

Questioning the assumptions

A critique of the Violent Crime Linkage Analysis System (ViCLAS)

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Most readers will be familiar with the Violent Crime Linkage Analysis System (ViCLAS), a computerised system designed to help identify serial offenders by cross-referencing information from one crime to information from others (e.g., current offence to past offences) to identify potential crime series.

ViCLAS is just one of several linkage systems used around the world (e.g., the Homicide Investigation Tracking System in Washington State). In this article, we take a critical look at ViCLAS because of its familiarity. Bear in mind that our observations are applicable to all linkage systems. We argue that, despite its widespread use, ViCLAS hasn't undergone sufficient scientific testing and consequently may not do what it is supposed to. We scrutinise four assumptions fundamental to ensuring its effectiveness (see *Bennell et al.*, in press, for a more detailed discussion of the issues raised below).

Assumption #1 Data entered into the system are reliable

ViCLAS relies on investigators recording crime behaviour in a reliable way. A test of reliability involves determining how often investigators agree on what actually occurred during a crime when completing a ViCLAS coding booklet (or the degree to which two data entry personnel agree when entering coding booklet data). In scientific research, this is known as inter-rater reliability.

To have confidence in ViCLAS two investigators reading through the same case material will each enter the same information in a coding booklet. For example, ViCLAS requires a judgement about how a victim was approached or whether he/she was targeted. If two inves-



tigators examining the same case come to different conclusions, this information cannot be depended upon to make valid decisions. It would be equivalent to one eyewitness identifying an assailant as having black hair and a second saying the same assailant had blonde hair.

In scientific research, a minimum level of 80 per cent agreement is typically required to trust the data used to make decisions. Arguably, a similar high-level of agreement should be demanded from crime linkage systems because the decisions being made are consequential. Surprisingly, given the importance of this issue, only two studies have examined the reliability of ViCLAS.

Martineau and Corey (2008) provided 237 police officers with a two-page summary of a sexual assault or homicide and asked them to complete a ViCLAS booklet. They calculated occurrence agreement values and reported 38 per cent agreement for the homicide case and 25 per cent agreement for the sexual assault

case. Across the two vignettes, the accuracy for specific types of variables in the ViCLAS booklet ranged from 88 per cent for weapon variables down to three per cent for crime scene information.

In the second study, *Snook, Luther, House, Bennell and Taylor (in press)* presented police officers genuine case materials. They reported 31 per cent occurrence agreement across the 106 variables their sample of police officers coded. Agreement ranged from two per cent for weapon variables to 63 per cent for administration variables. Only 10 per cent of the variables reached an acceptable level of agreement (more than 80 per cent).

The low reported agreement in the two studies demonstrates that officers often disagree about what is present in case material. If such agreement levels are representative of the reliability of ViCLAS data, the ability to use this system to make accurate linkage decisions is severely compromised. Clearly, more research should be conducted to examine this issue. Ideally, with the participation of police organizations, future research in this area will be more realistic than the previous research that has been conducted (e.g., simulating the pressures found in actual investigations).

Assumption #2 Data are entered accurately into the system

A second assumption is that the data entered into ViCLAS reflect what actually occurred at the crime. In scientific terms, this is an assumption about the validity of the data; that it represents what it is supposed to represent. This assumption is important because the quality of the links generated will

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only be as good as the accuracy of the data contained in the database. For example, an investigator may incorrectly indicate that an axe was used to kill the victim when in fact the murder weapon was a knife. Alternatively, an investigator may code the presence of a knife correctly but the information may accidentally be entered as an axe.

As far as we are aware, there has been no evaluation of the extent to which data stored in the ViCLAS system, or any other linkage system, are valid. Each question in a coding booklet provides an opportunity for errors to creep into the system. For example, lengthy, repetitive coding tasks (like the ViCLAS coding task) have been shown to increase the number of coding errors in other domains (cf. Reynolds-Haertle & McBride, 1992). Such errors influence the reliability of coded data and ultimately the accuracy of the data in ViCLAS. Crimes will be recorded as happening in a way that they did not.

Of course, quality assurance mechanisms may help improve the data's accuracy (and its reliability) through the identification of errors and various police organizations use them. However, their effectiveness needs to be evaluated and compliance rates monitored.

