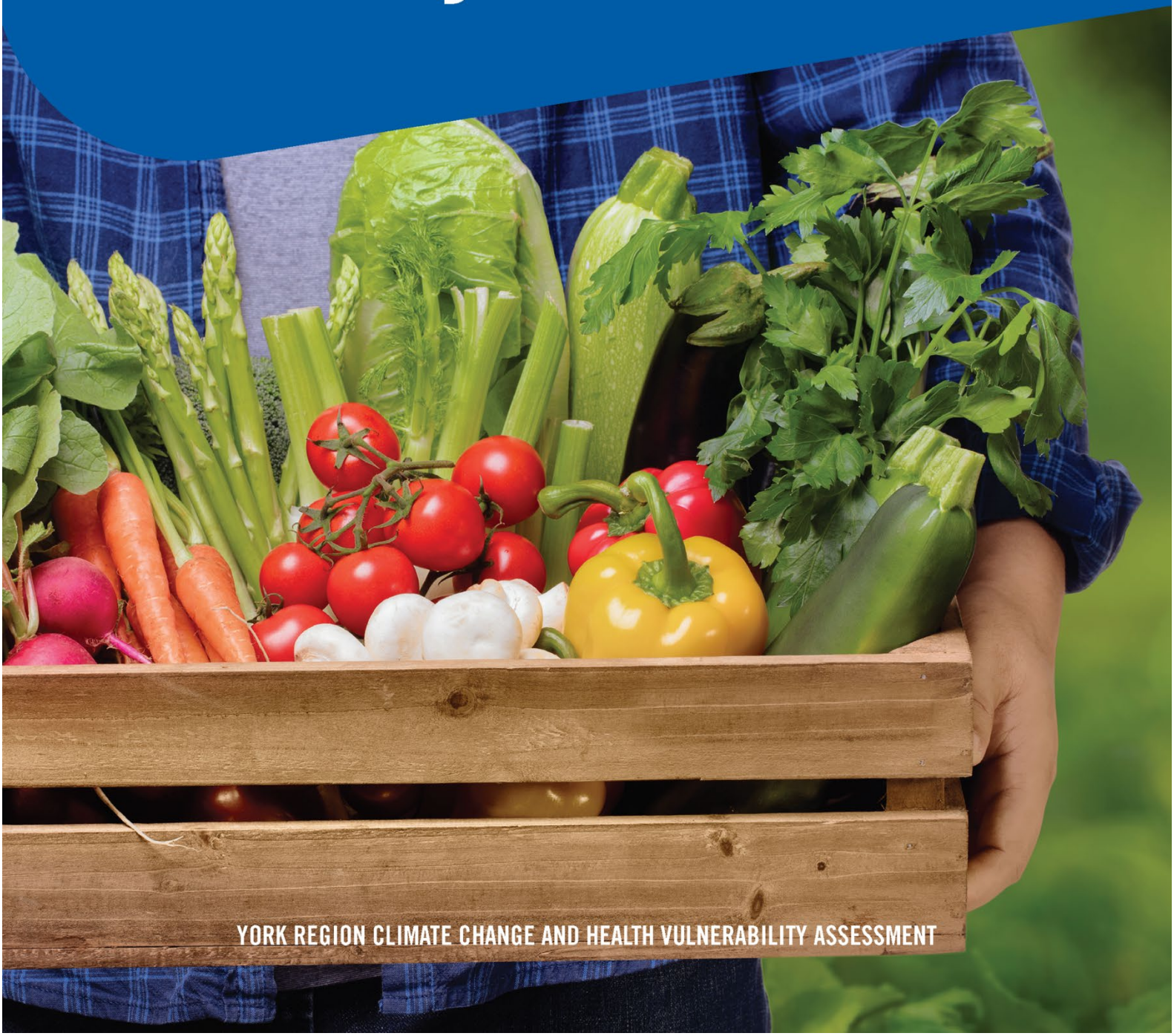
CHAPTER 10
Food Safety and Security



10 Food Safety and Security: Key Findings

Climate Drivers and Exposure Pathways

- Climate change will result in increased temperatures, expanded growing seasons, extreme weather and changing precipitation patterns. This can impact local farm production, distribution and supplies. York Region has more than 70,000 hectares of designated agricultural land
- York Region is expected to expand the growing season by 30 days. The number of days above 25˚C is expected to increase by 38 days in the 2050s, which may contribute to growth and survival of foodborne pathogens in locally produced food and the risk of food spoilage
- Extreme weather events such as extreme heat and ice storms can result in power outages that impact the safety of food products by compromising refrigeration, which can also affect local food supplies
- While local food systems may benefit from longer growing seasons, food security is dependent on global food systems, which climate change will adversely impact
- Floodplains within York Region can impact sanitation and storage conditions in food premises, which may increase the risk of exposure to foodborne pathogens. Less than 10% of premises fall within the floodplain, but risks of urban flooding are unknown

Population Sensitivity

- Food insecurity is associated with other determinants of health including existing chronic disease, low-income and mental health
- Food prices and cost of living are increasing close to or above income for low-income populations, which may increase the risk of food insecurity

Adaptive Capacity

- Adaptations to climate change need to be considered at all levels of the food system to increase resilience, including at the production, processing, distribution, preparation and consumption stages
- Food safety currently involves agencies from federal, provincial and local health unit levels and industry working to prevent foodborne illnesses. Food safety depends on human behaviour and the effectiveness of food safety regulatory, surveillance, monitoring and communication systems
- In 2018 York Region inspected approximately 3,000 food premises across York Region and has food safety promotional campaigns to reduce the risk exposure to foodborne pathogens
- York Region programs also target food insecurity and support local food systems within the Region

Health Impacts

- The relationship between climate change, food systems and food security is complex and involves multiple sectors within and outside of York Region. As a result, future estimates of foodborne illnesses or other outcomes are difficult to calculate for York Region
- Enteric disease cases may also be affected by altered human behaviour and activity such as greater outdoor activity (e.g., barbeques), travel and hygiene practices

Recent trends:

- The largest numbers of cases for enteric diseases are for *Campylobacter* enteritis and Salmonellosis in York Region. Most enteric diseases illustrate a seasonal trend peaking during the summer months or early fall
- Between 2009 and 2014, an estimated 7% of York Region households (approximately 24,700 households) experienced food insecurity

Climate change will have important implications for food safety and security within York Region and globally. This chapter provides an overview of food safety, food security and food insecurity implications due to climate change. While food safety is connected to elements of food security, each topic is discussed separately with food safety impacts focusing on risks to foodborne illnesses. As enteric diseases can be caused by food and water exposure routes, local health impact trends in York Region are discussed in the previous chapter (see Section 9.1). Food security is discussed from a local perspective, and does not include global or international impacts from food systems (see Section 10.2).

