



Healthy Eating in Ontario: What Do We Know?

An Analysis of Eating Behaviours,
Food Literacy and Food Insecurity Indicators

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This report has been prepared to provide a better understanding of the determinants of healthy eating of Ontarians and to help inform policy and program development surrounding healthy eating and chronic disease prevention.

Citation: Roblin L, Smith D, Purno N, Mehandra A. Healthy Eating in Ontario: What Do We Know? An Analysis of Eating Behaviours, Food Literacy and Food Insecurity Indicators. Toronto (ON): Nutrition Resource Centre, Ontario Public Health Association; 2017. September, 57 p.



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Summary

This exploratory study draws on existing population-based survey data sources to develop a cross-sectional analysis of several determinants of dietary intake among Ontarians, including healthy eating, food literacy and skills, and food insecurity. We also examined general health indicators, including self-rated health and physical activity. These indicators are important as they can be used to inform evidence-based and targeted policy and programming that promotes healthy eating and chronic disease prevention.

Stakeholders working in public health, arm's-length government organizations and academia were consulted to identify relevant indicators and an environmental scan was conducted to identify the best possible data sources. The Canadian Community Health Survey (CCHS) was identified as being the most comprehensive data source, and the annual core component of the 2014 CCHS was used, in addition to the Rapid Response Food Skills Modules from the 2012 and 2013 CCHSs. Selected indicators were stratified by socio-demographic characteristics (e.g. age, sex, household income and Aboriginal status, when available) to gain a greater understanding of how these determinants vary among these subgroups.

Specific indicators considered for healthy eating behaviours included fruits and vegetable consumption, self-perceived diet quality and adjusting a recipe to make it healthier. For food literacy and skills, the indicators selected were personal cooking skills; using Canada's Food Guide to learn about healthy eating and grocery shopping; participation of children in shopping for groceries; and helping with meal preparation or cooking. Data was not available for food literacy and skills indicators at the provincial level, so Canadian data was used as a proxy. For food insecurity, self-reported health and physical activity data from the 2014 CCHS was used.



A Summary of Key Findings

While the majority of Canadians report good or excellent eating habits, less than half (38.5%) consume fruits and vegetables more than five times or more per day. In Ontario, adults report the lowest prevalence of fruit and vegetable consumption compared to youth and older adults. Females report a higher prevalence of fruit and vegetable consumption than males and are also more likely to report adjusting a recipe to make it healthier. Adults report having more advanced cooking skills than youth, who report having more basic or intermediate cooking skills. A very small proportion of Canadians (8.9%) report using Canada's Food Guide to learn about healthy eating—and its use is highest among youth. More Canadians (31.1%), especially females and older adults, report using the food guide to shop for groceries. The majority of Canadian households report children participating in shopping for groceries and preparing meals. Moderate and severe food insecurity impacts 9% of households in Ontario, with a much higher prevalence in Aboriginal households (18%) and the lowest income households (27%). While the majority of Ontarians report their self-rated health as “very good or excellent”, a significantly lower proportion of older adults and people with Aboriginal status or low income report this. Over half of Ontarians report being moderately active or active, with the younger population (12-17 year olds) and those in higher income quintiles reporting being more active.

Healthy Eating

- **Almost half of Canadians, over the age of 12, report their eating habits as very good or excellent. Despite this, just 38% of Ontarians report consumption of fruits and vegetables five times or more per day.** In Ontario, adults (18-65 years old, 37%) reported the lowest prevalence of fruit and vegetable consumption compared to youth (12-17 years old, 43%) and older adults (over 65 years old, 44%). Females (45%) report significantly higher prevalence of fruits and vegetable consumption compared to males (32%). Consuming fruits and vegetables five or more times per day increases across income quintiles, with the lowest quintile having significantly lower consumption compared to the highest quintile. There is no significant difference between Aboriginal populations and non-Aboriginal households with regards to fruits and vegetables consumed five or more times per day.



- **Almost two-thirds (63%) of Canadians self-report adjusting a recipe to make it healthier**, with adults having the highest prevalence for adjusting recipes, while only about one-third of youth report this behaviour. In Canada, a significantly higher proportion of females (75%) compared to males (51%) report adjusting a recipe to make it healthier.
- **Almost half of Canadians report adjusting a recipe to make it healthier by reducing fat content or adding more fruits and vegetables.** Canadians also make efforts to reduce salt and sugar content, while few make a recipe healthier by adding whole grains. Less than one-third of Canadian youth report they adjust a recipe to make it healthier by reducing fat, sugar and salt content or by choosing whole grains; however, almost half of youth report adding more fruits and vegetables to a recipe to make it healthier. Similarly, almost half of Canadian females and males report adjusting a recipe to make it healthier by adding more fruits and vegetables. A greater proportion of females than males report adjusting a recipe to make it healthier by reducing fat or sugar content and by increasing whole grains. A greater proportion of males report adjusting a recipe to make it healthier by reducing salt content.

Food Literacy and Skills

- **The majority of adults (18-65 years old) report having more advanced cooking skills (81%)**, while a large portion of older adults (>65 years old) report having more advanced (73%) and average (22%) cooking skills. **Canadian youth report having basic or intermediate food skills (90%)**, such as preparing a simple meal or following a recipe.
- **Most Canadians (92%) report good or very good skills in “peeling, chopping or slicing vegetables or fruits”.** Across age groups, youth report the lowest percentage of good or very good self-perceived skills in peeling, chopping or slicing vegetables and fruits, compared to adults and older adults. While a high percentage of the Canadians surveyed report good or very good skills in “cooking a raw piece of meat, chicken or fish”, **there is a significant lower percentage of youth compared to adults and older adults (52% versus 92% and 89%, respectively) who report good or very good meat, chicken or fish preparation skills.** While the majority of both females and males report a good or very good skill level for “peeling, chopping or slicing vegetables and fruits” and



for “cooking a raw piece of meat, chicken or fish”, percentages are significantly higher among females than males. There is no significant difference in self-perceived food skills between Aboriginal and non-Aboriginal households.

- **Overall, Canada’s Food Guide (CFG) is not well utilized by Canadians to learn about healthy eating or to aid with grocery shopping.** A very small proportion of Canadians (9%) report consulting CFG to learn about healthy eating. The prevalence of consulting CFG to learn about healthy eating is higher among females compared to males, and decreases across age groups with youth having the highest prevalence compared to adults and older adults. A greater proportion of Canadians (31%) report using CFG while shopping for groceries rather than consulting it to learn about healthy eating, with a significantly higher proportion of older adults using CFG for grocery shopping compared to adults. Canadian females also show a significantly higher prevalence of consulting CFG for grocery shopping compared to males. There is no significant difference between Aboriginal and non-Aboriginal households with regards to using CFG to learn about healthy eating or using CFG to shop for groceries.
- **A high percentage of Canadian households report the participation of children in shopping for groceries (68%) and helping to prepare meals or cook food (60%).** Aboriginal households report significantly more children involved in preparing meals (76%) compared with non-Aboriginal households (59%).

Food Insecurity

- **In Ontario, 6% of children and 8% of adults (>18 years old) are living in households with moderate or severe food insecurity** (based on 2014 CCHS data). The percentage of older adults (> 65 years old) living in households with moderate or severe food insecurity is significantly lower (3.5%) compared to adults (18-65 years old) (9%) and children (6%). Overall, 9% of households in Ontario experience moderate or severe food insecurity. Households in the lowest income quintile have a significantly higher prevalence of food insecurity (27%) compared to households in highest income quintile (1%). The prevalence of food insecurity is significantly higher in Aboriginal households (18%) compared to non-Aboriginal households (9%).



Self-Reported Health and Physical Activity

- **The majority (60%) of Ontarians report their self-rated health as very good or excellent.** A significantly lower proportion of older adults (46%), people with Aboriginal status (50%) and individuals in the lowest income quintile (45%) report very good or excellent health status compared to their respective socio-demographic counterparts.
- **Over half (53%) of the total population of Ontario self-report being moderately active or active for leisure time physical activity.** The prevalence of being moderately active or active was significantly higher in the younger age group (12-17 year olds) compared to adults and older adults and for those in higher income quintiles compared to lower income quintiles. There is no statistically significant difference found in self-reported physical activity between males and females or between Aboriginal and non-Aboriginal populations.

Limitations of this Study

Overall, the data available to assess the determinants of healthy eating and dietary intake in Ontario is very limited. For this study, we were only able to access data on vegetable and fruit intake, self-rated eating habits, and adjusting recipes to make them healthier to measure eating behaviours. Furthermore, we were only able to access data on the food literacy and skills of Canadians, not Ontarians. **While we had data on moderate and severe (not marginal) food insecurity for Ontario, data on other important determinants of healthy eating—such as dietary intake, the food environment, and geographic or cultural influences—is not available.** The lack of data on these important determinants of dietary intake makes it difficult to paint a complete picture of healthy eating among Ontarians. Moreover, **the gap in dietary intake data from the CCHS nutrition component spans more than a decade in Canada, and this lack of data limits the authors' ability to assess the dietary intake of Ontarians and draw relationships between the determinants of healthy eating and diet quality or dietary intake.** While data collected in the 2015 CCHS Nutrition survey became available in July 2017, it was not be considered in this report due to timing.



Future Recommendations

Future initiatives should address developing and administering standardized indicators and surveys within the province of Ontario that provide population-representative estimates of important determinants of healthy eating. This includes, but is not limited to: eating behaviours, including food and nutrient intake (such as fat, sugar, sugar-sweetened beverages, sodium etc.); food literacy; food insecurity (including marginal); the food environment; and geographic and cultural influences, as well as more regular reporting on the dietary intakes and nutritional status of Ontarians.

