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Costs of violence to the healthcare system in Wales

A report for the Wales Violence Prevention Unit
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Executive summary

A growing body of global research identifies the heavy burden that violence places on our health and social prospects across the life course. Violence also affects families, communities and wider society and has an economic impact.

A public health approach to violence recognises that violence is a preventable problem requiring a societal response, and there is a clear public health argument for investing in violence prevention. However, a number of methodological and theoretical challenges are recognised in relation to public health economics (“how society uses scarce resources to prevent ill health, reduce inequalities in health and more widely promote human thriving through the life course”), which are relevant to violence prevention. Different forms of economic evidence are needed to help policy makers to understand how to prioritise investment in violence prevention.

Identifying the costs of violence to the healthcare system can be a useful starting point for demonstrating the ‘size of the problem’ to policy makers, and alongside evidence from economic evaluation can be useful to inform decision-making and investment in interventions to prevent and reduce violence. The overall aim of this work was to identify and measure the costs of violence to the healthcare system in Wales, using cost-of-illness (COI) methods.

We addressed the following objectives to meet this aim: (i) we carried out a review of the existing literature and approaches used in other COI studies of the costs of violence; (ii) developed a framework and analytical approach; and (iii) calculated the costs of interpersonal and self-directed violence to the healthcare system in Wales.

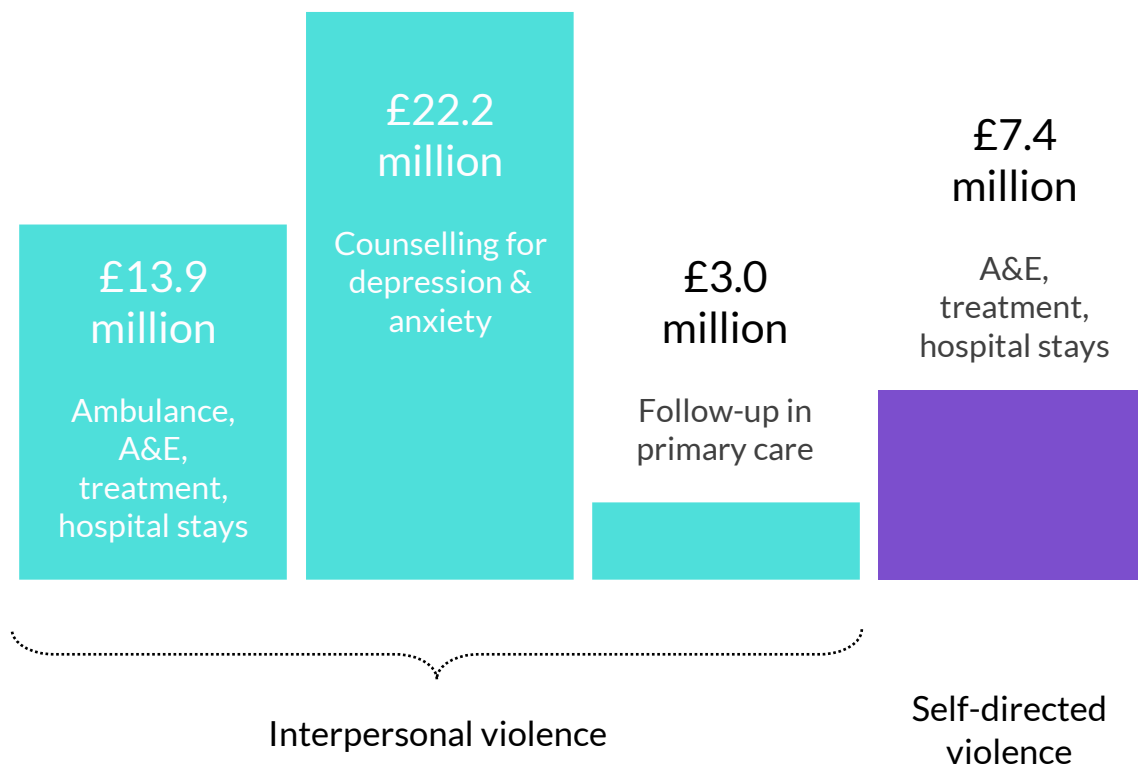
As the COI approach is not a form of economic evaluation, it is not possible to determine cost savings that would accrue from the prevention or reduction of violence. However, the approach does provide a means of presenting and understanding the economic burden of violence. This report only considers the costs of violence to the healthcare system and it is important to recognise that a large proportion of the cost burden from violence falls outside of the healthcare system.

Costs of the consequences of violence

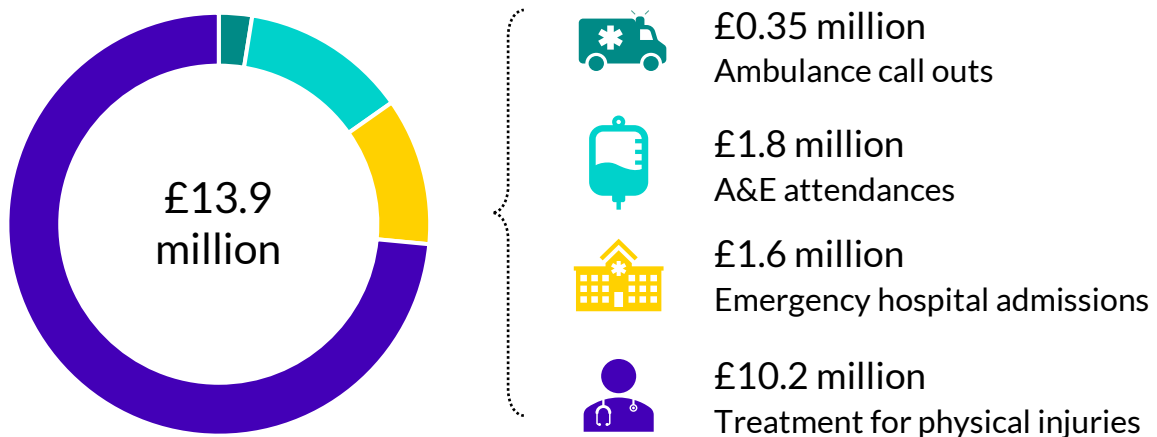
Short-term health-related costs

Violence imposes a large economic burden on the healthcare system in Wales, with estimated annual costs of **£46.6 million** spent on addressing the short-term consequences of violence (year ending March 2019).

Of the total short-term costs, 84% were associated with addressing the consequences of interpersonal violence. Annual costs associated with interpersonal violence and self-directed violence were calculated for the year ending March 2019.



Disaggregated costs of physical injuries from assault:



Long-term health-related costs

Violence is also associated with long-term consequences for health and an increasing body of research has identified the long-term harms that can result from adverse childhood experiences (ACEs), such as experiencing violence or neglect in childhood.

Exposure to ACEs as a proxy measure of the long-term consequences of violence was associated with estimated annual costs of **£158.8 million** (for the year ending March 2019).



