Data Explained

Violence-related incidents and underlying vulnerability

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This Data Explained provides information about a linkage project that combined health data from the Unscheduled Care Datamart (UCD) and the Scottish Drugs Misuse Database (SDMD) covering the period 2011 to 2018 across the whole of Scotland. This publication is intended to guide future researchers who wish to use data from these (or similar) sources and to offer advice on future dataset development and documentation.

The administrative data discussed in this Data Explained was made securely available through Scotland's National Safe Haven. The research was conducted by a team of researchers working for the Scottish Centre for Administrative Data Research (SCADR). The data, which was provided by Public Health Scotland, was not originally collected for research, so there are some gaps and inconsistencies, which are detailed in the following sections.

Introduction

Project background

Violent crime in Scotland has declined significantly over the last two decades. Nevertheless, it remains a key policy priority due to its lasting impact on individuals, families and communities. Emergency services, such as Police Scotland and the Scottish Ambulance Services, deal annually with thousands of incidents involving assault-related injuries, a high proportion of which involve some kind of health vulnerability or crisis (Scottish Government, 2024).

Scotland has been at the forefront within the UK of promoting a public health approach to violence, which recognises that dealing with the underlying causes and correlates of violence can help to reduce overall risk within the population. Scottish research has shown a strong relationship between different aspects of vulnerability and violence in youth and adulthood (Batchelor et al., 2019; McAra & McVie, 2016). Moreover, there is international evidence that the risk of violent victimisation is higher amongst those who experience health vulnerabilities, including mental illness and substance use (Turanovic, 2022).

Scottish policymakers are keen to understand more about violent victimisation and the factors that are associated with population risk (Scottish Government, 2025). Specifically, they would like to know more about the lives of those who experience repeat violent victimisation and what interventions might help to reduce levels of risk. This includes evidence about how violent victimisation is associated with health vulnerabilities, like mental illness and substance use.

This project sought to explore the issue using Public Health Scotland data to identify a cohort of individuals who had experienced violent victimisation, as identified using ambulance, emergency department and hospital admissions data, and examine the known health vulnerabilities experienced by these individuals.

Data

This project used linked data from the Unscheduled Care Datamart (UCD) and the Scottish Drug Misuse Database (SDMD).

The UCD is a collaboration between Public Health Scotland (PHS), NHS 24 and the Scottish Ambulance Service (SAS). It incorporates data from a variety of health services (including NHS 24, SAS, GP out of hours, and Emergency Department) and mortality data from the National Records of Scotland.

The SDMD holds information on the characteristics and circumstances of individuals who have sought assessment to receive care or treatment in relation to drug use. This dataset was replaced by the Drug and Alcohol Information System (DAISy) in 2021, which contains similar information.

The datasets used for this project are summarised in Table 1. The data requested were specific to this project and only available to the research team. Researchers interested in conducting similar projects can apply for these, or other, datasets following standard procedures: see the Researcher Access Service.

Table 1: Project datasets

Datasets		Description
Unscheduled Care Data Mart (UCD)	SAS	Unscheduled calls from Scottish Ambulance Service.
	ED	Patient-level data from emergency departments and minor injury units.
	SMR01	This data is collected as part of the Scottish Morbidity Records (SMR) and records general/acute inpatient attendance and day cases.
	SMR04	This data is collected as part of the Scottish Morbidity Records (SMR) and records patients' attendances for patients receiving care in Mental Health Specialities.
	Death records	Death records from the National Record of Scotland (NRS) submissions.
Scottish Drug Misuse Database (SDMD)		Information on individuals presenting to drug treatment services and their journey through treatment.

Cohort definition

The cohort for this study was anyone who was recorded as experiencing an assault-related injury by SAS, ED or hospital in Scotland between 01/01/2011 and 31/12/2018.

SAS uses the MPDS system (Medical Priority Dispatch Systems) to create an ***initial dispatch code***, and then a ***final AMPDS code (diagnosis)*** is recorded once the call-out is complete. The system does not provide a detailed classification of incidents involving different types of violence; however, it records information about whether the incident involved an 'assault'. For this study, the ***final AMPDS code*** was used by the UCD team to create flags to identify any SAS incidents classified as 'assault related' during the study period.

ED and hospital admissions (SMR01) datasets include diagnosis variables which are recorded at different stages of the emergency care pathway; these are based on dispatch or clinical codes using diagnostic information which is presented as **ICD-10 codes**. There were various ICD-10 codes that related to assault-related injury, so these were flagged by the UCD team.

