The Cardiff Model for Violence Prevention
The Cardiff Model described in this report exemplifies the public health approach to violence prevention. This approach has four steps. Step one involves systematically collecting data on the magnitude, characteristics, and consequences of violence. Step two involves conducting research to establish the factors that increase or decrease the risk for violence. Step three uses information from steps one and two to design, implement and evaluate interventions. Step four entails scaling up and implementing interventions shown in step three to be effective, and widely disseminating prevention information. Careful reading of this excellent report on the Cardiff Model shows how elegantly the process of developing the model has demonstrated the value of each step, and the power of all four in combination.

The key step one discovery was that the majority of violent incidents which result in emergency hospital treatment are not known to police, and therefore that by combining data from emergency departments and the police on the who, when, where and how of violent events, a much more accurate picture can be obtained to direct prevention efforts to where they are most likely to be effective. Step two innovations were to demonstrate that changes in rates of violence are closely tied to specific events, days of the week, and local practices, such as those related to sporting events, nightlife activities, and alcohol marketing, sales, and consumption. By comparing then existing efforts to address violence, step three was instrumental in diverting scarce resources away from ineffective interventions and towards actions that directly targeted the causes identified in step two. Meticulous step three evaluations showed the remarkable reductions in violence-related injuries and cost savings achieved through this data-driven prevention approach. Step four has seen the Cardiff Model replicated across the United Kingdom, and in cities in Australia, the Netherlands, and the USA, while in Colombia, Jamaica and South Africa local authorities are experimenting with the Cardiff Model as a way of grappling with often sky-high rates of alcohol, gun, and drug-related violence.

The clear role that hospital emergency departments can play in preventing violence is woefully neglected in most parts of the world. But the pioneering work of Jonathan Shepherd and the Cardiff University Violence Research Group described here shows that this does not need to be the case. That is why the WHO Prevention of Violence Unit, alongside other global violence prevention partners such as the United States Centers for Disease Control and Prevention, firmly endorse the Cardiff Model and encourage local and national authorities everywhere to implement it.

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Introduction

The ground-breaking Cardiff Model for Violence Prevention has its origins in the industrial unrest in the UK’s Yorkshire coalfield in the early 1980s when, during an operating list at Pinderfields Hospital, Wakefield, a surgeon commented that “We always see more assault patients (people injured in violence) when there’s a miners’ strike.”

This comment sparked the interest of Jonathan Shepherd, a trainee maxillofacial surgeon, in violence not as a problem for the justice system but as a public health problem. He had already observed that a few local public houses (taverns) seemed to be the locations of disproportionate numbers of assaults which resulted in emergency surgery. On moving to Bristol University as an honorary National Health Service (NHS) consultant surgeon at the Bristol Royal Infirmary, this became the subject of his PhD research (1985-1988). As the theme of one of the chapters, he compared Royal Infirmary emergency department (ED) records of treatment of people in injured in violence with Avon and Somerset Police records of violent offences which took place in the same area of the city over the same period.

The findings, later confirmed in Cardiff and Swansea, were astonishing: only 23% of the incidents recorded in the ED appeared in police records. This raised the obvious question of why this might be, and a successful bid with Bristol University law colleagues to the Economic and Social Research Council for funds to find out resulted. This study followed consecutive people injured in violence from the ED where they were first treated through the justice system. It revealed that police knowledge of violence depends almost entirely on injured people reporting these offences and, crucially, that many choose not to report. The main reasons for not reporting were that injured people were afraid of reprisals if they went to the police, they didn’t want their own conduct scrutinised, and they often could not identify their assailant and therefore couldn’t see what the police could do to respond.
Research Implications

The overall implications of these findings were that ED data might provide unique new information which could be used to prevent violence more effectively than prevention based only on police data, and that these same ED data could also be the basis of a new local and national measure of violence. These implications stayed with Dr Shepherd when he moved in 1991 to the University of Wales College of Medicine (from 2004 part of Cardiff University) as professor of oral and maxillofacial surgery.

The next five years were taken up with establishing his new department and two new research groups including Cardiff University’s Violence Research Group. To explore multiagency violence prevention in the County of Cardiff, he also invited South Wales Police, Cardiff County Council, the local district health authority and the third sector organisation, Victim Support, to send representatives to a meeting. He proposed that violence prevention should be based not only on police intelligence – incomplete because so much serious violence is not reported - but also on information collected in and shared by the University Hospital of Wales ED – the sole ED serving the capital city of Wales. These two developments operationalised violence prevention from a public health standpoint for the first time and, crucially, integrated evaluation with this.
Genesis and development of the Cardiff Model

This first meeting of what became Cardiff’s Violence Prevention Board - the prototype safety partnership and Violence Reduction Unit - took place on 25th July 1997. This partnership continues to be central to the Cardiff Model and uses combined police-ED data to measure and prevent violence. It turns surveillance data into action. Made up of executives with the authority to deploy prevention resources, it works through its constituent agencies, predominantly South Wales Police, Cardiff County Council and the Cardiff and Vale University Health Board. It exemplifies a public health approach to violence prevention.

