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ORIGINAL ARTICLE

Partners in prevention: the role of health systems in the prevention of youth violence in post-conflict Northern Ireland

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Abstract

Interpersonal violence is a wicked and complex issue with youth disproportionately affected. Its effects are multifaceted, placing an additional burden across systems. Despite this, there continues to be an exclusive focus on police recorded crime data in the context of post-conflict Northern Ireland. Given the enduring issue around police legitimacy, it is likely that police-related crime data are limited in its capacity to estimate incidences and trends of youth violence. Leveraging insights from other sources of data can add significant value in the prevention of youth violence. For example, there is significant utility in the use of health-related data in the prevention of higher-harm violence; however, in the context of Northern Ireland this has been under-evaluated. This retrospective cohort study sought to illustrate what could be gleaned using a novel approach to Emergency Department (ED) data. Routinely collected data captured from youth aged 12–25 attending an ED trauma centre for violence-related injuries between August 2020 and August 2021 were collated, coded and analysed. We found that young men were most likely to present to ED with violence-related injuries; incidences were temporally clustered across several months of the year (i.e. Summer); and younger aged youth were at greater risk of violence-related injuries during the afternoon and early evening. These findings illustrate the utility of health data for violence prevention and the potential for integrating administrative datasets in the design of prevention policy. Limitations and implications for practice are discussed.

Keywords Youth violence · Public health · Prevention

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Violence is a significant youth issue

Despite significant reductions during the late 1990s, there have been growing concerns about the increasing frequency and intensity of interpersonal violence. Globally, there are an estimated 500,000 people murdered each year, and this appears to be increasing at an annual rate of 2% (Mitis and Sethi 2015). Youth violence has received particular policy attention, with academic research consistently demonstrating that young people, particularly young males, are at elevated risk of violence-related harms (WHO 2011; Malik et al. 2020). Globally, five hundred young people die each day as a result of violence (Baxendale et al. 2012) and the scale is so vast that it may even be the said that most violence is youth violence. Administrative data suggest that interpersonal violence is the second leading cause of death for those aged 10–19 (WHO, 2016; UNICEF, 2017). In the USA, violence-related injuries are the leading cause of mortality for adolescents and account for elevated pressure on the health system (Hankin et al. 2014). For every fatality, there are approximately twenty other victims who require medical attention (UNODC 2019). In the UK, researchers have noted the rising trajectory of more serious injuries, including those caused by knives and sharps (Vulliamy et al. 2018; Wortley and Hagell 2020) with predictions that the public health implications associated with the Covid-19 era, and wider socio-economic impact could contribute to increased rates of violence (Ellis et al. 2021; Reid and Baglivio 2022).

The impact of violence extends beyond the physical impact to also include bio-psychological morbidities (Junger et al. 2001), an indicator of the long arm of harm associated with violence. In the most recent Global Burden of Disease (GBD) report, both self-directed and interpersonal violence were among the top five causes of global Disability Adjusted Life Years (DALYS), and were the leading causes of mortality for individuals in the 10–24 age group (GBD 2020). This represented a rise in global DALYS between 1990 and 2019. But not all youth appear to be at the same risk. It seems that those in areas of higher deprivation (Hughes et al. 2014) and young males are at elevated risk of violent injury. In Northern Ireland (NI), there is growing evidence that violence continues to affect young people in a myriad of ways, and despite the transition towards peace, violence is highly clustered in areas where young people are exposed in the home, in the community and among peers, all of which take place in the context of ongoing paramilitary violence (Walsh and Gray 2021; Walsh 2022). Indeed, violence is the single most commonly experienced trauma among young people in Northern Ireland (Bunting et al. 2020).

The benefits of leveraging health-related data for violence reduction

From both a policy and practice perspective, violence prevention efforts have been traditionally perceived as residing in the realm of justice, with greater focus placed on the deterrent effects of prosecuting perpetrators. This has presented several challenges. Firstly, this siloed approach ignores the impact on victims,

the connections between victimisation and perpetration, and the wealth of data available that exists across other sectors that could increase preventative insights (Widom 1989; Lee et al. 2017; Hibdon et al. 2021). In contrast to the criminal justice focus on punitive responses, a public health framework places greater emphasis upon an upstream–downstream model (McKinaly, 1979), seeking to understand the needs of those most vulnerable to violence and its harms based upon known risk and protective factors. By understanding these more comprehensively, both victims and perpetrators can be supported at the earliest possible stage to prevent violence and interrupt pathways of harm.

