Psychosocial Influences on Patient Presentations: Considerations for Research and Evaluation at Mass-Gathering Events

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Abbreviations:
EMS: Emergency Medical Services
MeSH: Medical Subject Headings
MGE: mass-gathering event
PPR: patient presentation rate

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Abstract

Aim: This review discusses the need for consistency in mass-gathering research and evaluation from a psychosocial perspective.

Background: Mass gatherings occur frequently throughout the world. Having an understanding of the complexities of mass gatherings is important to determine required health resources. Factors within the environmental, psychosocial, and biomedical domains influence the usage of health services at mass gatherings. A standardized approach to data collection is important to identify a consistent reporting standard for the psychosocial domain.

Method: This research used an integrative literature review design. Manuscripts were collected using keyword searches from databases and journal content pages from 2003 through 2018. Data were analyzed and categorized using the existing minimum data set as a framework.

Results: In total, 31 manuscripts met the inclusion criteria. The main variables identified were use of alcohol or drugs, crowd behavior, crowd mood, rationale, and length of stay.

Conclusion: Upon interrogating the literature, the authors have determined that the variables fall under the categories of alcohol or drugs; maladaptive and adaptive behaviors; crowd behavior, crowd culture, and crowd mood; reason for attending event (motivation); duration; and crowd demographics. In collecting psychosocial data from mass gatherings, an agreed-upon set of variables that can be used to collect de-identified psychosocial variables for the purpose of making comparisons across societies for mass-gathering events (MGEs) would be invaluable to researchers and event clinicians.

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Introduction

A mass gathering can be defined as an event where a group of people come together for a common purpose within a particular space or venue for a pre-determined range of dates and times. Examples of mass-gathering events (MGEs) include agricultural shows, music festivals, and sporting events. In a health context, an MGE can be defined as an event "where there is the potential for a delayed response to health emergencies because of limited access to patients or other features of the environment and location."[1] For many years, it has been widely argued that three domains influence the presentations of patients at MGEs: environmental, psychosocial, and biomedical.[2] An exploration began within the context of biomedical[3] and environmental[4] aspects of care; this paper takes the third step by examining reporting on the psychosocial aspects of MGEs, in relation to health outcomes.

Background

Although there are many descriptors and theories of crowd behavior, the psychosocial domain is the least understood of the three domains used to understand the potential drivers for injury and illness at MGEs.[5] Psychosocial literature has traditionally focused on crowd

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	Psychosocial Factors	Mass Gathering
MeSH Terms	Crowding	
	Social Identification	
	Social Behavior	Celebrating
	Mass Behavior	Celebration
	Alcohol and Other Drugs	
	Affect	
Keywords	Psychology	
	Group Processes	Mass Gathering
	Social Norms	Large Event
	Mood	Major Event
	Behavior	Event Medicine
	Motivation	Planned Event
	Crowd Interest	

Table 1. MeSH Terms and Keywords
Abbreviation: MeSH, Medical Subject Headings.

behavior, mood, motivation, and event type, but also includes alcohol and other drugs and length/duration of event.[2,6] Measurement of the crowd-related variables is still one of the most difficult to measure due to their subjective nature.[7,8] Hutton, et al[8] showed that through using subjective descriptors of crowd behavior, mood, and crowd type, a picture of activities during the event can be developed.[8] When described against the environmental backdrop of the event, behavior creates context for patient outcomes. For example, the music program at a music festival is a strong influence on behavior and should be considered as part of the psychosocial domain.[9,10] A comprehensive approach to psychosocial data collection would ideally encapsulate the types of variables discussed above.

Aim

This review aims to initiate a consistent data reporting standard for the psychosocial domain, including a set of variables for research and consideration for patient presentations at MGEs.

Methods

Design

This research used an integrated literature review[9] to identify psychosocial factors that are reported in the MGE literature.

Search Strategy

The search strategy included different combinations of Medical Subject Headings (MeSH) terms and keywords that are relevant to psychosocial factors and MGEs (Table 1). Terms and keywords in the columns were combined using the OR search strategy, while terms and keywords in the rows were combined using AND combinations. The papers were located through MEDLINE (US National Library of Medicine, National Institutes of Health; Bethesda, Maryland USA) database search.