The focus of this chapter is on climate change impacts relevant to the geographical context of York Region and local activities relevant to food safety and security. Coastal seafood and international food safety are important climate change impacts to consider due to a global food supply system that can impact York Region. However, these are not discussed further as they occur outside of York Region and fall under the mandate of other agencies. Additionally, issues relating to contaminants are not discussed due to limited research.[140,163]

10.1 FOOD SAFETY

Food sources have been a commonly attributed route of exposure to enteric disease cases in York Region. For instance, contaminated foods such as meats, raw vegetables and unpasteurized dairy have been sources for salmonellosis and verotoxin producing *E. coli* (VTEC) infections in York Region and Ontario.[146]

Climate impacts on food safety can appear across the food system in production, processing, distribution and preparation and consumption of food products. Changes in temperature and precipitation are expected to shift in the geographic range, seasonal occurrence and proliferation of pathogens. Some of the ways that climate change could impact food safety are listed below.[140]

- Higher air temperatures can lead to greater spoilage rates during transportation and storage
- Higher temperatures, CO_2 levels and drought conditions impact the proliferation of pests and pathogens, such as the growth of mould and mycotoxins in crop production and bacterial shedding of livestock
- Higher sea surface temperatures contribute to a higher risk of exposure to pathogens in seafood products such as *Vibrio*
- Heavier precipitation contributes to potential contamination of irrigation water
- Flooding events contribute to contamination of crops with toxins and pathogens
- Changes in soil properties impact production and presence of contaminants such as heavy metals in soils
- Extreme weather events or high energy demands lead to prolonged power outages, which could lead to food spoilage

10.1.1 Climate change impacts on foodborne illness outcomes in York Region

Some expected climate change impacts will have greater implications for York Region Public Health's Food Safety program. There are many potential impacts relevant to food safety in York Region, including an expanded growing season, increased temperatures and extreme weather events. However, impacts with greater implications on food safety could include:

- A potential increase in the number of food recalls within the Region, province or country
- Increased risk of foodborne illness from outdoor recreational activities such as barbecues and picnics
- Increased risk of foodborne illness from farmer's markets and other special events as a result of improper food storage and the proliferation of pathogens in warmer weather. Additionally, the preparation and handling of food outdoors without thermostat-controlled cooking or proper washing facilities can increase the risk of food contamination
- New pathogen risks to human health arising in local food produced in the Region
- Food premises non-compliance issues due to extreme heat, as premises may be faced with challenges in maintaining temperatures needed for food safety
- Extreme weather events contributing to power outages that can impact maintaining the correct temperatures of food stored in cold and/or hot holding units, food contamination/adulteration, or food safety concerns in emergency reception centres

Since food is sourced from local and international markets, food safety in York Region can be impacted by changes at the local, provincial, national and international levels. However, only a few studies have estimated the potential future risk climate change may pose on food safety. One study used a quantitative microbial risk assessment (QMRA) to estimate the increase in disability-adjusted life years (DALYs) from mycotoxins in wheat grown in Saskatchewan and *Vibrio parahaemolyticus* in oysters from Chrome Island in British Columbia.[182] The model found an increase in DALY by 14% and 33% for mycotoxins and Vibrio respectively by 2050 based on an annual air temperature increase of 0.04˚C.[183] However, with an annual air temperature increase of 0.08˚C, the DALYs for mycotoxins increased by approximately two-fold, while for vibrio the increase was much less, highlighting the model's sensitivity to temperature for mycotoxins.[182]

Climate change may also increase contaminants such as heavy metals in soils or create a greater need for pesticides. Some research suggests contaminants and toxins may be introduced into crops during flooding or drought through deposition of contaminated dust, but exposure is difficult to predict.[140] Other possible impacts, such as potential rise in food allergens or new insect vectors, are emerging topics with limited research.[4,140]

The impact of climate change on food safety is difficult to quantify as it can be buffered by a number of existing processes in York Region and Canada, including surveillance, preventive measures and food safety regulations. Resulting health impacts will not depend

solely on greater exposure to pathogens and contaminants, but on multiple factors that influence pathogen survival and growth, as well as human exposure. Future estimates of foodborne illnesses or other outcomes are difficult to model due to the many factors involved in investigating foodborne illnesses.

In addition, warmer temperatures may alter human behaviour, which may impact foodborne illness rates. An extended warm season is likely to lead to more barbecuing and gatherings. This could lead to an increase in foodborne illnesses if foods are not handled, prepared or stored safely while outdoors.[4,140] Climate change may also lead to changes in animal husbandry and animal-to-animal transmission that could affect existing pathogens in food or lead to the emergence of new ones (e.g., increase in bacterial shedding of animals in warmer temperatures).[4,140]

10.1.2 ADAPTIVE CAPACITY: EXISTING PROGRAMS ADDRESSING FOOD SAFETY

Food safety challenges range from local to international, and require the development of coordinated program activities across municipal, provincial and federal agencies. These agencies address the various stages of food safety, from production and transportation, to local consumption and handling. At the federal level, the Canadian Food Inspection Agency (CFIA) is responsible for the inspection of imported foods and local products from federally registered food establishments. The Public Health Agency of Canada also conducts investigations when more than one province or territory is involved or impacted by an outbreak. In addition, Health Canada provides standards and policies supporting the safety and quality of all food sold in Canada.

Provincial agencies such as the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) and the Ministry of Natural Resources and Forestry (MNRF) provide services that reduce food safety risks and maintain food safety standards for food produced and distributed for sale in Ontario. Additionally, through the *Health Protection and Promotion Act*, the MOH develops standards and protocols for food safety of food premises inspected by local public health units.

York Region Public Health inspects more than 3,000 food premises annually. In addition to established premises, York Region Public Health also investigates and assesses food safety standards for farmers' markets, special events involving mobile food trucks and events involving wild game dinners as needed (Table 10.1). There are also other facilities in York Region focused on food processing or production, which are regulated by other agencies such as the Canadian Food Inspection Agency.

Table 10.1. The number of food premises inspected by York Region in 2018.

Food Premises in York Region	Total Number of Inspections as of December 31, 2018
Food processing facilities:	
Food plant / production	41
Food distribution facilities:	
Food warehouse / depot	44
Food retail facilities:	
Supermarkets	179
Convenience / Variety	585
Restaurants	2,096
Potential Outdoor Food Vendors:	
Street food vending cart	18
Mobile preparation premises and catering vehicles	214
Farmers markets	8
Special events from May 1 to September 30, 2018	272
Food facilities focused on vulnerable populations:	
Child care: On-site preparation or catered	341
Group / Lodging home for more than nine individuals	42
Long-term care homes	26
Hospitals	4
Retirement homes	37

Currently, risk assessments are conducted on food premises to determine risk levels and frequency of inspections completed each year (one, two or three inspections). Inspections are also conducted on a complaint basis to ensure hygiene practices and foodborne pathogen risks are managed according to current best practices and regulatory requirements (e.g., maintaining appropriate temperatures, eliminating contaminated food sources or disposing of spoiled food due to power outages). These current best practices and regulatory requirement measures will also help to address future climate change impacts.

In addition to inspections, York Region Public Health has programs to reduce the risk of foodborne illness through food handler certification, which requires all food service premises to have a certified food handler on site at all times. York Region Public Health also has promotional material encouraging York Region residents to adopt food safety practices at home using the Home Food Safety Guide. Residents can also check YorkSafe.ca, an online platform for food premise inspection reports in York Region. Food safety messaging can include climate change adaptation measures, but more research is needed on effective interventions at the individual level and on linking current foodborne illness events to climate conditions.

10.1.3 CONCLUSION

The research highlights many ways climate change is expected to impact food systems and food safety around the world. In York Region, climate change will result in increased temperatures, extreme weather and increased precipitation. These factors can increase the local risk of foodborne pathogens and food spoilage at food premises.

Many factors must be considered when assessing the effects of climate change on increased exposure risks and cases of foodborne illnesses. Data from previous cases of foodborne illness in York Region highlight the various associated sources and factors leading to exposure and subsequent illness. With the challenges of underreporting, multiple potential sources of pathogens in the food system and complex linkages between climate and food safety, it is difficult to predict how reported cases of foodborne illness may increase or decrease in York Region due to climate change. Recent QMRAs provide some perspective on how foodborne illnesses may change, but it will depend on a wide range of assumptions.