From a public health perspective, understanding incidences and trends of violence-related harm can help to provide a framework for a tiered response (Lee 2017). To achieve this however, triangulation of data is preferable to a reliance on single sector data. For example, medical records, such as those obtained by Emergency Department (ED), have been shown to add value to those insights already established from police-recorded crime data (Hibdon et al. 2021; Sutherland et al. 2021a, b). While one could reasonably assume an overlap between health and police data, studies have found that despite some overlap, police data do not fully, or accurately capture the extent of violence in the community (Hibdon et al. 2021). With only a partial view, both operational decisions and policy decisions can be skewed (Weinborn et al. 2017). To illustrate this, Ariel et al (2015) found that almost 20% of ambulance hotspots were not recognised by the police as areas requiring a specific policing focus. In the USA, it has been estimated that only 41% of violent incidences are known to the police, and in other UK studies, it has been estimated that ambulance data contain between 60% and 90% of incidents that would otherwise not have been recorded by police data alone (Sutherland et al. 2017, 2021a, 2021b). In areas such as Brazil, it has been estimated that there is only a 50% overlap between police recorded sexual violence and those recorded by medics (Melo et al. 2020). In sum, the evidence suggests that many incidences go unreported to the police. The reasons for this are complex and multifaceted (Xie and Baumer 2019), and may be even more complex in post-conflict societies where the legitimacy of the police remains contested (Walsh, 2020). For example, in NI, police-community relations remain tense, and despite enduring community violence and paramilitarism, health-related data are not routinely joined up nor shared (Walsh and Gray 2021). In fact, following a series of freedom of information requests in 2019, author one discovered that no health Trust in NI routinely collected violence-related data (Walsh 2019). In other parts of the UK, National Health Service (NHS) ED's are required to comply with protocol 'ISB1594', which sets a minimum set of requirements for recording violence-related data. Embedded within this protocol is the expectation for ED staff collect violence-relevant data (e.g., time and date, time and date of arrival at ED, the specific location of the incident and the primary means of assault) and further, share these data with cross-sectoral community safety partnerships on a monthly basis.[1] The rationale for the protocol is clear. Collecting data from the health system

[1] https://digital.nhs.uk/data-and-information/information-standards/information-standards-and-data-collections-including-extractions/publications-and-notifications/standards-and-collections/isb1594-information-sharing-to-tackle-violence-minimum-dataset.

and combining this with police and empirical data can enhance our understanding of and responses to the harms associated with interpersonal violence (Ariel et al. 2015; Sutherland et al. 2021a, b). Further, there is at least some supporting evidence that this approach pays dividends. Over a ten-year period of information sharing between ED's and the Police in Cambridge, UK, assaults reduced by 37%, which some have attributed at least in part to this novel protocol (Boyle et al. 2018).

Secondly, the exclusive focus on justice responses (police, courts, prisons) stresses the primacy on deterrence without sufficient recognition bio-psycho-social factors that contribute towards the increased risk that within a given context, violence becomes more likely (Lee et al. 2017). There is a wealth of evidence that victimisation increases the risk of perpetration (Widom 1989; Kar 2019). For example, in one NI study, Walsh et al. (2021) found that across a custodial sample, youth who had been known to have been victims of violence were nine-times more likely to have been convicted for a violent offence than those who had not been victims of violence. Further, in the context of Northern Ireland, youth who had been victims of paramilitary threat and assault were at elevated risk of higher-harm violence (e.g. use of sharps). Observations such as these provide cumulative support to what Widom (1989) and others have described as the *'cycle of violence'* (Weaver et al. 2008). The findings are so common that they have been colloquialised as the *'victim-perpetrator-overlap'* (see for example (Lansford et al. 2007; Fox et al. 2015). ED's could serve as a site of early intervention, screening those most in distress and those most in need of support (Duffy et al. 2021), thus reducing psychological strain as well as addressing physical harm (Malvaso et al. 2017; Hasley, 2018; Baglivio et al. 2021). By understanding the needs of victims and connecting them to the services they require, at the point that they require them, evidence suggests that the ED environment could help to reduce further harm by reducing the criminogenic effects of victimisation and reducing pressures across the justice, health and social care systems (Carnell et al. 2006; Butts and Delgado 2017; Watkins et al. 2021).

For example, in one ED-based study in the USA, youth aged 18–24 were screened as they were waiting for a clinical assessment (n = 300) (Hankin et al. 2014). On average, these youth were 21 years old and 60% were female. Of this sample, 6.3% reattended within 12 months of their initial presentation illustrating that hospital recidivism, although associated with a proportionally small group, could be related to disproportional healthcare costs. Repeat visits were positively associated with risks identified during the initial presentation (peer influence, self-reported likelihood of violence and aggressive impulses). In another longitudinal study of more than 3000 emerging adults (18–25), youth attended ED on average 1.78 times, with violent offending (but not other types of offending) strongly associated with increased healthcare usage (Portnoy and Schwartz 2021). In a UK-based study examining all presentations of children 0–14 years old over a one-year period, Hughes et al (2014) found that from a sample of more than 3 million children, deprivation was a strong predictor of increased attendances for violent-related injuries and despite even from elsewhere (See for example Anderson 2001), and school holiday periods appeared to provide a protective factor illustrated by fewer attendances. In another UK study, trauma service data were analysed retrospectively across a ten-year period (2004–2014) (Vulliamy et al. 2018). All of those included in the

analyses were under the age of 25. 47.2% of the sample were aged 16–19, and 43.4% were aged 20–25. Only a minority were in the younger age group (12–15) (9.4%). The same study found that there were patterns of injury, with older youth experiencing the most severe forms of harm. However, most were considered to be *'non-critical'* injuries, with few requiring admission or surgery. Of the convergent findings, the most stable is that there appears to be a small number of ED patients which account for a disproportionate amount of total ED visits (LaCalle and Rabin 2010) and violence-related presentations appear to be predictive of a 'revolving door' cycle (Benedict et al. 2017).

