

## Review Article

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# Spontaneous and Unplanned Mass Gathering Events: A Scoping Review of Health Considerations for Riots, Civil Unrest, and Protest

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## Abstract

**Objective:** To identify the health planning, health provision, and health lessons learned from unplanned or spontaneous mass gathering events.

**Methods:** This research used a scoping review design. Data was collected from 4 databases, using search terms relating to “mass gathering events,” “spontaneous events,” and “health services.” Data was extracted relating to the event characteristics, health usage, and patient outcomes. Extracted data were deductively coded against the surge capacity domains of staff, stuff/supplies, space, and systems.

**Results:** Ten papers were included in this review. Most spontaneous mass gathering events were related to riots, civil unrest, or unplanned large parties, which required a response from the health care system. Health staff were predominantly from an ambulance, pre-hospital, or emergency medical services. Additional personal protective equipment, such as ballistic equipment and respiratory protection, was required.

**Conclusions:** The planning for a health care response to a spontaneous mass gathering event requires a risk-based approach. Such an approach should be applied in local disaster and mass casualty plans as a hazard-specific response. Preparation and response should include inter-agency collaboration. Enhancing the reporting of spontaneous mass gathering events will provide insights for future planning and response.

## Introduction

Globally, spontaneous mass gathering events (SMGEs) occur frequently. Spontaneous mass gathering events are unplanned assemblies of a significant number of people, often arising in response to specific triggers or circumstances. Unlike organized mass gathering events (MGEs),

SMGEs are characterized by their rapid formation and lack of formal pre-planning. Examples of SMGEs may include situations such as civil unrest, riots, state funerals, and protests. Despite a lack of data pertaining to SMGEs, the provided and available statistics offer an indication of the frequency of SMGEs. Therefore, using protests as an example, there were more than 75 protests globally in the first 6 months of 2024 (January–June), and nearly 200 protests in 2023.<sup>1</sup> These protests differ in context, highlighting the complexities of crowd motivation, which can significantly influence the dynamics of the event and the associated health system risks. Motivations can range from economic, political dissatisfaction, to concerns about corruption. The duration of some SMGEs can extend from days to months, and on some occasions to years. The public participation peak sizes in these SMGEs varied from less than 100 people to greater than 1,000,000 people.<sup>1</sup> Recent examples of SMGEs around the world included COVID-19 lockdown protests, election-related protests, perceived police brutality protests, environmental protests, and/or economic pressure-related protests.<sup>2</sup> Such SMGEs are said to gain public support as they attempt to address social problems by highlighting issues of concern, mostly related to social, legal, political, or institutional injustice.<sup>3</sup>

The unpredictable nature of SMGEs poses significant challenges for health response, both from a public health and emergency health care perspective. Spontaneous mass gathering events may result in adverse health outcomes for attendees or those in the communities where events are being held. This is similar, but much increased, to the risk of more traditional MGEs.<sup>4</sup> Traditionally, an MGE has been defined by the World Health Organization (WHO) as an occasion, either organized or spontaneous where the number of people attending is sufficient to strain the planning and response resources of the community, city, or nation hosting the event.<sup>5</sup> Such MGEs are often diverse to include social, festival, religious, cultural, and/or sporting events. While an MGE presents a unique health response challenge, it could be argued that an SMGE is more complex within a higher threat environment due to its inherent unpredictability, potential for volatility, difficulties in accessing affected populations, and uncertain timelines.<sup>6</sup>

Planning for SMGEs, from a health perspective may focus on outcomes for patients and the safety of health staff. The planning for a response to an SMGE may occur either minutes, hours, or in rare circumstances, days prior to an event. This preparation timing depends on several factors, mostly related to the intelligence obtained from traditional or social media, other response agencies, the public, and/or the SMGE organisers.<sup>7</sup> In addition to the challenges in timeframes for health planning response to SMGEs, the response is often made more complex by police, security, and/or military agencies leading, with limited health agency engagement.<sup>8</sup> This is mostly related to the time from activation to response, whereby there is limited time to engage in interagency planning, which is crucial for effective health preparedness and response. Despite these unique challenges, the specific needs for appropriate health preparedness and response in the context of SMGEs are not extensively discussed in the existing literature. This review will explore the unique health response challenges posed by SMGEs and propose strategies for improving health preparedness and response in these complex situations.

