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The adoption of a crime harm index: A scoping literature review

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ABSTRACT

An emerging line of research explores how calculating the harm associated with different types of crime serves as a method to measure crime across times, places and people. A crime harm index (CHI) is suggested to produce a more reliable bottom line indicator of public safety and it would allow law enforcement agencies to invest their scarce resources in proportion to the harm caused by various types of crimes. This scoping literature review maps the literature on crime harm indices published after 2006 by answering the following research questions: (1) what is the rationale for a CHI, (2) what are the possible ways to operationalize a CHI; (3) how can a CHI be used in crime analysis; (4) what are the general outcomes of the studies using a CHI; (5) what are the known challenges and critiques of a CHI and (6) what research gaps related to CHI are expressed in this field of research?

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1. Introduction

Some crimes are more serious and harmful to society than others. Therefore, it has been argued that raw counts of crime do not provide a 'meaningful bottom line indicator' of whether public safety is improving or declining in a given period or place (Andersen & Mueller-Johnson, 2018, p. 68). Various scholars have long acknowledged this, and accordingly developed tools to take into account the various levels of seriousness or harm associated with different crime types. For instance, in 1964, Sellin and Wolfgang (1964) designed an index to differentiate between crime seriousness based on public survey ratings. This work was updated in The National Survey of Crime Severity in 1985, including a total of 60,000 respondents each rating the seriousness of 25 criminal events (Wolfgang et al., 1985). Others have focused on estimating the monetary costs of different types of crime, including for 'pain' and 'suffering' (see, e.g., Cohen, 1988). To assist law enforcement agencies in establishing long-term priorities in organized crime control, Greenfield and Paoli (2013) more recently developed a harm assessment framework, which was applied to e.g., assess the harms of cocaine trafficking (Paoli et al., 2013).

Building on this long tradition of studies (for a discussion of the harm literature, see, e.g., Bland & Ariel, 2020b; House, 2017; Paoli & Greenfield, 2013), an emerging line of research uses sentencing guidelines or actual sentences to develop harm-weighted crime indices. Based on the Sentencing Guidelines for England and Wales, Sherman et al. (2016b) introduced the Cambridge Crime Harm Index (CHI) as a new method to measure (the harm of) crime across times, places and people. They argue that a CHI offers 'a low-cost, easily adoptable barometer of the total impact of harm from crimes committed by other citizens, as reported by witnesses and victims' (Sherman et al., 2016b, p. 172). In recent years, many authors in countries like Sweden, Denmark, New Zealand and

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Australia followed suit; they developed a CHI for their own jurisdiction. However, apart from a recently published book chapter by Curtis-Ham (2022), there is no research that has systemically mapped this emerging line of research.

Considering the recent development and applications of CHIs around the world, we designed a literature review to answer the following six questions: (1) what is the rationale for a CHI; (2) what are the possible ways to operationalize a CHI; (3) how can a CHI be used in crime analysis; (4) what are the general outcomes of the studies using a CHI; (5) what are the known critiques and challenges of a CHI and (6) what research gaps related to CHI are expressed in this field of research? With this literature review, we aim to provide a systematic overview of the CHI literature and set the grounds for both academics and law enforcement agencies interested in adopting a CHI.

2. Method

We answered our research questions with a scoping literature review, which is described as 'a form of knowledge synthesis that addresses an exploratory research question aimed at mapping key concepts, types of evidence, and gaps in research related to a defined area or field by systematically searching, selecting, and synthesizing existing knowledge' (Colquhoun et al., 2014, pp. 1293–1294). Our scoping review aimed to broadly examine the extent, range and nature of the literature on the crime harm index as well as to synthesize the research findings of these studies (Arksey & O'malley, 2005). The review protocol for this study was pre-registered through the Open Science Framework (OSF) and can be found here: https://osf.io/ukpc5/. In what follows, we will describe the data collection using the PRISMA-ScR Checklist (Tricco et al., 2018).

2.1. Screening criteria

This literature review included all academic literature ((non-)empirical and (non-)peer reviewed) related to the topic of crime harm indices published in the period between 2007 and January 2021. The year 2007 was chosen as the starting point because in this year Sherman (2007) hinted on the importance of introducing a 'total harm index' in criminology and crime policy, which ultimately led to the introduction of the Cambridge Crime Harm Index and similar CHIs in other countries (Barnes et al., 2020; Sherman et al., 2016b). To learn how CHIs are implemented by police services, this study also included grey literature such as publicly available police reports. Research from every geographical location was considered, yet only literature in English was included.

2.2. Primary databases and search strategy

The following seven primary databases were searched: Scopus, EbscoHost (Criminal Justice abstracts/APA PsycINFO/OpenDissertations), Web of Science Core Collection, ProQuest (International Bibliography of the Social Science), ScienceDirect, Wiley Online Library and JSTOR (data collected on 25 January 2021). A preliminary search aimed at identifying relevant search terms showed that in some jurisdictions a 'crime harm index' is called a 'crime severity index' and 'severity' is sometimes used as substitute for 'seriousness'. As shown in the research protocol, we considered five different search queries. After assessing the number of results per database for each query, we decided to adopt the following search query: (('harm ind*' OR 'severity ind*' OR 'seriousness ind*') AND ('crim*')). Although each database comes with its own (technical) limitations (see Appendix A for the search queries per database), this search query selected documents that contain the word 'crim*' (e.g., 'crimes' or 'criminal') and 'harm index' (or 'indexes' or 'indices'), 'severity index' or 'seriousness index'. The databases search returned a total of 4,658 articles.

2.3. Inclusion criteria and ASReview

After removing duplicates in EndNote, the remaining 3,693 articles were uploaded into ASReview. This open-source software tool uses machine learning to limit the number of titles and abstracts to be screened. In short, after the reviewer first 'trained' the machine learning software by selecting a number of articles as 'relevant' and 'irrelevant', the tool ranks the articles from most to least relevant and presents the reviewer the article it predicts to be most relevant. Because the software is further trained as the reviewer continues to label every new title and abstract as either 'relevant' or 'irrelevant', ASReview allows the reviewer to stop screening after only a fraction of the total set has been reviewed. A recent ASReview evaluation study showed that 95% of the relevant records were found after screening 8 to 33% of the records (Van De Schoot et al., 2021). ASReview thus not only offers a much quicker way to select relevant literature than screening by hand, it also automatically logs every screening decision, which benefits transparency and reproducibility of the reviewing process.[1]

In the pre-registered research protocol we first listed three basic inclusion criteria for the abstract screening phase, which was based on reviewing titles and abstracts:

(1) A direct reference is made to a 'crime harm index'.
(2) A direct reference is made to a 'harm index', 'severity index' or 'seriousness index' and it is clear from the title or abstract that this index is used for weighting counts of crime according to the seriousness of different offences.
(3) When the document generally discusses the method(s) for measuring the harm caused by crime (one specific crime type or crime in general) and/or how measuring crime harm in some way could help law enforcement agencies in addressing crime problems.