Inclusion and Exclusion Criteria

All identified papers were assessed against the following inclusion and exclusion criteria. Inclusion criteria were: event-level data, written in English language, peer-reviewed journal, and published between 2003-2018. Exclusion criteria were: editorials, discussion papers, and theoretical papers. Determination of what literature to include and exclude was done between three authors: Ms. Gray, Professor Hutton, and Mr. Ranse.

Data Analysis

In order to determine psychosocial factors that influence patient presentation rates (PPRs) at mass gatherings, articles were grouped in a pragmatic manner (Table 2[2,3,5–8,10–34]).

Findings

The search returned 304 potentially relevant papers (Figure 1[35]). Of the 304 articles retrieved, 245 papers were excluded based on title. There were six duplicates, 19 papers were excluded based on abstract review, and the remaining 53 papers underwent a detailed full-text examination (Supplementary Table; available online only). One additional paper was identified through scanning the reference lists of included papers. After full examination of the remaining 35 papers, four of those were excluded because they did not meet the inclusion criteria.

Overall, the quality of the current evidence was low. Sixteen of the studies reviewed were retrospective, systematic, literature, comprehensive, or critical reviews. Four of the studies were reports, and nine of the studies were original research case studies. There was one expert opinion and position statement.

Arbon's[2] mass-gathering model was used as a starting point for this review. Psychosocial variables reflected in this model and other variables identified in the literature are outlined in Table 2.

Discussion

The purpose of reviewing psychosocial variables at MGEs is to continue the discussion for consistency of data collection.[3,10] The psychosocial domain, as originally conceptualized by Arbon,[2] included: crowd type, crowd mood, and crowd behavior. Upon interrogating the literature, the authors have determined that the variables fall under the categories of alcohol or drugs; maladaptive and adaptive behaviors; crowd behavior, crowd culture, and crowd mood; reason for attending event (motivation); duration; and crowd demographics. Together, these variables paint a picture of the attendees at the MGE and how their behavior can lead to injury and/or illness.

Use of Alcohol or Drugs

Use of alcohol or drugs was the most common variable reported, highlighting the need for preventive strategies such as encouraging sensible alcohol consumption and safe drug use. In a study of 15 MGEs in Australia, during summer months, the authors reported 90% of patient presentations occurred at events where alcohol was available.[11] Alcohol and substance use were the most commonly identified variables in this review (n = 21/31; 67%).

Anikeeva, et al[11] reviewed 15 MGEs in South Australia in which alcohol availability was categorized as either "alcohol available for purchase" or a "dry event." In contrast, in most (n = 18/21; 86%) of the reviewed literature for the present study, the use of alcohol is not categorized in this way. Rather, the approach to how alcohol and drug use is captured is haphazard. The nonlinear study conducted by Arbon, et al argued that the accuracy of collecting alcohol or drug use data is limited to possible discrepancy between official and actual presence, and the effect of "loading" prior to the event.[10] Additionally, Hawkins and Brice, studying the National Collegiate Athletic Association Final Four Semi-Final and National Championship games, found that the patients evaluated by Emergency Medical Services (EMS) had a rate