## Aim

This review focuses on SMGEs and health service usage and outcomes. This review aims to determine the health planning, health

provision, and health lessons learned from unplanned or SMGEs. This review was guided by the question: What are the health service delivery needs (concept) to care for patients (population) in SMGEs (context)?

## Methods

### Design

This scoping review followed the guidelines of PRISMA-ScR (Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews) checklist and explanation (see [Supplementary Table 1](#)).<sup>9</sup> This review was registered with PROSPERO (Reference: CRD42023462318).<sup>10</sup>

### Data Collection

Papers were collected from various databases and search engines as artefacts of evidence to be included in this review. Databases and search engines used in this review included: CINAHL (EBSCO Information Services; Massachusetts, USA); PubMed (National Library of Medicine, USA); Science Direct (Elsevier; Amsterdam, Netherlands); and Scopus (Elsevier; Amsterdam, Netherlands). The search strategy included different combinations of Medical Subject Headings (MeSH) terms and keywords that are relevant to “mass gathering events,” “spontaneous events,” and “health services.” These keywords and MeSH terms are provided in [Table 1](#). The detailed search strategy using these keywords and terms for each database is included in [Supplementary File 1](#). The search was undertaken in February 2024 and was not limited by year. Additionally, the journal *Prehospital and Disaster Medicine* has a large publication base relating to MGEs. As such, the content page of this journal was reviewed for papers that would meet the inclusion criteria.

The titles and abstracts from the various databases were imported into Covidence® to allow for a blinded review process against the PRISMA-ScR guidelines. The title and abstract of each imported paper were screened by at least 2 authors. Any identified conflicts were then reviewed by an independent third author, who was blinded to the decisions of the first 2 authors. Papers were included if they reported on (i) real-world (actual) SMGEs, (ii) included health service delivery, and (iii) had information about health service usage such as first aid, ambulance transport, and hospital presentations. Papers were excluded if there were (i) editorials, (ii) conference abstracts, (iii) discussion papers, or (iv) papers of a theoretical nature. The same screening process to identify relevant papers was undertaken at the full-text review stage.

### Data Analysis

Information was extracted from each paper and entered into a Microsoft Word 2018 table (Microsoft Corporation, Redmond, Washington, USA). This included the publication characteristics, spontaneous event characteristics (country of event: the country where the spontaneous event took place; year of event: the year when the spontaneous event took place; duration: the duration of the event; crowd number: the estimated number of people attending the event as participants/spectators); and responding agencies (such as ambulance, military, police, fire services) (see [Table 2](#)). Health service involvement and patient outcomes outlining what happened were deductively coded against the well-established 4 “S”

**Table 1.** MeSH terms and keywords

	Mass gatherings	Spontaneous events	Health services
MeSH Terms	Anniversaries and special events Crowding Mass gatherings	Public demonstrations	Ambulances Doctor Emergency medical services Emergency Medical Technicians Emergency treatment First aid First responder Health personnel Medical staff Nurses Physicians Sports medicine Wounds and injuries
Keywords	Concert Event planning Festival Large event Major event Mass event Pilgrimage Safety Sport	Celebratory Civil unrest Crowd Surge Demonstration* Disorder* Flash mob dance Illegal* Politic* Protest* Rave Riot management Stampede State funeral Street takeover Underground dance	Healthcare Medical care Paramedic Patient presentations Physician Transport to hospital

\*Wildcard search symbol

surge capacity domains of staff, stuff/supplies, space, and systems.<sup>11</sup> Where staff relates to human resources or personnel; stuff/supplies relates to supplies, medicine, consumables, and equipment; space relates to facilities and physical infrastructure, congregation areas, and staging areas; and systems relates to procedures, policies, and processes (Table 3). The 4 “S” surge capacity domains are well-recognized in the disaster and humanitarian contexts to understand health resourcing. Since there are no equivalent frameworks in the MGE context, the 4 “S” surge capacity domains were used in a deductive manner to understand the health service delivery needs in SMGEs context. Additionally, lessons learned from each SMGE were deductively listed against the 4 surge capacity domains (Table 4).