Under existing regulatory requirements and current practices, many of the potential impacts relating to weather will likely be addressed. For example, impacts from increasing temperatures and extreme heat events are addressed through regulatory requirements and inspections or investigations of food premises. Future climate adaptation measures could consider including climate factors that may be more relevant for risk assessments for certain types of premises (e.g., outdoor premises, farmers markets, special events).

Behavioural aspects also play an important role in enteric disease cases, such as outdoor activity and cooking practices during summer months. Thus, health promotion activities including tailored messaging may need to be updated to address some of these potential exposure pathways.

More information is needed to understand the relationship between climate factors and local cases. This includes accounting for other contributing factors such as hygiene practices and travel, which can be related to enteric disease cases. Surveillance programs should consider reported cases and additional data that can support an understanding of climate variables and linkages to foodborne illness risk.

There are currently a number of measures in place at the municipal, provincial and federal levels to reduce the risk of foodborne illness across the food system. These include federal agencies responsible for the inspection of food products, ensuring compliance with regulations and food safety standards and provincial agencies ensuring farming and agricultural practices eliminate and reduce health hazard risks during production. As part of the Ontario Public Health Standards (OPHS), public health units must also meet the requirements of the food safety protocol as well as the requirements of the *Health Protection and Promotion Act* and Ontario *Food Regulation 493/17 (Food Premises)* to prevent health hazards. This implementation involves investigating cases of suspected foodborne illness and outbreaks, and regular inspections of food premises to ensure the protection of the public.

It is important to consider how health units can address future impacts and better prepare for climate change challenges. Adaptive capacity as it relates to food safety depends on human behaviour and the effectiveness of food safety regulatory, surveillance, monitoring and communication systems. Table 10.2. summarizes current activities that potentially address future climate change impacts and identifies opportunities to further support climate change adaptation planning.

It is important to note that climate change impacts to food safety can also involve disruptions to the supply and distribution of food. Impacts that contribute to food spoilage are just some factors that relate to issues of food security. Other important aspects to consider include nutrition, transportation of goods and vulnerable groups. The following section (Section 10.2) will discuss some of the food security and food insecurity issues in York Region.

Table 10.2. Summary of food safety activities and adaptation planning opportunities.

	Ongoing and Completed Activities	Opportunities
Population Health Assessment and Surveillance	**Health Surveillance:** Diseases of public health significance and outbreak case investigation and management as part of OPHS/HPPA requirements.	Exploring additional local data relating to risk factors or emerging foodborne pathogens relating to climate, which may be available from other agencies (e.g., OMAFRA, PHAC, and MNRF). Explore trends in inspection infractions and complaints related to environmental variables (e.g., outdoor temperature or heavy rainfall events).
	Completion of RRFSS module on Food Safety at Home (2014, 2016, 2017, 2018).	Consider adding questions to RRFSS relating to climate factors impacting foodborne pathogen risk for individuals.
Program and Policy	Inspections and investigations of food premises to ensure measures are in place to maintain sanitation and prevent contamination of food products. System to notify stakeholders of food recall warnings. 24/7 response for food safety concerns and food recall warnings. **Health Equity:** Food handler certification program for vulnerable populations.	Consider how climate factors can be incorporated to relevant food premise risk assessments (e.g., farmers markets and outdoor temperatures). **Emergency Preparedness and Response:** Food premises should consider adopting a plan for addressing food safety concerns during power outage events. Explore opportunities to incorporate messaging on relevant climate factors that can contribute to foodborne risk for food premises. Consult OMAFRA on issues relating to • Livestock stress from extreme temperatures and impacts to meat facilities • Impacts of flooding on local farms (e.g., Holland Marsh) Consider future opportunities for food handler training programs that are approved by the Ministry of Health.

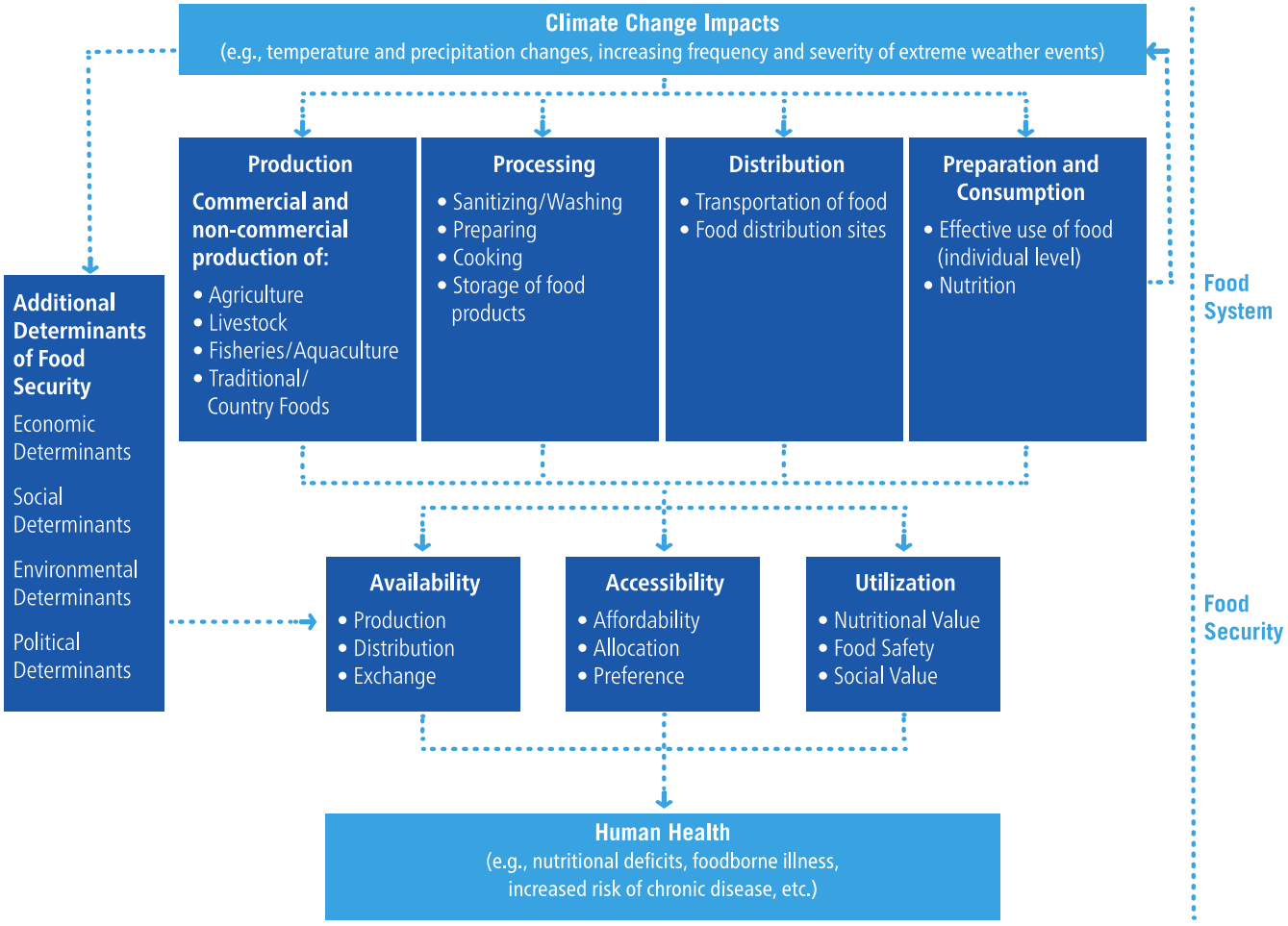
Health Promotion	**Health Equity:** Food Safety at Home campaign targeting families. YorkSafe disclosure system providing public information on inspection results for food premises across York Region.	Increase social media messaging on warm days on barbecuing and food safety risks.
Key Stakeholder Activities (Outside of Public Health)	MOH and PHO play a lead role in multi-jurisdictional outbreak surveillance and investigations. PHAC surveillance and investigation of outbreaks across provinces and/or territories. Conduct research and use of QMRA to assess future impacts of climate change on foodborne pathogen risk. CFIA inspection of federally registered establishments and food products, and issuing food recalls. OMAFRA management and assessment of local farms within York Region.	Consult relevant agencies regarding hazard analysis and critical control points (HACCP) plans for climate change impacts and implications for local public health functions. Reviewing and incorporating information from climate change and food safety assessments completed by other agencies (e.g., Additional QMRA assessments relevant to local health unit). Develop processes for dealing with emerging or novel food safety issues relating to other jurisdictions such as CFIA and/or OMAFRA. Increase understanding of food safety impacts related to climate change and local production within York Region (e.g., Holland Marsh).

