Disaster Medicine and Public Health Preparedness

www.cambridge.org/dmp

Mass Gathering Event Medical Preparedness and Response: A Review of Canadian Legislation and Guidelines

Marc-Antoine Pigeon MD FRCPC[1,2], Attila Hertelendy PhD[1,3], Alexander Hart MD[1,4,5], Adam Lund MD FRCPC[6], Jamie Ranse RN PhD[7,8] and Gregory Ciottone MD[1]

[1]BIDMC Disaster Medicine Fellowship, Boston, MA, USA; [2]Département de médecine de famille et médecine d'urgence, Faculté de médecine, Université de Sherbrooke, Sherbrooke, QC, Canada; [3]Department of Information Systems and Business Analytics, College of Business, & Herbert Werheim College of Medicine, Florida International University, Miami, FL, USA; [4]Department of Emergency Medicine, Hartford Hospital, Hartford, CT, USA; [5]University of Connecticut School of Medicine, Farmington, CT, USA; [6]Department of Emergency Medicine, University of British Columbia, Vancouver, BC, Canada; [7]Menzies Health Institute Queensland, Griffith University, Gold Coast, Queensland, Australia and [8]Department of Emergency Medicine, Gold Coast Health, Gold Coast, Queensland, Australia

Original Research

Cite this article: Pigeon M-A, Hertelendy A, Hart A, Lund A, Ranse J, Ciottone G. Mass gathering event medical preparedness and response: A review of Canadian legislation and guidelines. *Disaster Med Public Health Prep*. **18**(e50), 1–5. doi: https://doi.org/10.1017/dmp.2024.38.

Keywords:
mass gathering; mass gathering medicine; major planned event; legislation; guidelines; medical response

Corresponding author:
Marc-Antoine Pigeon;
Email: marc-antoine.pigeon.med@ssss.gouv.qc.ca.

Abstract

Introduction: The mass gathering event (MGE) industry is growing globally, including in countries such as Canada. MGEs have been associated with a greater prevalence of injury and illness when compared with daily life events, despite most participants having few comorbidities. As such, adequate health, safety, and emergency medical planning is required. However, there is no single entity regulating these concerns for MGEs, resulting in the responsibility for health planning lying with event organizers. This study aims to compare the legislative requirements for MGE medical response systems in the 13 provinces and territories of Canada.

Methods: This study is a cross-sectional descriptive analysis of Canadian legislation. Lists of publicly available legislative requirements were obtained by means of the emergency medical services directors and Health Ministries. Descriptive statistics were performed to compare legislation.

Results: Of the 13 provinces and territories, 10 responded. For the missing 3, a law library review confirmed the absence of specific legislation. Most ($n = 6$; 60%) provinces and territories referred to provisions in their Public Health laws. Four confirmed that MGE medical response was a municipal or local concern to be addressed by the event organizers.

Conclusions: No provinces could list specific legislation guiding safety, health, and medical response for an MGE.

Mass gatherings events (MGEs) of all kinds are becoming more frequent in our communities. It is projected that the music MGEs in Canada alone will produce revenues of over 1 billion US dollars by 2025.[1] An important number of these MGEs are organized under the structure of music festivals, and take place in the larger cities of Canada located in the eastern provinces (Quebec and Ontario) and western provinces (British Columbia and Alberta).[2] These gatherings sometimes reach over 100,000 attendees and occur over multiple days. Sporting events such as marathons or sport tournaments are also becoming more and more prevalent and lucrative, with estimated revenue of over 1 billion of dollars in Canada alone for 2022.[3] The MGE crowds are mostly composed of healthy, young athletes or young adults considered "well persons," but statistically have proved to be associated with a greater prevalence of injury and illness than in the general population.[4]

MGEs can cause a burden on health systems. In addition to higher proportions of injury and illness, deaths have also been reported at MGEs.[5] These deaths may be due to specific activities at MGEs that attendees participate in, or as a result of accidental disasters or intentional acts of harm.[5–8] The recent coronavirus disease 2019 (COVID-19) pandemic also shed light on the high risks of infectious diseases spreading during mass gatherings.[9] Due to the factors mentioned above, MGEs can create additional resource challenges for health-care systems that are often already overburdened.[10–12] The Canadian health-care system has been suffering from an increase in overcrowding over the past 15 y,[13,14] with many factors contributing to this phenomenon, including an overall increase in the number of patients, as well as the unpredictability of medical needs.[11] To alleviate this burden on health systems and provide appropriate care at MGEs, in-event health service (IEHS) professionals should be able to provide

a certain standard of care, within a defined scope of practice, and be held accountable as other health providers.