More importantly, such determinants of healthy eating should be analyzed in relation to current measures of diet quality and dietary intakes to determine which factors have the most impact among various sub-sets of the Ontario population. This would enable planning and assessing the impact of evidence-informed and targeted interventions and policies to improve population nutrition status; preventing and reducing obesity and other non-communicable chronic diseases; and reducing health inequities and associated health care costs in Ontario. Additionally, **this data should be centrally housed to be more easily accessed and utilized by public health policy and program decision makers** and others as benchmarks and indicators for provincial program and policy planning.



Introduction: Why this Study?

Poor dietary intake, poor diet quality and rising obesity rates have been a global public health concerns for some time now, as these increase the risk of chronic disease and costs to the health care system, while negatively impacting the health and wellness of individuals and communities (1). In Ontario, 54% of all adults and 23% of total youth had excess weight or obesity in 2014, according to self-reported weight and height data (2,3). Adults having excess weight or obesity are at an increased risk for a range of diet-related, non-communicable diseases, including type 2 diabetes, hypertension, cardiovascular disease and certain cancers (4). Children and adolescents with obesity also exhibit a higher prevalence of cardio-metabolic conditions, such as impaired glucose tolerance and hypertension (5-7). Additionally, evidence suggests that children and adolescents with obesity are more susceptible to bullying, which lowers self-esteem and can lead to adverse health outcomes in adulthood (8-10). In Ontario, individuals with obesity have higher physician and hospitalization costs compared to individuals with a Body Mass Index (BMI) in the “normal” or “least at-risk” range for developing health problems (11,12,13). Multiple studies have emphasized the urgency to address obesity in the population due to its impact on human health and burden on health care systems (1,14). One of the key recommendations for reducing obesity rates is to improve the eating habits and nutrition status of populations (1,14). This will involve addressing the determinants of healthy eating, including food literacy and food insecurity.

A healthy diet is a key factor in maintaining a healthy body weight and preventing chronic disease (15). However, people who do not have excess weight/ obesity can also be at risk for nutrition-related diseases due to poor diet quality. Multiple countries promote dietary guidelines that recommend a dietary pattern that is low in saturated fat, salt and sugar, and high in whole grains, fibre, fruits and vegetables (16,17,18). Consuming five or more servings of fruits and vegetables per day has been shown to reduce the risk of heart disease and stroke by about 20% (15). Contrary to these guidelines, over the past decades, there has been a “nutrition transition”, that is, a shift in dietary and physical activity patterns that has coincided with epidemiological, demographic and economic changes (19-21). This transition has greatly changed Canadians’ food choices and eating patterns towards increased consumption of fats, sugars and salt, and decreased consumption of fruits and vegetables, legumes and whole grains (19-21). Results from the Canadian Community Health Survey (CCHS) cycle 2.2, nutrition (2004), Canada’s last national nutrition survey, confirmed that more



than half of the Canadian population failed to meet the minimum recommended daily intake of fruits and vegetables (21,22) and a considerable proportion of Canadians' daily energy intake was derived from foods high in fat, sodium and sugar (21,23-25). Research also confirms that the current dietary patterns of Canadian children and adults are not consistent with the recommended healthy eating guidelines for Canadians (26,27).

The food environment can also impact dietary intake, eating behaviours and diet-related health outcomes (28, 29). Over the past decades, changes in the food environment have increased access to and the marketing of unhealthy foods and beverages and the proliferation of fast food outlets (28). Some food environments are called “obesogenic”, as they don't enable healthy dietary choices and make it difficult to choose whole foods and healthier prepared and prepackaged options (29). Food environments generally have encouraged overconsumption of unhealthy foods and beverages—and this can lead to excess weight and increased risk of chronic disease (28). In some areas, particularly areas of extreme poverty or very rural or isolated communities, access to healthy and affordable foods may be very limited, making it difficult to obtain healthy foods (30, 31).

There has also been a simultaneous transition in food preparation and cooking skills, with a general decline in food and nutrition-related knowledge and skills among Canadians (32,33). Frequency of cooking from basic ingredients has greatly decreased, in part due to increased consumption of processed and convenience food products becoming a norm in Canadian households (32,34,35). Along with this, the transference of traditional and basic cooking skills to children and adolescents from parents has potentially decreased (32). As evidence demonstrates that the involvement in food preparation is associated with higher diet quality among adolescents and young adults, the loss of food literacy and skills among the Canadian population is concerning (36-39). Moreover, food literacy programs, especially those involving experiential or “hands-on” learning, such as food preparation, taste testing, and gardening, have been shown to increase vegetable and fruit intake as well as willingness and preference for these healthy foods among children (40, 41).

In 2014, the Canadian Community Healthy Survey (CCHS) data analyzed by PROOF's Food Insecurity Policy Research Team showed 12% of Ontario households to be food insecure, meaning they had inadequate or insecure access to food because of financial constraints (30). Food insecurity is a serious public health concern as it affects the



overall health and wellness of individuals, negatively impacts mental health (30,42), increases risk for chronic disease and contributes to higher healthcare costs (43).

Healthy eating and physical activity reduces the risk for many leading chronic health conditions (14), however, the lack of consistent, fulsome and available data representing dietary intakes and other determinants of healthy eating at the local and provincial levels in Canada makes it challenging to monitor such health promoting behaviours. In the past decade, policy and program decision-makers and community health practitioners have had to use nutrient intake data collected in the 2004 CCHS cycle 2.2, nutrition (a themed component administered in addition to the core component) (44).

The more recent Canadian Health Measures Surveys (CHMS) provide some population health data, but reports primarily focus on body weight and physical activity levels of Canadians while data on foods and beverages consumed (via food frequency questionnaires or other validated tools) and important healthy eating behaviours (as mentioned in the introduction) have not been reported consistently and are not available provincially (45). While Canadian fruit and vegetable consumption data has been collected annually since 2007 in CCHS (46), other data on food and nutrient intakes, eating habits and determinants of healthy eating are required to provide a more comprehensive description of the dietary patterns and eating behaviours of Ontarians and to provide benchmarks to measure the impact of healthy eating programs, interventions and policies.

The last CCHS annual cycle which provided the full themed-component of nutrition data and measuring dietary intakes and consumption patterns was in 2004 (44). There has been a ten year gap in fulsome data collection as the next full nutrition component was not done until CCHS 2015, for which results are pending to provide more up-to-date information. Relying on nutrition survey data that is more than a decade old is insufficient for policy and program decision-makers to analyze trends, or develop evidence-based and targeted policies, programs and interventions to improve population health and reduce health inequities.



Purpose of this Study

This exploratory study draws on existing population-based survey data sources to develop a cross-sectional analysis of several determinants of dietary intake among Ontarians, including eating behaviours, food literacy and food insecurity.

The objectives of this study were to: 1) provide population-representative estimates of healthy eating behaviours, food literacy and skills, household food insecurity, as well as other health indicators; 2) stratify estimates across key socio-demographic factors; and 3) identify gaps in diet-related data sources required to paint a more adequate picture of the range of dietary determinants and key factors which influence eating behaviours and food choices of Ontarians.

Results from this study will serve to inform dietitians and health intermediaries, all levels of government, researchers and other stakeholders about the current state of important determinants of dietary intake among the Ontario population. This study may aid in the development of more targeted policies and interventions that aim to increase healthy eating among Ontarians by addressing the determinants of healthy eating—such as the promotion of food literacy, including nutrition related knowledge and skills, and interventions that target household food insecurity.



Methods and Data

Stakeholders were consulted to identify relevant indicators for analysis and an environmental scan was conducted to identify appropriate and available population-based survey data sources to select indicators that describe determinants of dietary intake among Ontarians, such as eating behaviours, food insecurity and food literacy.

Expert advisory: Two advisory groups—the Ontario Chronic Disease Prevention Alliance (OCDPA) and the Ontario Food & Nutrition Strategy Group (OFNS)—identified relevant healthy eating indicators considered for this report. The OCDPA identified core indicators to inform chronic disease prevention with respect to several risk factors, including unhealthy eating (47). A project undertaken by the Ontario Public Health Association determined food access and food literacy indicators for the Ontario Food & Nutrition Strategy (48). Both advisory groups included representatives from public health, arm’s-length governmental organizations and academia, and the work was funded by the Public Health Agency of Canada – Ontario with contributions by the Ontario Public Health Association. While these advisory committees identified many relevant key indicators, a major challenge was the lack of available data to measure them. Thus, the final selection of indicators was limited to those for which existing data sources was available.

Selected Data Sources: The Canadian Community Health Survey (CCHS), an annual cross-sectional national survey conducted by Statistics Canada (49), was identified as being the most comprehensive population-representative survey data source.

The following components were selected from the different CCHS cycles:

- 1) Knowledge, Planning and Transference of Food Skills - 2012 Rapid Response (Food Skills 1) (50)
- 2) Awareness and Usage of Canada’s Food Guide - 2012 Rapid Response (Food Skills 1) (50)
- 3) Mechanical Skills and Food Conceptualization - 2013 Rapid Response (Food Skills 2) (51)
- 4) Annual component of the 2014 CCHS (core component and the Food Security Module) (52)

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The sample sizes available for our analyses were as follows:

- 9, 559 Canadians from the 2012 Rapid Response (Food Skills 1)
- 9, 712 Canadians from the 2012 Rapid Response (Food Skills 1): Awareness of Canada's Food Guide Modules
- 10, 155 Canadians from 2013 Rapid Response (Food Skills 2)
- 19, 748 Ontarians from the CCHS 2014 annual component

Note: The rapid response modules do not provide population-representative estimates for the province, but rather national estimates. Thus we have used national data as a proxy for the Ontario context.