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Author(s)	Year	Country	Variables	Description
Ahmed QA[13]	2018	Saudi Arabia	• Crowd behavior • Crowd mood • Crowd interest/culture • Rationale • Use of alcohol or drugs	Violence is associated with intoxication and injuries at music festivals and EDMF. Religious MGE pilgrims can have a collective spirituality that benefit public health.
Alnabulsi H[28]	2014	Saudi Arabia	• Crowd behavior	It is suggested to apply the social identity approach to understand a range of crowd phenomena, including urban riots, football crowds, protest demonstrations, and audience experiences at music festivals.
Alquthami AH[25]	2014	Review	• Length of stay/duration • Use of alcohol or drugs	Majority of events that were multiple days had higher rates of medical use, which confirmed the previous systematic review of data before 2002. Yet the "Toronto Rock" single-day event had higher rates than many multiple day events, due to the youthful crowd, the usage of alcohol, and the confined space.
Anikeeva O[11]	2018	Australia	• Crowd behavior • Crowd mood • Use of alcohol or drugs	Anecdotal evidence suggests that crowd mood may be influenced by factors such as music, rivalry between sporting teams, and unexpected occurrences which can contribute to an increase in paranoia and mass hysteria leading to crowd crushing and violence between attendees. Nearly 90% of patient presentations occurred at events where alcohol was available.
Arbon P[2]	2004	Australia	• Crowd mood • Use of alcohol or drugs	Relationship model proposes the strength of influence between the mass-gathering domains. The environmental domain, such as ease of access and crowd density, have a strong influence on features of the psychosocial domain. A densely packed crowd will be more frustrated and be inclined to be violent. Preventive strategies encourage sensible alcohol consumption and safe drug use.
Arbon P[10]	2018	Australia	• Crowd behavior • Use of alcohol or drugs	Study on non-linear modelling of mass-gathering variables found the role of alcohol was unclear, because of accuracy of collecting availability data, the effect of "loading" prior to the event, and consumption. Model is best used when less information is required to support the prediction.
Crabtree N[27]	2017	Australia	• Individual behavior	This study found that patients from rural/regional areas were twice as likely to require medical attention. One factor that can explain the poorer socio-economic status residents' higher incidents is risk taking behavior.
				Two previous studies reported significantly higher PPR and TTHR, which may be due to high-risk nature of events and both being multi-day music/arts festival with the majority of attendees residing on-site for the duration of the event. This study found the PPR to be significantly decreasing.
FitzGibbon KM[23]	2017	USA	• Rationale • Use of alcohol or drugs • Length of stay/duration	Both the Arbon and Hartman models poorly predicted the required resources for EDMFs. Howard County DFRS found that alcohol availability and the hosting of multi-day events were the only variables that significantly affected patient presentation and transport rates.
Friedman MS[20]	2017	USA	• Crowd mood • Individual behavior • Rationale	Crowd mood and event type are correlated. Heavy metal bands attract rambunctious crowds, and sedating music generally has calm crowds. EDMFs combine high-risk elements: hot weather, active mobile crowds, and frequent alcohol and illicit drug use.
Hartman N[18]	2009	USA	• Crowd behavior • Crowd mood • Rationale • Use of alcohol or drugs • Length of stay/duration	Crowd intentions were assessed according to the event type and any historical data that were available about the event. Crowd intentions categorized into, "Animated-2 points," "Intermediate-1 point," or "Calm-0 points."