We decided to exclude publications related to harm indices of drug addiction and physical or mental disorders, unless it was clear that these indices were used to support law enforcement agencies in allocating resources and reducing crime. When in doubt about the inclusion of a document, it was kept for the full-text screening stage. The screening process was stopped after the first author had labelled 100 consecutive articles as 'irrelevant', a limit that was reached after reviewing the titles and abstracts of 374 documents (10,9%). As described in the research protocol, the second author screened and labelled a random subset of the data. The mismatches were then discussed to settle on the inclusion criteria. Screening in ASReview resulted in 52 records that were selected for a full-text eligibility check.

During full-text review it became clear that the above criteria cast a wide net, also including the general harm literature and publications that suggest different methods to measure harm, such as the harm assessment framework by Greenfield and Paoli (2013) or public and expert survey-based indices. In order to keep this literature review sufficiently focused, it was decided to only include literature that discusses crime harm indices calculated on the basis of sentencing guidelines, the criminal code or sentencing practice. Any literature that used a different method could still be be included in the review in case the authors *also* discuss CHIs based on sentencing guidelines – and in doing so, help to answer our research questions.

2.3. Additional literature sources

Besides the databases named above we identified some additional sources. First, preliminary searches revealed that the Cambridge Journal of Evidence-Based Policing published several articles related to the CHI, and also that the website of the Cambridge Centre for Evidence-Based Policing has a special page dedicated to the CHI, including references to relevant publications (https://www.cambridge-ebp.co.uk/the-chi). Checking both additional sources turned out important as it uncovered 32 extra unique documents (16 February 2021). Subsequently, Google Scholar found 7,320

results using the following search query: ('harm index' OR 'severity index' OR 'seriousness index') AND ('crime') (2007–2021, show most relevant results first) of which the search engine allows the user to only open and collect the first 1,000 results. Handsearching all 1,000 results resulted in another 69 documents for qualitative synthesis (search finalized on 3 March 2021). While screening the results from the Google Scholar search, it became clear that various Master's students – oftentimes police officers from the UK and abroad – wrote a thesis on the development and application of CHIs at the Institute of Criminology of the University of Cambridge. For this reason, we also searched (27 February 2021) the Thesis Database of the Institute of Criminology (https://www.crim.cam.ac.uk/alumni/available-theses), which resulted in five additional studies.

We also invited the authors of the identified literature to participate in an online survey (closing date 1 September 2021). In one of the questions, we asked them to report on any grey literature they might consider relevant to our review. The list of e-mail addresses was compiled by handsearching the contact details available in the collected articles and by searching for missing e-mail addresses on the internet. In total, 108 survey invitations were sent successfully. After two reminder e-mails, 29 authors completed the survey of which seven suggested a total of 49 documents. After removing duplicates and eligibility screening, 14 additional documents were included in our literature review. The final step to identify relevant literature involved a backward reference search (31 October 2021), which resulted in only a single additional document. Appendix B maps the complete data collection in a data flow chart.

2.4. Data analysis

For all documents that passed the screening stage in ASReview, we included the following information in a data charting form: year of publication, name of the journal, author(s), organization(s) author(s), contact information author(s), type of publication, aim of study, study location, data and methods used, and whether the study is relevant for this literature review and if not, why (the data charting form can be found at: https://osf.io/ukpc5/). Not least because of the number and length of the included documents (some involving dissertations of over 200 pages), we used Atlas.ti (version 8) during full-text review to keep a record of where we identified the relevant information regarding our research questions. The predefined thematic codes used to code the texts are listed in Appendix C. After coding all 141 documents, the codes and selected text segments were further analyzed to synthesize the findings regarding each research question.

3. Synthesis of results

3.1. The rationale for a crime harm index

The authors of the selected studies raised a variety of arguments why 'there is a great need' (Sherman, 2007, p. 113) for an index that assigns weights to crime classifications. Yet, in essence, all arguments stem from the general idea that the traditional way of counting the *number* of crimes (e.g., in police crime reports) provides an 'inadequate basis for crime policy' (Ignatans & Pease, 2016, p. 184) and is sometimes even thought of as a 'fruitless exercise' (Ratcliffe, 2014, p. 179). Most authors start their argument by citing Sherman et al. (2016b), who stressed that 'all crimes are not created equal' and that counting crime as if they are does not provide a 'meaningful measure of crime'. That is to say, crime reports that simply count the number of reported crimes or incidents fail to take into account the fact that some types of crimes are more harmful, severe or serious than others. Put differently, crime counts 'fail to reflect the intensity of crimes in a society' (Boivin, 2014, p. 905).

Consequently, it is argued that raw counts of crime do not provide a 'bottom line' indicator or 'common currency' of whether public safety is increasing or decreasing, and thus also only partially reflect policing demands (Weinborn et al., 2017, p. 227; Andersen & Mueller-Johnson,

2018, p. 68). An overall crime drop produced by a considerable decrease in petty crimes indeed might obscure an increase in crimes that are considered more harmful to society, such as robberies. Crime rates based on the raw number of all crimes combined will always be driven disproportionally by high-volume, less-serious offences and fail to address how much harm victims or specific areas are actually suffering (see, e.g., Dauvergne & Turner, (2010). p. 9). This could particularly lead to misleading conclusions when a crime drop in one area is compared to a larger or smaller crime drop in another area. The same argument is raised in relation to offenders (see, e.g., Liggins et al., 2019). It is argued to be misleading to analyze the criminal careers of different offenders without acknowledging that some offenders commit more serious offences and thus cause more harm to society than others. It was for this reason that the Canadian Association of Chiefs of Police requested Statistics Canada in 2004 to develop a 'measure of crime that reflects the relative seriousness of different offences', which ultimately resulted in the adoption of the Police-reported Crime Severity Index (CSI) in 2009 (Wallace et al., 2009, p. 7).

It is also suggested that adopting a CHI holds practical value for the police in particular, and to understand this 'usefulness', Kärrholm et al. (2020, p. 17) pointed to the phenomenon of the 'power few'. In short, the power few refers to the idea that most of the harm is caused by a small fraction of crimes, people, places and times. Precisely because the harm distribution is skewed, it is argued that targeting the power few 'units' can produce the biggest benefits in terms of harm reduction – as opposed to merely reducing counts of crimes (Sherman, 2007). Numerous authors subsequently pointed to the idea that police services and other public agencies are pressed to use their capacity in more cost-effective ways in times of austerity, and that a CHI allows the police to do so by prioritizing and allocating their resources to those research areas with most 'public interest' or 'community concerns' (e.g., most harm-inflicted locations; Ratcliffe, 2015, p. 3; Dudfield et al., 2017, p. 39). Although it is agreed upon that police officers themselves will naturally recognize the varying harms of different crime types and offenders and are able to take suitable action accordingly, a CHI systematically paves the way for police services to become more evidence-based (see, also, Sherman, 2020b, pp. 1–6).

