Geographic profiling - *The debate continues*

Ten problems with the Rossmo and Filer defence of computer profiling

by Craig Bennell, Brent Snook and Paul Taylor

In *Man versus machine* (*Blue Line*, April 2005) we summarized our research on people's ability to accurately predict an offender's home location based on where they commit their crimes. We argued that their performance improves, after a short training session, to that typically achieved by computerized geographic profiling (GP) systems.

In *Analysis versus guesswork* (*Blue Line*, Aug./Sept. 2005) highly respected geographic profilers Kim Rossmo and Scot Filer take issue with our statements. Although we addressed many of their concerns in *Applied Cognitive Psychology*, (2005, Volume 19, Issue 5), we review them again here so readers can make up their own minds about the value of our research and the usefulness of geographic profiling systems.

1. *Rossmo and Filer state that "none of the authors have experience as police officers, investigators or geographic profilers. The advice they offer is therefore of questionable operational value."*

This is a common and unfair criticism levelled at psychologists with no police experience who undertake applied police research. It disregards the great benefits psychological research has provided policing in such areas as eyewitness testimony, interviewing, suspect interrogation, personnel selection, detecting deception and stress management; most of this research was conducted by psychologists with no police experience. It's unclear why Rossmo and Filer feel psychological science cannot lead to similar contributions in geographic profiling. Psychologists have already made advances in this area and will continue to do so, especially as academic-practitioner collaborations increase.

2. *One senior police officer is quoted as saying "there is no way a team commander could justify to me the resources necessary for a comprehensive canvass based on educated guess work… something much more systematic, tested and evidence-based is needed as the foundation for important investigative decisions."*

This reflects an important perspective but it cannot be appropriately applied to the current state-of-play in geographic profiling. It implies that our "eye-ball" approach is simply educated guess work while computerized systems are systematic, tested and evidence-based. We don't question the need to rely on such standards when evaluating advice but question whether the approach advocated by Rossmo and Filer meets them.

GP systems and the advice their users provide can claim to be systematic, tested and evidence-based only after being evaluated and scrutinized by the academic, policing and GP communities, and this has yet to occur. The only evaluation published in a peer-reviewed journal considered the effectiveness of David Canter's profiling system, Dragnet, which Rossmo and Filer indicate is not widely used in North America. The only published study evaluating Rossmo's system appears in his own book. Both studies suggest that these systems can provide accurate predictions but more research is needed.

A second, broader concern with the statement comes from the substantial evidence that investigative advice is often grounded in educated guesswork. Several police investigators have told us it is quite common for neighbourhood canvasses to be based on such "guesswork." This is particularly the case for investigative advice given by geographic (or psychological) profilers.

A psychological profile is "an educated attempt to provide investigative agencies with specific information to the type of individual who committed a certain crime," said retired NYPD Lieutenant-Commander Vernon Geberth, who has 40 years of police experience. UK and Canadian profilers frequently make similar statements and Rossmo himself admits that a large component of GP is "subjective," particularly when the profiler attempts to reconstruct the offender's mental map.

The many examples of neighbourhood canvasses based on profiling advice provide, in our opinion, examples of investigative strategies being based on educated guesswork.

3. *Another senior police officer is quoted as saying "articles such as 'Man versus machine' are counter-productive to professional law enforcement and only make our job more difficult."*

We disagree – if he is referring to articles that critically examine the use of existing police procedures or propose potentially useful new ways of carrying out policing tasks. Empirical research conducted on investigative procedures and techniques help police services evolve better practice.

If he considers our article counter-productive because of a perception we have drawn conclusions based on flawed research, than that is a more reasonable criticism. We are the first to admit that there are some limitations with our research and have discussed these openly in our articles, but that does not make it counter-productive or limit the practical implications of the results. All psychological research is limited to some extent, but few would argue that it has no value.

Eyewitness testimony provides one of the best examples. Although the research may be considered highly artificial – it typically involves showing university students films of mock crimes, then asking them to recall or recognize information from the film – findings have had a very positive impact on policing (new lineup procedures to increase the accuracy of eyewitness identification, for example). We are currently attempting to improve the quality of our research, in part by taking on criticisms like those raised by Rossmo and Filer and working with police forces to ensure that it becomes more realistic.

It must be reiterated that there is little empirical evidence available to support the use of GP systems and that which does exist is limited in numerous ways. Thus, it could be viewed as equally counter-productive to rely on using these systems before such evidence exists.

4. *Rossmo and Filer imply that we have focused solely on students in our experiments and relied on solved cases.*

While our peer-reviewed experiments focused on students, we make it clear in our article that we also tested police officers, and the results were consistent with our student research. We used solved cases to evaluate different GP methods because it is necessary to compare the predicted home location to the offenders' actual home location to evaluate accuracy. While using solved offences may distort research findings, since there may be important differences between offenders who are caught and those that aren't, there is no other option and all researchers in this area use this approach.