Making the economic case for violence prevention

Economic evidence for violence prevention interventions

Sharing data and information between emergency departments and the police substantially reduces costs associated with violence

£82 in benefits are realised for every pound spent on delivering the Cardiff Model for Violence Prevention

Providing training and support for general practice teams to identify women experiencing domestic violence saves money

£37 in societal cost savings have been demonstrated per female patient in general practices that participate in the IRIS programme per year

Tackling ACEs could reduce the high economic costs associated with health-harming behaviours. Acting early and in the first few years of life is likely to provide the most efficient use of public resources.

Making the case for investment in violence prevention

Challenge any misconceptions and beliefs that policy makers and healthcare system providers may have about the value of investing in violence prevention

Communicate in clear everyday language that there is evidence that violence prevention interventions can be effective and cost-effective, and that they can help to free up resources for other parts of the healthcare system.

Counteract arguments that public health interventions cost more in the long-term by identifying interventions with short-term benefits, as well as the mid- to long-term and intergenerational benefits

Conventional discounting methods in economic analyses mean that any benefits that extend further into the future are valued less than short-term benefits. The value of the intergenerational benefits of violence prevention should be highlighted to encourage recognition of the potential benefits of preventing violence now for the future generations.

Identify potential shared objectives and goals and highlight 'win-win' situations where health and other sectors benefit from investment in violence prevention

Support intersectoral activity by considering mechanisms and regulatory structures to allow different organisations to share resources and responsibilities around violence prevention goals.

Give a 'human face' to the potential beneficiaries of violence prevention actions

There is evidence to suggest that individuals are more inclined to help an identified victim to a greater extent than an unidentified population statistic.

1 Introduction

A growing body of global research identifies the heavy burden that violence places on our health and social prospects across the life course (WHO, 2014). Violence also affects families, communities and wider society. Public services including healthcare, the criminal justice system, social services and other sectors such as education, bear the brunt of this impact. Violence is a risk to human health that requires collective action. Violence also has an economic impact. There is the emotional and physical impact on the victims of violence, and there may also be costs associated with damage to property, lost work time and medical costs. Fear of violence may also affect quality of life and may impact on the economic and social choices that people make. A recent study of the Welsh population found that the risk of emergency hospital admission for violence was highest in males and young people aged 18–24 years (Long et al., 2016). The most common cause of admission was head injuries. Living in deprived areas of Wales was associated with a clear gradient of increasing risk of admission for violence.

Identifying the costs of violence to the healthcare system can be a useful starting point for demonstrating the ‘size of the problem’ to policy makers, and in informing decision-making and investment in interventions to prevent and reduce violence. Estimates of the costs of violence to the healthcare system vary. The costs of violence to the NHS in England and Wales have previously been estimated at £2.9 billion (based on 2008/09 cost data; Bellis et al., 2012). More recently, the costs of domestic abuse to the health service in England and Wales have been estimated at £2.3 billion alone (Oliver et al., 2019). It is important to recognise that a large proportion of the cost burden of violence falls outside of the healthcare system. For example, in the form of lost time at work arising from sickness absence or early retirement through poor health. In 2008/2009, an analysis by the London School of Economics estimated the total economic and social costs of violence in England and Wales to be in the region of £30 billion (Bellis et al., 2012).

The overall aim of this work was to identify and measure the costs of violence to the healthcare system in Wales, using cost-of-illness (COI) methods. We addressed the following objectives to meet this aim:

- Carried out a review of the existing literature and approaches used in other COI studies of the costs of violence;
- Developed a framework and analytical approach;
- Calculated the costs of violence to the healthcare system in Wales.

2 Methods

Literature review

We carried out a review of the existing literature to identify published COI studies from the UK and other high-income countries that have examined the costs of violence. The purpose of COI studies is to examine the economic burden that an illness or problem (in this case, violence) imposes on society (see Appendix 1 for a summary of the methodological characteristics of COI studies). COI studies of any type were included.

COI studies typically group costs into the following three categories: direct, indirect and intangible. Costs to the healthcare system are a type of direct cost. Whereas, costs associated with productivity losses or with taking time off from work because of an illness are categorised as indirect costs, and the costs of pain and suffering are categorised as intangible. Findings of the literature review are reported in Appendix 2.

Developing a framework and analytical approach

Based on the findings of the literature review, we developed our framework and analytical approach.

Defining the problem and population

We used a broad definition of violence based on the following World Health Organization (WHO) definition [1]: *The intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment, or deprivation.*

We followed the World Report on Violence and Health typology (Krug et al., 2002), and considered types of violence within the following three broad categories of (i) self-directed violence, (ii) interpersonal violence and (iii) collective violence. However, in practice we did not identify any cost-generating components associated with collective violence.

Epidemiological approach

COI studies may be based on a prevalence or incidence approach (Appendix 1). We adopted a prevalence-based approach in order to calculate the costs to the healthcare system within the 2018/19 financial year.

Perspective of the analysis and costs assessed

COI studies may be conducted from different perspectives (Appendix 1). Our analyses were conducted from the healthcare system perspective, so only cost-generating components within the healthcare system were identified. The work considered a broad spectrum of costs, which were grouped into the main domains of: victims of violence and violence against NHS staff.

Estimating resource use

Estimates of resource use are made using either a top-down or bottom-up approach (Appendix 1). Our analyses were retrospective and so were based on data that has already been recorded using a top-down approach i.e. were based on aggregate figures from hospital admissions and data from other statistical databases/registers. Healthcare costs attributable to exposure to ACEs were estimated using a population attributable fraction (PAF) approach (Ding et al., 2016; Heron et al., 2019).

Valuation of unit costs

The final step in determining the costs of violence to the healthcare system involved identifying the cost-generating components and attributing a monetary value to them. Further details about the valuation of unit costs is provided in the mains sections of the report. Unit costs were based on a range of sources, including NHS Reference costs for 2017/18 (inflated to 2018/19), Curtis & Burns (2019) and national estimates.

Victims of violence

The cost-generating components are identified in Table 1. These are the resources used in the healthcare system as a consequence of violence resulting in physical and/or emotional harm to the victim.

Table 1. Cost-generating components as a consequence of violence

Activities	Primary care	Secondary care
Acute harm (physical injury)	✓	✓
Chronic harm (physical health)	✓	✓
Acute emotional harm (e.g. depression, anxiety disorders)	✓	✓
Chronic emotional harm (e.g. drug &/or alcohol dependency)	✓	✓
Counselling	✓	
Rehabilitation	✓	

Workplace violence

In addition, we planned to consider the costs of violence against NHS staff as a separate population. The cost-generating components associated with violence against NHS staff are identified in Table 2.

Table 2. Cost-generating components as a consequence of violence against NHS staff

Activities	Primary care	Secondary care
Training ('de-escalation')	✓	✓
Staff absence	✓	✓
Staff turnover	✓	✓

3 Costs of the consequences of violence

Short-term health-related costs

Interpersonal violence

The costs of interpersonal violence were estimated by examining physical injuries from assault, the emotional impacts of violence and the use of primary care services following a violent incident. Costs were calculated for the year ending March 2019 and represent costs accumulated over a single year.