Besides resource allocation, a CHI is described as a key metric to target, test and track crime prevention strategies and treatments. Ransley et al. (2018) argued that measuring the success of a crime policy or measure on the basis of crime counts says little about whether the intervention reduced the severity or harms of crime within a community (see also, Rinaldo, 2015, p. 2; House, 2017, p. 76). Bland and Ariel (2020b, p. 63) suggested in the context of domestic abuse: 'If we can filter the most harmful cases, we stand a better chance of understanding them, designing treatments for them, and possibly even forecasting them before they become harmful'. Multiple authors moreover added that a harm-focused approach based on a harm-weighted crime index promotes police accountability and legitimacy. As House (2017, p. 83) argued in developing a crime harm index for Western Australia, a harm metric allows the police to justify to the public why they invest resources to the 'areas of the highest community need'.

In sum, the rationale for adopting a CHI boils down to the notion that counting crimes as if they are equal does not provide a reliable basis for the police to understand the problem of crime and to allocate their scarce resources to the places and people that cause and/or suffer the greatest harms in society. Importantly, the CHI weights are meant as a proxy for *relative* harm only, and thus do not intend to capture all types of harm within a single metric (Curtis-Ham & Oliveira, 2020, p. 10).

3.2. Operationalizing a crime harm index

This scoping literature review focuses on sentencing-weighted indices, including studies in which sentencing guidelines or the length of actual sentences are used as a proxy measure for the relative harm caused by a given offence. These studies all start from the premise that more 'serious', 'severe'

or 'harmful' crimes deserve or receive more serious sentences, and that this gets reflected in the penal code and sentencing guidelines.

3.2.1. Calculating harm weights

We already pointed to the CSI first introduced by Statistics Canada in 2009. This index is calculated by multiplying the number of offences by the weight for each offence, to then divide the sum by the population. In Canada, these weights are calculated by multiplying the incarceration rate for an offence by the average sentence length handed down by the court for each offence. The CSI is updated every five years using sentencing data from the most recent years. Although Sherman et al. (2016b) were thus not the first to do so, their Cambridge Crime Harm Index was arguably most influential in inspiring other scholars and agencies to likewise develop a CHI for their own jurisdiction, for instance, in New Zealand (Curtis-Ham & Walton, 2017b), Western Australia (House & Neyroud, 2018) and Sweden (Kärrholm et al., 2020; Rinaldo, 2015). Introduced for England and Wales, the Cambridge CHI was suggested as a 'democratic', 'reliable' and 'inexpensive' method to measure (the harm of) crime across times, places and people.

The CHI for one particular crime type is simply calculated by multiplying the days of imprisonment recommended by the National Sentencing Guidelines for the respective crime type with the number of offences reported by victims and witnesses. The total CHI can be calculated by simply summing up all CHI scores. Importantly, other than with the CSI, the authors looked at the sentencing *guidelines* for a *first* time offender, because they argued a single crime committed by a first time offender creates the same amount of harm to the victims and larger community as every single offense committed by repeat offenders. Importantly, the authors opposed to using sentencing data, because actual sentences handed down are influenced by circumstances related to the offender(s) (e.g., prior convictions) and other aggravating or mitigating factors. These factors do not, however, so the authors argued, change the amount of harm caused to the victim: 'The actual punishment each offender "deserves" to receive is a very different question from how much harm the crime has caused. It is that concept of harm, independent of culpability, which we aim to measure in the Cambridge CHI' (Sherman et al., 2016b, p. 177).

The fact that sentencing guidelines are not available in every country or jurisdiction, forced other scholars to turn to other data sources to calculate harm weights. For instance, Taira (2018) used the criminal code of Japan to identify the lowest recommended sentence for each offence, while Mitchell (2019) used the maximum number of prison days as reflected in the California Criminal Code. See Appendix D for an overview of how the CHI weights in different jurisdictions are calculated. Operationalizing CHI weights involves important methodological choices. For example, using sentencing guidelines for first offenders is conceptually very different from using actual sentencing data, because the latter also include mitigating or aggravating factors unrelated to the harmfulness of the crime itself. Several other methodological choices have to be made, but because we cannot discuss all such practicalities at length, only some that clearly stand out will be mentioned.

3.2.2. Methodological challenges

Arguably the most important methodological task is to ensure a high degree of variance between the harm weights of the various offence types, which very much depends on the decision to either use sentencing guidelines or actual sentencing data to calculate the weights (Ashby, 2018; Kärrholm et al., 2020). Moreover, Barnes et al. (2020) argued that a CHI should only report victim-reported crimes and exclude, or otherwise mention separately, crimes detected by proactive policing efforts or 'police-discovered crimes' (such as drunk driving or drug possession). The latter types of crimes are more reflective of police outputs and including these in the CHI could mislead the public about public safety levels. Although most scholars agree with this argument, some decided that it is for the users of a CHI to decide whether or not to exclude this subset of offences – depending on the research question at hand (Curtis-Ham & Walton, 2017b).

Another methodological challenge involves the fact that minor offences are often punished by non-custodial sentences, such as fines or community sentences. To calculate CHI weights for these types of offences, the alternative sentences need to be converted into equivalent prison days (EPDs), as Andersen and Mueller-Johnson (2018) did by using the 'converter' as regulated in the Danish criminal code (see, also, Bangs, 2016, pp. 4–5; Sherman et al., 2016b; House & Neyroud, 2018, p. 76; Curtis-Ham & Oliveira, 2020, pp. 7–8). To develop the CSI, Babyak et al. (2009) in contrast decided to only use incarceration data and to leave out fines, probation and conditional sentences. The authors did account for the fact that youths are sentenced under different and less harsh provisions by developing a separate youth CSI. Life sentences pose another challenge. Some converted life sentences to 25 year imprisonment (see, e.g., Jackman, 2015; Wallace et al., 2009), while others used the average life expectancy as a proxy for life imprisonment (Ojo & Ojewale, 2019). Another challenge exists when the crime categories listed in a criminal code or sentencing guidelines do not fully correspond with the offence categories used by police, which makes linking police-reported crime data to a CHI weight difficult (House, 2017).

Other general methodological issues include: dealing with missing or insufficient sentencing data to calculate the harm weight of an offence category (Babyak et al., 2009; Bangs, 2016; Curtis-Ham & Walton, 2017b; House & Neyroud, 2018), outliers (Babyak et al., 2009; Barnes et al., 2020), dealing with multiple offences, offenders and/or victims within a single police-recorded incident (Curtis-Ham & Oliveira, 2020; Kärrholm et al., 2020; Linton & Ariel, 2020), using crime categories that are specific enough (Kärrholm et al., 2020), and the need to periodically update the harm weights to reflect changing sentencing guidelines (Weinborn et al., 2017).