## Results

In total, 10 papers were included in this review. Nine papers met the criteria for inclusion as identified through the Covidence® screening process. Additionally, 1 paper was identified in the search of the Prehospital and Disaster Medicine content page (see Figure 1). All papers were retrospectively reporting on SMGEs.

### Spontaneous Event Characteristics and Responding Agencies

From the papers included the types of SMGEs varied, mostly related to riots or civil unrest ( $n = 4$ , 40%) or unplanned large parties, such as end-of-school celebrations or raves ( $n = 2$ , 20%) that required a response from the health care system (see Table 2). The duration of these SMGs varied from a couple of hours, typically for unplanned large parties, to many months for civil unrest. The size of crowds varied too, from smaller crowds of approximately 500 people for large unplanned parties, to larger crowds for civil unrest. However,

exact or estimated crowd numbers were not consistently reported, and on some occasions completely omitted. It was common for the responding health agencies to be the local prehospital emergency medical services (EMS), alongside police from an enforcement and protective perspective.

### Health Service Involvement and Patient Outcomes

Most papers ( $n = 9$ , 90%) reported on the prehospital response (see Table 3). Three papers (30%) included the impact on emergency department (ED) services,<sup>8,12,13</sup> with 2 of these focusing only on the ED and hospital response. An analysis of health service involvement was undertaken against the 4 surge capacity domains. The staff were predominantly from an ambulance or EMS; however, their skills and number of staff were scantily reported. The one paper that focused on the ED and hospital involvement included the surgical capacity of staff, that being nurses ( $n = 12$ ), surgeons ( $n = 9$ ), and anesthesiologists ( $n = 5$ ).<sup>13</sup> Supplies included the need for additional personal protective equipment, such as ballistic equipment and respiratory protection.<sup>7</sup> The spaces used in responding to SMGEs were also scantily reported. The systems utilized to support a response were mostly related to disaster or mass casualty incidents ( $n = 3$ , 30%); however, this was variably reported. The reporting of patients transported to a hospital varied, as did the reporting of patient outcomes.

### Lessons Learned

Lessons learned from each SMGE were mapped against the 4 surge capacity domains (see Table 4). Key lessons learned relating to staff included the need for greater interagency collaboration and clearer protocols to protect staff. Supplies required included additional

**Table 2.** Spontaneous event characteristics and responding agencies

Author/s and publication year	Spontaneous event characteristics					Responding agencies involvement
	Country of event	Year of event	Event type	Event duration	Crowd number/ number of attendees	
Arkins et al., 2024 <sup>7</sup>	Indianapolis, Indiana, USA	2020	Civil unrest following death of George Floyd in police custody	4 days (May 29-June 1)	Not stated	Local EMS
Dong et al., 2017 <sup>15</sup>	Shanghai, China	2014	New Year's Eve Shanghai's Bund	Around 4 hours	310,000	Police, EMS/ambulance [No in-event health support; Shanghai Medical Emergency Center was informed after the incident and 19 ambulances arrived]
Hawkins and Brice, 2006 <sup>8</sup>	North Carolina, USA	2005	Victory celebration of University of North Carolina men's basketball team	2 nights (April 3 and 5)	70,000+	Emergency medical services and local hospital services
Krul et al., 2012 <sup>17</sup>	Netherlands	2006–2010	Rave (dance) parties	9–12 hours	Not stated	First aid station, ambulance transfer
Santos-Reyes and Olmos-Pena, 2017 <sup>14</sup>	Mexico	2008	End of school year celebration in a night club	1 h 50 m	500–550 attendees	No health service provider ambulance arrived later, police, emergency medical services
Sharma et al., 2023 <sup>36</sup>	Seoul, South Korea	2022	Halloween night celebration	Evening to night. Incident occurred at around 22.20 hours	10,000	Absence of effective rapid emergency response mechanism 400+ emergency workers responded to the injured
Solla et al., 2019 <sup>13</sup>	Nice, France	2016	Terrorist attack	5 minutes on the street, 6 hours impacted ED	30,000	Police, Fire services, EMS, Laval University Children's Hospital
Tin et al., 2023 <sup>16</sup>	Multiple countries	2021–2022	Political protests (multiple)	Not stated (article is not of a single event but looks at a comparison of fatalities at protests)	Not stated	Varied normally law enforcement
Lee et al., 2015 <sup>12</sup>	Singapore	2013	Riot	Approximately 8 h in the streets 17h impact on the ED	Approximately 400	Singapore Police Force Singapore Civil Defence Force (EMS, fire/rescue)
Yassine et al., 2021 <sup>37</sup>	Beirut, Lebanon	2019	Protests/riots	1 month (study period)	Not stated	Medical tent on site, Civil defense, Red Cross, Police, volunteers, Nongovernment organizations

