Public health surveillance response following the southern Alberta floods, 2013

Vanita Sahni, MHSc, Allison N. Scott, MSc, Marie Beliveau, MSc, Marie Varughese, MSc, Douglas C. Dover, MSc, James Talbot, MD, PhD

ABSTRACT

OBJECTIVE: In June of 2013, southern Alberta underwent flooding that affected approximately 100,000 people. We describe the process put in place for public health surveillance and assessment of the impacts on health.

METHODS: Public health surveillance was implemented for the six-week period after the flood to detect anticipated health events, including injuries, mental health problems and infectious diseases. Data sources were emergency departments (EDs) for presenting complaints, public health data on the post-exposure administration of tetanus vaccine/immunoglobulin, administrative data on prescription drugs, and reportable diseases.

RESULTS: An increase in injuries was detected through ED visits among Calgary residents (rate ratio [RR] 1.28, 95% confidence interval [CI]: 1.14–1.43) and was supported by a 75% increase in the average weekly administration of post-exposure prophylaxis against tetanus. Mental health impacts in High River residents were observed among females through a 1.64-fold (95% CI: 1.11–2.43) and 2.32-fold (95% CI: 1.45–3.70) increase in new prescriptions for anti-anxiety medication and sleep aids respectively. An increase in sexual assaults presenting to EDs (RR 3.18, 95% CI: 1.29–7.84) was observed among Calgary residents. No increases in infectious gastrointestinal disease or respiratory illness were identified. Timely identification and communication of surveillance alerts allowed for messaging around the use of personal protective equipment and precautions for personal safety.

CONCLUSION: Existing data sources were used for surveillance following an emergency situation. The information produced, though limited, was sufficiently timely to inform public health decision-making.

KEY WORDS: Floods; population surveillance; epidemiology

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

Can J Public Health 2016;107(2):e142–e148
doi: 10.17269/CJPH.107.5188

On June 19, 2013, heavy rainfall in southern Alberta resulted in one of the largest and most destructive floods in the province's history.[1] This led to a provincial state of emergency and 29 local states of emergency being declared.[1] A 55,000 km^2 region was directly affected, including 30 communities and with an estimated total of 100,000 people. Damage occurred to roadways, water and waste-water treatment facilities, over 80 schools and 5 health care facilities.[1] Several communities were affected, including Calgary, Alberta's largest city. The hardest hit community was High River, located 40 km south of Calgary. All 12,000 community members were evacuated, and mandatory evacuation remained in place for eight days, after which re-entry occurred in a staged approach.[2]

As part of the emergency response, the Alberta Ministry of Health was engaged to identify and report on any emerging health threats associated with the floods in order to inform public health actions. The immediate health impacts described in the literature were predominantly non-communicable and included deaths,[3] injuries[3–8] and physiological distress;[3,5] infectious diseases[3,5,9] were also a potential risk.

Injuries requiring medical attention can occur shortly before a flood (e.g., during evacuation), and during and after the event (e.g., drowning,[3,10] musculoskeletal stress,[7] punctures and lacerations,[4,8] electrocution[3] and carbon monoxide poisoning[6,7]).

Psychological distress, defined as a person's natural coping mechanisms becoming overwhelmed, is common after a natural disaster; for most people the effect will be temporary and they will recover independently with the support of personal networks.[11] Mental health impacts can include anxiety[12] and difficulty sleeping,[13] as well as the precipitation or exacerbation of mental health disorders requiring medical attention (e.g., depression, post-traumatic stress disorder).[11] For only a small subset of those with psychological distress will mental disorders go on to develop over the long term.[11] Monitoring prescription drug changes can provide an indirect measure of psychological distress in the population.[14–16] Psychological stress has been associated with externalized behaviour such as substance abuse and violence.[17] An increase in violence following a disaster has been observed in some studies.[18]

The potential for infectious diseases after a flood is related to what is endemic in the area. Following Hurricane Katrina, medical

Author Affiliations

Alberta Ministry of Health, Edmonton, AB
Correspondence: Vanita Sahni, Surveillance and Assessment, Alberta Health, 23rd Floor, ATB Place, 10025 Jasper Avenue NW, Edmonton, AB T5J 1S6, Tel: 780-415-2820, E-mail: vanita.sahni@gov.ab.ca
Acknowledgements: We thank the following for their contributions to this work: Hussain R. Usman, Adrienne Macdonald, Karen A. Yee, Kate Snedeker, Rita Biel, Kevin Lonergan.
Conflict of Interest: None to declare.