To conclude this section on CHI operationalization, it is worth noting that according to Sherman et al. (2016b), a CHI has to meet three criteria. The first criterion is that the CHI should reflect the resolution of conflicting viewpoints and, through a democratic process, 'the will of the people' ('democracy test'). Furthermore, the metric should provide a reliable measure (the 'reliability test') that is available without additional funding or resources (the 'cost test'). Curtis-Ham and Walton (2017b) added two additional criteria. The metric should also be 'valid', which means that the harm value should only reflect the harm associated with the specific offence type and not be influenced by other offender-related circumstances. With validity, the authors also noted that harm weights should not be based on broad crime categories, because this would conceal possible harm differences between crime types within one crime category. Finally, the CHI should be easy to understand and easily applicable in practice, without much additional training.

3.3 Crime harm index applications

In this section, we map the different ways in which CHIs have been applied and summarize the key findings of these applications – focusing specifically on how analyzing crime with a CHI yields new insights compared to analyses that use crime counts. It is argued that applying a CHI 'opens up a new paradigm of analytical opportunities' and is attractive for law enforcement agencies because it offers greater clarity for evidence-based policies without requiring large funding (Bland & Ariel, 2015, p. 47). Appendix E provides an overview of the various CHI applications linked to the respective studies. It shows that CHIs are mostly used to shine a (new) light on crime volume trends in a particular country or smaller region. The CHI is also applied to (groups of) offenders, and to a lesser extent, to victims, the victim-offender overlap and couples. A growing field of research in which CHI measures are applied is the spatial-temporal analysis of crime and evaluation studies.

3.3.1. Trends in crime

Statistics Canada fully incorporated the CSI into its yearly reports on Police-reported Crime Statistics in Canada by comparing crime count figures with CSI-scores (e.g., Moreau et al., 2020). However, (Boivin, 2014, p. 902) criticized the CSI because it correlated strongly with conventional crime rates (r = .926), which was to argue why weighted crime rates 'are not very popular among

crime analysts and criminologists'. The recent upsurge of publications related to a CHI yet reveals a different picture.

The applications of CHI clearly show that the crimes that take up a large proportion of the total crime volume oftentimes constitute a much smaller percentage of the total harm. Curtis-Ham and Walton (2017b, p. 462), for instance, showed that sex offences caused 30% of the total crime harm while only constituting 1% of the total crime volume in New Zealand in 2015. This is why a CHI can have an 'immense impact' on crime trend analysis (Kärrholm et al., 2020, p. 30). The authors revealed that since 2006 harm per capita has increased three times more than the number of crimes. Furthermore, several studies from different countries (Andersen & Mueller-Johnson, 2018; House & Neyroud, 2018; Taira, 2018) showed that harm and count values can be bi-directional, meaning that an increase or decrease in crime counts does not necessarily go hand in hand with an increase or decrease in harm levels. All in all, a CHI can make trends about public safety visible that would have gone undetected by merely analyzing crime counts (Andersen & Mueller-Johnson, 2018, p. 64). A CHI is also used to nuance claims made in the media about rising youth crime severity (Silcox, 2016, 2019) and to assess how the number of police officers and the police budget at the provincial or district level correspond with crime harm (e.g., Hutchins, 2015; Taira, 2018).

3.3.2. (Co-)offenders and victims

When applied to offenders, it is shown that crime harm is more concentrated than crime volume. Liggins et al. (2019) analyzed 39,545 offenders recorded by Northamptonshire Police from 2010 to 2016 and found that 80% of crime harm is linked to just 8% of the offenders, whereas 80% of the total crime volume comes from 54% of the offenders. By applying the Cambridge CHI, the authors moreover concluded that over time, offenders commit offenses that cause less harm. A similar 'power' or 'felonious few' selection of offenders (Sherman, 2019) was found in the study by Linton and Ariel (2020), who showed that offenders who have been involved in the same number of offences account for highly diverging CHI values – which 'alters our understanding of which suspects are high value targets considerably' (Jackman, 2015; Linton & Ariel, 2020, p. 271). By comparing judgments made by crime analysts and detectives, which are mostly based on intuition and experience, with a harm score generated list, Ratcliffe and Kikuchi (2019) indeed concluded that a 'harm score approach is a promising tactic' to identify the more harmful offenders (see, also, Sutherland & Mueller-Johnson, 2019). Interestingly, similar patterns are observed when a CHI is applied to co-offenders or groups. Morgan et al. (2020) showed that 5% of outlaw motorcycle gang (OMCG) members accounted for approximately 70% of the harm caused by members (as opposed to 42% of all offences) and that 5% of OMCG chapters accounted for 39% of all harm (as opposed to 33% of all offences) (see, also, Frydensberg et al., 2019; Prescott-Mayling, 2020). Similar analyses have been applied to victims, which shifts the question to who is *suffering* the most harm. To give an example, analyzing a dataset containing 30,244 crimes committed against 25,831 persons in Dorset (UK), Dudfield et al. (2017) located a 'power few' of 968 victims (4% of all victims) to have suffered 85% of the total crime harm as calculated by the Cambridge CHI (compared to 5% of total crime counts).

3.3.3. Victim-offender overlap and couples

A relatively small subset of the literature has applied a CHI to the victim-offender overlap and to victim-offender couples. The key takeaways from these studies are that people who have ever been reported as victim *and* offender have higher crime harm scores than (only) victims or offenders (Hiltz et al., 2020; Sandall et al., 2018). Furthermore, Bland and Ariel (2015) found that domestic abuse harm is highly concentrated, with 2% of the couples (over 36,000 abuse cases in a period of six years) accounted for 80% of all domestic abuse harm (see, also, Bland, 2014; Bland, 2019). Similar conclusions were reached by Barnham et al. (2017), who analyzed 140,998 recent incidents of intimate partner violence or abuse reported to Thames Valley Police in the period

2010–2015. They found that only 3% of the perpetrators accounted for 90% of total harm caused by intimate partner abuse. They also found, partly in line with Kerr et al. (2017) and Sherman et al. (2016a), that there is no escalation in crime severity in intimate partner violence incidents.

3.3.4. Crime locations

Another strand of the literature involves the spatial-temporal analysis of crime. While it is generally agreed upon that crimes are concentrated in what is known as 'hot spots', applying CHI scores makes it possible to similarly locate 'harm spots'. Importantly, it is found that harm spots are not necessarily located in the areas where most of the (reported) crimes are found. Put differently, the spatial distribution of harm tends to follow a different non-random distribution than crime volume (see, e.g., Etheridge, 2015; Rinaldo, 2015). Fenimore (2019) for instance, found that additional harm spots appear further away from the city center into more residential areas. A harm mapping study in New Zealand furthermore suggested that crime harm is not necessarily located in the more disadvantaged communities (Curtis-Ham & Walton, 2017a). Crime harm also seems to be somewhat more geographically concentrated than crime volume (Etheridge, 2015; Macbeth, 2015; Macbeth & Ariel, 2019; Weinborn et al., 2017), although this finding is not supported by all studies (Fenimore, 2020; Šimon & Jíchová, 2020).

