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Long-term health impacts of evacuations and widening inequities in Canada: An annotated bibliography

Prepared by: Ryan Huff, Shirley Chen, Juliette O’Keeffe, Sarah B. Henderson
National Collaborating Centre for Environmental Health



National Collaborating Centre
for Environmental Health

Centre de collaboration nationale
en santé environnementale

ncceh.ca

Key findings

This annotated bibliography presents the findings of a systematic review of literature reporting on health impacts that extend beyond the early recovery stage for communities that have experienced evacuations due to climate-related events including wildfires, floods, landslides, or major storms. The review was limited to peer-reviewed studies and grey literature on recent events (past 10 years) that have occurred in Canada. A total of 21 references were identified, with 18 pertaining to evacuations due to wildfires and three pertaining to floods. Most of the studies reviewed were qualitative or cross-sectional in design. No cohort studies specifically designed to examine the long-term impacts of evacuation were identified. The key findings of the review are summarized below.

Health effects

- Persistent and elevated mental health burden, with markedly high rates of post-traumatic stress disorder (PTSD), major depressive disorder (MDD), generalized anxiety disorder (GAD), insomnia, and substance use that remained elevated up to five years after the event.
- Physical health impacts (e.g., sleep disturbances, respiratory symptoms, chronic disease, weight changes, diabetes) and cognitive impairments (memory, concentration, flashbacks) up to at least three years post-evacuation.
- Reduced social engagement, poor community support, financial strain, employment disruption, and insurance challenges were often reported, contributing to poorer mental health following evacuation.
- Increased substance use, including alcohol, drug, and smoking relapse were observed.
- Increased food insecurity and nutritional disruptions, particularly among Indigenous communities and families with infants. Reported impacts included loss of access to traditional foods, such as disruptions to hunting, fishing, and local ecosystems, reliance on food assistance, and disruptions to breastfeeding and infant feeding practices.
- Compounding stressors such as economic downturns, fear of recurrence, and prolonged displacement amplified impacts and contributed to psychological distress and difficulty returning to normal life.

Health disparities

- Pre-existing vulnerabilities amplified adverse outcomes. Individuals with prior mental illness, poorer baseline health, financial stress, or previous trauma experienced disproportionately worse mental health outcomes after evacuation.
- Access to mental health services was limited by barriers such as a preference for self-management, limited awareness of available services, disruption to healthcare access, and limited social support. Lower uptake was observed among men, ethnic minorities, older adults, and those with lower educational attainment.



- Indigenous communities and Elders, people with disabilities, unhoused individuals, pregnant people, and long-term care residents experienced increased vulnerability due to evacuation-related disruptions.
- Structural and systemic inequities exacerbated health and social impacts in Indigenous communities, including language barriers, racism, cultural disconnection, lack of culturally appropriate services, and exclusion from decision-making.
- Lack of access to transportation, financial resources, food (especially traditional foods), healthcare continuity, and emergency planning capacity led to unequal exposure to risks and reduced recovery opportunities, particularly in remote and marginalized communities.

Recommendations

- Provide long-term mental health supports and follow-up. Several studies emphasized the need for sustained access to counseling, trauma-informed care, psychosocial supports, and ongoing monitoring after evacuations.
- Expand accessible mental health service delivery. Recommendations included increasing access to low-cost, location-independent, online, and self-directed mental health interventions to support recovery over the long term.
- Prioritize early identification and support for individuals at elevated risk of mental health impacts. Studies recommended targeted outreach and follow-up for people with pre-existing mental health conditions, limited social support, and financial hardship.
- Facilitate family and community continuity and reunification. Keep families together during evacuations when possible, and maintain continuity of health, education, and social services.
- Strengthen community resilience through peer support and psychosocial programming. Peer mentorship, counseling, psychoeducation, mindfulness programs, and school-based mental health initiatives were frequently recommended.
- Support culturally safe and community-led recovery. Several studies recommended incorporating Indigenous knowledge, supporting cultural practices, maintaining access to traditional foods, and ensuring Indigenous leadership in recovery planning and service delivery.
- Promote social connection and opportunities for collective healing, such as community gatherings, supportive spaces, and debriefing activities to help restore social networks and reduce isolation following evacuation.
- Address ongoing financial stressors and material needs. Simplify access to financial assistance, ensure timely reimbursement of expenses, and provide food and housing supports to support positive outcomes.



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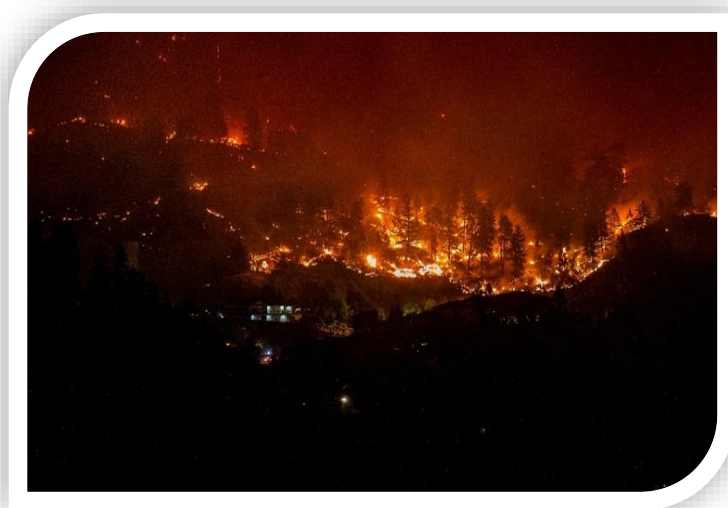


Introduction

Extreme weather events, leading to floods, wildfires, and other climate-related emergencies, are becoming more frequent and severe, causing threats to life and property, which can necessitate the evacuation of individuals or whole communities. Of climate-related evacuations listed in the [Canadian Disaster Database](#) between 2000-2023, most were caused by flooding (85) and wildfire (71), followed by various storm events (winter storms, tornados, hurricanes, etc.). The number of people affected by these events is increasing. Between 2000-2009, 163,566 people were evacuated due to climate-related disasters compared with 388,325 people evacuated between 2010-2019.

First Nations face disproportionate risks from climate-related evacuations. In Canada, 41.9% of wildland fire evacuations occurred in primarily Indigenous communities ([Christianson et al., 2024](#)). Between 2016 and 2026, there were 354 wildfire evacuations that affected First Nations communities, resulting in 143,724 evacuees ([Indigenous Services Canada, 2026](#)). During the same period, there were also 162 flood-related evacuations in First Nations communities resulting in 27,469 evacuees. 11.3% and 26.5% of fire and flood evacuations, respectively, resulted in displacement longer than 60 days.

Some communities have faced multiple evacuations over several years. [Christianson et al., \(2024\)](#) reported that 211 communities were evacuated more than once due to wildfires between 1980-2021. Of these, 130 communities were evacuated twice, 44 evacuated three times, 21 evacuated four times, and 16 communities evacuated 5 or more times.



The evacuation process can result in adverse impacts on evacuees, particularly for prolonged or repeated evacuations. Some examples include disruptions to essential services such as school, delayed health care provision or diagnoses, limited access to mental health supports and culturally safe spaces, food insecurity, loss of income, exposure to violence, and increased substance use. Individuals can be exposed to multiple threats simultaneously, and impacts can compound over time, particularly when people are exposed to lengthy and repeated evacuations.

Returning home does not always mean a return to safety, and some impacts can persist long after an evacuation order is rescinded. These impacts include dealing with damage to housing and



infrastructure, inadequate drinking water and sanitation services, reduced food safety and security, loss of livelihoods, disrupted communications or transportation routes, and dealing with trauma or physical injury or the results of disrupted or delayed healthcare provision during the evacuation ([Leppold et al. 2025](#)). These impacts can be inequitably distributed, resulting in delayed or incomplete recovery for some people, widening existing inequities ([Public Health Agency of Canada, 2023](#)).

There are research gaps in measuring and documenting long-term health outcomes following evacuations and across different types of climate-related emergencies. This annotated bibliography summarizes the results of a systematic review of the Canadian literature to understand how health impacts accumulate or deepen inequities following multiple climate-related evacuations, with considerations of the public health implications of the findings. This review was guided by the following objectives:

1. Identify what evidence exists on the long-term health impacts of evacuations in Canada.
2. Identify what evidence exists on disproportionate impacts or widening inequities for certain groups within communities experiencing evacuations.
3. Identify the factors that exacerbate health impacts and widening inequities.
4. Identify the public health measures and interventions that can prevent or reduce long-term health effects and widening inequities.

