



TRACIE

HEALTHCARE EMERGENCY PREPAREDNESS
INFORMATION GATEWAY

Mass Gatherings/Special Events
Topic Collection
6/8/2016

Topic Collection: Mass Gatherings/Special Events

Thousands of pre-planned mass gatherings and special events occur each year across the country and abroad. Examples include: sporting events, festivals, parades, conventions, dedications, memorials and occasionally high-profile meetings or visits by dignitaries. Unfortunately, in today's environment, special events attended by large numbers of people may be considered as terrorist targets due to large concentrations of crowds, the symbolic nature of the event, high-profile attendees, and increased media attention. Beyond the terrorist implications, there is still the inherent vulnerability of mass gatherings. The effects of a natural disasters, accidents, or disease outbreaks become amplified when they occur in a mass gathering. Further, the nature of crowds, in and of themselves, can be dangerous. Lastly, high concentrations of people may overwhelm the personnel support capacity in a given area, compromising basic human services and exacerbating existing medical conditions or creating unhealthy environments. It is for these reasons that local, state, and federal authorities should manage the public health and medical issues presented by mass gatherings and prepare for contingency response operations. Treating these events as "planned emergencies," including using incident management systems for planning and operating, allows a rapid transition to emergency response should an incident occur.

The resources in this Topic Collection include lessons learned, case studies, research, tools, and templates designed to help emergency medical staff create robust plans for mass critical care before an incident strikes their jurisdiction. This Collection does *not* include resources on mass casualty response but is designed to support pre-incident mass gathering contingency planning. More specific information can be found in the following ASPR TRACIE Topic Collections: [Fatality Management](#), [Responder Safety and Health](#), [Burn](#), [Explosives \(e.g., bomb, blast\) and Mass Shooting](#), [Mental/Behavioral Health \(non-responders\)](#), [Pre-Hospital Victim Decontamination](#), [Alternate Care Sites](#), [Mass Patient Care](#), [Pediatric](#), and [Trauma Care and Triage](#).

Each resource in this Topic Collection is placed into one or more of the following categories (click on the category name to be taken directly to that set of resources). Resources marked with an asterisk (*) appear in more than one category.

[Must Reads](#)

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Must Reads

Clements, B. (2010). [Public Health Security for Mass Gatherings](#). Domestic Preparedness Journal. 6(1): 24-26.

The author focuses on H1N1 and terrorism and highlights the importance of planning for related public health threats prior to a mass gathering. Several other articles in this issue are also relevant to mass gatherings.

Committee on Homeland Security. (2008). [Public Health, Safety, and Security for Mass Gatherings](#). U.S. House of Representatives.

Federal staff were charged with examining mass gathering events and identifying areas where additional resources would help ensure attendee safety. Their findings are categorized under three areas: countering biological threats, collaborative planning, and partnering across sectors.

Disaster Information Management Research Center. (2015). [Mass Gatherings](#). U.S. Department of Health and Human Services.

This webpage provides links to resources on mass gatherings under categories such as: mass casualty preparedness, outbreaks and communicable diseases, and environmental health and sanitation. Links to mass casualty response documents are also included.

District of Columbia Department of Health, Health Emergency Preparedness and Response Administration. (2014). [Special Events Health, Medical and Safety Planning Guide](#).

This document outlines the recommended procedures for creating a Health, Medical, and Safety Plan for a special event. It is directed to the event applicants/organizers and includes a list of requirements for medical care by type and size of event (page 7), checklists, and templates that can be tailored to a variety of jurisdictions.

Federal Emergency Management Agency. (2012). [Operational Templates and Guidance for EMS Mass Incident Deployment](#).

The goal of this comprehensive report is to share detailed model policies and practices and help emergency medical services (EMS) deploy more effectively to planned and spontaneous mass care incidents. Case studies and event templates for scheduled and unscheduled events are included that can help EMS planners develop local plans and conduct activities.

Ganguli, S., Friedman, M., and Bazos, A. (2014). [Raves and Saves: Massive Music Festivals Call for Advanced Emergency Care](#). *Emergency Physicians Monthly*.

The authors discuss electronic dance music festivals and explain drug-related complications and physical injuries that are most common during these festivals. The authors share a "game plan" and ten takeaways for healthcare providers responsible for preparing for these types of events which have a high potential to require advanced medical interventions.

Grange, J.T., Baumann, G.W., and Vaezazizi, R. (2003). [On-Site Physicians Reduce Ambulance Transports at Mass Gatherings](#). *Prehospital Emergency Care*. 7(3):322-6.

The authors found that the presence of on-site physicians significantly reduced ($p < 0.001$) the number of ambulance transports during a large motorsports event in California.

Hartman, N., Williamson, A., Sojka, B., et al. (2009). [Predicting Resource Use at Mass Gatherings Using a Simplified Stratification Scoring Model](#). (Abstract only.) *The American Journal of Emergency Medicine*. 27(3): 337-43.

The authors tested a classification system that stratifies events based on weather, number in attendance, presence of alcohol, demographic in attendance, and crowd intentions to predict medical needs at mass gatherings. The system predicted needs better for "minor" and "intermediate" events (less so for "major" events).

Kollek, D. (2014). [An Introduction to Mass Gatherings](#). The Centre for Excellence in Emergency Preparedness.

The author provides an overview of mass gatherings and the related medical strategies (surveillance, prevention, and diversion) and interventions planners can use to prepare for these events. Guidance on staffing and command and control is included and a question-based initial analysis is used. Table 2 provides a summary of risks and issues for all events.

Leonard, R., Winslow, J., and Bozeman, W. (2006). [Planning Medical Care for High-Risk Mass Gatherings](#). *The Internet Journal of Rescue and Disaster Medicine* 6(1).

