

Developing a Crime Harm Index for Western Australia: the WACHI

Paul D. House¹ · Peter W. Neyroud²

Published online: 9 May 2018

© The Author(s) 2018

Abstract

Research Question Can a reliable measure of precise harm levels for the 100 most harmful and frequently occurring offences be developed in Western Australia (WA) based on analysis of actual court penalties for first-time offenders?

Data Criminal and traffic court sentences in 2.2 million records over 6.5 years were analysed to extract the number of days of imprisonment actually imposed in sentencing decisions for approximately 52,000 first-time offenders (see House 2017).

Methods Sentences for all first offenders in a sample of the 102 most common offence categories were analysed to compute for the median number of days of imprisonment to which each first offender was sentenced in each of the categories. Monetary penalties and conditional community sentences were converted to equivalent ‘prison days’ and added to the computation of the median of days of imprisonment per offence category. The number of reported offences in WA in the study period for each of the 102 categories was then multiplied by the median prison days sentenced per category. The sum of the products of median prison days times offence count was then tallied across all offence categories to form a weighted index of crime harm, which we define as the Western Australian Crime Harm Index (WACHI). Applying a minimum requirement of at least five separate court cases for each crime category, a total of 88 offence categories survived the reliability threshold for inclusion in the index.

Findings The 88 offence categories in the WACHI contain both high-harm and high-volume offences, permitting 95% of all offences reported for over 5 years to be assessed for WACHI scores. The counts for these offences moved in different directions from the WACHI total in two of the four year-to-year comparisons. Changes in WACHI were shown to have been highly sensitive to increased reporting of historical sex crimes, isolated in one district each of both Metropolitan Perth and one Regional centre.

✉ Peter W. Neyroud
pwn22@cam.ac.uk

¹ Western Australia Police, Perth, Australia

² University of Cambridge, Cambridge, UK

Conclusions Carefully implemented use of the West Australian CHI could improve both public safety and policing by adding precision to resource allocation decisions, assessments of priorities and evaluations of policing initiatives. The WACHI would be even more reflective of the changing level of harm to victims if all crime trends were to be based on crimes that occurred in the year under analysis, with separate reporting of crimes that happened many years ago. With that key adjustment, police professionals, department of justice officials, citizens and local governments can use a WACHI to make better decisions about how to prioritise policing in a wide range of contexts.

Keywords Crime harm index · Crime trends · Crime seriousness · Resource allocation

Introduction

Counts of reported crimes, arrests and response times have long been the yardsticks by which police performance has been measured (Alpert and Moore 1993; Sherman 2013). Western Australia Police, for example, rely on internally reported crime statistics for performance grading and resource allocation within the force. Yet that methodology provides little guidance for consideration of the large differences in harm that societies attribute to various crime types. For example, some crimes cause severe injuries or death and others cause scant harm, but for the most part, they are counted equally. WA Police currently allocate resources based on the volume of two general categories of harm—personal crime and property crime. Comparing numbers in these broad categories lacks the specificity to distinguish more serious crimes that are low volume but high harm. As a result, there is no measure available to assess trends or differences in total harm to each community.

At the front line, police officers recognise the varying harms for individual crime types and officer discretion is based on this judgement. Officers usually weigh the crime harm for each individual incident and take an appropriate action (Goldstein 1963; Padfield 2010). Aside from these broad interpretations, however, crime harm is not measured or tracked. Implementing a force-standard crime harm index (CHI) would allow any police force greater precision with which to measure, report and allocate resources according to the actual total harm inflicted on the community by each offender, against each victim, in each area or community. In a time of fiscal constraint, WA Police, as in other forces, would then be able to ‘target scarce resources on predictable concentrations of harm from crime and disorder’ (Sherman 2013).

Research Question

This article proposes the first official Australian model of a CHI, derived from locally sourced harm values via the analysis of median court sentences for first-time offenders. Its aim is to answer this research question:

Can a reliable measure of precise harm levels for the 100 most harmful and frequently occurring offences be developed in Western Australia (WA) based on analysis of actual court penalties for first-time offenders?

To add further insight, the study applies the index to compare 5-year trends in crime counts to 5-year WACHI trends, both state-wide and across 11 districts in Western Australia.

Context: the Western Australia Police Jurisdiction Western Australia Police are responsible for policing the geographically largest single police jurisdiction in the world, an area covering 2.5 million square kilometres comprising 2 regions, 11 districts and 162 police stations. The state has a population of approximately 2.6 million, around 11% of the national total. Metropolitan Perth contains four police districts covering 67% of the population. The remainder of the population resides within Regional WA in seven police districts. The state employs 6800 police officers, including auxiliary officers and Aboriginal liaison officers, together with 2000 police staff.

Measuring Crime and Harm for Policing

This article is based on an extensive review of the published literature relating to crime harm and its application in policing (House 2017), including (a) how the recording of Police data and measurement of crime harm has developed in the past century; (b) the various options available for weighting the relative harm of each offence type; (c) how harm is measured internationally; (d) the development of harm indices in the UK, the USA, Canada and New Zealand; and (e) examples of how these indices have influenced policing deployments.

This section focuses on the decision to build a WACHI based on actual court sentencing outcomes. That decision was based on consideration of four possible methods for deriving relative harm values for each offence category from cost-free and accessible sources endorsed by the authority of a democratic government: sentencing guidelines, maximum sentences, actual sentences and first offender sentences.

Sentencing Guidelines Sherman (2007) and Sherman et al. (2016a) proposed the use of England and Wales sentencing guidelines as a basis for a ‘democratic’ index (Sentencing Council 2017). The CCHI was developed from these guidelines to achieve a standardised approach to sentencing. Bypassing the need for multiple unskilled arbiters to rate the seriousness of crimes with no context, the CCHI applies a framework of ‘starting point’ sentences developed over decades of consultation and deliberation by senior judges, under authority delegated to the Sentencing Council by the UK Parliament. A starting point sentence considers the penalty for a first-time offender with no aggravating or mitigating factors. Each component of this framework is designed and agreed to by a panel of justice practitioners and experts. One of the many benefits to this approach is transparency, with the CCHI relying solely on information that is already in the public domain. The CCHI is supplemented by the inclusion of court-imposed monetary penalties (fines), which are included in that assessment by converting to days in prison based on the local minimum wage. *Given the absence of official sentencing guidelines for our state, however, it was not possible to employ this method in WA.*

Maximum Sentences While Sherman et al. (2016a) also considered maximum penalties, they rejected this method for reasons that were then empirically tested in WA. A review of WA maximum sentences and their applicability as a harm measure was conducted by the WA Police Evidence-Based Policing Division (EBPD) in May 2016 (Kwan 2016). The aim was to determine whether maximum legislated penalties represented a reasonable metric on which to measure crime harm. This analysis compared the Cambridge CHI values with WA maximum sentencing data using a non-domestic assault dataset. Kwan found that maximum sentences do not vary to the same degree as CCHI prison days and are not able to distinctly separate harmful and less harmful crimes. *Based on this evidence, the EBPD considered maximum sentences not to be an appropriate metric for measuring harm in a WA context.*

Actual Court Sentences A number of developed countries have now implemented harm indices utilising actual court outcomes as a baseline measure. Canada's 'crime severity index' (CSI) and 'violent crime severity index' is based on a historical assessment of the actual court outcomes for each crime type, with the average number of days in prison used as a metric (Babyak et al. 2009). The CSI is used by its law enforcement agencies to track national and local harm values over time. These harm measures and trends are available in the public domain for citizens to view. The Canadian CSI does not take into account conditional punishments beyond incarceration, and offences attracting lower-scale punishments such as fines do not feature on the scale (Babyak et al. 2009). Similarly, New Zealand developed a Justice Sector Seriousness Score, utilising a similar method to Canada's (Sullivan et al. 2016). Similarly, the Office of National Statistics in the UK has also utilised the analysis of actual court sentencing data to measure relative harm. The Crime Severity Score incorporates non-custodial sentences by converting them into nominal days of imprisonment (Ashby 2017; Bangs 2016). *For reasons of confusing the harmfulness of offences with harm caused by each offence, WA rejected this method in favour of a more precise use of actual sentences, based on sentences of first offenders.*

First-Time Offender Sentences The most important point of difference between the guideline-based Cambridge CHI and the official severity scores derived from actual court sentences is the first-time offender. Only the CCHI focuses on the penalty for a first-time offender, whereas the other indices include sentence values influenced by the antecedent offences of repeat offenders. The latter method, as Sherman et al. (2016a, b) argue, clouds the representation of actual harm to the community caused by the offence per se. *Given the aim of the WACHI to help police allocate resources in ways that reduce harm to victims, the EBPD decided to focus on actual sentences of first offenders.* It only reached that decision, however, after a well-developed effort to survey judges to derive their own simultaneous rating of the relative harm caused by a large number of offence types.