Methodology

Research question

How do health impacts accumulate or deepen inequities following evacuations caused by climate-related emergencies, and what are the public health implications?

Literature search

The literature search focused on Canadian populations that were evacuated due to climate-related disasters and the long-term health and socioeconomic impacts. The concept of “long-term” was defined as impacts experienced more than three months post-evacuation for this review. The search was conducted using variants and Boolean operator combinations of key terms such as “evacuation,” “evacuees,” “wildfire,” “flood,” “storm,” “extreme weather,” “health,” “disease,” “mental health,” “inequit*,” and “vulnerability” (a full list of search terms is available upon request). Searches were conducted in EBSCOhost databases (includes Medline, CINAHL, Academic Search Complete, ERIC, etc.) and Google Scholar. Bibliographies and citations of key articles were used to retrieve additional literature via forward and backward chaining, along with supplemental searches as necessary. Only documents in English were considered.

The titles and abstracts of search results were screened by one of two reviewers (RH or SC). The full texts of results included in title and abstract screening were retrieved and screened by one of four reviewers (RH, SC, JO or SH) who also performed the data extraction. The annotated bibliography entries were written by one of two reviewers (RH or SC).

Annotated bibliography structure

This annotated bibliography comprises peer-reviewed literature and relevant grey literature reports and includes a brief summary of the main findings and implications for each citation. The entries are organized by climate-related emergency type and listed in reverse chronological order. Every entry starts at the top of a new page. Due to the large number of studies that focused on the 2016 Fort McMurray wildfire and associated evacuations, these studies were grouped together in a subsection.



Peer-reviewed literature

Wildfire entries – Fort McMurray studies

1. Mao W, Adu M, Eboreime E, Shalaby R, Nkire N, Agyapong B, et al. Post-traumatic stress disorder, major depressive disorder, and wildfires: A fifth-year post disaster evaluation among residents of Fort McMurray. *Int J Environ Res Public Health*, 2022. Available from: <https://doi.org/10.3390/ijerph19159759>.

Focus: Wildfire, mental health

Location and event: The 2016 Fort McMurray, AB wildfire.

Evacuation details: A major wildfire in and around Fort McMurray, AB in May 2016 led to the evacuation of all 88,000 residents. The evacuation order was in effect from May 3, 2016, to June 1, 2016. The evacuation location was not reported.

Study methods: Quantitative cross-sectional survey of residents 5 years post-fire.

Population: Residents of Fort McMurray were recruited from government, school, occupational, and community platforms (n = 186).

Findings: The study found that likely MDD rate was 45%, compared with the 9.7% prevalence of MDD in AB and 12.6% in Canada. The likely PTSD rate was 39.6%. Risk factors for MDD included receiving a mental diagnosis of MDD, taking sedative-hypnotics, and being unemployed. Risk factors for PTSD included receiving a mental health or depression diagnosis from a health professional and having only limited or no support from family. Willingness to receive mental health counseling and wanting to receive mental health counseling were protective factors for MDD and PTSD, respectively.

Study recommendations:

- 1) Development of emergency preparedness plans for disasters that include broad mental health resilience education.
- 2) Continued assessment of the residents.
- 3) Provision of cost-conservative, self-directed, and location-independent interventions.

Study implications and limitations: This study indicated the entire population of Fort McMurray was forced to evacuate but did not specifically confirm all participants in these analyses were evacuated. Study participants were volunteers, with no systematic sampling methods employed. In addition, data was collected via self-report, meaning that mental health diagnoses were only probable. Lastly, data was collected during the COVID-19 pandemic, was not controlled for, and may have influenced mental health outcomes.



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2. **Belleville G, Ouellet MC, Lebel J, Ghosh S, Morin CM, Bouchard S, et al. Psychological symptoms among evacuees from the 2016 Fort McMurray wildfires: A population-based survey one year later. 2021 Front Pub Health. Available from: <https://doi.org/10.3389/fpubh.2021.655357>.**

Focus: Wildfire, mental health

Location and event: The 2016 Fort McMurray, AB wildfire.

Evacuation details: A major wildfire in and around Fort McMurray, AB in May 2016 led to the evacuation of all 88,000 residents. The evacuation order was in effect from May 3, 2016, to June 1, 2016. The mean evacuation duration was 46 days (standard deviation: 39, range: 0-420).

Study methods: Quantitative cross-sectional survey of residents one year post-fire.

Population: Evacuees who responded to telephone survey through random digit dialing (n = 1510).

Findings: One-year post-fire, the prevalence of insomnia, PTSD, MDD, GAD, and substance use disorder (SUD) was much higher in this population than would be expected in the general Canadian population. Overall, 38% of the sample reported at least one outcome and 20% of the sample reported two or more outcomes. There was a downward shift in self-reported pre-event health status compared with post-event health status. Social impacts reported included decreased engagement in work, sports and leisure, and social life; more post-event problems with finances; problems with insurance claims; and increased use of drugs and alcohol. Pre-existing mental illness and financial stress were both significant predictors for all five mental health outcomes one year after the fire. A post-disaster decrease in social engagement had a relatively large association with all outcomes except SUD, and a very large association with PTSD. In general, the adverse effects on mental health were greater for individuals who reported poorer health.

Study recommendations:

- 1) Provide evacuees with effective support and stress management strategies at the acute phase of the disaster.
- 2) Evidence-based online interventions may be effective and possible to implement across large populations.
- 3) Consider direct clinical outreach to those with known mental illness prior to the disaster.
- 4) Target disaster financial relief to those with highest financial needs.
- 5) Before disasters occur, provide social and psychosocial intervention programs in at-risk communities to improve resilience and preparedness.

Study implications and limitations: As interviewers did not have clinical experience, the mental health questionnaire data may have overestimated prevalence compared to data from diagnostic interviews. Pre-evacuation prevalence of mental conditions in the sample was not provided.



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3. Binet É, Ouellet M-C, Lebel J, Békés V, Morin CM, Bergeron N, et al. A portrait of mental health services utilization and perceived barriers to care in men and women evacuated during the 2016 Fort McMurray wildfires. *Adm Policy Ment Health*, 2021. Available from: <https://doi.org/10.1007/s10488-021-01114-w>.

Focus: Wildfire, health services utilization, mental health

Location and event: The 2016 Fort McMurray, AB wildfire.

Evacuation details: A major wildfire in and around Fort McMurray, AB in May 2016 led to the evacuation of all 88,000 residents. The evacuation order was in effect from May 3, 2016, to June 1, 2016. The evacuation location was not reported.

Study methods: Quantitative cross-sectional survey of residents one year post-fire.

Population: Evacuees from the Fort McMurray wildfires who were 18 years or older and spoke English (n = 1,510).

Findings: Three mental health services were examined: information, medication and counseling, therapy or psychological help. In the 12 months after the evacuation, 42.1% reported receiving information about problems with their emotions, mental health, or use of alcohol or drugs; 12.9% reported receiving medication for problems with emotions, mental health, or use of alcohol or drugs; and 16.8% reported receiving counseling, therapy, or psychological help. The main barriers to receiving information were preference to self-manage, not knowing how or where to get information, and thinking about it but not getting around to it. The main barriers to receiving medication were preference to self-manage, thinking about it but not getting around to it, and not being able to afford to pay, and reluctance to take medication. The main barriers to receiving psychotherapy or counseling were preference to self-manage, thinking about it but not getting around to do it, and thinking it would not help. Women were more likely than men to receive information, medication, psychotherapy or counseling. Participants who were Caucasian were more likely to receive mental health services than participants from racial minorities. Participants with a post-secondary level of education were more likely to receive information and psychological help than those with a secondary education or less. Finally, younger participants were more likely to receive psychological help than older participants.

Study recommendations:

1) Examining patient perspectives on mental health needs can guide the development of large-scale interventions that are accessible and relevant after a disaster.

Study implications and limitations: This study indicated the entire population of Fort McMurray were forced to evacuate but did not specifically confirm all participants in these analyses were evacuated.

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4. Lalani N, Drolet JL, McDonald-Harker C, Brown MRG, Brett-MacLean P, Agyapong VIO, et al. **Nurturing spiritual resilience to promote post-disaster community recovery: The 2016 Alberta wildfire in Canada.** *Front Public Health*, 2021. Available from: <https://doi.org/10.3389/fpubh.2021.682558>.