Table 2. Psychosocial Factors which Influence PPR at MGEs *(continued)*

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Author(s)	Year	Country	Variables	Description
Hawkins ER[12]	2010	USA	• Crowd behavior • Crowd mood • Rationale • Use of alcohol or drugs	Study results were consistent with previously published mass-gathering literature showing that events associated with a high availability of alcohol and in a celebratory nature have higher rates of medical usage. Concerts with high-risk activities, like "mosh pits," have a high MUR. Celebratory fire-jumping is another example of high-risk crowd behavior, but had relatively lower injury rates due to a smaller proportion of the crowd participating.
Hopkins N[16]	2016	UK	• Individual motivation • Individual behavior • Crowd interest/culture • Rationale • Health benefits?	A psychological crowd is where people assume a shared social identity. Instead of following their own individual values, the cognitive transformation shapes their behavior to those identified in a group. Norms are specific to a given group, for example: religious festivals are characteristically a matter of abstinence while at music festivals they are more to do with excess.
Hutton A[8]	2010	Australia	• Crowd behavior • Crowd mood • Rationale • Individual behavior • Use of alcohol or drugs • Length of stay/duration	A psychosocial data collection tool was adopted from the work of Zeitz, et al (2009) to measure crowd behavior in a systematic way. The main reason for participation at the event was to be social and the mood was active, energetic, ambulatory, and participatory.
Hutton A[5]	2011	Australia	• Crowd behavior • Crowd mood • Individual behavior • Rationale • Use of alcohol or drugs • Length of stay/duration	Researchers used a conceptual framework tool to description of the participants' behavior to be analyzed. The length of the event was measured by the event timetable for three nights, three days festival. The presence or absence of alcohol and drugs was harder to determine. It was a dry event, but some young people drink prior to event.
Hutton A[14]	2013	Australia	• Crowd behavior • Crowd interest/culture • Use of alcohol or drugs	Culture of the event and of the audience are important factors for predicting likely behaviors and assessing for risks at events.
Hutton A[15]	2015	Australia	• Crowd interest/culture • Use of alcohol or drugs	The dancing and moshing, and the availability of alcohol contributed to injuries at the outdoor music festival.
Hutton A[6]	2018	Australia	• Individual motivation • Use of alcohol or drugs • Rationale • Crowd interest/culture	Attendees at outdoor music festivals reason for attendance is partially to escape everyday life, and this escapism may include the use of alcohol and other drugs. This attitude can modify crowd behavior.
Lam T[24]	2014	Australia	• Individual behavior • Rationale • Use of alcohol or drugs • Lengthen of stay/duration	The "holiday effect," a phenomenon where individuals on holiday tend to engage in risky behaviors, like at Schoolies with heavy alcohol use. As the drinking rates (SDs per hour) appeared similar to the last social event attended, it is possible that the longer hours available at the celebratory event accounted, to some extent, for the substantial quantities of alcohol consumed.
Locoh-Donou S[29]	2016	USA	• Use of alcohol or drugs	The presence of alcohol is associated with a 12% increase in the PPR, which is not significant statistically. Since crowd mood was not readily measurable, it was not included in variables because of the difficultly to define and measure.
Lund A[26]	2012	Canada	• Crowd mood • Use of alcohol or drugs • Length of stay/duration	A mass-gathering medicine registry was designed to standardize data collection. Data fields in "Event Description" pertaining to the psychosocial domain included: total event hours for day, crowd mood, drugs and alcohol use/sale at the event.
Milsten AM[17]	2017	USA	• Crowd behavior • Crowd interest/culture • Use of alcohol or drugs	Crowd culture at rock, punk, or heavy metal concerts includes moshing, stage diving, pushing, and/or shoving. "Patrons move in a highly energized collective motion," balancing between violence and order. The authors of the study theorize that rock concerts have a higher energy drink intake than alcohol use.

Table 2. Psychosocial Factors which Influence PPR at MGEs *(continued)*

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Author(s)	Year	Country	Variables	Description
Moore R[30]	2011	USA	• Crowd behavior • Use of alcohol or drugs	Event type is related to crowd behavior, such as rock concerts and the crowd participation in moshing, crowd surfing, and missiles thrown from the crowd. Mood of event can also be anticipated from event type, for example collegiate football games have widespread alcohol use and excitable fans.
Nable JV[31]	2014	USA	• Crowd behavior	Using the Hartman method to categorize an event as minor, intermediate, or major, one of the variables is crowd intention. Two points if the crowd is animated. Events with a score greater than five are classified as "major events."
Ranse J[3]	2012	Australia	• Crowd behavior • Crowd mood • Crowd interest/culture • Rationale	The psychosocial domain includes the crowd mood, behavior, crowd culture, and reason for attendance.
Schwartz B[32]	2015	Canada	• Crowd behavior • Use of alcohol or drugs	Predictive tools have been based on retrospective data and expert opinion and require prospective validation. Injures due to violence and substance abuse require special care.
Soomaroo L[33]	2012	UK	• Crowd behavior	Moshing, which primarily happens at live music events, is a crowd behavior that increases risks of injury. Mosh pit crowd control guidelines have been implemented, such as isolating the area from the main audience, provision of nearby first aid, and protocols to stop artists performance should crushing develop.
Steffen R[21]	2012	USA Saudi Arabia	• Crowd mood • Use of alcohol or drugs	Crowd mood can be affected by the type of mass gathering and the use of alcohol and drugs. Sporting and music events, rivalry might turn into aggression. Reports from Woodstock Festival show that the mood might change depending on the type of music. One study, nearly one-half the patients treated during a rock concert had admitted to using illicit drugs or alcoholic beverages.
Templeton A[34]	2015	Review	• Crowd behavior • Individual motivation	"Self-categorization theory suggests that shared social identity, people's cognitive representation of their relation to others, is what makes collective behavior possible."
Turris SA[19]	2014	Australia	• Crowd behavior • Crowd mood • Length of stay/duration • Use of alcohol or drugs	Crowd mood and behavior influence the tone of the event, and can increase the risk profile, such as political rallies. Objective measures of crowd mood are not yet well-developed for use in MGE context. However, crowd mobility and density are used as indicators for crowd mood.
Zeitz A[7]	2009	Australia	• Crowd behavior • Crowd mood	Matrix tool was used to classify the mood of the crowd as passive, active, or energetic. Crowd mood was found to impact medical workload.
Zeitz A[22]	2013	Australia	• Crowd mood • Rationale • Length of stay/duration	Density effects crowd mood. Supporters of different football teams generated different PPR.