Why Not Survey the Judiciary? An example of what WA initially attempted to do is the Swedish CHI that was developed in 2015 based on a survey of District Court Judges (Rinaldo 2015). The judges were asked to score 118 crime categories with starting point sentence values similar to those used in the CCHI (Weinborn et al. 2017). The researcher, a senior police officer, assessed inter-rater reliability of the judges'

scores and applied them to define harm hotspots for anti-social behaviour in Gothenburg, Sweden (Rinaldo 2015). Establishing consensus between raters and, in this case, judges, was essential to gauge the average expert opinion. However, the sample size in this case was quite low, with responses from only five of the ten judges surveyed, raising questions about the external validity of this method.

Sentencing guidelines have not been published within any Australian state or Territory, so working with the judiciary to construct a local harm index was a natural step to consider in applying this methodology to the WA Police jurisdiction. Due to the tight time frame for the research project, this step was placed on hold in favour of analysing actual sentences but may still have value if completed at some future point.

Data and methods

Given the decision to construct a WACHI based on sentences for first offenders, the first step in such a process is to decide which offence types to analyse. Analysing sentences on all 1333 offence types was considered impractical, so a smaller sample was chosen to capture both the harmful and frequently occurring offences. Within the 5-year period 2012–2016, 1,541,639 offences were recorded in the WA Police Incident Management System (IMS) against 774 offence categories (tried in both the criminal court and traffic courts). Analysis identified a ‘power few’ distribution (Sherman 2007) within this data where 96% of the offences (1,476,830 of 1,541,639) occurring within those 5 years were recorded against only 13% of the offence categories (102 of 774). To ensure an appropriate representation of high and low harm offences was included in this sample, the categories were cross checked with other published crime harm indices. Following this cross-check, it was confirmed that these 102 distinct offence categories capture a representative sample of both the high harm and high-frequency offences and so were selected as the survey questions (Fig. 1).

Data Sources The primary data sources for this analysis were 880,000 criminal court and 1,200,000 traffic court cases, captured by the WA Department of Justice between January 2010 and June 2017. Within these data, each court case is recorded as one row, with a unique identifier for the case and the offender and includes specific information on the following:

- Offence: including the offence count, offence name, legislation reference (criminal code act, road traffic act, misuse of drugs act, etc.), legislation section, sub-section and paragraph reference
- Court: including the court name and location
- Outcome: including the outcome type (fine, imprisonment, detention, withdrawn, supervision order, good behaviour bond) and outcome description (fine in dollars, incarceration in years, months or days and community order duration)

All 102 of the sample offence categories were recorded within these data, eight within the traffic court data and 94 categories within the criminal court data. These data were solely used to derive CHI weightings. For further details, see House (2017).

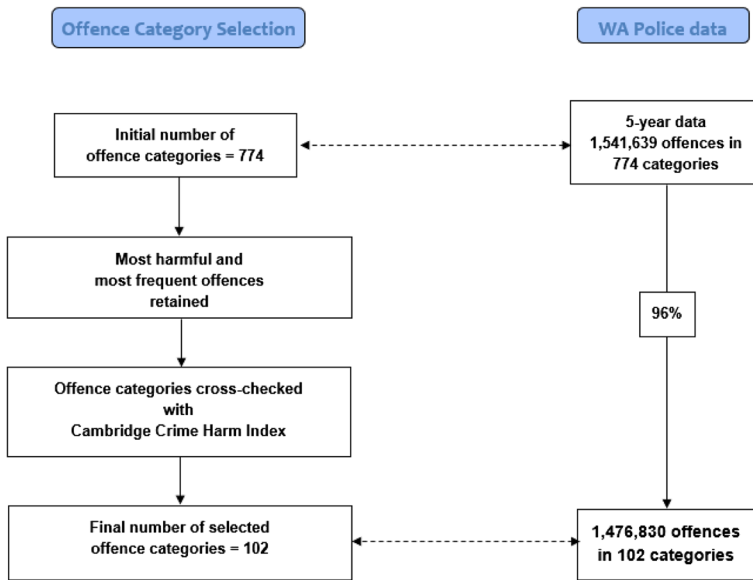


Fig. 1 Offence category selection process

The second source of data was a table of offences recorded by WA Police in the Incident Management System (IMS) for the period 2012–2016 (1,541,639 offences), with attributes including the offence type, date and district of occurrence. As previously described, offence frequencies were used to refine the 774 offence categories to the 102-category sample (Fig. 1). These data were also used to calculate 5-year harm trends.

Limitations and Data Cleaning The court case and outcome data used was collated from the Supreme, District, Magistrate’s, Drug, Traffic and Children’s courts. These are located in both Metropolitan Perth and regional Western Australia. Data recording practices that appear to be consistent with any government or private database requiring human input and inconsistencies were noted, requiring a lengthy process of data cleaning.

Each case is tried and recorded against criminal code legislation, yet court data fields containing legislative code, section and paragraph were completed for approximately 30% of cases. For the remaining cases, these fields were populated by extracting this information from narrative offence text.

Primary outcomes were captured within a results field containing a combination of text and numerical data (e.g. \$2000 or 6 months imprisonment). Calculated variables were created to sort these results into length of imprisonment (years/months/days) or dollars where a fine was issued. A dichotomous variable was used to highlight those cases that were eligible for analysis. An eligible case was a court outcome for a first-time offender that aligns with one of the 102 sample codes, for a single offence, with an outcome of fine, imprisonment or detention.

Fine Conversion This study replicates similar research from NZ, the UK and Sweden in which a harm value is calculated according to the number of days in prison that a

first-time offender would receive for each selected offence. For ease of calculation and comparison, sentence duration is converted to days, referred to in this document as ‘prison days’.

Offences that incurred a fine penalty were converted to prison days using similar methodology to the Cambridge CHI (Sherman et al. 2016a), based on the WA state minimum wage of \$709 per week (Commerce 2017). For example, a fine of AUD\$2000 was divided by 709 then multiplied by 7 = 19.74 prison days. This methodology is based on the premise that it would take the person 19.74 days to work off the fine value with their income being solely directed to pay off the fine.

The most important consideration when applying a fine conversion method is to ensure that it is used in a standardised manner in all cases. (Sherman et al. 2016a, Rinaldo 2015; Curtis-Ham and Walton 2017). Therefore, it is important to acknowledge that some of the offences within this court data occurred in 2010 when minimum wage was different to what it was in 2017. However, the 2017 value (\$709 p/w) is applied consistently across the entire dataset in this study.

Isolating Cases for a First-Time Offender For the purpose of this research, a first-time offender is defined as a person who has presented in court on one occasion only within the last six and a half years. This methodology involved filtering each set of data to return cases where Offender ID numbers had occurred only once within the Criminal and Traffic Court data. These data were analysed separately due to slight differences in data structure and because they could not be easily combined with the computer processing infrastructure available. It must be acknowledged, however, that this is not an ideal method of determining such a cohort, with a number of factors for and against this selection method (see House 2017).

Criminal Court Data Preparation and Analysis Applying this selection methodology to 880,000 criminal court cases resulted in approximately 46,100 cases (5%) attributable to first-time offenders. These were first-time offenders for any offence type heard in WA courts, including some commonwealth offences and other offences beyond the prosecutorial jurisdiction of the WA Police. The majority of these 46,100 cases, 40,100 (87%), directly aligned with the 94 selected offence categories, including those with and without an incarceration result.

A wide spectrum of offence result types were recorded in these data, including acquittals, case withdrawn, case dismissed and case discontinued—categories that did not permit calculation of prison days. Only four sentence result types were suitable for prison days calculations: imprisonment, detention, community sentences with a monetary penalty and sentences resulting in a fine. Of those 40,100 cases, 29,700 (74%) met these criteria and were used for the final analysis (Fig. 2).

If all 29,700 cases were evenly distributed across the sample of 94 categories, then approximately 316 outcomes could be analysed for each. As anticipated, this was not the case. Offences such as disorderly behaviour and stealing were represented according to their prevalence within society with more than 4000 outcomes for each category. Unfortunately, this resulted in some of the higher harm, less frequent offences with a smaller share of the 29,700 total cases and therefore a smaller sample size for calculating the median harm. Some offence categories had a very small number of outcomes so a minimum outcome threshold for inclusion was determined.