Table 1. Summary of data sources

Data source	Population under surveillance (area of residence)	Baseline period	Timeliness: time for the data set to be updated	Frequency of reporting	Date of first report
Emergency departments and urgent care centres	Calgary*	June 6–18, 2013 2003–2012 historical ED discharge data for the same weeks	1 day	Daily	July 4
	Flood-affected vs. not-affected neighbourhoods in Calgary*				
Prescription information network	High River* Calgary* Selected First Nations communities Flood-affected vs. not-affected communities	June 16, 2012–June 19, 2013	3 days	Weekly	July 9
Immunization registry (ImmARI)	Calgary*	April 1–June 16, 2013	Calgary: 1 week Other health regions: variable	Calgary: weekly	July 4
	Palliser Region Chinook Region David Thompson Region				
Communicable Diseases Reporting System	Regional health authorities	June 1–June 18, 2013	2 days	Daily	June 28
	Flood-affected vs. not-affected communities	3-year historical monthly averages			

* Population counts for the areas under surveillance: Calgary – 1,237,857, flood-affected – 118,391, not-flood affected – 1,119,465, High River – 16,702.

issues consisted predominantly of skin/wound infections, acute respiratory infections and diarrhea.[9] Injury-related infections are expected within a few days after a flood; airborne, waterborne and foodborne infections are expected up to a month afterwards because of incubation times. In North America, infectious disease outbreaks after a flood are uncommon;[9] however, factors that may be present and may increase infectious disease risks include crowded living conditions (e.g., evacuation centres),[9] compromised sanitation (e.g., of hand hygiene, waste disposal, food preparation, drinking water)[3,19] and power outages (e.g., loss of food refrigeration).[19]

This report describes public health surveillance activities, results and actions for the six weeks after the flood in southern Alberta. It discusses the extent to which surveillance contributed to public health actions and lessons learned.

METHODS

Enhanced surveillance efforts focused on injuries, mental health, violence and infectious diseases. Data sources that had the potential to aid in monitoring these three areas were identified and evaluated according to the following criteria: 1) available to the surveillance team, 2) sufficiently timely to inform a rapidly changing situation (at least weekly) and 3) of high quality. Four sources were identified to examine the health events under surveillance: emergency department data, the immunization registry, prescription drugs and communicable disease reporting data.

Injury surveillance focused on the injuries most likely associated with post-flood clean-up, including carbon monoxide poisoning (e.g., from generators), electrical injuries and physical punctures/lacerations. Mental health surveillance centred on violence; substance abuse; assaults; and dispensed prescriptions for depression, anti-anxiety and sleep-aid medications. Infectious disease surveillance focused on waterborne and foodborne pathogens, and those infections with outbreak potential, including shigellosis, campylobacteriosis, salmonellosis, giardiasis, ameobiasis, verotoxigenic *E. coli* O157:H7, rotavirus and norovirus.

Affected communities were defined as Calgary neighbourhoods where flooding was reported and southern Alberta communities where a state of emergency had been declared.

The surveillance period was defined as the six weeks after the flood (June 19–July 31, 2013). A blend of statistical and visual approaches was used in analyzing the data, with the goal of detecting and interpreting changes in health event rates. When a signal was observed in one data source, whether as a statistical signal or visual cue, other data sources were examined in an attempt to validate it. This broad approach was designed to incorporate statistical analysis with expert opinion, taking all sources of data and information available into consideration. The data sources are summarized in Table 1.

Data sources and analysis

Emergency Department (ED) Data

Real-time data from EDs were not available when flooding began; however, work was under way to expand the Alberta Real Time Syndromic Surveillance Net (ARTSSN), a database of presenting complaints updated in real time,[20] to include Calgary EDs. This work allowed for the creation of daily datasets of presenting complaints, including a baseline (comparison) period of two weeks. The availability and duration of baseline data were limited because of a change in information systems used by Calgary EDs. This dataset was shared with the Ministry of Health starting nine days after the flood (June 28). Similar data from other communities were not available.

A systematic classification system of presenting complaints was used to identify injuries, assaults, violence and substance abuse (see Table 2). Carbon monoxide poisoning did not have a dedicated category. Initially a triage nurse collated counts of discharge