Unfortunately, there were issues with the ED and hospital admissions data, which did not provide reliable information on assault-related injuries (these are discussed in the 'Data Limitations' section below). Therefore, the cohort used for analysis included only those with an assault-related injury identified by the final AMPDS code from SAS.

Data linkage

The Community Health Index (CHI) number was used to link the records of cohort members across different data sources.

The UCD team extracted the CHI numbers for the cohort and sent these to the eDRIS team to conduct the data linkage. The UCD team also sent the CHI numbers to the SDMD team, who extracted relevant data about drug treatment services for the cohort members and sent this to the Electronic Data Research and Innovation Service (eDRIS) which is a part of Public Health Scotland (PHS).

Once the eDRIS team received the relevant data from both UCD and SDMD, they linked the datasets together and removed the CHI identifier. The CHI was replaced with a pseudonymised identifier that did not allow individuals to be identified by the researchers. Finally, eDRIS transferred the linked data to the National Safe Haven project area, making the data available to the researchers.

Key variables

The key variables used for analysis in this study are described below and summarised in Table 2, along with details of which datasets the information was drawn from and why they were included.

Demographic variables
All datasets included in the UCD contain core demographic information, which was used to examine the characteristics of individuals involved in assault-related incidents. These variables help to analyse how experience of violence varied across population groups and places. The key demographic variables used were:

- Age
- Sex
- Deprivation (Scottish Index of Multiple Deprivation)
- Geography (Local Authority, Urban/Rural classification and datazone)

Health vulnerabilities
The project also incorporated a range of indicators to explore some of the underlying characteristics and broader circumstances in which violence occurred. These were derived from a combination of diagnostic codes ICD-10 (SMR01, SMR04), AMPDS code (in ambulance data), data from SDMD and relevant flag variables, where available. The purpose of these variables was to identify co-occurring health issues that may be associated with episodes of violence.

- Mental health (diagnosis)
- Alcohol Related (flag and diagnosis)
- Substance Misuse Related (flag, diagnosis and SDMD)

Continuous Urgent Care Pathways (CUPs)
A Continuous Urgent Care Pathway (CUP) describes the sequence of emergency care services accessed by an individual within a 24 hours period. In cases involving a mental health-related hospital stay (SMR04), the pathway may extend to cover a 48-hour period. This variable was requested to understand care pathways following assault-related incidents.

Mortality
Mortality data was used to assess long-term outcomes of individuals who experience violence. The relevant variables used were:

- Date of death
- Cause of death (ICD-10 codes)

Alcohol
In addition to the health datasets, the project also included aggregate-level data about alcohol outlet availability in Scotland. Aggregate data on alcohol outlets by Datazone from the Centre for Research on Environment, Society and Health (CRESH) was used.

Table 2: List of key variables

Variables	Dataset	Description	Reason to include
Age	All datasets	Patient's age at time of event	Descriptive and confounder variable
Sex	All datasets	Patient's recorded sex	Descriptive and confounder variable
SIMD Decile	SAS, ED, SMR01	Area level deprivation indicator for patient and locus of incident	Used to explore deprivation gradients in exposure to violence
Urban/Rural Classification	SAS, ED, SMR01	Area level classification based on datazone	Used to explore social gradients in exposure to violence
Mental Health	SAS, ED, SMR01, SMR04	Diagnosis or coded indicator of mental health conditions or treatment	Assesses health vulnerabilities linked to violence
Alcohol-Related (flag, diagnosis)	SAS, ED, SMR01	Diagnostic code or flag indicating alcohol involvement	Assesses health vulnerabilities linked to violence
Substance Use (flag, diagnosis	SAS, ED, SMR01, SDMD	Diagnostic code or flag indicating drug involvement or drug treatment	Assesses health vulnerabilities linked to violence
Continuous Urgent Care Pathways (CUPs)	SAS, ED, SMR01	Measuring Patient Journeys through Emergency Services	To assess care pathways following assault-related incidents.
Date of Death	Death Records	Date of mortality	Mortality outcome analysis
Cause of Death	Death Records	ICD-10 cause of death	Mortality outcome analysis

What can the data be used for?

We used this data to examine the association between violent victimisation (based on information about assault-related incidents) and underlying health vulnerabilities and how it varied across Scottish communities. We also investigated how violence varied geographically and how patterns changed over time, with a particular focus on analysing area-level factors such as deprivation and alcohol outlet availability.