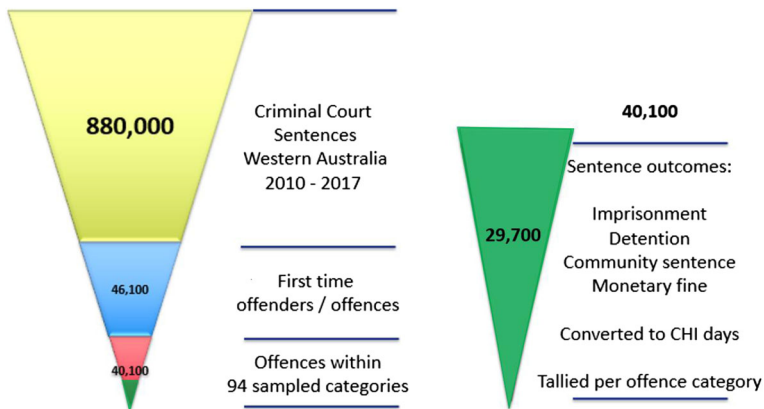


Fig. 2 Criminal court sentence data sample

The outcomes for an offence category will vary depending on the offender and offence circumstances and the particular judge or magistrate. When the outcome distribution for each offence category was plotted, there were varying degrees of skewness and kurtosis (Walker and Maddan 2008). Assessing the most common outcome for each offence category in a standardised manner when the data is skewed is best determined by calculating the median (Piquero and Weisburd 2010).

Therefore, crime harm values, measured in prison days, were calculated based on a median value rather than mean for this analysis because court outcome distributions were highly skewed.

A popular social research method from which median values are determined is the Likert scale. Often, five ordered response levels are used, with seven or nine levels used in circumstances requiring more detail. New Zealand's CHI (Curtis-Ham and Walton 2017) uses a minimum threshold of five court outcomes for inclusion, based on a methodology where the outcomes' 15th percentile value is taken as the harm value. However, this methodology considers all offenders rather than the WACHI method using the median court outcome for first-time offenders only.

In smaller sample sizes, selecting the 15th percentile becomes easier when the total sample size is five or greater. For the NZ CHI, offence categories with court outcome samples less than five were assigned the value of other offences within the same ANZSOC group. For the WACHI, low sample size offence categories were not assigned a harm value. For the criminal court outcomes data, 13 categories did not meet the sample size threshold (less than five) and were excluded from subsequent analyses.

Traffic Court Data Preparation and Analysis A similar process was used to analyse the traffic court outcomes, with 1,200,000 cases recorded during the 6.5-year period. Cases (65,026) were attributable to first-time offenders of which 12,294 (19%) were captured within the 8 sampled offence categories. These (10,245) had an outcome of imprisonment, detention, community sentence with a monetary penalty and sentences resulting in a fine. One major difference between traffic data and the criminal court outcomes was that the traffic data had a 'first offence' variable included at data

collection. Each case was appended with a first, second or subsequent offence descriptor, which was used to select the first-time offenders only (Fig. 3).

Common offences such as ‘exceeding the speed limit’ were represented by 5764 outcomes. Less common offences such as ‘exceeding 0.08 g alcohol in 100 ml of blood’ were represented only seven times within these data for first-time offenders. A threshold of five offence outcomes was again used as the minimum for inclusion; as such, only one traffic offence category was excluded from analysis due to a small sample size. CHI values based on prison days were calculated for the remaining seven categories.

Excluded Categories

In total, 14 offence categories were excluded from analysis due to sample size, leaving 88 out of 102 initial categories for reliable analysis. Even though this number was reduced, the calculated CHI permits crime harm values to be applied to 1,457,553 of 1,541,639 (95%) offences. Special considerations for burglary categories, illicit drugs and misclassifications are described in House (2017).

Findings

The WA Crime Harm Index Table 1 depicts the 88 offence categories for which a crime harm index value was calculated, measured in prison days and listed in increasing order by legal code (ASOC) categories. Additional statistics are captured within the full WACHI table in the Appendix Table 6.

Figure 4 presents all 88 offences ordered (logarithmically) in increasing values of harm, with names of only selected offence categories displayed. Almost two thirds (55) of the 88 categories (63%) have a score of 10 or below. Sixteen categories (18%) score between 12 and 39. Twelve categories (14%) score between 255 and 910 with the remaining five categories (5%) between 1095 and 6023. A natural break was evident where the values jump from 39 to 255, representing the greatest change in harm within the sample data. Categories that

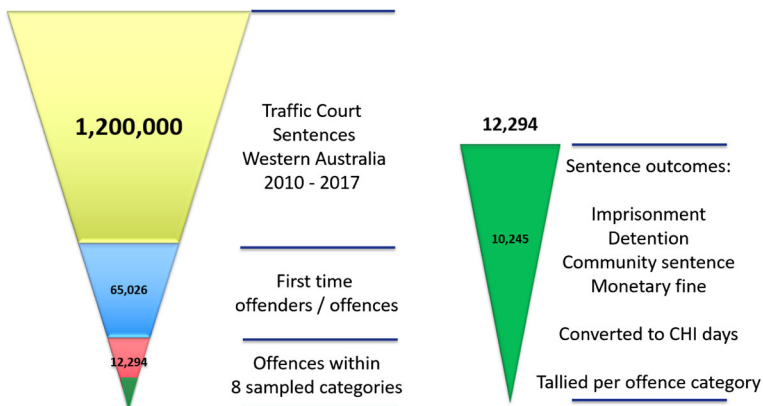


Fig. 3 Traffic court sentence data sample

Table 1 The WA Crime Harm Index

Number	ASOC	Offence description	Sample size	WACHI value (median)
1	0111-03	Murder	36	6023
2	0131-10	Manslaughter	19	2370
3	0211-02	Grievous bodily harm	86	545
4	0211-03	Assault with intent	709	8
5	0211-04	Acts intended to cause GBH	11	1095
6	0211-06	Assault occasioning BH	605	18
7	0211-07	Wounding	94	30
8	0212-01	Common assault	1380	8
9	0212-04	Assault public officer	175	10
10	0299-06	Acts/omissions with intent to harm	6	910
11	0311-01	Aggravated sexual penetration	7	1460
12	0311-02	Sexual penetration	14	1140
13	0311-08	Aggravated indecent assault	37	15
14	0311-11	Sexual penetration of child under 13 years	5	850
15	0311-12	Indecent dealing with child under 13 years	7	360
16	0311-23	Indecent dealing with child by lineal relative	8	425
17	0312-01	Indecent assault	20	20
18	0411-01	Driving under the influence	7	8
19	0412-04	Reckless driving	16	5
20	0412-05	Dangerous driving	436	5
21	0499-02	Acts/omissions causing bodily harm	17	20
22	0499-03	Acts/omission to endanger life	12	32
23	0611-03	Robbery while armed	20	760
24	0611-04	Robbery with aggravation	13	850
25	0611-05	Armed robbery in company	23	730
26	0612-01	Robbery	7	730
27	0711-01	Burglary and commit	29	20
28	0711-02	Burglary with intent	21	39
29	0811-01	Steal motor vehicle	115	8
30	0829-01	Stealing	1788	3
31	0831-02	Receiving stolen property	81	6
32	0831-05	Possess stolen property	346	5
33	0911-01	Cheque fraud	106	5
34	0911-01	Cheque fraud—commonwealth	158	25
35	0919-02	Forgery and uttering	20	7
36	0919-12	Give false details to police	507	3
37	0931-06	Steal as a servant	181	10
38	1021-01	Sell/supply illicit drug	41	7
39	1021-02	Possess illicit drug with intent	171	10
40	1021-04	Possess prohibited plant with intent	15	15
41	1031-01	Cultivate prohibited plant	280	5

Table 1 (continued)