Harm and crime counts also show different cyclical temporal patterns. Norton et al. (2018) analyzed crimes recorded over a four-year period in the county of Sussex, showing that harm 'spikes' above crime counts in January and March and that harm is higher during the evenings and nights, a conclusion that was also reached by Etheridge (2015). The latter also found that crime harm in South Yorkshire (UK) exceeds crime counts during the weekends. In general, police officers appear to be rather unsuccessful in accurately estimating harm spot locations – a finding used to argue in favor of adopting a CHI (Macbeth, 2015; Macbeth & Ariel, 2019; Sutherland & Mueller-Johnson, 2019).

3.3.5. Interventions

Finally, several studies have used CHI scores as a control or outcome variable in the evaluation of crime interventions. For instance, Mitchell (2019) developed and applied the California CHI to evaluate the Sacramento Hot Spot Experiment (SHSE), a 90-day randomized controlled trial testing the effectiveness of 15-minute high-visibility police patrols. Using CHI values in this context is relevant, because it allows to not just detect changes in crime volume, but also to see whether offenders reoffend less harmfully as a result of the intervention. Ariel et al. (2016, p. 304) argued that using a CHI 'may be a far more powerful way' to present the results of an experiment in more concrete terms. In some studies, the intervention caused a (slightly) larger drop in crime volume than in crime harm (Carr et al., 2017; Mitchell, 2019), while other studies found that an intervention actually had a larger effect in terms of reducing crime harm compared to reducing crime counts (Barnes et al., 2020). The findings by Walton and Brooks (2019) are telling in this respect. The authors evaluated a program aimed at reducing family violence within Māori and Pasifika communities in New Zealand and found that the number of crimes and victims actually increased while the program reduced the harm from offending by 15%. The authors therefore argued that the intervention would have been unjustly labelled 'unsuccessful' had they only relied on crime counts, missing out on what the authors called the 'true impact' of the intervention (Walton & Brooks, 2019, p. 3, see, also, 2020). A similar conclusion was reached by Walton et al. (2019, p. 14) in a different evaluation study: 'by finding a reduction in harm, as opposed to rate, we have additionally demonstrated the benefit for using a crime harm index in the assessment and evaluation of recidivism or programmes designed to reduce re-offending. Indeed, the opposite finding would have been reasonable if we relied on the observed rates of re-offending'.

3.4. Challenges, critique and future research

In this final section, we discuss challenges, critiques and future lines of research as expressed in the literature. The challenges of adopting a CHI are mostly related to the methodology, and we already discussed these in section 3.2. However, several studies also address implementation challenges. House (2017, p. 77) argues that it is a challenge for the police and the wider policing community 'to think differently about harm' and to make clear that the CHI is not 'just another crime measure'. Part of this challenge is that a CHI should not be seen as 'panacea' or intended to replace traditional crime counts. These challenges call for a well-planned implementation strategy. House and Neyroud (2018, p. 89) argue that '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'.

Critique

The adoption of a CHI not only faces methodological or implementation challenges. Various authors also formulated some fundamental critiques on the premises underlying (the use of) CHIs. One common critique is that the harm weight in a sentencing index cannot account for the varying 'harm' as experienced by a victim or the wider community, and thus leaves untouched the fact that a particular offence can have a different impact on various people or communities: 'even if two offences of the same type are identical, different victims may experience them in very different ways' (Paoli & Greenfield, 2013; Linehan, 2016; Ashby, 2018, p. 448; Šimon & Jíchová, 2020). In other words, whereas 'traditional' crime counts are criticized for treating different crimes categories equally, it is now assumed that every particular crime category is equal in terms of seriousness or harm. Maguire and Mcvie (2017) also argued in this context that sometimes 'the whole is greater than the sum of the parts', meaning that the (awareness of) high *frequency* of relatively minor offences can have a larger impact (in terms of fear or worry) on an individual as opposed to only a single serious crime.

Another somewhat similar critique relates to the idea that a CHI would be a tool able at identifying 'areas of the highest community need' (House, 2017, p. 83). Since every CHI is based on crimes reported to the police, it fails to account for non-crime incidents and antisocial behavior and physical disorder, which are known to also have an important influence on community and thus policing needs (Ashby, 2018; Curtis-Ham & Walton, 2017a; Innes & Innes, 2018). In this context, Norton et al. (2018, p. 366) pointed to the 'premise of community and neighborhood policing strategies' stating that citizens are sometimes bothered more by low-harm incivilities than serious crimes, and that police forces are likewise held accountable for dealing with these low-harm incidents.

Paoli and Greenfield (2018) furthermore argued that a CHI that is based on sentencing (guidelines) cannot be used to independently investigate crime and set policy priorities, because sentencing inherently reflects prior policy decisions and (political) priorities. Morrell and Rowe (2019) similarly argued that sentencing (guidelines) partly reflects 'historical and political priorities rather than the absolute gravity of the impact of a particular offence type'. Thus, where Barnes et al. (2020) argued that a CHI should exclude police-discovered crimes (such as the production or possession of drugs) because these are more reflective of priorities and police outputs, Paoli and Greenfield (2018, pp. 67–68) claimed that the same might be true for CHI-weights of victim-reported crimes: 'The index reflects and codifies prior policy decisions, which, in turn, involved a mix of public perceptions and political imperatives. For that reason, it cannot be used to establish criminality, policy priorities, or sanctions because it already embodies decisions about each.'

Finally, an important issue is raised by Bell (2017). The often cited rationale for adopting a sentencing-weighted index is that counting crime as if they are equal does not provide a meaningful measure of crime, especially for the police, and fails to take into account that some crimes are more harmful than others. The author, however, noted that police services in reality often employ various techniques to identify the most problematic and harmful persons and places, yet these practices largely go unnoticed because police seldom publish on their work. The idea that

police services (still) treat crimes as if they are equal and mainly look at aggregate crime counts thus might in itself be a bit too simplistic and subsequently fuel one-sided conclusions about the added value of a CHI for the police. It is furthermore argued that it is too simple to assume that crimes with low CHI scores automatically demand fewer police resources. Laufs et al. (2021) for instance, pointed to cybercrimes, which might have relatively low harm scores but often require many specialized resources.

Future research

We end this section by pointing to a few lines of future research, based on recurring research gaps mentioned in the literature. We should first conclude that the development and application of CHIs is still a relatively new but quickly expanding field of research. This literature review showed that various authors have for the first time developed a CHI for a particular jurisdiction and applied it to analyze crime trends and, to a lesser extent, people and locations. The authors generally call for validation studies to increase the reliability of a CHI (see, e.g., Fenimore, 2020, p. 55). For example, Andersen and Mueller-Johnson (2018, p. 66) argued to split up broader crime categories in order to see whether this would yield different results. Testing multiple methods to compute a CHI is also important, because a comparison of the CSS with the CHI showed that two measures can 'produce substantially different estimates' (Ashby, 2018, p. 449). To be able to better compare CHI applications across jurisdictions, the author argued in favor of building 'consensus' among academics and professionals on which method to use (see, also, Curtis-Ham & Walton, 2017b, pp. 465–466). To ensure a CHI enjoys public legitimacy, some authors also suggested to compare CHI scores to public perceptions of crime severity (Ashby, 2018; Mackinnell et al., 2010; Norton, 2016).