Our project had the following research questions:

1. What is the burden of assault-related call-outs on the ambulance service, and how has this changed over time?

2. What are the typical care pathways following assault-related ambulance call-outs, and how have these evolved over the study period? Specifically, what proportion results in emergency department attendance or hospital admission, and how do these patterns vary?

3. To what extent do assault-related ambulance call-outs involve alcohol or drug-related factors, and how have these patterns changed over time?

4. What are the characteristics of people who experience assault-related ambulance call-outs, and how has this changed over the study period?

5. To what extent do assault-related ambulance call-outs lead to repeated contact with emergency services?

6. How are prior and subsequent health-related vulnerabilities (e.g. alcohol, drugs, mental health) associated with assault-related call-outs?

7. What is the risk of mortality among those who experience assault-related ambulance call-outs, and what are the typical causes of death?

8. What are the spatial and temporal patterns of assault-related ambulance call-outs in Scotland?

9. What is the association between are area-level characteristics such as alcohol availability and deprivation associated with the occurrence and recurrence of assault-related ambulance call-outs?

Existing research or examples of previous research

This is the first large-scale data linkage project of its kind in Scotland, and as such, we will be the first to produce research outputs using this approach. While health data has previously been used to explore related issues, these earlier studies focused on more specific questions. For instance, Goodall and colleagues (2019) analysed the incidence of assault related injuries due to sharp force in Scotland. In the same year, Duncan et al. (Duncan et al., 2019) analysed ambulance service calls related to mental health problems and self-harm.

Data limitations

As with any project using administrative data, there are inherent challenges in repurposing routine data for research purposes. The dataset used for this study consists of administrative health records originally collected for operational and clinical purposes rather than research. Consequently, the structure and content of the data prioritises the needs of healthcare delivery over research requirements and present several limitations (Schölin et al., 2025).

The project's scope and methods required ongoing considerations of practical and data-related constraints. Even though a formal feasibility assessment was not undertaken, some aspects of feasibility were explored throughout the project as part of the research process. In addition, the absence of a user guide with detailed information about data quality impacted the ability to assess the feasibility of the research questions before requesting the data.

As a consequence, several limitations in the data prevented some of the original research questions from being fully addressed. This mostly affected the questions that required analysis of ED and hospital admission data. Therefore, for some of our analysis it was necessary to restrict the analysis to assault-related incidents originating from the ambulance service data only. This provided more robust data by which to address our research questions.

'Flags' variables
The UCD contains flagged variables for 'significant factors' involved in a patient pathway and contact with emergency and urgent care services. This project required the inclusion of 'flags' for 'assault', 'substance misuse', 'alcohol related' and 'police involved'. In addition, diagnosis variables such as 'presenting complaint code' that provides the AMPDS and diagnosis using the ICD-10 clinical codes were requested to support further classification.

The derived flag variables for 'substance misuse-related' and 'alcohol related' appeared to miss some incidents. This may reflect differences in the criteria used to generate the flagged variables. Therefore, more transparency regarding the criteria used to generate the flags would be beneficial for researchers planning to undertake similar analyses. In addition, there is no clear guidelines on how to use the dataset, so it would be helpful to obtain a codebook detailing the available variables and how the derived variables (flags) have been estimated.

Additionally, there is no flag for mental health-related incidents in the UCD data, which is a missed opportunity as it limits the exploration of co-occurring needs in assault victims. Although AMPDS and ICD-10 codes were used to identify cases involving mental health incidents, this proved particularly problematic for the SAS dataset. This is because the SAS dataset provides only a single diagnosis code per incident, which limits the ability to identify cases involving assault alongside mental health concerns or other co-occurring issues.

Diagnostic information gaps in ED
The ED dataset had poor coverage of the diagnosis codes required to obtain a reliable picture of assault incidents. This resulted in substantial variability in data quality across years and health boards. The researchers sought further advice from a UCD data analyst, who confirmed the main findings regarding the data quality and provided reassurance that this was a known issue.

Following the initial inspection of the data and consultation with our Research Advisory Group (including members of Public Health Scotland) and UCD's analysts, it was decided that the ED and SMR01 data were not reliable enough to provide a full picture of the prevalence of assault-related incidents in Scotland during the study period. Consequently, the study cohort was defined exclusively using assault-related incidents identified in ambulance (SAS) data. Information from ED and SMR01 was then used to supplement this cohort, providing additional context on individuals' previous or subsequent healthcare contacts and related incidents.