Number	ASOC	Offence description	Sample size	WACHI value (median)
42	1041-02	Possess illicit drug—cannabis	3202	3
43	1041-02	Possess illicit drug—methylamphetamine	794	5
44	1041-02	Possess illicit drug—unspecified	562	4
45	1099-01	Possess smoking implement	442	2
46	1099-11	Possess drug paraphernalia containing prohibited drug/plant	1521	2
47	1121-02	Carry/possess prohibited weapon	282	5
48	1121-03	Carry/possess controlled weapon	274	4
49	1121-05	Possess unlicensed firearm	212	4
50	1211-01	Damage by fire	12	378
51	1212-07	Possess with intent to apply graffiti	27	6
52	1219-05	Criminal damage	624	5
53	1219-15	Damage	1001	5
54	1223-01	Fail to comply with noise abatement	17	5
55	1311-09	Trespass	847	4
56	1313-09	Disorderly behaviour (insulting/offensive)	6883	5
57	1314-10	Possess house breaking equipment	5	12
58	1319-31	Cruelty to animals	45	30
59	1319-50	Street drinking	69	1
60	1322-01	Sell liquor without permit	25	20
61	1322-09	Juvenile possess/control liquor on public premises	25	1
62	1322-10	Re-enter licenced premises	13	2
63	1322-11	Contravene liquor licence or permit	5	10
64	1323-28	Possession of child exploitation material	15	365
65	1325-08	Indecent act	45	8
66	1329-24	Possess/sell/supply alcohol against community by-laws	442	2
67	1411-01	No MDL	5	2
68	1411-03	Unauthorised driving	2855	2
69	1421-01	Unlicensed vehicle	992	1
70	1422-01	Drive un-roadworthy vehicle	31	6
71	1431-01	Excess 0.08%	6	7
72	1432-01	Speeding	5764	1
73	1439-166	Fail to stop (traffic accident—damage)	82	5
74	1511-11	Escape by prisoner	17	30
75	1512-02	Fail to comply with bail undertaking	895	2
76	1512-03	Breach protective bail conditions	59	4
77	1515-01	Breach of violence restraining order	820	4
78	1515-04	Breach police restraining order	910	3
79	1519-01	Fail to comply with released offender reporting obligations	182	2

Table 1 (continued)

Number	ASOC	Offence description	Sample size	WACHI value (median)
80	1521-08	Attempt to pervert justice	20	255
81	1522-13	Obstruct/hinder police	487	5
82	1522-20	Fail to obey order by police	1027	3
83	1611-01	Stalking	11	12
84	1613-02	Carry/possess weapon to injure	51	5
85	1613-03	Carry/possess weapon to cause fear	291	5
86	1613-04	Going armed in public to cause fear	100	8
87	1613-05	Threats	78	8
88	1613-09	Disorderly behaviour (threatening)	5	35

score 255 and above were influenced by prison sentence outcomes, and those below 39 were influenced predominantly by fine penalties.

What Proportion of Offences Were Covered? The ASOC offence classification scale groups offences into 16 discrete divisions based on common offence types, each with multiple subdivisions. Fifteen divisions were represented within the final sample of 88 offences. Only division five, titled ‘Abduction, harassment and other offences against the person’ was not represented in the WACHI. Table 2 summarises the 5-year

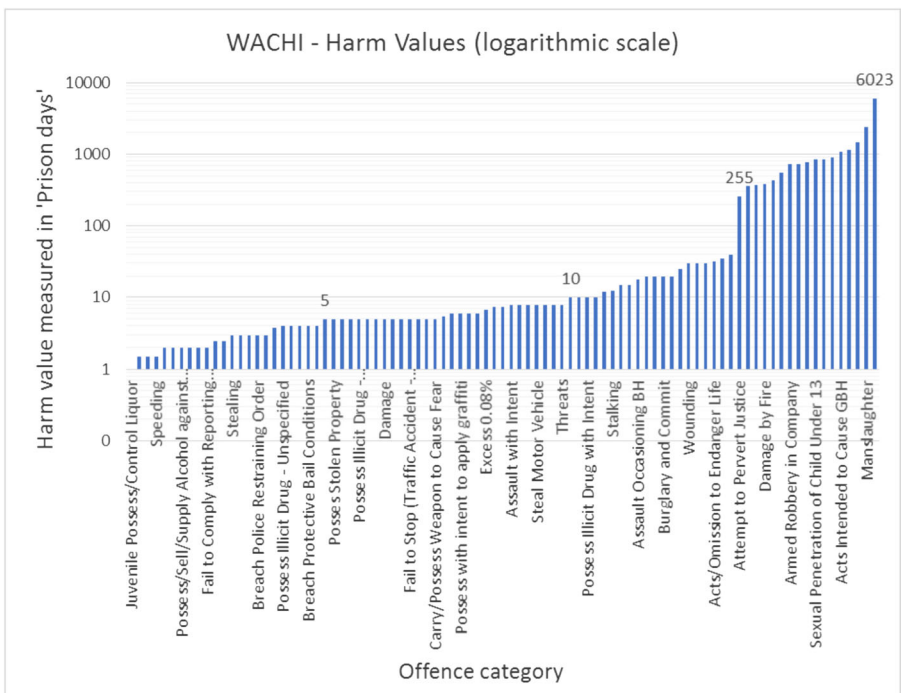


Fig. 4 WACHI harm value chart

Table 2 Proportion of harm calculated by crime category division (ASOC)

ASOC division	Title	5-year offence count	Harm calculated	Harm not calculated	
01	Homicide and related offences	482	182	38% 300	62%
02	Acts intended to cause injury	146,343	144,820	99%	1523 1%
03	Sexual assault and related offences	22,031	11,906	54%	10,125 46%
04	Dangerous or negligent acts endangering persons	21,616	14,441	67%	7175 33%
05	Abduction, harassment and other offences against the person	1331	–	0%	1331 100%
06	Robbery, extortion and related offences	7251	6494	90%	757 10%
07	Unlawful entry with intent/burglary, break and enter	182,488	182,488	100%	– 0%
08	Theft and related offences	489,357	485,920	99%	3437 1%
09	Fraud, deception and related offences	125,698	119,671	95%	6027 5%
10	Illicit drug offences	133,787	131,727	98%	2060 2%
11	Prohibited and regulated weapons and explosives offences	20,011	15,803	79%	4208 21%
12	Property damage and environmental pollution	200,159	186,917	93%	13,242 7%
13	Public order offences	52,448	48,318	92%	4130 8%
14	Traffic and vehicle regulatory offences	32,059	8658	27%	23,401 73%
15	Offences against government procedures, government security and government operations	73,723	68,877	93%	4846 7%
16	Miscellaneous offences	32,854	29,817	91%	3037 9%
<i>Total</i>	<i>1,541,638</i>	<i>1,456,039</i>	<i>95%</i>	<i>85,600</i>	<i>5%</i>

offence count for each division and the proportion for which a crime harm value was calculated.

Crimes were reported against 774 crime category ASOC codes during the 5-year period, distributed across these 16 divisions; however, harm was calculated for 88 codes only. More than 90% of offences were accounted for in ten divisions, and overall, 95% of offences recorded in the past 5 years were attributed a harm value. The remaining 85,600 offences (5%) were a mixture of low and high harm offences.

Five-Year Offence Trends To test how the WACHI could be operationalised, it was applied to 5 years of offence data, seeking to identify district and year-on-year comparisons. As the WACHI was calculated per ASOC code, it was reasonable to apply a CHI weighting per code to assess the trends. Five-year harm and count trends were analysed for the whole state for the period July 2012–July 2017.



Fig. 5 State-wide crime harm and crime count: 5-year comparison

Figure 5 depicts the crime count and crime harm total during the same period. Note that the harm totals are much greater than the count as the CHI is applied to count as a multiplying factor, for which the median value is 7.5.

The first point to note from this graph is that changes in harm and count values are bi-directional: an increase in count does not necessarily result in an increase in harm and vice versa. Trend comparison showed a reduction in harm for the first 3 years (FY 2012–2015) while crime count went up (slightly). This period was followed by a large increase in both count and harm in FY 2015/2016, with both reducing in the final year of analysis (FY 2016/2017). Considering the variation in scales, analysing percentage changes is a more appropriate way to review these data. Figure 6 depicts the change in harm and count from the previous year.

A more detailed analysis of the data is required to determine where the changes in harm occurred and for what specific offence types. Approximately 67% of the state’s population lives in Metropolitan Perth which is less than 1% of the total geographical area. The remainder reside in regional WA. These two regions are resourced and managed differently due to the large population density imbalance, so it is prudent to analyse the application of harm separately.

