



## Risk factors for violence-related injuries in emergency departments: a Danish linkage study

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### ABSTRACT

**Background:** Interpersonal violence is a pervasive global public health problem associated with myriad health, social and economic consequences. In recent years the rates of interpersonal violence have decreased, however, high numbers of individuals continue to present to emergency departments for non-fatal violence-related injuries.

**Objective:** This study aimed to examine a range of risk factors associated with violence-related injuries in an emergency department in Denmark.

**Method:** A case-control study was conducted on a sample of 3,940 victims of violence collected by the Accident Analysis Center for Aarhus County Municipality. Using the Danish Civil Registry System, controls were matched 10:1 on age, gender and municipality. Risk factors were rendered from Danish health and social registers five years prior to the violent assault. These included marital status, educational qualification, employment status, national origin, involvement with child protective services (CPS), prior convictions, and a diagnosis of adjustment disorder and alcohol and/or substance use disorders.

**Results:** Multivariate logistic regression identified that being male, divorced, unmarried, non-Danish origin, attending compulsory education, being outside the labour force, students, involvement with CPS, prior criminal conviction and a diagnosis of alcohol and/or substance use disorders were associated with an increased likelihood of being exposed to violence. The dominant risk factors were alcohol and/or substance use disorders (OR = 3.62) and prior criminal conviction (OR = 3.54). Attainment of tertiary education was associated with a reduced likelihood of being a victim of violence.

**Conclusion:** These findings highlight that research into effective interventions offered in emergency departments may help the public health effort to reduce the health, social and economic burden of interpersonal violence.

### Factores de riesgo para lesiones relacionadas con la violencia en los departamentos de emergencia: un estudio danés de vinculación

**Antecedentes:** la violencia interpersonal es un problema generalizado de salud pública mundial asociado con innumerables consecuencias sanitarias, sociales y económicas. En los últimos años, las tasas de violencia interpersonal han disminuido, sin embargo, un gran número de personas continúan presentándose en los servicios de urgencias por lesiones relacionadas con la violencia no mortal.

**Objetivo:** este estudio tuvo como objetivo examinar una serie de factores de riesgo asociados con lesiones relacionadas con violencia en un servicio de emergencias en Dinamarca.

**Método:** se realizó un estudio de casos y controles en una muestra de 3,940 víctimas de violencia recolectadas por el Centro de Análisis de Accidentes del Municipio del Condado de Aarhus. Usando el Sistema de Registro Civil Danés, los controles fueron pareados 10: 1 en edad, género y municipio. Los factores de riesgo provinieron de los registros sociales y de salud daneses cinco años antes del ataque violento. Estos incluían estado civil, calificación educativa, estado laboral, origen nacional, participación en los servicios de protección infantil (CPS), condenas anteriores y un diagnóstico de trastorno de adaptación y trastorno por abuso de sustancias.

**Resultados:** La regresión logística multivariada identificó que ser hombre, divorciado, no casado, de origen no danés, asistir a la educación obligatoria y no tener empleo, educación o capacitación, ser estudiante, participación en el CPS, condena criminal previa y diagnóstico de un trastorno por abuso de sustancias estaban asociados con mayor probabilidad de ser expuesto a violencia. Los factores de riesgo dominantes fueron un trastorno por abuso de sustancias (OR = 3,62) y una condena penal previa (OR = 3,54). El logro de la educación terciaria se asoció con una menor probabilidad de ser víctima de violencia.

**Conclusión:** estos hallazgos resaltan que la investigación sobre intervenciones efectivas ofrecidas en los departamentos de emergencia puede ayudar al esfuerzo de salud pública para reducir la carga sanitaria, social y económica de la violencia interpersonal.

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### PALABRAS CLAVES

Violencia interpersonal; lesiones relacionadas con violencia; factores de riesgo; enlace de datos

### 关键词

人际暴力; 暴力相关的伤害; 风险因素; 数据关联

### HIGHLIGHTS

- Risk factors for violence-related injuries were assessed using a case-control design.
- A prior diagnosis of a substance misuse disorder and history of criminal conviction were the dominant risk factors.
- Interventions offered in emergency department targeting substance misuse and aggressive behaviours may help public health efforts to reduce the negative outcomes associated with interpersonal violence.