Table 2. Health events under surveillance using emergency department data

Health event under surveillance	Groups of presenting complaints
Gastrointestinal illness	Blood in stool/rectal bleeding, diarrhea, vomiting and/or nausea, vomiting blood
Diarrhea	Blood in stool/rectal bleeding, diarrhea
Vomiting	Vomiting and/or nausea, vomiting blood
Respiratory	Cough/congestion, nasal congestion, shortness of breath, wheezing
Injury	Abrasion, amputation, back pain (traumatic), electrical injury, eye trauma, facial trauma, head injury, isolated abdominal trauma – blunt, isolated abdominal trauma – penetrating, isolated chest trauma – blunt, isolated chest trauma – penetrating, laceration/puncture, lower extremity injury, major trauma – blunt, major trauma – penetrating, neck trauma, upper extremity injury abrasions, lacerations, amputations, electrical injury, punctures and traumas to the body
Abrasions/lacerations	Abrasion, laceration/puncture abrasions, lacerations
Electrical injury	Electrical injury
Chemical injury	Chemical exposure, chemical exposure (eye) abrasion, amputation, back pain (traumatic), electrical injury, eye trauma, facial trauma, head injury, isolated abdominal trauma – blunt, isolated abdominal trauma – penetrating, isolated chest trauma – blunt, isolated chest trauma – penetrating, laceration/puncture, lower extremity injury, major trauma – blunt, major trauma – penetrating, neck trauma, upper extremity injury
Noxious inhalation	Noxious inhalation
Carbon monoxide poisoning	Carbon monoxide poisoning*
Mental health	Anxiety, deliberate self harm, depression/suicidal, situational crisis
Sexual assault	Sexual assault
Violent behaviour	Violent behaviour
Substance use	Substance misuse, substance withdrawal
Cardiac events	Cardiac arrest, cardiac type pain, chest pain (cardiac features)
Rash	Hives, other skin conditions, rash

* Identified through the text description of the presenting complaint.

diagnoses for carbon monoxide poisoning from Calgary EDs and reported them on a daily basis to the Ministry of Health via the emergency operations centres. As ARTSSN ED became available, text descriptions of presenting complaints were also searched for carbon monoxide poisoning.

As only Calgary ED information was available, analysis was restricted to Calgary residents. People displaced to Calgary from other communities during the floods were not included in the analysis to ensure that the underlying cohort was comparable.

Comparisons were made between the pre-flood period (June 6 to 18) and the post-flood period (June 26 to date of analysis). A major ED facility was flooded and therefore unable to assess patients between June 19 and 25; thus, using data between these dates would have shown an artificial decrease in ED events. Rate ratios (RRs) and 95% confidence intervals (95% CI) were calculated by means of Poisson regression in SAS version 9.2. A signal for this data source was defined as a statistically significant difference between the two time periods. Visually, daily counts were compared with the pre-flood average daily count. As daily counts can be quite variable and influenced by day-of-the-week effects, a seven-day moving average (with 95% CI) was also visually examined. The visual tools were designed to aid in the interpretation of any observed increased rates by providing more details on their time and duration.

In order to compensate for a relatively short baseline period, ED discharge data between 2003 and 2012 for the same facilities were used as an additional comparison group. The comparison data were not restricted to Calgary residents.

Immunization Distribution and Registry

Post-exposure prophylaxis (i.e., with tetanus vaccine and immunoglobulin) was investigated as an indicator of injuries. The number of tetanus immunizations and administrations of immunoglobulin after exposure by public health staff in Calgary was provided weekly by Calgary Zone public health. Numbers for other affected areas were obtained through Alberta's immunization registry (Imm/ARI). Immunization data for tetanus prophylaxis were examined visually comparing the baseline period (April 1–June 16) with the post-flood period.

Pharmaceutical Information Network

The Pharmaceutical Information Network is a database of all dispensed prescriptions from 98% of the community pharmacies in Alberta and includes identifiers, so that the data can be analyzed by individual. Records contain information such as patient characteristics, dispensed date, Anatomical Therapeutic Chemical Classification System codes (ATC code) and location of pharmacy. Dispensed prescriptions for antidepressants (ATC codes: N06A, N06CA) anti-anxiety/anxiolytic medications (ATC codes: N05B) and hypnotics and sedatives (ATC codes: N05C) were used as indicators of mental distress among residents of Calgary, High River and selected First Nations communities.

Counts of total and new prescriptions dispensed for these medications in the post-flood period were examined. A prescription was defined as new if an individual had had no prior prescription for that specific drug type in the previous 365 days. New prescriptions were used, as some pre-existing medications could have been abandoned or lost during the flood and evacuation.

Dispensed prescriptions in the post-flood period were examined in comparison with data from the year before the flood (June 16, 2012–June 19, 2013) for residents of Calgary, High River and selected First Nations communities. A signal was defined as more than two standard deviations above the mean with reference to the pre-flood period. The 95% confidence interval was calculated for the relative risk comparing pre- and post-flood dispensations.

Communicable Diseases Reporting System (CDRS)

Shigellosis, campylobacteriosis, salmonellosis, giardiasis, ameobiasis, verotoxigenic *E. coli*, rotavirus and norovirus infections are notifiable under Alberta's *Public Health Act* and must be reported within 48 hours of confirmation to a medical officer of health (MOH). The MOH or the designate contacts the patient to obtain risk factor information; the final case report form is then forwarded to the Ministry of Health within 14 days of diagnosis and entered into the provincial CDRS database.