The authors outline security requirements for mass gatherings with a focus on presidential and dignitary visits (and good discussion of the role of the local and federal agencies) and describe the role of emergency medical services coverage for various threats that could lead to mass casualties (e.g., hot weather and terrorist incidents).

Lukins, J.L., Feldman, M.J., Summers, J.A., and Verbeek, P.R. (2004). [A Paramedic-Staffed Medical Rehydration Unit at a Mass Gathering](#). (Abstract only.) *Prehospital Emergency Care*. 8(4): 411-416.

The authors described using a paramedic-staffed medical rehydration unit at an event attended by more than 450,000 people during the summer as an adjunct treatment facility to prevent overload on the field hospital.

Massachusetts Emergency Management Agency, Massachusetts Department of Public Health, City of Boston, et al. (2014). [After Action Report for the Response to the 2013 Boston Marathon Bombings](#).

This after-action report is a review of response and recovery activities of public safety, public health, and medical personnel related to the April 15, 2013 bombings, the care and support of those impacted by the events in the following days, and the search and apprehension of the bombing suspects. It details how a “planned disaster” turned into a successful emergency response, featuring best practices, lessons learned, and recommendations for the purpose of assisting public safety, public health, and medical personnel involved in the response in further developing actions that went well, and taking corrective measures to address areas needing improvement.

McCloskey, B. and Endericks, T. (2013). [Learning from London 2012: A Practical Guide to Public Health and Mass Gatherings](#). Health Protection Agency.

The authors share lessons learned from the London 2012 Olympic and Paralympic Games. The book is split into two sections: “What Might Happen” (which includes an overview and scenarios), and “Technical Subjects” (with chapters on surveillance, exercises and testing, communications, and terrorism). Particularly valuable information on recommendations derived from the Olympic experience are highlighted in purple boxes.

Milsten, A.M., Maguire, B.J., Bissell, R.A., and Seaman, K.G. (2002). [Mass-Gathering Medical Care: A Review of the Literature](#). (Abstract only.) *Prehospital and Disaster Medicine*. 17(3):151-62.

The authors examine medical utilization rates during large events to determine the role of intervening variables such as temperature, attendance, and alcohol and drug use.

Milsten, A.M., Seaman, K.g., Liu, P., et al. (2003). [Variables Influencing Medical Usage Rates, Injury Patterns, and Levels of Care for Mass Gatherings](#). (Abstract only.) *Prehospital and Disaster Medicine*. 18(4):334-46.

The authors examined medical utilization rates during three types of mass gatherings over a three-year period. They found that event type and temperature best predicted specific injuries and medical utilization rates.

Minnesota.gov. (n.d.). [Special Event and Mass Gathering Medical Care Planning Guideline](#). (Accessed 5/4/2016).

This event classification matrix was developed to help local emergency healthcare providers develop medical plans for large events based on risk.

National Library of Medicine. (2015). [Public Health Preparedness for Mass Gatherings](#).

This website provides links to resources on healthcare preparedness for mass gatherings, including lessons learned from large events, planning considerations, and tools and resources on mass casualty planning and response.

Northwest Center for Public Health Practice. (2010). [Mass Gatherings: Are You Prepared?](#)

This free 90-minute course focuses on mass gathering preparation. The course is based on a hypothetical three-day music festival and includes various scenarios and case studies. Users can also access the print version of the course from this site.

Perron, A.D., Brady, W.J., Custalow, C.B., and Johnson, D.M. (2005). [Association of Heat Index and Patient Volume at a Mass Gathering Event](#). (Abstract only.) *Prehospital Emergency Care*. 9(1):49-52.

The authors examined the relationship between heat index and the need for medical care during events at a Division I college football stadium located in the southeastern United States. They concluded that for every 10-degree increase in the heat index, three more patients per 10,000 patrons will require care.

Schwartz, B., Nafziger, S., Milsten, A., et al. (2015). [Mass Gathering Medical Care: Resource Document for the National Association of EMS Physicians Position Statement](#). *Prehospital Emergency Care*. 19(4).

This comprehensive review can be helpful to medical directors and emergency medical systems operations planners, as it includes definitions, a literature review of contributing factors to medical needs, an overview of the role of the medical director, and strategies for determining on-site medical resources.

State of New Hampshire. (2014). [Mass Gathering Standard Operating Guideline Template](#).

This standard operating guideline published by the State of New Hampshire can be customized to meet the needs of other states during mass gathering emergency medical services resource planning. The template covers all areas that need to be addressed and includes a scoring matrix helpful to predict risk and coverage needs.

The Lancet: Infectious Diseases. (2012). [Mass Gatherings Health](#).

This webpage provides links to articles on mass gathering health. Articles on the Hajj pilgrimage, disease prevention, non-communicable disease risks, and crowd and environmental management are included.

World Health Organization. (2008). [Communicable Disease Alert and Response for Mass Gatherings](#).

This document highlights the key considerations related to setting up and implementing communicable disease alert, response, and operation plans for mass gatherings. Sections include: risk assessment and management; surveillance and alert systems; and outbreak alert and response.

Education and Training

Baez, A. and Sztajnkrzyer, M. (2015). [Basic Principles of Mass Gathering Medical Care. Supercourse Lectures #17951](#). The Department of Emergency Medicine, Mayo Clinic College of Medicine.

This PowerPoint presentation is a brief overview of medical care aspects of mass gatherings. It includes nine planning elements (e.g., triage, personnel, data collection, and crowd size); a planning timeline; anticipated conditions by event; and lessons learned from past events. The authors emphasize the use of incident command, but readers should note that the charts they include are neither NIMS compliant nor mass-gathering related.