Curtis-Ham and Walton (2017b, p. 465) suggested as an 'avenue for future research' to take account of the possible variation in harm suffering or perception between subgroups. Furthermore, several authors suggested that future research should focus on covering more offences and on incorporating, possibly in a separate index, nuisance and non-crime incidents, which – according to Fenimore (2019, p. 6) comprise 'the bulk of police calls for service' (Curtis-Ham & Walton, 2017b; House, 2017; Rinaldo, 2015; Sidhu et al., 2017; Taira, 2018). It is worth noting that Ratcliffe (2014) explored ways to extend the harm index by also including investigative police stops and traffic accidents.

More research is also needed into the spatial-temporal patterning of crime harm. Fenimore (2019) explained that the differences in the degree of concentration between crime counts and harm could be the result of using different spatial units of analysis in studies. Others suggested to research the 'dynamics' and 'mechanisms' underlying harm spots. The question then is: what makes harm spots different from hot spots, and why? (Weinborn et al., 2017, p. 236). Curtis-Ham and Walton (2017a, p. 253) moreover suggested to gain a better understanding of the 'harm profiles' in terms of neighborhood-level sociodemographic and environmental factors, possibly to more effectively respond to the underlying causes of crime harm (Etheridge, 2015, p. 103; Norton, 2016, p. 108; Fenimore, 2020, p. 125). Another follow-up question would be to measure the effect of hot spot policing on reducing crime *harm* (Bennett et al., 2017).

Further research questions were raised in relation to offenders and victims. Since these applications of CHIs are still relatively new, the research field would benefit from new studies that apply a CHI to different groups of offenders and/or victims, but also from replicating the current studies in different jurisdictions. Given the small group of 'power few' (harmful) offenders (and victims), several studies (e.g., Dudfield et al., 2017; Frydensberg et al., 2019; Liggins et al., 2019; Prescott-Mayling, 2020; Williams, 2018) call for predictive studies and the targeting of the most (future) harmful offenders and victims with evidence-based strategies.

Finally, Ratcliffe and Kikuchi (2019, p. 69) noted that the 'operational impact of harm-focused efforts' is still largely unknown. Although it is generally suggested that allocating resources to (repeat) offenders with a high harm score reduces future harm, future research is required to assess if maybe even more harm is to be prevented by tackling 'key players' with relatively low harm scores but with an important role within the criminal network.

4. Closing remarks

In this literature review, we mapped an emerging line of research that uses sentencing guidelines or sentencing practice to develop harm-weighted crime indices. In doing so, we captured the latest developments of a longer tradition of studies that take into account the various levels of seriousness or harm associated with different crime types. In the literature, adopting a CHI is encouraged, especially for law enforcement agencies, because crime counts would not provide a bottom line indicator of whether public safety is increasing or decreasing. In fact, crime counts are generally considered misleading, simply because 'all crimes are not created equal'. By constructing and adopting a CHI, so it is suggested in the literature, it becomes possible for police services to allocate their scarce resources to the places and people that cause or suffer the greatest harms in society.

This literature review has clearly shown the potential benefit of adopting a CHI for the police and for criminological research in general. To summarize, using a CHI in addition to crime counts allows to shine a new light on crime trends across regions, for instance, by showing that increasing crime counts do not necessarily go hand in hand with an increase in crime harm values, and vice versa. A CHI also helps to identify the 'power few' offenders and victims that cause or suffer the greatest harm, as well as to identify crime 'harm spots' – which are not necessarily concentrated in the same areas as 'hot spots'. Finally, a CHI offers an interesting new and extra metric to be used in evaluation studies. In criminological research, recidivism and the success of interventions are often measured in terms of re-offending only. Yet with a CHI it becomes possible to see if a program also reduced crime *harm*.

This literature review warrants the conclusion that the adoption of a CHI has various potential benefits. However, we also feel that virtually all CHI studies have started from a strawman's argument by first assuming that police would treat crimes as if they are equal, and second by only empirically assessing how CHI metrics differ from those based on crime counts. In reality, the police often already make use of classifications that allow them to identify the most harmful offenders, cases and locations, as also noted by Bell (2017). It would contribute to the adoption of CHI in police practice if future studies would move beyond the mere comparison of CHI metrics to crime counts by showing how CHI metrics actually compare to the classifications that are already in use.

Note

1. The log file is published with the protocol at OSF.

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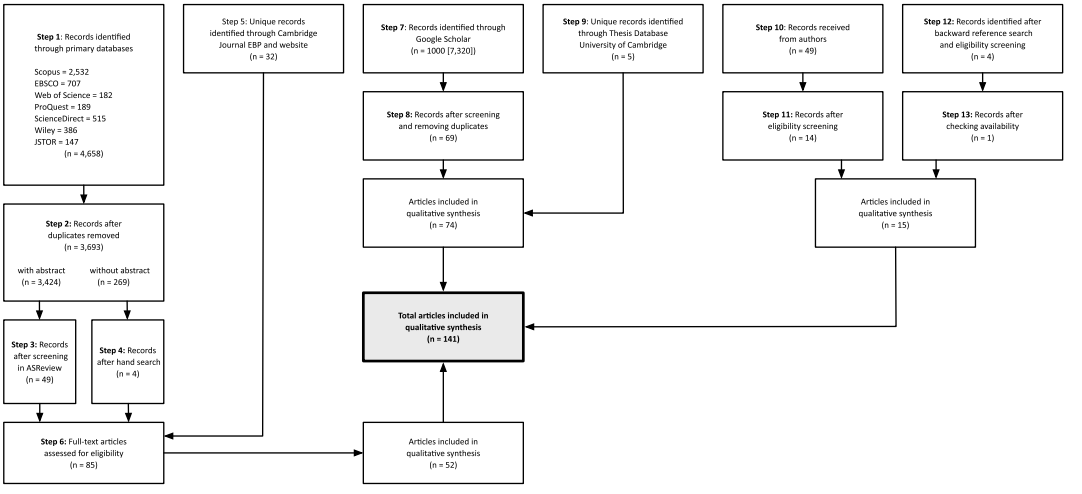
Appendix A: Search Queries

Database	Search query
Scopus	ALL (‘harm ind*’ OR ‘severity ind*’ OR ‘seriousness ind*’) AND ALL (‘crim*’)
EBSCO	TX (‘harm ind*’ OR ‘severity ind*’ OR ‘seriousness ind*’) AND TX (‘crim*’)
Web of Science	ALL = (‘harm ind*’ OR ‘severity ind*’ OR ‘seriousness ind*’) AND ALL = (‘crim*’)
IBSS	(‘harm ind*’ OR ‘severity ind*’ OR ‘seriousness ind*’) AND ‘crim*’)
ScienceDirect	(‘harm index’ OR ‘severity index’ OR ‘seriousness index’) AND (‘crime’)
Wiley	(‘harm index’ OR ‘severity index’ OR ‘seriousness index’) AND (‘crime’)
JSTOR	(‘harm index’ OR ‘severity index’ OR ‘seriousness index’) AND (‘crime’)