10.2 FOOD SECURITY AND INSECURITY

The previous section noted how climate change can impact food safety across the food system. However, climate change is also expected to impact the food system and food security by reducing the nutritional content of certain agricultural crops and by disrupting the production, harvest, distribution and supply of food systems in Canada and globally.[140]

Food security is made up of three elements: Availability, accessibility and utilization of food.[184] When one of these elements is missing or impacted, food security is not met. The following components of food systems can also impact food security (Figure 10.1):

Figure 10.1. Framework of the relationship between food systems, food security and human health.



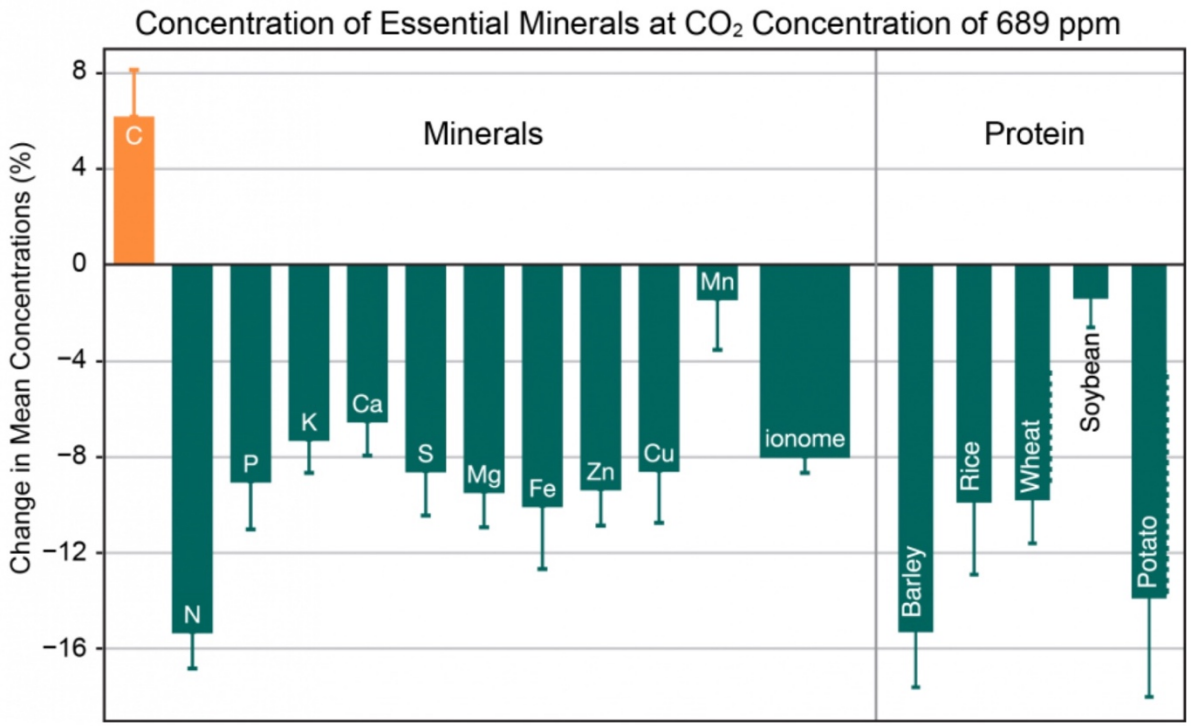
Source: Schnitter R., Berry P. The climate change, food security and human health nexus in Canada: a framework to protect population health. Int. J. Environ. Res. Public Health [serial online]. 2019;16(14): 1-16. Fig.2. Food security, climate change, and human health nexus framework; p. 6. Available from: https://www.mdpi.com/1660-4601/16/14/2531/htm. Reproduced under the terms of the Creative Commons Attribution-NonCommercial-No Derivatives License (CC BY NC ND)

Ultimately, food security depends on many factors including the production and supply of nutritious food locally and internationally, transportation and storage networks, food retail locations and an understanding of vulnerable communities in York Region. The following is an overview of the available information relating to food security. This section includes an outline of how climate change is expected to impact food security from a health lens and linkages to vulnerable populations.

10.2.1 CLIMATE CHANGE LINKAGES TO FOOD SECURITY

Rising atmospheric carbon dioxide levels will have an impact on the nutritional value of important crops such as wheat and rice. Many plant species produce lower concentrations of protein and essential minerals when grown at elevated carbon dioxide (CO_2) levels.[140] Loladze[185] provides a summary of the anticipated impact on 125 plant species with projected CO_2 levels in 2100. Crops such as rice, soybeans, wheat and barley will have 6% to 15% lower protein concentrations, but other crops such as corn will not likely decrease in protein content (Figure 10.2).[140]

Figure 10.2. The concentration of nutrients in 125 plant species in the year 2100 at CO_2 concentrations of 689 ppm.



Source: Ziska L, Crimmins A. Ch. 7. Food safety, nutrition, and distribution. In: The impacts of climate change on human health in the United States: a scientific assessment [Internet]. Washington: U.S. Global Change Research Program; Fig. 4. Effects of carbon dioxide on protein and minerals; p. 198. Available from https://health2016.globalchange.gov/. Reproduced by permission from the copyright holder.

Disruption of food systems due to climate change

In some regions, climate models suggest potential benefits to food systems by creating conditions more favourable for crop yields. The results of the fourth Intergovernmental Panel on Climate Change report indicate increases in local temperature of 1°C to 3°C in North America, along with concurrent increases in CO_2 and rainfall can benefit rain-fed crops in the early decades of the twenty-first century, increasing yields between 5% and 20%.[186] There will likely be little change in grain prices up to a global temperature change of 3°C, after which prices will rise due to declines in production.[187] This is consistent with Austin et al.[25] noting how southern Canada is relatively food secure and expected to be less vulnerable to global yield fluctuations. However, it is important to note that climate change impacts are likely to have an adverse impact on food security globally, which can have important implications for local food systems in York Region.