Federal Emergency Management Agency. (n.d.). [NSSE/NLE Support](#). (Accessed 6/1/2016.)

This webpage defines National Special Security Events and National Level Exercises and offers a link to Center for Domestic Preparedness Regional Training Coordinators who can help communities plan for these events.

Federal Emergency Management Agency. (2013). [IS-15.B: Special Events Contingency Planning for Public Safety Agencies](#).

This web-based course teaches first responders about pre-event planning, forming the planning team, event hazard analysis, and responding to incidents during special events in their community.

Northwest Center for Public Health Practice. (2010). [Mass Gatherings: Are You Prepared?](#)

This free 90-minute course focuses on mass gathering preparation. The course is based on a hypothetical three-day music festival and includes various scenarios and case studies. Users can also access the print version of the course from this site.

Texas A&M Engineering Extension Service. (2016). [Sports and Special Events Incident Management](#).

This 16-hour course is offered around the U.S. to emergency responders and others involved in planning for sport/special event management. Topics include incident management, multi-disciplinary management, and planning and after-action reporting.

Guidance

Calabro, J., Rivera-Rivera, E., Reich, J., et al. (1996). [Provision of Emergency Medical Care for Crowds](#). American College of Emergency Physicians, EMS Committee.

The authors share lessons learned from recent experiences and highlight key considerations for providing medical care at mass gatherings in a comprehensive, step-by-step document that is valuable though somewhat dated as far as terrorism-related considerations.

Clements, B. (2010). [Public Health Security for Mass Gatherings](#). Domestic Preparedness Journal. 6(1): 24-26.

The author focuses on H1N1 and terrorism and highlights the importance of planning for related public health threats prior to a mass gathering.

Committee on Homeland Security. (2008). [Public Health, Safety, and Security for Mass Gatherings](#). U.S. House of Representatives.

Federal staff were charged with examining mass gathering events and identifying areas where additional resources would help ensure attendee safety. Their findings are categorized under three areas: countering biological threats, collaborative planning, and partnering across sectors.

Disaster Information Management Research Center. (2015). [Mass Gatherings](#). U.S. Department of Health and Human Services.

This webpage provides links to resources on mass gatherings under categories such as: mass casualty preparedness, outbreaks and communicable diseases, and environmental health and sanitation. Links to mass casualty response documents are also included.

Dries, D.J., Frascone, R.J., Hick, J.L., and Salzman, J. (2012). [Medical Preparation for the 2008 Republican National Convention: A Practical Guide](#). (No preview available.) The Journal of Trauma and Acute Care Surgery. 73(6): 1614-23.

The authors stress the need for planners to anticipate "low-probability, high impact incidents" (e.g., chemical, biological, and nuclear attacks) when planning for National Special Security Events and include specific supply recommendations for on-site care.

Environmental Surveillance Section, Environmental Health Service, Department of Health (Australia). (2006). [Guidelines for the Management of Public Health & Safety at Public Events](#).

This document provides background information and guidance on pre-event planning, communications, event (and health) promotion, environmental health, emergency services, and first aid. Appendices that cover specific scenarios (e.g., needle stick injuries) are also included.

Jaslow, D., Yancy, A., and Milsten, A. (2000). [Mass Gathering Medical Care. National Association of EMS Physicians Standards and Clinical Practice Committee](#). Prehospital Emergency Care. 4(4):359-60.

This position paper emphasizes that mass gathering medical care plans include 15 components (e.g., medical reconnaissance, medical equipment, access to care, and documentation).

Kollek, D. (2014). [An Introduction to Mass Gatherings](#). The Centre for Excellence in Emergency Preparedness.

The author provides an overview of mass gatherings and the related medical strategies (surveillance, prevention, and diversion) and interventions planners can use to prepare for these events. Guidance on staffing and command and control is included and a question-based initial analysis is used. Table 2 provides a summary of risks and issues for all events.

Leonard, R., Winslow, J., and Bozeman, W. (2006). [Planning Medical Care for High-Risk Mass Gatherings](#). The Internet Journal of Rescue and Disaster Medicine 6(1).

The authors outline security requirements for mass gatherings with a focus on presidential and dignitary visits (and good discussion of the role of the local and federal agencies) and describe the role of emergency medical services coverage for various threats that could lead to mass casualties (e.g., hot weather and terrorist incidents).

Ossman, E. (2014). [From Mosh Pits to Marathons: Preparing for Mass Gathering Events](#).

In this presentation, the author highlights how emergency physicians are uniquely suited to providing medical care during mass gathering events. He highlights the pros and cons of preparing to serve as on-site or facility medical care provider during a mass gathering event.

Schwartz, B., Nafziger, S., Milsten, A., et al. (2015). [Mass Gathering Medical Care: Resource Document for the National Association of EMS Physicians Position Statement](#). Prehospital Emergency Care. 19(4).

This position statement includes definitions, a literature review, an overview of the role of the medical director, and strategies for determining on-site medical resources. The authors emphasize the need for "the consistent use and further development of universally accepted consistent metrics" to streamline the planning process.

World Health Organization. (2015). [Public Health for Mass Gatherings: Key Considerations](#).

This guidance document incorporates lessons learned from past mass gatherings across the globe and includes 18 chapters on topics such as: planning, command and control, communications, event medical services, surveillance and outbreak response, preventing and controlling infection, and use of modern technology in planning and operations.

Infectious Disease

* Khan, K., Clark, C., Freifeld, B.S., et al. (2010). [Preparing for Infectious Disease Threats at Mass Gatherings: The Case of the Vancouver 2010 Olympic Winter Games](#).