At the same time, after a fruitless attempt to interest the then Home Office police minister, his shadow minister, the member of parliament for Cardiff South and Penarth, Alun Michael, was approached with the proposal that this multi-agency approach should be adopted more widely, and that the NHS should become a partner in crime prevention policy and practice. This proposal, consistent with the belief of the then shadow Home Secretary, Jack Straw, that crime prevention was too important an issue to be left just to the police, was warmly welcomed. The 1998 Crime and Disorder Act followed the 1997 change in government and reflected this principle. It created 373 Crime and Disorder Reduction Partnerships across Great Britain (Community Safety Partnerships in Wales and subsequently elsewhere) in which, reflecting the Cardiff approach, the NHS is a statutory partner. The Cardiff Model was highlighted in the guidance to the Act as an example of good practice.
“Using specific information collected in emergency health services to better target primary prevention, [allows] emergency health services to identify the injured so that repeat harm can be prevented.. and the mental health and other impacts of violence can be minimised”

Developing this approach in Cardiff involved several important steps, all with national implementation in mind too. Setting up a sustainable flow of useful, high-quality information from the emergency department of the University Hospital of Wales was crucial. To do this, ED software was adjusted to include facilities to routinely record violence time, date, weapon used, numbers of assailants, relationship between the injured and those who caused injury, and precise location where violence had occurred using a free text facility. A trial showed that digital recording of this information by ED receptionists (termed registrars in the United States) worked far better than paper recording by clinicians who, in any event, were too busy with their clinical duties for this extra task. Anonymisation and sharing of these case-by-case data with local authority and police analysts became, and remains, a routine, weekly task for the Health Board IT unit.

A substantial grant was subsequently obtained from the Home Office policing fund to establish a “Tackling Alcohol related Street Crime” (TASC) team to focus on this high-volume category of violence. This included a full-time analyst who analysed the combined data, identified violence hotspots in the county and summarised findings and other key information for the decision-making Violence Prevention Board (the Board). In 2001 this work was mainstreamed by Cardiff’s Community Safety Partnership and the Cardiff Model for Violence Prevention (the Model) became ‘business as usual’. NHS ethics committee and Information Commissioner approval for this data-driven approach were obtained, facilitated by a key feature of the Cardiff Model, that all information collected in the ED is anonymised before it is shared with analysts and other partners. This strategy is not about bringing more offenders to justice or increasing the numbers of police investigations; it is about using specific information collected in emergency health services to better target primary prevention, and to allow emergency health services to identify the injured so that repeat harm can be prevented – secondary prevention from a public health perspective – and the mental health and other impacts of violence can be minimised – tertiary prevention.
Practical Violence Prevention

Working through South Wales Police, patrol routes were adjusted on a weekly basis to include hotspots identified by the combined data. Police officers were redeployed from largely crime-free suburbs into the city centre at night, part of the ‘Cardiff After Dark’ initiative which has been continued and refined to the present day. Working from the data and through the local authority and South Wales Police, the Board also instituted changes in alcohol licensing: opening hours were restricted, a few premises including Bar Risa in the new Millennium Plaza adjacent to Cardiff’s Millennium Stadium lost their licences, and a licensing condition was introduced on major event days (international rugby match days for example), to the effect that premises could only sell drinks in toughened glass, and, subsequently, only in non-glass drinking vessels. This action reflected the violence research group’s findings in a randomised controlled trial that toughened pub glasses resulted in dramatically reduced breakage and injury risk and glass replacement costs11.
In 2000 the Board published a top ten list of Cardiff licensed premises reflecting numbers of violent incidents therein reported in the ED. Apart from drawing prominent public attention to the relative risks in named premises – a step strongly and publicly supported by patrons of Cardiff’s night-time economy - this prompted Cardiff licensees, supported from the start by South Wales Police, to establish a joint forum for discussion of licensing issues in the County. Forum meetings continue. This naming and shaming strategy has been used by the Board from time to time since, including to highlight premises where selling alcohol to intoxicated customers appeared to be taking place according to reports of drunk patients in the ED, an approach subsequently implemented in Australia. An additional full time ED nurse, funded first by the Home Office and subsequently by the South Wales Police and Crime Commissioner (see below), scrutinised records of those injured in violence in domestic settings, principally but not exclusively women, and supported and helped protect them from repeat harm through Multi-agency Risk Assessment Conferences (MARACs), refuge accommodation where necessary, and in other ways.