**Table 3.** Health service involvement and patient outcomes

Author/s and publication year	Health service involvement				Number of patients/outcomes	
	Staff	Stuff/Supplies	Spaces	Systems	Treated at the event	Transported to hospital
Arkins et al., 2024 <sup>7</sup>	EMS transports Police, Fire service, and EMS support; 3 extraction ambulances in protest area; Ambulances staffed with EMS physician, 2 tactical paramedics, 2 law enforcement officers	All wore ballistic personal protective equipment (PPE) and respiratory protection rated for crowd control agents; Burn blankets and fire extinguishers were added to the equipment on the rescue ambulances	At the protest area	Not stated	Not stated	EMS transports (mostly did not result in hospitalization)
Dong et al., 2017 <sup>15</sup>	Police 300; Ambulances 19, therefore estimate 38 healthcare staff	Not stated	No onsite activity at event stated	EMS called to attend the event after it happened. This might be assumed as a system change	Not stated clearly Injured 49 Fatalities 36	Not clearly stated
Hawkins and Brice, 2006 <sup>8</sup>	EMS; ED; police	First aid, ambulance transfers	First aid stations	EMS and ED	Treated 49	Admitted to hospital 4; Discharged to home after treatment 36; Left hospital before completed evaluation 9; Of those treated: Burn 14; Laceration 13; Alcohol intoxication 7; General musculoskeletal injury 9; Fracture 4 Subdural hematoma 1; Other 1
Krul et al., 2012 <sup>17</sup>	Nurses, paramedics, and doctors (6 health care providers were required for every 10,000 party visitors to eliminate waiting time at first aid stations)	Medical supplies for minor injuries and conditions	First aid stations	Protocols for treating common injuries and conditions; Registration; Triage; Environmental surveillance; Catastrophe management and response	Treated at the event: Majority for mild conditions like unwell-being, nausea, etc; Few severe requiring hospital transfer; Mild injuries (Nausea, dizziness, vomiting, contusions, sprains, blisters, insect bites, anxiety, disorientation, agitation, etc.) 91.1%; Moderate injuries (consciousness, fractures, wounds, eye injuries, multiple trauma, delirium, psychotic delusions) 2.4%; life-threatening injuries (cases related to drugs) 0.03%	Transported to hospital 2.2%; Transported by ambulance 0.7%
Santos-Reyes and Olmos-Pena, 2017 <sup>14</sup>	Police forces (observed the situation but did not provide assistance nor called for help); Ambulance crew (one ambulance) at the scene; 2 additional ambulance (and crews) followed 20 minutes later	3 ambulances during the first 20 minutes, later supplemented by an unknown number of ambulances in the following 30 minutes	Night club	No policies	No stated	Not stated

(Continued)

Table 3. (Continued)

Author/s and publication year	Health service involvement				Number of patients/outcomes	
	Staff	Stuff/Supplies	Spaces	Systems	Treated at the event	Transported to hospital
Sharma et al., 2023 <sup>36</sup>	Absence of effective rapid emergency response mechanism. No stated health service provider on-site	Not stated	Not stated	Not stated	Not stated clearly Injuries 170 Fatalities 156	Not stated
Solla et al., 2019 <sup>13</sup>	Those on regular duty at the hospital with additional: 12 OR nurses; 9 surgeons; 5 anesthesiologists; Unknown number of Psychologists	14 units PRBCs, 7 units of plasma 3 external fixator, 1 internal Otherwise not reported	1ED 5ORs 1 CT 1 PICU	MCI plan activated that included retaining staff and call-out to outside medical staff and opening beds	Not stated clearly Injuries 47	Not stated clearly; 4 reportedly arrived with no prehospital management; 43 presumed via EMS,
Tin et al., 2023 <sup>16</sup>	Not stated	Not stated	Not stated	Not stated	Bermuda injuries 15 fatalities 0 Canada injuries 3653 fatalities 9 Mexico injuries 28,675 fatalities 16,056 Saint Pierre and Miquelon Injuries 8 Fatalities 0 United States injuries 27,178 Fatalities 240	Not stated clearly
Lee et al., 2015 <sup>12</sup>	EMS Paramedics ED Physicians, nurses	Ambulances 6	Emergency Department 1	Special Operations Command was activated	Not stated	Treated in ED 36 Admitted 1 Treated and Discharged 35
Yassine et al., 2022 <sup>37</sup>	Volunteers: physicians, nurses, paramedics, and psychologists [12 providers included in the study]	Stretchers and chairs, blood pressure measurement, gauzes, saline, antiseptics, oxygenated water, glucometers, oxygen tanks, pain medication, allergy and asthma medications, antibiotics, insulin, ambulances, Cell phones and/or tablets	Tents, close to the incident	Missing protocols	Not stated	Not stated