Study Population: The CCHS represents the population aged 12 years and older living in private dwellings in the ten provinces and three territories across Canada. Individuals living on reserves and Aboriginal settlements, full-time members of the Canadian Forces, institutionalized individuals and residents of two health regions in the province of Quebec are not included in the survey. Overall, the excluded population is representative of less than 3% of Canadian population who are aged 12 years and older.

To complete the CCHS core component, one person per household is selected based on their age and household composition. Data is collected using Computer Assisted Interviewing. Three sampling frames are used to select the study sample, and the sampling design and size is developed to provide estimates that are representative at the provincial and health region levels (50, 52).

Rapid Response Modules are buy-in components of the CCHS and are administered to a random subsample of the annual CCHS sample (across provinces only; territories are excluded from the Rapid Response sampling frames). They are offered to governments and organizations interested in obtaining information on specific issues related to the health of the population of Canada. The three Rapid Response Modules used in this study were bought by Health Canada to obtain information on food skills among the Canadian population (52). Rapid Response Modules are designed to provide national level estimates and are not applicable for the calculation of population-representative estimates for the provinces (52). The data sources were reviewed for potential survey questions that would be informative of the determinants of dietary intake among Ontarians (or Canadians where data for Ontarians were not available or representative).

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Select questions were operationalized into indicators and divided into four clusters:

- 1) Cluster 1: Healthy Eating
- 2) Cluster 2: Food Literacy and Skills
- 3) Cluster 3: Food Insecurity
- 4) Cluster 4: General Health Indicators

Specifically, this report examined three determinants of dietary intake among Ontarians: healthy eating behaviours, food literacy and skills, and food insecurity. Data was further stratified by age, sex, Aboriginal status and household income quintile, where available.

Cluster 1: Healthy Eating: For healthy eating behaviours, this study examined data on the consumption of fruits and vegetables five or more times per day (from the 2014 CCHS annual component) (52), self-perceived diet and making adjustments to recipes “to make them healthier” (from the 2013 Rapid Response Food Skills 2 component) (51).

Cluster 2: Food Literacy and Skills: For food literacy and skills, this study examined data on personal cooking skills from basic ingredients among Canadian youth (12-17 years old), adults (18-65 years old) and older adults (65 years old and above) (from 2013 Rapid Response Food Skills component)(51). Food literacy and skills was also briefly analyzed based on the percentage of Canadians whose self-perceived skills in “peeling, chopping or slicing vegetables or fruits” are good or very good and the percentage who rate their skills in cooking “a piece of raw meat/chicken/fish” as good or very good (from the 2013 Rapid Response Food Skills components) (51). The authors of this study also considered data showing the percentage of the Canadian population that consults or uses the *Canada’s Food Guide* to learn about healthy eating or shop for food, and the participation of children in household grocery shopping and food preparation (from 2012 Rapid Response Food Skills 1 component) (50).

Cluster 3: Food Insecurity: For food insecurity, this study examined data obtained from the 2014 CCHS that measured the percentage of households in Ontario experiencing “moderate” or “severe” food insecurity (52). Moderate food insecure households includes those that indicate compromise in quality and/or quantity of food consumed while severe food insecure households includes those that indicate reduced food intake and disrupted eating patterns (53). In describing food insecurity, the authors have used an approach consistent with Statistics Canada and Health Canada in population health reports and, thus, have not reported on “marginal” food insecurity.



Cluster 4: General Health Indicators: This study also examined CCHS 2014 data on general health indicators, such as self-rated health and physical activity status, as well as basic socio-demographic variables (sex, age, Aboriginal status and household income) (52).

Analysis: CCHS share data files were used for all analyses purposes. Descriptive analyses were conducted by calculating prevalence rates and 95% confidence intervals for all estimates. Given the multistage stratified survey design, all estimates were calculated using weighted samples provided by Statistics Canada. Subgroup estimates were stratified by key socio-demographic variables, as appropriate. All analyses were carried out using SAS Enterprise Guide 5.1. Variance estimates were generated using the bootstrap variance SAS program and bootstrap re-sampling weights, provided by Statistics Canada with the CCHS Product. All estimates are based on self-reported survey data. Quintiles were provided by Statistics Canada with lower quintiles representing lower income population.



Results: What We Found

Cluster 1: Healthy Eating

The 2013 Rapid Response Food Skills 2 survey shows that overall, 46% of Canadians report their eating habits as “very good or excellent”; and a significantly higher proportion of older adults (60% for adults 18-65 years old) report having “very good or excellent eating habits” compared to other age groups (45% for youth 12-17 years old and 44% for adults 18-65 years old) (Table 1).

Using CCHS 2014 data, less than half of Ontarians (39%) report consumption of fruits and vegetables five times or more per day (Table 1). Adults (18-65 years old) in Ontario report the lowest prevalence of fruits and vegetable consumption (37%), compared to youth (12-17 years old) (43%) and older adults (>65 years old) (44%). Females report significantly higher prevalence of consuming fruits and vegetables (45%) compared to males (32%). Consuming fruits and vegetables five or more times per day increases across income quintiles with the lowest quintile having significantly lower consumption compared to the highest quintile (Table 1). There was no significant difference between Aboriginal and non-Aboriginal households with regards to fruits and vegetables consumed five or more times per day.

The 2013 Rapid Response Food Skills 2 data shows that, overall, 63% of Canadians report adjusting recipes to make them healthier (Table 1). Canadian adults (18-65 years old) have the highest prevalence for adjusting recipes (68%), whereas 35% of youth (12-17 years old) and 52% of older adults (>65 years old) report adjusting recipes to make them healthier. A significantly higher proportion of females (75%) compared to males (51%) report adjusting recipes to make them healthier (Table 1).

Almost half of the total population report adjusting a recipe to make it healthier by reducing fat content and/or adding more fruits and vegetables (Table 2). Canadians also made efforts to reduce salt and sugar content, while fewer (33%) made a recipe healthier by adding whole grains (Table 2). Less than one-third of Canadian youth (12-17 years old) report adjusting a recipe to make it healthier by reducing fat, sugar and salt content or by choosing whole grains, although 47% of youth report adding more fruits and vegetables to a recipe (Table 2). Similarly, almost half of Canadian females (47%) and almost half of Canadian males (48%) report adjusting a recipe to make it healthier by adding more fruits and vegetables (Table 2). A greater proportion of



females, compared to males, report they have adjusted a recipe to make it healthier by reducing fat content (females 52%; males 47%); by reducing sugar content (females 51%; males 38%); and by increasing whole grains (females 36%; males 30%) (Table 2). Contrarily, a greater proportion of males report adjusting a recipe to make it healthier by reducing salt content (males 44%; 38% females) (Table 2).

Cluster 2: Food Literacy and Skills

Data from the 2013 Rapid Response Food Skills 2 component examined food skills in the Canadian population using six questions to identify whether respondents had basic or more complex food skills. As the Rapid Response modules are administered with a sub-set of the sample population, estimates are only population-representative at the national level. The majority of youth (12-17 years old) report basic or intermediate skills (90.5%), such as preparing a simple meal or following a recipe (levels 1-4) (Figure 1A). The majority of adults (18-65 years old, 81%) and older adults (> 65 years old, 73%) report having more advanced cooking skills (levels 4-6), whereas a large portion of older adults (> 65 years old, 22%) also report having average cooking skills (level 3) (Figures 1B and 1C).

The 2013 Rapid Response Food Skills 2 data shows a very high percentage (92%) of Canadians report good or very good skills in “peeling, chopping or slicing vegetables or fruits” (Table 3). Across age groups, youth (12-17 years old) report the lowest percentage (78%) of good or very good self-perceived skills in peeling, chopping or slicing vegetables and fruits compared to adults (18-65 years old, 93%) and older adults (> 65 years old, 92%). While 88% of the total population surveyed report good or very good skills in “cooking a raw piece of meat, chicken or fish” (Table 3), a significantly lower percentage of youth (52%) report having good or very good meat, chicken or fish preparation skills when compared to adults (92%) and older adults (89%) (Table 3). While the majority of both females and males report good or very good skill levels for “peeling, chopping or slicing vegetables and fruits” (females 94%; males 90%) and for “cooking a raw piece of meat, chicken or fish” (females 91%; males 86%), percentages were higher among females than males. There were no significant differences in self-perceived food skills reported between Aboriginal and non-Aboriginal households (Table 3).

The 2012 Rapid Response Food Skills 1 data capturing awareness and knowledge of Canada’s Food Guide (CFG) indicates that a very small proportion (9%) of Canadians consult CFG to learn about healthy eating in the past six months (Table 4). The



prevalence of consulting CFG to learn about healthy eating is higher among females (11%) compared to males (6%), and decreases across age groups with youth (12-17 years old) having the highest prevalence (15%), adults (18-65 years old) less than youth (9%) and older adults (>65 years old) having the lowest prevalence (5%) (Table 4). A greater proportion of Canadians (31%) report using CFG while shopping for groceries rather than consulting it to learn about healthy eating (9%), with a significantly higher proportion of older adults over 65 years of age (37%) using CFG for grocery shopping compared to adults aged 18-65 years (30%) (Table 4). Canadian females also show a significantly higher prevalence of consulting CFG for grocery shopping (38%) compared to males (23%) (Table 4). There were no significant differences between Aboriginal and non-Aboriginal households with regards to using CFG to learn about healthy eating or using CFG to shop for groceries (Table 4).