Many specific prevention operations instituted by the Board were prompted by the combined data. These included joint South Wales Police and local authority parks department work to cut down shrubs in Cardiff’s Gorsedd Gardens and Castle Grounds to increase natural surveillance; this reduced homophobic and other serious violence in these locations almost to zero. A park in the Fairwater neighbourhood was identified as the location of youth violence and successfully targeted. St Mary’s Street – the centre of Cardiff’s night-time economy, was pedestrianised when it became apparent that restricting hundreds, sometimes thousands, of intoxicated, hungry people to narrow pavements, especially when they were seeking transport home, triggered violent incidents. Street lighting was installed in a previously poorly lit pedestrianised side street where a late-night opening nightclub was situated. A street CCTV camera was installed to provide real time surveillance of previously unidentified violence hotspot at an isolated row of retail premises in the, by then entirely redeveloped, Tiger Bay area of the city.
Throughout its existence, the Violence Prevention Board has worked closely with Cardiff University’s Violence Research Group, now an integral part of the University’s Crime and Security Research Institute. Both the Board and the research group were chaired for two decades by Jonathan Shepherd, the clinical academic who convened them and who co-founded the Institute. This close relationship has facilitated rigorous evaluation of the Cardiff Model, evaluation of new interventions suggested by the Board, rapid transfer of effective new approaches into prevention practice, and termination of interventions which proved not to work.
In this last category, free, confidential phone lines installed in the ED waiting area together with "Silence Hurts Too" advice leaflets given to patients and posters encouraging injured people to report to South Wales Police and to seek help from the third sector organisation Victim Support proved ineffective and were discontinued. Victim Support clinics designed in various ways were also introduced in the ED, but uptake was minimal, and these were not continued. It was thought that probation and judiciary representation on the Violence Prevention Board would increase its effectiveness, but this turned out not to be the case. A glass cash back scheme designed to reduce the availability of glasses and bottles which could be used as weapons was initiated in the city but lack of any legislative framework or funding to support it were lacking.

But many interventions initiated by the Board did work, grounded in the evidence-based principles that, for example, limiting alcohol availability, targeted policing and reducing weapon availability (in this case of glasses and glass bottles) are effective.\textsuperscript{16} Rather than displace violence, targeted police activity has been found to create a halo of prevention around targeted locations\textsuperscript{17}. Effective interventions flowing from the Violence Research Group’s knowledge, observations and evaluations also included CCTV camera installation to cover previously hidden violence hotspots (see above).\textsuperscript{18} South Wales Police operations targeted fast-food outlets and night clubs identified as violence locations and included deployment of drug detection dogs among queues of people seeking nightclub access. This last strategy was prompted by the group’s research findings that antisocial lifestyles comprise not only violence but also drug misuse, truanting, car crime and a range of other behaviours harmful to health.\textsuperscript{19,20,21}
Helpful and Unhelpful Influences

Over its first two decades, the Cardiff Violence Prevention Board experienced pressures to deviate from data and evidence driven approaches. Examples include pressure from organisations wanting the principal or exclusive focus to be women and girls at risk rather than also on men and boys who, as the data continue to show in Cardiff and elsewhere, are most at risk of harm.

Following public health principles, the Model is applicable to violence affecting all age groups, both genders and all environments in which it occurs. A further pressure has been to copy non-evidence-based interventions being tried elsewhere, often loudly and persistently advocated. Unbridled enthusiasm and curiosity can get in the way too, for example when the collection of further data items is suggested despite such information having not been shown to be useful for violence prevention. Another important lesson was learnt here: ED receptionists can record some additional data, such as those essential to the Cardiff Model, but add further data items still and the whole data recording enterprise becomes impossible in a busy ED.

Multiagency groups, learning from the Model also shows, need to have strong links with the agencies they comprise, not least so that proposals to disinvest in posts key to multiagency work can be forestalled. Cuts in local authority funding in Cardiff after the 2008 economic downturn led to more than one proposal to disinvest in a crucial data analyst post; retaining this was achieved through the Local Service Board. More damagingly, without reference to the Violence Prevention Board, the University Hospital dispensed with the nurse post responsible for identifying and supporting people injured in violence in domestic settings. This gap in provision was eventually filled with an Independent Domestic Violence Advisor, funded by the South Wales Police Commissioner.

Key to successful implementation of the Cardiff Model continues to be an effective board made up of motivated professionals with the right prevention and communication skills and enough authority in their respective agencies to bring about change – such as redeploying police resource. These roles need to be reflected in professionals' job descriptions.
The data supply chain needs to be strong too; if ED receptionists, the NHS IT officer who anonymises and shares ED data, or the data analyst lose motivation or are not replaced, this breaks down. In Cardiff, the presentation by the Chief Constable of a community safety award to a senior ED receptionist was highly valued and motivated her and her team for many years. Careful selectivity is needed, including when board members are promoted, deployed elsewhere or retire. Sustained senior leadership is important. The key agencies represented in a violence prevention board, whether at city or region level can be kept engaged if they meet in their various headquarters in turn – in County Hall, the Central Police Station, and the University Hospital where the principal ED is located, for example.

Flexibility is needed to reflect the need to prevent violence affecting all age groups, and the emergence of new agencies and new research findings. For example, in response to an audit of Health Board safeguarding responses to children reporting injury in violence, Cardiff prevention board’s work expanded into the education sector. The Board also recruited the manager of Cardiff’s street pastor scheme with its scores of church-based volunteers – “capable guardians” in criminology – in city centre streets at weekends assisting and protecting vulnerable people. The addition of a representative of the Commissioner’s team was helpful when the Police and Crime Commissioner implemented the Model across the South Wales Police force area in 2012. Implementation of the Model in other countries – see below – also requires variation so that it fits national and local circumstances.
Evaluation of the Cardiff Model: is it effective and cost beneficial?