Regional WA Figure 7 depicts the crime harm totals for seven non-metropolitan (‘regional’) districts in WA. South West district realised an approximate decline in

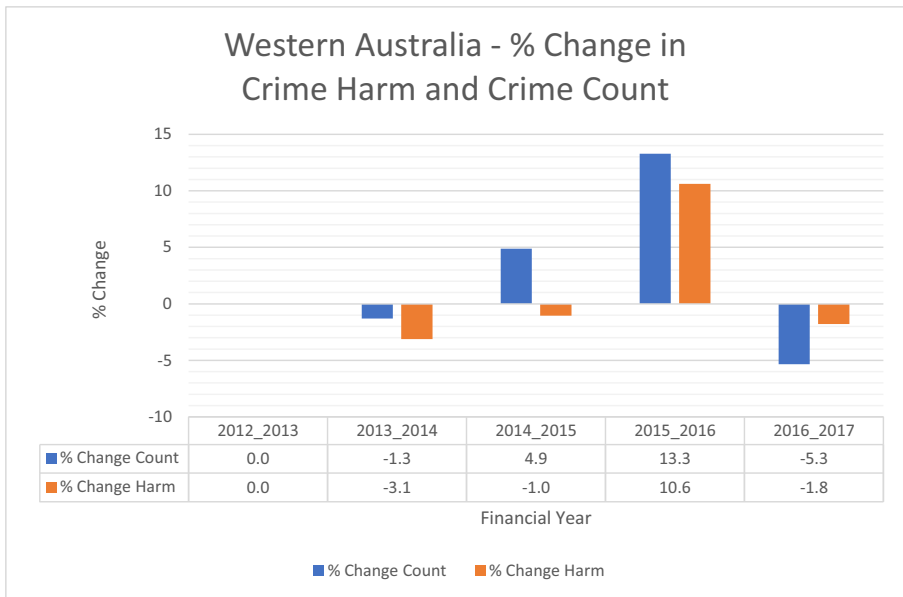


Fig. 6 State-wide count and harm percentage change: 5-year comparison

harm by 33,000 units during the analysis period and with the exception of the Kimberley and Pilbara; harm in other regional districts remained constant. Harm in the Kimberley rose by 50,000 units, the majority of this increase occurring in the most recent 2 years. In the Pilbara, harm rose by twice this amount, 101,000 units, in half that time, which is a cause for concern, prompting further analysis.

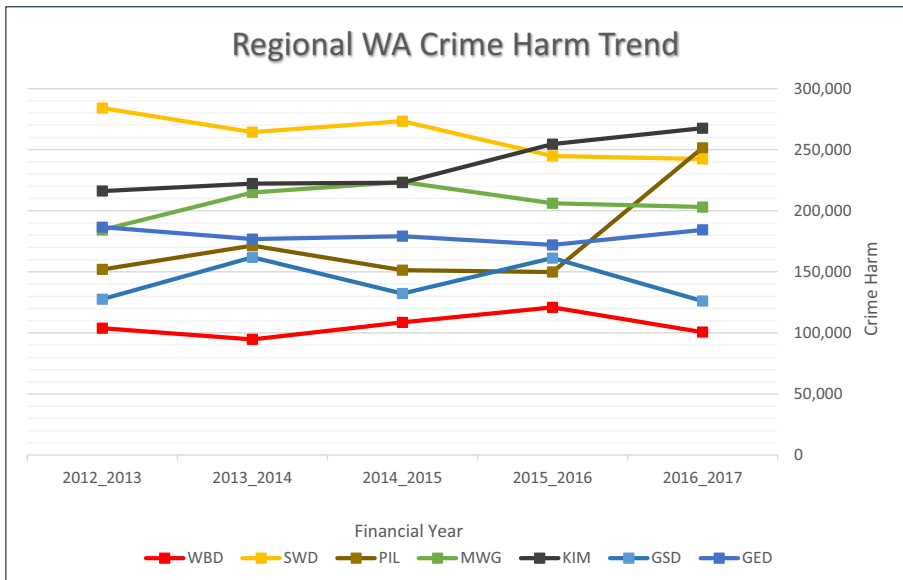


Fig. 7 Regional WA crime harm: 5-year trend

The Pilbara District experienced the largest increase in crime harm during the analysis period, with a percentage increase of 67% between FY 2015/2016 and FY 2016/2017. Analysis of the underlying data showed only a moderate increase in crime count of 1384 offences (12.5%), with the change in harm due to increases in historical sexual assault and indecent dealings with children. Within the comparison year, an additional 63 recent and 43 historical sex offences were recorded against ten offence categories. Only six categories were attributed a harm score, totalling 38,755 for current offences and 32,035 for historical offences. In total, 106 additional sex offences resulted in a harm increase of 70,790 accounting for 70% of the total increase in harm, but only 8% of the crime count.

This case study highlights the influence of high harm offences on the overall harm value for a district. In general, more serious crimes (with higher harm scores) have longer statutes of limitations, requiring police to record these offences. Less serious crimes (with lower harm scores) have reduced or statutes of limitations meaning that historical low harm crimes may not even be recorded. Due to these factors, historical crimes like those reported in the Pilbara have more of an influence on the total calculated harm. In this example, the harm index results can be used to draw attention to the additional investigative effort required by complex investigations imposed by serious cases.

Metropolitan WA Similar analyses were conducted for the four districts within the Perth Metropolitan Region. Figure 8 depicts crime count and crime harm totals for Central Metropolitan district (CMD), North West Metropolitan district (NWM), South

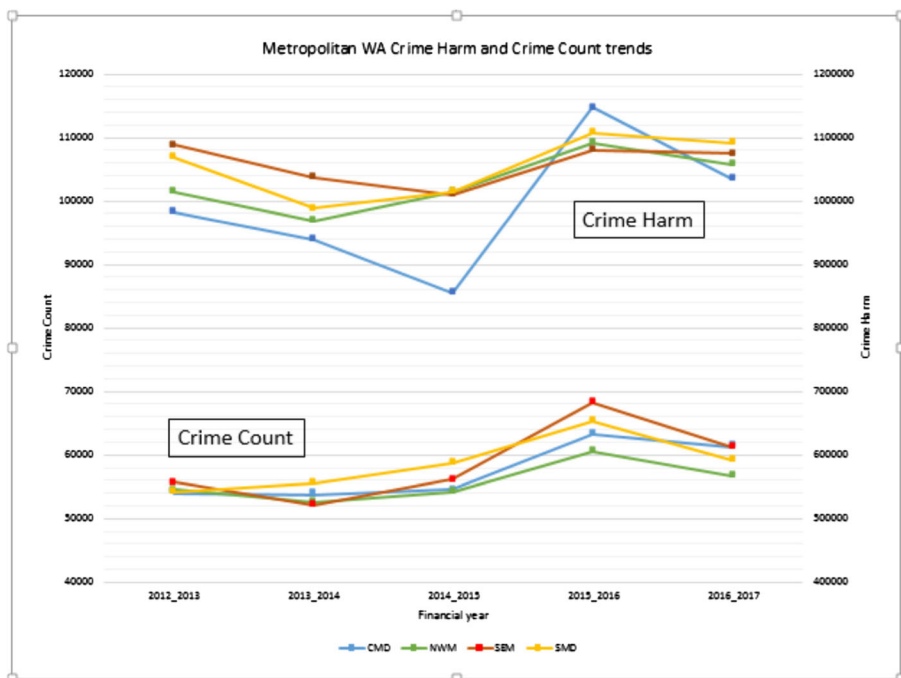


Fig. 8 Metropolitan WA crime harm and count: 5-year trend

East Metropolitan district (SEM) and South Metropolitan district (SMD), for the same 5-year period. Crime count increased for most districts within the first 3 years, and all districts experienced a greater increase in FY 2015/2016 followed by a decline in FY 2016/2017.

A large fluctuation in crime harm was recorded in Central Metropolitan district during the 5-year period. Encompassing Perth city, CMD experienced the largest proportional decline and then largest increase in harm in the metropolitan area, increasing by 34% between FY 2014/2015 and FY 2015/2016. Preceding the increase, CMD experienced an annual –4 and –9% reduction in harm, and following the sharp rise, a –10% reduction. By comparison, during the 5-year period, all metropolitan

Table 3 Central Metropolitan District: FY 2015–2016 crime harm increase influenced by recent and historical sex crimes

ASOC	CHI value	Timeframe	Offence description	Count change 2014–2015 to 2015–2016	Harm change 2014–2015 to 2015–2016
0311-01	1460	Recent	Agg sexual penetration	15	21,900
0311-02	1140	Recent	Sexual penetration	48	54,720
0311-08	15	Recent	Aggravated indecent assault	5	74
0311-11	850	Recent	Sexual penetration of child under 13 years	18	15,300
0311-12	360	Recent	Indecent dealing with child under 13 years	120	43,200
0311-13	0	Recent	Sexual penetration of child 13–16 years	10	–
0311-14	0	Recent	Indecent dealing with child 13–16 years	28	–
0311-20	0	Recent	Sexual penetration of child by lineal relative	8	–
0311-22	0	Recent	Indecent dealing with child under 16 years by lineal relative	7	–
0311-23	425	Recent	Indecent dealing with child by lineal relative	2	850
			Total recent sexual offences	245	136,044
0311-01	1460	Historical	Agg sexual penetration	8	11,680
0311-02	1140	Historical	Sexual penetration	7	7980
0311-08	15	Historical	Aggravated indecent assault	–	–
0311-11	850	Historical	Sexual penetration of child under 13 years	17	14,450
0311-12	360	Historical	Indecent dealing with child under 13 years	7	2520
			Total historical sexual offences	39	36,630
			Total sexual offences	284	172,674
			All other offences	8417	119,717
			CMD district total	8701	292,391
			Sexual offence proportion	3%	59%

districts experienced similar fluctuations in crime count, but CMD was the only district to experience such a large change in harm.