Focus: Wildfire, mental health, community resilience

Location and event: The 2016 Fort McMurray, AB wildfire.

Evacuation details: A major wildfire in and around Fort McMurray, AB in May 2016 led to the evacuation of all 88,000 residents. The evacuation order was in effect from May 3, 2016, to June 1, 2016. Evacuation locations included Edmonton and Calgary.

Study methods: Qualitative descriptive cross-sectional study design using interviews and focus groups of community influencers.

Population: Community influencers: direct service providers, community leaders, social work practitioners, educators, individuals delivering services and programs to youth and families in a variety of organizations (n = 30).

Findings: An analysis of interview results identified common themes. Participants noted that most families were still experiencing mental health impacts, like symptoms of PTSD and anxiety. One participant noted that they gained 20 pounds and that their husband started smoking again. The mental health impacts were compounded by additional stressors related to the economic downturn in Fort McMurray - loss of income, employment, and less work available. The study discussed resources and programs that promoted resilience and well-being post-disaster, but these were not specific to evacuation. Participants identified spirituality, social cohesion and communications as protective factors for mental health. Events that promoted social cohesion were community dinners organized by community organizations and service providers. Sometimes a film on mental health would be shown, but mostly the dinners were a venue to offer support, talk, and socialize. Participants shared that hope, faith, gratitude, compassion, and being of service to others could promote resilience and recovery post-disaster. Several programs enhanced well-being and recovery post-disaster: 1) Service providers were able to access funding through "Wellness Grants" to support community programs to help with coping and trauma; 2) A "Journey of Hope" program supported families who were experiencing separation, divorce, domestic violence, grief, and loss – the program was designed for the more vulnerable members of the community to re-integrate; 3) Mental health and peer support programs in elementary and secondary schools to encourage community integration; 4) Mindfulness and psychoeducational programs to support well-being and resilience in children, youth, and families.

Study recommendations:

1) Expand programs in peer mentorship, counseling, psychoeducation and mindfulness and provide funding for them.



Study implications and limitations: Outcomes were not specific to evacuation, although the participants were evacuated. The authors do not specifically indicate how long after the evacuation the community influencers were approached. It is also noted that COVID-19 may have exacerbated ongoing post-fire impacts during the recovery process.



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5. Thériault L, Belleville G, Ouellet M-C, and Morin CM. The Experience and Perceived Consequences of the 2016 Fort McMurray Fires and Evacuation. *Frontiers in Public Health*, 2021. Available from: <https://doi.org/10.3389/fpubh.2021.641151>.

Focus: Wildfire, mental health, physical health and disease

Location and event: The 2016 Fort McMurray, AB wildfire.

Evacuation details: A major wildfire in and around Fort McMurray, AB in May 2016 led to the evacuation of all 88,000 residents. The evacuation order was in effect from May 3, 2016, to June 1, 2016. Evacuation locations included crisis centers, homes of family and friends, hotel/motel rooms, or rented lodgings.

Study methods: Qualitative prospective follow-up of a cross-sectional survey of residents three months and three years post-fire.

Population: Residents over the age of 18 were considered (n = 394 surveyed three months post-evacuation, and n = 31 three years post-evacuation).

Findings: After analyzing survey responses several themes emerged. At three months post-evacuation, participants experienced anxiety, irritability/frustration, guilt, and sadness, and wrote about suffering from PTSD, anxiety, and depression because of the wildfire. Participants also indicated the development of cognitive impairments, including memory lapses, poor concentration, daytime flashbacks, and nightmares. They also perceived an increase in smoking and alcohol use. Although not measured, comments related to sleep problems, changes in appetite, tiredness, exhaustion, lack of energy, lung infections, somatic complaints, headaches, high blood pressure, chest congestion, coughing, sneezing, nausea and hypothyroidism were all noted. After three years, participants still experienced mental health effects such as emotional distress when exposed to traumatic reminders, continuing PTSD, depression and anxiety regarding the fires. In addition, participants reported weight changes, sleep problems, and diabetes as physical consequences of the fires and evacuations. Long-term social impacts were also identified at three months, including financial loss and worry, negative effects on social life by the separation from friends and family members, and concern about community members choosing to permanently relocate from Fort McMurray. At three years, feelings of isolation from friends and family and financial stressors still remained. When asked about the most difficult part of the evacuation, participants mentioned communication issues between friends, families, and government authorities to be troublesome. Some residents only had 30 minutes to evacuate, which was traumatic. In addition, some residents without access to a car ended up evacuating on foot.

Study recommendations:

1) Mental health professionals could help evacuees develop awareness of positive consequences of the event and promote positive action and perceptions to enhance recovery.



2) The importance of providing support and services to victims of a natural disaster over a long period of time (three years in this study).

Study implications and limitations: The authors of this study also commented on issues that made the evacuation more traumatic and stressful, which may have influenced reported outcomes. In addition, the follow up time point used a different data collection method (i.e., questionnaires vs. interviews), making it difficult to compare the three-month and three-year results.

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6. Ritchie A, Sautner B, Omege J, Denga E, Nwaka B, Akinjise I, et al. Long-term mental health effects of a devastating wildfire are amplified by sociodemographic and clinical antecedents in college students. *Disaster Med Public Health Prep*, 2021. Available from: <https://doi:10.1017/dmp.2020.87>.

Focus: Wildfire, mental health

Location and event: The 2016 Fort McMurray, AB wildfire.

Evacuation details: A major wildfire in and around Fort McMurray, AB in May 2016 led to the evacuation of all 88,000 residents. The evacuation order was in effect from May 3, 2016 to June 1, 2016.

Study methods: Quantitative cross-sectional survey 18 months after the wildfire and evacuations.

Population: College students enrolled at Keyano College (n = 329).

Findings: The one-month prevalence rate for likely MDD, GAD, and PTSD was 23.4%, 18.7%, and 11.0%, respectively 18 months after the Fort McMurray wildfires. Although no assessment was made for prevalence rates prior to the wildfire, based on the self-report questionnaire 11.0%, 14.6%, and 0.0% of study participants reported histories of a depressive disorder, an anxiety disorder, or PTSD, respectively. The rate of problematic drug use 18 months after the wildfire was 13.8%, with 5.6% and 17.6% of males and females affected respectively, with other non-disaster related studies reporting levels of 5%. Several significant associations between risk factors and likely MDD, GAD, and PTSD were identified. The odds ratios for likely MDD 18 months after the wildfire for age was 0.25 (95% CI, 0.12–0.49), history of depressive disorder was 5.16 (95% CI, 2.46–10.81), history of anxiety disorders was 2.60 (95% CI, 1.35–5.01), and being on antidepressants before the wildfires was 4.06 (95% CI, 1.65–10.01). Similar significant associations between GAD and PTSD were also observed for age, history of depressive or anxiety disorders, and being on antidepressants. In addition, for PTSD, the odds ratio for perceived low level of support received from family/friends, the Red Cross, and the Government of Alberta were, respectively 3.97 (95% CI, 1.49–10.58), 3.20 (95% CI, 1.38–7.46), and 3.43 (95% CI, 1.56–7.51). This study also reported no correlation at 18 months between depressive symptoms and receiving counseling after the wildfire.

Study recommendations:

1) Further research is needed on the effects of major disasters on mental health.

Study implications and limitations: This study indicated the entire population of Fort McMurray were forced to evacuate but did not specifically confirm all students in these analyses were evacuated. Moreover, the sample population was not representative of the general student population, over 71% of survey respondents were female even though females comprised approximately 44% of the general population of students. In addition, data was collected via self-report, meaning that mental health diagnoses were only probable.

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7. Agyapong VIO, Ritchie A, Brown MRG, Noble S, Mankowski M, Denga E, et al. Long-term mental health effects of a devastating wildfire are amplified by socio-demographic and clinical antecedents in elementary and high school staff. *Front Psychiatry*, 2020. Available from: <https://doi.org/10.3389/fpsy.2020.00448>.

Focus: Wildfire, mental health

Location and event: The 2016 Fort McMurray, AB wildfire.

Evacuation details: A major wildfire in and around Fort McMurray, AB in May 2016 led to the evacuation of all 88,000 residents. The evacuation order was in effect from May 3, 2016 to June 1, 2016.