There is a need to have MGE organizers and IEHS providers regulated. Over the past 3 decades, many articles have been published globally regarding MGEs, with most being single case reports or descriptive studies. These studies lack definitions and reporting of patient outcomes, therefore, limiting comparison between MGEs.[15–19] The paucity of literature, combined with a lack of standardized approach to data reporting on MGEs limits IEHS in the way they can draw conclusions and plan MGEs accordingly.[16,20] Thus, IEHS and MGE organizers are left without guidance on how they should prepare for MGEs.[21] To compensate for a lack of evidence, legislation and regulations should be provided for what constitutes the provision of reasonable IEHS at MGEs. To draft legislation, an understanding of the existing legislation on MGE IEHS provision would provide insight as to what constitutes a minimum requirement for MGEs.[22]

This study aims to determine the existence and details of legislation, regulations, and guidance in Canada. Understanding Canadian legislation regarding MGEs will then inform the requirements for future legislation in both Canadian jurisdictions, and international jurisdictions, without legislation.

Methods

Study Design

This research was a cross-sectional descriptive study among the 10 provinces and 3 territories of Canada to determine if there are any acts, regulation, or guidelines that exist relating to MGE medical care.

Setting

This research is set in Canada, a federation, whereby the federal government, 10 provinces, and 3 territories all have different legislative requirements and oversight of different aspects of law. This oversight also includes oversight for MGEs. Municipal regulations are outside the scope of this study.

Sample

The sample for this research is any Act, Regulation, and/or Guideline that stipulates MGE medical care from any of the Canadian provinces and territories. For this study, an Act, also called a statute, is a law enacted by the Legislative Assembly. A regulation is delegated legislation, and is made by a person or body under the authority of an Act passed by the Legislature.[23] A guideline is not bound by any legal frameworks, rather, a guideline provides general principles and recommendations. However, aspects of a guideline are not enforceable by law.

Ethical Considerations

This review aimed to find any document that would be publicly available, as is normally the case for legislation. Contacts by means of agency e-mails and/or phone numbers that were available on the province government or agencies websites, were only used to guide the research and obtain the documents in a more pro-active manner. As such, the individuals that answered our requests were not considered research participants; none of their personal data or contact information were obtained.

Data Collection

Contact information for provincial and territory Emergency Medical Service (EMS) governing bodies were obtained by means of their respective websites, as shown in Table 1. Provincial and territorial agencies were then contacted by e-mail to determine if they were aware of any federal, provincial/territory, or regional MGE medical care legislation, regulations, and/or guidelines. Up to 2 e-mail reminders were sent, and if no response was received by means of e-mail, EMS governing bodies were then contacted by means of phone, for a maximum of 2 attempts. In some cases, inquiries were transferred to departments of ministries of health responsible for legislation. If e-mails and phone calls were not returned, a review of the published legislation was performed, by means of the Nahum Gelber Law Library. Data collection took place between October 16, 2022, and March 15, 2023.

Data Analysis

Data analysis was undertaken using descriptive statistics, such as frequencies. Data were analyzed directly into Microsoft Word tables.

Results

Of the 13 jurisdictions that were contacted, 10 replied. This represents a response rate of 76.9%. An overview of the laws, Acts, Regulations, and/or guidelines from each province and territory is outlined in Table 1.

Governance Structure for Regulations in Canada

The Canadian structure for governance is briefly summarized as follows. Federal government, as the highest level of governance, can issue legislations that will apply throughout the whole country; it is the case for immigration laws, for instance. Within the boundaries of these legislations, provinces can further implement more specific legislations or regulations. The federal government can also entrust provinces to governate on specific matters. If so, the legislative assembly of a province or territory has full power to enforce legislation, within boundaries of which localities can implement their own regulations; it is the case for Health, for instance.