Appendix B: Data Flow Chart



Appendix C: Coding Scheme

Code group	Codes
A_General information study	A_Study location
	A_Study organization authors
	A_Study publication year
	A_Study type of publication
B_Harm index general	B_Harm index challenges
	B_Harm index critique
	B_Harm index name
	B_Harm index rationale
	B_Harm index research gaps
C_Computing index	C_Index advantages
	C_Index disadvantages
	C_Conditions
	C_Considerations
	C_Index data
	C_Operationalization
D_Index applications	D_Index application
	D_Index application case examples
	D_Index application considerations
	D_Index application data/method
	D_Index application outcomes

Appendix D: CHI Weight Operationalizations

Name index	Year first introduced	Country/ jurisdiction	Document(s)	calculation of crime harm weights
National Offence Index Judicial Commission of New South Wales / NSW Bureau of Crime Statistics and Research	2003	Australia	Mackinnell et al. (2010)	**Criminal Code (maximum sentence) and sentencing practice (median sentence length)** The author proposes two new measures of offence seriousness. The first one is based on statutory maximum penalties in the criminal code and the second on actual sentencing practice (first offenders).
Police-Reported Crime Severity Index (CSI) Statistics Canada	2009	Canada	Babyak et al. (2009), Wallace et al. (2009), Babyak et al. (2013)	**Sentencing practice (average sentence length)** The weights for the CSI are calculated by multiplying the incarceration rate for an offence by the average sentence length in days for the same offence for those people who were imprisoned. The weights are updated every five years.
Cambridge Crime Harm Index (Cambridge CHI)	2016 [2011, 2013]	England and Wales	Sherman (2011), Sherman (2013), Sherman et al. (2016b), Sherman (2020a)	**Sentencing guidelines (minimum)** The weights for the Cambridge CHI are taken from the days of imprisonment recommended as the 'starting point' or minimum (first offender) by the National Sentencing Guidelines published by the Sentencing Council of England and Wales.
Measure of Crime Seriousness	2014	Canada	Boivin (2014)	The author criticized the Police-Reported CSI (see above) for being too much of a measure of crime volume. To separate crime seriousness from crime volume, and to thus come up with a ratio that is not affected by the volume of crime, the author suggests to divide the weighted sum of offences by the unweighted sum of offences.
Pennsylvania Offence Gravity Score	2014	Philadelphia/ USA	Ratcliffe (2014)	**Sentencing guidelines for trial judges** In this study, the author uses Philadelphia (PA) offence gravity scores, which are guidelines determined by the Pennsylvania Commission on Sentencing to assist trial judges in determining an appropriate penalty, as weights for each offence. In addition, the author experimented with widening the concept of harm beyond crime by estimating gravity scores for investigative stops and traffic accidents.

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Name index	Year first introduced	Country/ jurisdiction	Document(s)	calculation of crime harm weights
Jackman Crime Harm Index (Jackman CHI)	2015	Norfolk, United Kingdom	Jackman (2015)	**Sentencing practice** Derived from the Cambridge CHI, the author designed a new CHI specifically aimed to analyze sex offenders in Norfolk (UK) based on the number of days each offender was sentenced to imprisonment.
Crime Severity Score (CSS) UK Office of National Statistics	2016	England and Wales	Bangs (2016)	**Sentencing practice (average sentence length)** Similar to the CSI in Canada, the CSS weights were calculated by averaging sentencing data for England and Wales between 2011 and 2015.
Irish Recorded Crime Index (I-RCI)	2016	Ireland	Linehan (2016)	**Sentencing practice (average sentence length)** In line with the CSI in Canada, the proposed I-RCI weights are calculated based on sentencing data (2008–2010), by multiplying the average sentence length for an offence with the likelihood of being sentenced to prison for the same offence.
New Zealand Crime Harm Index (NZ-CHI)	2017	New Zealand	Curtis-Ham and Walton (2017b), Curtis-Ham and Oliveira (2020)	**Sentencing practice (15th percentile)** The NZ-CHI is derived from sentencing data and by translating the sentences to Equivalent Prison Days (EPD). The CHI weights were calculated by taking for each offence code with at least five eligible charges the 15th percentile along the distribution of EPDs.
New Zealand Justice Sector Seriousness Score	2017	New Zealand	Sullivan et al. (2017)	**Sentencing practice (average sentence length)** Using sentencing data from the previous five years, seriousness scores are calculated as an average of the actual sentences imposed by courts.
Western Australia Crime Harm Index (WA-CHI)	2017	Western Australia/ Australia	House (2017), House and Neyroud (2018)	**Sentencing practice (median sentence length)** The WA-CHI was calculated by taking the median sentence length in prison days for first time offenders.
Japan Crime Harm Index (J-CHI)	2018	Japan	Taira (2018)	**Criminal code (minimum sentence)** For the Japan CHI, the criminal code of Japan was used as a substitute for sentencing guidelines, meaning that the lowest available sentence assigned to each crime type was used to calculate the crime weights.
Danish Crime Harm Index (D-CHI)	2018	Denmark	Andersen and Mueller-Johnson (2018)	**Sentencing guidelines for prosecutors** To calculate the weights for the D-CHI, the authors used the prosecutor guidelines from the Danish Director of Public Prosecutions (DPP). These guidelines specify what sentence (i.e., days imprisonment) the prosecutor should ask for in court in case of a first time offender charged without mitigation or aggravating factors.

(*Continued*)

Name index	Year first introduced	Country/ jurisdiction	Document(s)	calculation of crime harm weights
Crime Severity Rate (CSR)	2018	Italy	Capuano and Massimiliano (2018)	**Sentencing practice (average sentence length)** The authors developed a CSR to measure organized crime in different parts of Italy. The weights for this index are calculated by taking the average sentence length.
Icelandic Crime Harm Index (I-CHI)	2019	Iceland	Hringsson (2019)	The author did not create a new CHI for Iceland. To show how crime statistics in Iceland might change with a CHI, the author used the Danish CHI to analyze fifteen offences recorded in 2017 in Iceland.
Hong Kong Crime Harm Index (HK-CHI)	2019	Hong Kong	Chong (2019)	**Sentencing practice (median sentence length)** The weights for the HK-CHI were calculated by taking a median approach to sentencing data (days in prison) using sentencing outcomes in the period 2013–2017.
California Crime Harm Index (CA-CHI)	2019	California/ USA	Mitchell (2019)	**Criminal code (maximum sentence)** The CA-CHI is based on the maximum number of prison days for each crime type (for first offenders) as reflected in the California Criminal Code.
United States Crime Harm Index (US-CHI)	2019	United States	Fenimore (2019), Fenimore (2020)	**Sentencing guidelines (minimum)** For this study, the author used the United States Federal Sentencing Guidelines to, in line with the Cambridge CHI, develop a new crime harm weighting scale using the lowest sentence length in days.
Northern Urban Crime Harm Index (N-UCHI) Southern Urban Crime Harm Index (S-UCHI)	2019	Nigeria	Ojo and Ojewale (2019)	**Criminal code** For both indices, the authors used the guidelines for punishing criminal offences (in years) as listed in the two different Criminal Code Acts used in the northern and southern states of Nigeria.
Swedish Crime Harm Index (S-CHI)	2020	Sweden	Kärrholm et al. (2020)	**Sentencing practice (average sentence length)** To design a CHI for Sweden, five different scales were considered and compared: expert panel of judges (Rinaldo, 2015), the statutory maximum penalties, statutory minimum penalties, the average of maximum and minimum penalties and the average of sentences imposed for each crime type. The authors concluded that average sentence length (over at least 3 years) provides the best measure to calculate CHI weights for Sweden.