The timeliest notification of confirmed cases comes from laboratory data. The provincial laboratory provides notification to the Ministry of Health at the same time as notifying the local MOHs; regional laboratories only report to the local MOH, and only selected specimens are forwarded to the provincial laboratory.

In order to support the earliest possible notification of increased enteric activity and/or outbreaks, routine laboratory reporting was enhanced. A request was made by the Chief Medical Officer of Health to the regional laboratories in the flood-affected areas to forward a copy of all positive reports of campylobacteriosis, giardiasis, cryptosporidiosis and amoebiasis to the Ministry of Health in addition to the MOH within 48 hours of confirmation. This allowed the Ministry of Health to report on enteric diseases with greater timeliness.

Counts and seven-day rolling averages were used to compare the number of incident (non-travel associated) cases of enteric diseases in the pre-flood period (June 1 to 18) with the post-flood period (starting June 19). As enteric illnesses tend to increase in the summer months, three-year historical averages of the pre-flood and post-flood periods were also used to account for any seasonal trends.

Reporting

Surveillance reports were published daily from June 28 to July 8, 2013; twice a week from July 9 to July 21, 2013; and weekly from July 22 to July 31, 2013. They were distributed through emergency operations centres and to a distribution list of public health professionals.

RESULTS

Injuries

The first sign of increased injuries came on June 28, 2013, with increased visits among Calgary residents to EDs for abrasions and lacerations. This was reported the following week (Figure 1a). As of July 4, 2013, the RR was 1.28 (95% CI: 1.14–1.43). This result was found for residents of both flooded and non-flooded areas in Calgary.

A 75% increase in the average weekly administration of tetanus post-exposure prophylaxis by public health in Calgary Zone was seen in the three weeks after the flood (June 24–July 14) compared with the pre-flood period. This increase was consistent with the simultaneous increase in ED visits for abrasions and lacerations, and was temporally associated with residents returning to their homes and the post-flood clean-up effort.

An increase in carbon monoxide poisoning was identified and reported on July 2 (14 days post-flood). In the 10 days after the flood (June 19–28), 24 ED visits presenting with carbon monoxide as the primary complaint were reported; in comparison, two cases were reported in the two weeks prior to the event, and five were expected based on historical ED discharge data. Text descriptions from the presenting complaint indicated that the carbon monoxide poisonings in the post-flood period were largely due to the use of generators.

Mental health and violence

A 1.64-fold (95% CI: 1.11–2.43) and 2.32-fold (95% CI: 1.45–3.70) increase was observed in new prescriptions for anti-anxiety medications and sleeping aids respectively for female residents of High River in the six-week period after the flood (Figures 2 and 3). No changes in new prescriptions for anti-depressants were observed for either males or females. In Calgary no changes in new prescriptions for anti-anxiety medications, sleeping aids or antidepressants were observed. The ED data for Calgary did not show any changes in visits for anxiety, depression, deliberate self-harm, suicidal/situational crisis, substance misuse and/or substance withdrawal.

A threefold increase in sexual assaults (RR 3.18, 95% CI: 1.29–7.84) compared with the pre-flood period was reported on July 10 (Figure 1b). Between June 26 and July 9 there were 21 ED visits with