Physical injuries from assault

The costs of physical injuries from assault were calculated across a number of steps. Firstly, incidents of police-recorded violent crime with injury (Table 3) were uplifted within each police force area to take account of observations that A&E assault attendances are underreported to the police. We increased the original police totals by 35.3% for women and 18.1% for men in line with Gray et al (2017). In the absence of data stratified by sex, we assumed that 49.8% of victims in the police-recorded incidents were male. This recalculation resulted in an estimated **35,998 incidents of violent crime with injury** in 2018/19.

Table 3. Summary of interpersonal violence 2018/19

	Police-recorded violent crime with injury ¹	28,420
	South Wales A&E attendances for assault ²	4,673
	Emergency hospital admission for assault or maltreatment ³	958

¹Crime Survey for England and Wales police recorded crime in Wales in 2018/19. Recorded incidents of violence against the person resulting in injury to the victim. ²South Wales A&E Assault attendances for 2018/19. ³Emergency hospital admissions (non-elective inpatient stays) in 2018/19 extracted from the Patient Episode Database for Wales.

Using the South Wales A&E Assault attendance dataset (Table 3), cross-referenced with the police recorded incidents, we estimated that 30.0% of the upshifted total assaults resulted in a visit to A&E. Using this estimate, we extrapolated A&E assault attendance figures to the whole of Wales. This identified an estimated **10,817 A&E attendances** for assault across the whole of Wales at a cost of £200 per attendance. Within the South Wales A&E Assault attendance dataset, 3.7% of A&E attendances

involved arrival by ambulance. We also extrapolated this estimate to the whole of Wales, identifying an estimated **1,324 ambulance call outs** at a cost of £267 per call out.

Estimates of the average costs of medical procedures to treat the physical harms of violence with injury were taken from a report on the economic and social costs of crime (Heeks et al., 2018). Costs were based on assumptions about the types of treatment needed and the prevalence of injury among victims of violent crime based on victim interviews from the Crime Survey for England and Wales (CSEW; Table 4). The average cost of these medical requirements was estimated at £1,254 per patient who required medical treatment. These costs were offset against those calculated for ambulance call outs, A&E attendance and emergency admissions.

Table 4. Prevalence of harms and medical requirements following injury

Type of injury	Prevalence of harm among victims	Medical requirement following injury	Unit cost ¹
Minor bruising	59%	0%	£0
Severe bruising	28%	29%	£1,262
Scratches	21%	0%	£0
Cuts	27%	36%	£930
Stabbed	4%	68%	£1,265
Broken bones	6%	85%	£3,097 ²
Nose bleed	7%	0%	£0
Broken nose	2%	100%	£1,199
Lost teeth	2%	84%	£300
Chipped teeth	2%	100%	£156
Dislocation	2%	39%	£930
Concussion	2%	86%	£732
Internal injury	1%	0%	£0
Facial injury	1%	36%	£930
Eye injury	0	0%	£0
Other	8%	45%	£930

¹Extracted from Heeks et al., 2018 and inflated to 2018/19 prices. ²Includes costs for physiotherapy (average. 10 hours).

Adapted from Heeks et al., 2018 (Tables 16, 17 & AP1)

We identified **958 emergency admissions** (comprising 1,636 bed days) for assault and maltreatment within the Patient Episode Database for Wales (based on ICD-10 codes: T73, T74, X85-Y09). Costs for a non-elective inpatient stay (£1,603 from 2017/18 NHS Reference Costs) were applied.

Emotional impacts of violence

Drawing on the findings from victim interviews for the CSEW, Heeks et al. (2018) estimated the emotional impact on the victims of violent crime with and without injury. We applied these estimates to our dataset (Table 5). The resulting hours of counselling were multiplied by the cost per hour of face-to-face contact (£44; Curtis & Burns, 2019).

Table 5. Emotional impacts of violent crime

	Depression		Anxiety/Panic attacks	
	No. affected	Hrs of counselling	No. affected	Hrs of counselling
Violence with injury (n=35,998)	5,400	107,994	7,920	197,989
Violence without injury (n=34,426)	2,754	55,082	4,475	111,885

Use of primary care services

Costs associated with the use of primary care services following an assault injury have not routinely been included in studies of the costs of violence. However, in an early costing study of the impact of domestic abuse, Walby (2004) included costs for GP consultation based on the assumption that victims would make an average of three additional visits to their GP following physical harm.

At an estimated £84 for three additional GP consultations per victim of violence with injury (based on unit costs of £28 per surgery consultation; Curtis & Burns, 2019), the approximate spend on follow-up care in primary care services is £3.0 million when applied to our dataset.

Self-directed violence

The costs of self-directed violence were calculated over fewer steps. Firstly, we identified 4,552 emergency admissions for self-directed violence within the Patient Episode Database for Wales (based on ICD-10 codes X60-X84). Drawing on a recent English study (Cooper et al., 2013), which suggested that 54% of self-harm episodes presenting to A&E result in hospital admission, we uplifted the number of emergency admissions. By applying the 54% uplift to the Patient Episode Database for Wales admission data, we identified an estimated 8,430 self-harm episodes in Wales in 2018/19. To determine the costs of self-directed violence, we used a retrospective analysis of hospital resource use and care that estimated an overall mean hospital cost per episode of self-harm was £809 in 2013/14 (Tsiachristas et al., 2017). The cost per episode calculated by Tsiachristas et al. included A&E attendances, treatments received in A&E and hospital wards, and hospital ward and critical care unit stays. Costs were inflated to 2018/19 prices and multiplied by the estimated number of self-harm episodes.

Exploring costs across different types of interpersonal violence

We examined the feasibility of exploring costs across different types of interpersonal violence. In practice it was not possible to reliably determine the costs associated with each of the types of violence examined. We therefore present a narrative on the burden of each type of interpersonal violence but without calculating a final cost.

Intimate partner violence

It is not possible to reliably determine the number of people who are victims of intimate partner violence (IPV) within the A&E assault attendance and hospital admissions data. Reliable estimates of the number of incidents suffered by victims of IPV are also difficult to find (Oliver et al., 2019). According to the CSEW, an estimated 7.0% of women and 4.8% of men aged 16-59 years in Wales experienced any domestic abuse¹ in the year ending March 2019². The police in Wales recorded 80,924 domestic abuse-related incidents over the same time period and of these, 41,532 were recorded as domestic abuse-related crimes (Table 6). Further, an estimated 34.7% of violence against the person offences recorded by the police in England and Wales were flagged as related to domestic abuse.

Table 6. Recorded domestic abuse-related incidents and crimes by police force area in Wales (year ending March 2019)

Police force area	Recorded incidents		Recorded crimes	
	No. of incidents	Rate per 1,000 population	No. of crimes	Rate per 1,000 population
Dyfed-Powys	6,549	13	4,395	8
Gwent	24,533	41	8,421	14
North Wales	17,137	25	11,327	16
South Wales	32,705	25	17,389	13

Although IPV may also be perpetrated by women against men, women are more likely than men to experience severe physical violence (WHO, 2013), and IPV is a common cause of non-fatal injury in women. The CSEW (for the year ending March 2018) identified that 25.5% of IPV victims reported that they had sustained a physical injury, and 33.1% reported that they had received medical attention (CSEW 17/18). Victims of IPV typically present to health services with multiple minor injuries, and with recognisable patterns of injury to the head, neck or face (Hackenberg et al., 2019; Wu et al., 2010). A review (based on findings in the US health service) estimated that upwards of 35% of all A&E visits by women may be prompted by IPV (Guth & Pachter, 2000).