Acts, Legislation, and Regulations

There were no laws or Acts identified that related to MGE medical response. However, it is noted that most of the jurisdictions that replied ($n = 6$; 60%) had clauses in their Public Health Acts relating to MGEs.[25–30] These clauses were public health specific and not related to MGE medicine or IEHS; in fact, they do not contain any provision on acute health services or first responder-type activities. The Public Health Acts contain information related to public health aspects such as water access, sanitation, clean and sanitary aspects of MGEs. These Public Health Acts include broader aspects, such as when to cancel an event, and were referred to during the COVID-19 pandemic. However, no information or requirement as to a minimum standard specifically regarding the medical response or health infrastructure needed for MGEs was noted. Regulations on the topic of mass gatherings were enforced at the municipal level; therefore, their more in-depth analysis and comparison were outside the scope of this study.

https://doi.org/10.1017/dmp.2024.38 Published online by Cambridge University Press

Table 1. Contact information for provincial and territory EMS governing bodies

Province/Territory	Law/ Act	Regulation	Highest level	Guidelines	EMS agency/Ministry of Health website
Newfoundland/Labrador	No	No	N/A	No	https://www.gov.nl.ca/hcs/ehps/
Nova Scotia	No	Yes	Municipal	Yes	https://novascotia.ca/dhw/ehs/
New-Brunswick	No	No	N/A	No	https://www2.gnb.ca/content/gnb/en/services/services_renderer.525.Ambulance_Services.html
Prince Edward Island	No	No	N/A	No	https://www.princeedwardisland.ca/en/information/health-and-wellness/ambulance-services
Quebec	No	Yes	Municipal	Pending	https://www.prehospitalierquebec.ca/nous-joindre/
Ontario	No	No	N/A	No	https://www.health.gov.on.ca/en/pro/programs/emergency_health/default.aspx
Manitoba	No	No	N/A	No	https://sharedhealthmb.ca/services/emergency-response/
Saskatchewan	No	No	N/A	Online Workshop[24]	https://www.rqhealth.ca/departments/ems-emergency-medical-services
Alberta	No	No	N/A	Yes	https://www.albertahealthservices.ca/ems/ems.aspx
British-Columbia	No	Yes	Municipal	Yes	http://www.bcehs.ca/
Northwest Territories	No	No	N/A	No	https://www.maca.gov.nt.ca/en/services/ground-ambulance-and-highway-rescue
Yukon	No	Yes	Municipal	No	https://yukon.ca/en/employment/apply-job/learn-about-emergency-medical-services
Nunavut	No	No	N/A	No	https://www.gov.nu.ca/fr/sant%C3%A9
Total, *n (%)*	0 (0)	4 (30.8)	N/A	5 (38.5)	

Abbreviation: EMS, Emergency Medical Service; N/A: not available.

Guidelines

Although no laws or Acts were identified specifically relating to IEHS at MGEs, nearly a third ($n = 4$; 30.8%) of the jurisdictions had some form of regulation. Guidelines were the most common form of governance document located, with 5 (38.5%) jurisdictions having some form of guideline. Of these 5, 3 were established event planning guidelines,[31–33] 1 was pending and should be available sometime in 2024, and the remainder was an online workshop. Of the MGE guidelines, 3 provided suggestions for MGE management, of which also included IEHS aspects.[31–33] These suggestions included considerations for weather, size of the crowd, mass casualty incident protocols and emergency planning. These guidelines cover broad topics regarding general risk assessments of MGEs. However, only 1 guideline[33] contains a detailed section on risk and vulnerability assessment. Alberta's Mass-Gathering Guidebook provides numerous charts, a risk assessment matrix, and a step-by-step approach to evaluating categories of MGE hazards. It also contains a specific chapter that briefly covers emergency plans and what to consider for specific scenarios such as lost children, mass casualty, bomb threat, etc. Nova Scotia's guidelines also provide a sample worksheet for risk assessment but does not provide details and tools to adequately assess each of the components needed to complete the assessment. British Columbia's guide is the only 1 that provides a stepwise approach to elaborating a medical plan for a MGE.[32] The 3 guidelines, although heterogeneously, cover key components of what should constitute a thorough risk assessment according to the WHO.[34] None of the guideline's mandate or enforce any type of IEHS. The 3 guidelines were authored by provincial working groups, composed of stakeholders with a variety of MG expertise important to the organization of a major event: government, law enforcement, fire services, emergency medical services, environment, and weather services. None of the 3 guidelines provide specific information as to how the regulating organizations would provide authorizations for the event to take place.