While general climate trends such as longer growing seasons may support food production, other climate impacts such as extreme weather events (e.g., floods and droughts) can adversely impact farms and local food supplies. Furthermore, changes in temperature and precipitation patterns will require that farmers adapt their methods to maintain productivity. This may pose a critical challenge for many farmers.[188] Food prices, which are an important factor for food security, can be impacted as extreme weather events caused by climate change worsen, particularly as global temperatures rise more than 3°C.[187]

Additionally, it is important to note that extreme weather events not only impact production, but can have temporary impacts on distribution routes and accessibility. In Toronto's recent vulnerability assessment of climate change impacts on food systems, the top issues identified include the impacts of flooding, risks to the Ontario Food Terminal, disruptions to infrastructure and vulnerable neighbourhoods that have limited access to major food retail stores.[189]

10.2.2 FOOD SYSTEMS IN YORK REGION

A large portion of York Region is used for agricultural purposes. York Region has 74,058 hectares of designated agricultural land, with 4,992 hectares designated as specialty crop land.[190] Corn, soybeans and wheat are the largest crops in York Region with more than 25,890 hectares of production; however, fruit, vegetable crops and livestock are also important contributors to the agricultural sector.[190] The Holland Marsh area is also the largest cultivated marsh in Ontario at 2,800 hectares, and is dependent on a system of dykes and canals controlling the amount of water entering the area.[174] In total there are more than 700 agriculture-based businesses in York Region.[191]

In addition to agriculture, York Region has approximately 270 manufacturers and distributors of food and beverages.[191] York Region Public Health inspects approximately 42 facilities involved in the processing and preparation of food. In terms of food retail sites, there are more than 180 grocery stores that are located mostly in urban areas, towns and villages across York Region. While not within York Region boundaries, the Ontario Food Terminal in Toronto also plays a key role in the distribution of fresh fruits and vegetables across the Greater Toronto Area.

Assessments of food systems require a detailed understanding of the production, processing and distribution of food throughout York Region. It is unclear how climate change impacts could contribute to the three key elements of food security (availability, accessibility and utilization) and how other factors such as social determinants of health may play a role. Further assessments should consider how the local food system can better support food security experienced in York Region.

Vulnerabilities to the local food system in York Region

Flooding can have important implications for local food security. A substantial number of farms fall within the floodplain in York Region. There are more than 7,500 properties with farm-related activities falling within floodplains, whereas less than 7% of food premises are within a floodplain. However, these estimates are only reflective of riparian flooding and do not consider urban areas where most food premises currently exist in the Region[cc]. While there is a significant amount of food production in York Region, it is not clear how much is distributed and available for consumption within York Region.

As there is limited information on urban floodplains, the number of potentially impacted properties from flooding events is likely underestimated. Within Toronto, urban and river flooding was identified as the largest risk to food retail, processing and suppliers compared to other extreme weather events.[189] Heat waves and ice storms were noted to potentially play an important role in power outages, which could impact local food security.[189] Infrastructure impacts relating to disruptions in electricity, road networks and access to fuel were also noted as key areas that could impact potential vulnerabilities.[189]

10.2.3 HEALTH IMPACTS RELATING TO FOOD INSECURITY

While the IPCC reports highlight how climate change will contribute to food insecurity, particularly for developing countries, food insecurity is also an existing and important issue for Canadian populations. Inadequate or insecure access to food due to financial constraints results can lead to difficulties in meeting the dietary needs of individuals and families.[192] Food insecurity status is defined in three categories ranging from marginal to severe. Marginal food insecurity is defined as worrying about limited food selection or not having enough food due to a lack of money. Moderate food insecurity is defined as having to compromise the quality or quantity of food due to lack of money. Severe food insecurity results in having to reduce food intake, skip meals or go without food due to lack of money.[192]

When assessing climate change impacts on food insecurity, it is important to consider how extreme weather events can disrupt access to adequate food for the general public, in particular

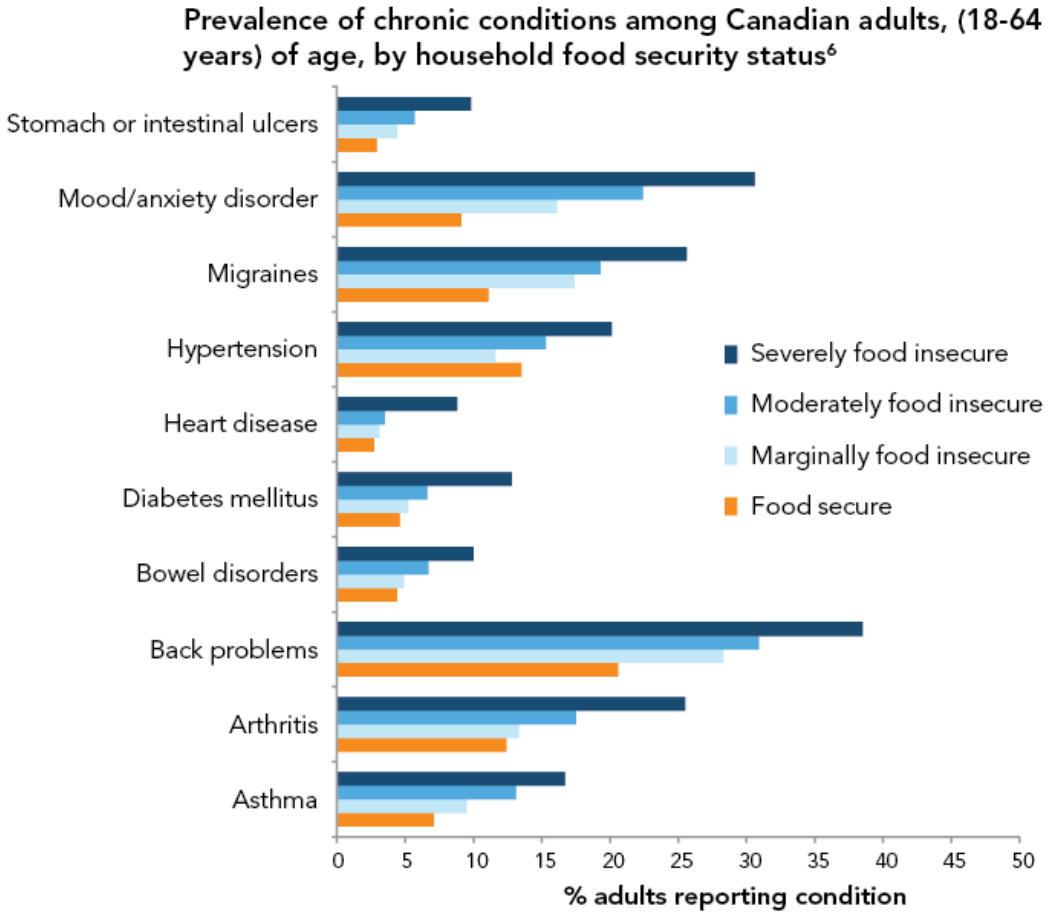
[cc] Note: Floodplain data is provided by Conservation Authorities and are based on watershed hydrology assessments that consider large storm event scenarios. Certain parts of the floodplain maps were created in the early 2000s and may not accurately reflect current conditions.

to those most vulnerable (e.g., individuals or families living on low-income who meet marginal, moderate and severe food insecurity status).

In Ontario, annual health care costs were 49% higher for those living in moderately food insecure homes and 121% higher for severely food insecure homes, even when accounting for social determinants of health such as education and income levels.[193] Food insecurity is also associated with higher mortality rates, which are especially large for individuals in the most severe food insecurity category.[194]

Food insecurity can be a risk factor for chronic diseases. Research shows potential associations with inflammation markers for chronic health conditions such as diabetes, hyperlipidemia and cardiovascular disease.[195] Figure 10.3 highlights how food insecurity status is commonly linked to a wide range of chronic health conditions.