The current study

From a prevention perspective, understanding the timing of incidences of violence-related injury has significant potential. By leveraging data that approximates the temporal clustering of violence, or that illustrates patterns in the data around specific times, days or months, prevention efforts could become more targeted. Despite assumptions of late evening and weekend risk of harm, the authors of one London-based study reported that those under the age of 16 were most likely to be injured during the afternoon, while the older age groups were more likely to be injured after midnight (Vulliamy et al. 2018) adding support for how prevention efforts are designed, how they target the most vulnerable populations and when they are implemented.

Given the paucity of violence-related data collected from within the ED systems across NI, the goal of the current study was to examine a limited amount of available violence-related data which was prospectively collected by one ED and to explore the utility of routine collection of such data for understanding patterns of violence and preventing violence-related harms.

Based on previous studies, we hypothesised that older age and male gender would be associated with increased levels of violent injury, and that late night/early morning would be associated with a clustering of incidences. We also hypothesised that those who presented with more severe injury would be more likely to re-attend ED with subsequent violence related injuries.

Data and method

We performed a retrospective cohort study of patients presenting to an urban emergency department in the city of Derry, Northern Ireland between August 2020 and August 2021. The department receives approximately 300 patients requiring trauma team activations per year. The department is one of two emergency departments which services a population of approximately 300,000 people across the entire health Trust area and more specifically, a population of approximately 151,000 across the Derry and Strabane area. The department is situated within the Western Trust, one of five local health Trusts across NI. It also covers some of the most deprived areas in the region. In fact, five of the top ten most deprived electoral Wards are within this Trust area. All patients who met the criteria (had presented to

ED for a violence-related injury) between 2020 and 2021 were screened for inclusion. Data sharing for the purpose of the study followed three phases. During phase 1, author 1 (an academic) met with author 2 (an ED consultant) to co-produce a broad set of inclusionary and exclusionary criteria, taking advice on what data was likely to be available. Patients under the age of 25 and those over the age of 12 who were recorded by hospital staff as having presented to the emergency department following a violent injury were included. Accidental injuries (including sports-related injuries) and those resulting from deliberate self-harm were excluded. A limited amount of demographic data (age and gender), injury characteristics (type of injury) and outcomes were recorded prospectively by hospital staff. The time that patients presented to ED was also obtained from the hospital records. During phase 2, administrative staff in the ED completed the relevant database searches and generated a report with the required data. All data was anonymised, with any personally identifiable data removed. While this presented an additional burden on administrative staff, reports were generated within 24 h of the request, inferring that this was relatively easily done within the context of the IT system being used. During phase 3, the researchers coded and analysed the data.

First, univariate analysis was performed to characterise the study population using select variables, including gender, age, type of injury and outcome. Descriptive statistics are reported. Second, bivariate analysis with Chi-square tests as well as group mean comparisons using independent samples t tests, and one-way ANOVA tests. Analyses were completed using SPSS v27.

This study was approved by QUB School of Social Sciences, Education and Social Work ethics committee.

Results

The sample

Between August 2020 and August 2021, a total of 91 youth aged 12–25 presented to the ED trauma activation team primarily for the treatment of interpersonal injury.

The mean age for youth presenting to ED with violent injuries was 18.2 (SD = 2.7), ranging between 12 and 23 years old. In line with WHO (2011) definitions on childhood (< 16),

adolescence (16–19) and young adulthood (20–25), the age range was trichotomized into three age bands: 12–15; 16–19; and 20–25. 46.2% (n = 42) were within the 16–19, representing the single highest age band. Only a minority were within the 12–16 age band (15.4%, n = 14). 79.1% (n = 72) of all of those presenting were male compared with 20.9% (n = 19) who were female.