Funded by grants mainly from the Wales Office of Research and Development (the then NHS Research and Development scheme in Wales), evaluations showed that this new approach was effective. For example, when the National Health Service (NHS) was involved in targeting, violence levels in licensed premises were significantly reduced compared to when the NHS was not involved. Home Office iQuanta ‘woundings’ data, which the Violence Prevention Board uses to monitor progress, showed that Cardiff was becoming steadily safer in its family of 14 Home Office designated “most similar” cities in England and Wales. In 2007, Cardiff became the safest city in its family according to this measure.

Most convincingly, a systematic review of evaluations of the Model by public health academics at Deakin University, Australia and a meta-analysis led by public health academics at the University of Cape Town, South Africa, provide evidence that this approach is effective. The Deakin University review of nine evaluations concluded that:

“All studies attempting to measure intervention effectiveness reported substantial reductions of assaults and ED attendances post-intervention, with one reporting no change. Negative logistic feasibility concerns were minimal, with consensus among authors being that data-sharing protocols and partnerships could be easily implemented into modern ED triage systems, with minimal cost, staff workload burden, impact on patient safety, service and anonymity, or risk of harm displacement, or increase to length of patient stay.”

The meta-analysis of evaluations of the model (which the authors termed “injury surveillance systems (ISS) that address violence prevention”) led by the University of Cape Town concluded that: “...the introduction of ISS showed significant results in reducing assault (incidence rate ratio=0.80; 95% CI 0.71 to 0.91).”

Further evidence of effectiveness came from homicide data collected independently by Manuel Eisner, professor of criminology at Cambridge University. The graph in Figure 1 shows that during the period when the Cardiff Model was implemented in Cardiff, homicide levels fell whereas in Birmingham, London, Leeds and Edinburgh, homicide levels rose.
An experimental study and time series analysis of the Cardiff Model for Violence Prevention

Setting
Cardiff, Wales, and 14 comparison cities designated "most similar" by the Home Office in England and Wales.

Intervention
After a 33-month development period, anonymised data relevant to violence prevention (precise violence location, time, days, and weapons) from patients attending emergency departments in Cardiff and reporting injury from violence were shared over 51 months with police and local authority partners and used to target resources for violence prevention.

Main Outcome Measures
Health service records of hospital admissions related to violence and police records of woundings and less serious assaults in Cardiff and other cities after adjustment for potential confounders.

Results
Information sharing and use were associated with a substantial and significant reduction in hospital admissions related to violence. In the intervention city (Cardiff) rates fell from seven to five a month per 100 000 population compared with an increase from five to eight in comparison cities (adjusted incidence rate ratio 0.58, 95% confidence interval 0.49 to 0.69). Average rate of woundings recorded by the police changed from 54 to 82 a month per 100 000 population in Cardiff compared with an increase from 54 to 114 in comparison cities (adjusted incidence rate ratio 0.68, 0.61 to 0.75). There was a significant increase in less serious assaults recorded by the police, from 15 to 20 a month per 100 000 population in Cardiff compared with a decrease from 42 to 33 in comparison cities (adjusted incidence rate ratio 1.38, 1.13 to 1.70).

Conclusion
An information sharing partnership between health services, police, and local government in Cardiff, Wales, altered policing and other strategies to prevent violence based on information collected from patients treated in emergency departments after injury sustained in violence. This intervention led to a significant reduction in serious violent injury and was associated with an increase in police recording of minor assaults in Cardiff compared with similar cities in England and Wales where this intervention was not implemented.
Cost benefit analysis of the Cardiff Model for Violence Prevention

Results
Anonymised information sharing and use led to a reduction in wounding recorded by the police that reduced the economic and social costs of violence by £6.9 million in 2007 compared with the costs the intervention city, Cardiff UK, would have experienced in the absence of the programme. This includes a gross cost reduction of £1.25 million to the health service and £1.62 million to the criminal justice system in 2007. By contrast, the costs associated with the programme were modest: setup costs of software modifications and prevention strategies were £107,769, while the annual operating costs of the system were estimated as £210,433 (2003 UK pound). The cumulative social benefit-cost ratio of the programme from 2003 to 2007 was £82 in benefits for each pound spent on the programme, including a benefit-cost ratio of 14.80 for the health service and 19.1 for the criminal justice system. Each of these benefit-cost ratios is above 1 across a wide range of sensitivity analyses.

Conclusion
An effective information-sharing partnership between health services, police and local government in Cardiff, UK, led to substantial cost savings for the health service and the criminal justice system compared with 14 other cities in England and Wales designated as similar by the UK government.
Homicide Rates in Major UK Cities

Figure 1: Homicide rates in major UK cities

SOURCE: EISNER 2015
Implementation of the Cardiff Model for Violence Prevention in the UK

Almost from its inception in the late 1990s, police forces, cities and regions elsewhere in the UK showed interest in the Cardiff Model.