According to 2012 Rapid Response Food Skills 1 data, a high percentage of Canadian households report the participation of children in shopping for groceries (68%) and helping to prepare meals or cook food (60%) (Table 5). Aboriginal households report significantly more children involved in preparing meals (76%) compared with non-Aboriginal households (59%) (Table 5).

Cluster 3: Food Insecurity

Without reporting on marginal food insecurity, this study found several significant associations using 2014 CCHS data. In Ontario, 6% of children and 8% of adults (>18 years old) live in households with moderate or severe food insecurity (Table 6). The percentage of older adults (>65 years) living in households with moderate or severe food insecurity is significantly lower (3.5%) compared to adults (18 - 65 years old) (9%) and children (6%) (Table 6). Overall, 9% of households in Ontario experience moderate or severe food insecurity (Table 7). Households in the lowest income quintile have a significantly higher prevalence of food insecurity (27%) compared to households in highest income quintile (1%) (Table 7). The prevalence of food insecurity is significantly higher in Aboriginal households (18%) compared to non-Aboriginal households (9%) (Table 7).



Cluster 4: General Health Indicators

The population prevalence for very good or excellent self-rated health was 60% for Ontario, according to CCHS 2014 data (Table 8). A significantly lower proportion of older adults (>65 years old, 46%), people with Aboriginal status (50%) and individuals in the lowest income quintile (45%) report very good or excellent health status compared to their respective socio-demographic subgroup counterparts (Table 8).

2014 CCHS data indicates 50% of the total population of Ontario self-report being moderately active or active for leisure time physical activity (Table 9). The prevalence of being moderately active or active was significantly higher (69%) among the younger age group (12-17 years old) compared to 52% of adults (18-65 years old) and 47% of older adults (>65 years old) (Table 9). Higher income quintiles show higher prevalence rates of being moderately active or active (quintile 4, 58%; quintile 5, 65%) compared to lower income quintiles (quintile 2, 47%; quintile 1 42%). There was no statistically significant difference found between self-reported physical activity between males and females or between Aboriginal and non-Aboriginal populations.



Discussion of Results

Based on the data considered for this report, only a few conclusions can be made about the determinants of dietary intake and healthy eating behaviours among Ontarians specifically. While limited, the Ontario and Canadian data do provide some insights that may be considered by policy makers and health professionals in the Ontario context.

Healthy Eating

Data analyzed for the Cluster 1: Healthy Eating indicators were obtained from both the CCHS core component population sample as well as the Rapid Response (Food Skills 1 and 2) modules sub-sample populations. As such, some population estimates are representative at the provincial level (i.e. those based on CCHS 2014 core component data), while others are only representative at the national level (i.e. those based on CCHS 2012 and 2013 rapid response food skills surveys) and, thus, are considered proxy for provincial data.

In terms of healthy eating, the authors examined self-perceived eating habits, fruit and vegetable consumption and whether and how individuals have modified a recipe to make it healthier. While almost half (46%) of Canadians report their eating habits as “very good or excellent”, our analysis shows that less than half of Ontarians (39%) consumed fruits and vegetables five times or more per day. As fruit and vegetable intake is often used as a marker for healthy eating habits, our findings illustrate that an increase in consumption of fruits and vegetables needs to be targeted in all age groups. While this study did not look at the actual number of servings of fruits and vegetables consumed the last CCHS cycle 2.2, targeting nutrition in 2004, showed that no age group met the minimum recommended number of servings for fruits and vegetables (54). According to Canada’s Food Guide, teens and adults should consume at least seven (females) to eight (males) servings of fruits and vegetables each day (17). Forthcoming eating behaviour data has been collected in the 2015 CCHS cycle, themed nutrition component, and will provide much needed information on actual food and nutrient intakes in Canadians and Ontarians in order to make associations between determinants of healthy eating and diet quality/dietary intake.

Consuming five or more servings a day of fruits and vegetables was significantly lower in the lowest income quintile. This may be due to a lack of household income or limited supply of available or affordable fruits and vegetables in the communities where they



live. Currently, the only indicator available to consistently track the cost and affordability of foods in Ontario is the Nutritious Food Basket (55). In some communities, the cost of a Nutritious Food Basket can be much higher than in other communities. For example, in Northern Ontario, the average Nutritious Food Basket costs \$669.24 more for a family of four over the course of the year in comparison to the average Nutritious Food Basket in southern Ontario (56). In order to improve healthy eating among the Ontario population, there is a need to address the social determinants of health, such as lack of income and cost of housing, which are directly linked to food insecurity, and to ensure access to equitably-priced fruits and vegetables in low income neighbourhoods, particularly in Northern and remote regions of Ontario (30,56).

Results of this study show a large proportion (63%) of Canadians self-report adjusting a recipe to make it healthier, however, fewer youth (35%) reported doing so. Females (75%) are more likely to adjust a recipe to make it healthier, compared to males (51%), which may suggest that females are more health conscious about health than males; that females have the skills required to make a healthy recipe change; or that a greater proportion of females are preparing family meals than males. However, these specific conclusions cannot necessarily be drawn from the data considered here. When survey respondents were asked more specifically about how recipes were adjusted, less than half of Canadians report adjusting a recipe to make it healthier by reducing fat content (50%); salt content (40%); sugar content (46%); by adding more fruits and vegetables (47%); or by increasing or adding whole grains (33%). This further breakdown, looking more closely at how recipes are adjusted to be healthier, suggests that fewer Canadians may actually be adjusting recipes to make them healthier as reported in the yes or no question (Table 1). Reducing fat content and adding more fruits and vegetables seem to be the most favourable way recipes are adjusted. Notably, one self-reported food skill where the proportion of males was significantly higher than females was in adjusting a recipe to lower salt content. This may be related to nutrition knowledge acquired from physicians and/or dietitians to treat or prevent health conditions; for example, sodium's effect to raise blood pressure and increase risk for hypertension, stroke and cardiovascular disease (57). A higher proportion of males taking this action corresponds with higher rates of hypertension among males (aged 12 or older) compared to females in the general Canadian population (58).

Looking across age groups, on the whole, youth report the least amount of recipe adjustments. However, when it comes to adding fruits and vegetables to a recipe, 47% of youth (12-17 years old) report doing so; a proportion of youth which is similar to the adult age group (18-65 years old, 48%) and older adults (>65 years old, 43%). Thus, it



could be said that a significant proportion of Canadian youth seem to be aware that adding fruits and vegetables to recipes makes them healthier and, perhaps, understand the overall health benefits of fruits and vegetables in general.

Food Literacy and Skills

Data analyzed for the Cluster 2: Food Literacy and Skills indicators were obtained from the CCHS Rapid Response (Food Skills 1 and 2) modules' sub-sample populations in 2012-2013. As such, population-representative estimates are only available at the national level and, thus, are used by proxy for provincial data.

This study found that over 90% of the Canadian population rate themselves as having good or very good skills in peeling, chopping or slicing vegetables or fruit. Likewise, over 88% of the Canadian population report having good or very good skills in cooking a piece of raw meat/chicken/fish. However, these food skills do not necessarily lead to healthy meals, as we are not aware if these foods were processed or how they were prepared. No associations can be made between food literacy and skills reported in this study and diet quality or actual dietary intakes. Despite these high self-reported ratings on food skills, fewer Canadians (63%) report adjusting a recipe to make it healthier, and less than half report adjusting a recipe to make it healthier by reducing fat, salt, or sugar content or by adding more fruits or vegetables and whole grains. These data indicate that Canadians may feel more confident in their food preparation and cooking skills than in their nutritional knowledge or ability to improve recipes to increase their healthfulness. This highlights that guidance may be provided regarding healthy food preparation methods and healthy recipe adjustments to increase food literacy, self-efficacy and transference of nutritional knowledge and food skills to increase healthy eating behaviours.

In terms of food skills, Canadian youth self-perceive their “cooking skills from basic ingredients” as more basic compared to adults and older Canadians. More than half of youth surveyed (54%) report they could do simple skills, such as boil an egg, make a grilled cheese sandwich or prepare a simple meal, but nothing too complicated (Figure 1A). While most Canadian adults and older adults perceive their skills as good or very good in cooking a piece or raw meat/chicken/fish, just over 50% of youth feel this way. The proportion of youth who self-rate skills in peeling, chopping or slicing vegetables or fruits as good or very good is high (78%), but still lower than reported by adults and older adults. This may suggest that youth are not getting enough food skills training or opportunities to prepare meals at home or in school.