Study methods: Quantitative cross-sectional survey 18 months after the wildfire and evacuations.

Population: Elementary and high school staff (n = 197), 168 females (85%) and 29 males (15%).

Findings: The two-week prevalence rates for likely MDD, GAD and PTSD among the school staff were 18.3, 15.7 and 10.2%, respectively, 18 months after the wildfire. Prior to the onset of the wildfires, 7.0% of respondents had self-reported histories of depressive disorder, 8.6% had a self-reported anxiety disorder, while none (0%) self-reported a previous history of PTSD. Significant associations with sociodemographic variables and likely MDD, GAD and PTSD were also identified. For PTSD, the odds ratios for witnessed homes burning was 6.29 (95% CI, 47.62–1.22), level of support received from the Government of Alberta was 4.92 (95% CI, 1.89–12.80), and received counseling after the wildfires was 2.91 (95% CL, 1.10–7.70). For MDD, significant associations were also found with being fearful for respondent's life and/or those of their loved ones, receiving limited support from family and friends and also receiving counseling after the wildfire, with reported odds ratios of 11.23 (95% CI, 1.49–83.33), 6.50 (95%, 2.41–17.52) and 3.15 (95% CI, 1.44–6.94), respectively. For GAD, significant associations were found with being fearful for respondent's life and/or those of their loved ones, and level of support received from the Government of Alberta, with reported odds ratios of 4.35 (95% CI, 1.01–18.87), 6.38 (95% CI, 2.34–17.44) and 2.43 (95% CL, 1.08–5.50), respectively. This study also identified higher proportion of female staff than male staff had likely MDD, GAD or PTSD. For instance, female staff had almost three times the likely PTSD rate compared to male staff.

Study recommendations:

1) Further research on school-based mental health interventions, such as supportive text messaging.

Study implications and limitations: This study indicated the entire population of Fort McMurray were forced to evacuate but did not specifically confirm all staff in these analyses were evacuated. The study response rate was low (13.6%) considering the total sampling methods employed. Data was collected via self-report, meaning that mental health diagnoses were only probable. In addition, no baseline data for the survey respondents on drug and alcohol use was available.



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8. Belleville G, Ouellet MC, Morin CM. Post-traumatic stress among evacuees from the 2016 Fort McMurray wildfires: Exploration of psychological and sleep symptoms three months after the evacuation. *Int J Environ Res Public Health*. 2019; 16(9):1604. Available from: <https://doi.org/10.3390/ijerph16091604>.

Focus: Wildfire, mental health, sleep quality, quality of life

Location and event: The 2016 Fort McMurray, AB wildfire.

Evacuation details: A major wildfire in and around Fort McMurray, AB in May 2016 led to the evacuation of all 88,000 residents. The evacuation order was in effect from May 3, 2016 to June 1, 2016

Study methods: Quantitative cross-sectional survey and interview of residents two to four months post-fire.

Population: Evacuated residents (n = 379) were surveyed, average age of 40.1 and 72% female. A proportion (n = 55) completed a psychiatric/psychological diagnostic interview, mean age 43.07 and 51% female.

Findings: Three months after the fire, survey results indicated that 60% of respondents suffered from significant post-traumatic stress. On the PTSD checklist, the most frequently reported of 20 different symptoms were repeated disturbing memories (77.39%), feeling upset when reminded of the experience (76.66%), and trouble falling or staying asleep (72.49%). Survey data also revealed high prevalence rates for other mental health conditions, with respondents indicating diagnostic criteria for major depressive disorder (33.1%), somatoform disorder (27.0%), anxiety disorders other than panic (27.0%), panic disorder (17.4%), alcohol abuse disorder (17.1%), and binge eating disorder (15.1%). Analysis of the clinical interviews indicated that 29.1% of participants met the criteria for PTSD, 25.5% for major depression disorder, and 16.7% for substance use disorder. Additionally, 43.6% met the criteria for insomnia disorder, with the vast majority of these cases being definitely (68%) or probably (16%) related to the fires. PTSD symptom severity negatively correlated with age (e.g., more severe in younger people), and no differences were observed between sexes.

Study recommendations:

1) Interventions to protect or restore sleep after exposure to a disaster are likely to be useful.

Study implications and limitations: Some of the respondents had not returned home at the time of the survey, meaning that they had not experienced the full scope of the evacuation and start of the recovery process. This study did not perform comparisons with a non-exposed control group, limiting the ability to establish causal relationships between the evacuation and the observed psychiatric outcomes.

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9. **Brown MRG, Agyapong V, Greenshaw AJ, Cribben I, Brett-MacLean P, Drolet J, et al. Significant PTSD and other mental health effects present 18 months after the Fort McMurray wildfire: Findings from 3,070 grades 7–12 students. Front Psychiatry. 2019; 10:623. Available from: <http://doi.org/10.3389/fpsy.2019.00623>.**

Focus: Wildfire, mental health, substance abuse, quality of life

Location and event: The 2016 Fort McMurray, AB wildfire.

Evacuation details: A major wildfire in and around Fort McMurray, AB in May 2016 led to the evacuation of all 88,000 residents. The evacuation order was in effect from May 3, 2016 to June 1, 2016.

Study methods: Quantitative cross-sectional survey 18 months post-fire.

Population: Students (70% of student population, n = 3,070) in grade 7-12.

Findings: Significant mental health impacts in students were identified 18 months after the fire event. Significantly higher rates of suicidal thinking (16% vs. 11%) were observed for students who were present at any point during the fire. Significantly higher mean questionnaire scores were also observed for PTSD, depression, anxiety, alcohol and drug use, and lower scores for quality of life when students personally witnessed the fire. Low resilience (CYRM-12 score) students showed significantly higher scores on all mental health conditions, higher rates for all probable diagnoses, and lower self-esteem and quality of life scores.

Study recommendations:

1) This study recommends a need for long-term mental health supports in disaster-affected communities.

Study implications and limitations: This study indicated the entire population of Fort McMurray were forced to evacuate but did not specifically confirm all students in these analyses were evacuated. In addition, the study relied on self-report rather than clinical interviews, meaning that mental health diagnoses were only probable. This study also did not have baseline data to compare before and after the fire and evacuation.

10. Moosavi S, Nwaka B, Akinjise I, Corbett SE, Chue P, Greenshaw AJ et al. Mental health effects in primary care patients 18 months after a major wildfire in Fort McMurray: Risk increased by social demographic issues, clinical antecedents, and degree of fire exposure. Front Psychiatry, 2019. Available from: <https://doi.org/10.3389/fpsy.2019.00683>.

Focus: Wildfire, mental health

Location and event: The 2016 Fort McMurray, AB wildfire.

Evacuation details: A major wildfire in and around Fort McMurray, AB in May 2016 led to the evacuation of all 88,000 residents. The evacuation order was in effect from May 3, 2016, to June 1, 2016. The evacuation location was not reported.

Study methods: Quantitative cross-sectional survey 18 months post-fire.

Population: People accessing medical services at the out-of-hours primary care network (PCN) clinic in Wood Buffalo (N=290). 44.8% were over the age of 40 and 54.9% were female.

Findings: There was an increase in prevalence of PTSD (0% to 13.6%), MDD (15.2% to 24.8%), and GAD (14.5% to 18.0%) from pre-fire to 18 months after the fire. There was also an increase in prevalence in problematic/hazardous drinking (10.3% to 15%) but decreased prevalence of drug use (14% to 9.1%) compared to the general population 6 months after the wildfire. Several risk factors were associated with mental health disorders after the fire. Witnessing the burning of homes was significantly associated with MDD and GAD. A history of mental health diagnosis, depressive disorder, or anxiety disorder was significantly associated with PTSD, MDD, and GAD. History of mental health diagnosis, depressive disorder, or anxiety disorder were significantly associated with PTSD, MDD and GAD. Respondents who had a history of anxiety disorder were 5.8 times more likely to present with likely PTSD 18 months after the wildfires. Respondents who were fearful for their lives or the lives of friends/family were 3.52 times more likely to present with likely GAD 18 months after the fire. Protective factors associated with a reduction of mental disorders included receiving support from family and friends or the Red Cross and seeking or receiving counselling after the wildfire. Being employed was significantly associated with reduced mental disorders.

Study recommendations:

1) To mitigate the mental health effects of wildfires, utilize innovative and cost-effective interventions such as supportive text messaging, and rapid identification and referral to secondary care for those most affected.