¹The CSEW definition of domestic abuse includes non-physical abuse, threats, force, sexual assault or stalking carried out by a current or former partner or other family member.

² Based on 2018 mid-year population estimates, an estimated 102,338 individuals (41,589 males and 60,749 females) aged 16-59 years in Wales experienced any domestic abuse in the year ending March 2019.

Child maltreatment

Woodman et al. (2008) have established that physical abuse affects 1 in 11 children in the UK each year and estimated that approximately 1% of all injury-related visits to A&E by children are due to physical abuse. Further, according to a study by Gonzalez-Izquierdo et al. (2014), 6-7% of all unplanned injury-related hospital admissions among children (aged 0-18 years) may be for injuries arising from maltreatment or violence.

Estimates by Lyons et al. (2016) suggest that injuries result in 8,556 hospital admissions and 97,810 A&E attendances amongst children aged 0-17 years each year in Wales. Applying the proportions from Woodman et al. (2008) and Gonzalez-Izquierdo et al. (2014), we would therefore expect an estimated 978 visits to A&E and around 556 hospital admissions each year in Wales related to child physical abuse. We identified 95 emergency admissions relating to assault or maltreatment among children aged 0-16 years in the Patient Episode Database for Wales for the year ending March 2019 (based on ICD-10 codes T73, T74, X85-Y09). In the A&E assault attendance data for South Wales, 352 attendances were recorded among children aged 0-16 years. A range of injuries may be associated with child physical abuse, including head injury, fractures, bruising, and burns (Woodman et al., 2008) and the type of injury sustained has different implications for long-run health impacts and costs (Cattan et al., 2019).

Knife crime




For the year ending March 2019, we identified 100 emergency admissions relating to assault by a sharp object in the Patient Episode Database for Wales (based on ICD-10 code X99). Of these admissions, 28.0% were among individuals aged 16-24 years old and 90% of admissions were male. In the A&E assault attendance data for South Wales, 297 attendances in 2018/19 were recorded as being due to assault by a sharp object, including 70 attendances where a knife was identified as the means of assault. Of these A&E attendees, 31.4% were aged 16-24 years old and 88.6% were male. Stabbing injuries result in significant hospital costs. A study by Christensen et al. (2008), which examined the acute treatment costs of penetrating trauma injury in England and Wales, estimated average hospital costs of £7,196 per penetrating injury due to stabbing.

Long-term health-related costs

As well as the short-term cost burden falling on the healthcare system to treat injuries from violence, violence is also associated with long-term consequences for health. An increasing body of research has identified the long-term harms that can result from Adverse Childhood Experiences (ACEs), such as violence, neglect or living with individuals with substance abuse issues. The Welsh ACE survey (Bellis et al., 2015) found that of adults resident in Wales, 47% had experienced at least one ACE and 14% had experienced four or more ACEs.

Total direct healthcare costs were extracted from the Welsh healthcare budget (where available) for specific groupings related to the following risk factors and causes of ill health related to ACEs: (i) anxiety and depression; (ii) harmful alcohol use; and (iii) illicit drug use. Recently calculated population attributable fractions (PAFs) (Bellis et al., 2019) were then applied to the total healthcare costs to estimate the costs associated with exposure to ACEs.

Across the domains of anxiety and depression, harmful alcohol use, and illicit drug use, exposure to ACEs was associated with long-term costs in the region of £158.8 million in the year ending March 2019. The breakdown of how this cost was calculated across the three domains is set out below:

<p>Anxiety and depression</p> 	<p>The cost of services provided by the NHS in Wales for people with mental health problems was £746 million in 2017/18 (statswales.gov.wales). This figure combines mental health spend across four categories. We took the figure for general mental illness and, following Friedli & Parsonage (2009), combined this with a proportion of NHS spending under the category of general medical services (i.e. services provided by GPs); based on the assumption that around 30% of all GP consultations are associated with mental problems. After inflating to 2018/19 prices, NHS spending on general mental health problems in Wales was an estimated £470 million in 2018/19.</p> <p>Anxiety and depression have PAFs associated with ACEs of 28.3% and 27.5%, respectively (Bellis et al., 2009). If we therefore assume that around 28% of expenditure on anxiety and depression in the year ending 2018/19 was related to the treatment of individuals who have experienced ACEs this generates costs in the region of £130.8 million.</p>
<p>Harmful alcohol use</p> 	<p>The costs of harmful alcohol use to the NHS in Wales were estimated at between £69.9 million and £73.3 million in 2008/09 (Phillips et al., 2011) After inflating to 2018/19 prices, NHS spending on harmful alcohol use in Wales was estimated to be in the region of £83.0 million to £87.1 million.</p> <p>Harmful alcohol use has a PAF associated with ACEs of 24.7%. Applying this to the lower bound figure for expenditure in 2018/19 generates costs in the region of £20.5 million.</p>
<p>Illicit drug use</p> 	<p>An unpublished report (cited in the Substance Misuse Strategy for Wales 2008-2018) estimated the health service costs of illicit drug use in Wales to be in the region of £17.6 million per year. The cost year for these estimates was not clear. If we assume they are based on 2006/2007 prices, then after inflating to 2018/19 prices NHS spending on problem drug use is an estimated £22.0 million.</p> <p>Illicit drug use has a PAF associated with ACEs of 34.1%, and correspondingly an estimated £7.5 million was spend responding to illicit drug use among individuals who have experienced ACEs.</p>

Exploring the costs of violence against NHS staff

It was not possible to reliably determine either the size of the problem or the costs associated with violence against NHS staff in Wales. We therefore present a narrative on what is currently known about the economic burden of violence against NHS staff but without calculating a final cost.

The size of the problem

A 2018 report by the Royal College of Nursing brought together data sources to show the size of the problem of physical and verbal abuse against NHS staff in the UK. Quoting research by the Health Service Journal and Unison, they reported an estimated 312 assaults per trust every year in England. The report also quoted findings from the 2016 NHS Staff Survey for Wales, which identified that 11% of staff had experienced physical violence at work.

Based on more recent figures reported in a 2019 WalesOnline article (Miller & Smith, 2019), there were 3,805 physical assaults against staff reported by Welsh health boards in 2017/18, and although not based on complete data, staff were reportedly injured at least 1,654 times as a result of an assault in 2017/18.

Economic costs of violence against NHS staff

Cost components

Hassard et al. (2019) have mapped out a conceptual understanding of workplace violence showing the main costs to society (Table 7). The pathway also accounts for the economic costs associated with indirect (or vicarious) exposure to violence, for example through exposure to violence as a witness or bystander.

Table 7. Economic costs of workplace violence

Intangible costs	Indirect costs	Direct costs
Estimated monetary value prescribed to the pain and suffering and reduced quality of life, experienced by the victim of violence	Estimated economic costs of productivity losses e.g. reduced workplace productivity due to staff turnover, sickness absence and presenteeism ¹ .	Medical care expenditure for diagnosis, treatment or rehabilitation e.g. medication and counselling costs. Non-healthcare costs e.g. transportation, household expenditure, litigation.