### 急诊科里暴力伤害的风险因素：一项丹麦关联研究

**背景：**人际暴力是一种普遍的全球公共卫生问题，与许多健康、社会和经济后果有关。近年来，人际暴力的比率有所下降，但还是有大量的人继续向急诊部门反映非致命性暴力相关伤害。

**目的：**本研究旨在探讨丹麦的急诊科和暴力相关伤害相关的一系列风险因素。

**方法：**对奥胡斯县（Aarhus County Municipality）事故分析中心收集的3940名暴力受害者的样本进行案例对照研究。使用丹麦民事登记系统匹配年龄、性别和籍贯，控制组比例为10:1。提取在暴力袭击发生前五年丹麦的健康和社会登记处系统信息作为风险因素，包括婚姻状况，教育资格，就业状况，国籍，参与儿童保护服务（CPS），犯罪记录以及适应障碍和药物滥用障碍的诊断。

**结果：**多变量逻辑回归分析发现，男性、离婚、未婚、非丹麦血统、接受义务教育、无职业或教育或培训、学生身份、参与CPS，先前的犯罪记录和药物滥用障碍的诊断都让暴露于暴力的可能性增加。主要的风险因素是药物滥用障碍（OR = 3.62）和先前的刑事定罪记录（OR = 3.54）。高等教育的实现与暴力受害的可能性降低有关。

**结论：**这些研究结果强调，对急诊科提供的有效干预措施进行研究可能有助于公共卫生工作减少人际暴力带来的健康、社会和经济负担。

Globally, violence is the fourth leading cause of death for those aged 15 to 44 years worldwide (World Health Organisation (WHO), 2014). However, rates of non-fatal interpersonal violence are much higher than fatal, with many victims of physical violence attending emergency departments (ED) for treatment of their injuries (Ranney et al., 2011; Walton et al., 2010). This indicates that ED represent a focal venue to examine risk factors associated with violence-related injuries. Notably, risk factors for physical violence are complex and intertwined and are often common in both victims and perpetrators of violence (WHO, 2014). In studies that have focused on physical assaults using ED data a number of demographic variables have been identified. For example, a Norwegian study investigated assault characteristics of victims over a 2-year period and found that the majority were under the influence of alcohol, young males, had higher rates of unemployment, and were living in an economically deprived area (Steen & Hunnskaar, 2004). A Danish register-based study found that being male, young adults (aged 16 to 30 years), non-Danish and being single or divorced were all significant risk factors associated with being victims of physical violence (Kruse, Sørensen, Brønnum-Hansen, & Helweg-Larsen, 2010). In another study that explored risk factors for assault-related injuries treated in ED among children and adolescents found that increasing age, living in a metropolitan area, being of African American race, and the lack of private insurance were independent predictors in the USA (Monuteaux, Fleegler, & Lee, 2012).

Alcohol and substance misuse have also been documented as robust risk factors for violence-related injuries treated in ED (Cherpitel, Martin, Macdonald, Brubacher, & Stenstrom, 2013; Vitale & Van de Mheen, 2006). For example, a recent study compared youth attending ED for an assault-related injury (AI) and those with non-assault injuries. This study found that over half of the AI group met the criteria for a drug or alcohol

disorder, had a prior visit to the ED for assault injuries, were on probation and met the criteria for posttraumatic stress disorder (PTSD) on the index visit (Bohnert et al., 2015). This latter finding is interesting to note as PTSD and stress-related disorders (acute stress reaction and adjustment disorder) are commonly reported consequences of interpersonal violence, however, less research has looked at the role of stress-related conditions as a risk factor for violence-related injuries. Indeed, it has been well-established that experiencing adversity, particularly in childhood, has been associated with adult re-victimisation (Barnes, Noll, Putnam, & Trickett, 2009; Widom, Czaja, & Dutton, 2008) and studies demonstrate that reinjury for physical assaults are common, particularly in youth samples (Bohnert et al., 2015; Cheng et al., 2003; Copeland-Linder, Johnson, Haynie, Chung, & Cheng, 2012). Adverse experiences may therefore be an important factor in predicting violence-related injuries; however, few ED studies have examined this.