Study implications and limitations: The source of baseline rates of mental health disorders was not clearly specified, though the authors stated that pre-fire prevalence rates were self-reported and 6-month rates were from the general population of Fort McMurray. This study also relied on self-report, meaning that diagnoses were only probable. Furthermore, this study did not rule out confounding variables such as recent experiences of death and loss, or other medical conditions.



11. DeYoung SE, Chase J, Branco MP, Park B. The effect of mass evacuation on infant feeding: the case of the 2016 Fort McMurray wildfire. *Matern Child Health J*, 2018. Available from: <https://doi.org/10.1007/s10995-018-2585-z>.

Focus: Wildfire, maternal and infant health, breastfeeding

Location and event: The 2016 Fort McMurray, AB wildfire.

Evacuation details: A major wildfire in and around Fort McMurray, AB in May 2016 led to the evacuation of all 88,000 residents. The evacuation order was in effect from May 3, 2016, to June 1, 2016. The location to which residents were evacuated was not specified.

Study methods: Qualitative and Quantitative cross-sectional survey four to eight months post-fire.

Population: Evacuated caregivers of children age 0-36 months from the Fort McMurray wildfire (n = 115). 53.4% were evacuated for more than 6 weeks, 27.18% were evacuated for 3-6 weeks, and 19.42% were evacuated for less than 2 weeks. The average age of evacuees was 30 and the average number of children per evacuee was 1.48.

Findings: The health impacts from evacuation were related to the replacement of breastmilk with substitutes such as infant formula for children age 0-36 months. The study found that the odds of exclusive breastfeeding were 1.96 times higher before the evacuation compared with after the evacuation. They also found that there were 0.3 times the odds of bottle feeding with infant formula before the evacuation compared with after the evacuation. The evacuation-related risk factors for breastfeeding included: 1) Lack of social support, 2) Pressure from family members to wean during the evacuation, 3) Stress from the logistics of driving long distances, 4) Moving from destination to destination, 5) Lactation anxiety, 6) Well-meaning volunteers attempting to give babies inappropriate solid foods as a way to “support” evacuees. However, some study participants felt that breastfeeding was important for coping, a sense of safety, and the ability to soothe their children during the evacuation. The ability to breastfeed during evacuations was limited in some participants by access to formula and feeding supplies and proper nutrition to support breastfeeding.

Study recommendations:

- 1) Lactation and infant feeding supports should be “built in” to the incident command system and evacuation procedures.
- 2) Infant feeding support counsellors or volunteers should be available in relief centres.
- 3) Mass sheltering scenarios should take into account the space and privacy needs of breastfeeding families.
- 4) Communication and outreach should be integrated into emergency and public health planning for future evacuations.

Study implications and limitations: Awareness of infant nutrition needs in emergency evacuations can promote both infant and caregiver health. The sample sizes for specific quantitative comparisons (e.g., exclusive breast feeding) were low, meaning that differences pre- and post-evacuation may have been due to infants growing and developing.

12. Cherry N, Haynes W. Effects of the Fort McMurray wildfires on the health of evacuated workers: follow-up of 2 cohorts. CMAJ Open, 2016. Available from: <https://doi.org/10.9778/cmajo.20170047>.

Focus: Wildfire, worker health

Location and event: The 2016 Fort McMurray, AB wildfire.

Evacuation details: A major wildfire in and around Fort McMurray, AB in May 2016 led to the evacuation of all 88,000 residents. The evacuation order was in effect from May 3, 2016, to June 1, 2016. Workers evacuated in different directions (n = 73 south, n = 30 north). Evacuation shelters included vehicles or recreational vehicles (n = 39), reception centre (n = 4), motel/hotel (n = 24), staying with friends/family (n = 21), returned to own home (n = 11), and other accommodation (n = 3)

Study methods: Quantitative cohort surveyed 3-26 weeks post-evacuation. Average follow up time was 102 days after the fire.

Population: Two cohorts of workers (n = 130), most of which (n = 109) were present in Fort McMurray on the first day of evacuations. Of those present in Fort McMurray on the first day of evacuations, 103/109 were evacuated and 26.9% were living in a work camp.

Findings: A survey was issued after the fire, with a follow-up survey completed on average 102 days post-fire. Those who were evacuated had significantly higher anxiety and depression scores than those who were not evacuated. 16.7% of those evacuated had scores aligned with moderate or severe anxiety or depression at follow-up compared with 0% of those who were not evacuated. Fire-related health conditions were reported after the fire by 10.1% participants, including mental ill health (n=8) and respiratory symptoms (n=2). Anxiety scores were significantly higher for women and evacuees who spent the first night in a motel. Depression scores were higher for women. The number of health issues attributed to the fire declined between the period during or immediately after the fire to the time of the follow-up survey. Mental ill-health symptoms were reported more frequently than respiratory symptoms. There was no difference in use of alcohol, cigarettes, recreational drugs, or medication before or after the fire. Other impacts reported by survey respondents included damage to their neighbourhood (19.2%), not working since the fire (24%), and financial loss from lack of work (53.8%). Only 44.6% had returned to Fort McMurray. There was some indication that financial loss from lack of work caused higher anxiety and depression scores.

Study recommendations: None reported.

Study implications and limitations: Results for "healthy workers" indicate persisting ill health was not widespread at early follow up. Participants were all employed, physically active, and generally in good health, and it is possible that their resiliency might not be representative of a wider population group.

Wildfire entries – other studies

13. Michaud-Tétrault J, Bouchard-Bastien E, Peel M, Perron S. Emergency evacuations during wildfires: a public health perspective in Québec (Canada). Disaster Prev Manag. 2026; 35:1. Available from: <https://doi.org/10.1108/DPM-03-2025-0067>.

Focus: Wildfire, mental health, fatigue, stress

Location and event: Five small- and medium-sized Quebec (QC) municipalities (150–7,500 inhabitants) in the socio-administrative region of Nord-du-Quebec, including Chapais, Villebois and Valcanton, Lebel-sur-Quevillon, Chibougamau, and Radisson during the 2023 wildfire season.

Evacuation details: Evacuations related to the 2023 wildfire season. Duration and location not indicated.

Study methods: Qualitative cross-sectional survey one to four months post-evacuation.

Population: Responders from organizations that support the management of wildfire-related evacuations (n = 12), with 75% (n = 9/12) also members of affected communities.

Findings: Qualitative analysis of surveys and interviews indicated that participants experienced fatigue, stress, and fear. Worries over recurrence were indicated, and difficulty resuming a state of normality. Stressors including signs of climate change (i.e., early melting of permafrost) and the sight of air tankers brought on anxiety. Anxiety about job security and stress were exacerbated by financial strains from the temporary closures of businesses and the destruction of the forest. Some participants also experienced food insecurity and had to seek out food assistance post-evacuation. Those already experiencing social and material deprivation were more likely to experience the health and social impacts of evacuation (i.e., the elderly). The authors also explicitly identified long-term care patients as a vulnerable population. One participant reported that long-term care patients who were receiving home care were disoriented during evacuations and had disruptions after return to home.

Study recommendations:

- 1) Establish specific criteria to return to home to minimize psychological impacts.
- 2) Implement cultural mediation activities for promoting "collective healing" in communities, and resource sharing among evacuees.
- 3) Ensure access to psychosocial support.
- 4) Simplify access to financial aid and food assistance.

Study implications and limitations: The authors indicated that they did not interview responders from Indigenous communities, and the results may not fully reflect their experiences. The small sample size may also not be representative of the general population, and observations reported by respondents were not confirmed by other sources.



14. Young K and Roher SIG. Exploring the impacts of the 2023 wildfire evacuations in the Northwest Territories: a grey literature review. Int J Circumpolar Health. 2025; 84(1). Available from: <https://doi.org/10.1080/22423982.2025.2557701>.

Focus: Wildfire, mental health and psychosocial stressors

Location and event: Northwest Territories (NT) wildfire evacuations of 2023.

Evacuation details: Evacuations during the 2023 wildfire season. Across the NT (19 communities including Yellowknife), accounting for 70% of the territorial population). An official evacuation order was in place for 22 days during the 2023 wildfire season. Evacuation locations were both internal (within NT) and external (other provinces and territories).

Study methods: Qualitative grey literature review with thematic analysis of 96 sources that included news articles, community, and government reports from May 5, 2023, to Jul 23, 2024

Population: General population impacted by wildfires and evacuations.