¹Continuing to work whilst suffering a physical or mental health problem.

Adapted from Hassard et al., 2019 (Fig 1.)

As shown in Table 7, workplace violence leads to costs associated with increased staff turnover, medical care, lost productivity, and a range of other issues for injured staff. Expenditure may also be allocated in NHS budgets to approaches that aim to manage, reduce and prevent violence towards staff. Approaches to violence prevention or reduction in the workplace include redesigning the environment or physical layout of

buildings, introducing security measures and policy or procedural changes, as well as staff training to manage and de-escalate violent incidents (Leach et al., 2019).

Cost estimates

The most recent estimate of the economic costs of violence against NHS staff that we could identify come from a 2003 National Audit Office (NAO) report based on staff working in the NHS in England. The NAO analysis suggested that the direct costs of violence against NHS staff in England were likely to be at least £69 million per year (an estimated £110 million in 2019 prices). This was based on the assumption that around 40% of work-related accidents in the NHS were related to violence and aggression (estimated at £173 million per year in 2003).

A more recent US study of the costs of community violence to the healthcare system (Van Den Bos et al., 2017) estimated the costs of workplace violence at \$428.5 million (an estimated £335.5 million), comprising costs for staff turnover, medical care and indemnity, and disability and absenteeism costs.

4 Making the economic case for violence prevention

Why invest in violence prevention?

A public health approach to violence recognises that violence is a preventable problem requiring a societal response (WHO 2002). Violence co-exists alongside and intersects with other root causes of poor health and wellbeing in society, including poverty and deprivation, poor housing, poor quality work, social isolation and poor-quality environments.

There is therefore a clear public health argument for investing in violence prevention. Actions to prevent and reduce violence support basic human rights, reduce deaths, injury and disease, and contribute to addressing the underlying societal factors that harm communities (WHO 2011).

In many countries, however, greater investment is made in treating the ‘downstream’ impacts of violence rather than on violence prevention. According to Finch et al. (2020), “there is far less consensus around the state’s role in keeping us healthy in the first place... concerns about the perceived unpopularity of these interventions, which can be seen as limiting individual freedoms or unnecessary state interference, tend to stifle the long-term change that’s needed.” Hale et al. (2012) also highlight research that suggests that “the incentives in the system remain geared towards secondary care and preoccupied by the demands of the acute care sector”.

A number of challenges associated with public health economics have also been recognised (Richardson, 2012); including the expectation that public health interventions should save money, the belief that long run prevention may cost more than treatment and the reality that evidence alone does not drive policy making.

What is public health economics?

In addition to the public health arguments for investment in prevention, there is a case to be made on economic grounds and a number of reports and papers clearly outline an economic rationale for governments to invest in prevention (e.g. Hale et al., 2012; McDaid et al., 2015; Edwards et al., 2016; McDaid et al., 2018). In outlining the case for investment in early years, Edwards et al. (2016) describe *public health economics* as being “about how society uses scarce resources to prevent ill health, reduce inequalities in health, and more widely promote human thriving through the life

course”. Public health economics provides an overall framework for how scarce resources can be allocated to address public health problems in the most optimal way.

Using economic evidence to inform public health policy and practice

Economic evidence can help policy makers to understand how to prioritise investment in violence prevention. Investing in violence prevention requires investment both within and outside of the healthcare system, including investment in criminal justice policies and strategies directed at societal factors, such as access to education, employment opportunities and income equality (Bellis et al., 2012).

Violence prevention strategies and interventions have costs and benefits that affect different parts of society. Although a form of economic evidence, the costs of violence to the healthcare system alone (as outlined in the previous sections) can't be used as a means of priority setting. To guide and set priorities for the allocation of resources, we also need evidence about the relative cost-effectiveness of different violence prevention strategies and interventions captured through economic evaluation.

It is well recognised that the economic evidence base for public health interventions in general is not well developed, and that there are methodological challenges in the application of economic evaluation methods to public health (Weatherly et al., 2009). This poses a challenge for the economic evaluation of violence prevention interventions, which are typically complex and delivered at a population level.

Types of economic evaluation

Economic evaluation is the “comparative analysis of alternative courses of action in terms of both their costs and consequences” (Drummond et al., 1997). Methods that are widely applied in the economic evaluation of ‘clinical’ healthcare interventions, such as cost-effectiveness analysis and cost-utility analysis, are not always suitable for the evaluation of public health interventions. A cost per QALY (quality-adjusted life year), for example, may not capture the wide-ranging social benefits (and costs) of public health interventions (Edwards et al., 2016).

Health economists have therefore begun exploring the social benefit of public health interventions through other forms of economic evaluation, including return on investment and cost-benefit ratio, which value the financial return (or benefit) of an intervention against the total costs of its delivery (Masters et al., 2017).

Economic evidence for violence prevention interventions

The limitations of the evidence base notwithstanding, there is a growing body of evidence supporting both the effectiveness and cost-effectiveness of violence prevention interventions. Below we provide an illustrative overview of those with relevance to Wales that involve investment from the healthcare system, and which have been shown to be effective and cost-effective.

Community interventions

Sharing data and information

The *Cardiff Model for Violence Prevention* was developed in 1997 in response to the finding that half of all violent incidents that lead to emergency hospital treatment are not reported to the police. The model advocates for the sharing of information between emergency departments and the police. In the emergency department, violence-related injury data (including location, time, date, and mechanism) are collected and combined continuously with police intelligence. The data are used to map where violence occurs frequently and guide an integrated violence prevention response. The model was fully implemented in Cardiff in 2001 and an evaluation compared outcomes in the city with 14 comparison cities across England and Wales. As well as more targeted policing, over the course of the intervention period, a range of prevention strategies were also implemented including pedestrianising sections of a city centre street with a high concentration of bars and pubs, mandatory use of plastic glassware in selected licensed premises, and more frequent late-night public transport services. In the three years following implementation, the results showed the model was associated with a significant reduction in hospital admissions from assault, compared with an increase over the same period in the comparison cities (Florence et al., 2011).

A 2014 study assessed the costs and benefits of the *Cardiff Model* (Florence et al., 2014). After taking account of the costs of implementation, the model was shown to have substantially reduced costs associated with violence. The overall cost/benefit ratio was 1:82, indicating that £82 in benefits were realised for every pound spent on delivering the programme.

Supporting parents and families

Community interventions that provide early intervention to support parents and families can have long lasting benefits, for example by reducing risk factors in childhood that are associated with involvement in violence in later life. There is a substantial body of work and expertise related to early intervention in Wales (Early Intervention Foundation, 2015). *Flying Start* is the Welsh Government's flagship early intervention programme for families with children up to the age of four. The progress of children who have engaged with *Flying Start* is currently being monitored and evaluated to explore their health, education and broader outcomes through a new partnership, Administrative Data Research Wales (ADR, 2019).