Table 3 depicts changes in count and harm within CMD, revealing the influence of current and historical sexual offences on the overall harm score.

Analysis of the underlying data showed that most of the increase was attributed to reporting of historic sex crimes, similar to the Pilbara district. Table 3 reflects the influential power of high harm offences showing that sexual offences were only 3% of the count increase but 59% of the increase in harm (excluding the ‘hidden harm’ for those offences where a harm score was not calculated). Table 3 does not explain the influence of other offence types that contributed to the harm rise in CMD. These other offence types should be considered to fully understand the influence of a CHI on trend analysis (see House 2017).

During this period, CMD recorded 8701 more offences, resulting in a harm increase of 292,391. Table 3 shows that the ten *most frequently occurring* offences were responsible for 28% by count but only 3% of the harm in that district. The top ten *most harmful offences* accounted for 12% of the harm increase and 22% of the increase in crime count. Offences against the person such as murder, GBH and robbery caused a large portion of the increase. Lower harm offences including possession of illicit drugs, drug paraphernalia and possession of stolen property occurred so frequently that they also contributed to a large increase in harm. In this example, the WACHI is sensitive to not only high harm but also high-frequency offences, shedding light on how harm could drive a new set of priorities for District Superintendents and Regional Commanders state-wide.

Comparing WACHI to Other Measures Table 4 shows how the days of imprisonment for the same offence types compare across different versions of a crime harm index. While the specific values may appear substantially different across offence types, the relative values correlate well to each other one pair at a time in a correlation matrix.

A Pearson correlation was calculated between the members of each pair of CHIs, with values ranging from 0.84 to 0.97 (Table 5). An exception was the WA maximum sentence data where the correlation value varied between 0.57 and 0.65 when compared with other indices.

Conclusions

This article demonstrates that a crime harm index (Sherman et al. 2016b) can be calculated in Western Australia based on the median number of days of imprisonment (or its equivalent) imposed as sentences for each offence category, covering 95% of all reported crimes. More importantly, it shows that the WACHI can produce different conclusions about trends in public safety than can be seen by merely observing changes in total crime counts—or even counts of one offence type at a time.

The application of the WACHI to harm trends at the level of the 11 police districts in WA clearly showed two facts. One is that harm trends can differ substantially from one district to another, even when crime counts follow similar trends across districts. The other fact is that the sharp changes in some districts may be driven by a spike in reporting of historic crimes, which distort public and police understanding of whether

Table 4 CHI scores compared across different methods

Offence	WA Max	WACHI	UK CCHI	UK CSS	NZ CHI	NZ JSSS
Murder	9125	6023	5475	7979	1629	12,045
Manslaughter	7300	2370	3825	7979	1687	1983
Sexual assault (rape)	7300	1140	1825	2895	1172	3627
Armed robbery	5110	760	365	746	742	1738
Robbery	3650	730	365	746	155	475
Grievous bodily harm	3650	545	1460	1965	425	892
Damage (arson)	9125	377	33	185	110	474
Dwelling burglary	7300	39	20	438	63	171
Assault occasioning bodily harm	3650	18	20	184	108	192
Stalking	2920	12	42	51	10	76
Motor vehicle theft	2555	8	5	124	12	177
Common assault	745	8	1	16	13	12
Threatening behaviour	2555	8	10	280	4	14
Graffiti implements	993	6	2	7	5	1
Fraud	2555	5	10	200	48	170
Damage (property)	3650	5	2	7	45	58
Disorderly conduct (public fear)	59	5	5	10	2	2
Harassment	365	5	10	39	10	11
Breach of restraining order	365	3	6	54	9	73
Theft	5110	3	2	86	10	25

areas (or even offenders) become more or less dangerous in current context. Thus, to whatever use this study may be put, one clear issue is whether to separate historical offences from contemporaneously reported (same year) offences. This issue is global, with the USA and UK equally vulnerable to misleading conclusions from a failure to link measurement by year to the year in which harm occurs.

As House (2017) points out, increasing numbers of police impact evaluations employ a crime harm index. These studies often reach different conclusions from analyses using only crime count measures. Thus, another low-visibility, but high impact implication of using the WACHI is the potential for more accurate assessments of what works in policing.

Table 5 Crime harm indices compared—Pearson correlations

	WA max	WACHI	UK CCHI	UK CSS	NZ CHI	NZ JSS
WA Max	1	0.599	0.594	0.602	0.652	0.575
WACHI	0.599	1	0.950	0.895	0.843	0.965
UK CCHI	0.594	0.950	1	0.981	0.929	0.880
UK CSS	0.602	0.895	0.981	1	0.946	0.788
NZ CHI	0.652	0.843	0.929	0.946	1	0.777
NZ JSSS	0.57.5	0.965	0.380	0.788	0.777	1

In addition, WACHI can be consistently applied to local offence categories, for temporal analysis of district offence trends. Beyond district analysis, the WACHI can be applied to identify trends in smaller geographical areas such as sub-districts or even to identify micro harm spots and hot spots (Macbeth 2015).

It is also important that the WACHI is inexpensive. It can be developed, tested and updated in-house using basic software such as Microsoft Excel. It can therefore be easily adapted by WA Police into the existing Statistical Analysis Software (SAS) data analysis and crime reporting framework. Automation could be used to improve the identification of first-time offenders by relying on the courts to indicate first-time offenders in all criminal cases rather than just for the traffic cases. This may result in a larger sample size boosting the reliability beyond 86%.

If the WACHI is to be adopted more widely, other research strongly suggests that a well-planned implementation strategy is essential for success (House 2017). The fate of innovations may depend more on the readiness of an organisation to embrace it than on the intrinsic value of the innovation itself. Consistent, tailored and lasting messaging for the both the force and external stakeholders is essential to describe how the change affects them.

The WACHI is possibly a ‘new way to measure successes’ of policing practices and to avoid current measures ‘keeping them mired in the past’ (Alpert and Moore 1993). Harm will no longer be a ‘neglected concept’ (Paoli and Greenfield 2013) if the WACHI is implemented. Even if it is not adopted as the benchmark reference frame for harm, this article may at least re-ignite the conversation about the pressing need for a standardised method of crime harm measurement.

Acknowledgements The first author acknowledges the assistance and support of Olivia House, Barak Ariel, Stephen Brown and the officers, police staff and interns in the Western Australia Police evidence-based policing team.

Appendix

Table 6 WACHI sample size, mean, standard deviation and median, calculated for 88 offences

Number	ASOC	Offence description	Sample size	Mean value	Standard deviation	WACHI value (median)
1	0111-03	Murder	36	5713	1681	6023
2	0131-10	Manslaughter	19	2203	993	2370
3	0211-02	Grievous bodily harm	86	717	547	545
4	0211-03	Assault with intent	709	14	38	8
5	0211-04	Acts intended to cause GBH	11	1419	676	1095
6	0211-06	Assault occasioning BH	605	38	73	18
7	0211-07	Wounding	94	152	220	30
8	0212-01	Common assault	1380	19	56	8
9	0212-04	Assault public officer	175	42	76	10
10	0299-06	Acts/omissions with intent to harm	6	899	430	910

Table 6 (continued)