The authors created a model that integrated data on worldwide patterns of commercial air traffic with data on global surveillance of infectious diseases using Web-based intelligence-gathering tools. This allowed them to combine information on locations from where large numbers of people are expected to travel to attend a mass gathering with reports of infectious disease threats of public health significance.

* The Lancet: Infectious Diseases. (2012). [Mass Gatherings Health](#).

This webpage provides links to articles on mass gathering health. Articles on the Hajj pilgrimage, disease prevention, non-communicable disease risks, and crowd and environmental management are included.

World Health Organization. (2008). [Communicable Disease Alert and Response for Mass Gatherings](#).

This document highlights the key considerations related to setting up and implementing communicable disease alert, response, and operation plans for mass gatherings. Sections include: risk assessment and management; surveillance and alert systems; and outbreak alert and response.

Lessons Learned: General

Baird, M.B., O'Connor, R.E., Williamson, A.L., et al. (2010). [The Impact of Warm Weather on Mass Event Medical Need: A Review of the Literature](#). (Abstract only.) American Journal of Emergency Medicine. 28(2):224-9.

From an in-depth literature review, the authors found that most studies found a positive relationship between heat/humidity and the frequency of patient presentation. In addition to the literature review, the authors propose an algorithm for predicting patient volume at mass events.

Centers for Disease Control and Prevention. (2000). [Public Health Aspects of the Rainbow Family of Living Light Annual Gathering: Allegheny National Forest, Pennsylvania, 1999](#). Morbidity and Mortality Weekly Report. 49(15): 324-326.

Nearly 20,000 attended this event, held in a remote location that was not accessible by vehicle and did not have sanitary facilities. The festival provided alternative medical care and local public health employees were permitted to visit the site daily (but were requested to keep their interactions informal). Local emergency department staff asked all patients seeking care during a certain time period if they had attended the festival. Of the 115 recorded attendees seeking healthcare, one death was reported, as were a variety of infections, musculoskeletal injuries, insect/dog/snake bites, and other conditions.

Centers for Disease Control and Prevention. (2006). [Surveillance for Early Detection of Disease Outbreaks at an Outdoor Mass Gathering: Virginia, 2005](#). Morbidity and Mortality Weekly Report. 55(3): 71-74.

This report details a sentinel disease surveillance system used to monitor injury and illness among more than 40,000 campers attending a 10-day event. The incidence of gastroenteritis was 22.2 per 1,000 (four clusters were discovered); nearly 15,000 heat-related events were recorded; and nearly 4,000 other injuries and illnesses were noted. These findings illustrate the importance and utility of health screening and surveillance at mass gatherings.

De Lorenzo, R. (1997). [Mass Gathering Medicine: A Review](#). (Abstract only.) Prehospital and Disaster Medicine. 12(1):68-72.

The author conducted a literature review on the planning, organization, personnel, and staffing requirements needed to provide medical care at large events.

Grant, W.D., Nacca, N.E., Prince, L.A., and Scott, J.M. (2010). [Mass-Gathering Medical Care: Retrospective Analysis of Patient Presentations over Five Years at a Multi-Day Mass Gathering](#). (Abstract only.) Prehospital Disaster Medicine. 25(2):183-7.

The authors reviewed the data from patients seen during the New York State Fair over five years to identify the range and nature of injury and illness. The most common reason for seeking medical assistance was dehydration, primarily by females.

Locoh-Donou, S., Guofen, Y., Welcher, M., et al. (2013). [Mass-Gathering Medicine: A Descriptive Analysis of a Range of Mass-Gathering Event Types](#). (Abstract only.) American Journal of Emergency Medicine. 31(5): 843-846.

The authors reviewed cases from two years' worth of planned mass gathering events to determine the nature of illness/ injury. They found most cases were mild; the average patient age was 33 years old and female.

Lukins, J.L., Feldman, M.J., Summers, J.A., and Verbeek, P.R. (2004). [A Paramedic-Staffed Medical Rehydration Unit at a Mass Gathering](#). (Abstract only.) Prehospital Emergency Care. 8(4): 411-416.

The authors described using a paramedic-staffed medical rehydration unit at an event attended by more than 450,000 people during the summer as an adjunct treatment facility to prevent overload on the field hospital.

Michael, J. and Barbera, J.A. (1997). [Mass Gathering Medical Care: A Twenty-Five Year Review](#). Prehospital and Disaster Medicine. 12(4): 72-79.

The authors examined international mass gathering literature to better understand the relationship between size of the gathering and the frequency of patients seeking medical aid. Events that took place on hot weather days had higher numbers of patient visits and statistically more cardiac events occurred at sporting and papal events.

Milsten, A.M., Maguire, B.J., Bissell, R.A., and Seaman, K.G. (2002). [Mass-Gathering Medical Care: A Review of the Literature](#). (Abstract only.) Prehospital and Disaster Medicine. 17(3):151-62.

The authors examine medical utilization rates during large events to determine the role of intervening variables such as temperature, attendance, and alcohol and drug use.

Milsten, A.M., Seaman, K.g., Liu, P., et al. (2003). [Variables Influencing Medical Usage Rates, Injury Patterns, and Levels of Care for Mass Gatherings](#). (Abstract only.) Prehospital and Disaster Medicine. 18(4):334-46.

The authors examined medical utilization rates during three types of mass gatherings over a three-year period. They found that event type and temperature best predicted specific injuries and medical utilization rates.

* National Library of Medicine. (2015). [Public Health Preparedness for Mass Gatherings](#).

This website provides links to resources on healthcare preparedness for mass gatherings, including lessons learned from large events, planning considerations, and tools and resources on mass casualty planning and response.