Assumption #3

Criminal behaviours are consistent and distinct

A third assumption is that offenders commit their crimes in a way that is distinct from other offenders and consistent enough over time to allow their series to be recognised. This is important because analysts linking crimes appear to use modus operandi behaviours and/or behavioural signatures in addition to information about the offender and victim (Santtila, Pakkanen, Zappalà, Bosco, Valkama, & Mokros, 2008).

Assuming an offender's crimes series can be identified by consistent, distinct MOs appears to originate from the view that behaviour is determined by a person's predispositions (i.e., traits). However, situational factors have a huge impact on how people behave. Although a few studies have found high levels of occurrence of distinctive MO behaviours across crime series, the majority of research finds only moderate levels. Even then, moderate levels of consistency and distinctiveness tend to be reported when the analysis focuses on behaviours that are largely under the offender's control (e.g., where and when they decide to commit the crime), but not when the analysis focuses on behaviours more likely influenced by the situation (e.g., the degree of an offender's hostility, which can be influenced by the victim's resistance). Thus, most research suggests an offender's MO is determined by both person-dependent behavioural tendencies and crime-dependent situational factors. Any attempt to link crimes must be sensitive to the interaction of these two factors.

In contrast to MO, the perceived usefulness of signature behaviours for linking purposes seems to be based on the belief

signatures instantiate offenders' 'scripts' that are rehearsed, deeply engrained and rooted in personal fantasies. As far as we are aware, no empirical research has been published that examines the potential value of these behaviours (as traditionally defined) for linking purposes, although many case studies have been presented to support their use (e.g. Keppel, 2000).

Aside from the behavioural issues, it is also unclear how analysts use these kinds of behaviours. For example, we do not know which MOs analysts use to link crimes (we have been informed that different analysts will often use different behaviours) and whether these behaviours are likely to be exhibited in a consistent and/or distinct fashion. Similarly, with respect to signature behaviours, we do not know whether linkage analysts can even identify behavioural signatures reliably across a series of crimes, if they are in fact exhibited, or the extent to which these signatures are actually useful for establishing crime linkages (or how their usefulness varies across crime type).

Assumption #4

It is possible to identify linked crimes

The fourth assumption is that people who have received specialized training to link crimes are able to accurately identify serial crimes. This is important because misidentifying serial crimes may alter an investigation or spark the search for a non-existent serial

offender. Unfortunately, we are not aware of any research examining the impact of linkage training on linkage decision accuracy. Nor do we know of any research that has examined performance in the types of linking tasks analysts actually face in reality.

The only available research examines how law enforcement personnel (and members of the public) who have not received formal training in linkage analysis perform on simulated linking tasks. For example, in one of the most recent studies in this area, Bennell and his colleagues (2010) examined how university students, police professionals and a statistical model performed on a linking task where the goal was to determine whether the same offender, using a range of crime scene behaviours, committed pairs of burglaries.

Half of the study participants in each group were provided with a brief training session, which informed them that the likelihood of two offences being committed by the same offender increases as the distance between the offences decreases (as commonly found in studies of crime linkage; e.g., Bennell & Canter, 2002).

Interestingly, the results indicated three things: (a) within each condition (trained and untrained) students outperformed police professionals with respect to linking accuracy, (b) providing information about appropriate linking cues increased linking accuracy for both students and professionals and (c) the statistical model, which relied solely on inter-crime distance, outperformed human judges by



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a large margin, even when the participants were trained. The major problem for even trained participants was an over-reliance on ineffective linking cues, which seemed to result from inaccurate beliefs about what MO features are consistent and/or distinct in cases of burglary.

Notwithstanding issues of realism, the main message to take from research in this area is that no evidence exists various types of police professionals, including experienced investigators, can accurately link serial crimes. If these studies had reported positive results it would be reasonable to assume trained linkage analysts would do as well as the tested participants, if not better, because they have been trained in the linkage task.

Unfortunately, we simply do not know

whether trained analysts possess the ability to link serial crimes, either in laboratory-based studies or in naturalistic settings where linkage systems are actually used. What we do know is that human decision-making in other domains can be fallible (e.g., *Kahneman, Slovic, & Tversky, 1982*) and this does little to ease our concerns about the ability of crime analysts to do their task well.