Table 2. *(continued)*. Psychosocial Factors which Influence PPR at MGEs
Abbreviations: EDMF, electronic dance music festival; MGE, mass-gathering event; MUR, medical usage rate; PPR, patient presentation rate; TTHR, transfer to hospital rate.

of 70% alcohol use.[12] Of note, intoxication, violence, and traumatic injuries occur through the use of drugs and alcohol at both sporting and music MGEs.[13–15]

Maladaptive and Adaptive Behaviors

Consequences to attendees at MGEs due to norm behavior changes of participants have been quantified through the Hawkins, et al study.[12] The authors did a retrospective review of ambulance (EMS) and hospital emergency department records of patients injured as a result of risk-taking celebratory behavior from University of North Carolina (Chapel Hill, North Carolina USA) sports championship game. Characteristics of patients evaluated in relation to crowd behavior included assault and bonfire-associated burns.[12] Another study reviewed used a two-part self-reporting survey of respondents from the school leavers' celebrations outside of Perth, Australia which recorded the likelihood of negative consequences associated with alcohol and other drug use, as well as other risk factors, at the school leavers' celebration. Consequences relating to individual behavior included emotional outburst, heated argument, physical aggression, unprotected sex, blackout, stolen private/public property, act of vandalism, and arrests for intoxicated behavior.[14] Sampsel, et al[36] published the first reports of MGEs associated with sexual assaults and found that sexual assaults peak at MGEs on specific

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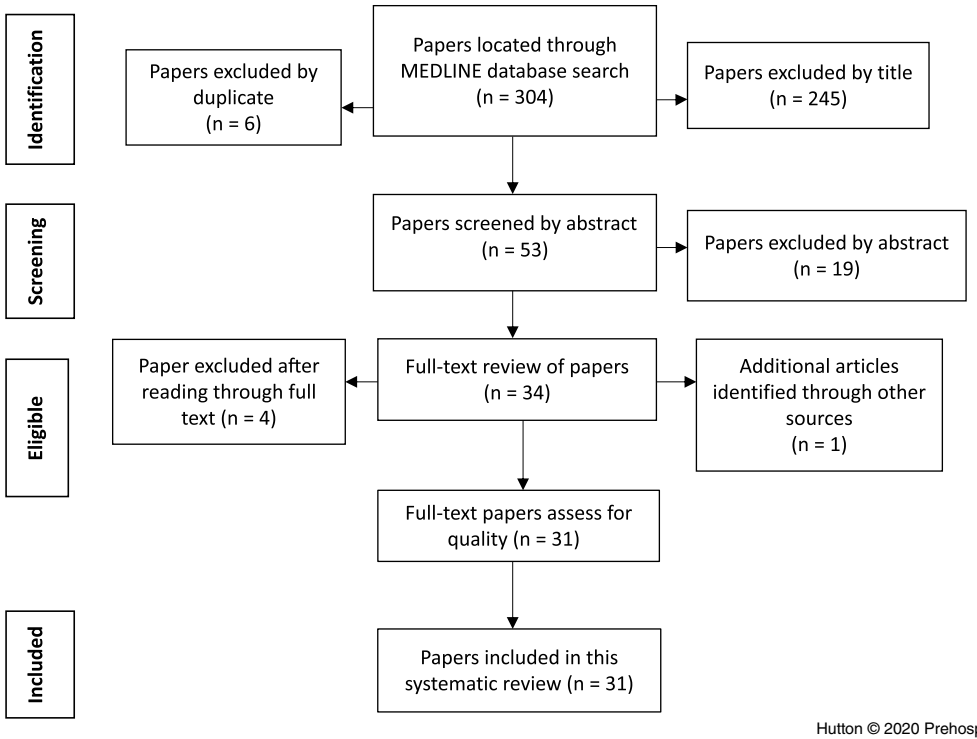

