

Understanding the Characteristics of Patient Presentations of Young People at Outdoor Music Festivals

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Abstract

Outdoor music festivals are unique events given that they are, for the most part, bounded and ticketed, and alcohol is served. They frequently have a higher incidence of patient presentations when compared with similar types of mass gatherings. Often, however, single events are reported in the literature, making it difficult to generalize the findings across multiple events and limiting the understanding of the “typical” patient presentations at these mass gatherings. The aim of this paper was to understand the characteristics of young people who have presented as patients to on-site health care at outdoor music festivals in Australia, and the relative proportion and type of injury and illness presentations at these events. This research used a nonexperimental design, utilizing a retrospective review of patient report forms from outdoor music festivals. Data were collected from 26 outdoor music festivals across four States of Australia during the year 2010. Females presented at greater numbers than males, and over two-thirds presented with minor illnesses, such as headaches. Males presented with injuries, in particular lacerations to their face and their hands, and alcohol and substance use made up 15% of all presentations.

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Introduction

The term “mass gathering” is commonly defined in relation to the number of attendees, such as an event with greater than 25,000 attendees.¹ Various types of mass gatherings exist, including sporting events, agricultural shows, and music festivals. Music festivals, and in particular, outdoor music festivals, are events that are increasingly common globally and in the Australian setting.² Outdoor music festivals are unique events.³ Given that they are, for the most, part bounded and ticketed, and alcohol is served, concerts frequently have a higher incidence of patient presentations when compared with other types of mass gatherings.⁴ Often, however, single events are reported in the literature, making it difficult to generalize the findings from one event to another, thereby limiting understanding of the typical patient presentations at these mass gatherings.

Background

In the Australian setting, most outdoor music festivals are ticketed, bounded, and have on-site health care. On-site health care has become an important component of mass-gathering management because people may be injured, become ill, or occasionally, lose their lives during these large-scale public events. Worldwide, a small number of deaths have been reported at outdoor music festivals, notably as a result of crowd crushes at the Glastonbury Festival in the United Kingdom and the Roskilde Festival in Denmark.² Milsten⁴ reported that rock concerts have a positive association with an increased incidence of trauma and injury. Moshing and crowd surfing are the predominant causes of injuries at concerts,⁵ followed by throwing of missiles, such as

plastic water bottles, and using blankets to throw audience members into the air.⁴ Even so, there is a paucity of literature pertaining to the characteristics of patient presentations at outdoor music festivals.

Aim

This research aimed to understand the characteristics of young people who had presented as patients to on-site health care at outdoor music festivals in four Australian states, and the relative proportion and type of injury and illness presentations at these events in Australia.

Methods

Design

This research used a nonexperimental design, utilizing a retrospective review of patient report forms from on-site health services at outdoor music festivals.

Setting

Data were collected from 26 outdoor music festivals across four different States of Australia (New South Wales, Queensland, South Australia, and Victoria), during the year 2010. Commonly, these outdoor music festivals are held during late spring to early autumn. The events required spectators to purchase and hold tickets. Additionally, these events were bounded (fenced) and commonly set in a large venue, such as a showground or football stadium. The use of large venues allowed for multiple and concurrent musical performances to be conducted at any one point in time. The genres of pop, rock, and techno music were most prevalent at the outdoor music festivals included in this research.

Population and Sample

The population was comprised of those participants who presented to a St John Ambulance Australia member for clinical assessment and/or management and had a patient report form completed while at one of the 26 outdoor music festivals in the sample.

Data Collection

St John Ambulance Australia volunteer members used a standardized patient report form to record clinical information, such as the patient's personal details, presenting problem, observations, management, and disposition. The researchers had access to de-identified patient report forms from each event in the sample. Using the Ranse and Hutton¹ minimum data set for mass-gathering health research and evaluation, presentations were placed into four categories; illness, injury, environmental, and mental health. Data were transcribed from the patient record forms into Microsoft Excel 2010 (Microsoft Corporation, Redmond, Washington USA).

Statistical Analysis

Data were exported from Microsoft Excel to STATA Version 12.0 for analysis (StataCorp. Stata Statistical Software: Release 12. College Station, Texas USA). Proportions were presented as percentages of the respective denominator (n) for categorical data. Variations in proportions between categories were assessed using the Fisher exact test. An adjusted binary logistic regression model was used to explore the association between each variable and the risk of presenting for clinical assessment and/or management.