* The Lancet: Infectious Diseases. (2012). [Mass Gatherings Health](#).

This webpage provides links to articles on mass gathering health. Articles on the Hajj pilgrimage, disease prevention, non-communicable disease risks, and crowd and environmental management are included.

Zeitz, K.M., Zeitz, C.J., and Arbon, P. (2005). [Forecasting Medical Work at Mass-Gathering Events: Predictive Model Versus Retrospective Review](#). (Abstract only.) Prehospital and Disaster Medicine. 20(3): 164-168.

The authors compared two methods of forecasting and discuss each model's utility when planning to provide medical care at mass gathering events.

Lessons Learned: Music/Other Festivals

Bledsoe, B., Songer, P., Buchanan, K., et al. (2012). Burning Man 2011: [Mass Gathering Medical Care in an Austere Environment](#). (Abstract only.) Prehospital Emergency Care. 16(4): 469-76.

The authors provide an overview of the planning and emergency care process associated with Burning Man 2011. The authors listed several challenges to providing emergency medical care, including attendance size, distance to "definitive medical care," and the need for physicians because some of the necessary care exceeded paramedics' scope.

Feldman, M., Lukins, J., Verbeek, R., et al. (2009). [Use of Treat-and-Release Medical Directives for Paramedics at a Mass Gathering](#). (Abstract only.) Prehospital Emergency Care. 9(2).

The authors examined records from a large single-day summer concert; more than 450,000 attended and 1,870 presented for medical attention. Of the patients treated and released by paramedics, none were found to require subsequent ambulance transport, leading the authors to conclude that treat-and-release medical directives helped divert patients from requiring care at actual facilities.

Ganguli, S., Friedman, M., and Bazos, A. (2014). [Raves and Saves: Massive Music Festivals Call for Advanced Emergency Care](#). Emergency Physicians Monthly.

The authors discuss electronic dance music festivals and explain drug-related complications and physical injuries that are most common during these festivals. The authors share a "game plan" and ten takeaways for healthcare providers responsible for preparing for these types of events which have a high potential to require advanced medical interventions.

Grange, J.T., Green, S.M., and Downs, W. (1999). [Concert Medicine: Spectrum of Medical Problems Encountered at 405 Major Concerts](#). *Academic Emergency Medicine*. 6(3): 202-207.

The authors examined patient cases of those reporting to first aid stations at five major concert venues in southern California over a five-year period. They found that music type was only able to account for 4% of injury variability, and trauma-related complaints were most frequent across all types of concerts.

Hutton, A., Ranse, J., Verdonk, N., et al. (2014). [Understanding the Characteristics of Patient Presentations of Young People at Outdoor Music Festivals](#). (Abstract only.) *Prehospital Disaster Medicine*. 29(2):160-6.

The authors reviewed patient report forms from 26 outdoor music festivals held in four States of Australia during 2010. They found that more females presented than males, and were more likely to report minor illnesses (e.g., headaches). Males were more likely to present with injuries, namely cuts to their face and hands. Alcohol and substance use made up 15% of all presentations.

Krul, J., Sanou, B., Swart, E.L., and Girbes, A.R. (2012). [Medical Care at Mass Gatherings: Emergency Medical Services at Large-Scale Rave Events](#). (Abstract only.) *Prehospital Disaster Medicine*. 27(1):71-74.

The authors reviewed Dutch rave dance parties over a five-year period and determined that "a medical team of six healthcare workers for every 10,000 rave party visitors" would suffice. They made additional planning recommendations regarding staff and treatment protocols.

McQueen, C. and Davies, C. (2012). [Health Care in a Unique Setting: Applying Emergency Medicine at Music Festivals](#). *Open Access Emergency Medicine*. 4: 69–73.

The authors conducted a literature review on medical care provided at music festivals in the United Kingdom over 25 years. They examined workload, care provided, equipment and related standards, and planning needs.

Thierbach, A.R., Wolcke, B.B., Piepho, T., et al. (2003). [Medical Support for Children's Mass Gatherings](#). (Abstract only.) *Prehospital Disaster Medicine*. 18(1):14-9.

The authors describe the medical care provided to children at a television-sponsored fair. During this event, approximately 20% of the children (under 10 years of age) seeking medical attention were not accompanied by adults; the authors emphasize that medical providers consider this finding and be qualified to handle all types of medical emergencies.

Lessons Learned: Political Events

CNA. (2013). Command, Control, and Coordination: [A Quick-Look Analysis of the Charlotte-Mecklenburg Police Department's Operations during the 2012 Democratic National Convention](#). Bureau of Justice Assistance.

This report summarizes the events that occurred during the 2012 Democratic National Convention in Charlotte, NC. It identifies the strengths and areas for improvement that were demonstrated during the event. Section 2.8 specifically addresses the aspects of Fire/EMS and Public Health agencies with some discussion of the robust amount of on-site and peri-venue support.

Colwell, C.B., Bookman, S., Johnston, J., et al. (2012). [Medical Preparation for the 2008 Democratic National Convention, Denver, Colorado](#). (No preview available.) *The Journal of Trauma and Acute Care Surgery*. 73(6): 1624-8.

This article summarizes the preparatory work done over more than a year's time by Denver Health Paramedic Division and dozens of agencies at every level to prepare for the 2008 Democratic National Convention.

Hick, J.L., Frascione, R.J., Grimm, K., et al. (2009). [Health and Medical Preparedness and Response to the 2008 Republican National Convention](#). (Abstract only.) *Disaster Medicine and Public Health Preparedness*. 3(4):224-32.