Figure 1. PRISMA Flow Diagram.[35] Evaluation Tools - Scoping Review.

holiday events, including New Year's Eve, Canada Day, Halloween, and University Freshman's week.[36]

In addition to sexual assaults, stampedes have been recorded as crowd behavior.[13] Stampedes can occur as a result of unmanageable crowd density; however, crowd density is not necessarily documented as a stressor. Hopkins reported that if participants felt greater identification with fellow attendees, they then felt less crowded, stating the joy of crowds related to "collective self-realization" can be a potential health benefit for participants.[16]

Crowd Behavior

There are numerous theories of crowd behavior attempting to explain the tendencies of crowds; however, there are few practical applications to monitor and assess crowd behaviors in MGEs that have been discussed or examined. Of the 18 papers that cited crowd behavior as a key influence on MGE PPRs, nine provided a tool for collecting this data.

Patient presentation trends at 15 MGEs in South Australia had fieldworker's record behavior on the crowd characteristics questionnaire.[11] The crowd characteristics questionnaire recorded the number and proportion of patients presenting to in-site health care service by crowd characteristics variables, which included crowd density, male to female ratio, proportion of crowd seated or stationary, proportion of crowd in motion, proportion of crowd displaying cohesive behavior, and proportion of crowd wearing cohesive dress.[11] Additionally, Hutton, et al's[5] study collected crowd behavior once every hour at five designated collection points using a tool adopted from the work of Zeitz, et al.[7] The main form of data collected were descriptive field notes collected via observation categorized into behaviors: dancing, singing, sitting, resting, walking, talking, chatting, talking on a mobile, sending SMS, fighting, wrestling, videotaping, taking pictures, celebrating, or socializing.[7,8] Hutton, et al's[5] study evaluated crowd mood using descriptive tools developed by Pines and Maslach,[37] and crowd type using Berlonghi's model,[38] applying a scoring system. Although the study was interpretive using participant observation, pre-event training was provided to ensure comprehensive and uniform data collection.

Crowd Culture

Crowd culture can include behaviors such as moshing and pushing and shoving. Hutton, et al documented social environmental factors at MGEs using Haddon's matrix, an epidemiology tool used to determine potential injuries, through behaviors such as dancing or "moshing."[15] Three studies used different methods to collect different variables to measure and/or identify crowd culture. For example, Milsten, et al[17] analyzed retrospective data from prehospital patient care reports to identify mosh-pit-related injuries at rock concerts, festivals, and electronic dance music events.[17] Hartman, et al used a scoring system that measured crowd intention as either "animated, intermediate, or calm," but did not outline the merits behind classification.[18] Finally, Turris, et al listed classification examples of crowd behavior as: mood, activity levels, queuing, movement, behavior, predispositions, motivations, crowd movement, and flow.[19]

The Emergency Management Australia (Canberra, Australia) descriptors for "crowd types" include behavior (Table 3[38]).[39] Within this comprehensive review, the authors underline the lack of congruence with the use of terminology between "crowd behavior," "crowd type," "crowd management," and "crowd mood." Moreover, demographics of a crowd is used as an environmental descriptor of a "crowd type."[7] For example, the profile at a football game is typically male-dominated who are passionate and loyal fans. This crowd type makes predictable crowd behavior.[40]