ED, Emergency Departments; EMS, Emergency medical services; LEO, Law enforcement officer.



**Table 4.** Lessons learned from health service involvement

Author/s and publication year	Health service involvement			
	Staff	Stuff/Supplies	Spaces	Systems
Arkins et al., 2024 <sup>7</sup>	It is the authors' opinion that care must be taken to distinguish EMS clinicians from LEOs, which can be accomplished with brightly colored American National Standards Institute (Washington, DC, USA) vests	Medical response plan should include a backfill of transport ambulances in support of the event	Not stated	The findings demonstrate a generally high level of acuity in the trauma patients encountered. This emphasizes the importance of ensuring that EMS clinicians minimize trauma
Dong et al., 2017 <sup>15</sup>	Community and community member training in first aid and basic life support	Maintaining and easily accessing necessary emergency items by EMS	Not stated	Comprehensive risk assessment essential to planning of mass gatherings with clear responsibility of stakeholders and establish a communication system before, during, and after the event Surveillance and information systems are required, including early advisory warnings Encouragement of general public to improve first-aid knowledge and basic life support training, funding first-aid organizations, and change of legislation to allow on-site mutual aid
Hawkins and Brice, 2006 <sup>8</sup>	Emergency departments and EMS systems, especially in locations associated with major sports teams, should be aware of the potential for this type of spontaneous celebratory mass gathering and subsequent burn injury pattern associated with bonfires and fire jumping	Burn injury supplies required	Not stated	Not stated
Krul et al., 2012 <sup>17</sup>	Need for specifically trained staff in advanced life support and dealing with event-specific injuries and incidents Recommendations: A medical team of 6 health care workers for every 10,000 rave party visitors consisting of 50% first aid providers, 50% nurses, both with additional training One physician for every 10,000 visitors, ambulance team for every 15,000 visitors Two ALS-trained professionals, one nurse with mental health care experience for every 15,000 visitors	Adequate supplies for managing minor injuries and psychological distress	Adequate and well-equipped spaces for first aid and urgent medical care	Effective systems for managing patient flow, triage, and emergencies Guidelines at the site: for anaphylaxis treatment. Ottawa knee and ankle rules to determine radiographical referral. Instructions for coping with lower back pain, blisters, and headache A catastrophe response plan in which all possible scenarios are anticipated
Santos-Reyes and Olmos-Pena, 2017 <sup>14</sup>	Police forces only observed the situation, but did not provide assistance nor called for help, delaying the emergency response There was an insufficient number of emergency medical service providers	Deficiencies of the medical services (e.g., lack of equipment during the assistance to the injured)	Police forces were ordered to block the only available exit door. At all times provide and secure emergency exits and evacuation routes. Prevent shutting down ventilation systems in crowded spaces	A risk assessment is necessary before this type of operation A crowd safety management system is required Rehearsal of emergency procedures required Plan required for monitoring and coordination amongst the police forces involved the inspection operation There was a lack of standards, codes, and regulations regarding crowd management Provide policies relating to ICE Police forces should be trained in providing first aid Policies required for informing involved parties in similar police operations Staff briefings should be provided

(Continued)

Table 4. (Continued)