The authors describe the health and medical planning for and impact of the Republican National Convention on the City of St. Paul and the Minneapolis-St. Paul metropolitan area.

National Capital Region. (2009). [2009 Presidential Inauguration January 17 – 21: 2009 Regional After-Action Report Summary](#).

This after action report summarizes the events that occurred during the January 20, 2009 Presidential inauguration of Barack Obama. It identifies the strengths (including several coalition activities and the use of the Health Emergency Coordination Center) and areas for improvement that were demonstrated during the event.

Serino, R. (n.d.). [Democratic National Convention After Action Briefing](#). (Accessed 5/5/2016.)

This presentation is an Emergency Medical Services (EMS) after action briefing on the Democratic National Convention held in Boston, MA in July 2004. It provides an overview of EMS roles and responsibilities during the convention, and identifies lessons learned.

Lessons Learned: Races/Other Sporting Events

Almond, C., Shin, A., Fortescue, E., et al. (2005). [Hyponatremia among Runners in the Boston Marathon](#). The New England Journal of Medicine. 352:1550-1556.

The authors studied a cohort of marathon runners to determine the incidence and risk factors of hyponatremia. They found that considerable weight gain while running, a long racing time, and body-mass-index extremes were associated with hyponatremia.

Başdere, M., Ross, C., Chan, J.L., et al. (2014). [Acute Incident Rapid Response at a Mass-Gathering Event through Comprehensive Planning Systems: A Case Report from the 2013 Shamrock Shuffle](#). (Abstract only.) Prehospital Disaster Medicine. 29(3): 320-5.

The authors describe the "Chicago Model" used to prepare for the 2013 "Shamrock Shuffle" and include lessons learned.

Billows, G.L. (2010). [EMS in the Fast Lane. Mass-Gathering Medicine at the Indianapolis Motor Speedway](#). Journal of Emergency Medical Services. 35(9): suppl 11-3.

The Indianapolis Motor Speedway is home to the Indy 500, which is attended by hundreds of thousands of spectators every year. This article highlights the preparation, staffing, and resources dedicated to this event in 2010, including the unique aspect of having an on-site emergency department.

Burdick, T.E. (2005). [Wilderness Event Medicine: Planning for Mass Gatherings in Remote Areas](#). (Abstract only.) Travel Medicine and Infectious Disease. 3(4): 249-258.

The author reviews data on wilderness injury and illness rates and shares a framework for planning and carrying out Wilderness Event Medicine, broken into three stages: event planning, medical treatment at the event, and post-event tasks.

Centers for Disease Control and Prevention (1994). [Carbon Monoxide Levels During Indoor Sporting Events: Cincinnati, 1992-1993](#). Morbidity and Mortality Weekly Report. 43(2): 21-23.

This report shares results from a study on carbon monoxide measurements during a tractor pulls, monster truck jumps, and a mud race held in an indoor arena. Poisoning symptoms and treatment strategies are also included.

Chiampas, G. (2014). [Preparing for Disaster](#).

The author highlights mass event preparedness, implementing incident command during mass events, and shares lessons learned from the Chicago Marathon.

Chiampas, G. and Jaworski, C. (2009). [Preparing for the Surge: Perspectives on Marathon Medical Preparedness](#). (Abstract only.) *Current Sports Medicine Repots*. 8(3):131-5.

The authors explain medical considerations for mass gatherings and other lessons learned from the Chicago Marathon.

Clancy, T. and Cortacans, H.P. (2014). [Super Ready: How a Regional Approach to Super Bowl EMS Paid Off](#). *EMS World*.

The authors discuss their experiences preparing for Superbowl XLVIII, held in the MetLife Stadium in East Rutherford, New Jersey. Together with several partners, they developed a comprehensive, 500-page plan, categorized by jurisdictional areas, with appendices for general areas of operation and support functions.

Grange, J.T., Bodnar, J.A., and Corbett, S.W. (2009). [Motocross Medicine](#). (Abstract only.) *Current Sports Medicine Reports*. 8(3): 125-130.

The authors provide an overview of the sport and related medical issues. They emphasize that on-scene caregivers should have a solid understanding of spine and head trauma, and which injuries need to be transported versus treated at the scene.

Hiltunen, T., Kuisma, M., Määttä, T., et al. (2007). [Prehospital Emergency Care and Medical Preparedness for the 2005 World Championship Games in Athletics in Helsinki](#). (Abstract only). *Prehospital and Disaster Medicine*. 22(4):304-11.

The authors analyzed the medical preparedness, ambulance patient characteristics, emergency care, and the use of pre-hospital resources during the 2005 World Championship Games in Athletics in Helsinki, Finland.

Lund, A., Turris, S., Wang, P., et al. (2014). [An Analysis of Patient Presentations at a 2-day Mass-Participation Cycling Event: the Ride to Conquer Cancer Case Series, 2010-2012](#). (Abstract only.) *Prehospital and Disaster Medicine*. 29(4): 429-36.

The authors examined three years' worth of data from this race and concluded that medical plans for similar events (multi-day, cross-national) must take into account "legislative issues, long-distance communication capabilities, and highly mobile participants."

Massachusetts Emergency Management Agency, Massachusetts Department of Public Health, City of Boston, et al. (2014). [After Action Report for the Response to the 2013 Boston Marathon Bombings](#).

This after-action report is a review of response and recovery activities of public safety, public health, and medical personnel related to the April 15, 2013 bombings, the care and support of those impacted by the events in the following days, and the search and apprehension of the bombing suspects. It details how a “planned disaster” turned into a successful emergency response, featuring best practices, lessons learned, and recommendations for the purpose of assisting public safety, public health, and medical personnel involved in the response in further developing actions that went well, and taking corrective measures to address areas needing improvement.