Discussion

Absence of Legislation

This study demonstrates that, although there are some legislative requirements for MGEs from a public health perspective, there are no legislative requirements in Canada from an IEHS perspective. In a cross-sectional survey of states in the United States of America in 1999,[22] Jaslow et al. showed that only 6 states had specific guidance on IEHS provision at MGEs. The legislation of these 6 states were grouped in 2 categories, either public health and hygiene elements, or medical care elements. This first category shares many similarities with the Public Health Acts reported in this Canadian study. Arguably, both public health and IEHS are focused on protecting the health of MGE attendees and those in the communities where MGEs occur. As such, it would be reasonable to have legislation for IEHS and MGE organizers. Future research on this matter could include a Delphi study to identify most important areas to orient lawmakers in developing pertinent legislation. Many studies have been published to identify important aspects to consider in planning a mass gathering medical response, but a strong consensus on the way to address these issues is lacking.

Guidelines

Guidelines normally outline the interplay between factors that may influence the risk of patient presentations to an IEHS and the transport to hospital from an MGE. These factors can broadly be described as biomedical, psychosocial, environmental, public health, command and control, and security.[35] Internationally, many guidelines or considerations are primarily based on expert opinion rather than evidence. However, it could be argued that some guidelines bring a false sense of security to MGE organizers and attendees, while missing important parts of the risk assessment. It is also possible that focusing on the requirements without tailoring the plan to a specific MGE will lead to a lack of important

https://doi.org/10.1017/dmp.2024.38 Published online by Cambridge University Press

resources to adequately respond during the event. The provincial guidelines described in this study use a descriptive approach to detail the important aspects of mass gatherings planning, rather than suggest ways to respond to or mitigate hazards.

Although it has been demonstrated that the presence of an IEHS on-site during an event may influence risky behaviors among attendees,[36] it has not been shown to influence the rate of patient presentation and severity of medical emergencies in any ways.[37] Given the above, there is no consistency; the medical response is not evidence based and primarily based on resource allocation depended on the budget of the event organizer rather than the health needs of the attendees or communities where MGEs are being held. Guidelines are not enforceable; however, guidelines may be used to inform contracts and general IEHS provision. In the absence of legislation, guidelines should be in place in all jurisdictions. Guidance for similar MGEs could be a place to commence standardization for MGEs. Engaging with MGE industries, organizations, and associations would be a reasonable place to start developing standardized guidelines.

Contracts

In the absence of legislation and guidelines, MGE organizers and IEHS providers will still develop MGE plans, considering health issues and providing a medical response for attendees. In this situation, MGE organizers' obligations are not enforced by law, instead agreed to within contracts between MGE organizers and IEHS providers. Contracts are often agreed upon between these parties to provide health support at MGEs. This study did not explore individual contacts between IEHS providers and MGE organizers. However, contracts often include an agreed upon cost for providing IEHS, usually in the form of an agreement between parties on the minimal standards of IEHS provision at an MGE. These standards are negotiated between parties and vary between MGE types, while also taking into consideration the financial means of both parties. The downside of this situation is that these contractual clauses can be very broad and not specific without taking into consideration many crucial aspects of the planning related to a particular MGE. Financial considerations may also overly influence the planning and response process. While these considerations may mean that many MGE have some IEHS provision, standardized legislation to ensure that all MGEs have a basic, minimum response plan in place would protect MGE attendees and the health resources in the communities where MGEs are being held.

Despite some jurisdictions having some legislation relating to public health aspects of MGEs, no jurisdictions had specific IEHS provision or MGE organizer requirements. As such, MGE organizers and IEHS providers may rely on guidance documents, which are limited to 3 jurisdictions. As a result, IEHS providers and MGE organizers essentially determine, on an individual MGE basis what the minimum IEHS provision will be. This provision is often embedded within contracts. Legislation is required to ensure a standardized approach to IEHS provision with consequences when adequate services are not provided. Legislation would be an important step in providing safer MGEs.

Limitations

This research was conducted in 1 country. The legislative requirements of other countries may also provide insight for Canada. Therefore, future research should explore legislation internationally to inform practice locally. A further limitation was the collection of data directly from EMS in each jurisdiction. In some jurisdictions, our inquiries were transferred to deputy ministers or communication officers within the ministry of health, whereas in some others we got feedback by means of EMS directors or other field representatives. Finally, our research strategy did not access municipal legislations or guidelines. It may be that some municipalities may have guidelines for MGE organizers.