Characteristics	Category	Number	Percentage
Gender	Male	1682	34.0
	Female	3087	62.4
	Not recorded	181	3.6
Age (Mean(SD))		4484	21.6 (5.8)
Age	≤ 25 years	3875	78.3
	> 25 years	609	12.3
	Not recorded	466	9.4
Age ≤ 25 years	Male	1292	34.1
	Female	2500	65.9
Age > 25 years	Male	253	43.6
	Female	328	56.4

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Table 1. Patient Demographics

This was done to adjust for confounding between age and gender. The model also was adjusted for potential clustering effects because patients' presentation was heterogeneous for different events; this was achieved by using event as a random factor in the regression model. Regression coefficients were expressed as adjusted odds ratios (ORs) from the logistic regression model. Odds ratios were considered statistically significant if their 95% confidence intervals (CIs) did not include unity. The more the OR deviated from 1, the stronger the association between the exposure variable and the presentation being studied. This regression analysis was undertaken using the *logit* procedure in STATA.

Protection of Human Participants

The St John Ambulance Australia Human Research Ethics Committee approved this research.

Findings

Demographics

Of the 4950 presentations for health care, almost two-thirds were female (n = 3087, 62.4%). The mean age of all patient presentations was 21.3 (SD = 5.8) years. The majority of patients (n = 3875, 78.3%) were ≤ 25 years of age. Of those patients aged ≤ 25 years, the number of presenting females was higher (n = 2500, 65.9%) when compared to males (n = 1292, 34.1%). Table 1 highlights some key demographics for the patient population.

A test of proportions showed that there was a statistically significant difference between the illness ($P < .001$), injury ($P < .001$), and mental health ($P = .04$) presentations of males and females. Additional information pertaining to presentation types, gender, and age is presented in Table 2. Table 3 highlights the risk of presentation type between age and gender. The following results report on the various presentation categories.

Illness

The majority of patients (n = 2766, 55.9%) presented with illness-related health problems. Within the age range ≤ 25 years,

Characteristics	Total (N = 4950)		Male (n = 1682)		Female (n = 3087)		P Value
	Number	%	Number	%	Number	%	
Type of presentation:							
Injury	1377	27.8	616	36.6	732	23.7	< .001
Illness	2766	55.9	788	46.9	1838	59.5	< .001
Environment	777	15.7	273	16.2	491	15.9	.80
Mental health	31	0.6	5	0.3	26	0.8	.04
≤ 25 years							
	Total (N = 3875)		Male (n = 1292)		Female (n = 2500)		
Type of presentation:							
Injury	1076	27.8	480	37.2	582	23.3	< .001
Illness	2120	54.7	581	45.0	1476	59.0	< .001
Environment	654	16.9	226	17.5	421	16.8	.65
Mental health	26	0.7	5	0.4	21	0.8	.16
> 25 years							
	Total (N = 609)		Male (n = 253)		Female (n = 328)		
Type of presentation:							
Injury	194	31.9	91	36.0	95	29.0	.09
Illness	353	58.0	134	53.0	202	29.0	.09
Environment	62	10.2	28	11.1	31	9.5	.045
Mental health	-	-	-	-	-	-	-

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Table 2. Number of Casualties by Types of Presentations

Type of presentation	Female			> 25 years		
	OR	95% CI	P Value	OR	95% CI	P Value
Injury	0.54	0.47-0.62	< .001	1.14	0.95-1.38	.17
Illness	1.71	1.51-1.94	< .001	1.22	1.02-1.46	.03
Environmental	0.94	0.80-1.12	.50	0.55	0.41-0.72	< .001
Mental Health	2.18	0.82-5.80	.12	1.00	-	-

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Table 3. Logistic Regression Model ^a Used to Assess Any Significant Difference of Type of Presentation Between Age and Gender

Abbreviations: CI, confidence interval; OR, odds ratio.

^a The model was adjusted by age and gender.