This interest reflected links with national networks of police forces, local authorities and relevant medical specialties, especially emergency medicine; publication of evaluations by Cardiff University’s Violence Research Group; and links with national government, especially with the UK Home Office. Early adopters included the Wirral/Merseyside Police, Glasgow/Strathclyde Police, Cambridge/Cambridgeshire Constabulary, and the then Government Office for the South East (GOSE) which adopted the model in the early 2000s. National government also showed interest, first in 1996/7. Home Secretaries Jack Straw, Charles Clarke and Alan Johnson visited the Cardiff Violence Prevention Board, as did Attorney General, Patricia Scotland. The board chair took part in Prime Minister’s Downing Street summits on Youth Violence (2000) and, after steep rises in homicide and knife crime in England and Wales, Serious Violence (2019). From 2000 the Home Office crime survey team was interested in the use of ED data as a measure of violence, as proposed by the board chair, and government groups concerned about domestic violence began exploring how the Model could help identify and protect those at risk. Starting in 2006, the Model was the subject of a series of training workshops for relevant practitioners, community safety partnership personnel, and analysts across Wales, organised by the community safety directorate of the then Welsh Assembly Government. In 2007, the Cardiff Model was included in the UK government’s updated Alcohol Strategy, “Safe Sensible Social”.31

Implementation of the Model across the UK was included in the Liberal Democrat manifesto prior to the 2010 General Election. As a result, the new Conservative-Liberal Democrat coalition included it in its programme for government. This prompted the establishment of a cross-government information sharing group based in the then Department of Health; a new Information Sharing to Tackle Violence (ISTV) information standard (ISB 1594) published by NHS Digital which codified Cardiff Model data items; mandatory data collection by NHS Hospital Trusts in England; and two England and Wales audits of implementation. The second of these audits showed that by 2013, 60% of Community Safety Partnerships had implemented the Model at least to some extent.34

However, the economic downturn from 2008 and subsequent local authority and police
Service cost saving programmes reduced the capacity for multiagency violence prevention. In Cardiff, the Community Safety Partnership was disbanded leaving little except its name, with staff redeployed or laid off. Elsewhere, many local authority and police analysts were dispensed with, reducing the capacity for data driven, targeted violence prevention. Unlike in the more protected NHS, where targeted surgery, for example, depends on high quality imaging and other investigations, data analysis was not seen as essential to targeted policing and community safety.\(^{35}\) Perhaps this is not surprising as successive annual Crime Surveys of England and Wales were by then showing year-on-year falls in violent offending – evidence corroborated by the Violence Research Group’s annual surveys of violence related ED attendances.\(^{36}\) However, the upturn in homicides and knife violence in the mid-2010s showed that reinvestment was urgently needed.

In 2017 Cardiff Model data items (Information Standard 1594) were incorporated into the new Emergency Care Data Set (ECDS) implemented in every ED in England. In a further development, in 2020, a free text field was included in this national dataset to facilitate recording of precise violence locations – a crucially important step which facilitates the highly responsive, targeted prevention which the Cardiff Model delivers.

From a violence prevention perspective, the UK 1998 Crime and Disorder Act which mandated a multi-agency approach to reduce crime overall did not go far enough. Whilst it created statutory Community Safety Partnerships and laid a foundation on which agency collaboration could be built it did not mandate or prioritise collaboration to prevent violence specifically.

To address this problem, in 2019 the UK government, relying heavily on published evidence of effectiveness and cost benefit of the Cardiff Model (see above) published its impact assessment of potential new legislation ("public health measures")\(^{38}\) designed to mandate collaboration for violence prevention. This impact was estimated to be substantial. Benefits were forecast to include cost savings across public services “of £858 million over 10 years, equivalent to a reduction of around 20 homicides per year, if just five percent of community safety partnerships implemented the Cardiff Model”. This assessment persuaded the UK government to legislate to introduce a new serious violence duty for specified authorities - local government, police, NHS, and other authorities - to collaborate to prevent serious violence. This new duty is included in the Police, Crime, Sentencing and Courts Bill which, at the time of writing, will become law in mid-2022. In the words of UK government minister Rachel Maclean, "VRUs agree multiagency responses to serious violence based on shared data, emulating the Cardiff Model."

In 2019 the UK Home Office also funded 18 new Violence Reduction Units (VRUs, Violence Prevention Unit (VPU) in Wales) based in police force areas in which serious violence was most prevalent. Based on the concept set out by Jonathan Shepherd and David Farrington in 1993 that violence needed to be addressed as a public health issue, a concept adopted by the World Health Organisation in its 2002 World Report on Violence and Health, UK VRUs take this approach to violence prevention.\(^{40,42}\)
Violence Measurement

Realising that Cardiff Model data could form the basis of a new measure of violence as well as a new way to prevent it, Jonathan Shepherd, in his original Bristol work, compared trends derived from police and ED data. From the outset Cardiff’s violence prevention board has used Cardiff Model data to monitor progress. In 2001, violence related ED attendances in the city were around 80/week; by 2018 they had fallen to around 35/week (see Figure 2).

These data also revealed trends in serious violence in the city during lockdowns and other restrictions imposed during the COVID-19 epidemic. These included substantial falls in violence outside the home, no change in levels of violence in the home or in which weapons were used, reduced risk of violence in which children were injured and substantial reductions in injury risk for males but no significant change for females (Figure 3). Violence levels returned to pre-COVID levels when restrictions were lifted though school reopening was associated with a temporary peak in violence affecting children reflecting friction associated with return to normal school routines.
Figure 3: Trends in serious violence in Cardiff over the period of the COVID-19 epidemic.