Findings: Thematic analysis indicated mental health was the primary concern across sources (20.8%, n = 20). Mental health concerns were exacerbated or arose during or after the fire, and included stress, eco-anxiety, and post-traumatic stress. This study identified risk factors that included financial stressors, lack of access to resources and services, food insecurity, and disruptions to healthcare, supply chain, and education. Evacuation exacerbated existing vulnerabilities for certain populations, including unhoused individuals, people with disabilities, Indigenous Elders, substance users, long-term care residents, pregnant people, and newcomers. Risk factors for equity-deserving populations included availability of cultural and linguistic supports, miscommunication between agencies and systems (including healthcare records), and poor tracking of evacuees. Community organizations and Indigenous governments were found to act swiftly to support their constituents and evacuees, filling gaps left by other agencies.

Study recommendations:

- 1) Indigenous governments and communities included in emergency preparedness and recovery.
- 2) Improve communications between interjurisdictional authorities, and between governments and populations and organizations impacted by the evacuations to enhance logistical coordination and public trust.
- 3) Address potential for interconnected and cascading events to exacerbate problems, including mental health challenges and financial strain. Enhanced financial and psychosocial supports and information on how to access resources are critical to recovery.
- 4) Invest in local capacity building to ensure response can be initiated by the community.
- 5) Develop interoperable data systems between jurisdictions to ensure continuity of health services and accurate data collection.

Study implications and limitations: The findings of this review may be biased towards sensationalized events due to its reliance on grey literature, and specifically media sources.



Moreover, there was an overrepresentation of experiences of Yellowknife residents compared to the rest of the NWT. Nevertheless, this review highlights the need for community-led and equity-oriented emergency planning.



15. McGee TK. Evacuating First Nations during wildfires in Canada. *Fire Saf J*, 2021. Available from: <https://doi.org/10.1016/j.firesaf.2020.103120>.

Focus: Wildfire, First Nations

Location and event: Whitefish Lake, AB; Dene Tha, AB; Onion Lake, Saskatchewan (SK); Lac L Ronge, SK; Mishkeegogamang, SK; Deer Lake, Ontario (ON); Sandy Lake, ON

Evacuation details: Multiple evacuations from wildfires in First Nations communities between 2011 and 2015. First Nations and reserve communities ranged in size from 800 to 10,000 living on reserve. All First Nations were relatively remote, and two in ON were fly-in only. For interviews conducted in each community, some people were evacuated, some people stayed behind, and some people supported the evacuation and evacuees.

Study methods: Qualitative cross-sectional interviews one to two years post-evacuation.

Population: Multiple participants from each of the above First Nations (N=225) affected by wildfires ranging in age from 12-56 years. More than half were female. A high proportion of households spoke predominantly their traditional language in the home. Many of the Elders did not speak English.

Findings: Psychological distress came from multiple sources, including chaotic evacuation processes, separation from support networks, and uncertainty about long-term housing loss. Interviewees feared being evacuated again years later. They reported respiratory health impacts from smoke for adults and children, and additional health effects due to leaving medications behind during rushed evacuations. Food security was impacted by a lack of access to traditional foods and power outages. Social impacts included the separation of large, close-knit families into different host communities, overcrowding of hotels in host communities and lack of privacy and noise in large evacuation centres, experiences of racism in host communities, culture shock for those evacuated to cities, especially for Elders who did not speak English, and variable financial assistance available across communities. There were several risk factors identified, including not having a community emergency or evacuation plan, followed by having a poorly-developed plan, and a lack of dedicated personnel for emergency management. Other risk factors included not having a vehicle or money for gas, respiratory conditions and other chronic illnesses, Elders becoming separated from family who could speak English, and living in a First Nation with a housing shortage, which amplified stress associated with potential housing loss. There were also protective factors identified, including reliable and timely information about what was happening in the community to those living outside of the community, a community member to relay information to evacuees, including in the traditional language, individual financial support that was easily accessible during evacuation, freely available gasoline, and timely reimbursement of evacuation expenses incurred by the First Nation. Social support protective factors mentioned included social support from family and friends, activities, meals, and other services provided by host communities, and a welcome home event and other opportunities to debrief on the experience and provide closure. The impacts of evacuation were exacerbated for those who only spoke their traditional

language, those who relied more heavily on traditional foods, who did not have a vehicle or money for gas, those who were in an environment with limited and managed housing supply, and those in fly-in communities where there was a multi-stage evacuation with a higher risk of family separation.

Study recommendations:

- 1) Keep emergency plans up-to-date and community specific.
- 2) Keep Elders with family who can help to support them including for translation, keep families together as much as possible.
- 3) Provide on-reserve cleaner air shelters, improve preparation of host communities to receive First Nations evacuees, including adequate accommodation and cultural safety.
- 4) Provide financial support during evacuation and for losses at home while evacuated, such as supply of traditional foods; actively plan for return and debrief to provide closure.

Study implications and limitations: The number of people in each community affected by evacuation was not always provided. Interviews of participants were conducted years after the evacuation in most cases, using an open-ended format. It is challenging to know which health effects were experienced at the time of evacuation and which were longer-lasting.

16. McGee T, Christianson A, Whitefish Lake First Nation 459. Wildfire evacuation experiences of band members of Whitefish Lake First Nation 459, Alberta, Canada. Nat Hazards, 2018. Available from: <https://doi.org/10.1007/s11069-018-3556-9>.

Focus: Wildfire, evacuation, food security

Location and event: Utikuma wildfire, AB

Evacuation details: Whitefish Lake First Nation was evacuated because of the Utikuma wildfire. The evacuation period was 3 weeks. Reception centres were set up in the host communities of High Prairie, Valleyview, Grande Prairie, and Edmonton. 20 residents stayed behind in the community.

Study methods: Qualitative case study with semi-structured interviews three years post-evacuation.

Population: Band members of Whitefish Lake First Nation (n = 45)

Findings: The evacuation led to food insecurity related to lack of access to traditional foods, particularly wild meat, which was stored in freezers and ruined. Evacuees were worried about disaster and evacuation recurrence, feeling triggered by seeing smoke in the sky. They expressed difficulty with returning to “normal” post-evacuation. The Band had issues with accessing disaster financial assistance, which was a confusing and resource-intensive process. They could not reclaim the entirety of their expenses after the evacuation, including repair of the damaged sewage treatment plant. Impacts of the evacuation were exacerbated by housing shortages, language barriers to receiving assistance, and poverty – which led to disaster financial assistance being misspent in some cases, creating additional stress for community leaders.

Study recommendations:

- 1) Keep First Nations families together during evacuations.
- 2) Provide more health resources during First Nations evacuations to assist with health issues that may be exacerbated during evacuations.
- 3) Provide financial assistance after evacuation to cover food and other losses after return to home.
- 4) Bring community together post-evacuation to provide emotional support and reduce negative impacts.

Study implications and limitations: This study identified factors specific to the First Nations communities, which often involved the compounding of existing issues such as how fear of home loss was compounded by existing housing shortages.

17. Dodd W, Scott P, Howard C, Scott C, Rose C, Cunsolo A, et al. Lived experience of a record wildfire season in the Northwest Territories, Canada. CJPH, 2018. Available from: <https://doi.org/10.17269/s41997-018-0070-5>.

Focus: Wildfire, lived experience, mental health

Location and event: Four communities affected by the 2014 wildfires in NT. The majority were Dene First Nation, represented by Ka'a'gee Tu First Nation. Of the four communities, one (Kakisa) was evacuated.

Evacuation details: Residents of Kakisa were evacuated 135 km by road to Hay River, where they stayed together in a local community hall. The evacuation was 1.5 weeks in length.

Study methods: Qualitative case study with semi-structured interviews approximately one year post-fire season.

Population: n = 7/30 interviewees in the study were from Kakisa (population 36). The interviewees included community leadership (n = 1), Elder (n = 1), community firefighter (n = 1), community members (n = 3), and youth (n = 1).

Findings: Evacuation led to acute and ongoing fear, uncertainty, and anxiety. The longer-term impact of the fires (without specific mention of evacuation) led to struggles with resuming regular activities and staying close to the community because of the uncertainty of the fire returning. Community members identified that staying together during the displacement at their evacuation host site mitigated emotional stress that could have come from family separation.