Figure 10.3. Prevalence of chronic conditions among Canadian adults (18 to 64 years of age) by household food security status.



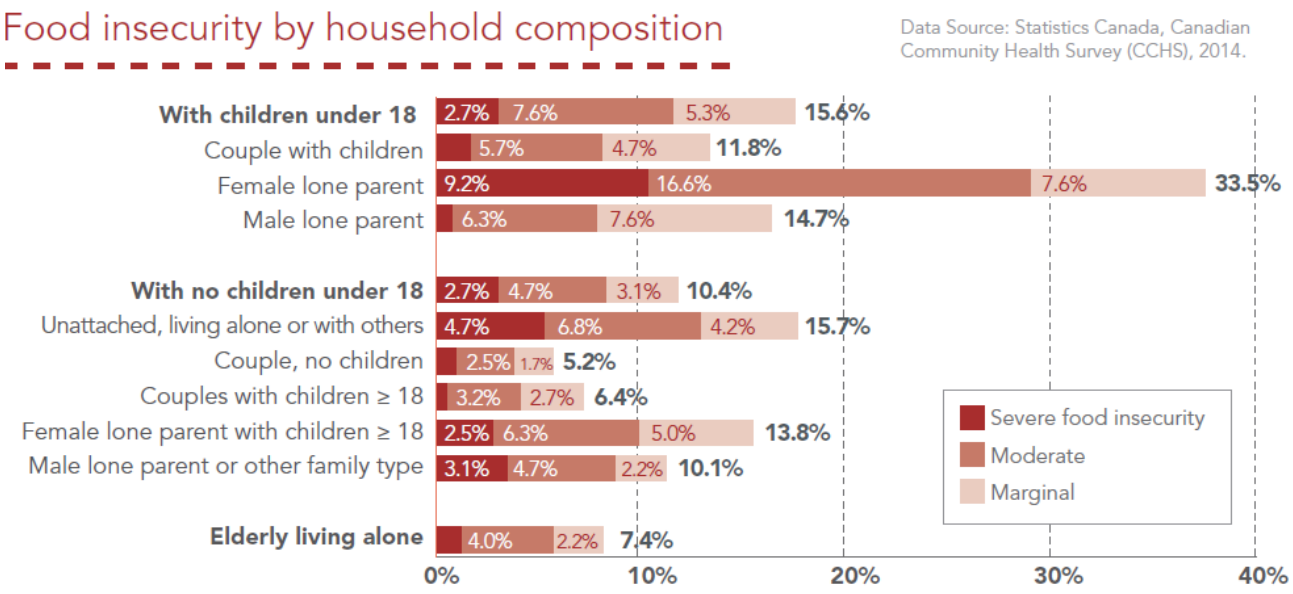
Source: PROOF Food Insecurity Policy Research. The impact of food insecurity on health [Internet]. Toronto: PROOF; 2015. Prevalence of chronic conditions among Canadian adults, (18-64 years) of age, by household food security status. Available from: https://proof.utoronto.ca/wp-content/uploads/2016/06/health-impact-factsheet.pdf. Reproduced under the terms of the Creative Commons 4.0 Attribution International License

Rising food prices due to climate change can also amplify existing health inequities. Increasing food costs are likely to cause even more food insecurity for people already struggling to buy food and may lead to eating cheaper food sources.[187] In many cases, cheaper food options are less nutritious, more processed with higher sugar and fat content. These foods are also less likely to be affected by agricultural price increases, because the majority of their costs come from processing and marketing.[187] This might lead to an increased risk of obesity in children, young adults, smokers and seniors who already have marginal nutritional status, and may contribute to other chronic conditions.[187]

Vulnerable populations

Households in York Region living on low-income will be hardest hit by increased food prices as a nutritious diet will become increasingly unaffordable and less available. As a result of climate change impacts on food systems, certain populations may be more vulnerable due to rising food prices and limited availability of nutritious food. Figure 10.4 highlights findings from the Canadian Community Health Survey, which notes the households most impacted by food insecurity. In particular, one third of households with a single female parent and children under the age of 18 experience some form of food insecurity in Canada.[192]

Figure 10.4. Food insecurity by household composition in Canada.

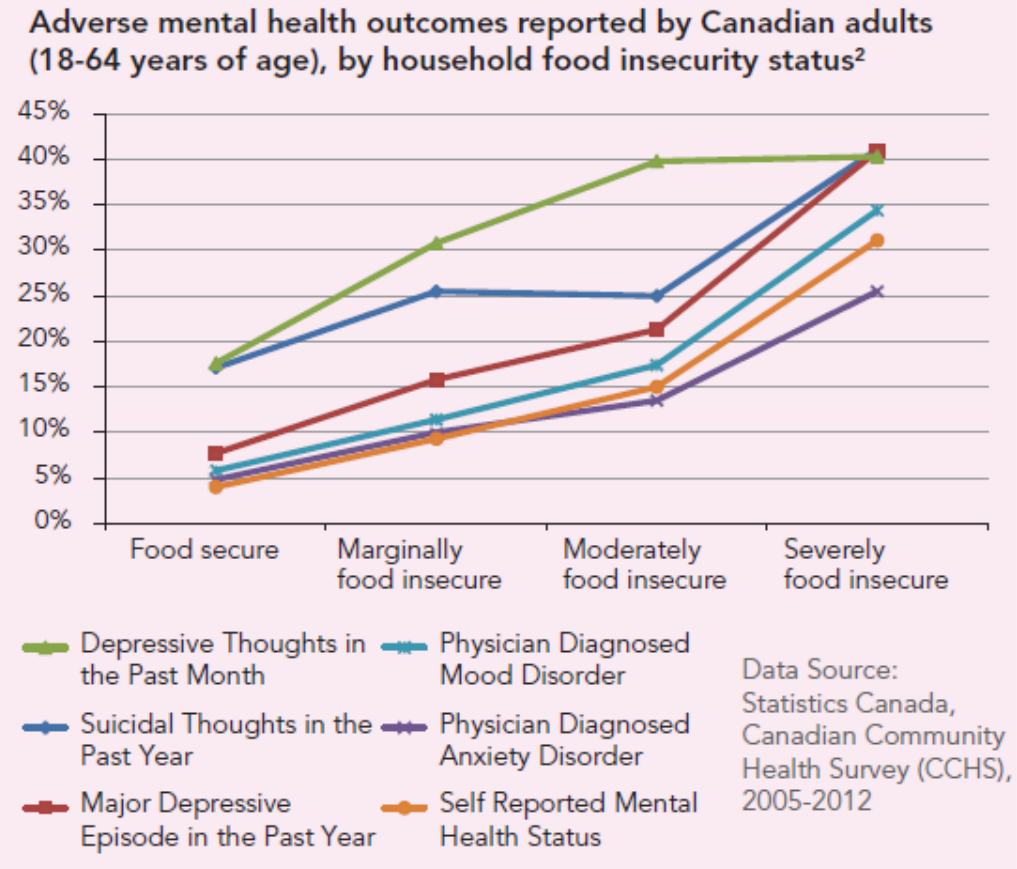


Source: Tarasuk V, Mitchell D, Dachner N. Household food insecurity in Canada 2014[Internet]. Toronto: PROOF; 2016. Food insecurity by household composition. Available from: https://proof.utoronto.ca/wp-content/uploads/2016/04/Household-Food-Insecurity-in-Canada-2014.pdf. Reproduced under the terms of the Creative Commons 4.0 Attribution International License

Mental health has been found to be associated with food insecure households, particularly with increasing severity of food insecurity status. While 1 in 8 households in Ontario is considered food insecure, adults that live in food insecure homes make up more than 1 in 3

hospitalizations related to mental health problems.[196] Figure 10.5 provides an overview of various mental health outcomes by food insecurity status.