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Crowd Type	Comment
Ambulatory	Walking, usually calm
Disability/Limited Movement	Crowd has limited or restricted movement; requires additional planning
Cohesive/Spectator	Watching specific activity
Expressive/Revelous	Emotional release, for example, community fun runs
Participatory	Involved in actual event, for example, pickets, marches
Aggressive/Hostile	Initially verbal, open to lawlessness
Demonstrator	Organized to some degree, for example pickets, marches
Escape/Trampling	Danger may be real or imaginary
Dense/Suffocating	Reduction of individual physical movement
Rushing/Looting	Attempt to acquire/obtain/steal something, for example, tickets
Violent	Attacking/terrorizing

Table 3. Crowd Types/Behaviors[38]

Mood Descriptor	Crowd Descriptor
Passive	Little or no talking
	Little or no physical movements
	Little or no physical contact
	Little or no audience participation
	Cooperative
Active	Moderate degree of talking
	Moderate degree of physical movements
	Moderate degree of physical contact
	Moderate degree of audience participation
	Cooperative
Energetic	Considerable degree of talking
	Considerable degree of physical movements
	Considerable degree of physical contact
	Considerable degree of audience participation
	May be episodes of violence

Table 4. Crowd Mood Classifications[7]

Category	Year
Case Study[28]	2014
Case Study[10]	2018
Case Study[8]	2010
Case Study[5]	2011
Case Study[24]	2014
Case Study (Descriptive)[15]	2015
Case Study (Descriptive/ Retrospective)[27]	2017
Case Study (Longitudinal)[11]	2018
Case Study (Retrospective)[23]	2017
Comprehensive Review[3]	2012
Comprehensive Review[7]	2009
Critical Review[14]	2013
Descriptive Report[20]	2017
Literature Review[33]	2012
Retrospective Review[18]	2009
Retrospective Review[12]	2010
Retrospective Review[29]	2016
Retrospective Review[17]	2017
Retrospective Review[31]	2014
Retrospective Review[22]	2013
Review[13]	2018
Review[16]	2016
Review[30]	2011
Review[21]	2012
Special Report[2]	2004
Special Report/Opinion[6]	2018
Special Report[26]	2012
Special Report[19]	2014
Special Report[32]	2015
Systematic Review[25]	2014
Systematic Review[34]	2015

Table 5. Quality of Research

Crowd Mood

The term "crowd mood" is a descriptor of crowd emotion and tone which has become an indicator of probable crowd behavior outcomes.[5] Although crowd mood is less visible than crowd behavior, it can still be assessed and quantified. Pines and Maslach developed a practical matrix that classified the mood of crowd as passive, active, or energetic (Table 4).[37] The table scores the amount of verbal noise, physical movement, and overall audience participation into a numerical grading system.[5]

Hutton, et al adapted a psychosocial data collection tool from Zeitz, et al[41] and Emergency Management Australia[39] to group crowd mood as energetic, active, festive, passive, subdued, or delighted.[8] Despite Pines and Maslach's[37] tool being successfully used in Hutton, et al's study,[5] Turris, et al[19] found that objective measures of crowd mood are not yet well-developed for use in the mass-gathering context; "Crowd mobility and density are sometimes used as proxies for crowd mood or indicators of risk (qualitative)."[17] Evidence suggests that crowd mood can be influenced by factors such as type of music[20,21,42] or sporting rivalry.[22] Hutton, et al found that crowd mood at sporting events is influenced by the level of engagement with the event.[6] For example, they found that spectators displayed a myriad of emotions, such as yelling, cheering, shouting, jumping up and down, and getting angry and upset.[14] The animated mood at sporting events and festivals was also exacerbated by the "conspicuous consumption" of large amounts of food and alcohol, which in turn can have adverse health effects.[43] Further adverse circumstances can result in paranoia and mass hysteria leading to crowd crush and violence between attendees at MGEs.[11] To further understand crowd mood, Ranse and Hutton[3] included anxiety and psychiatric disorder under the mental health header in their patient data set and entry codes. Anxiety was observed as "Presentation related to anxiety or panic attack, not necessarily psychiatric in nature or substance related," and psychiatric disorder was defined as "Psychiatric or mental health related presentations."[3] This remains

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the only documented evidence of mental distress and is an area that needs further attention in the MGE space.