Number	ASOC	Offence description	Sample size	Mean value	Standard deviation	WACHI value (median)
11	0311-01	Aggravated sexual penetration	7	1293	512	1460
12	0311-02	Sexual penetration	14	1061	571	1140
13	0311-08	Aggravated indecent assault	37	50	99	15
14	0311-11	Sexual penetration of child under 13 years	5	1031	366	850
15	0311-12	Indecent dealing with child under 13 years	7	339	118	360
16	0311-23	Indecent dealing with child by lineal relative	8	494	273	425
17	0312-01	Indecent assault	20	74	134	20
18	0411-01	Driving under the influence	7	8	6	8
19	0412-04	Reckless driving	16	7	4	5
20	0412-05	Dangerous driving	436	6	3	5
21	0499-02	Acts/omissions causing bodily harm	17	65	116	20
22	0499-03	Acts/omission to endanger life	12	62	77	32
23	0611-03	Robbery while armed	20	830	309	760
24	0611-04	Robbery with aggravation	13	784	305	850
25	0611-05	Armed robbery in company	23	824	418	730
26	0612-01	Robbery	7	572	326	730
27	0711-01	Burglary and commit	29	248	313	20
28	0711-02	Burglary with intent	21	166	199	39
29	0811-01	Steal motor vehicle	115	35	114	8
30	0829-01	Stealing	1788	5	22	3
31	0831-02	Receiving stolen property	81	14	42	6
32	0831-05	Possess stolen property	346	14	65	5
33	0911-01	Cheque fraud	106	10	12	5
34	0911-01	Cheque fraud—Cwth	158	10	12	25
35	0919-02	Forgery and uttering	20	13	13	7
36	0919-12	Give false details to police	507	3	2	3
37	0931-06	Steal as a servant	181	100	219	10
38	1021-01	Sell/supply illicit drug	41	9	8	7
39	1021-02	Possess illicit drug with intent	171	17	39	10
40	1021-04	Possess prohibited plant with intent	15	17	12	15
41	1031-01	Cultivate prohibited plant	280	5	3	5
42	1041-02	Possess illicit drug—cannabis	3202	4	2	3
43	1041-02	Possess illicit drug—methylamphetamine	794	4	2	5
44	1041-02	Possess illicit drug—unspecified	562	4	2	4
45	1099-01	Possess smoking implement	442	2	2	2
46	1099-11	Possess drug paraphernalia prohibited drug/plant	1521	3	2	2
47	1121-02	Carry/possess prohibited weapon	282	41	137	5

Table 6 (continued)

Number	ASOC	Offence description	Sample size	Mean value	Standard deviation	WACHI value (median)
48	1121-03	Carry/possess controlled weapon	274	5	3	4
49	1121-05	Possess unlicensed firearm	212	5	7	4
50	1211-01	Damage by fire	12	526	455	378
51	1212-07	Possess with intent to apply graffiti	27	6	3	6
52	1219-05	Criminal damage	624	7	10	5
53	1219-15	Damage	1001	6	4	5
54	1223-01	Fail to comply with noise abatement	17	5	3	5
55	1311-09	Trespass	847	5	4	4
56	1313-09	Disorderly behaviour (insulting/offensive)	6883	5	4	5
57	1314-10	Possess house breaking equipment	5	11	7	12
58	1319-31	Cruelty to animals	45	39	35	30
59	1319-50	Street drinking	69	2	1	1
60	1322-01	Sell liquor without permit	25	18	7	20
61	1322-09	Juvenile possess liquor on public premises	25	2	1	1
62	1322-10	Re-enter licenced premises	13	3	1	2
63	1322-11	Contravene Liquor Licence or Permit	5	11	8	10
64	1323-28	Possession of child exploitation material	15	458	272	365
65	1325-08	Indecent act	45	10	5	8
66	1329-24	Possess/sell/supply alcohol community by-laws	442	2	2	2
67	1411-01	No MDL	5	2	1	2
68	1411-03	Unauthorised driving	2855	2	1	2
69	1421-01	Unlicensed vehicle	992	1	1	1
70	1422-01	Drive un-roadworthy vehicle	31	6	1	6
71	1431-01	Excess 0.08%	6	6	2	7
72	1432-01	Speeding	5764	2	2	1
73	1439-166	Fail to stop (traffic accident—damage)	82	5	2	5
74	1511-11	Escape by prisoner	17	64	86	30
75	1512-02	Fail to comply with bail undertaking	895	5	11	2
76	1512-03	Breach protective bail conditions	59	5	3	4
77	1515-01	Breach of violence restraining order	820	5	13	4
78	1515-04	Breach police restraining order	910	4	4	3
79	1519-01	Fail to comply offender reporting obligations	182	3	7	2
80	1521-08	Attempt to pervert justice	20	268	226	255

Table 6 (continued)

Number	ASOC	Offence description	Sample size	Mean value	Standard deviation	WACHI value (median)
81	1522-13	Obstruct/hinder police	487	6	4	5
82	1522-20	Fail to obey order by police	1027	3	2	3
83	1611-01	Stalking	11	19	16	12
84	1613-02	Carry/possess weapon to injure	51	6	3	5
85	1613-03	Carry/possess weapon to cause fear	291	6	4	5
86	1613-04	Going armed in public to cause fear	100	10	8	8
87	1613-05	Threats	78	10	11	8
88	1613-09	Disorderly behaviour (threatening)	5	157	186	35

Open Access This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made.

References

- Abc News. (2017). *Child sex abuse charges laid against dozens of men in the Pilbara District* [Online]. Available: <http://www.abc.net.au/news/2017-06-03/child-sex-abuse-charges-laid-against-dozens-of-men-in-pilbara/8586266>. Accessed 2 Oct 2017.
- Alpert, G. P. & Moore, M. H. 1993. Measuring police performance in the new paradigm of policing. *Performance Measures for the Criminal Justice System*, 109–142.
- Andersson, C. Development of a national offence index for the ranking of offences. Evaluation in crime and justice: trends and methods conference. Canberra. <http://www.aic.gov.au/events/aic%20upcoming%20events/2003/~media/conferences/evaluation/andersson.ashx>, 2003.
- Ariel, B., Smallwood, J., Sherman, L., Wain, N., Goodhill, W., Sosinski, G., Tankebe, J. & Yahalom, O. (2014) The Birmingham hot spots experiment. Operation Savvy. Presentation at the 7th International Conference on Evidence-Based Policing. <http://www.crim.cam.ac.uk/events/conferences/ebp/2014/slides/223>, Institute of Criminology, University of Cambridge.
- Ariel, B., Weinborn, C., & Sherman, L. W. (2016). “Soft” policing at hot spots—do police community support officers work? A randomized controlled trial. *J Exp Criminol*, 12, 277–317.
- Ashby, M. P. (2017). Comparing methods for measuring crime harm/severity. *Policing: a Journal of Policy and Practice*.
- Australian Bureau of Statistics. (2016). *Crime victimisation Australia, 2014/15* [Online]. Available: <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4530.0~2014-15~Main%20Features~Key%20findings~1>. Accessed 22 July 2016.
- Australian Crime Commission. (2013). Australian crime commission annual report 2012–2013. *Australian Crime Commission*.
- Australian Institute of Criminology 2016. (2014). Australian crime: facts and figures.
- Babyak, C., Alavi, A., Collins, K., Halladay, A., & Tapper, D. (2009). *The methodology of the police-reported crime severity index*. Vancouver: Statistical Society of Canada annual meeting.
- Bangs, M. 2016. *Research outputs: developing a Crime Severity Score for England and Wales using data on crimes recorded by the police*. [Online]. Available: <http://bit.ly/2fZCUbY> Accessed 19 July 2017.
- Barnham, L. (2016). *Targeting perpetrators of partner abuse in the Thames Valley: a two-year follow up of crime harm and escalation*. MSt in Applied Criminology and Police Management, University of Cambridge.