Beyond the assumptions

Little is also known about the success rates (e.g., number of actual links established) for ViCLAS, or from other linkage systems for police use. Although we are aware of some anecdotes of successful police investigations that have drawn on ViCLAS and we have

some indication of the number of potential links included in certain systems, we are not aware of any data from wide-scale studies of linkage accuracy in actual investigations. Clearly, such studies need to be conducted before any conclusions are drawn about the value of the systems.

Final thoughts

It is important for professions responsible for public safety and security to critically review the assumptions on which current techniques and practices are based to ensure they are contributing as intended. The use of ViCLAS and crime linkage systems in general is a case in point.

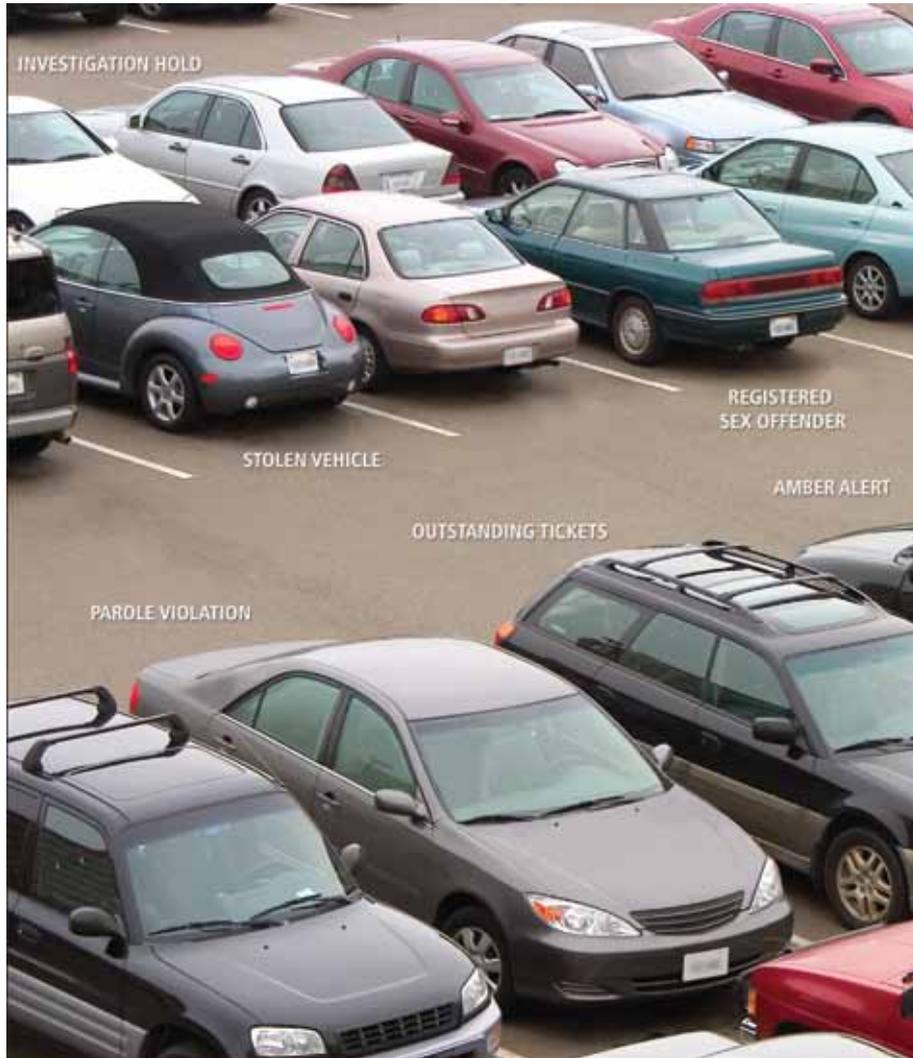
We know police agencies will decide for themselves how much weight to put on our arguments and what conclusions to draw about the potential value of ViCLAS. However, at the very least, we believe all linkage systems ought to be evaluated as a matter of urgency to ensure current linking efforts are achieving optimal results and that officer effort to complete ViCLAS booklets is not being wasted. Such an evaluation cannot be achieved overnight but carrying out a program of research to examine the assumptions described above should allow crime linkage systems, and the analysts who operate them, to reach their full potential.

There are plenty of university research teams that would be interested in assisting with this research so it does not have to be too expensive or even time consuming.

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