TITLE: Violence-related ambulance call-outs in the North West of England: a cross-sectional analysis of nature, extent and relationships to temporal, celebratory and sporting events

AUTHORS: Zara Quigg[a], Ciara McGee[a], Karen Hughes [b], Simon Russell[a], Mark A Bellis[b]

[a] Public Health Institute, Liverpool John Moores University, Liverpool, UK

[b] Public Health Wales, Cardiff, UK

Corresponding author:

Zara Quigg

Public Health Institute

Faculty of Education, Health & Community

Liverpool John Moores University

2nd Floor Henry Cotton Campus

15-21 Webster Street

Liverpool, L3 2ET, UK

Tel: 0151 231 4513

Fax: 0151 231 4552

Email: z.a.quigg@ljmu.ac.uk

Key words: violence, prevention, data, health, paramedics

Word count: 2,794

ABSTRACT

Objective: To explore the potential of ambulance call-out data in understanding violence to inform prevention activity.

Method: Cross-sectional (2013-2015) study examining the nature, extent and characteristics of violence-related ambulance call-outs (n=15,687) across North West England, and relationships with temporal, celebratory and sporting events.

Results: The majority of call-outs were for males, with a mean age of 33 years. Most call-outs were to deprived (64.4%) and urban (65.4%) areas, and occurred at night (6pm-5.59am; 75.2%). Three-quarters (77.3%) were recorded as assault/sexual assault and 22.7% stab/gunshot/penetrating trauma. Significant differences in call-out characteristics were identified between the two violence types. Generalised linear modelling (GLM) found that call-outs significantly increased on weekends, New Year's Eves and weekday bank holiday eves (except for stab/gunshot/penetrating trauma). No significant associations between all violence call-outs, the two violence categories, and sporting or celebration events were identified. Two-thirds (66.1%) of call-outs were transferred to another health service for further assessment and/or treatment. The odds of being transferred was significantly higher amongst males (adjusted odds ratio [AOR] 1.5; 95% confidence interval [95%CI] 1.4-1.6), those aged 13-24 years (AOR 1.2; 95%CI 1.0-1.4), call-outs for stab/gunshot/penetrating trauma (AOR 1.4; 95%CI 1.3-1.5), call-outs on Fridays/Saturdays (AOR 1.1; 95%CI 1.0-1.2), and lower for call-outs on New Year's Eves (AOR 0.6; 95%CI 0.4-0.9).

Conclusion: Ambulance call-out data can provide a wealth of information to understand violence and subsequently inform violence prevention and response activity. Ambulance services and staff could play a key role in preventing violence, through sharing data, and identifying and supporting victims.

INTRODUCTION

Globally, interpersonal violence accounts for around half a million deaths each year[1]. For every death many more people suffer from violence both directly and indirectly. Thus preventing violence is a key global priority and forms part of the United Nations Sustainable Development Goals[2]. Criminal justice and health treatment data can provide vital intelligence on non-fatal violence that could inform and monitor progress of violence prevention activity[1]. The use of health data in violence prevention is advocated by the World Health Organization[1] and is a key focus of many injury and violence surveillance systems across different countries[3-8]. However, internationally, such data are not available across all countries, and where data are available, data may not be routinely accessible to local areas, or provide sufficient information to describe the full nature and extent of the problem[1].

In the UK, addressing violence has traditionally been informed by police data yet there is growing recognition of the importance of health data and increasing work to support its use in prevention[3,5-8]. Across England and Wales, a number of health and crime data sources are available at national and local levels. In 2013/14, there were 526 recorded homicides and an estimated 1.3 million incidents of violence against adults in England and Wales[9]. It's estimated that half of these violent incidents have not been reported to the police, yet with nearly half resulting in injury many victims may present at health services[9]. Research suggests that the police are unaware of many incidents of violence that result in healthcare treatment[4-5,10-11]. In 2014, an estimated 211,514 people attended emergency departments (EDs) as a result of violence across England and Wales[3]. Other prehospital health services are also affected, such as paramedic services[10-12], yet the impact of violence on ambulance services across England and Wales is poorly measured.