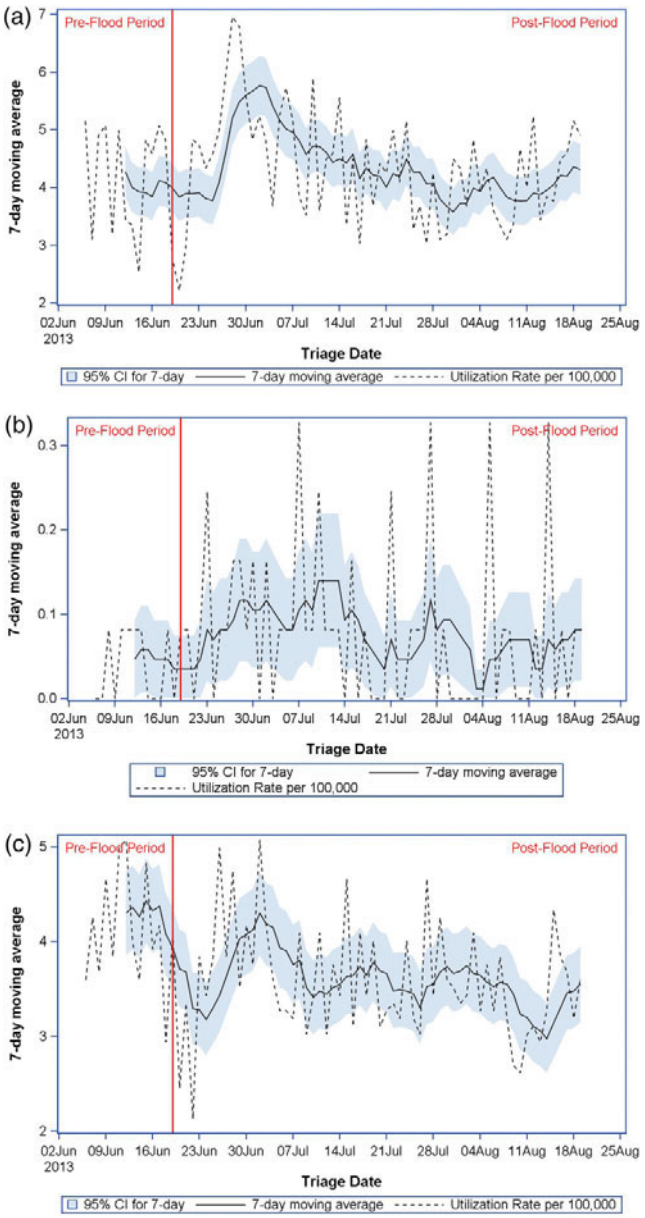

Figure 1. a) Daily rate of emergency department visits with a presenting complaint of abrasions and lacerations, per 100,000 population, Calgary residents, June 6–August 18, 2013. b) Daily rate of emergency department visits with a presenting complaint of sexual assault, per 100,000 population, Calgary residents, June 6–August 18, 2013. c) Daily rate of emergency department visits with a presenting complaint of gastrointestinal illness per 100,000 popultion, Calgary residents, June 6–August 18, 2013

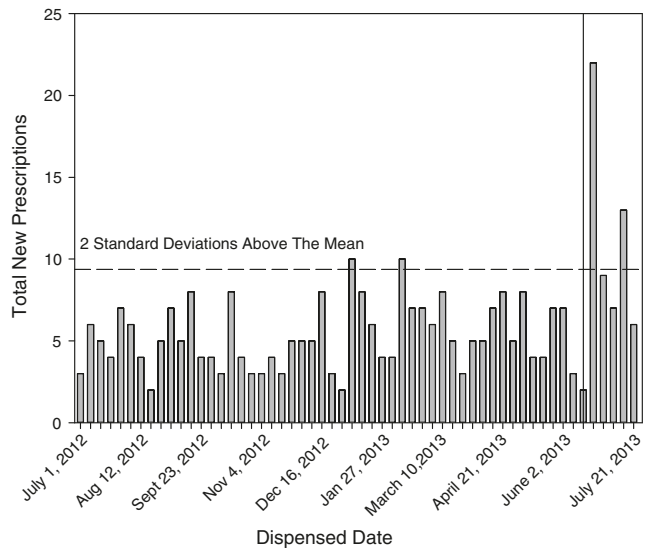

Figure 2. Number of new prescriptions for sleeping aids filled by day between July 2012 and July 2013 for High River residents, females

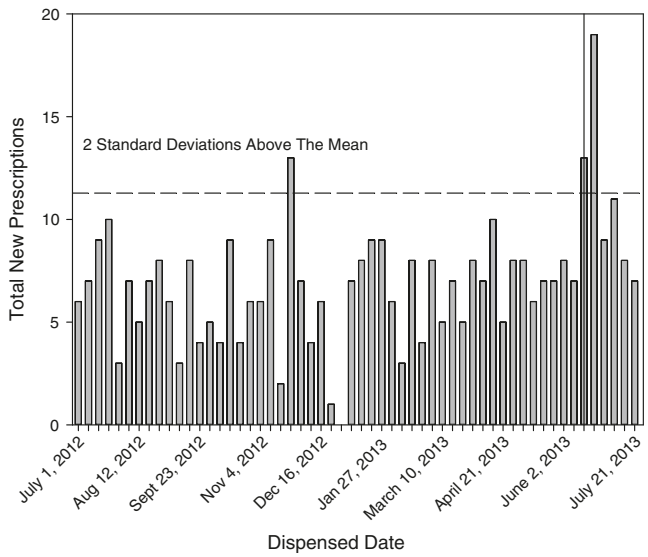

Figure 3. Number of new prescriptions for anti-anxiety medication filled by day between July 2012 and July 2013 for High River residents, females

presenting complaints of sexual assault (23 for all visits regardless of residence); 14 visits were expected on the basis of historical data. No change was observed in ED visits for violent behaviour.