Consistent evidence highlights that rates of violence are higher in youth samples than adults. The National Survey of Children's Exposure to Violence (NatSCEV) reported more than one-third of youth were exposed to a physical assault and 60.8% were exposed to at least one form of violence during the past year. Furthermore, this survey found that those exposed to one form of violence were more commonly exposed to multiple forms (Finkelhor, Turner, Shattuck, & Hamby, 2015). Gender differences in physical violence have also been noted with males being at an increased risk of experiencing fatal forms of violence (WHO, 2014) that occur in public places and/or where the perpetrator is a stranger; whilst females are at heightened risk of violence from intimate partners and/or at home (Johansen, Wahl, & Weisaeth, 2008; Steen & Hunnskaar, 2004; Walton et al., 2009).

This study aimed to identify a number of risk factors associated with exposure to physical violence in a Danish sample of victims presenting to the ED for treatment of their injuries. Specifically, we explored demographic factors (e.g. civil status, national background, employment status); adverse experiences (e.g. involvement in child protective services); a diagnosis of alcohol and substance use problems and a previous criminal conviction. It is anticipated that the findings of this study will contribute to the existing research in a number of ways. First, data were derived from the Danish nationwide registers which represent a powerful tool to investigate a multitude of risk factors in comparison to self-reported measures. Second, risk factors were assessed five years prior to exposure of the physical assault which ensures temporally ordered models of risk are estimated. Third, this study examines a broader range of violence-related injuries treated in ED's as previous studies have focused on specific subgroups, for example, victims of intimate partner violence (e.g. Wu, Huff, & Bhandari, 2010) and adolescent populations (e.g. Walton et al., 2010). Fourth, the current study will use a matched control group to assess differences between those exposed and non-exposed to physical violence. Finally, studies using ED data have highlighted that individuals presenting with assault-related injuries often experience re-injuries possibly as a result of retaliation (Copeland-Linder et al., 2012). Therefore, ED's represent a pivotal setting to target violence prevention interventions. The findings of this study may therefore be useful to assess multiple risk indicators of violence-related behaviours in the years prior to the assault which can be used to inform interventions.

## 1. Methods

### 1.1. Study population

The population consists of individuals with an emergency room contact for a physical violence-related injury, as collected by the Accident Analysis Center for Aarhus County Municipality during three survey rounds: 1987–1988 ( $n = 1613$ ), 1993–1994 ( $n = 1398$ ) and 1999–2000 ( $n = 1052$ ). Using the Civil Registration System, a case-control cohort was established whereby victims 3,940 victims were successfully matched with controls according to age, gender and municipality in a 10:1 ratio of controls to cases. The control group did not have had any emergency room contact or police record due to violence. In Denmark, all residents are assigned a unique civil registry number (CPR), which can be used to link information within and across the nationwide Danish registers. (Pedersen, 2011).

### 1.2. Measures

The population statistics register was used to collect demographic information on the victims and controls. Age was measured in terms of year of birth and was calculated to correspond to the age in the year in which the victim presented to hospital for treatment of violent assault. Marital status was defined as widow/widower, divorced, married and unmarried. National origin was defined as Danish or non-Danish (the latter category comprising immigrants and descendants from immigrants).

### 1.3. Employment status

Using information derived from the Income Statistics Register socioeconomic status was defined as employed, unemployed (defined as unemployed for at least half of a calendar year) outside labour force (OLF; e.g. individuals outside the workforce due to sickness, disability, pensioners) and being a student.