Figure 3a: Overall trends in serious violence.

Figure 3c: Violence in which weapons were and were not used to inflict injury.

Figure 3d: Violent injury in and outside the home.

Figure 3e: Violence in which children were injured.
This new metric was also found by Cardiff’s violence research group to be valid and reliable at a national, England and Wales, level\(^{36}\). This was then used alongside national crime survey data and police records to triangulate measurement. Importantly, the group found that trends derived from ED data mirrored trends identified in the Crime Survey for England and Wales – validating both measures. In contrast, police records, always susceptible to substantial swings reflecting the introduction of new crime types and variable reporting and recording rates, were confirmed as an unreliable violence measure\(^{36}\).

Vaseekaran Sivarajasingam, whose PhD was supervised by Jonathan Shepherd and who, since 2018 has been a clinical professor in the research group, led the development of the National Violence Surveillance Network (NVSN) of over 120 EDs in England and Wales. This was established to facilitate annual surveys of serious violence from this public health perspective; annual NVSN reports have been published since 2000. In addition to clarifying violence trends, this new measure came into its own during the COVID-19 epidemic when the face-to-face interviews which are the basis of the Crime Survey were not possible. 2020 Cardiff Model (NVSN) data showed that COVID restrictions were associated with substantial reductions in violence serious enough to result in emergency hospital treatment in England and Wales (Figure 4)\(^{45}\).

![Figure 4: Trends in violence in England and Wales according to ED (Cardiff Model) data and data from the Crime Survey of England and Wales (CSEW).](image)

**NOTE:** The Crime Survey depends on face to face interviews but these were not possible during the COVID-19 epidemic. It was therefore not possible to derive Crime Survey estimates for 2020.
Case Study

The Cardiff Model, London

In the London Mayor’s Question Time on 17th March 2010, Boris Johnson was asked by London Assembly member, Dee Doocey, if he supported “the use of the so-called Cardiff Model of tackling knife crime, developed by Professor Jonathan Shepherd, where accident and emergency departments collect anonymous data on the precise location and time of violent incidents involving knife crime and with the data then shared with the crime and disorder reduction partnership? If so, what steps have you taken to encourage its greater use across the whole of London?”

This prompted a successful bid by the Mayor’s Office for Policing and Crime (MOPAC) to the Home Office for funds to support implementation of the Model across London. From 2011, London Assembly member Caroline Pidgeon took up this cause and asked the Mayor a series of detailed questions about implementation. This “Information Sharing to Tackle Violence” (ISTV – the Cardiff Model) initiative resulted in all 29 London EDs collecting and sharing Cardiff Model data with the central Greater London Authority (GLA) Safe Stats team by 2019. An information sharing agreement between the Metropolitan Police and the GLA supports operational use of these data for targeted policing.

An example of the issues which implementation of the Model can raise concerns St George’s Hospital, the major NHS trauma centre serving Southwest London. Here, in 2018, a data manager brought Cardiff Model data sharing to a halt because, despite Information Commissioner approval and legislation permitting data sharing for the prevention of crime, she was concerned that this approach might not be compliant with the new General Data Protection Regulations (GDPR). Every effort was made to solve this problem and, in the end, the Cardiff Violence Prevention Board chair contacted the crime correspondent of the Evening Standard, Justin Davenport, who in turn reported the concern to Caroline Pidgeon who commented that it was “truly horrific” that violence prevention had been interrupted in this way. Within a week of publication of the ensuing article in the Evening Standard, data sharing by St George’s Hospital had been re-established. Furthermore, it also prompted the laggard Chelsea and Westminster Hospital to begin Cardiff Model data sharing.

Across London, these ED data have revealed many violence hotspots which would otherwise be invisible. It was clear, for example, that violence hotspot maps of Tower Hamlets looked very different when they were made using data from EDs compared with maps generated from Metropolitan Police data. Here, ED data showed concentrations of violence around the Royal London Hospital, Stepney Green Park and immediately to the west of Bethnal Green Technical College, whereas, from police intelligence, the only obvious hotspot was at the junction of Whitechapel and Mile End Roads. Cardiff Model data also showed that hotspot locations vary by day of the week. Most strikingly, these data revealed crack houses for the first time, for example immediately south of the Homerton Hospital in North London and east of Heathrow Airport in West London.

Implementation of the Model in London also showed that injury at the hands of more than one assailant was a signal of gang violence (Cardiff Model data include numbers of assailants involved in each incident). This enables the Metropolitan Police to identify gang violence more often, even if injured people involved seek treatment in an ED far from the scene of attack. The Integrated Hackney Gang Unit uses these data to identify and target gang activity across the metropolis.
International implementation of the Cardiff Model


Other than in research settings, where the Model had been described at criminology and public health conferences in Paris, Stockholm, Atlanta and other cities, the first international interest in implementation came in 2011 from the city of Milwaukee in the United States. Professor of emergency medicine, Stephen Hargarten, convened a series of workshops with city authorities with the result that Cardiff Model data collection began in Froedtert Hospital, one of two Level I adult trauma centres in the state of Wisconsin, and in the Children's Hospital of Wisconsin. Discoveries from these data included schools and parks in the West Allis suburb of the Milwaukee metropolitan area which were hotspots of violence in which children were injured; these were not apparent from law enforcement data. The collection of Cardiff Model data in adult and paediatric trauma centres in the United States has subsequently been studied and found to be feasible and practical.