Figure 10.5. Adverse mental health outcomes reported by Canadian adults (18 to 64 years of age) by household food insecurity status.



Source: PROOF Food Insecurity Policy Research. Food insecurity and mental health [Internet]. Toronto: PROOF; c2018. Adverse mental health outcomes reported by Canadian adults (18-64 years of age), by household food insecurity status. Available from: https://proof.utoronto.ca/resources/fact-sheets/#mentalhealth. Reproduced under the terms of the Creative Commons 4.0 Attribution International License

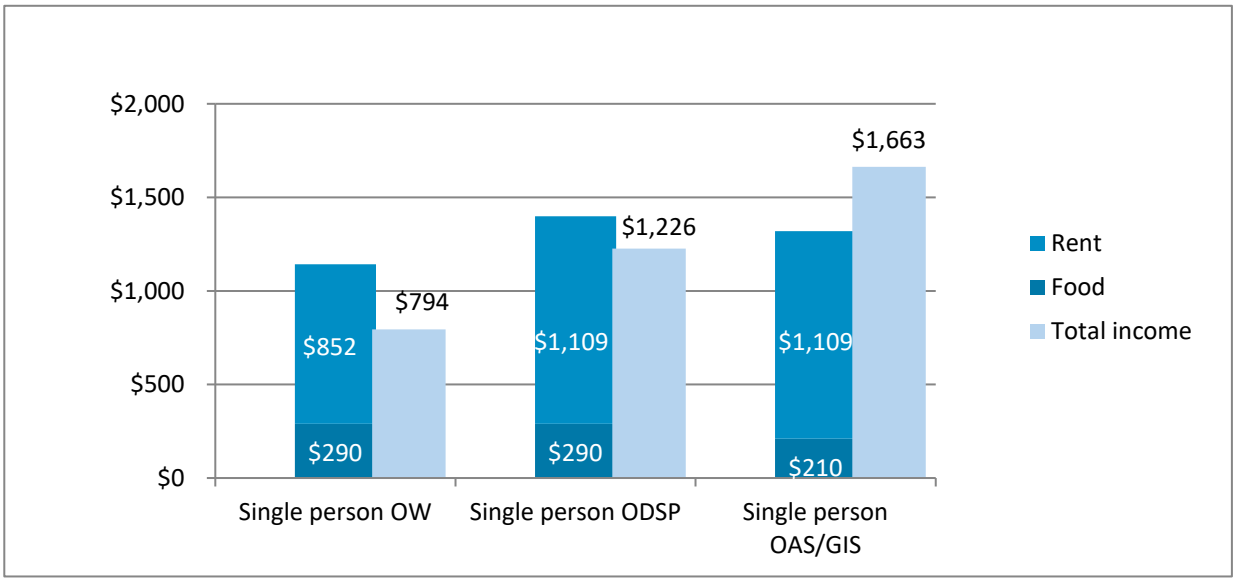
Climate change can also have long-term impacts on children that last into their adult lives.[197] There are also long-term consequences of child malnutrition on education and income as an adult. Children are most vulnerable to malnutrition when they are younger than two years of age. Malnutrition during gestation and during the first three years of life often results in severe and irreversible effects (physical deformity and weakness, delayed motor, cognitive, and behavioural development, increased susceptibility to infection and disease and premature mortality) and leads to reduced productivity and costs to society.[198] Nutrition is also essential for a healthy pregnancy and for breastfeeding. Poor nutrition during pregnancy is linked to problems during delivery, low birth weight, difficulty with breastfeeding and newborn death.[147] See Chapter 4 for more information on vulnerable populations in York Region.

10.2.4 FOOD INSECURITY IN YORK REGION

Between 2009 and 2014, an estimated 7% of York Region households (approximately 24,700 households) experienced food insecurity.[199] Teens and adults in food insecure households eat fewer fruits, vegetables and dairy. They are at risk for inadequate intake of nutrients including protein, vitamin A, folate, B vitamins, magnesium, phosphorus and zinc.[200]

The results from the 2017 Nutritious Food Basket Survey, which measures the cost for healthy diets, indicate that low-income households in York Region often cannot afford a nutritious diet, as shown in Figures 10.6 and 10.7.[201] When comparing income to the cost of food and rent,[dd] a single parent plus two children receiving Ontario Works assistance would need to spend 82% of their income on food and rent, while a family of four with one full-time minimum wage earner would need to spend 68% of their income.[201] Rent and food costs would exceed income for a single person receiving Ontario Disability Support Program assistance or receiving Ontario Works assistance.[201] In contrast, seniors receiving the Guaranteed Income Supplement and Old Age Security would have some remaining money after paying for rent and food. This is consistent with research that indicates the rate of food insecurity in Canadians 60 to 64 years of age is double the rates of those 65 to 69 years of age.[201] Rising food costs stemming from climate change impacts will exacerbate this problem. Additionally, this may cause food-secure households to become food insecure in the future, putting additional individuals at risk.[195]

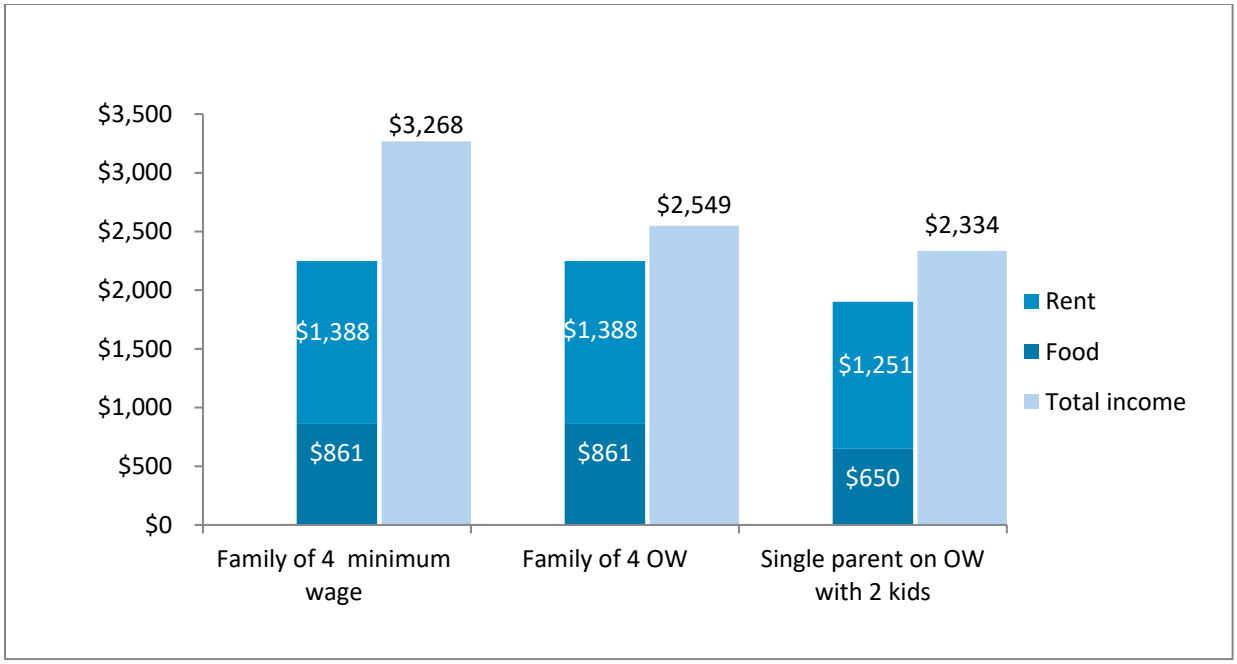
Figure 10.6. Monthly income compared to monthly rent and food costs for individuals in York Region, 2017. OW: Ontario Works, ODSP: Ontario Disability Support Program, OAS: Old Age Security, GIS: Guaranteed Income Supplement.