5. *GP is more than just analyzing crime locations, Rossmo says, arguing that we didn't examine auxiliary factors such as offender type, demographics, crime sites, hunting method, target backcloth, land use and zoning, arterial routes and barriers, temporal patterns and displacements.*

While Rossmo and Filer's approach considers these factors, we are less convinced of the value they add to the GP process. Geographic profilers cannot draw on research to guide them in using the additional information to refine their quantitative predictions. Although information regarding the impact of offender type and demographics does exist, the other factors have not been adequately researched.

We have begun to research these issues. In one study, for example, we examined how the number of crimes an officer considers when making a prediction and the level of topographical detail they're given affects their predictive accuracy. As in previous studies, our training approach improved their performance to a point where they were as accurate as a GP system, but neither of the two factors had an impact on participants' performance.

6. *Rossmo and Filer argue that five crime locations are typically needed to construct a geographic profile, with the average being 20. They suggest the three locations used in some of our research makes our results questionable. They also provide two maps, one consisting of only a few crime site locations and the other with many, arguing that it's harder to "eyeball" the centre of a crime series when considering a larger number of crimes.*

There is much debate about the number of crimes required for a geographic prediction to be reliable. Research conducted by ourselves and others indicates the number of crimes doesn't have a large impact on predictive accuracy. For

example, we have conducted studies using series of three, five and seven crimes and our results did not change. Furthermore, serial offenders, other than burglars, rarely commit 20 or more crimes; even Rossmo's published serial homicide data supports this, showing there are few crime series of this length since 1980. There were five or more victims in only .07 per cent of US homicides in 2002, according to US Bureau of Justice statistics.

We are not convinced it's harder to find the center of a crime distribution as the number of crimes increase – but even if it is, there are profiling approaches effective in such circumstances that are far less complex and expensive than GP systems. For example, as we indicated in our article, a number of researchers have found that simply calculating the spatial mean of a crime series (assigning each point an X and Y coordinate and then calculating an average X and Y coordinate) can produce predictions that are as accurate as those made by GP systems.

7. *Rossmo and Filer argue that the way we measure predictive accuracy is incorrect.*

In all of our studies, we have had participants predict a particular location as the (single) point where an offender lives and measured their accuracy by calculating the distance between the predicted and actual home location. Rossmo and Filer believe this approach is incorrect because GP systems provide a search strategy which indicates the probability of an offender residing at every location around the area of criminal activity.

The measure of accuracy they prefer is referred to as hit percentage – the percentage of locations to be searched within the search area, from highest to lowest probability, before the offender's home is located. Their approach is potentially useful, but to be valid, it must have utility for police and it's not clear, from current evidence, that this is the case. Some GP system users, such as David Canter in the UK, indicate police forces are often unable to effectively use this strategy because they cannot always search the prioritized area. High costs or too many residents in the area leads them to focus their efforts on the highest probability area.

Under such conditions, there is little difference between the single-point predictions we have focused on and the search strategy approach advocated by Rossmo and Filer. Even when this is not the case, single-point predictions could potentially provide the basis for an effective search strategy; police could start searching for the offender at the predicted point, for example, and work their way outwards until resources are depleted.

8. *Rossmo and Filer state that the heuristics we teach have been shown to result in errors in reasoning and they caution against using them.*

While there is research to support this statement, it was done mainly in the 1970s and '80s and has been superseded by studies suggesting a more positive role for heuristics. For example, Rossmo and Filer don't mention a growing body of research demonstrating that using heuristics can and often does result in good decisions. Some of this research has compared simple heuristics to complicated computational

techniques across a range of domains; the results suggest simple heuristics can result in better decisions.

9. *Our results support a low-cost, easy to implement alternative to GP systems. Rossmo and Filer take issue with this because "this conclusion ignores the fact that US, Canadian and UK police agencies can obtain geographic profiling services from federal law enforcement agencies at no cost."*

While agencies can obtain GP services at no cost, they are not free; the burden of costs are simply shifted to a different agency. Nor does their rebuttal help the many countries – South Africa, for example – that deal with serial crime on a regular basis but don't have recourse to a free service.

There's also the cost in time, which is perhaps more important than financial cost. Geographic profiles of the type advocated by Rossmo and Filer take up to two weeks longer to complete than heuristic-led judgments. If future research continues to confirm that both approaches produce equally accurate results, it seems disingenuous to discourage police from using the quicker method.

10. *Rossmo and Filer argue that the systems we have examined are not commonly employed by police agencies and are not used in Canada.*

We focused on two GP systems in our research – CrimeStat, developed by Ned Levine in a National Institute of Justice funded project and now offered free to anyone who wishes to use it – and Dragnet, developed by David Canter at the University of Liverpool. We are not aware of how commonly these systems are used but Levine does provide some interesting statistics, although he admits they're only rough estimates.

CrimeStat has been downloaded 6,000 times since March 2004, he stated recently. Based on e-mails for technical support, he estimates that 75 per cent of users are researchers and 25 per cent practitioners from a range of government agencies, including police officers or crime analysts.