### 1.4. Highest education

Education level was derived from the Education Register and defined as compulsory education (primary and lower secondary, up until age 15–16), secondary education (e.g. upper secondary, vocational, apprenticeships) and tertiary education (bachelor degree or higher).

### 1.5. Adverse experiences

In this study, we used two measures of adversity. The first was any involvement with child protective services (CPS). This variable was defined as the start date of any child/young person who received preventive measures in the form of individual or family support or were placed in out-of-home care. This variable was coded 0 for no CPS involvement and 1 for CPS involvement. The second measure of adversity was a diagnosis of adjustment disorder. This disorder was selected as it manifests after a stressful life event or significant change in life circumstances which causes subjective distress and emotional disturbance. In Denmark, every time a person has contact with a hospital, including emergency rooms and hospital outpatient departments they receive one or more ICD-10 diagnoses, which are recorded in the National Patient Register. The diagnosis codes are registered at the time of discharge by the physician. Danish hospitals went straight from using ICD-8 to ICD-10 in 1994. Adjustment disorder was identified using ICD-8 code 309 and ICD-10 code F43.2. This variable was computed in the five years prior the incident and was coded as 1 if a diagnosis was present.

## 1.6. Criminal conviction

Using the Criminal Statistics Register criminal conviction was defined as any conviction in the previous five years. This variable was coded with a value of 1 if a criminal conviction was recorded.

## 1.7. Alcohol and/or substance use disorders

The National Patient Register was also used to create a variable representing substance use disorder that included diagnoses related to both alcohol and illicit drugs. This variable was defined using ICD-8 303–304 and ICD-10 F10–19 codes with a value of 1 if a diagnosis was present.

## 1.8. Statistical analysis

All demographic information and ICD-10 diagnoses were computed for each cohort separately using the time frame of five years prior to the hospital admission for the violence-related injury. To assess the univariate associations between the risk factors and being the victim of violence, a series of chi-square tests were conducted. For binary variables, the associated odds ratio and 95% confidence interval were also computed. In the second stage of the analysis, a multivariate logistic regression analysis was performed to determine the adjusted differences in associations between the risk factors and being the victim of a violence-related injury. This type of analysis therefore shows the unique effect of each factor whilst controlling for other risk factors. All analyses were conducted in SPSS.

## 2. Results

### 2.1. Descriptive statistics

There was a total of 3,940 victims of violence across the three cohorts, the majority were male ( $n = 2,972$ , 75.4%). The descriptive statistics of the demographic variables are presented in Table 1. Over half of the victims were between 16 and 30 years of age when they experienced the violent injury, just over a third of the victims were aged between 30 and 64 years, attacks for children and those over the age of 65 were least common. There were significant differences between victims and controls regarding their marital status with more victims being unmarried and divorced. Education status was also significantly different with victims being more likely to have attained compulsory education and less likely to attain secondary and higher-level education. Victims were more likely to be outside the labour force (OLF) due to sickness, disability or of pension age. Table 2 presents the univariate risk estimates associated with the binary risk factors. Immigrants were significantly more likely to be victims of violence than Danes.

**Table 1.** Descriptive statistics between risk factors and victims and controls.

	Control N (%)	Victim N (%)	Total N (%)	$\chi^2$ df p
<i>Marital status</i>				
Widow(er)	222 (0.6)	23 (0.6)	245 (0.6)	369.54 (3) $p < 0.001$
Divorced	1,197 (3.1)	335 (8.5)	1,532 (3.6)	
Unmarried	26,334 (68.4)	2787 (70.7)	29,121 (68.6)	
Married	10,747 (27.9)	795 (20.2)	11,542 (27.2)	
<i>Education</i>				
Compulsory	12,952 (36.7)	2013 (57.7)	14,965 (38.6)	634.80 (2) $p < 0.001$
Secondary	20,057 (56.8)	1411 (40.5)	21,468 (56.8)	
Higher	2,317 (6.6)	63 (1.8)	2,380 (6.1)	
<i>Employment status</i>				
Employed	14,647 (38.0)	908 (23.1)	15,555 (36.7)	1077.11 (3) $p < 0.001$
Unemployed	2,372 (6.2)	344 (8.7)	2,716 (6.4)	
OLF	6,296 (16.4)	1424 (36.2)	7,720 (18.2)	
Student	15,180 (39.4)	1,261 (32.0)	16,441 (38.7)	
N	3,940	38,500	42,440	

Note: N = sample size;  $\chi^2$  = chi-square; df = degrees of freedom; p = probability value; OLF = outside labour force.