McCloskey, B. and Endericks, T. (2013). [Learning from London 2012: A Practical Guide to Public Health and Mass Gatherings](#). Health Protection Agency.

The authors share lessons learned from the London 2012 Olympic and Paralympic Games. The book is split into two sections: “What Might Happen” (which includes an overview and scenarios), and “Technical Subjects” (with chapters on surveillance, exercises and testing, communications, and terrorism). Particularly valuable information on recommendations derived from the Olympic experience are highlighted in purple boxes.

Nguyen, R.B., Milsten, A.M., and Cushman, J.T. (2008). [Injury Patterns and Levels of Care at a Marathon](#). (Abstract only.) Prehospital Disaster Medicine. 23(6):519-25.

The authors analyzed medical care reports from five first-aid stations set up along a marathon route. The primary reason for seeking medical attention was "medication request;" secondary reasons included musculoskeletal injuries, dizziness, dermal injuries, and headache.

Perron, A.D., Brady, W.J., Custalow, C.B., and Johnson, D.M. (2005). [Association of Heat Index and Patient Volume at a Mass Gathering Event](#). (Abstract only.) Prehospital Emergency Care. 9(1):49-52.

The authors examined the relationship between heat index and the need for medical care during events at a Division I college football stadium located in the southeastern United States. They concluded that for every 10-degree increase in the heat index, three more patients per 10,000 patrons will require care.

Roberts, W.O. (2000). [A 12-yr Profile of Medical Injury and Illness for the Twin Cities Marathon](#). (Abstract only.) Medicine and Science in Sports and Exercise. 32(9): 1549-1555.

The author analyzed 12 years' worth of data to determine the types of injury and illness suffered by runners in the Twin Cities Marathon. Mild injury/illness was the primary reason 90% sought medical care, and runners mainly suffered "exercise-induced collapse," skin problems, and musculoskeletal problems.

Sabra, J.P., Cabañas, J.G., Bedolla, J., et al. (2014). [Medical Support at a Large-Scale Motorsports Mass-Gathering Event: The Inaugural Formula One United States Grand Prix in Austin, Texas](#). (Abstract only.) *Prehospital and Disaster Medicine*. 29(4): 392-398.

The authors share the details of preparation for an inaugural mass-gathering motorsports event, and review and describe the details of the medical care rendered to 566 patients during the 3-day event.

Spaite, D.W., Criss, E.A., Valenzuela, T.D., et al. (1998). [A New Model for Providing Prehospital Medical Care in Large Stadiums](#). (Abstract only.) *Annals of Emergency Medicine*. 17(8):825-828.

The authors studied the medical incident patterns occurring during events that took place in a major college facility and combined this with previously reported information from four other large stadiums. Using this data, they emphasize the need for rapid availability of CPR-trained personnel, AEDs, and availability of advanced life support care within five minutes at major venues including the adjacent parking areas.

Tang, N., Kraus, C.K., Brill, J.D., et al. (2008). [Hospital-Based Event Medical Support for the Baltimore Marathon, 2002-2005](#). (Abstract only.) *Prehospital Emergency Care*. 12(3):320-6.

The authors analyzed four years' worth of data on injuries and illnesses and related evaluation, treatment, and disposition among Baltimore Marathon participants. Care was provided by an on-site event medical team comprised of physicians and staff from an urban, academic emergency department.

World Health Organization, Regional Office for Europe. (2007). [Mass Gatherings and Public Health: The Experience of the Athens 2004 Olympic Games](#).

This book features chapters on a variety of emergency medical topics related to preparing for the 2004 Olympics, including the following: epidemiological surveillance; preparedness for deliberate use of biological or chemical agents, or radionuclear materials; food and water safety; and emergency medical services preparedness.

Lessons Learned: Religious Events

Hnatowa, D. and Gordon, D. (1991). [Medical Planning for Mass Gatherings: A Retrospective Review of the San Antonio Papal Mass](#). (Abstract only.) *Prehospital and Disaster Medicine*. 6(4):443-450.

The heat index reached 102 degrees Fahrenheit during this event, which attracted close to 100,000. The authors summarize medical problems; 72% were heat-related.

Iliyasa, F.T., Manib, S., Pradeepkumar, A.P., and Mohana, K. (2013). [Human Stampedes during Religious Festivals: A Comparative Review of Mass Gathering Emergencies in India](#). (Abstract only.) *International Journal of Disaster Risk Reduction*. 55:10-18.

The authors reviewed stampede data from religious, entertainment, and political gatherings over the last five decades in India to develop a risk reduction framework for mass gatherings. The framework emphasizes inter-agency, multi-disciplinary contemplation related to hazard identification and mitigation measures.

Shafia, S., Booy, R., Haworth, E., et al. (2008). [Hajj: Health Lessons for Mass Gatherings](#). *Journal of Infection and Public Health*. 1: 27-32.

Hajj is attended by nearly 2 million people every year; the authors highlight recent Hajj-related outbreaks and share how the collaboration between health policy makers and community stakeholders leaders in the United Kingdom resulted in quick identification and reduction of the infections.

Plans, Tools, and Templates

Bulson, J. (2013). [Large Gathering Medical Plan Template](#).

Emergency medical services planners and other healthcare providers can tailor this template to their facility and event. It includes sample forms and schematics for several injuries and scenarios.

District of Columbia Department of Health, Health Emergency Preparedness and Response Administration. (2014). [Special Events Health, Medical and Safety Planning Guide](#).

This document outlines the recommended procedures for creating a Health, Medical, and Safety Plan for a special event. It is directed to the event applicants/organizers and includes a list of requirements for medical care by type and size of event (page 7), checklists, and templates that can be tailored to a variety of jurisdictions.