Study recommendations:

- 1) Timely and accurate risk and public health communication before and after wildfires.
- 2) Debriefing during recovery to inform future planning.
- 3) Acknowledge importance of local connections to place for mental and physical well-being.

Study implications and limitations: The study focuses on four communities, only one of which was evacuated. Insights were drawn from the participants living in the evacuated community, unless otherwise noted. The relatively small sample size may limit generalization of findings.

Flood entries

18. Hetherington E, Adhikari K, Tomfohr-Madsen L, Patten S, Metcalfe A. Birth outcomes, pregnancy complications, and postpartum mental health after the 2013 Calgary flood: A difference in difference analysis. PLoS One, 2021. Available from: <https://doi.org/10.1371/journal.pone.0246670>.

Focus: Flood, maternal and child health

Location and event: Calgary floods, 2013. Participants were located in Calgary, High River, and Canmore, AB.

Evacuation details: Not specified. Not all participants were evacuated.

Study methods: Quantitative difference-in-difference causal inference design with temporal (previous year birth outcomes or subsequent year mental health outcomes) and spatial (population from Edmonton area) contrasts. Administrative health data used in the study spanned from 2012 to 2015.

Population: Pregnant mothers (in 2013: 5,180 flood area cases vs. 4,077 non-flood area controls; in 2012: 5,089 flood area cases vs. 3,945 non-flood area controls) and post-partum mothers (in 2013: 7,399 flood-area cases in 2013 vs. 5,788 non-flood area controls; in 2014: 7,641 flood area cases vs. 6,188 non-flood area controls).

Findings: There were null or small effects on birth outcomes and pregnancy complications for pregnant mothers. Effects estimates were null for pre-term birth, small for gestational age, and preeclampsia. There was a very small effect of the flood on increased gestational hypertension (2%). Effect estimates were null for diagnoses or prescriptions for depression or anxiety among post-partum mothers.

Study recommendations:

1) The authors hypothesized that the null results for negative birth outcomes could have been due to high-quality and comprehensive prenatal care in AB.

Study implications and limitations: Findings for the study included participants who were not evacuated, but sensitivity analyses were included with those who lived only in areas under evacuation order. Only qualitative results were provided for the sensitivity analyses, without details on the number of subjects in each group. The authors were unable to control for income, education, or ethnicity in their analysis due to lack of administrative data.

19. Ballard M, Coughlin J, Martin D. Reconciling with minoaywin: First Nations Elders' advice to promote healing from forced displacement. Can J Aging, 2020. Available from: <https://doi.org/10.1017/S0714980819000412>.

Focus: Flood, mental health, First Nations Elders

Location and event: The Interlake region of Manitoba (MB) downstream from the 2011 Fairford Dam flood.

Evacuation details: 17 communities were fully or partially evacuated to a Winnipeg, MB hotel in 2011. Eight years later many evacuees were still in temporary housing, with some relocated over 10 times until settled into rental housing.

Study methods: Qualitative case study with semi-structured interviews approximately four years post-flood.

Population: Elders from Pinaymootang, Little Saskatchewan, Lake St. Martin, Dauphin River, and Lake Manitoba First Nations (n = 23).

Findings: The study documented Elders' "maziaya" (not well/not health) and "minoaya" (well-being/healthy) perspectives of the flood, including their own experiences and observations from their community. Health impacts include deep trauma for multiple, significant losses, and high stress and anxiety. Many Elders felt that some evacuees could no longer fulfill their assigned purpose in life, leading to depression and suicide. Mental health impacts had increased over years-long displacement, including sadness, loneliness, and worry. Elders shared their experiences with deteriorating health, new and worsening chronic illness. There were anecdotal reports of stress leading to miscarriages in the community. Elders reported stress leading to marital breakups and family disruption. As a result of the evacuations, they experienced culture shock and racism. Other impacts of the evacuation included the geographical separation of families, loss of homes and possessions, lack of access to traditional foods, and lack of fair compensation for their losses. They reported disruptions to education and health services among community members. Impacts were worsened by lack of access to trapping and hunting and lack of affordable healthy food in urban food environments, as well as limited access to resources and supports for education, housing, and adjusting to urban settings. Concerns were also raised about children exposed to racism during displacement to urban settings, and culture shock when returning to reserve. First Nations communities felt that they were not involved in the management of the displacement, with a lack of consideration of the impact of the temporary housing on mental health and well-being.

Study recommendations:

Recommendations made by Elders as needs for well-being include:

- 1) Clean and safe environment during evacuation.
- 2) A land base during evacuation (access and living on the land), access to clean water and air for traditional foods and harmony with nature.



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- 3) Access to counseling and mental health supports during and after evacuations.
 - 4) Provision of places to meet, be supported, share and talk, hold gatherings to restore and rebuild social and community connections.
 - 5) Allowing a return home to bring a sense of stability and reunite families.
 - 6) Financial compensation for loss of property and possessions.
 - 7) Seeking a formal apology as a part of reconciliation for the forced displacement from a deliberate flood.
 - 8) Mediation services to assist in conflict resolution within the community.
 - 9) Reclaiming identity and connection to land.

The authors recommended:

- 1) Developing a First Nations-specific emergency response plan.
- 2) Developing a communications strategy including a resource handbook to help evacuees adjust to urban environments in the event of another evacuation with information on accessing housing, education, employment, and health services.

Study implications and limitations: The authors indicate that the number of participating communities were low. However, in the communities that participated, engagement was strong, leading to not everyone having the chance to speak with study personnel about their experiences.

20. Drolet J, Fulton A. Integrating wellness and self-care in the curriculum and workplace perspectives of community influencers engaged in post-flood recovery in Alberta, Canada. Int J Learning: Annual Rev, 2018. Available from: <https://doi.org/10.18848/1447-9494/CGP/v25i01/29-38>.

Focus: Flood, self-care, burnout

Location and event: Multiple communities affected by flooding in AB, 2013.

Evacuation details: Details about the evacuation were not specified. The paper is focused on the post-disaster recovery period.

Study methods: Qualitative case study with semi-structured interviews during the recovery phase post-flood.

Population: Community influencers engaged in post-flood recovery (n = 37). Community influencers included social workers and human service providers. Some community influencers were also affected by the flooding.

Findings: Service providers experienced burnout from supporting the post-flood recovery. Burnout can affect physical and mental health. They also expressed challenges balancing professional and personal demands. The study implied that being affected by the flood was a risk factor for burnout among those providing human services. Organizational support for professional boundaries and self-care and use of apps, including HeartMath to structure self-care, were identified as protective factors for burnout.

Study recommendations:

- 1) Include self-care curriculum in training for social work and related fields.
- 2) Strengthen the culture of self-care in practice.

Study implications and limitations: The study does not directly investigate the health impacts of evacuated populations. It does highlight impacts to those who support evacuees and who will influence community outcomes, and some service providers were also affected by flooding.

Grey literature

21. Mihychuk M. From the Ashes: Reimagining fire safety and emergency management in Indigenous communities. House of Commons, 2018. Available from:
<https://www.ourcommons.ca/Content/Committee/421/INAN/Reports/RP9990811/inanrp15/inanrp15-e.pdf>.

Focus: Wildfire, long term impacts, emergency response, First Nations

Location and event: 49 wildfire emergencies across AB, British Columbia (BC), MB, and SK

Evacuation details: First Nations impacted by wildfires in Western Canada. They represented 13,000 evacuees from First Nations (500 in AB, 3,200 in BC, 7,000 in MB, and SK).

Study methods: Qualitative and Quantitative cross-section study using witness testimony up to a year post-fire season.

Population: First Nations (n = 47) impacted by wildfires in Western Canada.

Findings: Long-term health impacts included psychosocial trauma and lack of cultural safety. During lengthy evacuations, there was often no room to practice traditional activities or prepare traditional foods. Sometimes, family units were split up across different shelters, which had poor conditions and an inadequate supply of basic necessities. Witnesses felt that the social and cultural impacts of emergency measures were more harmful than the fire itself. Other impacts included food security through the disruption of ecosystems, which affected families who relied on hunting and fishing, disruption of economic activities at the community level like logging projects, decreased land values, and difficulties attracting new businesses, and difficulty in disaster financial payments at the community level. For example, Chief Alphonse's First Nation was reimbursed for only \$840,000 from \$3.1 million of spending after the summer 2017 wildfires. Risk factors for adverse impacts included lack of mental health resources at the shelters, underlying generational trauma from the residential schools era and the Sixties Scoop, exclusion of First Nations representation from evacuation coordination activities, lack of funding and access to training activities to prepare and implement emergency plans at the community level, and partial or complete denial of claimed expenses and losses by communities. There was also a lack of consideration of Elders during evacuation. Protective factors identified against harmful impacts of evacuation included use of First Nations knowledge of the local environment, clarification provided by Indigenous Services Canada on the claims and reimbursement process for the recovery of expenses on reserve, public education programs on fire safety, and funding of First Nations fire services.