In Ontario, home economics, including food literacy education and training, was removed several decades ago from grades 7 and 8, corresponding with a time where there has been a proliferation in processed and ready to consume foods and marketing of unhealthy food and beverages (34). Curriculum related to healthy eating is now integrated in the elementary health and physical activity curriculum (59). While seven high school courses dealing with food and nutrition were added to the Ontario curriculum in 2013, none of these are mandatory (60), which is unfortunate as they can play a role in increasing food literacy among adolescents and help build the needed skills to independently choose and prepare healthy food. It is estimated that approximately one-third of Ontario students who entered Grade 9 from the 2005/06 to 2009/10 school years earned one or more credits in a course that included a food literacy component during their secondary school education (61). A study of Ontario youth found that while school is an important place to learn these skills, classes need to go beyond theory and include shopping for healthy food and preparing basic foods at home with limited resources (62). A recent study exploring Home Economics Food and Nutrition (HEFN) education in Manitoba found that enrolment of youth in HEFN classes decreased significantly between grades 7 and 12 and qualitative reports from home economics teachers indicate that fewer children were learning general cooking skills at home (63). While our study was not able to analyze trends in food skills due to the cross-sectional nature of our data and analysis, our results do show that Canadian youth lack advanced food skills. A recent review of research shows that interventions or programs that include food literacy and hands-on education for younger children is effective to increase intake of, preference for and willingness to try vegetables and fruit (64). This would make a strong case for bringing back food literacy programming in schools to improve population nutrition status, using a more upstream approach that targets Ontarians at a younger age to reduce risk for chronic diseases.

Overall, the data analyzed suggests that more Canadians are able to prepare vegetables and fruit compared to meat, and this is especially so among youth. This could point to less opportunity or desire for youth to prepare or eat meat, chicken or fish or it could simply be that youth are more familiar with how to prepare fruits and vegetables, however more data is needed to support these possible conclusions. One consistent theme that emerged across the study results was that Canadian males have fewer healthy eating behaviours and lower levels of food literacy and skills compared to females. Men report lower consumption of vegetables and fruit and were less likely to adjust a recipe to make it healthier. A recent study, released by Slater and Mudryj in 2016 (63) used the same food skills data as this study and found that significantly more women than men had good or very good food preparation skills when it came to cooking

raw meat, making a soup/stew or casserole from scratch and baking muffins or a cake. In addition, more females than males report using Canada's Food Guide. Like the findings on adjusting recipes, these findings could suggest that females, compared to males, could be more engaged in health-promoting behaviours (63), more concerned with diet and health in general, and/ or are more involved in domestic work within their households, including shopping and food preparation. Again, more data is required to support these potential explanations.

Regarding the use of Canada's Food Guide, very few Canadians (9%) consult it to learn about healthy eating. Between the range of age groups, youth had the highest prevalence (15%) of consulting CFG to learn about healthy eating, which is likely related to learning about CFG through school curriculum and activities. Compared to using CFG to learn about healthy eating, a higher proportion of Canadian adults (31%) and a significantly higher proportion of older adults (38%) report using CFG while shopping for groceries. Health Canada's evidence review of CFG showed that, while it is a sound tool to communicate nutrition and dietary guidance, its credibility has been challenged and it has been subject to much criticism (65). While 80% of consumers use a food label to make healthy choices (65), only 31% of Canadians use CFG when grocery shopping. These findings support the revision of CFG based on current evidence; increasing positive promotion and awareness of CFG; and supporting alternative resources and tools to improve health and food literacy in the Canadian population, especially among adults and males.

In the analysis of children's participation in shopping for groceries and preparing or helping to cook meals, results show that approximately two-thirds of households involve children in household food preparation and grocery shopping. This is consistent with the findings of a recent study using the same data source (66), as well as another study conducted among grade 5 children in Alberta (67). Our results also show that Aboriginal households are more likely to involve children in shopping for food and meal preparation compared to non-Aboriginal households. These behaviours should be encouraged among all families, as the involvement of children in cooking provides them with opportunities to learn about and try new foods during meal preparation and is shown to be effective for increasing vegetable and fruit intake (67, 68).



Food Insecurity

Food Insecurity (Cluster 3) indicators were obtained from the CCHS 2014 annual component; therefore, population-representative estimates are available at the provincial level. In describing household food insecurity, the authors have used the approach consistent with Statistics Canada and Health Canada in population health reports—reporting on people living in moderately and severely food insecure households.

Analysis of the 2014 CCHS data shows that roughly 9% of households in Ontario experience moderate or severe food insecurity and 6% of Ontario's children live in food insecure households. Recent publications have analyzed the same data, using a different methodology that includes reporting on households also experiencing marginal food insecurity (30). The inclusion of marginal food insecurity results in larger population estimates compared to those generated in this study (30) and, therefore, the results of this study may underestimate the magnitude of the problem in Ontario. Specifically, Tarasuk et al (2016) report the number of food insecure households in Ontario in 2014 is 12%, and that 17% of children live in food insecure households (30). The methodology used by Tarasuk et al (2016) considered all members of households classified as food insecure, whereas we have reported on food insecurity among those 12 years of age and older (30). Even so, our analyses noted significant associations that are consistent with Tarasuk et al (2016) (30), such as a greater percentage of households experiencing moderate to severe food insecurity being Aboriginal and from the lowest income quintile. The results of this study also show a lower percentage of older adults (over 65 years of age) living in food insecure households. Additional research by McIntyre et al (2015) (69) suggests this could be attributed to receiving old age security, which provides an income safety net.

Low income is the strongest predictor of food insecurity and research shows that social policies that provide income support and improve the material circumstances of vulnerable households could be the most effective way to reduce food insecurity (70). In April 2017, the Ontario Government announced that it will be launching a 3-year pilot project to assess whether a basic income can better support vulnerable workers, and improve health and education outcomes for people on low incomes (71). This pilot will examine whether giving people a basic income is an effective way to provide income security support to people living on low incomes. The pilot will assess outcomes including food security (reduced food insecurity), mental health, health and health care usage, among others (71). The Ontario government's Poverty Reduction Strategy Office



also announced its intentions to develop a community food security strategy in April 2017 (72). The strategy aims to address factors that influence affordability and considers community initiatives and innovation to increase access to food (72). Data on food insecurity and the cost of food in regions across the province will be required to evaluate the outcomes and impact of these initiatives.

Huisken et al (2017) report that adults in food insecure households have similar cooking, food preparation and recipe adjustment skills as adults in food secure households (73), which could suggest that food insecurity may have a stronger influence on diet quality. While shopping and menu planning behaviours are also shown to be similar in Huisken's study, the majority of adults (85%) in food insecure households report using a food budget compared to 43% of adults in food secure households who report using a food budget (73). This may suggest that interventions that increase household income, rather than food literacy alone, would have a greater impact on improving diet quality. In this study, similar analyses were not conducted to compare food literacy indicators between food secure and food insecure households, but rather a comparison was made between Aboriginal and non-Aboriginal households. Given that there is a greater prevalence of food insecurity among Aboriginal households compared to non-Aboriginal households (30), similar results to those reported by Huisken et al (2017) are expected. In this study, however, there were no significant differences in healthy eating, food literacy and skills, or other indicators between Aboriginal and non-Aboriginal respondents, with the exception of the proportion of households experiencing moderate or severe food insecurity.

General Health Indicators

Indicators analyzed in this study, including fruit and vegetable consumption, food insecurity, and the Cluster 4 indicators self-rated health and physical activity levels, have all demonstrated an inverse relationship across the income gradient, which indicates a social gradient to health and the life circumstances that promote health. This finding highlights the need for decision-makers to assume a targeted, upstream approach to health that addresses social determinants to promote health equity.



Limitations of this Study

Firstly, this study relied on large scale population-based survey data, which presents several limitations (49,74). Moreover, given the sampling frame for CCHS, the results of this study are not generalizable to households with children under the age of 12 years old (49). Similarly, the authors of this study frequently report national estimates in the absence of provincial data, and as most estimates generated are population-representative at the national level only, they are not necessarily generalizable to each province within Canada. In addition, CCHS data does not include individuals living on reserves or homeless people, which underestimates levels of food insecurity. It is also important to reiterate that all generated estimates were based on self-reported CCHS survey data, which can be subject to both social desirability and reporting bias (49,74,75,76). In a survey which aims to assess health behaviours and factors (e.g. dietary intake, healthy eating behaviours, physical activity, weight), the respondent may respond in a way as to avoid criticism or seek praise, contributing to decreased validity of data. It is a common phenomenon, particularly with healthy behaviours and healthy eating and nutrition data, that desirable behaviours are over-reported, while less desirable behaviours are under-reported (63,75,77). There is potential for additional inherent bias, including recall bias, which is the inability to accurately recall information needed to answer the question, or response bias, meaning differences between those who agree to participate in the survey (compared to non-participants) (49,77).

Secondly, the survey design for this study is cross-sectional, providing estimates at one point in time, which prohibits the authors' ability to draw associations between determinants of healthy eating and other variables examined in this study (49). Additionally, as much of the data examined in this study (i.e., Rapid Response Food Skills 1 and Rapid Response Food Skills 2) has never been collected through any other cycle of CCHS, no comparisons can be made between point estimates for previous years. This underscores the need for ongoing measurement and monitoring of a comprehensive range of indicators that measure the determinants of healthy eating, including current dietary intake data, to make the necessary associations between determinants of healthy eating and dietary intake/diet quality. In the absence of significant associations between determinants of healthy eating and dietary intake, it is not advisable to base programming and policy decisions on population estimates alone, as this may not lead to healthier eating and improved nutrition status among Ontarians.



Next, with limited data sources available for analysis, the authors were unable to identify relevant population-representative data sources for Ontarians with regards to food literacy and skills indicators, and thus, relied on national estimates. This points to a general lack in the availability of relevant data on this subject matter at the provincial level and emphasizes the need to consider this data gap in forthcoming population-based surveys. Regarding measuring food literacy and skills specifically, it is very difficult to define and measure food literacy and skills, especially as cooking is contextualized through historical, cultural and generational perspectives (78). There might have been differences in the understanding, interpretation and subsequent reporting of these specific indicators in the population over time, which reduces the validity of the study's results. There is a need for a consistent, standard way to measure food literacy at the provincial and national levels. Progress in Ontario is being made through the work of 16 health units involved in the Locally Driven Collaborative Group supported by Public Health Ontario (79). This group has defined food literacy and its attributes and will be further investigating a tool to measure food literacy in the context of public health (79).