Health data can be used to identify the nature and extent of violence, and at-risk groups and communities, to inform, monitor and evaluate prevention activity[3-7]. Further, it could be used to examine the demands placed on health services from violence, and how this can be associated with temporal and celebratory events (e.g. public holidays [5,6,13]). Yet, whilst various studies and surveillance systems have shown the utility of some health data sources in violence prevention, the focus has been ED attendance and hospital admissions[3-8,14]. Few studies have demonstrated similar uses of ambulance data[10-12,15]. Ambulance call-out data has the potential to provide rich information on violence pertinent to informing prevention activity[11].

In England nearly a quarter (4.4 million) of ED attendances arrived by ambulance/helicopter in 2013/14[16]. However, around a third of ambulance call-outs do not result in a transfer to a health service, but rather patients are assessed and, if necessary treated in situ[16]. Such incidents would not be identified through ED or hospital admission data systems. A study comparing violence-related ambulance call-outs and police-recorded crimes in one English city suggests that half of all assaults recorded by the ambulance service are not recorded by the police[10]. Thus, ambulance data can provide an additional source of intelligence not found in other health or crime data sources. In 2013/14, there were 8.5 million emergency calls to eleven ambulance services across England[16]. To help inform violence prevention activity, using data from one of the eleven ambulance services (the North West Ambulance Service [NWAS]), here we explore the potential utility of ambulance call-out data in violence prevention through examining the nature and extent of violence-related call-outs, patient characteristics, and the relationship with temporal, celebratory and sporting events.

METHODS

The North West of England has a population of 7.1 million residents and includes 39 local authority areas[17]. The NWAS provides accident and emergency services to those in need of medical treatment and transport (e.g. to EDs), 24 hours per day, 365 days per year, across North West England. All calls to NWAS are received by an operator who asks a range of questions and logs the information on a triage system to identify what the problem is, create a dispatch code and determine the response required. The data is processed electronically using the Medical Priority Dispatch System (MPDS) software. Data is captured in the Ambulance Command and Control System, and then replicated and stored in a reporting database. To inform violence and injury prevention across North West England, a subset of required fields are extracted from this database and shared with the Trauma and Injury Intelligence Group Injury Surveillance System (TIIG ISS; www.tiig.info) on a quarterly basis via a secure drop box (SharePoint 2013). Information collected by NWAS and shared with TIIG include: time/date of the call; incident type (e.g. assault/sexual assault); patient age/gender; and outcome of the call-out (e.g. transferred to another health service). NWAS automatically maps the geographical coordinates of each call-out location (where the ambulance stopped to assess/treat the patient) to a lower super output area (LSOA). LSOAs are geographical areas with a population mean of 1,500, developed to standardise reporting of small area statistics in England and Wales. The LSOA of each call-out location is also shared with TIIG.

Data on ambulance call-outs for violence (i.e. calls coded as assault/sexual assault and stab/gunshot/penetrating trauma, and identified as genuine [i.e. not a hoax call]) were extracted from the TIIG ISS for the period April 2013 to March 2015. Duplicate call-outs for the same incident were removed leaving a sample of 15,687. Additional variables were derived to indicate whether the call-out day was a weekend (Friday/Saturday), bank holiday, bank holiday

eve or New Year's Eve. Further, sporting events and celebration days (Table 1) were identified. We assigned each call-out location (i.e. LSOA) to a national quintile of deprivation (based on the 2010 Index of Multiple Deprivation [18]) and a rural-urban classification. Where collected, age was grouped into an age group. The younger age group (i.e. 13-24 years) was selected as this age group is often the focus of key UK interventions aiming to prevent violence.