Nature of injuries

Uncommon for Health Trusts in Northern Ireland, the type and the nature of injuries were recorded. Table 1 illustrates the range of injuries over this period. 87.9%

Table 1 Index injury

Injury	%	*n*
No assessment undertaken	7.4	6
No clear injury	1.2	1
Contusion	23.5	19
Muscle	4.9	4
Fracture/dislocation	19.8	16
Wound/incision	12.3	10
Traumatic brain injury	22.2	18
Seizure	1.2	1
Other	7.4	6

Table 2 Injury by age band

Age band	No assessment	No injury	Bruising	Muscle	Fracture	Wound	TBA	Seizure	Other
% Within age band									
12–15	7.1	0	28.6	0	7.1	0	**42.9**	0	14.3
16–19	2.4	2.4	16.7	9.5	**28.6**	9.5	14.3	2.4	0
20–25	11.4	0	22.9	0	8.6	**17.1**	17.1	1.1	2.2

Bold indicates the statistically significant differences between the age groups and types of violent injury at the $p = <.05$ level

(n = 80) of the sample waited on a clinical assessment; however, a significant minority (12.1%, n = 11) left the ED without appropriate review and treatment. Of those reviewed, injuries ranged from 'bruising' (23.5%) through to suspected 'traumatic brain injury' (22.2%). However, only 5.5% of the sample were admitted to a ward indicating that most did not require ongoing observation and/or treatment.

A Chi-square test of independence showed that there was a significant association between age and type of injury, $X^2(18, N = 91) = 30.9$, $p = 0.03$ (see Table 2) with those in the 12–15 age band more likely to present with probable traumatic brain injury than the other two older age groups. Likewise, those in the 16–19 age group were more likely to present with fractures, and those in the 20–25 age group were more likely to present with incision/wound. In the absence of additional data, it is difficult to fully appraise this relationship, but could point to differences in the ways that youth engage in violence as they age, with greater risk of transitioning from blunt force to sharps.

Time and day of presentation

To identify any potential temporal patterns in the data, the date, day, and time of presentations were analysed. Figure 1 illustrates incidences over a 12 monthly period. Visually, it appears that serious injuries are clustered across the summer

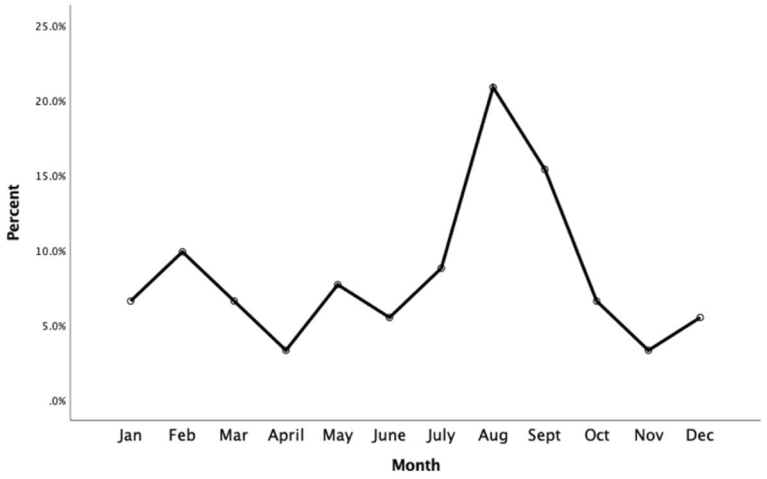

Fig. 1 Violent-related injuries (12 months)

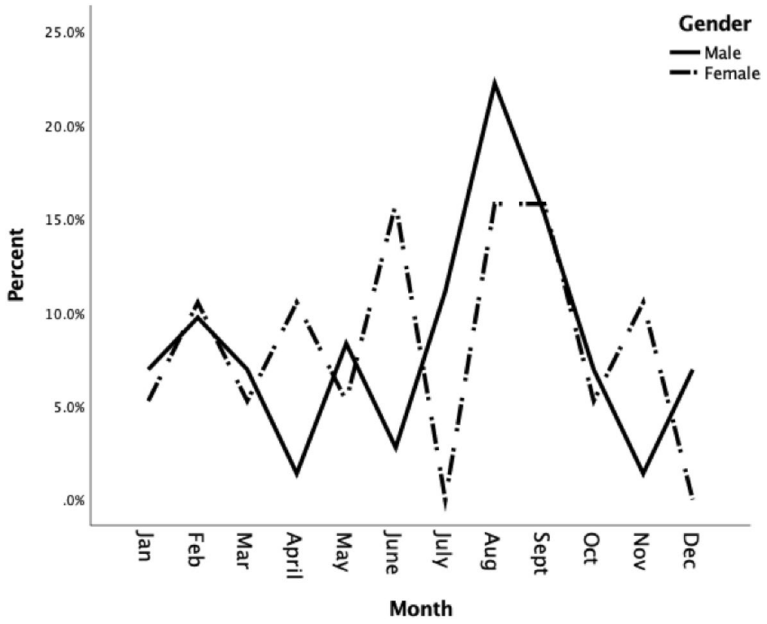

Fig. 2 Violence-related injuries by gender (12 months)

months, in particular, August and September. In fact, these two months account of a total of 36.8% of the total presentations to this ED.