Appendix E: Overview of CHI Applications

Unit of analysis	Type of analysis	Literature
Trends in crime	The CHI is used as a tool to analyze crime volume trends and to make comparisons across e.g., provinces, police districts, age and gender. This type of analysis typically reveals how a decrease or increase in crime volume in a given time period corresponds with the crime harm trends in that same period. This type of analysis fuels questions related to police performance and accountability. For instance, CHI totals in police districts can be measured against allocated police budget, police strength (e.g., police officers per 1,000 residents) and patrol strategies.	Dauvergne and Turner (2010), Brennan and Dauvergne (2011), Brennan (2012), Boyce et al. (2014), Ratcliffe (2014), Allen and Perreault (2015), Hutchins (2015), Allen (2016), Allen and Superle (2016), Ruddel and O'connor (2016), Ruddel and Weinrath (2016), Sherman et al. (2016b), Andersen and Mueller-Johnson (2018), House and Neyroud (2018), Kärrholm et al. (2020), Ruddel (2020), Ruddel and Asadullah (2020), Ruddel and Britto (2020), Ruddel and Sauvageau (2020), Ruddel and Winterdyk (2020), Babyak et al. (2009), Wallace (2009), Wallace et al. (2009), Babyak et al. (2013), Perreault (2013), Boivin (2014), Linehan (2016), Silcox (2016), Curtis-Ham and Walton (2017b), Keighly (2017), Ashby (2018), Capuano and Massimiliano (2018), Moreau (2019), Ojo and Ojewale (2019), Perreault (2019), Silcox (2019), Moreau et al. (2020) Carrington (2013), Bangs (2016), Mccormick (2017), Hringsson (2019) Chong (2019), House (2017), Taira (2018) Security (2011), Macbeth (2015), Sawatsky et al. (2017), Stobbe (2018)
Individual offenders	CHI values are used to analyze and make comparisons across individual offenders. The question that is answered here is not (only) how many crimes an offender committed (in a given time period), but how severe or harmful the crimes committed by this offender are. This type of analysis often includes measuring (re-)offending severity over time (recidivism) and identifying the 'power few', i.e., the small subset of offenders that is producing the most harm to society.	Ratcliffe (2014), Jackman (2015), Williams (2018), Ibrahim (2019), Liggins et al. (2019), Ratcliffe and Kikuchi (2019), Stewart et al. (2019), Linton and Ariel (2020), Richards and Harinam (2020) Thanh Vo (2015), Sutherland and Mueller-Johnson (2019)
Co-offending /groups	The CHI is applied in relation to co-offending incidents and (criminal) groups or networks (including families) – providing insight in the most harmful co-offenders. Adding a weight to the crimes committed by a group of offenders also adds a new dimension to social network analysis.	Carrington et al. (2013), Frydensberg et al. (2019), Morgan et al. (2020), Prescott-Mayling (2020)
Victims	CHI values are applied to identify how much crime harm victims have suffered (over time) and to what extent harm is concentrated in 'power few' victims. As with offenders, this perspective provides a basis for predicting future harm and allows state agencies to direct their resources to the victims that suffer the most harm.	Thanh Vo (2015), Dudfield et al. (2017)
Victim-offender overlap	CHI values are applied to address the victim-offender overlap, focusing specifically on the group of offenders that in the past have also been reported as a victim and vice versa. By including a CHI to this subfield is becomes possible to analyze how crime harm is concentrated in the victim-offender category (e.g., compared to the offenders-only category) and to track escalation in levels of harm.	Sandall et al. (2018), Hiltz et al. (2020)
Victim-offender couples	CHI values are used analyze offender-victims couples or dyads (e.g., intimate partner violence) to see if crime harm is concentrated in victim-offender couples and escalates over time.	Bland (2014), Bland and Ariel (2015), Barnham (2016), Sherman et al. (2016a), Barnham et al. (2017), Kerr et al. (2017), Bland (2019), Bland and Ariel (2020c), Bland and Ariel (2020a)

(*Continued*)

Unit of analysis	Type of analysis	Literature
Crime locations	Whereas crime locations are typically analyzed by counts of crime (hot spots), CHI values are applied to the spatial-temporal analysis of crime for the purpose of locating harm concentrations or harm spots. By also including time, it becomes possible to pinpoint the times (months, weeks, days, hours) vulnerable to the most harmful crime.	Macbeth (2015), Rinaldo (2015), Norton (2016), Weinborn et al. (2017), Fenimore (2019), Macbeth and Ariel (2019) Norton (2016), Curtis-Ham and Walton (2017a), Norton et al. (2018), Kärrholm et al. (2020), Ratcliffe (2014), Etheridge (2015), Sutherland and Mueller-Johnson (2019), Fenimore (2020), Šimon and Jíchová (2020)
Interventions	To measure the effectiveness of an intervention (e.g., in a randomized control trial), crime count is traditionally taken as the principal outcome measure. CHI scores are used as an outcome measure or control variable to identify whether an intervention (e.g., police patrol) was successful in reducing crime (harm).	Thanh Vo (2015), Whinney (2015), Ariel et al. (2016), Smith (2016), Bennett et al. (2017), Carr et al. (2017), Gibson et al. (2017), Goosey et al. (2017), Sidhu et al. (2017), Strang et al. (2017), Cumberbatch and Barnes (2018), Nettleton and Strang (2018), Neyroud (2018), Parmar et al. (2018), Mitchell (2019), Walton and Brooks (2019), Walton et al. (2019), Barnes et al. (2020), Walton and Brooks (2020), Walton (2021), Walton et al. (2021)
Other	Economic impact of violent victimization In this study on the economic impact of violent victimization in Canada, the authors used the number of incidents and the CSI to determine how much police money was spent on preventing, combating, and responding to each crime.	Hoddenbagh et al. (2014)
	Organized Crime The CSI is used to create a methodology to measure the volume and severity of criminal incidents related to organized crime in Canada and to develop an Organized Crime Severity Index	Saunders and Lawrence (2013), Bouchard et al. (2015), Hashimi et al. (2016)