Data were analysed in SPSS version 21. Analyses used chi-squared and ANOVA to explore associations between call-outs, and patient (e.g. gender) and call-out (e.g. location) characteristics. Generalised linear modelling (GLM; negative binomial/step wise approach) was used to examine the independent effects of calendar days, holidays, sporting and celebration events on ambulance call-outs for all violence, and assault/sexual assault and stab/gunshot/penetrating trauma separately. For GLM, days were recoded into 24 hours days starting at 6am (e.g. Saturday = Saturday 6am-Sunday 5.59am). This ensured that call-outs during the early hours (12-5.59am) of Sunday morning, for example, were coded as Saturday night, as such call-outs are likely to be associated with nightlife activity on what would be a Saturday night out. As a result complete data were only available between 1st April 2013 and 30th March 2015, and GLM analyses were limited to this period. Finally, we used logistic regression (backward conditional) to identify factors independent associated with a violence-related ambulance call-out patient being transferred to another healthcare provider for further assessment and/or, treatment. Ethical approval was not required for the study as NWAS data shared with TIIG are anonymised, and their use is governed through a data-sharing protocol agreed with information sharing leads (e.g. Caldicott guardian).

Table 1: Calendar and sporting events included in analysis

Event	Details
Year	2013/14-2014/15
Month of year	January to December
Day of week	Monday to Sunday
English bank holidays	Any national public holiday
English bank holiday eves	Day before any national public holiday
New Year's Eves	31st December
Football World Cup 2014	Includes only England matches played
Local football matches	Includes only football matches played by teams in North West England in the premier league during the study years
Local rugby matches	Includes only rugby matches played by teams in North West England in the super league during the study years
Local horse racing	Includes all day and night horse racing events held in Aintree, Carlisle, Chester and Haydock race courses
St Patrick's days	17th March
Halloween	31st October
Valentine's days	14th February
Guy Fawkes nights	5th November
St George's days	23rd April

RESULTS

Over the two year period there were 15,687 violence-related ambulance call-outs (0.8% of all unique call-outs to NWAS). Overall, 72.5% of these call-out patients were male and the mean age was 33 years (Standard deviation, 14.5). In terms of deprivation and habitation type, 64.4% of call-outs were to deprived areas (quintile 1) and 65.4% to urban areas. The majority (75.2%) of call-outs occurred during the night (6pm-5.59am) and 36.6% on weekend days (Fridays and Saturdays); 28.5% of all call-outs occurred between the hours of 6pm-5.59am on a Friday/Saturday or Saturday/Sunday night (Supplementary table 1). In terms of outcomes, 66.1% were transferred to another health service (i.e. hospital trust 99.9%; walk-in-centre/minor injury unit 0.1%) for further assessment and/or treatment (Supplementary table 1).

Of violence-related call-outs, 77.3% were for assault/sexual assault, with the remainder recorded as stab/gunshot/penetrating trauma. There were significant patient demographic (i.e.

age/gender) and circumstantial (i.e. hospital transfer, call-out location/date) differences between assault/sexual assault and stab/gunshot/penetrating trauma call-outs. Compared with assault/sexual assault, a significantly higher proportion of stab/gunshot/penetrating trauma patients were male, were injured in the most deprived communities and were transferred to another health service for further assessment and/or treatment (Supplementary table 1). Stab/gunshot/penetrating trauma patients were significantly younger than assault/sexual assault patients (mean: 31.7 vs. 33.3). Call-outs for stab/gunshot/penetrating trauma were significantly less likely to occur during the night, weekend or weekend night, when compared with assault/sexual assault call-outs (Supplementary table 1).