Suggested improvements & recommendations to data owners

Develop a codebook or user guide for UCD data
To support the effective use of the UCD dataset for research purposes, it is recommended that a codebook or user guide is developed and made available to researchers. This should provide detailed descriptions of the available variables, including their definitions, coding structures and data sources. In particular, it should provide detailed documentation on how derived variables, such as flag indicators for significant factors such as assault, substance misuse, alcohol involvement and police involvement, are constructed, including the criteria and codes used.

This guideline would greatly improve the transparency and reproducibility of research using the UCD data, as well as the consistency of findings, and would support more robust and informed analysis across projects.

Ensure availability of ethnicity and other protected data
Ethnicity is a critical variable for understanding disparities across a range of indicators and for the effective targeting of interventions. There is also increasing demand for information on other protected characteristics (including gender identity and sexual orientation). We recommend that data on protected characteristics are systematically collected and consistently included in data extracts provided to researchers. This will highlight the differential impact of violence across ethnic and other vulnerable groups and support efforts to address health inequalities.

Incorporate an assault flag in incident records
Given the importance of accurately identifying cases of assault within health service data, we suggest that ED and ambulance services implement a clear flag to indicate suspicion or confirmation of assault when incidents are recorded. This flag would improve the identification of episodes involving violence for both clinical and research purposes. In addition, there is significant interest in distinguishing assault-related injuries that have resulted from a domestic assault compared to other types of violence. It would be useful for healthcare workers to record this information.

Include a mental health flag for the UCD data
There is a known overlap between mental health issues and co-occurring morbidities such as alcohol consumption and substance misuse as well as the increased risk of victimisation for individuals presenting with those conditions. Therefore, it would be beneficial to introduce a mental health flag in the UCD data to help identify these cases.

Suggested future data linkages

A future project could extend the scope of the 'Violence and Underlying Vulnerabilities' project by creating a data linkage between health records and police-recorded crime data. This would enable the development of repeated cross-sectional cohorts of individuals who have experienced assault. This would also allow understanding the overlap between police-recorded incidents and potentially capture violent incidents that are not known to the police. Creating annual cohorts would enable year-on-year comparisons of victimisation patterns and their associations with underlying vulnerabilities, including mental health issues, substance misuse and alcohol-related conditions.

If individual-level data linkage is not feasible, an alternative would be to link aggregate assault counts at small area level units (such as data zones) to aggregated measures of violence from police records. While this data linkage would provide a more limited understanding of the individual-level risk of victimisation, it would offer meaningful insights into the spatial patterns of violence and the overlap between health and police records.

Finally, linking health records from UCD data with the Police data from the Vulnerable Person Database (VPD) would greatly benefit research into domestic violence. This would improve our understanding of associated risks and help us to identify patterns of use of health services among individuals flagged as vulnerable in domestic abuse contexts.

Conclusion

In this Data Explained, we provided an overview of the project, highlighting the innovative use of health records to explore criminological issues. The project demonstrates the potential of administrative data in interdisciplinary research by linking routinely collected emergency health data to broader questions of victimisation and underlying vulnerabilities.

We also included a description of the datasets used and their limitations for this project to support future use. Although not exhaustive, these insights offer a starting point for further projects. This is an example of the value of interdisciplinary approaches to improve our understanding of complex social issues.

References

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Glossary

ADR-S: Administrative Data Research Scotland
AMPDS: Advanced Medical Priority Dispatch System
ED: Emergency Department
CHI: Community Health Index
CRESH: Centre for Research on Environment, Society and Health
DAISy: Drug and Alcohol Information System
DMDS: Drug Misuse Database
eDRIS: Electronic Data Research and Innovation Service
EPCC: Edinburgh Parallel Computing Centre
ICD10: International Classification of Diseases and Related Health Problems, Tenth Revision
iVPD: Interim Vulnerable Person Database
NRS: National Records Scotland
PHS: Public Health Scotland
SAS: Scottish Ambulance Service
SCADR: Scottish Centre for Administrative Data Research
SMR: Scottish Morbidity Records
UCD: Unscheduled Care Datamart

Disclaimer

This work was produced using administrative data accessed through the Scottish National Safe Haven. The use of the data in this work does not imply the endorsement of the Trusted Research Environment or data owners in relation to the interpretation or analysis. This work uses research datasets which may not exactly reproduce National Statistics aggregates. National Statistics follow consistent statistical conventions over time and cannot be compared to linked datasets.

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