Involvement with CPS was associated with nearly a fourfold increase in the risk of being a victim of violence and having a criminal conviction was associated with just over a fivefold increase in risk. A prior diagnosis of adjustment disorder and alcohol and/or substance use disorders were robust predictors of being victim of violence.

### 2.2. Multivariate analysis

Results from the multivariate analysis are presented in Table 3. Males were significantly more likely than females to have a physical injury. When compared to those who were married, being divorced or unmarried were significant predictors of violence. Compared to those who completed secondary level education, those who attained compulsory level were at elevated risk

**Table 2.** Risk estimates between risk factors and victims and controls.

	Control N (%)	Victim N (%)	Total N (%)	$\chi^2$ df p	OR 95% CI
Immigrant	2735 (7.1)	430 (10.9)	3,165 (13.6)	75.17 (1) <0.001	1.60 (1.44,1.78)
CPS	605 (1.6)	234 (5.9)	839 (2.0)	351.86 (1) <0.001	3.96 (3.39,4.62)
AD	59 (0.2)	32 (0.8)	91 (0.2)	72.53 (1) <0.001	5.34 (3.47,8.21)
Conviction	2962 (13.2)	958 (42.5)	3920 (15.9)	1313.41 (1) <0.001	4.85 (4.42,5.32)
A/SU	377 (1.0)	331 (8.4)	708 (1.7)	1200.18 (1) <0.001	9.27 (7.99,10.79)

Note:  $\chi^2$  = chi-square; df = degrees of freedom; OR = odds ratio; CI = confidence intervals; p = probability value; CPS = Involvement with child protective services; AD = adjustment disorder; A/SU = alcohol and/or substance use disorders.

**Table 3.** Odd ratios for multivariate logistic regression predicting violence-related injuries.

Risk factors	OR	95% CI	<i>p</i>
Male	1.14 <sub>a</sub>	1.02, 1.29 <sub>a</sub>	.03 <sub>a</sub>
Female			
<i>Marital status</i>			
Widow(er)	1.48	0.73–3.02	.28
Divorced	2.07	1.64–2.63	<.001
Unmarried	1.25 <sub>a</sub>	1.09–1.43 <sub>a</sub>	.002 <sub>a</sub>
Married			
Non-Dane Danish	1.18 <sub>a</sub>	1.00–1.39 <sub>a</sub>	.05 <sub>a</sub>
<i>Education</i>			
Compulsory	1.44	1.30–1.60	<.001
Higher	0.49 <sub>a</sub>	0.36–0.67 <sub>a</sub>	<.001 <sub>a</sub>
Secondary			
<i>Employment status</i>			
Unemployed	1.63	1.32–2.02	<.001
OLF	2.54	2.17–2.97	<.001
Student	1.35 <sub>a</sub>	1.16–1.57 <sub>a</sub>	<.001 <sub>a</sub>
Employed			
CPS	1.91 <sub>a</sub>	1.54–2.37 <sub>a</sub>	<.001 <sub>a</sub>
No CPS			
AD diagnosis	1.75 <sub>a</sub>	0.99–3.10 <sub>a</sub>	.054 <sub>a</sub>
No AD diagnosis			
Conviction	3.54 <sub>a</sub>	3.18–3.95 <sub>a</sub>	<.001 <sub>a</sub>
No conviction			
A/SU diagnosis	3.62 <sub>a</sub>	2.93–4.49 <sub>a</sub>	<.001 <sub>a</sub>
No ASA diagnosis			

Note: OLF = outside labour force; CPS = Involvement with child protective services; AD = adjustment disorder; A/SU = alcohol and/or substance use disorders; OR = odds ratio; CI = confidence intervals; *p* = probability value. <sup>a</sup> = reference category.

whilst having a tertiary education was a protective factor. Collectively, the strongest risk estimates were for having a diagnosis of an alcohol and/or substance use disorders (OR = 3.62), a prior criminal conviction (OR = 3.54), being OLF (OR = 2.54) and being divorced (OR = 2.07).