Using our 24 hour day (i.e. starting at 6am), in bivariate analyses, all violence call-outs, and the two violence categories individually, significantly increased during bank holiday eves (Supplementary table 2), and when a rugby match or horse racing event was held in a local area (Supplementary table 3). Call-outs for all violence, and assault/sexual assault only, significantly increased on Halloween. No other significant associations were observed for other celebration days. Additional details on the bivariate associations can be found in Supplementary tables 2 and 3. Table 2 shows results of the GLM on the effects of calendar days, holidays, sporting and celebration events on ambulance call-outs for all violence, and assault/sexual assault and stab/gunshot/penetrating trauma separately, as well as all violence occurring in areas where events (e.g. football) were held. For all categories, call-outs significantly increased over the weekend. Thus, compared with Sundays to Thursdays, all violence-related call-outs increased by 119%, assault/sexual assault by 142%, and stab/gunshot/penetrating trauma by 59% on Fridays and Saturdays. Call-outs significantly increased during bank holiday eves occurring on a weekday (all violence, 160%; assault/sexual assault, 204%), except for stab/gunshot/penetrating trauma call-outs; all violence also

increased during bank holidays occurring on a weekday (74%). Finally, call-outs significantly increased on New Year's Eves (all violence, 426%; assault/sexual assault, 418%; stab/gunshot/penetrating trauma, 377%). There were no significant associations found between any category of call-out and sporting events or celebrations. Even when looking at violence-related call-outs in local areas hosting sporting events only, no significant association with sporting events was observed, although associations with weekends, weekday bank holiday eves and New Year's Eves remained (Table 2).

Logistic regression was used to identify factors independently associated with being transferred to another health service for further assessment and/or treatment. The odds of being transferred was significantly higher amongst males (adjusted odds ratio [AOR] 1.5; 95% confidence interval [95%CI] 1.4-1.6), those aged 13-24 years (AOR 1.2; 95%CI 1.0-1.4), call-outs for stab/gunshot/penetrating trauma (AOR 1.4; 95%CI 1.3-1.5), call-outs on Fridays/Saturdays (AOR 1.1; 95%CI 1.0-1.2), and lower for call-outs on New Year's Eves (AOR 0.6; 95%CI 0.4-0.9).

Table 2: Generalised linear models[a] examining impacts of calendar events on mean numbers of violence-related ambulance call-outs, NWAS, 2013/14 to 2014/15

Variable		Model 1: All violence-related call-outs				Model 2: All violence-related call-outs in areas with sporting events only				Model 3: Assault/sexual assault call-outs only				Model 4: Stab/ gunshot/ penetrating trauma call-outs only			
		Slope (B)	95%CIs		p value	Slope (B)	95%CIs		p value	Slope (B)	95%CIs		p value	Slope (B)	95%CIs		p value
Months[b]	January	-0.144	-0.513	0.225	0.446	-	-	-	-	-0.161	-0.534	0.212	0.398	-	-	-	-
	February	-0.100	-0.480	0.280	0.606	-	-	-	-	-0.135	-0.519	0.249	0.491	-	-	-	-
	March	0.389	0.019	0.759	0.039	-	-	-	-	0.466	0.094	0.839	0.014	-	-	-	-
	April	0.175	-0.197	0.547	0.356	-	-	-	-	0.168	-0.207	0.544	0.380	-	-	-	-
	May	0.090	-0.277	0.458	0.630	-	-	-	-	0.070	-0.301	0.440	0.712	-	-	-	-
	June	0.223	-0.149	0.595	0.241	-	-	-	-	0.218	-0.157	0.594	0.255	-	-	-	-
	July	0.269	-0.100	0.638	0.152	-	-	-	-	0.266	-0.106	0.638	0.161	-	-	-	-
	August	0.212	-0.155	0.578	0.258	-	-	-	-	0.202	-0.168	0.572	0.284	-	-	-	-
	September	0.180	-0.193	0.552	0.344	-	-	-	-	0.194	-0.182	0.569	0.312	-	-	-	-
	October	0.161	-0.209	0.530	0.394	-	-	-	-	0.147	-0.225	0.520	0.438	-	-	-	-
	November	0.013	-0.360	0.385	0.947	-	-	-	-	-0.010	-0.386	0.367	0.959	-	-	-	-
Weekdays & holidays[c]	Fri-Sat	0.786	0.620	0.952	<0.01	0.756	0.587	0.924	<0.01	0.881	0.714	1.048	<0.01	0.464	0.288	0.641	<0.01
	BHE Fri-Sat	0.473	-1.542	2.488	0.646	0.519	-1.511	2.550	0.616	0.704	-1.314	2.723	0.494	-0.715	-3.117	1.688	0.560
	BHE Sun-Thurs	0.958	0.235	1.681	<0.01	0.857	0.141	1.574	0.019	1.111	0.385	1.836	<0.01	0.405	-0.349	1.158	0.293
	NYE Sun-Thurs	1.659	0.238	3.081	0.022	1.491	0.084	2.899	0.038	1.646	0.220	3.071	0.024	1.563	0.138	2.987	0.032
	BH Fri-Sat	0.722	-1.291	2.735	0.482	0.653	-1.369	2.675	0.527	0.785	-1.237	2.808	0.447	0.384	-1.735	2.503	0.722
	BH Sun-Thurs	0.555	0.004	1.107	0.049	0.429	-0.123	0.981	0.128	0.594	0.039	1.149	0.036	0.396	-0.178	0.970	0.176