Study recommendations:

That Indigenous Services Canada:

- 1) Recognize First Nations as equal partners, work with them and provinces and territories through trilateral agreements to clarify the various roles and responsibilities regarding emergency management in First Nation communities.
- 2) In cooperation with First Nations, review its Emergency Management Assistance Program to ensure that funding provided addresses the actual needs of First Nations; that in so doing, the department also ensure that sufficient funding is allocated for emergency preparedness activities, such as developing, updating and implementing emergency response plans.
- 3) Through tripartite agreements, ensure that emergency service providers, where feasible, engage, train and employ local workforce from the communities for fire prevention and fire suppression, and that financial compensation is provided.
- 4) Support local collaboration efforts between First Nation and non-First Nation communities to identify a systematic approach to ensuring First Nations expertise and knowledge of lands and fire behaviour is shared with emergency service providers during and leading up to a response.
- 5) Require tripartite agreements to include training for key staff on traditional cultures and practices in order to ensure that high-quality and culturally appropriate services are delivered; and in jurisdictions where the federal government is not involved in an emergency response, encourage those leading the efforts to engage with local First Nations to provide necessary training.
- 6) Through tripartite agreements: require that one or more resource person(s) be identified to assist with the registration of evacuees and to highlight their specific needs; ensure that a contact person be available throughout an evacuation to respond to emerging needs or concerns, which could include but not be limited to translation services, medical care and mental health supports; ensure that all pertinent information be communicated with relevant contacts from a First Nation community.
- 7) Clarify the claims process and criteria for emergency response and recovery expenses on reserve; and that the department provide greater support to regional offices to expedite the timely reimbursement of claims; further, that the department clarify the claims process and criteria for expenses incurred by First Nations that provide emergency support services to non-First Nation communities, and that claims be reimbursed in a timely manner.
- 8) In cooperation with First Nation communities and the provincial government in British Columbia, review recommendations in the recently-published report, *Addressing the New Normal: 21st Century Disaster Management in British Columbia*, and develop an action plan for implementation.
- 9) Allocate additional resources for First Nations to develop and implement fire prevention campaigns, such as Amber's Fire Safety Campaign from the Nishnawbe Aski Nation.
- 10) In collaboration with First Nations, establish an independent Indigenous Fire Marshal's Office in order to promote fire safety and prevention in First Nation communities including but not limited to activities such as undertaking public education and awareness campaigns, implementing

standardized training for fire safety officials, developing and enforcing fire safety standards and building codes, and conducting regular building inspections; that to allow the Indigenous Fire Marshal's Office to effectively perform its role, a robust data collection system be developed and implemented; and that First Nations provide input and be informed of the progress of this initiative.

That Innovation, Science and Economic Development Canada:

11) Recognize the growing importance of broadband and cellular telecommunications infrastructure in delivering emergency response measures, and given the existing gaps in such infrastructure in rural and Indigenous communities across Canada, evaluate new mechanisms that will enable an accelerated deployment of such infrastructure in emergency situations facing Indigenous communities.

Study implications and limitations: It's not clear how representative the 47 witnesses are of impacted communities.

Summary

In this annotated bibliography, most of the literature covering the long-term health effects associated with climate-related emergencies requiring evacuations in Canada focused on wildfires. In total, 17 of 20 peer-reviewed studies focused on wildfire evacuations, with the majority (11/17) examining the aftermath of the 2016 Fort McMurray wildfire. The other three studies reported on the long-term health effects associated with flood evacuations. One grey literature report was identified that focused on wildfire emergency response in Canada.

Across the literature, mental health impacts were consistently identified as the most significant and persistent health outcome following emergency evacuations. In multiple populations, including students, workers, primary care patients, and community members, elevated rates of post-traumatic stress disorder (PTSD), depression, anxiety, substance use, and reduced quality of life can persist from months to years. Risk of suicide was also described. These impacts were often linked to direct exposure (e.g., witnessing fires, fearing for life), as well as ongoing recovery stressors. Physical health effects were also documented, including respiratory symptoms, sleep disturbances, exhaustion, and chronic disease development or progression. Social and economic disruptions, such as financial loss, reduced employment, food insecurity, and interrupted education, further contributed to declines in overall well-being and reinforced longer-term stress.

Inequities among already vulnerable or equity-denied populations often led to differing long-term consequences. Indigenous communities and Elders, individuals with pre-existing mental health conditions, those experiencing poverty or housing insecurity, and people facing language or cultural barriers experienced more severe and prolonged impacts. Indigenous communities in Canada were disproportionately affected by evacuations. Evacuations disrupted access to and loss of harvested traditional foods, land-based practices, and cultural connections for First Nations communities, while also impacting community level projects such as logging operations. Evacuations also contributed to experiences of racism, family separation, and inadequate living conditions. Other populations, including pregnant people, infants, long-term care residents, and people with disabilities, face additional risks such as disrupted care and food insecurity during evacuations. Pre-existing vulnerabilities, such as mental illness, financial strain, or limited social support, consistently increased the likelihood of adverse mental health and social outcomes.

The bibliography also highlights how evacuation and recovery processes themselves can contribute to adverse health outcomes. Chaotic or poorly coordinated evacuations, family separation, lack of privacy in shelters, and inadequate access to essential resources significantly increased stress and trauma. These impacts can be substantial and long-lasting. For example, one population-based study found that 38% of evacuees experienced at least one mental health condition (i.e., PTSD, GAD, MDD, or SUD) one year after the 2016 Fort McMurray wildfire, and 20% experienced two or



more conditions. Prolonged displacement and repeated relocations were also associated with worsening mental health, social disruption, particularly when compounded by financial losses and employment instability. Barriers to accessing care, such as cost, lack of awareness, preference for self-management, and limited culturally appropriate services further exacerbated these outcomes. A few studies suggested a link between evacuations and the development of chronic diseases, but no studies used an epidemiologic approach (i.e., cohort study) that could demonstrate this association with confidence.

Common recommendations emphasized the need for long-term, equity-oriented, and community-driven public health responses. Evidence from multiple studies highlighted the scale of ongoing need; for instance, five years after the Fort McMurray wildfire, likely MDD affected 45% of respondents (n = 186) and likely PTSD affected 39.6%, far exceeding baseline population rates. To address such sustained impacts, recommendations included extended mental health supports beyond the immediate disaster period, improved emergency preparedness and communication systems, and provision of culturally appropriate services co-developed with Indigenous communities. Strengthening social and community infrastructure, such as keeping families together, enabling collective healing, access to traditional foods, and supporting local leadership, were identified to promote community resilience. Additional strategies include integrating specialized supports (e.g., infant feeding and maternal care) into emergency planning, ensuring interoperable health data systems, simplifying access to financial aid, and investing in local capacity building.



It is important to note that the health impacts and recommendations that have been identified are specific to wildfire and flooding evacuations and may not have the same impacts after other climate-related disasters such as catastrophic storms or hurricanes. In addition, the evidence on how climate-related emergency evacuations affect chronic disease (i.e., diabetes, respiratory diseases, or cardiovascular diseases) was limited, with only one qualitative study reporting on these outcomes. Lastly, several of the studies included a mix of evacuated and non-evacuated populations, or an assumption that the study group had been evacuated (i.e., Fort McMurray residents), meaning that not all the health effects reported may be associated with evacuations.

Overall, the literature underscores that the long-term consequences of evacuations due to climate-related emergencies lead to cumulative stress that negatively affects mental health and deepens inequities. To address these sustained impacts, recommendations include long-term, community-driven public health responses that extend mental health funding, invest in local leadership, and co-develop culturally appropriate services with Indigenous communities.

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Michele Wiens, Information Specialist (NCCEH), PHAC



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655 W. 12th Ave., Vancouver, BC, V5Z 4R4
contact@ncceh.ca | www.ncceh.ca