More importantly, we tested an approximation of the underlying algorithm used in Rossmo's system in our research (you can use a range of algorithms in CrimeStat). The results, included in *Man versus machine*, support our arguments.

We encourage readers to make up their own minds. While we fully respect Rossmo and Filer's work, there is a growing tendency in policing to assume that technology is needed to accomplish tasks once done daily by officers and crime analysts. This is appropriate when the technology has been empirically evaluated in an appropriate fashion and found to improve the investigative process, but we think this has yet to be convincingly shown with GP systems. Contrary to some views, if the only thing our work does is encourage future research of this sort, than we feel it will have been very productive indeed.

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B.C. security manager receives award

by Jim Clark

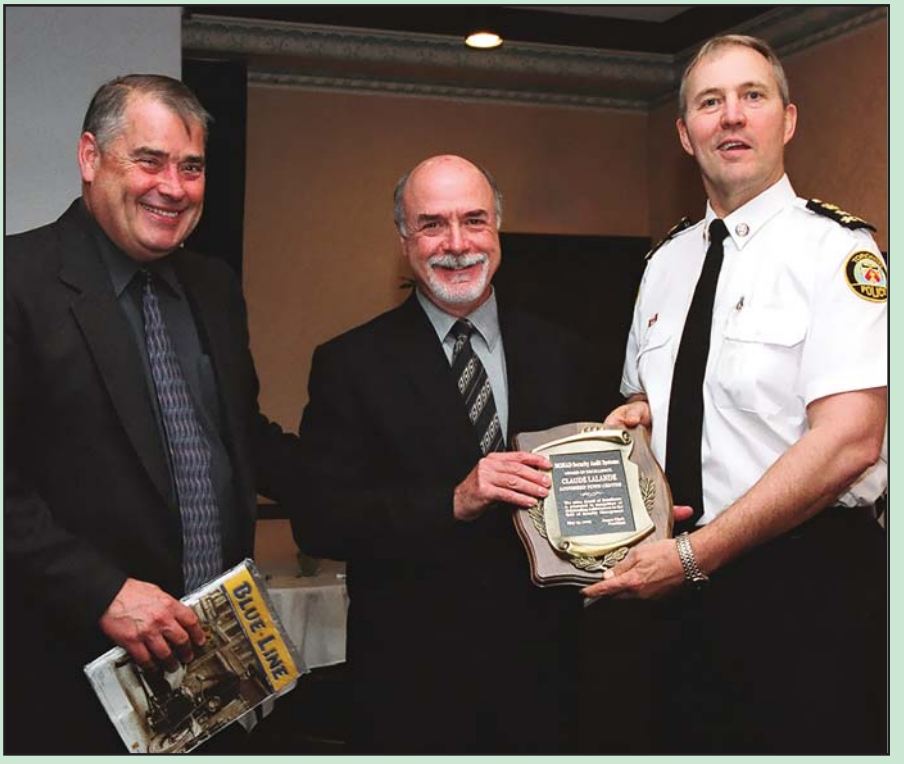
For the past nine years Monad Security Audits Systems has held a security conference in Toronto. Each spring security managers from across Canada attend this conference to listen and learn from professionals from all branches of the justice system. Each year the staff at Monad Security Audit Systems selects a security manager who has stood out as a leader and achieved a level of excellence in the field of security.

This year the "Award of Excellence" for 2004 was presented to security manager Claude Lalande who works for the Lougheed Town Centre located in Burnaby, British Columbia. Claude took over the position at Lougheed upon retiring from the RCMP. He was presented with the award along with a lifetime subscription to *Blue Line Magazine* by the newly appointed Toronto Chief of Police, William Blair.

Chief Blair was the keynote speaker at this year's conference and his informal style of presentation was very well received by the audience. He spoke for well over an hour on the importance of security and police working together. The audience was surprised with the fact that his start in law enforcement began as a security officer in north Toronto's Fairview Mall. The previous chief of police Julian Fantino, who spoke at this conference several years ago, also talked about his start as a security officer about 10 kilometers to the west at Yorkdale Shopping Centre.

Police and security will continue to work well together because the young men and women who are looking for a police career often work as security officers to gain life skills after leaving school. They can offer more to the police service in most cases than someone who comes right out of the education system. Blair and Fantino are excellent examples.

At the other end, many police officers retire after a successful career in policing and move into the security field. Claude Lalande is an excellent example of a police officer who saw duty both in Canada and abroad. He brought his policing and management skills to Burnaby's Lougheed Town Centre and quickly became a leader in his new position. There are few better ways to start and finish one's career.



In one of his first public functions as Chief of the Toronto Police Service, Bill Blair is shown presenting the "Award of Excellence" to Claude Lalande as Jim Clark of Monad Security Audit Systems looks on.

Jim Clark is a principle with Monad Security Audit Systems and a former Deputy Chief of Police with the Toronto Police Service.