When the data were disaggregated by gender, the elevation during the summer months appears to much steeper, and earlier for male youth than it was for female youth (see Fig. 2). However, the trajectory for both male and female youth increased

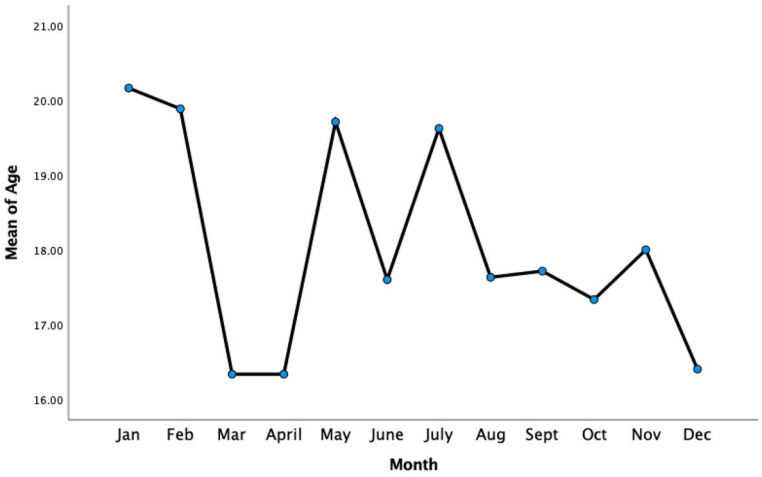

Fig. 3 Mean age of victims (12 months)

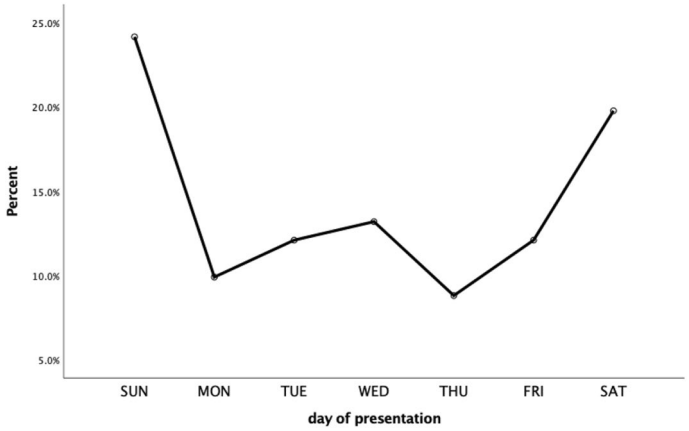

Fig. 4 Proportion of ED presentations for violence-related injury by day of the week

during July and August before reducing significantly from September and into October. While incidences increase again for males during December, this is not the case for females. In fact, like other months, there appears to be an inverse relationship.

There were statistically significant differences in the mean age of youth and presentations across the year (f (11,79) = 1.99, p = 0.04). Figure 3 illustrates the means plot suggesting that there are particular points in the year that patients were more likely to be older (e.g. January and February), while there were other points in the year that patients were more likely to be younger (e.g. August, September and December). The effect size, using eta squared (Cohen, 1988) was 0.29 indicating a strong effect size. In fact, it was during the peak summer months (August, m = 17.6; September, m = 17.7) that injured youth appear to be on average younger than they

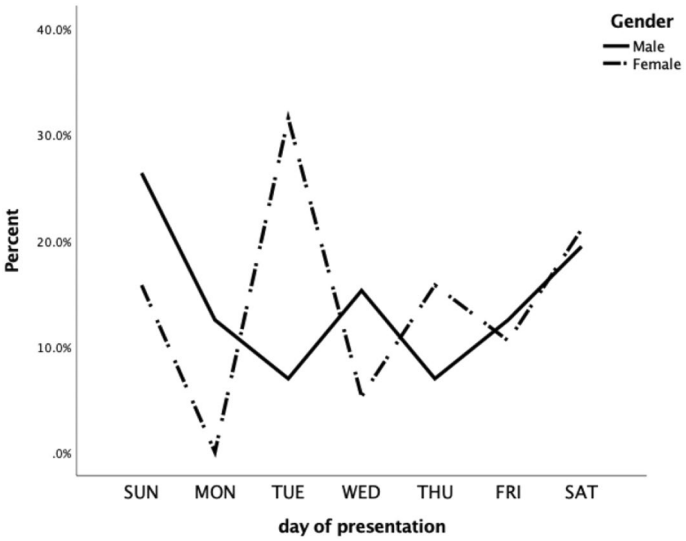

Fig. 5 Proportion of presentations to ED for violence-related injury by day of the week (gender)

appear to be during other times of the year, particularly January (m = 20.2), February (m = 19.9), May (m = 19.6) and July (19.6). However, March (m = 16.3) and April (m = 16.3) appear to be the periods of time when the youngest victims seek medical treatment.