Conclusions

The lack of MGE legislative requirements demonstrated in this study may result in attendees and host communities of MGEs being at risk of avoidable morbidity and mortality. Guidelines are heterogeneous and provide variable guidance in different provinces and territories. Strengthening legislation and guidelines may strengthen health outcomes for event attendees and communities where events are held.

Authors contributions. Marc-Antoine Pigeon had the original idea for the research. Marc-Antoine Pigeon, Attila Hertelendy, and Alexander Hart designed the protocol. Marc-Antoine Pigeon conducted the data collection and analysis. All authors equally contributed in writing and reviewing the manuscript.

Funding statement. None of the authors received funding to participate in this study.

Competing interests. Adam Lund has been working as a medical director for many events and medical coverage companies for many years, although none of them provided funding for this research. Marc-Antoine Pigeon volunteers as medical director for many events and as provincial commissioner for St-John Ambulance Canada, Council of Quebec, and did not receive any funding for this research.

References

1. **Statista**. Music events – Canada. 2022. Accessed October 20, 2022. https://www.statista.com/outlook/dmo/eservices/event-tickets/music-events/canada
2. **CIMA**. Festivals and conference (domestic). 2022. Accessed March 8, 2022. https://cimamusic.ca/events/other/festivals-and-conferences
3. **Statista**. Sport events – Canada. 2022. Accessed March 8, 2022. https://fr.statista.com/outlook/dmo/eservices/event-tickets/sport-events/canada
4. **Arbon P.** Mass-gathering medicine: a review of the evidence and future directions for research. *Prehosp Disaster Med.* 2007;22(2):131-135.
5. **Turris SA, Lund A.** Mortality at music festivals: academic and grey literature for case finding. *Prehosp Disaster Med.* 2017;32(1):58-63.
6. **Campion EW, Morrissey S, Malina D, *et al.*** After the mass shooting in Las Vegas - finding common ground on gun control. *N Engl J Med.* 2017;377(17):1679-1680.
7. **Alhadhira A, Molloy MS, Casasola M, *et al.*** Use of dimensional analysis in the X-, Y-, and Z-axis to predict occurrence of injury in human stampede. *Disaster Med Public Health Prep.* 2020;14(2):248-255.
8. **Glick J, Rixe J, Spurkeland N, *et al.*** Medical and disaster preparedness of US marathons. *Prehosp Disaster Med.* 2015;30(4):344-350.
9. **Ranse J, Beckwith D, Khan A, *et al.*** Novel respiratory viruses in the context of mass-gathering events: a systematic review to inform event planning from a health perspective. *Prehosp Disaster Med.* 2021;36(5):599-610.
10. **Milsten AM, Seaman KG, Liu P, *et al.*** Variables influencing medical usage rates, injury patterns, and levels of care for mass gatherings. *Prehosp Disaster Med.* 2003;18(4):334-346.
11. **Rowe BH, McRae A, Rosychuk RJ.** Temporal trends in emergency department volumes and crowding metrics in a western Canadian province: a population-based, administrative data study. *BMC Health Serv Res.* 2020;20(1):356.

https://doi.org/10.1017/dmp.2024.38 Published online by Cambridge University Press