In 2017 the US Centers for Disease Control and Prevention (CDC) published its Cardiff Model toolkit. A formal process evaluation of replication of the Cardiff Model in the South-eastern United States was published in 2019. In 2020, with CDC support, the United States National Cardiff Model Network of cities implementing and planning to implement the Model was established; city, state, university and CDC representatives in the United States meet every two months.

In 2012, the then mayor of Amsterdam, Eberhard van der Laan, decided to replicate the Model in the city and convened a round table conference in his parlour. Invitees included chief executives of all the Amsterdam hospitals with EDs, the chief executive of the biggest health insurance provider in the Netherlands, and leaders of other key agencies. A pilot with a view to adoption followed, funded in part by the Netherlands government justice department. Challenges included deeply ingrained antipathy to information sharing, including in legislation, which resulted from occupation by a foreign power in World War II which daily demanded from hospital doctors, on pain of arrest or worse, personal information about hospital admissions. Unexpected concern came from the hospital chief executives...
who were all worried about the impact of violence prevention on numbers of trauma patients and consequent reductions in hospital income; this adversely affected their motivation to implement the model. In contrast, the national health insurance provider told the conference that if violence is reduced this would reduce insurance premiums. A further pilot followed in the University city, Tilburg.

Encouraged by WHO endorsement, interest, pilot projects and implementation in other countries followed, including in Colombia in South America prompted by the country’s Attorney General, Nova Scotia in Canada prompted by the province’s chief medical officer, and Jamaica, prompted by the chairman of the country’s Violence Prevention Alliance. Facilitated by the Pan American Health Organisation, the Model is being implemented as part of Jamaica’s 2018-2030 National Plan of Action for an Integrated Response to Children and Violence.60

In the Western Cape province of South Africa, led by trauma surgeon, Andrew Nicol, and public health specialist, Richard Matzopoulos, both University of Cape Town professors, Cardiff Model data is collected in Groote Schuur Hospital’s trauma centre and used by an injury and violence observatory to map violence in the Cape Town metropolitan district.27 Implementation in the city of Paarl, also in Western Cape province, has been intermittent reflecting changes in police leadership there. In 2020 the South African Local Government Association, working with the Joe Slovo Foundation, decided to implement the Model across the country, starting in the Tshwane metropolitan municipality (the greater Pretoria area) where the initial prevention focus is gender-based violence61.

In Australia, led by Deakin University public health professor Peter Miller, the Cardiff Model has been implemented in Sydney, Melbourne, Canberra, Geelong, and Warrnambool in a randomised trial, “Driving change”12 in which emergency department data is used to reduce alcohol-related injury and violence. EDs in nine hospitals are randomised in five groups clustered according to geography and, from 2016, they began interventions at three monthly intervals. ‘Last-drinks’ data on alcohol consumption in the 12 hours preceding ED treatment, typical alcohol consumption, and precise location of alcohol purchase and consumption, are collected by ED triage nurses and clinicians as a part of standard clinical process. Information formulated according to the principles of motivational interviewing (“brief advice”) is given to ED patients who self-report risky alcohol consumption. Public health interventions include information sharing with licensed premises, with police and other community agencies, and public release, as carried out in Cardiff (see above) of ‘Top 5’ premises lists. Logistic and feasibility concerns are documented, together with clinical impacts of implementing this systems-change model in an Australian context. Economic impact and return on investment are being evaluated in a formal economic cost-benefit analysis.12

Launched alongside the Global Partnership to End Violence Against Children in 2016, INSPIRE is a set of seven evidence-based strategies for countries and communities working to eliminate violence against children. Initiated by the WHO, INSPIRE serves as an evidence based technical package and guidebook for implementing effective, comprehensive global programming to combat violence. The Cardiff Model is part of the Safe Environments strategy (the S in INSPIRE) and has been described and promoted in WHO events for African, Nordic, Eastern European, Latin American and South American countries.62
How the Cardiff Model became a Welsh and UK export to the United States: A personal perspective

“Little did I imagine that sending our published evaluation of a new violence prevention strategy to a couple of hundred criminologists around the world would be a crucial step to formal adoption in the United States.

One recipient, Robert Boruch, professor at the University of Pennsylvania, sent this to one of his former graduate students, Laura Leviton, then at the Robert Wood Johnson Foundation (RWJF), the United States’ largest philanthropic organisation focused solely on health. Dr Leviton visited Cardiff. A substantial grant followed, which funded replication and evaluation of the Model in Atlanta and Philadelphia. Along the way, the CDC’s injury research centre in Milwaukee, Wisconsin, was funded by the US Bureau of Justice Assistance to replicate the Model there. Lectures and workshops in these cities followed. I’d already presented at the CDC after American Society of Criminology meetings. Replication of the Model identified issues specific to the US which can influence implementation. For example, whereas Cardiff, a city with approximately half a million people, is served by just one emergency department, in the US a city of similar size has several EDs. Helpfully, the Greater London Authority Safe Stats team had developed a way of combining and analysing data from multiple sites - a solution tailor made for the United States.