There also appear to be clear peaks and troughs throughout the week (see Fig. 4). Maybe unsurprisingly, the weekend represents the busiest time for ED dealing with violence-related injuries. Thursday and Monday appear to be the quietest periods, with the latter preceding a swift rise, and the former reflecting a steep decline in injuries that require medical attention. A Chi-square test of independence showed that there was a significant association between gender and the day on which youth presented to ED for the treatment of interpersonal violent injuries, $X^2(6, n = 91) = 13.2$, $p = 0.04$. Figure 5 illustrates these differences. While there are clearly some elevated periods common to both male and female youth, there are other days of the week where incidences appear to diverge based on gender. For example, while presentations appear to peak on Tuesdays for young women, they actually decline for young men. For male youth, incidences of violence-related injury peak on Sunday. Similarly, mid-week, cases rise again for young men, but decline steeply for young women.

Although not at the point of statistical significance, there do appear to some important differences in ED presentations by the age of youth. Figure 6 illustrates the percentage of cases over the seven-day week broken down by age band.

While the younger age group (12–15) appear to be more likely to present over the weekend days (Fri and Sat), the older age bands (16–19 and 20–15) appear to be more likely to present during weekdays, particularly Sundays.

Based on findings from previous studies, the time of presentation was divided into five key bands: 6am–12 pm; 12 pm–6 pm; 6 pm–9 pm; 9 pm–12am; and 12am–6am.

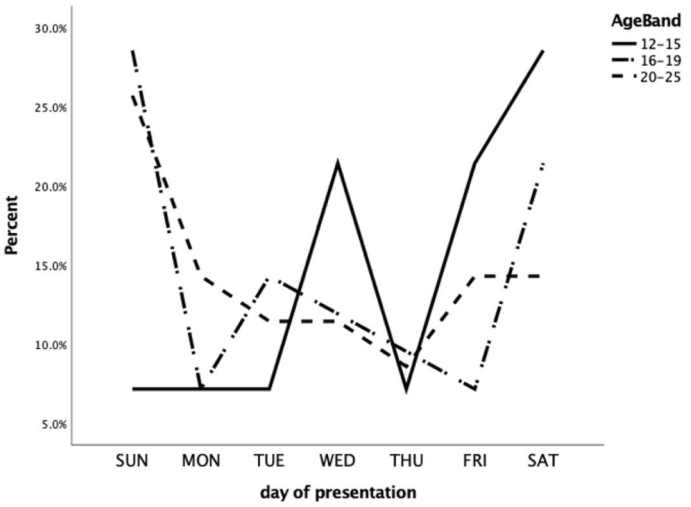

Fig. 6 Proportion of presentation to ED for violence-related injury by day and age

Table 3 ED presentations by time

Time	%	n
6am–12 pm	14.3	13
12 pm–6 pm	22	20
6 pm–9 pm	9.9	9
9 pm–12am	18.7	17
12am–6am	35.2	32

Table 4 Injuries at subsequent presentation to ED

Injury	%	n
Fracture/dislocation	30	3
Wound/incision	50	5
Traumatic brain injury	10	1
Other	10	1

The majority of presentations took place between the hours of 12am and 6am (see Table 3). However, more than one-fifth of all presentations took place between the hours of 12 pm and 6 pm suggesting that despite conventional assumptions in preventative practice, afternoons appear to be as much of, if not a greater risk for some young people as late evening and early hours. In fact, there was a statistically significant difference in the age band of young people and the time at which they presented to ED for the treatment of violent injuries $X^2(8, N=91)=19.3$, $p=0.01$. This observation could be investigated further.

While only 7.7% of 20–25 and 33.3% of 16–19-year olds presented between 12 and 9 pm, 57.2% of all presentations for 12–15 years olds took place prior to 9 pm. Conversely, 48.6% of all presentations for the oldest age group (20–25) took place between 12 and 6 am.

Multiple presentations

Using hospital-based ID codes, it appeared that almost one-quarter (24.2%) of presentations were actually multiple presentations, indicating that there was a small, but important subgroup of youth who are at elevated risk of poly-injury. It also appears that this group could be at greater risk of more serious injury given that the nature injuries appear to become more serious with subsequent presentations (see Table 4).

There was a statistically significant difference between those with single and multiple presentations, and the nature of injuries ($X^2(8, N=91)=19.1$, $p=0.01$). For example, those with a history of only a single presentation to ED were much more likely to require treatment for bruising (29% v 5.3%), whereas those with a history of multiple presentations were more likely to present with wounds or incisions (26.3% v 8.1%). They were also more likely to leave ED with an appropriate clinical assessment (21.1% v 3.2%). Mean time between first and second presentation appear to be relatively short at only 63.7 days (SD = 103.2 days). However, with a large range (309 days), removing three outliers on the extremities (310 days; 134 days and 142 days), the time between visits reduced significantly to 6.43 days, ranging between 1 and 19 days). Given the relatively short time between presentations for a small number of youth, there may well be a reachable or teachable moment during each presentation to ED and previous studies have already isolated the benefit of identifying and supporting those most at risk of violence-related harms and likely to present multiple times within the ED environment (e.g. Carnell, Eslinger and Stolley, 2006; Butts and Delgrado, 2017).