Similarly, this study only used fruit and vegetable consumption, self-rated diet quality perception and adjusting a recipe to make it healthier as measures of healthy eating behaviours due to limitations in data availability. Not all of the healthy eating behaviours were population-representative at the provincial level and, thus, national estimates were again used as proxies. Although fruit and vegetable consumption is a widely used measure to reflect diet quality, other crucial and robust measures such as calories, salt, fat, fibre, sugar, sugar-sweetened beverage and fast and processed food intake are needed to better reflect dietary habits and nutritional status of the population, particularly for youth.

It is important to emphasize that our selection of indicators is far from exhaustive. Data on other indicators were recommended by The Ontario Chronic Disease Prevention Alliance (OCDPA), for example: sodium intake (both total consumption and percent of population above the tolerable upper intake level), sugar consumption and percentage of population drinking sugar sweetened beverages daily (80) as healthy eating and nutrition measurements. Cultural or traditional influences on eating and various aspects of the food environment, such as the Association of Public Health Epidemiologists in Ontario (APHEO) work on developing a core indicator for urban geographic food retail accessibility (81), may also be important to consider.



The Ontario Food and Nutrition Strategy group, for example, recommends the following food access and food literacy indicators be collected: percentage of Ontario households that are food insecure (marginal, moderate and severe), regional cost of Nutritious Food Baskets in Ontario, number of existing provincial and/or municipal prevention policies as they relate to the risk factor of unhealthy eating, percentage of secondary school students in Ontario who earned at least one credit in a course that included a food skills component, number of persons accessing an Eat Right Ontario Dietitian (phone or by email), and the number of dietitians practicing in Family Health Teams and Community Health Centers (48).

Monitoring and Surveillance Data Challenges

The lack of monitoring and surveillance of the determinants of healthy eating and dietary intake of Canadians, particularly at the provincial level, is a challenge as data gaps make it difficult to access baseline data and track trends. The 2015 CCHS nutrition-themed component is the first complete national survey of nutrient intakes of Canadians since 2004. The 2015 CCHS nutrition survey data was released in July 2017 as was not considered in this report. The 2012 and 2013 Response Surveys provided some details about the food literacy and skills of Canadians and use of Canada's Food Guide, however this data is not robust enough to use at the provincial level and we are not aware whether this data will be repeated for trend analysis.

Annual reporting on both the cost of a Nutritious Food Basket in different regions of the province and food insecurity at the provincial level are needed as food insecurity is a determinant of both health and healthy eating. This data is required to measure changes in food insecurity statuses of the population and to evaluate the impact of poverty reduction strategies, including the proposed community food security strategy to be launched in Ontario in 2017. The removal of the Nutritious Food Basket program as a requirement for Boards of Health (under the 2017 modernized standards for public health) may reduce the availability of data to monitor changes to the cost of food in regions across the province. As well, since Ontario opted out of the 2015-16 CCHS food security module (HFSSM) for the first time ever since the food security module was added to the CCHS in 2005, there will be a four year gap in data to measure food insecurity until the 2017-18 module is released (82).

In addition to the indicators used in the CCHS and Rapid Response Surveys (e.g. vegetable and fruit intake, food insecurity), annual data on other determinants of healthy eating among Ontarians could include, for example, calorie/ energy intake, sodium



intake, sugar-sweetened beverage consumption, food environment characteristics and more. This would help gain a more accurate understanding of the determinants of healthy eating and would lead to more evidence-based policies and program interventions. Adding questions to forthcoming Rapid Response Surveys to gather information on the impact of Health Canada's new dietary guidelines, CFG and Healthy Eating Strategy initiatives is of utmost importance to set future directions for nutrition policy and program decision-making.

An international study assessing the food environment policy in Canada (INFORMUS) recommends regular monitoring of adult and childhood nutrition status and population intakes against specified intake targets or recommended daily intake levels, with this data collection taking place every five years or more frequently (83).

Additionally, the INFORMUS project recommends monitoring systems, implemented by the government, be put in place to regularly monitor food environments (especially for food composition for nutrients of concern, food promotion to children and nutritional quality of food in schools and other public sector settings) (83). Swinburne et al (2013), state that "the government's monitoring and intelligence systems (surveillance, evaluation, research and reporting) should be comprehensive and regular enough to assess the status of food environments, population nutrition and diet-related non-communicable diseases and their inequalities, and to measure progress on achieving the goals of nutrition and health plans" (83).

Ideally annual and less frequently collected data would be housed in a central provincial data base similar to the Tobacco Informatics Monitoring System (TIMS) housed at the Ontario Tobacco Research Unit (84). This data could then be accessed by policy, program and decision makers to plan and measure the impact of evidence-based healthy eating and nutrition policies, interventions and programs.

Conclusion

From the evidence presented, it is clear that more can be done to both assess and improve the determinants of dietary intake, including eating behaviours, food literacy and skills, and the prevalence of food insecurity among Ontarians. This is particularly important since diet is a major predictor of chronic disease and influences risk factors, such as having excess weight and/or high blood pressure (14), which in turn impacts health care spending in Ontario. **There is a need for continuous surveillance data on the determinants of healthy eating—such as dietary intake (e.g. food and nutrient intakes), food literacy, food insecurity and the food environment—and the ways in which these determinants link to dietary intake and health outcomes.** There may be a need for more support for food literacy and skills development for youth and adults, especially males. **There is also a need to implement strategies that reduce household food insecurity in Ontario, particularly among low-income and Aboriginal households.**

Ontario adults showed the lowest prevalence of consuming fruits and vegetables five times or more per day across all age groups, and **men had significantly lower prevalence rates across nearly all indicators for healthy eating and food literacy and skills compared to females.** Less than half of youth reported consuming fruits and vegetables five times or more per day, and **youth had the lowest prevalence for adjusting a recipe to make it healthier.** Despite the high prevalence of self-perceived good or very good food skills such as preparing vegetables or fruit among the general Canadian population, and a relatively high proportion of households reporting childrens' participation in food preparation, which may both be over-estimated, there was a significantly lower prevalence of youth rating their skills in cooking a piece of raw meat/chicken/fish as good or very good. In addition, a significant proportion of **youth report having more basic versus advanced cooking skills.** A very small proportion of Canadians report using Canada's Food Guide to learn about healthy eating and its use is highest among youth. More Canadians, especially females and older adults, report using the food guide to shop for groceries.

These findings suggest **there may be a need for more food literacy and skills initiatives, targeted to youth and males in particular;** however, further studies are needed to draw conclusive relationships between food literacy interventions and dietary intake for all age groups. Future studies should investigate other key aspects of eating behaviours and dietary intake such as energy, salt and sugar intake, as well as sugar-



sweetened beverages, processed and fast food consumption, and examine the relationship between these determinants of healthy eating and diet quality. Additionally, given the low prevalence estimates across all Canadian sub-populations for self-reported consumption of daily fruits and vegetables, and use of CFG it may be beneficial for population-level interventions to include strategies that raise awareness and provide education around current dietary guidance and Canada's healthy eating guidelines. This research also suggests that targeted interventions for males and youth could potentially serve to reduce differences observed in this study between these sub-populations.

Food insecurity has been shown to be a strong predictor of dietary intake and can heighten risk of nutrient inadequacies, particularly among Canadian youth and adults (85). Moderate and severe food insecurity impacts significantly more lower income and Aboriginal households in Ontario. **This study showed that individuals in the lowest income quintile have significantly lower intakes of healthy fruits and vegetables;** however, this study cannot conclude that there is a relationship between household food insecurity and intake of fruits and vegetables, or with diet quality in general. Likewise, no relationships can be made between households experiencing food insecurity and food literacy and skills.

Given the lack of fulsome and current data, **there is a strong need for regular monitoring and surveillance of a comprehensive range of healthy eating determinants and dietary intake data.** This is strongly recommended as it is essential to draw relationships between intervention strategies and dietary intake among the population, thereby providing a basis to plan evidence-based and targeted interventions, policy and programming. Moreover, the regular collection of such publically-available data enables monitoring trends and impact over time. It is further recommended that this data be stored in a central location to make it readily accessible and available for use by public health policy and program decision makers and others.

In conclusion, **future initiatives should address developing and administering standardized indicators and surveys within the province of Ontario that provide current, population-representative estimates of the important determinants of healthy eating,** including but not limited to: eating behaviours, food literacy, food insecurity (including marginal), the food environment, and geographic and cultural influences, as well as more regular reporting on the dietary intakes and nutritional status of Ontarians. **More importantly, such determinants of healthy eating need to be analyzed in relation to current measures of diet quality and dietary intakes to**



determine which factors have the most impact among various sub-sets of Ontarians in order to plan evidence-informed and targeted interventions and policies to improve the nutritional status of Ontarians, to prevent and reduce obesity and other non-communicable chronic diseases, and to reduce health inequities and associated health care costs in Ontario.

Acknowledgements

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We would also like to thank Elizabeth Manafo, MHS, RD who coordinated the two advisory groups that identified the healthy eating indicators, including members of the Quality Indicators Advisory Group for the Ontario Chronic Disease Prevention Alliance and the Ontario Food and Nutrition Strategy Indicators Advisory Group. We gratefully acknowledge the financial support of the Public Health Agency of Canada that supported this work.