### 3. Discussion

This study aimed to assess a range of risk factors associated with being the victim of violence using a sample of individuals presenting to an ED for a physical violence-related injury. Previous studies have demonstrated that adverse experiences have been associated with an increased risk of victimisation in both adolescence and adulthood (Barnes et al., 2009; Widom et al., 2008). In the current study, two measures of adversity were used, contact with CPS and a prior diagnosis of adjustment disorder. Findings indicated that CPS involvement was significant predictor of being a victim of violence. This would support previous findings highlighting high rates of revictimisation seen in individuals exposed to childhood violence. Another explanation may be that children who experience maltreatment or witness violence at home have been found to be at heightened risk of aggressive and antisocial behaviour across adolescence and adulthood (Gilbert et al., 2009; Lansford et al., 2007). These factors have also been associated with being a victim of violence in adulthood (Chen, 2016;

DeCamp, Zaykowski, & Lunn, 2017). Whilst adjustment disorder was a significant predictor of being a victim of violence at a bivariate level when entered into the multivariate framework it became non-significant when controlling for all other risk factors.

The dominant risk factor was a prior diagnosis of an alcohol and/or substance use disorders which supports a large body of evidence demonstrating the role of alcohol and drug abuse in violence-related injuries (Cherpitel et al., 2013; Vitale et al., 2006). Furthermore, this finding is consistent with an international study that found that the relative risk (RR) for a violence-related injury was significantly greater in current drinkers (RR = 22.2) than for injuries from other causes across all 15 countries (RR = 4.33) (Cherpitel & Ye, 2010). A possible explanation for the role of alcohol and drug misuse in violence-related injuries is that these substances reduce inhibitions and are generally consumed in social situations whereby others are also participating, leading to more aggressive behaviours which may subsequently lead to a violent provoking situation.

A substantial proportion of victims had a conviction in the five years prior to the attack (42.5%) and findings from the multivariate analyses found that having a criminal conviction conferred a three-fold increase in risk compared to controls. This finding has been noted in other ED studies examining violence-related injuries (Bohnert et al., 2015). Indeed, evidence suggests that victims and perpetrators of interpersonal violence often share similar characteristics (Aaltonen, 2017; Jennings, Higgins, Tewksbury, Gover, & Piquero, 2010). Furthermore, prior studies have shown that individuals treated for violence-related injuries in ED are more likely to be involved in criminal activities than individuals treated for unintentional injuries (Rivera, Shephard, Farrington, Richmond, & Cannon, 1995). One potential explanation for this is that there are certain sociodemographic factors such as neighbourhood disadvantage, engagement with delinquent peers that increase exposure to violent individuals or situations whereby aggressive or antisocial behaviours are more likely to emerge.

Evidence indicates that young males are at increased risk of physical assault than females (Bell, Qiao, Jenkins, Siedlecki, & Fecher, 2016; Monuteaux et al., 2012; Sivarajasingam et al., 2016; Steen & Hunskaar, 2004) which was consistent with the current findings that demonstrated when controlling for all other risk factors males remained at a higher risk than females. Notably, it was evident that males aged between 16 and 30 constituted over half of the current sample highlighting that this particular group may be over-represented in the current study. Furthermore, being of non-Danish origin was a risk