Author/s and publication year	Health service involvement			
	Staff	Stuff/Supplies	Spaces	Systems
				Adequate communication and coordination with regard to detecting problems and emergency situations required
Sharma et al., 2023 <sup>36</sup>	Not stated	Not stated	Not stated	Crowd management strategies required Pre- and during event planning needed
Solla et al., 2019 <sup>13</sup>	Presence of surgeons in the ED deemed useful for clinical decision making MCI triage should be done by senior doctor Early psychological support is important Recommends creating a system where outside staff like surgeons can be used in the hospital	Recommends a system to obtain “stuff” like external fixators from outside the hospital	Not stated	Following event disaster plan reviewed with the following lessons learned: diffuse the alert; keep the staff on duty; organize the crisis unit around the administrative director; designate a chief “organizing” doctor and a chief “triaging” doctor; stop or achieve all ongoing medical and surgical activities; count and release beds; prepare the trauma bays with resuscitation tools; prepare a second zone for “ordinary” emergencies (not related to MCI) make available paper medical records and identification stickers instead of informatics Upgrade training with simulation and conferences Recommend that all hospitals prepare protocols to face MCI and receive unusual type of patients of varying age, severity, and characteristics of lesions
Tin et al., 2023 <sup>16</sup>	Collaboration of multiple agencies such as fire, law enforcement, transport, safety, medical, and emergency medical services	Not stated*	Not stated*	Conduct pre-event hazard analyses to identify and mitigate potential safety risks Social media surveillance can provide critical information to officials before or during an event, and officials can use social media to communicate health-related or emergency preparedness instructions, mitigating adverse public health effects
Lee et al., 2015 <sup>12</sup>	Safety of the staff and ED take priority. The first casualties were fully armed. There was no security screening system that could detect weapons among riot casualties Staff must be familiar with the hospital’s MCI plan but they must also remain flexible and adapt according to the nature of the incident	Almost all patients did not require inpatient management No specific information provided about the utilization of health supplies such as medical equipment, medications, or other consumables during the response to the riot	No specific information provided regarding the utilization of facilities, congregation areas, or staging areas within the hospital during the response to the riot	Critical information may not come from official channels. Media monitoring using mainstream news channels and social media networks such as X (formally Twitter) may be able to provide early warning signs of impending MCIs The hospital’s MCI plan must include a critical incident stress management plan for staff
Yassine et al., 2022 <sup>37</sup>	Lacking knowledge and organization, need for training and clear protocol, missing coordination and unique workflow, recruitment of volunteers, safety. Communication!!! Government-funded task force is essential	Limited equipment, mainly due to financial restraints. Some equipment disappearing or sabotaged. Need for safety equipment. Need for a storage room to protect all medical supplies	Noise disturbing first aid. Risk for sabotage or aggression taken into account when choosing location	Absolute need for protocols, training, and communication The establishment of specialized organizations for mass gathering health needs was also agreed upon following this event.

ALS, Advanced life-support trained; ED, Emergency Departments; EMS, emergency medical services; LEO, law enforcement officer; MCI, Mass casualty incident.

\*\*This article is not about a single event but looks at a comparison of fatalities at protests