^b Male and ≤ 25 years are the reference group.

both males (n = 581; 45.0%) and females (n = 1476; 59.0%) predominantly presented with illness-related concerns. On adjustment for age, the risk of illness was approximately 1.7 times

(OR = 1.71; 95% CI, 1.51-1.94; P < .001) higher for females than males in the ≤ 25 year age group. However, the risk of illness was higher for patient presentations age > 25 years (OR = 1.22;

Illness type	Total (N = 2,626)		Male (n = 788)		Female (n = 1,838)		Comparison ^a	P Value ^b
	n	%	n	%	n	%		
Cardiac arrest	2	0.08	1	0.13	1	0.05	-	- ^c
Chest pain	13	0.50	6	0.76	7	0.38	-	< .001
Respiratory arrest	-	-	-	-	-	-	-	- ^c
Asthma	216	8.23	90	11.42	126	6.86	-	< .001
Seizure	6	0.23	-	-	6	0.33	-	- ^c
Collapse (unspecified)	91	3.47	15	1.90	76	4.13	+	< .01
Nausea/vomiting	211	8.04	48	6.09	163	8.87	+	.02
Diarrhea	7	0.27	5	0.63	2	0.11	-	- ^c
Diabetes related	33	1.26	11	1.40	22	1.20	-	.67
Headache	1389	52.89	422	53.55	967	52.61	-	.66
Skin/rash	35	1.33	9	1.14	26	1.41	+	.58
Fever	2	0.08	-	-	2	0.11	-	- ^c
Pain	264	10.05	64	8.12	200	10.88	+	.04
Eye	41	1.56	19	2.41	22	1.20	-	.02
Ear	6	0.23	-	-	6	0.33	-	- ^c
Faint	73	2.78	7	0.89	66	3.59	+	<.001
Other	173	6.59	62	7.87	111	6.04	-	.08

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Table 4. Type of Illness Occurrences Between Male and Female Casualties at Mass-Gathering Events^a (+) Female injury occurrences > Male injury occurrences and (-) Male injury occurrences > Female injury

occurrences.

^b P values are based on proportion test and considered significant at $P < .05$.^c P values are not reported due to small number of casualties.

95% CI, 1.02-1.46; $P = .03$) than age ≤ 25 years when adjustment was done by gender. The presenting problem most common for illness was headache ($n = 1389$, 52.9%). There was no statistically significant difference between gender for the headache ($P = .66$) category. Additionally, Table 4 highlights that pain ($n = 264$, 10%), asthma ($n = 216$, 8.2%), and nausea and vomiting ($n = 211$, 8%) were the next most frequent presentations after headache.

Injury

The risk of a female sustaining an injury was almost half (OR = 0.54; 95% CI, 0.47-0.62; $P < .001$) that of males. Age was not a significant factor in predicting injury. The main types of injury presentations were superficial lacerations ($n = 281$, 20.4%), followed by sprain or strains ($n = 268$, 19.2%), and head injuries, including concussion ($n = 168$, 11.9%). When comparing number of males and females presenting with each type of injury, the results showed significantly lower proportion of females presenting with dislocations and superficial lacerations than males. However, the number of crushing injuries, blisters and foreign bodies, and external injuries to the eye was

significantly higher for females than males. Table 5 provides greater detail on the injuries sustained and patient presentations.

Environment

Gender was not a significant variable for predicting presentations related to features of the environment, such as heat or the availability of alcohol. The risk of presenting with an environmental-related presentation was lower for patient presentations aged > 25 years (OR = 0.55; 95% CI, 0.41-0.72; $P < .001$). Alcohol-related presentations were the most common ($n = 250$, 32.8%) in this category, with substance related ($n = 135$, 17.7%) and combined alcohol and substance use ($n = 125$, 16.4%) the next most frequent presentations. Table 6 highlights that both heat exhaustion and substance use were statistically significant when compared to gender. Heat exhaustion was more prevalent for females ($P < .001$), while substance related presentations were more prevalent for males ($P < .001$).