factor for a violence-related injury which supports previous studies that reported elevated risk in ethnic minorities (Kruse et al., 2010; Monuteaux et al., 2012; Steen & Hunskaar, 2004). However, it should be noted that the magnitude of these effects for both gender and national origin was relatively small. Findings further indicated that compared to married individuals, those who were unmarried and divorced also conferred an elevated risk of violence-related injuries. This was similar to an earlier Danish study that found being single and divorced was associated with an increase in interpersonal violence for both males and females (Kruse et al., 2010). Furthermore, individuals who were in receipt of sickness/disability benefits and pensioners were at higher risk of being victims of violence. This finding is consistent with previous studies demonstrating individuals with disabilities are at heightened risk of violence (Hughes et al., 2012) and physical abuse in older adults (Friedman, Avila, Tanouye, & Joseph, 2011).

This study should be considered in the context of some methodological limitations. First, the current analyses were based on hospital admission data on victims of violence presenting for treatment of their injuries. This is therefore likely to underestimate the strength of the reported associations as many individuals may not seek medical care for their injuries. Second, the time period covered in this study is between 1987–2000, therefore, the findings may not be reflective of current trends in interpersonal violence. Third, we did not include analysis of perpetrator status which may have shed light on the type of interpersonal violence the victims experienced (e.g. intimate partner violence or stranger violence). Fourth, a challenge with linked administrative data is that these data are collected for other purposes and researchers do not get to decide what variables are collected. For example, the use of adjustment disorder is not an ideal measure of adversity, therefore, interpretation of this finding should be treated with caution. Finally, details of the nature of the assault and the degree of injuries incurred were not available.

Notably, the current findings indicate that the presence of an alcohol and/or substance use disorders and a previous conviction in the current study were the dominant factors in violence-related injuries. The international consistencies of these risk factors highlight an important focal point to target interventions aimed at reducing interpersonal violence. Indeed, studies have found that experiencing interpersonal violence is usually not an isolated event and that there is a heightened risk of recurrent violence-related injuries particularly within a six-month period (Cunningham et al., 2015; Kaufman et al., 2016). This evidence highlights that recidivism rates are high in assault-injured patients and therefore

future violence interventions may be most effective in the first 6 months after injury. However, the majority of individuals who attend ED are treated and then discharged, the current findings suggest that when these risk factors are taken into consideration these individuals are a vulnerable group in need of services that reduce the recurrence of violence related assaults and reduction in the intent to retaliate (Bohnert et al., 2015).

Several interventions have been developed to target the harmful effects of alcohol on violent crime. Particularly, evidence for the effectiveness of brief interventions in ED's have demonstrated a reduction in violence-related injury and consequences by targeting youth peer violence and alcohol misuse (Walton et al., 2010). Furthermore, there has been some evidence that increasing the price of alcohol has led to a reduction in violence-related injuries requiring hospital treatment (Page et al., 2016). Increases in alcohol prices may be particularly beneficial to youth who represent a high-risk population for violence-related injuries treated in ED's. Additionally, given the links between criminality and violent victimisation it may be beneficial to explore interventions that reduce criminal behaviours as a preventive strategy for violence-related injuries particularly in youth and young adult samples. Evidence from a systematic review of cognitive behavioural programmes for criminal offenders demonstrated a crime recidivism reduction of 25% over a 12-month period (Lipsey, Landenbeger, & Wislon, 2007) which may subsequently reduce violence-related injuries. Finally, more research into effective interventions offered in ED's may help with the public health effort to reduce the health, social and economic burden of interpersonal violence.

In conclusion, this study used the Danish nationwide registers to explore a number of risk factors for violence-related injuries treated in emergency departments using a time period of five years prior to the violent assault. The findings demonstrated that whilst there are multiple risk factors associated with violence-related injuries the strength of these risk estimates differ in magnitude with substance abuse and previous criminal convictions being the most dominant. Recent evidence suggests that rates of violence-related injuries may be declining, however, there are still substantial figures of non-fatal assaults requiring treatment at emergency departments (Sivarajasingam et al., 2016; Summer et al. 2015). Emergency departments, therefore, represent an important venue to target violence reduction interventions.

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