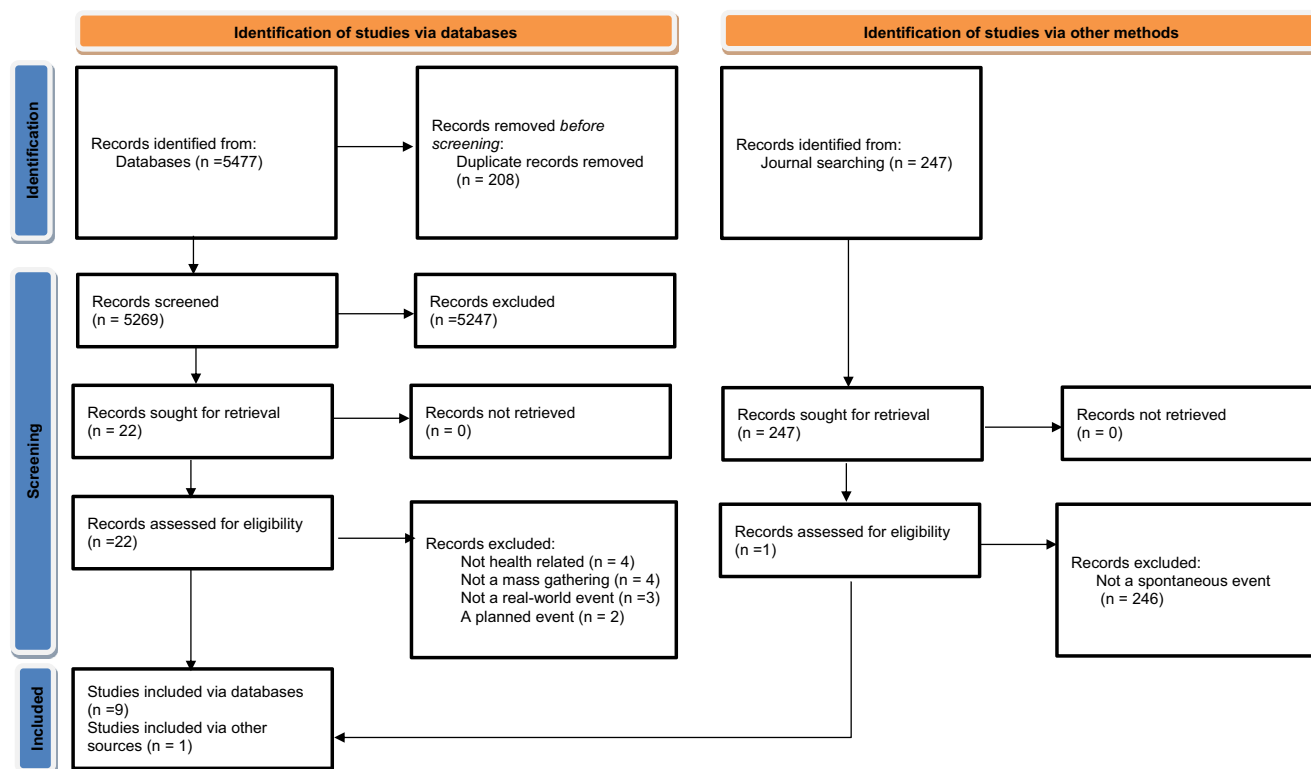


Figure 1. Modified PRISMA flow diagram.<sup>38</sup>

burn equipment and generally a need for faster resupply of ambulances. To create safe spaces for EMS to operate, police were required to be involved.<sup>14</sup> Most of the lessons related to the need to strengthen systems. This included the need to have in place a risk approach,<sup>14,15,16</sup> engage in interagency training and exercising,<sup>13</sup> and have patient flow processes well-established.<sup>17</sup>

## Discussion

The health planning, operational response, and postevent stages of an SMGE should be conducted using a risk approach. This was highlighted in the lessons learned from the reported SMGEs in this review. An evaluation of the health risk at SMGEs should be undertaken similarly to that of other MGEs.<sup>18,19</sup> This risk assessment should consider the characteristics of the SMGE and the demographics of the participants.<sup>20</sup> Furthermore, it is well recognized that in addition to biomedical<sup>21,22</sup> and environmental factors,<sup>23</sup> psychosocial factors such as crowd mood and motivation are significant distinguishing factors in the number of patients presenting for injury and illness influencing health outcomes at MGEs.<sup>24</sup> While the psychosocial factors of crowd mood and motivation are known to influence patient presentation rates and transport to hospital rates from MGEs, it could be surmised that these are more significant influencing factors in the SMGEs. This is the case as the crowd's mood and motivation within the context of SMGEs can be volatile and unpredictable. Information about the volatility, mood, and motivation of the crowd at an SMGE may be haphazardly shared from organizers, attendees, responding agencies, and/or governments. As such, the availability and reliability of information from various agencies should be considered in an assessment of risk to ensure the safety and security of health staff to provide appropriate care.<sup>25</sup> Information

about this volatility, mood, and motivation may be haphazardly shared, necessitating careful consideration of the reliability of information from various agencies to ensure the safety and security of health staff providing care.

An SMGE should be considered as a known hazard, and as such be embedded within disaster, and mass casualty incident plans for appropriate health service planning. Often mass casualty incident plans will have consideration of an all-hazards approach to planning and response, to do the greatest good for the greatest number of people.<sup>26,27</sup> However, when a particular hazard is known for a specific jurisdiction, it is reasonable to give additional weight to those hazards in mass casualty incident plans, using a top-hazards approach.<sup>28</sup> For example, in jurisdictions with perennial events such as wildfires, floods, or cyclones, plans may include special considerations unique to responding to these events.<sup>29</sup> Likewise, if a jurisdiction is known to have SMGEs, this should be considered a top hazard and have special consideration beyond an all-hazards approach. As identified in this review, such considerations should include staff requirements, safe spaces for staff to work, and additional supplies in general consumables and personal protective equipment.