The Early Intervention Foundation report (2015) notes that an important challenge for early intervention is that the impact of programmes, such as intensive home visiting in the early years, can be very long term and experienced across a broad range of outcomes. We have seen these challenges play out with the evaluation of the *Family Nurse Partnership* (FNP) in England. Originally developed in the USA as the Nurse Family Partnership, an extensive evidence base demonstrates that this intensive home visiting programme can have long-term benefits for low income families (e.g. Olds et al., 1997; Olds et al., 1998; Kitzman et al., 2019; Mejdoubi et al., 2015). It has also been

shown that the programme accumulates economic benefits over the longer term that exceed its costs (Cannon et al., 2018; Investing in Children, 2013).

The *Building Blocks trial* was commissioned to evaluate the effectiveness and cost-effectiveness of the FNP intervention in England. Based on a two-year follow-up period, the results of the Building Blocks trial found that the FNP programme had little additional short-term benefits over existing services on a range of health related outcomes (Robling et al., 2016) and that it was not a cost-effective use of resources within the context of the NHS (Bell et al., 2019). Within the UK context, it is acknowledged that wider societal issues, such as poor housing or a poor-quality environment, may have inhibited the effectiveness of the programme (Sanders et al., 2019).

Identification, care and support in primary and secondary care

Identifying the signs of violence

The *Identification and Referral to Improve Safety (IRIS) programme* is a domestic violence training and support programme for general practice teams. A randomised controlled trial showed that IRIS training and support had a substantial effect on recorded referrals and recorded identification of women experiencing domestic violence (Feder et al., 2011). A 2012 Welsh Assembly Government White Paper acknowledged that the *IRIS programme* was an effective primary care training programme.

Economic analyses of the *IRIS programme*, both within (Norman et al., 2010; Devine et al., 2012) and outside of trial settings (Barbosa et al., 2018), show that it is both cost-effective from a health service perspective and cost-saving when a broader societal view of its impact is considered (Barbosa et al., 2018). Societal cost savings of £37 have been demonstrated per female patient in the primary care practice per year (£178 saved to a cost of £136 for delivery).

A two-year pilot programme to implement the *IRIS programme* in Wales has been funded by the South Wales Police and Crime Commissioner, with IRIS rolled out to the Cardiff & Vale and Cwm Taf University Health Boards (South Wales Police and Crime Commissioner and Chief Constable with Partners, 2019). There is currently ongoing work towards the joint implementation of IRIS across the Swansea Bay University Health Board.

Working with high risk youth and gangs

Hospital settings can provide opportunities for accessing and intervening with high risk youth injured through violence. *Hospital-based violence intervention programmes (VIPs)* aim to stop the “revolving door” of violence and to reduce the recurrence of violent injury (Dicker & Juillard, 2020).

The health care sector in the USA is increasingly engaged in some form of violence prevention (Decker et al., 2018) and there are examples of VIPs being implemented in English and Welsh hospitals (e.g. www.redthread.org.uk/what-we-do/#a&e). While some US-based studies (in single centres) show that hospital-based VIPs may reduce

future injury and violence and therefore save costs, taken as a whole, the evidence base for VIPs is currently limited as many studies are of poor methodological quality (Strong et al., 2016; Affinati et al., 2016).

Tackling adverse childhood experiences

Tackling ACEs could reduce the high economic burden on the NHS associated with treating a range of health-harming behaviours (including poor diet, smoking, violence perpetration, heroin/crack cocaine use and unintended teenage pregnancy) that have been linked to experiencing ACEs (Bellis et al., 2015).

A UCL Institute for Health Equity report (Allen & Donkin, 2015) identified that there are promising policy options to prevent ACEs from occurring, which involve tackling risk factors for ACEs and acting early. A report by Edwards et al. (2016) brings together evidence relevant to Wales on the likely return on investment and cost-effectiveness of programmes and practice to support the Early Years of children living in Wales. They note that investment in the Early Years offers a means for government to generate social and economic returns simultaneously and reduce lifetime inequalities. They argue that investment focused on the first few years of life is likely to provide the most efficient use of public resources, yielding returns over and above other forms of investment later in the life course.

Making investment in violence prevention happen

This illustrative overview of violence prevention actions demonstrates that there is a substantial body of work and expertise directed towards violence prevention in Wales. However, the challenges of building on these current investments remains. Richardson (2012) identified barriers and possible solutions to investment in public health.

Drawing on Richardson (2012) and McDaid (2018), below we outline a series of strategies that could be used to make the case for further (or to bolster current) investment in violence prevention in Wales.

Challenge any misconceptions and beliefs that policy makers and healthcare system providers may have about the value of investing in violence prevention.

Communicate in clear everyday language that there is evidence that violence prevention interventions can be effective and cost-effective, and that they can help to free up resources for other parts of the healthcare system.

Counteract arguments that public health interventions cost more in the long-term by identifying interventions with short-term benefits, as well as the mid- to long-term and intergenerational benefits.

Conventional discounting methods in economic analyses mean that any benefits that extend further into the future are valued less than short-term benefits. The value of the intergenerational benefits of violence prevention should be highlighted to encourage recognition of the potential benefits of preventing violence now for the future generations.

Identify potential shared objectives and goals and highlight 'win-win' situations where health and other sectors benefit from investment in violence prevention.

Support intersectoral activity by considering mechanisms and regulatory structures to allow different organisations to share resources and responsibilities around violence prevention goals.

Give a 'human face' to the potential beneficiaries of violence prevention actions.

There is evidence to suggest that individuals are more inclined to help an identified victim to a greater extent than an unidentified population statistic.

5 Conclusions

Violence imposes a large economic burden on the healthcare system in Wales, with an estimated £46.6 million spent on addressing the short-term consequences of violence in 2018/19. Of the total short-term costs, 84% were due to the consequences of interpersonal violence. As a proxy measure of the long-term consequences of violence, total costs of £158.8 million were associated with addressing three risk factors and causes of ill health related to ACEs, anxiety and depression, problem alcohol use and illicit drug use.

Violence places a heavy burden on individuals, as well as families, communities and wider society. We used COI methods to estimate the economic costs of violence to the healthcare system in Wales. As the COI approach is not a form of economic evaluation, it is not possible to determine cost savings that would accrue from the prevention or reduction of violence. However, the approach does provide a means of presenting and understanding the economic burden of violence.

The annual burden of violence to the healthcare system in Wales in 2018/19 was estimated at:

- **£46.6 million** for short-term health-related costs. It is likely that this figure underestimates the full costs associated with acute violence-related injuries (Table 8).
- **£158.8 million** for long-term health-related costs using exposure to ACEs as a proxy measure of the long-term consequences of violence (Table 9).

Table 8. Annual costs of violence to the healthcare system in Wales, 2018/19: short-term costs

Short-term health-related costs	£46,597,325
Interpersonal violence	£39,179,345
Physical harms	£13,917,574
Ambulance	£353,512
A&E	£1,767,641
Inpatient	£1,568,487
Medical treatment	£10,227,934
Emotional harms	£22,237,909
Primary care services	£3,023,863
Self-directed violence	£7,417,979
A&E attendance, treatment, hospital stays	£7,417,979

Table 9. Annual costs of violence to the healthcare system in Wales, 2018/19: long-term costs

Long-term health-related costs	£158,817,535
Anxiety and depression	£130,805,066
Problem alcohol use	£20,507,500
Illicit drug use	£7,504,969

While the costs appear substantial, there are limitations to the estimates derived. Importantly, the costs calculated were often based on assumptions drawn from the wider UK and international literature and in these cases, it is not known whether the estimates derived represent an under- or over-estimate of the true costs of violence to the healthcare system in Wales. Nonetheless, these estimates provide decision makers with information about the economic burden of violence and offer a sense of how big a problem it is.