Discussion

Violence is an enduring and wicked social problem (WHO 2020). It disproportionally affects youth (Struyk et al. 2021) and elevates the risk of a range of psychosocial harms (Malik et al. 2020). Despite the promise of health-related surveillance (Hughes et al. 2014; Bandy, 2017), and increasing calls from international body's such as the World Health Organisation to employ public health approaches (WHO, 2016), there are few examples of these whole system approaches to violence prevention in the NI context (Walsh et al. 2021; Walsh and Gray 2021). From a public health perspective, understanding who is most at risk of violence, where and when is central to prevention. While most healthcare professionals are legally mandated to screen for exposure to particular forms of violence (e.g. domestic abuse and maltreatment), there is no similar requirement to screen for other forms of violence including community violence (Struyk et al. 2021). This could be particularly problematic in contexts such as Northern Ireland where community violence persists

(Bunting et al. 2020), and confidence in police remains strained (Walsh and Gray 2021). Police-recorded crime statistics, while they are publicly accessible and provide a partial overview of incidences and trends, do not fully capture the realities of exposure, and even less in terms of related harms.

Because of its unique access to victims, health systems can play a pivotal role in collecting violence-related data that when combined with other sources, increase insights for prevention (Hibdon et al. 2021). In 2015, the WHO spelt this out clearly, challenging national governments to take the issue of violence and health seriously. They argued that:

1. Health has a duty to prevent death and morbidity
2. Health has a powerful economic interest in preventing violence since it absorbs a substantial proportion of direct health costs
3. Health systems are uniquely situated to capture relevant data
4. Youth violence prevention should be included in every national action plan for public health.

The criminogenic effects of exposure to community violence are well-established (Fowler et al. 2009), but despite the increased healthcare burden (Flannery et al. 2001; Portnoy and Schwartz 2021), health systems are generally not well-designed to identify those traversing between them, or to complement other data sources to provide a fuller picture of prevalence and exposure. Given this health burden (GBD 2020), it is in the interests of health systems to become more proactively involved in its prevention. Data-driven responses have the potential to improve healthcare responses, as well as to contribute towards preventing hospital recidivism (Carnell and Esligner, 2006; Watkins et al. 2021).

Using this small but novel dataset, taking prospectively collected data from one ED in Northern Ireland, it is clear that there is significant potential for health data to contribute towards increased surveillance of violence-related injury. Further, given the well-established associations between victimisation and perpetration (Widom 1989; Fox et al. 2015), by identifying those most in need of support, the routine collection and sharing of health data has the potential to prevent both incidences and the harms associated with interpersonal violence (Quigg, Hughes and Bellis, 2011).

Our hypothesis that incidences would be temporally clustered within discrete months of the year was supported, and despite evidence from other studies (e.g., Hughes et al. 2014), the late summer months were associated with higher incidences of violence-related injury. Combined, August and September accounted of more than one-third of the total number of annual injuries. This variation in observations may be accounted for by the wider age range of this sample, extending up to and including the age of 24 compared with an age range of 10–14 in the Hughes et al (2014) study. This difference therefore may be attributed to changes to the routine activities of older youth (Antunes Lobo and Ahlin 2017) and other factors including increased temperatures (Anderson 2001) that may have a differential impact on the socialisation, recreational activities and behaviours of older youth compared with

younger children. Therefore, the data, while limited, generally support these finding and points to the potential role of a range of contextual factors that may impact on community violence and violent victimisation. More consistent data collection and further analyses will help to test these observations further and unpack the reasons behind them.

While a call for integrating research evidence into health system practices, it is also of note that this study illustrated that the rise for young males appeared to be steeper and begin much earlier in the Summer than it did for young women. Although these gender patterns reflect wider criminal justice research, predicting the periods of time where violence is more likely to be elevated and for whom could help health systems prepare, and at the same time contribute towards wider prevention activities in the community.

Our hypothesis that incidences would also be clustered around late evening/early morning during the weekend was only partially supported. On aggregate, Saturday and Sundays reflected the busiest times for youth presenting to ED; however, when these data were disaggregated by age and by gender, several divergent findings emerged. For instance, the youngest age group appeared to be more likely to present earlier in the weekend, while older youth appeared to be more likely to present later in the weekend and during weekdays. Only a minority of patients were 12–16, indicating that these injuries could be less serious/less likely to require medical attention. Conversely, those in 16–19 age band were most likely to require clinical support.

In keeping with previous findings (e.g., Vulliamy et al. 2018), these NI data confirm that younger youth also appear to present earlier in the day, particularly during the hours of 12am and 6 pm, and that there is a stronger association between older youth presenting late night/early morning. This has significant implications for both ED-based interventions and for community-based supports. Understanding when, when and how to interrupt incidences is critical and practical responses should be tailored to the different needs of these different populations.