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Appendices - Tables and Figures

Table 1. Healthy Eating Indicators: Self-perceived diet quality, fruit & vegetable consumption and % of Canadians who self-report adjusting a recipe to make it healthier

		Percentage of population in Canada rating their eating habits as very good or excellent*	Percentage of Population in Ontario consuming fruits and vegetables 5 times or more per day**	Percentage of population Canadians who self-report adjusting a recipe to make it healthier*
Total Population		45.9% (44.2%-47.6%)	38.5% (37.2%-39.8%)	63.0% (61.6%-64.4%)
Age	12-17 years old	45.4% (40.8%- 50.0%)	43.4%* (39.3%-47.5%)	34.7%* (30.2%-39.2%)
	18-65 years old	43.8% (41.82%-45.75%)	36.8% (35.3%-38.4%)	67.9% (66.2%-69.6%)
	>65 years old	56.9%* (54.4%-59.7%)	44.4%* (42.1%-46.8%)	52.2%* (49.4%-55.0%)
Sex	Males	43.2% (41.1%-45.3%)	31.6% (29.8%-33.4%)	51.0% (48.8% -53.3%)
	Females	48.5%* (46.3%-50.7%)	45.0%* (43.2%-46.8%)	74.5%* (72.8%-76.3%)
Aboriginal Status	Aboriginal	37.5% (29.6%-45.3%)	37.0% (30.8%-43.2%)	62.2% (56.1%-68.3%)
	Non Aboriginal	46.2% (44.4%-47.9%)	38.6% (37.3%-40.0%)	63.1% (61.6%-64.5%)
Income Quintiles	Quintile 1	-	34.6%* (31.5%-38.2%)	-
	Quintile 2	-	34.6% (31.8%-37.4%)	-
	Quintile 3	-	38.0% (35.0%-40.9%)	-
	Quintile 4	-	40.4% (37.7%-43.1%)	-
	Quintile 5	-	44.0%* (41.6%-46.4%)	-
<i>Data Sources: Statistics Canada, Rapid Response 2013 Food Skills 2* and CCHS 2014** data, Estimate (95% confidence interval)</i>				

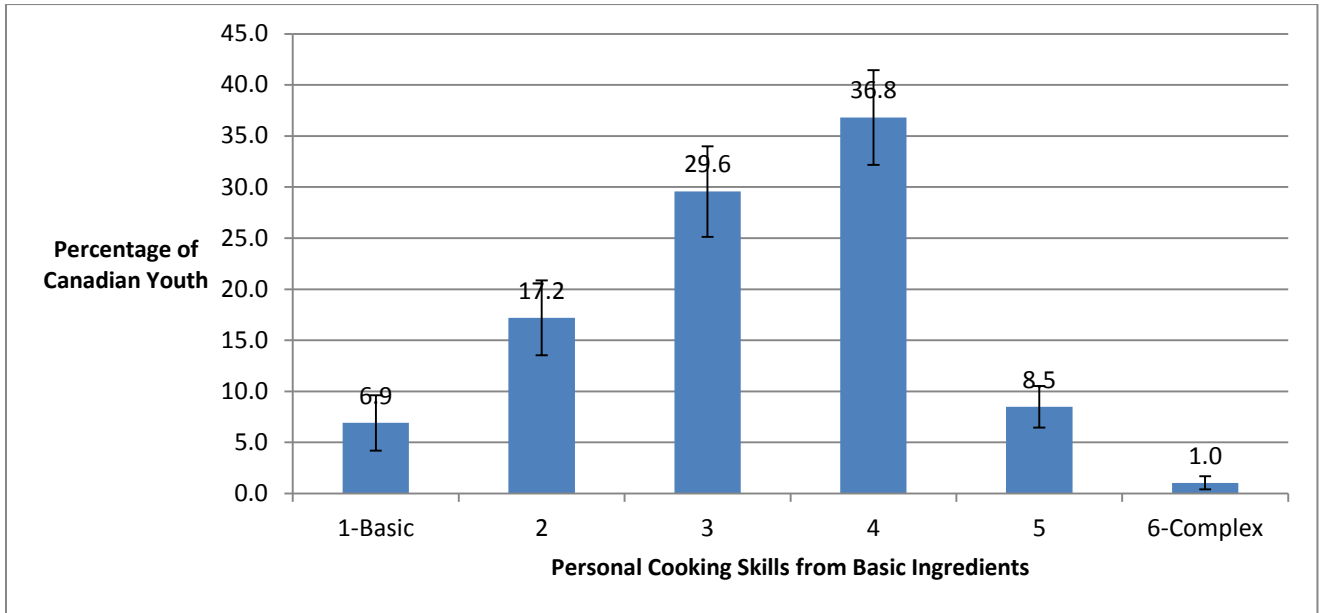


Table 2. Healthy Eating Indicators: making adjustments to improve diet quality

Population Characteristics		Percentage of population in Canada who adjust the recipe to make it healthier by reducing fat content	Percentage of population in Canada who adjust the recipe to make it healthier by reducing salt content	Percentage of population in Canada who adjust the recipe to make it healthier by reducing sugar content	Percentage of population in Canada who adjust the recipe to make it healthier by adding more fruits or vegetables	Percentage of population in Canada who adjust the recipe to make it healthier by increasing or adding whole grains
Total Population		49.6% (47.5%-51.8%)	40.3% (38.0%-42.5%)	45.6% (43.3%-47.8%)	47.1% (45.1%-49.2%)	33.1% (31.1%-35.1%)
Age	12-17 years old	25.0% (18.6%-31.4%)	28.1% (20.7%-35.6%)	28.8% (22.8%-34.7%)	47.4% (39.9%-54.8%)	28.9% (21.9%-36%)
	18-65 years old	51.6% (49.1%-54.0%)	40.5% (38.0%-43.1%)	46.4% (43.9%-49.0%)	47.8% (45.4%-50.1%)	34.0% (31.7%-36.3%)
	>65 years old	44.7% (40.7%-48.6%)	42.5% (38.5%-46.6%)	45.9% (42.2%-49.6%)	42.7% (39.1%-46.2%)	28.3% (25.1%-31.5%)
Sex	Males	46.5% (49.3%-50.0%)	43.9% (40.3%-47.5%)	37.6% (34.2%-40.9%)	47.8% (44.5%-51.1%)	29.2% (26.0%-32.3%)
	Females	51.7% (49.3%-54.1%)	37.8% (35.2%-40.5%)	51.0% (48.4%-53.5%)	46.7% (44.1%-49.2%)	35.7% (33.2%-38.2%)
<i>Data Source: Statistics Canada, Rapid Response 2013 Food Skills 2, Estimate (95% confidence interval)</i>						

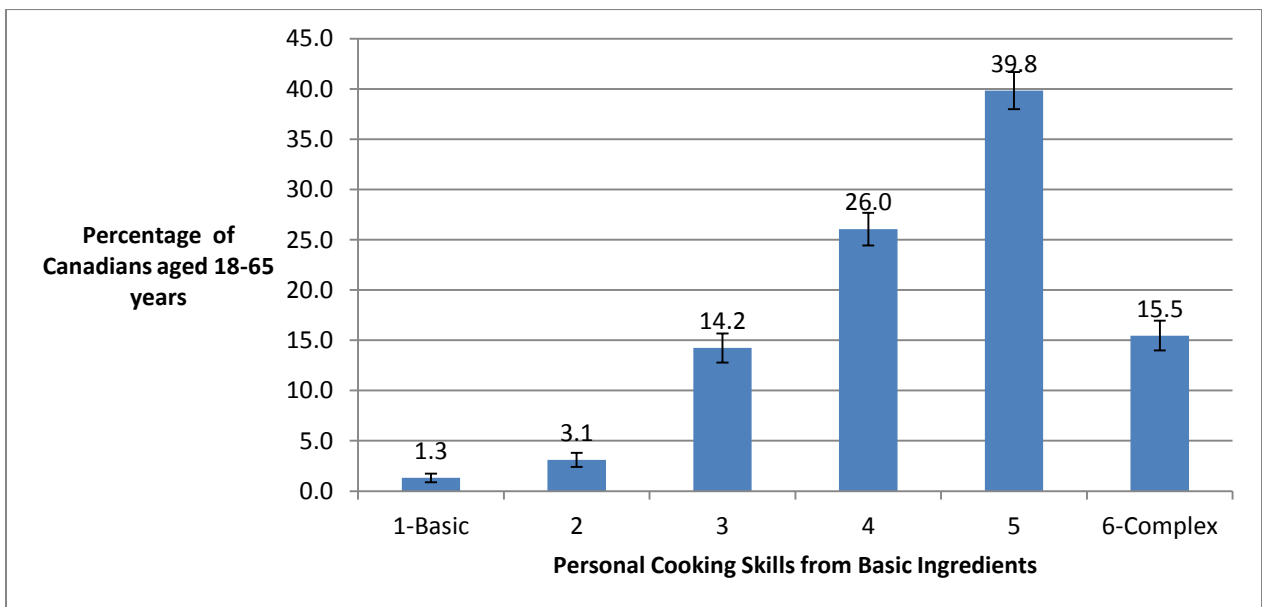


Figure 1A. Personal Cooking Skills from Basic Ingredients in Canadian Youth (12-17 years old)