This review highlighted the interagency approach to SMGEs. In particular, the relationship between police or security agencies and health agencies such as ambulances or EMS. Interagency approaches have been pivotal to the success of MGEs in general and SMGEs should be considered no different.<sup>30</sup> As such, an interagency approach, particularly between police and EMS, should be implemented at all stages of the planning and response for SMGEs. For preparations, an interagency approach may include the simulation or exercising of various SMGE scenarios. Using tools, such as CSCATTT (Command and Control, Safety, Communication, Assessment, Triage, Treatment, Transport) that have

been used in the disaster context, may be useful in the SMGE context.<sup>31</sup> If civil unrest tensions are rising in a jurisdiction, just-in-time exercising in the days leading up to a response may be of benefit. Simulation and exercising have been demonstrated to strengthen a response during mass casualty incidents, whereby agencies are known to one another, and role delineation is clear.<sup>32</sup> During an SMGE interagency collaboration should be a balance of safety and security with health needs and outcomes. Interagency collaboration during the SMGE should provide safe passage for EMS and other health staff to provide care to patients. Potential challenges, such as conflicting priorities between security and health care, can be mitigated by establishing clear communication protocols and shared objectives. Additionally, ways to share intelligence regarding the SMGE should be encouraged.<sup>33</sup>

To help inform lessons learned from SMGEs there must be sharing of information. This review highlights a lack of volume in SMGE papers and a lack of consistency between these papers. Ensuring consistency in the collection, data reporting, and data dissemination of information will then inform future planning and response. The broader MGE literature has gained momentum to achieve consistency and quality in data reporting,<sup>21,22</sup> and such an approach could be applied to the SMGE space. Based on the findings from this review, data that was collected on some occasions, and could be collected on all occasions, might include staff: skill mix, discipline, numbers; stuff: items used outside of general consumables and medical supplies; space: where was health care taking place; and systems: what was used to help support the health outcomes and staff protection, such as existing, revised or new processes. Furthermore, information about the SMGE itself would be useful, such as the estimated number of crowd attendees and the duration of the SMGE. Such quantity, quality, and consistency in data will help plan for future SMGEs.<sup>34,35</sup> This approach would help inform a tailored, risk-based, and collaborative interagency approach, informed by robust data collection, for effectively managing the unique health challenges posed by SMGEs.

### Study Limitations

A scoping review was a sensible place to start in developing a collective understanding of the peer-reviewed literature in the SMGE space. However, this approach has limitations primarily related to the lack of data-driven papers on this subject. As such, it was difficult to compare like-for-like SMGEs and subsequently health outcomes from these events. Likewise, there was a lack of some details, such as injury and/or illness to health care professionals at SMGEs. Future research should focus on more consistency and reporting of SMGEs to enhance our understanding of SMGEs and health resource requirements to enhance health outcomes. This review did not include gray literature and there may have been some instances where the gray literature provides some insights into health resourcing for SMGEs. Only papers written in English were included. Papers in other languages might provide different insights into SMGE health preparedness and response.

### Conclusion

The increasing frequency and diverse nature of SMGEs present unique and significant challenges for health planning and response. Unlike their planned counterparts, SMGEs are characterized by their rapid onset, unpredictable nature, and often emotionally charged environments, making them inherently more complex to manage from a health perspective. To ensure appropriate and

timely health service provision, a proactive and risk-based approach should be used in the health assessment and preparation for SMGEs with an emphasis on crowd mood and motivation. Mass casualty incident plans with an SMGE section should address staff requirements, provide safe working spaces for staff, and ensure additional supplies of general consumables and personal protective equipment. Key recommendations include embedding SMGE considerations within existing disaster and mass casualty incident plans, utilizing a top-hazards approach in jurisdictions prone to such events, and prioritizing robust interagency collaboration, particularly between law enforcement and health care agencies, across all stages of planning and response.

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