A further issue was federal law requiring security for health information in electronic form, including depersonalised information such as that which is key to the Cardiff Model. In the UK, sharing this had been considered and approved by UK Information Commissioners. Similar guidance and reassurance were needed in the United States. These were forthcoming in 2017 in CDC’s Cardiff Model Toolkit which includes guidance on setting up the Model, for hospitals and law enforcement, guidance on legal, technical, and financial considerations, building partnerships, external communications and media relations and a “readiness checklist” for cities. In his introduction, CDC Director James Mercy writes “We encourage you to use these materials to create a broad partnership to prevent violence in your community”. Further grants have since been awarded in the United States to support implementation, including use of the Model to map drug overdoses many of which are not known to agencies other than health. The need for and relevance of the Model has been boosted in the United States by a 2019 study showing that almost 90% of violence resulting in emergency hospital treatment in the state of Georgia is not known to police.
“As in the UK, the stories of violence prevention achieved in the United States through the Model, are as compelling as the data.”

As in the UK, the stories of violence prevention achieved in the US through the Model, are as compelling as the data. In Atlanta, for example, Cardiff Model data revealed a shopping mall, gas station and budget hostel where violence is concentrated, prompting the Cardiff Model partnership to include managers from these businesses. As in the UK, lessons are being learnt about prevention mechanisms. These include the mutual accountability which is generated in the multi-agency boards at the heart of the Model – accountability for prevention not generated if agencies work in their traditional silos.

Nowhere is such silo working and the need for accountability more evident than in United States policing where 18,000 police departments, some with just a few officers, many not trusted or seen as legitimate, are responsible for violence prevention. A 2015 report initiated by President Obama recommended that “Law enforcement agencies should engage in multidisciplinary, community team approaches for planning, implementing, and responding.”57 As I and Steve Sumner at CDC have written, the Cardiff Model provides a blueprint for such teamwork.58 Writing this at my Crime and Security Research Institute desk an image comes to mind of the sign on the door of an Atlanta restaurant, “Cardiff Dinner”, signposting police, health and local government executives to their supper after a day of CDC workshops. It signaled that the Cardiff Model really had become a Welsh and UK export.”

Jonathan Shepherd
The Future.

Prerequisites to implementation of the Cardiff Model for Violence Prevention and the benefits it can generate include local commitment to and senior leadership of collaborative violence prevention; establishing and maintaining a continuum of Cardiff Model data collection, anonymisation, analysis and use; and city or community violence prevention boards comprising executives of specified authorities with the authority to act on the data promptly.
Taking each of these pre-requisites in turn, commitment to multi-agency prevention can be at regional level - as in the violence reduction units in England and Wales - or national level – as in the UK’s Crime and Disorder Act and serious violence duty legislation. But local, city or community level commitment is essential. Here, sustained senior leadership can come from any relevant agency, for example a senior emergency physician, surgeon, or public health doctor; a senior police officer; or a senior local authority (municipality) official.

Embedding Cardiff Model items in ED software so that data collection can be sustained may involve commissioning such changes, implementing new data sets such as the Emergency Care Data Set in the UK, or capitalising on local, acute hospital or trauma centre IT expertise and facility to make these changes. Continuous recording of Cardiff Model data means receptionist (registrar or nurse in the United States) training and motivating week to week relationships with hospital violence prevention leads – ideally an emergency physician in the ED. Since all Cardiff Model data are normally in electronic form, data anonymisation and sharing can be done at a distance from the ED by hospital or trauma centre IT staff – this is a routine task in Cardiff and elsewhere in the UK.

Data analysis requires mapping and other data skills and the ability to communicate regularly and effectively with the local violence prevention board on one hand and with data recorders in the ED on the other. In Cardiff, data is shared on a weekly basis. Each link in this data chain is important – relationships between them need to be managed – as in any multidisciplinary team. Violence prevention boards need to meet often enough to respond promptly as new geographic and temporal concentrations of violence are identified from the data. Cities are dynamic and evolve continuously. Cardiff Model data can be used for strategic assessments, but their real power is to drive week to week, month to month, tactical prevention.

Effective governance is needed, including at national or state inspectorate level and violence prevention processes need to be integrated with the governance of other city or community services. None of them are more important than arrangements to keep people safe.

As examples in this report show, collaboration between violence prevention practitioners and researchers with relevant quantitative and qualitative skills can be very helpful. Evaluation interest and research funding is increasingly available – from the National Institute for Health Research (NIHR) in the UK for example. But such collaboration is not essential to local prevention. Fidelity to Cardiff Model principles and practice is key, adapted to local and regional circumstances and flexible enough to evolve as new findings emerge.

Adoption of the Cardiff Model by national government on both sides of the Atlantic and by the World Health Organisation sets the scene for further adoption and scaling up. The CDC Cardiff Model toolkit53, including its readiness checklist, is applicable internationally.
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