Data source: Statistics Canada, 2013 Rapid Response Food Skills 2

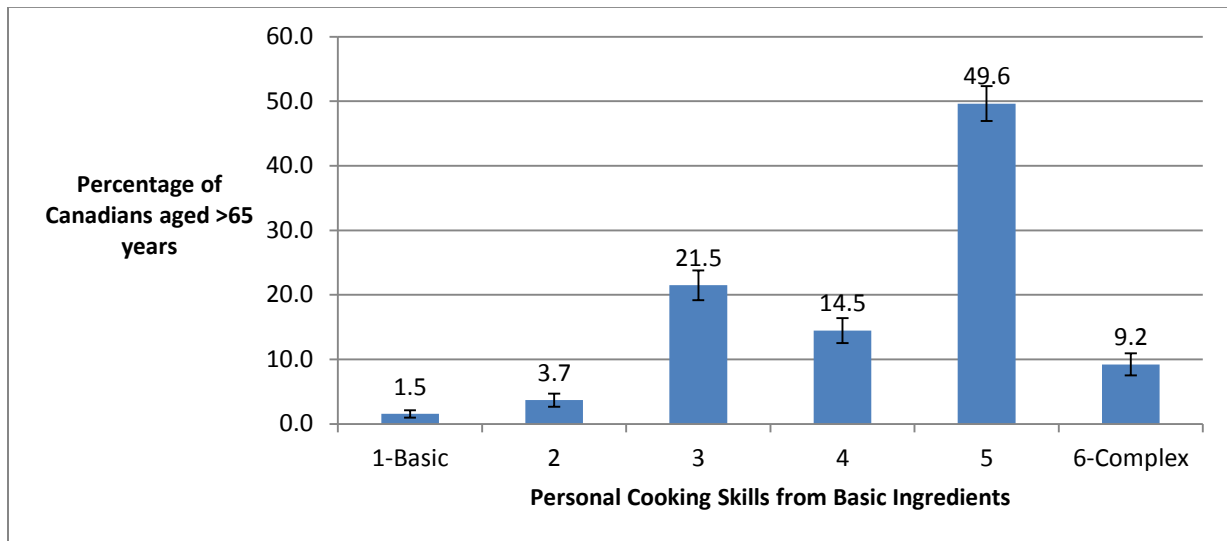
Figure 1B. Personal Cooking Skills from Basic Ingredients in Canadian Adults (18-65 years old)



Data source: Statistics Canada, 2013 Rapid Response Food Skills 2



Figure 1C. Personal Cooking Skills from Basic Ingredients in Canadian Older Adults (>65 years old)



Data source: Statistics Canada, 2013 Rapid Response Food Skills 2



Table 3. Food Skills in the Canadian Population

Population Characteristics		Percentage of population in Canada whose self-perceived skills in peeling, chopping or slicing vegetables or fruits are good or very good	Percentage of population in Canada who rate their skills in cooking a piece of raw meat/chicken/fish as good or very good
Total Population		92.0% (91.2%-92.7%)	88.3% (87.3%-89.2%)
Age	12-17 years old	77.6% (73.5%-81.6%)	52.2% * (47.3%-57.2%)
	18-65 years old	93.3% (92.4%-94.2%)	91.6% (90.6% -92.7%)
	>65 years old	92.4% (90.0%-94.0%)	89.3% (87.4%-91.3%)
Sex	Males	89.8% (88.6%-91.1%)	85.8% (84.2%-87.3%)
	Females	94.0%* (93.1%-95.0%)	90.6%* (89.4%-91.8%)
Aboriginal Status	Aboriginal	92.2% (89.1%-95.3%)	92.4% (88.8%-96.1%)
	Non Aboriginal	91.9% (91.1%-92.7%)	88.1% (87.1%-89.1%)
<i>Data Source: Statistics Canada, Rapid Response 2013 Food Skills 2, Estimate (95% confidence interval)</i>			



Table 4. Usage of Canada’s Food Guide Among Canadians

Population Characteristics		Percentage of population in Canada who report consulting Canada’s Food Guide in the past 6 months to learn more about healthy eating	Percentage of population aged 18 years and older in Canada who report using Canada’s Food Guide while shopping for groceries
Total Population		8.9% (8.0%-9.8%)	31.1% (29.5%-32.7%)
Age	12-17 years old	14.6%* (10.75%-18.34%)	N/A
	18-65 years old	8.9%* (7.8%-10.0%)	30.1% (28.3%-31.9%)
	>65 years old	5.3%* (4.2%-6.5%)	36.8%* (33.7%-39.8%)
Sex	Males	6.4% (5.3%-7.5%)	23.4% (21.2%-25.7%)
	Females	11.2%* (9.9%-12.5%)	38.1%* (35.8%-40.4%)
Aboriginal Status	Aboriginal	6.0% (3.5%-8.6%)	33.3% (25.4%-41.2%)
	Non Aboriginal	9.0% (8.0%-9.9%)	31.3% (29.7%-32.9%)
<p><i>Data Source: Statistics Canada, Rapid Response 2012 Food Skills1, Awareness and Knowledge of Canada’s Food Guide, Estimate (95% confidence interval)</i></p>			



Table 5. Participation of Children in Household Food Preparation in Canada

Population Characteristics		Percentage of households in Canada where children participate in shopping for groceries	Percentage of households in Canada where children help to prepare meals or help to cook food
Total Population		67.8% (63.1%- 71.5%)	59.6% (55.2%- 63.6%)
Aboriginal Status	Aboriginal	74.0% (61.0 %-87.1%)	76.0%* (64.5%-87.6%)
	Non Aboriginal	67.0% (62.7%-71.4%)	58.7% (54.4%-63.0%)
<i>Data Source: Statistics Canada, Rapid Response 2012 Food Skills 1, Estimate (95% confidence interval)</i>			

Table 6. Food Insecurity in Ontario by Age Group

Indicators		Percentage of children/ adults in Ontario living in households with moderate or severe food insecurity
Percentage of children in Ontario living in households with moderate or severe food insecurity		5.8% (4.6%- 8.0 %)
Percentage of adults in Ontario living in households with moderate or Severe Food Insecurity	All adults (18 years and older)	8.3% 7.4%-9.1%
	18-65 years old	8.8% (7.8%-9.7%)
	Older than 65 years	3.5%* (2.1% -5.0%)
<i>Data Source: Statistics Canada, 2014 CCHS, Food Security Optional Module, Estimate (95% confidence interval)</i>		



Table 7. Food Insecurity in Ontario by Income and Aboriginal Status

Population Characteristics		Percentage of households in Ontario experiencing moderate or severe food insecurity
Overall number of households in Ontario		8.8% (8.0% -9.6%)
Aboriginal Status	Aboriginal Households	17.9%* (13.3%-22.5%)
	Non Aboriginal Households	8.5% (7.7%-9.3%)
Income Quintiles	Quintile 1	26.9%* (24.2%-29.6%)
	Quintile 2	8.3% (6.7%-9.8%)
	Quintile 3	5.1% (3.9%-6.3%)
	Quintile 4	2.5% (1.7%-3.3%)
	Quintile 5	0.6%* (0.2%-00.9%)
<i>Data Source: Statistics Canada, 2014 CCHS, Food Security Optional Module, Estimate (95% confidence interval)</i>		



Table 8. Self-Rated Health of Population in Ontario

Population Characteristics		Percentage of Population in Ontario rating their health as very good or excellent Estimate (95% Confidence Interval)
Total Population		59.2% (58.0%-60.4%)
Age	12-17 years old	70.1% (66.5%-73.6%)
	18-65 years old	60.9% (59.4%-62.4%)
	>65 years old	45.6%* (43.3%-48.0%)
Sex	Males	58.8% (57.0%-60.6%)
	Females	59.6% (57.8%-61.3%)
Aboriginal Status	Aboriginal	49.3%* (42.8%-55.8%)
	Non Aboriginal	59.7% (58.4%-60.9%)
Income Quintiles	Quintile 1	44.6%* (41.3%-48.0%)
	Quintile 2	52.8% (50.0%-55.5%)
	Quintile 3	61.7% (58.9%-64.5%)
	Quintile 4	65.1% (62.5%-67.7%)
	Quintile 5	71.3% (68.8%-73.8%)
<i>Data Source: Statistics Canada, 2014 CCHS</i>		



Table 9. Self-Reported Physical Activity in Ontario Population

Population Characteristics		Percentage of Population in Ontario who self-report being moderately active or active
		Estimate (95% Confidence Interval)
Total Population		53.0% (51.6%-54.3%)
Age	12-17 years old	69.4%* (65.7%-73.2%)
	18-65 years old	52.4% (50.8%-53.9%)
	>65 years old	47.3% (44.9%-49.7%)
Sex	Males	55.7% (51.7%-54.3%)
	Females	50.5% (48.6%-52.3%)
Aboriginal Status	Aboriginal	57.8% (51.3%-64.3%)
	Non Aboriginal	53.1% (51.7%-54.5%)
Income Quintiles	Quintile 1	42.2%* (38.8%-45.5%)
	Quintile 2	46.9%* (44.0%-49.9%)
	Quintile 3	53.1% (50.3%-55.9%)
	Quintile 4	57.5% (54.8%-60.3%)
	Quintile 5	64.6%* (62.1%-67.1%)
<i>Data Source: Statistics Canada, 2014 CCHS</i>		

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This document has been prepared with funds provided by the Government of Ontario. The information herein reflects the views of the authors and does not necessarily reflect the views of the Government of Ontario.



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