Reason for Attending Event (Motivation)

The reason for attending an event has a strong impact on the bio-medical domain, as the individual's motivation for attending and their behavior at an MGE can also be a factor in injury presentation.[8] Motivation for attending an event is a key influence on crowd behavior. However, due to visibility, Hutton, et al[5] suggested crowd behavior should be the focus as the observable and measurable element. Reasons for attendance were categorized in the comprehensive review by Ranse, et al within individual demographics as either participant, spectator, official, or other.[3] Hartman, et al scored crowd intentions data with a point value as animated, intermediate, or calm.[18] Hawkins, et al carried out a retrospective review of an MGE to celebrate the success of University of North Carolina men's basketball championship.[12] They found that participants' behavior at celebratory riots ranged from non-threatening behavior to rioting, burning of personal property, and physical violence against other participants or bystanders.[12] Although FitzGibbon, et al[23] and Friedman, et al[20] did not specifically collect data on motivation for crowd attendance in their studies, Jaensch, et al[44] and Lam, et al[24] found that a core part of motivation for festival-goers at outdoor music festivals was to use alcohol and other drugs in a group setting. Whereas participants' motivations that go to religious festivals or pilgrimages are focused on abstinence and faith.[16] Like religious festivals, sporting events bring attendees together for a shared sense of belonging.[6,13] However, many of these sport enthusiasts may be motivated to fit in with the crowd, which can lead to an over-consumption in alcohol.[6]

Duration

Of the papers reviewed, nine included the event duration as a variable that was or should be collected at MGEs.[5,8,18,19,22–26] Multiple-day events are generally associated with higher rates of medical use.[25] Data from Hutton, et al's pilot project[8] showed that there is a change in crowd behavior from the start of the event and the end of the event.[5] For some of the research papers, duration was a fixed variable determined during data collection, which remained the same for all of the events.[22]

Crowd Demographics

Crabtree, et al's[27] study found that patients from rural/regional areas were twice as likely to require advanced treatment and review by health care professionals. Additional variables such as crowd interest/culture and individual motivation are not as frequently mentioned, but for specific MGEs, are an important aspect of data collection.

Study Limitations

Despite the use of a rigorously designed search strategy, there is potential that the search outcomes and the subsequent findings of this literature review are at-risk of selection bias. In addition, manuscripts included in this review were of a low quality, descriptive, and retrospective (Table 5). The search strategy was restricted to studies published in English, and as such, may have not identified relevant studies written in other languages.

Conclusion

As outlined by Arbon,[2] there are three categories which influence the presentation of patients to in-event health services at MGEs: biomedical, environmental, and psychosocial. This review has provided a framework for collecting psychosocial variables that influence PPRs at MGEs. In regards to crowd behavior, the majority of the literature focuses on the negative effects to crowd safety; however, there are some potential benefits to social well-being which may be explored in future research.[28] In addition, there is an opportunity to develop a standardized set of scales for crowd measurement. Overall, this review is one of three to pull together sets of variables to document the impact of MGEs on the health of attendees. This manuscript has presented a range of psychosocial variables that are documented within academic literature as being collected at MGEs. Even though the rationale behind the collection of variables are subjective, they identify activities that take place which influence injury and illness at events. It is not expected that all variables documented in this manuscript will be collected at each MGE; however, through identifying what is currently collected, researchers can determine which variables can be collected to suit their own needs. As MGE science develops, data collected under these specific psychosocial variables can be used for the purpose of making comparisons across societies for MGEs, which will in turn propel forward the science of MGEs.

Supplementary Material

To view supplementary material for this article, please visit https://doi.org/10.1017/S1049023X20000047

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