Infectious disease

No increases in enteric illness were reported during the surveillance period (Figure 1c). The drinking water system in Calgary was not compromised.[21] Higher rates of *E. coli* positivity in untreated water were reported in some communities, though drinking water surveillance was put into place by the provincial laboratory;[22] concurrent increases in enteric illness were not detected.

DISCUSSION

Injuries

Public health actions as a result of injury surveillance included media attention reminding residents to use personal protective equipment during flood clean-up. The signal for injuries was temporally associated with residents returning to homes and post-flood clean-up efforts. The fact that it was observed among residents of both flood-affected and non-affected areas may have been due to the outpouring of assistance from residents of neighbourhoods and communities not affected by flooding in the clean-up efforts.[23]

Provincial-level surveillance was not sufficiently timely to inform messaging for carbon monoxide; however, alerts were generated through concurrent hospital-level surveillance. In response, a public advisory was issued by Alberta Health Services and messaging about gas leaks was included in home re-entry information provided by the city of Calgary.[24,25] Knowledge that carbon monoxide toxicity may be a concern in flooding events should prompt proactive, anticipatory messaging for future events.

Mental health and violence

Surveillance information showing an increase in new prescriptions for anti-anxiety and sleep-aids dispensed among females in High River was disseminated widely to health care workers through professional networks and the media. We do not know what actions (if any) resulted from this dissemination.

The increase in new prescriptions for these medications may be an indicator of psychological health impacts attributable to the flood. This is consistent with studies in the UK and Australia that found associations between flooding and psychological distress, anxiety and sleep quality.[12,13] However, it differs from an Australian study that showed a decrease in prescriptions of anti-anxiety medications immediately after a cyclone but an increase over a six-month period.[16] A possible explanation is that this Australian study looked at overall rates of prescriptions, whereas the current study looked at new prescriptions among individuals who had not had a previous prescription in the preceding year, and this specificity allowed for the detection of a signal. As ED data were not available for High River, we were unable to look for other indicators of psychological health. The absence of change in new anti-depressant prescriptions is not unexpected, as guidance documents suggest waiting at least a month after a disaster before diagnosing a mental health condition such as depression.[26]

Surveillance data contributed to public health messaging regarding gender-based violence and the need for precautionary measures (e.g., not walking alone after dark). Violence and sexual assault, including domestic/intimate partner violence, has been reported after natural disasters, including flooding events caused by Hurricane Katrina.[18] The reasons for this are not clear.

Infectious diseases

No increases in gastrointestinal illness requiring investigation were identified, and this information was used to reassure the public that the situation was being monitored and was not deteriorating. Local active surveillance implemented at evacuation centres detected small clusters of norovirus, which were quickly

controlled.[27] This is consistent with the experiences of flooding events in other developed countries, where large increases in gastrointestinal illnesses are rare,[3] but contained outbreaks, particularly diarrheal illness, are documented in areas where people are living in close quarters (e.g., evacuation centres).[9]

Strengths and limitations

A strength of Alberta's post-flood surveillance was the ability to monitor real time or near real time health data using pre-existing sources and indicators. These data streams were used to monitor a large range of health events and were sufficiently sensitive to detect and validate signals, some of which resulted in public health actions.

This surveillance made possible comparisons with pre-flood baseline counts and rates. This capability is often missing from post-disaster surveillance, which tends to be retrospective and include post-event data only;[4–6,8,9] this makes it difficult to assess whether an increase was temporarily associated with the event. The baseline data available were sufficient to make short-term pre-post comparisons but were not always suitable for the consideration of other factors (e.g., seasonality).

Challenges emerged in integrating the results found in multiple datasets, using different indicators, populations and baseline periods. This is not unusual for post-disaster surveillance, when conclusions need to be drawn from the best available information, but it is nevertheless a limitation. Challenges with data availability in other geographic areas meant that surveillance was focused on Calgary, and it is possible that we missed signals in other communities. Smaller communities may have experienced different or more severe health effects, as they did not have the same level of municipal infrastructure as Calgary.

We believe this is the first study to use post-exposure tetanus immunizations as an indicator of injury. While further validation of the indicator is required, it may contribute to the range of tools available for emergency response surveillance.

CONCLUSION

Public health surveillance implemented to detect injuries, psychological distress, violence and infectious diseases following the floods was useful in that the signals detected resulted in timely public health messaging.