Emergency Management Australia. (1999). [Safe and Healthy Mass Gatherings. A Health, Medical and Safety Planning Manual for Public Events](#).

This comprehensive plan (from Australia) includes sections on pre-event planning (including medical care), safety issues (including occupational health and safety and a detailed description of on-site safety risks), and public health. Chapter 6 focuses on medical care and contains information on aid posts, site hospitals, teams, and equipment.

Federal Emergency Management Agency. (2010). [Special Events Contingency Planning](#).

This job aid manual groups information into five chapters: pre-event planning; event operational considerations; incident command and control; additional planning; and post-event actions.

Federal Emergency Management Agency. (2012). [Operational Templates and Guidance for EMS Mass Incident Deployment](#).

The goal of this comprehensive report is to share detailed model policies and practices and help emergency medical services (EMS) deploy more effectively to planned and spontaneous mass care incidents. Case studies and event templates for scheduled and unscheduled events are included that can help EMS planners develop local plans and conduct activities.

* Khan, K., Clark, C., Freifeld, B.S., et al. (2010). [Preparing for Infectious Disease Threats at Mass Gatherings: The Case of the Vancouver 2010 Olympic Winter Games](#).

The authors created a model that integrated data on worldwide patterns of commercial air traffic with data on global surveillance of infectious diseases using Web-based intelligence-gathering tools. This allowed them to combine information on locations from where large numbers of people are expected to travel to attend a mass gathering with reports of infectious disease threats of public health significance.

Minnesota.gov. (n.d.). [Special Event and Mass Gathering Medical Care Planning Guideline](#). (Accessed 5/4/2016).

This event classification matrix was developed to help local emergency healthcare providers develop medical plans for large events based on risk.

*National Library of Medicine. (2015). [Public Health Preparedness for Mass Gatherings](#).

This website provides links to resources on healthcare preparedness for mass gatherings, including lessons learned from large events, planning considerations, and tools and resources on mass casualty planning and response.

Oregon Department of Human Services, Public Health Division. (n.d.). [Regulations Governing Health and Safety at Outdoor Mass Gatherings](#).

Though written specifically for the State of Oregon, these rules can be used as a model for other jurisdictions when planning for a mass gathering. The document specifies rules for emergency medical facilities, fire protection, security personnel, traffic control, water supply, drainage, sewer facilities, trash storage and disposal, and sanitary food service.

Pennsylvania Emergency Management Agency. (n.d.). [Special Event Emergency Action Plan Guide](#). (Accessed 4/15/2016.)

This document outlines the recommended procedures for creating an Emergency Action Plan for a special event.

San Francisco EMS Agency. (2013). [Mass Gathering: Report of Treatment by Event Medical Resources](#).

This form (prepared by San Francisco emergency medical services agency) can be used by healthcare providers to track and report a summary of injury and health-related problems that occur during a mass gathering event.

State of New Hampshire. (2014). [Mass Gathering Standard Operating Guideline Template](#).

This standard operating guideline published by the State of New Hampshire can be customized to meet the needs of other states during mass gathering emergency medical services resource planning. The template covers all areas that need to be addressed and includes a scoring matrix helpful to predict risk and coverage needs.

U.S. Department of Homeland Security. (2008). [Mass Evacuation Planning Guide for Major Events: NASCAR Pilot](#).

This mass evacuation template can help NASCAR-sanctioned facilities develop and implement a mass evacuation plan while protecting spectators, competitors, and the general public in the event of an incident.

U.S. Department of Transportation, Federal Highway Administration. (2006). [Planned Special Events: Checklists for Practitioners](#).

While this reference pertains to the transportation aspects of preparing for special events, the formula used for the planning process and checklists can be adapted to health and medical concerns.

Resource Requirements

Grange, J.T., Baumann, G.W., and Vaezazizi, R. (2003). [On-Site Physicians Reduce Ambulance Transports at Mass Gatherings](#). *Prehospital Emergency Care*. 7(3):322-6.

The authors found that the presence of on-site physicians significantly reduced ($p < 0.001$) the number of ambulance transports during a large motorsports event in California.

Hartman, N., Williamson, A., Sojka, B., et al. (2009). [Predicting Resource Use at Mass Gatherings Using a Simplified Stratification Scoring Model](#). (Abstract only.) *The American Journal of Emergency Medicine*. 27(3): 337-43.

The authors tested a classification system that stratifies events based on weather, number in attendance, presence of alcohol, demographic in attendance, and crowd intentions to predict medical needs at mass gatherings. The system predicted needs better for "minor" and "intermediate" events (less so for "major" events).

Thackway, S., Churches, T., Fizzell, J., et al. (2009). [Should Cities Hosting Mass Gatherings Invest in Public Health Surveillance and Planning? Reflections from a Decade of Mass Gatherings in Sydney, Australia](#).

The authors examine the public health response to mass gatherings in Sydney, including resource deployment and using planning for mass gatherings as a preparedness exercise for other health emergencies.

Agencies and Organizations

Note: The agencies and organizations listed in this section have a page, program, or specific research dedicated to this topic area.

American College of Emergency Physicians. [Mass Gathering Resources](#).

[Centre for Excellence in Emergency Preparedness](#).

[Mass Gathering Medicine Interest Group](#).

U.S. Department of Health and Human Services, Disaster Information Management Research Center. [Mass Gatherings](#).

U.S. Fire Administration. [Research Topic: Mass Gatherings](#).

World Association for Disaster and Emergency Medicine. [Mass Gathering](#).

World Health Organization. [Mass Gatherings](#).

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