Mental Health

Gender didn't demonstrate a significant risk for mental health-related presentations due to the small number of cases. Interestingly,

Injury type	Total (N = 1,377)		Male (n = 616)		Female (n = 732)		Comparison ^a	P Value ^b
	n	%	n	%	n	%		
Fracture	38	2.76	21	3.41	17	2.32	-	.30
Dislocation	23	1.67	16	2.60	7	0.96	-	.04
Crushing injury	50	3.63	13	2.11	37	5.05	+	< .01
Head injury	163	11.85	70	11.36	90	12.30	+	.66
Internal organ/Asphyxia	2	0.15	2	0.32	-	-		-
Burn or corrosion	19	1.38	6	0.97	13	1.78	+	.31
Sprain or strain	264	19.19	115	18.67	147	20.08	+	.56
Blister	82	5.96	21	3.41	59	8.06	+	< .001
Abrasion	79	5.74	36	5.84	39	5.33	-	.77
Superficial laceration	281	20.42	1577	25.49	116	15.85	-	< .001
Open wound	19	1.38	18	1.14	12	1.64	+	.58
Other Minor wound	42	3.05	3	2.92	23	3.14	-	.94
Eye/Dental injury	7	0.51	40	0.49	4	0.55	+	-
Foreign body in external eye	110	7.99	5	6.49	69	9.43	+	.04
Foreign body in soft tissue	17	1.24	-	0.81	11	1.50	+	.36
Review of injury	160	11.63	75	12.18	79	10.79	-	.48
Injuries of more than one nature	11	0.80	6	0.97	5	0.68	-	.77

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Table 5. Type of Injury Occurrences Between Male and Female Casualties at Mass Gathering Events

^a (+) Female injury occurrences > Male injury occurrences and (-) Male injury occurrences > Female injury occurrences.

^b P values are based on proportion test and considered significant at $P < .05$.

no patients >25 years presented with mental health-related concerns.

Outcome

Regardless of gender and age, most of the patient presentations were assessed by the medical team, treated, and returned back to the event (n = 2421, 48.9%). With regard to the relationship between patient outcomes and presentation categories, the environmental-related patient category contained the most cases of concern with 9.1% (n = 71) referred to hospital, 12.5% (n = 97) referred to a doctor, and 17.0% (n = 132) discharged home.

Discussion

Demographics

Interestingly, Milsten et al⁴ found that the gender distribution of those seeking on-site care was equal. Krul and Girbes,⁶ who undertook a 9-year study of dance parties in the Netherlands, found that over this period of time more men visited health stations than women. However, as the study progressed, this number equalized out to 53.1% male and 46.4% female. Conversely, this study found that two-thirds of presentations

were female. This finding may be explained by the universal phenomenon that women seek health care more readily than men,⁷ or alternately, it may be that Australian outdoor music festivals attract more female than male concert participants. These conclusions are, however, speculative and further investigation is required to understand the relationship between crowd demographics and presentation for health care.

Illness

Even though these data allowed identification of the most prevalent presenting patient problems (headaches, pain, and nausea and vomiting), these categories related to presenting signs and symptoms rather than to a provisional diagnosis or identified pathology for the health problem. This drilling down was an important consideration because, while on-site health services frequently focus on treatment of the presenting problem (for example, breathing difficulty or chest pain), an improved understanding of the diagnostic categories for presentations would improve the understanding of the profile of illnesses that were both more prevalent and more likely to be exacerbated in the concert event environment. This was an important consideration

Environmental type	Total (N = 764)		Male (n = 273)		Female (n = 491)		Comparison ^a	P Value ^b
	n	%	n	%	n	%		
Sunburn	39	5.10	15	5.49	24	4.89	-	.72
Heat exhaustion	146	19.11	25	9.16	121	24.64	+	< .001
Heat stroke	23	3.01	5	1.83	18	3.67	+	.15
Hypothermia	6	0.79	1	0.37	5	1.02	+	- ^c
Frostbite	-	-	-	-	-	-		
Envenomation	40	5.24	11	4.03	29	5.91	+	.26
Alcohol related	250	32.72	95	34.80	155	31.57	-	.36
Substance related	135	17.67	72	26.37	63	12.83	-	< .001
Substance and Alcohol related	125	16.36	49	17.95	76	15.48	-	.38

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Table 6. Type of Environmental Occurrences Between Male and Female Casualties at Mass Gathering Events

^a (+) Female injury occurrences > Male injury occurrences and (-) Male injury occurrences > Female injury occurrences.

^b P values are based on proportion test and considered significant at $P < .05$.