REFERENCES

1. Government of Alberta. *Southern Alberta 2013 Floods: The Provincial Recovery Framework*, 2013. Available at: http://alberta.ca/release.cfm?xID=344769171D065-C5D7-28D8-E02995572F86EB0A (Accessed March 20, 2014).
2. Government of Alberta. *First Residents of High River Go Home*, 2013. Available at: http://alberta.ca/release.cfm?xID=344769171D065-C5D7-28D8-E02995572F86EB0A (Accessed February 19, 2014).
3. World Health Organization (WHO) – Europe. In: Menne B, Murray V (Eds.), *Floods in the WHO European Region: Health Effects and Their Prevention*. Denmark: WHO Regional Office for Europe, 2013. Available at: http://www.euro.who.int/__data/assets/pdf_file/0020/189020/e96853.pdf (Accessed March 20, 2014).
4. Cretikos MA, Merritt TD, Main K, Eastwood K, Winn L, Moran L, et al. Mitigating the health impacts of a natural disaster – the June 2007 long-weekend storm in the Hunter region of New South Wales. *Med J Aust* 2007;187(11):670–73. PMID: 18072915.
5. Howe E, Victor D, Price EG. Chief complaints, diagnoses, and medications prescribed seven weeks post-Katrina in New Orleans. *Prehosp Disaster Med* 2008;23(1):41–47. PMID: 18491660.
6. Morbidity and Mortality Weekly Report (MMWR). Carbon monoxide exposures after Hurricane Ike – Texas, September 2008. *Morb Mortal Wkly Rep* 2009;58(31):845–49. PMID: 19680219. Available at: www.cdc.gov/mmwr/preview/mmwrhtml/mm5831a1.htm (Accessed March 20, 2014).
7. NIOSH. *Update: NIOSH Warns of Hazards of Flood Cleanup Work*. Atlanta, GA: Centers for Disease Control and Prevention, 1994. Available at: www.cdc.gov/niosh/docs/94-123/ (Accessed February 19, 2014).
8. Morbidity and Mortality Weekly Report (MMWR). Morbidity surveillance following the Midwest Flood – Missouri, 1993. *Morb Mortal Wkly Rep* 1993;42(41):797–98. PMID: 8411590. Available at: www.cdc.gov/mmwr/preview/mmwrhtml/00022056.htm (Accessed October 21, 2015).
9. Morbidity and Mortality Weekly Report (MMWR). Infectious disease and dermatologic conditions in evacuees and rescue workers after Hurricane Katrina – multiple states, August–September, 2005. *Morb Mortal Wkly Rep* 2005;54(38):961–64. PMID: 16195696. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5438a6.htm (Accessed March 20, 2014).
10. Zhong S, Clark M, Hou XY, Zang YL, Fitzgerald G. 2010–2011 Queensland floods: Using Haddon's Matrix to define and categorise public safety strategies. *Emerg Med Australas* 2013;25(4):345–52. PMID: 23911026. doi: 10.1111/1742-6723.12097.
11. Murray V, Caldin H, Amlôt R, Stanke C, Lock S, Rowlatt H, et al. *The Effects of Flooding on Mental Health*. London: Health Protection Agency, 2011. Available at: www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1317131767423 (Accessed March 20, 2014).
12. Paranjothy S, Gallacher J, Amlôt R, Rubin GJ, Page L, Baxter T, et al. Psychosocial impact of the summer 2007 floods in England. *BMC Public Health* 2011;11(145). PMID: 21371296. doi: 10.1186/1471-2458-11-145.
13. Alderman K, Turner LR, Tong S. Assessment of the health impacts of the 2011 summer floods in Brisbane. *Disaster Med Public Health Prep* 2013;7(4):380–86. PMID: 24229521. doi: 10.1017/dmp.2013.42.
14. Trifirò G, Italiano D, Alibrandi A, Sini G, Ferrajolo C, Capuano A, et al. Effects of L'Aquila earthquake on the prescribing pattern of antidepressant and antipsychotic drugs. *Int J Clin Pharm* 2013;35(6):1053–62. PMID: 24045997. doi: 10.1007/s11096-013-9822-8.
15. Rossi A, Maggio R, Riccardi I, Allegrini F, Stratta P. A quantitative analysis of antidepressant and antipsychotic prescriptions following an earthquake in Italy. *J Trauma Stress* 2011;24(1):129–32. PMID: 21351173. doi: 10.1002/jts.20607.
16. Usher K, Brown LH, Buettner P, Glass B, Boon H, West C, et al. Rate of prescription of antidepressant and anxiolytic drugs after Cyclone Yasi in North Queensland. *Prehosp Disaster Med* 2012;27(6):519–23. PMID: 23009700. doi: 10.1017/S1049023X12001392.
17. Temple JR, van den Berg P, Thomas JF, Northcutt J, Thomas C, Freeman DH. Teen dating violence and substance use following a natural disaster: Does evacuation status matter? *Am J Disaster Med* 2011;6(4):201–6. PMID: 22010597. doi: 10.5055/ajdm.2011.0059
18. Harville EW, Taylor CA, Tesfai H, Xiong X, Buekens P. Experience of Hurricane Katrina and reported intimate partner violence. *J Interpers Violence* 2011;26(4):833–45. PMID: 20495099. doi: 10.1177/0886260510365861.
19. Centers for Disease Control and Prevention. *Prevent Illness after a Disaster*. Atlanta: CDC, 2011. Available at: http://emergency.cdc.gov/disasters/disease/facts.asp (Accessed October 21, 2015).
20. Fan S, Blair C, Brown A, Gabos S, Honish L, Hughes T, et al. A multi-function public health surveillance system and the lessons learned in its development: The Alberta Real Time Syndromic Surveillance Net. *Can J Public Health* 2010;101(6):454–58. PMID: 21370780.
21. Government of Alberta. *Statement from Alberta's Chief Medical Officer of Health on Boil Water Orders in Flooded Communities*. Edmonton, AB: Government of Alberta, 2013. Available at: http://www.health.alberta.ca/newsroom/news-2013-06-21-TopDoc-water.html (Accessed February 19, 2014).
22. ProvLab Laboratory Informatics & Surveillance Team. *Provincial Laboratory Weekly Flood Report*. Edmonton, Provincial Laboratory for Public Health. July 17, 2013.
23. Dormer D. Thousands of volunteers descend on Calgary's Mission district to help with flood cleanup. *Calgary Sun*. 29 June 2013. Available at: www.calgarysun.com/2013/06/29/thousands-of-volunteers-descend-on-calgarys-mission-district-to-help-with-flood-cleanup (Accessed January 13, 2014).
24. Alberta Health Services. *Staying Safe While Pumping Flood Waters*. Calgary: AHS, 2013. Available at: http://www.albertahealthservices.ca/8678.asp (Accessed March 19, 2014).
25. City of Calgary. *State of Local Emergency – Update 5 a.m., Monday, June 24*, 2013. Available at: http://newsroom.calgary.ca/news/state-of-local-emergency-update-247019 (Accessed March 19, 2014).
26. National Collaborating Centre for Mental Health. *Post-Traumatic Stress Disorder: The Management of PTSD in Adults and Children in Primary and Secondary Care*. Leicester: Gaskell, 2005. Available at: http://www.ncbi.nlm.nih.gov/pubmed/21834189 (Accessed March 26, 2014).
27. Alberta Health Services. *Daily Surveillance Tracking Update*. Edmonton, AHS, 2013.