[a] Backward stepwise elimination was used, meaning only significant variables remained in the final models. [b] Reference category = December. [c] Reference category = Sunday-Thursday. BHE = Bank Holiday Eves. NYE = New Year's Eve. BH = Bank Holidays. 95%CIs = 95% confidence intervals.

DISCUSSION

This study develops knowledge on patterns of violence in North West England and the burden such violence places on the ambulance service. At the same time it strengthens understanding of the potential use of ambulance data in monitoring long-term trends in violence and identifying at-risk groups and communities to target prevention activity[10,12]. Where ambulance data are not routinely used in violence prevention, this potential should be explored, particularly given our finding that around a third of ambulance call-outs for violence were not transferred to another health service for further assessment and/or treatment, and therefore would not be identified through ED or hospital admission data systems (a similar proportion to that found across England[16]). Previous research has identified that, even when transferred to an ED, many ambulance call-outs for violence may not be recorded as assaults in ED datasets[19]; and that police can be unaware of many violence-related ambulance call-outs[10]. Thus, ambulance data have the potential to fill a gap in knowledge about violence at both local and national levels.

In our study, violence-related call-outs accounted for less than 1% of all ambulance call-outs. However, analyses highlight the fluctuations that can be seen in demands on the ambulance service. In particular, call-outs for all violence increased by 426% on New Year's Eves compared with a usual Sunday to Thursday period. Similar findings have been reported in analyses of night-time assault presentations to EDs across England[6]. Whilst not identified in our study, previous research has also found associations between other celebrations (e.g. Halloween) and/or, sporting events (e.g. Football World Cup), and pressures on local health services [6,13,15,20,21]. Consistent with previous work, our study found that males and young people were most at-risk of violence-related ambulance call-outs[5,6,19]. In particular, call-outs for stab/gunshot/penetrating trauma were significantly more likely to be for males and

younger age groups than call-outs recorded as assault/sexual assault. Whilst ambulance data available via TIIG does not allow for the severity of injury to be measured, or the urgency of the ambulance call-out, more severe violent injuries are likely to require transferral to another health service. In our study around two-thirds of violence call-outs were transferred. Multivariate analyses found that the odds of being transferred were significantly higher amongst males, those aged 13-24 years, call-outs for stab/gunshot/penetrating trauma and call-outs on Fridays/Saturdays, and significantly lower for call-outs on New Year's Eves. Whilst it is not known if patients are subsequently admitted to hospital as a result of their condition, one study found that around half of the highest priority ambulance call-outs for violence were admitted to hospital after being transferred to an ED[19].