While of interest, there are several limitations with the data to draw conclusive findings from the temporal data (months of the year, days of the week and times of the day). For example, this is based on presentation to ED as opposed to the date and the time of violent incidents. There could indeed be a time lag between victimisation and ED assessment. This uncertainty could be reduced by full implementation of the NHS protocol which not only requires ED staff to capture incidences of violent injury, but to also record the date, time and location of incidents (Quigg, Hughes and Bellis, 2011).

Despite the need for clinical assessment and treatment, only a minority of youth appear to be admitted to a ward-one indication of the severity of injury. This reflects similar studies elsewhere that there is a small but important subgroup youth who require greater clinical care (LaCalle and Rabin, 2010; Hankin et al. 2014). In this sample, they tended to be those who were male, and who first presented with a wound/incision, as well as those who failed to engage in a medical assessment. Therefore, ED-based interventions could triage victims of violence at elevated risk more quickly and prioritise those in need for specialist supports in the community.

While these data are unable to capture the extent to which these injuries were known to the police, evidence from previous studies predict that only a minority are likely to be known to the police thus limiting the utility of police recorded crime data alone (Ariel et al. 2015; Xie and Bummer, 2019; Hibdon et al. 2021; Sutherland et al. 2021a b). This extends the utility of hospital-related data by increasing our understanding of those most likely to be victims of violence in the community. With the cumulative evidence providing support for the reciprocity of violence exposure, and its traumatic effects (Lansford et al. 2007; Ford et al. 2012), the routine collection of ED data could also help to identify those at elevated risk of perpetrating violence in the community, thus contributing to the prevention of wider harm. This appears all the more crucial given the fact that for most recidivists in this sample, the mean time between first and second presentation was less than seven days (ranging between 1 and 19 days) in line with previous studies (Vulliamy et al. 2018). That is not to say that health-related data, alongside police-recorded crime data, provides the full picture. Indeed, benefits aside, this study also noted several limitations. Firstly, as has been found in the previous studies (see for example Quigg, Hughes and Bellis, 2011), violence-related data used in this study were not systematically collected by trained ED staff, and despite collecting more violence-related data than other health trusts in NI, they did not employ the recommended NHS protocol for minimum collection of violence-related data. This is a challenge for the health system in post-conflict NI. It also infers that these data could be an underestimate and incomplete version of the experience of victims using this ED. Secondly, previous studies have found that deprivation is associated with higher rates of presentation (Hughes et al. 2014). Without a location identifier, this dataset was unable to test for such associations. Further, violence-related data were only collected when violence-related injury was the index clinical concern. This underestimation actually exacerbated further given that the period under review was during Covid, when it is well-established that incidences of community violence reduced significantly only to rise (and even supersede) the pre-Covid rates (Ellis et al. 2021; YEF 2022).

This dataset, while useful, was limited in its potential to more wholly inform a prevention response. Additional data, including relevant predictors of victimisation and perpetration, were not routinely collected. Crucially, these data are not currently joined up/shared with other services (e.g., justice and education). This is despite NI's intimate relationship with community violence. Joined up systems are possible (Hibdon et al. 2021; Sutherland et al. 2021a b). Data protection is not a bulwark and so this study presents a challenge, as well as an opportunity for administrators to make best use of existing data to enhance outcomes for communities, support victims at the time that their needs are most acute, and contribute to the prevention of violence. Of course, the data itself was limited to those who presented to ED. It is highly likely that there are clusters of other victims neither known to police nor to the health system, particularly among young people who are less likely to seek support or treatment. Notwithstanding these limitations, this study has demonstrated the utility of ED data in surveillance management and programme design. Using even limited data, it is possible to make inferences about the needs of victims of violence, enhance and test efforts to identify those most at risk of revictimisation and also inform the design of interventions aimed at reducing perpetration.

Public health approaches in the field of violence prevention appear to offer a relatively novel framework for understanding and preventing youth violence. A prerequisite is that appropriate data are not only collected but also shared (Boyle et al. 2018; Hibdon et al. 2021; Sutherland et al. 2021a b). This study has illustrated what can be gleaned from a small number of violence-related variables collected prospectively within ED. An additional issue therefore for health systems to consider how similar data can be collected and shared (Quigg, Hughes and Bellis, 2011). Privacy legislation and introduction of GDPR appear to have added additional challenges to information sharing across systems. However, some argue that this need not be the case. With the absence of personally identifiable information, privacy issues can be avoided and therefore, challenges on the grounds of privacy can be negated (Sutherland et al. 2017; Hibdon et al. 2021). On these grounds, data sharing should be prioritised (Hibdon et al. 2021). Linked data have the potential to monitor trends, to increase injury surveillance, shape policy and inform prevention efforts (Boyle et al. 2018; Tainter et al. 2020). Combined, these approaches could reduce pressures on front line services and reduce the *'revolving door'* effect, particularly where the community are central to the analyses and response (Benedict et al. 2017; Sharkey et al. 2017).

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