Violence is preventable, and while there is a clear public health argument for investing in violence prevention, there is also a case to be made on economic grounds. Estimates of the economic costs of violence cannot by themselves be used as a means of priority setting. To guide and set priorities, decision makers should draw on the growing body of evidence supporting both the effectiveness and cost-effectiveness of violence prevention interventions. Increased spending on evidence-based prevention interventions would help to prevent the realisation of the costs of violence and over the longer term reduce the economic burden on the healthcare system. They are also worth pursuing for their wider benefits and for the savings that would accrue outside of the healthcare system. Furthermore, the huge burden that arises from the long-term health impacts of ACEs could be avoided if investment in ending violence against children and the funding of evidence-based prevention strategies was prioritised. There is a substantial body of work and expertise directed towards violence prevention in Wales and strategies should be leveraged to make the case for further investment.

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Appendix 1. Methodological characteristics of COI studies

Introduction

There are three key features that distinguish between different types of COI studies

1. Whether a *prevalence* or an *incidence* approach has been used;
2. Whether the methods chosen to estimate the economic costs are based on a *top-down* or *bottom-up* approach; and
3. Whether the temporal relationship between the initiation of the study and the data collection are *retrospective* or *prospective*.

Prevalence or incidence

Prevalence-based COI studies are more common than incidence-based studies and are based on the total number of cases in a predetermined period of time, usually a year. Incidence-based studies refer only to the new number of cases of a condition or group of conditions arising in a predefined period. For conditions with long-term consequences, prevalence-based studies usually result in larger estimates of the economic costs.⁷

Top-down or bottom-up approach

Incidence-based studies require that the methods chosen to estimate the economic costs are performed 'from the bottom-up'. In this approach, the quantity of health inputs used is first estimated from a patient sample and multiplied by estimates of the unit costs of the inputs used. The top-down approach usually consists of allocating total cost estimates for a given population using statistical databases and/or registers. In the top-down approach, a population attributable fraction (PAF) is usually calculated and applied to the corresponding medical cost.

Econometric approach

The econometric approach is similar to the bottom-up approach and estimates the violence attributable costs from estimates of the number of victims within a given period multiplied by the increase in medical costs over that period. The increase in costs is estimated using regression analysis. Individual-level data that include annual medical expenditures and a measure of exposure to violence are required for econometric analyses.

Retrospective or prospective data collection

Approaches to COI studies can also differ depending on whether the temporal relationship between the initiation of the study and the data collection is retrospective or prospective; prevalence- and incidence-based studies can be both performed either prospectively or retrospectively. In practice, prospective studies can be expensive and time-consuming, particularly for conditions that have a long duration.

Appendix 2. Literature review

Methods

Literature searching & selection

We carried out a review of the existing literature to locate studies conducted in the UK and other high-income countries that have examined the costs of violence (including, but not limited to costs to the healthcare system). Literature searches were undertaken in Medline and PsycINFO to identify relevant studies published since 2010. A search strategy was developed using a combination of free text and database index terms.

Table 10. Example search strategy (Medline via Ovid)

#	Search terms
1	exp Violence/
2	(violen* or aggression or ((deviant or antisocial or anti-social or "anti social" or aggressive) adj (behavior or behaviour)) or delinquen* or (conduct adj problem*) or externali?ing or (crime adj victim*) or offend* or conviction or recidivism or robbery or arson or homicide or murder or femicide or infanticide or filicide or terror* or warfare or conflict or ((social or public) adj disorder) or mistreat* or neglect or maltreat* or rape or (unwanted adj (sex* or touch* or fondl*)) or (sexual adj (coercion or harass* or exploit*)) or (human adj traffic*) or (female adj genital) or slavery or (forced adj (prostitution or marriage)) or bully* or bullie* or fight* or fought or assault or batter or battered or (harsh adj parent*) or ((harsh or physical) adj2 discipline) or punish* or suicide or suicidal or suicidality or parasuicide or self-harm or self-injury or (self-directed adj violence) or parasuicidal or (intentional adj injur*).ti.
3	((physical or sexual or mental or emotional or domestic or elder or child or psychological or partner or spouse) adj4 abuse).ti.
4	Crime/ or Crime Victims/ or exp Homicide/ or exp Sex Offenses/ or Coercion/ or "Circumcision, Female"/ or Punishment/ or Bullying/ or Suicide/ or "Suicide, Attempted"/ or Self-Injurious Behavior/
5	or/1-4
6	((economic or social or "health care" or medical or hospital or inpatient) adj cost*).ti.
7	((economic or financial) adj (burden or impact* or effect* or consequence* or loss or losses)).ti.
8	((cost adj2 illness) or "cost-of-illness").ti.
9	"Cost of Illness"/ or "Health Care Costs"/
10	exp Patient Care/ec or exp Medicine/ec or exp Health Services/ec or exp Health Facilities/ec
11	or/6-10
12	5 and 11
13	exp Violence/ec or "Crime victims"/ec or Crime/ec
14	12 or 13
15	limit 14 to (humans and yr="2010 -current") [1095]

One researcher screened the titles and abstracts of the articles identified via the database searches and a random sample of 20% were screened by another researcher for quality purposes. Full text copies of any articles identified as potentially relevant were retrieved and screened for relevance. Any study that aimed to estimate the economic impact of violence using COI methods was eligible to be included. Additional searches were conducted based on forwards and backwards citation searching (using

the identified articles) in Google Scholar. A total of 1,695 records were identified through database searching and other sources (citation searching, reference screening and other report known to the team). A total of 21 COI studies were identified that examined the social and economic costs of violence. The process of study identification and selection is summarised in the modified PRISMA 2009 flow diagram (Figure 1).