Knowledge of the extent and nature of violence can be limited by gaps in available data. The data covered in our study comes from one of eleven ambulance services across England and therefore may not be representative of other areas, or other countries. However, some of our findings are consistent with previous work analysing ED data for the whole of England[6]. Across England, ambulance statistics are collated and published to understand total volume activity and performance levels against national targets[16]. However, these data are only provided at an aggregate level and are not broken down by call-out type or cause, as occurs for hospital admissions and ED data[22]. Detailed ambulance data are only available on an individual service level, and thus the impact violence has on the ambulance service as a whole across England is currently unknown. Whilst local ambulance data has been accessed and used in some areas, both within and outside the UK, to support research studies, surveillance systems or prevention activity[10,12,15,20,23], in England few areas readily have access to routine ambulance data. Further consideration should be given to collating data on violence-related

ambulance call-outs at a national level, including practical issues around accessing and collating data from various services.

Even where ambulance call-out data are shared to inform violence prevention, the type of data shared may limit the use of the data. For instance, through analysing the available NWAS data, we were able to identify the types of communities most at risk of violence-related call-outs (i.e. the most deprived and urban areas). Whilst such information can be useful for targeting primary prevention initiatives, data on the exact call-out location, specifically geographical coordinates that are often recorded by ambulance services, would have allowed a greater breadth of analysis. Critically, such data can be translated (using mapping software) into maps to identify hotspot locations for violence across geographical areas, which may provide valuable information to support targeted policing and licensing enforcement[10,20]. In England the Information Standard to Tackle Violence (ISTV) requires EDs to collect data from assault patients on the circumstances of assault, specifically the assault location, time and date, and weapon used, and share such data with local partners to inform violence prevention[8]. ED data have been shown to support violence prevention activity beyond the use of police data alone[3-7]. Ambulance data can also provide detailed information on violence, similar to that detailed in the ISTV (e.g. call-out type, time/date and location) but potentially in a more accessible manner (e.g. assault/call-out location: electronic geocoded versus free text). Further research evaluating the value of using ambulance data beyond existing data sources through, for example, a case control study [4], would support the future use of ambulance data in violence prevention. Even without this, available studies suggest that the routine use of ambulance data in local violence prevention, alongside ED and police data, has the potential to add significant value and should be policy consideration [10-12,15,21].

Internationally, violence prevention is a key priority due to its wide ranging impacts on society. Health data can make a valuable contribution to informing and monitoring violence prevention activity, yet the use of health data for these purposes has typically focused on ED attendances and hospital admissions. Whilst it is evident that ambulance data can be useful to identify violence hotspots and offer unique information for violence prevention strategies and response activity, further consideration should be given on how to promote and support the sharing of such data at local and national levels. Ambulance services and staff could play a key role in preventing violence, through sharing data, and identifying and supporting victims.

Box: What this paper adds

What is already known on this subject

- Prevention of violence is a key public health priority.
- The use of police data, ED attendance or hospital admissions may underestimate incidents for violence prevention strategies.
- Few studies have demonstrated the utility of ambulance call-out data.

What this study adds

- A third of ambulance call-outs for violent incidents in the North West were not conveyed to another health care provider.
- This study shows that ambulance data can identify unique information for violence prevention strategies and response activity.

ACKNOWLEDGEMENTS

We are grateful to the North West Ambulance Service Informatics Team particularly Graeme McCormick and Paul Wickstead, for supporting the TIIG ISS.

COMPETING INTERESTS

We wish to declare no competing interests.

FUNDING

The TIIG ISS is funded through contributions from public health and community safety partners across the North West. The additional analyses required for this study were funded by the Public Health Institute, Liverpool John Moores University.

CONTRIBUTORS

ZQ planned and conducted the study, analysed the data and drafted the manuscript. CM^{c}G assisted with data preparation, analyses and the literature review. KH edited the manuscript. SR assisted with data preparation. MAB advised on statistical analyses. All authors reviewed, edited and approved the final manuscript.