- Berk, R., Sherman, L., Barnes, G., Kurtz, E., & Ahlman, L. (2009). Forecasting murder within a population of probationers and parolees: a high stakes application of statistical learning. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, *172*, 191–211.
- Clark, W. W. (1922). Whittier scale for grading juvenile offenses, Whittier State School.
- Cohen, M. A. (1988). Pain, suffering, and jury awards: a study of the cost of crime to victims. *Law and Society Review*, *537–555*.
- Cohen, M. A., Rust, R. T., Steen, S., & Tidd, S. T. (2004). Willingness-to-pay for crime control programs. *Criminology*, *42*, 89–110.
- Commerce, D. O. (2017). WA minimum wage rise July 2017 [Online]. Available: <https://www.commerce.wa.gov.au/announcements/wa-award-and-minimum-pay-rates-have-increased-1-july-2017> Accessed 08 Oct 2017.
- Community Development and Justice Standing Committee. (2015). *A measure of trust, How WA Police evaluates the effectiveness of its response to family and domestic violence* [Online]. Legislative Assembly Parliament of Western Australia. Available: [http://www.parliament.wa.gov.au/Parliament/commit.nsf/\(Report+Lookup+by+Com+ID\)/80AB18FC4D5DED3F48257EE6000D17B5/\\$file/20151019%20Domestic%20violence%20policing%20ONLINE%20title%20corrected.pdf](http://www.parliament.wa.gov.au/Parliament/commit.nsf/(Report+Lookup+by+Com+ID)/80AB18FC4D5DED3F48257EE6000D17B5/$file/20151019%20Domestic%20violence%20policing%20ONLINE%20title%20corrected.pdf) Accessed 22 July 2016.
- Curtis-Ham, S., & Walton, D. (2017). *The New Zealand crime harm index: quantifying harm using sentencing data*. Policing: A Journal of Policy and Practice.
- Ferrante, A., Loh, N., & Maller, M. (2009). Assessing the impact of time spent in custody and mortality on the estimation of recidivism. *Current Issues Crim Just*, *21*, 273.
- Fixsen, D., Naoom, S. F., Blase, K. A., & Friedman, R. M. (2005). A conceptual view of implementation' and 'conclusions and recommendations. *Implementation Research: a Synthesis of The Literature*, *11-22*, 67–79.
- Francis, B., Soothill, K., Humphreys, L., & Cutajar Bezzina, A. (2005). *Developing measures of severity and frequency of reconviction*. Lancaster: Lancaster University.
- Friendship, C., Beech, A. R., & Browne, K. D. (2002). Reconviction as an outcome measure in research. A methodological note. *Br J Criminol*, *42*, 442–444.
- Goldstein, H. (1963). Police discretion: the ideal versus the real. *Public Adm Rev*, 140–148.
- Higgins, A. (2017). Mixed signals for police improvement: the value of your Crime Severity Score may go up as well as down. *The Police Foundation*.
- House, P. (2017). *Developing a crime harm index for Western Australia*. MSt Thesis, Institute of Criminology, University of Cambridge.
- Ignatans, D., & Pease, K. (2016). Taking crime seriously: playing the weighting game. *Policing*, *10*, 184–193.
- Jackman, R. (2015). *Measuring harm in a cohort of sex offenders in Norfolk*. MSt. in Applied Criminology and Police Management, University of Cambridge.
- Kahneman, D. (2011). *Thinking, fast and slow*. Macmillan.
- Kwan, L. (2016). Western Australian maximum sentence values compared with the Cambridge Crime Harm Index, Internship report.
- Lum, C., Telep, C. W., Koper, C. S., & Grieco, J. (2012). Receptivity to research in policing. *Justice Research and Policy*, *14*, 61–95.
- Macbeth, E. (2015). *Evidence-based vs. experience-based targeting of crime and harm hotspots in Northern Ireland*. MSt. in Applied Criminology and Police Management, University of Cambridge.
- Maltz, M. D. (1984). *Recidivism*. Orlando: Academic Press Inc.
- Maxfield, M. G., Weiler, B. L., & Widom, C. S. (2000). Comparing self-reports and official records of arrests. *J Quant Criminol*, *16*, 87–110.
- Messner, S. F. (1984). The “dark figure” and composite indexes of crime: some empirical explorations of alternative data sources. *J Crim Just*, *12*, 435–444.
- Nutley, S. M., Walter, I., & Davies, H. T. (2007). *Using evidence: how research can inform public services*. Policy press.
- Oswald, M., Grace, J., Urwin, S. & Barnes, G. C. (2017). Algorithmic risk assessment policing models: lessons from the Durham Hart Model and ‘experimental’ proportionality. *Information & Communications Technology Law*.
- Padfield, N. (2010). *Chapter 5: discretion and decision-making in public protection*. Cullompton: Willan Publishing.
- Paoli, L., & Greenfield, V. A. (2013). Harm: a neglected concept in criminology, a necessary benchmark for crime-control policy. *European Journal of Crime, Criminal Law and Criminal Justice*, *21*, 359–377.
- Pease, K., Ireson, J., & Thorpe, J. (1974). Additivity assumptions in the measurements of delinquency. *The British Journal of Criminology*, *14*, 256–263.
- Piquero, A., & Weisburd, D. (2010). *Handbook of quantitative criminology*. New York: Springer.

- Ratcliffe, J. H. (2015). Towards an index for harm-focused policing. *Policing: a Journal of Policy and Practice*, 9, 164–182.
- Rinaldo, M.-B. V. (2015). *Comparing crime hotspots and crime harm-spots in a Swedish City: a descriptive analysis*. England: Cambridge University.
- Roman, J., & Farrell, G. (2002). Cost-benefit analysis for crime prevention: opportunity costs, routine savings and crime externalities. In: N. Tilley (Ed.) *Evaluation for Crime Prevention. Crime Prevention Studies*, 14, 53–92.
- Ruane, J. (2005). *Essentials of research methods: a guide to social science research*. Oxford: Blackwell.
- Sellin, T. & Wolfgang, M. E. (1964). The measurement of delinquency.
- Sentencing Council. (2017). *The Sentencing Council for England and Wales* [Online]. Available: <https://www.sentencingcouncil.org.uk/>. Accessed 31/04/2017 2017.
- Sherman, L. W. (2007). The power few: experimental criminology and the reduction of harm. *J Exp Criminol*, 3, 299–321.
- Sherman, L. W. (2013). Targeting, testing and tracking police services: the rise of evidence-based policing, 1975-2025. *Crime and Justice in America*, 43.
- Sherman, L. W., Gartin, P. R., & Buerger, M. E. (1989). Hot spots of predatory crime: routine activities and the criminology of place. *Criminology*, 27(1), 27–56.
- Sherman, L., Neyroud, P. W. & Neyroud, E. (2016a). The Cambridge Crime Harm Index: measuring total harm from crime based on sentencing guidelines. *Policing*, paw003.
- Sherman, L. W., Bland, M., Strang, H. & House, P. (2016b). The felonious few vs the miscreant many. *Targeting Domestic Violence in Western Australia* [Online] Available: <https://www.police.wa.gov.au/~media/Files/Police/About-us/News/WA-Felonious-Few.pdf?la=en>. Accessed 5 June 2017.
- Smith, R. G., Jorna, P., Sweeney, J. & Fuller, G. (2014). Counting the costs of crime in Australia: a 2011 estimate. *AIC reports. Research and Public Policy series.*, xvii.
- Strategic Criminal Justice Forum. (2017). *RE: personal communication at the Strategic Criminal Justice Forum*.
- Sullivan, C., Su-Wuen, O. & Mcrae, R. (2016). *Justice Sector Seriousness Score (2016 update): FAQs* [Online]. Available: <https://www.justice.govt.nz/assets/Documents/Publications/2016-FAQs-Seriousness-Scores2.pdf>. Accessed 27 April 2017.
- The Economist. (2016). *Measuring crime-bobbies on the spreadsheet* [Online]. The Economist Available: <https://www.economist.com/news/britain/21706343-new-way-count-crimes-could-reduce-amount-harm-they-cause-bobbies-spreadsheet>. Accessed 5 June 2017.
- Vo, Q. T. (2015). *6000 cases of missing and absent persons: patterns of crime harm and priorities for resource allocation*. MSt. in Applied Criminology and Police Management, University of Cambridge.
- Wagner, H., & Pease, K. (1978). On adding up scores of offence seriousness. *Brit J Criminol*, 18, 175.
- Walker, J. T., & Maddan, S. (2008). *Statistics in criminology and criminal justice: analysis and interpretation*. Burlington: Jones & Bartlett Learning.
- Wallace, M. (2009). Police-reported crime statistics in Canada, 2008. *Juristat*, 29, 1–37.
- Weinborn, C., Ariel, B., Sherman, L. W. & O'Dwyer, E. (2017). Hotspots vs. harmspots: Shifting the focus from counts to harm in the criminology of place. *Applied Geography*. <https://doi.org/10.1016/j.apgeog.2017.06.009>.
- Whinney, A. (2015). *A descriptive analysis of multi-agency risk. Assessment Conferences. (MARACs) for reducing the future harm of domestic abuse in Suffolk*. MSt. in Applied Criminology and Police Management, University of Cambridge.

Paul House M.St. (Cantab) is a Data Analytics Manager for the Western Australia Police. This article is a shortened version of his M.St. thesis for the Cambridge Police Executive Programme.

Peter Neyroud Ph.D.(Cantab) is a Lecturer in Evidence-Based Policing at the University of Cambridge and former Chief Constable of both the Thames Valley Police and the National Policing Improvement Agency. He was academic supervisor of the thesis from which this article is derived.