^c P values are not reported due to small number of casualties.

as illness was 53% ($n = 2,626$) of presentations. Additionally, results from these data had shown that there was scope for further investigation of preventable presentations, such as headaches. The diagnosis of headache was innocuous on its own but could have meant many things: dehydration, low blood sugar, and stress, all of which may result in headache. An improved understanding of diagnosis groups and causation could open up the opportunity for more effective preventative strategies at concert events.

Injury

In this grouping, a significantly lower proportion of females presented with injuries. The majority of injuries were lacerations, sprains, and strains. This finding confirmed previous research that demonstrated the high incidence of minor injury during outdoor events, especially where crowds are more mobile within the venue and in an unfamiliar environment.⁸ Lacerations and abrasions were cited as the most common presenting injuries by Rose et al⁹ when undertaking a 6-year review of American Collegiate Football games. Hutton et al¹⁰ concurred and found that during Schoolies festivals, the majority of injuries young people presented with where lacerations, sprains, and abrasions due to ill-fitting footwear and an undulating environment. Given the strength of this conclusion, further work to improve the identification of the cause of injury and the location(s) within the venue where injuries are occurring is important. Furthermore, a timely response to make repairs or limit access to areas where injuries are occurring is essential.

Environmental

Five hundred and thirty-nine presentations for alcohol and substance use comprised 15% of all presentations. Milstein et al⁴ found 27% of all presentations were associated with alcohol.

However, as attendance for on-site health care is voluntary, data were not available concerning the number who may have been inebriated or affected by other drugs and did not present to the health care service. These individuals may not have required acute care, may have been cared for by friends, or may have been managed by site security or police. Zietz et al¹¹ have demonstrated that real-time surveillance by health services, police, and the event site owners lead to cohesive management of mass-gathering events.

Mental Health

Thirty-one people presented to on-site care with mental illness-related problems. Even though this was, on average, little more than one presentation across each event, the fact that mental health had been recorded as a presentation was significant in itself. Patient records utilized in this research focused on acute presentations of injury and illness and, arguably, did not provide adequate scope for the recording of mental health problems that may have been associated with a patient presentation. Often the more *acute* problem may be recorded and the underlying mental health problem not addressed adequately. For example, an injury or an overdose would be the focus of immediate care within the on-site health facility. As a result, it is not understood fully the incidence, types, and outcomes of mental health problems at these events and, to date, mental health aspects have not been well reported in the mass-gathering literature.

Outcome

In regards to the transport to hospital rates, the majority of patients were transferred to hospital for drug and alcohol-related presentations. While it is recognized that outdoor music festivals normally have a higher rate of patient presentations

when compared with other events, there previously has been only anecdotal evidence that these types of presentation have a higher transport to hospital rate for Australian events. This finding could assist event health services planners in their efforts to allocate sufficient transport resources and in planning for the placement and response strategy for ambulance resources in the future.

Limitations

Demographic data for the concert-going crowd that would have provided an overall profile of concert crowd demographics was not available, and this limits the extent to which the findings can provide an assessment of the incidence or prevalence of different injury and illness types across age or gender groupings. As a whole, the proportion of attendees in each gender or age group in the crowd is poorly understood. Yet, the research does contribute a better understanding of the demographics and presentations of those who actually attend on-site health services and require health care. Further research that samples the demographics of the crowd, as well as considering actual patient presentations for that crowd, will improve the understanding of some of the causative factors and help to focus strategies for prevention and treatment services in the future.

Conclusion

This research confirmed previous findings concerning the high incidence of minor injury and illness presentations, the dominance of environmental-related presentations, especially those related to alcohol consumption, and the profile of patients requiring transport to secondary and tertiary level care service. Importantly, it raised several questions which require further investigation. Future research should incorporate a sampling technique that provides a whole of crowd demographic against which patient presentation data can be assessed and accurate findings for incidence and prevalence can be developed. This approach may confirm the conclusion that females are more likely to present, and perhaps, are more willing to do so, especially in the minor illness categories where presentation for health care is optional. In addition, it is apparent that many minor cases, and those related to excessive consumption of alcohol or other drugs, may be preventable. An increased focus on research and evaluation of prevention strategies is required. In particular, it may be that mental health-related presentations are submerged in the patient presentation data as they may be poorly documented, or considered secondary, and the focus of on-site health care may be upon the primary presenting problem. Either way, there is a need to understand the incidence, type, and outcomes for this group in greater detail.

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