REFERENCES

1. World Health Organization. *Global status report in violence prevention 2014*. Geneva; World Health Organization 2014.
2. United Nations (n.d). *Sustainable Development Knowledge platform*. https://sustainabledevelopment.un.org/
3. Sivarajasingam., V, Moore, S., Page., N . et al. *Violence in England and Wales in 2014. An accident and emergency perspective.* Cardiff: Violence Research Group, Cardiff University 2015.
4. Faergemann, C., Lauritsen, J.M., Brink, O., et al. Trends in deliberate interpersonal violence in the Odense Municipality, Denmark 1991–2002. The Odense study on deliberate interpersonal violence. *J Forensic Leg Med* 2007;14:20-26.
5. Quigg, Z., Hughes, K. and Bellis, M.A.. Data sharing for prevention: a case study in the development of a comprehensive emergency department injury surveillance system and its use in preventing violence and alcohol-related harms. *Inj Prev* 2012;18:315-320.
6. Bellis, M.A., Leckenby, N., Hughes, K., et al. Nighttime assaults: using a national emergency department monitoring system to predict occurrence, target prevention and plan services. *BMC Public Health* 2012;12:746.
7. Florence, C., Shepherd, J., Brennan, I., et al. Effectiveness of anonymised information sharing and use in health service, police, and local government partnership for preventing violence related injury: experimental study and time series analysis. *BMJ* 2011;342:d3313.
8. Information Standards Board for Health and Social Care. *ISTV Initial Standard: Specification*. London, Health and Social Care Information Centre 2014. http://www.isb.nhs.uk/documents/isb-1594/amd-31-2012/1594312012spec.pdf.

9. Flatley, J. *Focus on violent crime and sexual offences: 2013/14*. Office for National Statistics 2015.
10. Ariel, B., Weinborn, C. and Boyle, A. Can routinely collected ambulance data about assaults contribute to reduction in community violence? *EMJ* 2013;0:1-6.
11. Taylor, A., Boyle, A., Sutherland, A. et al. Using ambulance data to reduce community violence: critical literature review. *European Journal of Emergency Medicine*. 2016;23:248-252.
12. Gray, J.T. and Walker A. ‘‘At the sharp end’’: does ambulance dispatch data from south Yorkshire support the picture of increased weapon-related violence in the UK? *Prehospital care* 2009;26:741-742.
13. Quigg, Z., Hughes, K. and Bellis, M.A. Effects of the 2010 World Cup football tournament on emergency department assault attendances in England. *Eur J Public Health* 2012;23:383-385.
14. Crawford, T.V., Barnett, J.D. and Shaw-Sanderson, J.H. Epidemiological features of violence-related injuries in Jamaica. *J Clin Diagn Res* 2014;8: JC01-JC04.
15. Deakin, C.D., Thompson, F., Gibson, C., et al. Effects of international football matches on ambulance call profiles and volumes during the 2006 World Cup. *EMJ* 2007;24:405-407.
16. Health and Social Care Information Centre. *Ambulance services, England 2013-14*. London: Health and Social Care Information Centre 2014.
17. Office for National Statistics. *Regional profiles - population and migration – Northwest, March 2013*. http://www.ons.gov.uk/ons/dcp171780_302060.pdf.
18. Department of Communities and Local Government. *Official Statistics. English indices of deprivation 2010*. https://www.gov.uk/government/statistics/english-indices-of-deprivation-2010.

19. Downing, A., Cotterill, S. and Wilson R. The epidemiology of assault across the West Midlands. *EMJ* 2003;20:434-437.

20. Forgan, S. Hot blocking. *US-CHINA LAW REVIEW* 2014;11:749-762.

21. Sivarajasingam, V., Moore, S., and Shepherd, J. Winning, losing, and violence. *Inj Prev* 2005;11:69-70.

22. Health and Social Care Information Centre. *Accident and emergency attendances in England, 2013-14*. http://www.hscic.gov.uk/catalogue/PUB16728/acci-emer-atte-eng-2013-14-rep.pdf.

23. Backe, S.N. and Andersson R. Monitoring the "tip of the iceberg": ambulance records as a source of injury surveillance. *Scand J Public Health* 2008;36:250-257