Received: July 6, 2015
Accepted: January 17, 2016

RÉSUMÉ

OBJECTIF : En juin 2013, des inondations ont touché environ 100 000 personnes dans le Sud de l'Alberta. Nous décrivons le processus mis en place pour surveiller la santé publique et évaluer les impacts sur la santé.

MÉTHODE : Une surveillance de la santé publique a été mise en œuvre pendant les six semaines qui ont suivi les inondations afin de détecter les épisodes morbides prévus : traumatismes, troubles de santé mentale et maladies infectieuses. Les sources de données étaient les présentations aux services d'urgence (SU), les données de santé publique sur l'administration post-exposition du vaccin antitétanique/de l'immunoglobuline, les données administratives sur les médicaments sur ordonnance, ainsi que les maladies à déclaration obligatoire.

RÉSULTATS : On a détecté une hausse des traumatismes chez les résidents de Calgary en examinant les visites aux SU (rapport de taux [RT] 1,28, intervalle de confiance de 95 % [IC] : 1,14–1,43); ce résultat était appuyé par une hausse de 75 % de l'administration hebdomadaire moyenne de la prophylaxie post-exposition contre le tétanos. Des effets sur la santé mentale des résidents de High River ont été observés chez les femmes d'après la multiplication par 1,64 (IC de 95 % : 1,11–2,43) et par 2,32 (IC de 95 % : 1,45–3,70) des nouvelles ordonnances de médicaments contre l'anxiété et de somnifères, respectivement. Une hausse des agressions sexuelles chez les personnes se présentant aux SU (RT 3,18, IC de 95 % : 1,29–7,84) a été observée chez les résidents de Calgary. Aucune hausse des maladies gastrointestinales infectieuses ni des maladies respiratoires n'a été constatée. L'identification rapide et la communication des alertes de surveillance ont permis d'émettre des messages sur l'utilisation d'équipement de protection individuelle et sur les précautions à prendre pour sa sécurité personnelle.

CONCLUSION : On a utilisé des sources de données existantes pour assurer la surveillance après une situation d'urgence. L'information produite, bien que limitée, a été suffisamment rapide pour éclairer la prise de décisions de santé publique. Il faudrait pousser la recherche pour confirmer la validité des résultats obtenus et l'utilité des interventions connexes.

MOTS CLÉS : inondations; surveillance de population; épidémiologie