Source: Regional Municipality of York. York Region nutrition food basket – 2017. Newmarket: The Regional Municipality of York; 2018. Fig.1, Monthly income compared to monthly rent and food costs for individuals in York Region, 2017.

[dd] Rent cost is based on the Canada Mortgage and Housing Corporation average market rents for York Region reported in 2017, and food costs are based on the 2017 Nutritious Food Basket Survey.

Figure 10.7. Monthly income compared to monthly rent and food costs for families, 2017. OW: Ontario Works, ODSP: Ontario Disability Support Program, OAS: Old Age Security, GIS: Guaranteed Income Supplement.



Source: Regional Municipality of York. York Region nutrition food basket – 2017. Newmarket: The Regional Municipality of York; 2018. Fig.1, Monthly income compared to monthly rent and food costs for families, 2017.

10.2.5 ADAPTIVE CAPACITY

Adaptation to climate change needs to be considered at all levels of the food system to increase resiliency. Adaptive capacity for sustainable eating habits depends on human behaviour. Various food banks and pantries[ee] are available across York Region to provide short-term/emergency support to individuals and families that are food insecure. While food banks, pantries and other services targeting food insecurity are critical for those most vulnerable, adequate incomes are needed to address the root cause of food insecurity. As well, building a more resilient food system in terms of production, processing, distribution and preparation will be essential to address the key elements of food security (utilization, accessibility and availability) for all York Region residents. To ensure a more resilient food system, it is important to encourage more sustainable diets and farming practices to help reduce stress on the environment and on food systems.

Current initiatives such as the York Region Food Council support the development of coordinated food-related programs and policies with stakeholders in York Region. The Council also recognizes a multi-pronged approach is needed, guided by the following values from the York Region Food

[ee] Food banks and food pantries collect, store and distribute food to individuals and agencies.

Charter: Health and well-being, environmental sustainability, economic opportunities, equity and social justice, and education and skills.[202]

There are also other initiatives that support building a stronger local food system and mitigate food insecurity issues in York Region including:[201]

- The Good Food Box program, which provides fruit and vegetables at an affordable price, offering food packages focused on local produce
- Food banks and pantries across York Region that provide food to individuals and families in need
- Development and promotion of a local food map in York Region where residents can purchase local products directly from farmers
- Community gardens where residents can grow their own produce
- Community meal events where residents can join others in the community to have meals
- Promotion of land use planning policies and programs that support food access in communities

10.2.6 CONCLUSION

Food security is a complex subject involving multiple variables across sectors (e.g., demographics, economic factors, environmental factors, etc.) and at multiple scales (local, regional, international and global). Based on currently available information, it is difficult to determine the likely impacts from climate change on food security in York Region. Some of the limitations include:

- Limited information on food systems in York Region (e.g., linkages between production, processing, distribution preparation within the Region) and dependence on food systems outside of York Region
- Floodplain maps only consider river and lake flooding with certain watershed areas updated prior to 2010
- How other climate drivers (e.g., extreme weather events, temperature) will impact local food systems and food security
- How local food systems impact food security (availability, accessibility and utilization) for York Region residents, and how other factors such as social determinants of health contribute to food insecurity

Similar to Toronto, weather events that can have important implications for food systems in York Region include flooding, ice storms and heat waves. Additionally, there is limited information on other vulnerabilities that are important to assess climate change impacts on food security. These include:

- Fuel, electricity and transport infrastructure impacts from extreme weather events that could impact distribution and supply of food in York Region

- Impacts on food production from extreme weather events, and capacity of existing food assistance organizations to support food supply challenges during emergency events
- The ability of the general public to shift their consumption to more sustainable diets

To better address food insecurity impacts resulting from climate change, further research is needed to better understand food systems, food security and other determining factors such as social determinants of health. Additionally, efforts to address food safety may also impact food systems and local food security. Table 10.3. provides a summary of activities in York Region relating to food systems and food security, and identifies opportunities for future consideration.

Table 10.3. Summary of food security activities and adaptation planning opportunities.

	Completed and Ongoing Activities	Opportunities
Public Health Assessment and Surveillance	**Population Survey:** Monitoring food intake and nutritional status of the population (e.g., Canadian Community Health Survey Vegetable and Fruit Consumption, Nutritious Food Basket data).	Consider additional food intake data (beyond vegetable and fruit consumption) to inform food security in York Region. **Emergency Preparedness and Response:** Determine information needs for food security issues in York Region (e.g., vulnerability maps, evaluation of components to food security and contributing factors). **Emergency Preparedness and Response:** Consider assessment of food systems in York Region, including local production and supply, and reliance on processing and suppliers outside of York Region. Review transportation climate assessment to better understand potential disruptions in transportation networks that can impact food distribution.
	Completed RRFSS Survey on food security (2016).	Consider additional questions on local food consumption activities and behaviours to better understand vulnerabilities.
Program and Policy	Advocate for adequate incomes for all families. Establishment of York Region Food Charter that aims to "create a thriving, resilient, healthy and just food system for all." Public health nutrition programs and partnerships tailored to most vulnerable populations.	**Health Equity:** Advocate for addressing food insecurity issues for those low-income individuals and families receiving financial assistance and who are potentially food insecure. **Emergency Preparedness and Response:** Ensure key elements of food security (access, availability and utilization) are considered in emergency planning. **Health Equity:** Consider how food security can be incorporated into mental health activities, and better understand the linkages between mental health and food security in York Region. Enhance policy measures for resilient agriculture and local agriculture/horticulture (e.g., processing, storage, food hubs) to support food security as part of the York Region Municipal Comprehensive Review of the Regional Official Plan and the Agri-Food Strategy.

Health Promotion	Promotional activities to increase awareness of the importance of and ways to eat according to Canada's Food Guide, including eating plenty of vegetables and fruits, and plant-based protein foods. Promotion of urban agriculture such as backyard gardening, community gardens, rooftop gardening and local farms in York Region. Fact sheet that discusses built environment factors contributing to food access.	Provide additional messaging to the public to better understand the linkages between climate change and the food system. Support Canada's Food Guide messaging that encourages plant-based protein foods and sustainable diets (which can also be relevant to different cultural and religious dietary preferences) to mitigate the negative health effects of climate change. Expand promotion of food literacy, food waste reduction and backyard composting. Review components of the food system to better understand how the built environment and land use planning policies in York Region can support a more resilient food system and greater food security. Act on findings from this review.
Key Stakeholder Activities (Outside of Public Health)	Initiatives from York Region Food Network that promote food security (e.g., community garden programs, Good Food Box program, Community Cooks program and supporting the York Region Food Council).	Public health consultation with stakeholders on what information could support the York Region Food Council relating to climate change impacts (e.g., food security vulnerability maps). Public health expands support for community agencies in York Region working on food security and climate change issues.