12. **Almalki Y, Hart A, Issa F, *et al.*** The Holy Month of Ramadan: mass-gathering event implications for hospital surge capacity planning in Saudi Arabia. *Prehosp Disaster Med.* 2021;36(4):393-398.
13. **Pearce S, Marchand T, Shannon T, *et al.*** Emergency department crowding: an overview of reviews describing measures causes, and harms. *Intern Emerg Med.* 2023;18(4):1137-1158.
14. **Affleck AP, Parks P, Drummond A, *et al.*** Emergency department overcrowding and access block. *CJEM.* 2013;15(6):359-380.
15. **Turris S, Rabb H, Munn MB, *et al.*** Measuring the masses: the current state of mass-gathering medical case reporting (paper 1). *Prehosp Disaster Med.* 2021;36(2):202-210.
16. **Guy A, Prager R, Turris S, *et al.*** Improving data quality in mass-gatherings health research. *Prehosp Disaster Med.* 2017;32(3):329-332.
17. **Lund A, Turris SA, Bowles R, *et al.*** Mass-gathering health research foundational theory: part 1 - population models for mass gatherings. *Prehosp Disaster Med.* 2014;29(6):648-654.
18. **Ranse J, Hutton A.** Minimum data set for mass-gathering health research and evaluation: a discussion paper. *Prehosp Disaster Med.* 2012;27(6): 543-550.
19. **Ranse J, Hutton A, Turris SA, *et al.*** Enhancing the minimum data set for mass-gathering research and evaluation: an integrative literature review. *Prehosp Disaster Med.* 2014;29(3):280-289.
20. **Turris S, Rabb H, Chasmar E, *et al.*** Measuring the masses: a proposed template for post-event medical reporting (paper 4). *Prehosp Disaster Med.* 2021;36(2):218-226.
21. **Lund A, Turris S, Rabb H, *et al.*** Measuring the masses: mass-gathering medical case reporting, conceptual modeling - The DREAM Model (paper 5). *Prehosp Disaster Med.* 2021;36(2):227-233.
22. **Jaslow D, Drake M, Lewis J.** Characteristics of state legislation governing medical care at mass gatherings. *Prehosp Emerg Care.* 1999;3(4):316-320.
23. Manitoba Go. Manitoba Laws Internet. 2022. Accessed March 18, 2024. https://web2.gov.mb.ca/laws/index.php
24. **Tourism Saskatchewan Canada**. Organizing special events. 2023. Accessed March 18, 2024. https://stec.skillbuilder.co/catalog/organizing-special-events
25. **Justice, M.** n.d.. C.C.S.M. c. P210. Accessed March 18, 2024. =https://web2.gov.mb.ca/laws/statutes/ccsm/p210.php?lang=en
26. The Saskatchewan Public Health Act. 1994. Accessed March 18, 2024. https://publications.saskatchewan.ca/#/agencies/47
27. Public Health Act Yukon. 2002. Accessed March 18, 2024. https://laws.yukon.ca/cms/images/LEGISLATION/PRINCIPAL/2002/2002-0176/2002-0176.pdf
28. Public Health Act, Nunavut. 2016. Accessed March 18, 2024. https://www.nunavutlegislation.ca/en/consolidated-law/public-health-act-consolidation
29. Public Health and Promotion Act of St-John, Newfoundland and Labrador, P-37.3. 2018. Accessed March 18, 2024. https://www.assembly.nl.ca/legislation/sr/statutes/p37-3.htm
30. Prince Edward Island Public Health Act. 2022. Accessed March 18, 2024. https://www.princeedwardisland.ca/en/legislation/public-health-act
31. Nova-Scotia EMOo. Community Event Emergency Response Planning. 2014. p. 36. Accessed March 18, 2024. https://beta.novascotia.ca/government/emergency-management-office
32. BC EM. British Columbia Major Planned Events Guidelines. In: BC EM, editor. 2014. p. 54. Accessed March 18, 2024. https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/local-government/majorplannedeventsguidelines.pdf
33. **Alberta Emergency Management Agency**. Emergency response planning for community events. Government of Alberta. 2013. p. 115. Accessed March 8, 2024. https://open.alberta.ca/dataset/b49f1b6a-b5fb-4bf7-a728-e4c7f54aef4d/resource/ba9bb19a-6702-40ca-bdf7-56971f42adda/download/mass-gathering-guidebook-2013.pdf
34. **World Health Organization**. Public health for mass gatherings: key considerations. 2015. Accessed March 8, 2024. https://www.who.int/publications/i/item/public-health-for-mass-gatherings-key-considerations
35. **Hutton A, Ranse J, Zimmerman P-A.** Rethinking mass-gathering domains for understanding patient presentations: a discussion paper. *Prehosp Disaster Med.* 2021;36(1):121-124.
36. **Hutton A, Munn MB, White S, *et al.*** Does the presence of on-site medical services at outdoor music festivals affect attendees' planned alcohol and recreational drug use? *Prehosp Disaster Med.* 2021;36(4):403-407.
37. **Goldberg SA, Maggin J, Molloy MS, *et al.*** The Gillette Stadium Experience: a retrospective review of mass gathering events from 2010 to 2015. *Disaster Med Public Health Prep.* 2018;12(6):752-758.

https://doi.org/10.1017/dmp.2024.38 Published online by Cambridge University Press