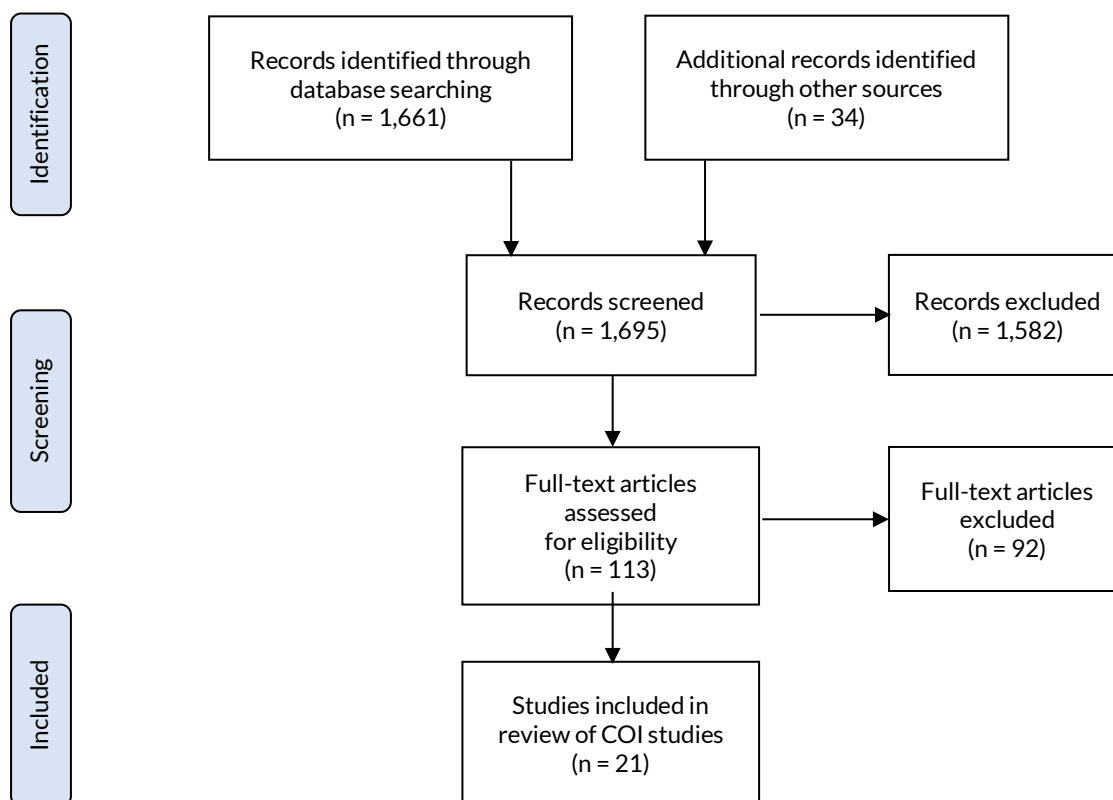


Figure 1. Summary of study identification and inclusion

Review & categorisation of costing studies

Studies identified through the searches were categorised into the following three broad categories: self-directed violence, interpersonal violence, and collective violence. Although in practice, no COI studies on collective violence were identified. For interpersonal violence, we applied further categorisation as follows: child abuse and neglect; intimate partner violence (IPV); abuse of the elderly; sexual violence; youth violence; and workplace violence.

Overview

We included 29 studies that examined the social and economic costs of violence. Most studies examined specific types of violence. Two examined violence in general; one study (Van Den Bos et al., 2017) examined “community violence” and another “violence against women” (Kruse et al., 2011). Methodological characteristics are summarised in Table 11.

Table 11. Cost of illness study characteristics

Reference Country	Violence type	Reference year	Perspective	Prevalence, Incidence	Top-down, Bottom-up, Econometric	Retrospective, prospective	Cost estimate(s)
Boschung et al., 2015 USA	Child abuse & neglect	2013	Societal	Incidence	Top-down	Retrospective	Annual costs
Conti et al., 2017 UK	Child abuse & neglect	2015	Societal	Incidence	Bottom-up	Retrospective	Lifetime cost per victim
Czernin et al., 2012 Switzerland	Self-directed (attempted suicide)	2003	Healthcare	Prevalence	Econometric	Retrospective	Cost per episode; Annual costs
Fang et al., 2012 USA	Child abuse & neglect	2010	Societal	Incidence	Econometric	Retrospective	Lifetime cost per victim
Habetha et al., 2012 Germany	Child abuse & neglect	2008	Societal	Prevalence	Bottom-up	Retrospective	Annual costs
Kahui & Snively, 2014 New Zealand	Child abuse & neglect; IPV	2014	Societal	Prevalence	Top-down	Retrospective	Annual costs
Kinchin & Doran, 2018 Australia	Self-directed (youth suicide)	2014	Societal	Incidence	Bottom-up	Retrospective	Annual costs
Kruse et al., 2011 Denmark	“Violence against women”	2006	Healthcare	Prevalence	Econometric	Retrospective	Excess annual costs
Letourneau et al., 2018 USA	Child abuse & neglect	2015	Societal	Incidence	Econometric	Retrospective	Lifetime cost per victim
McCarthy et al., 2016 Australia	Child abuse & neglect	2014/15	Societal	Incidence	Top-down/Bottom-up	Retrospective	Lifetime cost per victim
Oliver et al., 2019 UK	IPV (domestic abuse)	2017	Societal	Prevalence	Bottom-up	Retrospective	Annual costs
Peterson et al., 2018 USA	IPV	2014	Societal	Prevalence	Econometric	Retrospective	Lifetime cost per victim
Peterson et al., 2017 USA	Sexual violence (Rape)	2014	Societal	Prevalence	Econometric	Retrospective	Lifetime cost per victim
Peterson et al., 2018 USA	Child abuse & neglect	2015	Societal	Incidence	Econometric	Retrospective	Lifetime cost per victim; annual costs
Sgobin et al., 2015 Brazil	Self-directed (attempted suicide)	NR	Healthcare (+ indirect)	Incidence	Bottom-up	Prospective	Cost per episode
Shepard et al., 2016 USA	Self-directed (suicide, attempted suicide)	2013	Healthcare (+ indirect)	Prevalence	Bottom-up	Retrospective	Cost per episode; Annual costs
Sinclair et al., 2011 UK	Self-directed (self-harm)	2005	Healthcare	Incidence	Bottom-up	Retrospective	Costs in year following episode
Tsiachristas et al., 2017 UK	Self-directed (self-harm)	2013/14	Healthcare	Incidence	Bottom-up	Retrospective	Cost per episode
Van Den Bos et al., 2017 USA	“Community violence”	2016	Healthcare	Prevalence	Bottom-up	Retrospective	Annual costs
Wada & Igarashi, 2014 Japan	Child abuse & neglect	2012	Societal	Prevalence	Top-down	Retrospective	Annual costs
Yang et al., 2014 USA	Sexual violence	2009	Societal	Incidence	Bottom-up	Retrospective	Annual costs

Across the specific types of violence identified, 14 studies examined interpersonal violence (including, nine studies of child abuse and neglect, six studies of domestic violence and two studies of sexual violence) and six studies examined self-directed violence. Four studies were conducted in the UK and examined the costs of child abuse and neglect (Conti et al., 2017), IPV (Oliver et al., 2019) and self-directed violence (Sinclair et al., 2011, Tsiachristas et al., 2017), respectively.

Three studies examined the costs of violence in European countries, including Switzerland, Germany and Denmark. Fourteen studies examined costs in the rest of the world, including nine studies from the USA, two studies from Australia and one study each from New Zealand, Brazil and Japan.

Fourteen studies had a societal perspective (including estimation of the direct, indirect and 'human' costs of violence) and seven studies focused on healthcare costs. All but one of the included studies was based on retrospective data collection and just over half (n=11) used an incidence-based method. Ten studies used a bottom-up approach to costing and seven studies were based on econometric methods. The remaining three studies used a mix of top-down and bottom-up methods (Boschung et al., 2015; McCarthy et al, 2016; Wada & Igarashi 2014; Yang et al., 2014).

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