Public Crime Mapping in Canada: Interpreting RAIDS Online

Alexander Eikelboom, Elysia Martini, Luisa Ruiz, Alison D. St. Pierre, and Ali Tejani
Arts & Science Program / McMaster University / Hamilton / ON / Canada

ABSTRACT

The capacity for the mapping of crime data has shifted to the digital world, allowing online public crime mapping and the dissemination of information to a broader audience. While the field of critical cartography has questioned the elements and underlying assumptions of various map types, public crime mapping has not been analyzed in the same manner. Through analysis of the design choices and omissions in online public crime maps that pertain to Hamilton, ON and London, ON, the concepts of critical cartography are applied to the largely ignored field of crime maps. While the existence of online public crime maps can potentially facilitate data sharing and analysis to better allow police forces to reduce the incidence of crime, there are also consequences of maps presenting incomplete or inaccurate information to their audiences, as was found to be the case for both cities that were analyzed. These consequences include effects on the public perception of crime, changing attitudes toward crime-induced fear, and negative implications for economic development in areas that might be seen as too high-risk.

Keywords: crime mapping; public crime mapping; critical cartography; Hamilton, ON; London, ON

RÉSUMÉ

Les ressources en cartographie des données sur la criminalité ont désormais franchi le seuil de l'ère numérique, ce qui permet la cartographie en ligne de la criminalité et la diffusion d'informations à un large public. Si le domaine de la cartographie critique a remis en question les éléments de divers types de cartes et les hypothèses sur lesquelles reposent ces cartes, la mise à la disposition du public de données cartographiques relatives à la criminalité n'a pas fait l'objet d'une analyse semblable. En étudiant les choix et les omissions des concepteurs des cartes de criminalité accessibles au public des villes ontariennes de Hamilton et de London, les auteurs appliquent les notions de cartographie critique au domaine cruellement négligé des cartes de criminalité. Bien que l'accessibilité des cartes de criminalité au public soit susceptible de faciliter le partage et l'analyse des données et de permettre ainsi aux corps policiers de réduire l'incidence de la criminalité avec plus d'efficacité, la présentation d'informations tronquées ou inexactes dans ces cartes a également des conséquences, ainsi qu'en témoigne le cas des deux villes analysées. Parmi ces conséquences figurent l'incidence de ces informations sur la façon dont le public peçoit la criminalité, les changements d'attitude à l'égard de la peur engendrée par la criminalité, et les répercussions négatives du développement économique dans des secteurs qui peuvent paraître présenter un risque trop élevé.

Mots clés : cartes de criminalité accessibles au public, cartographie critique, cartographie de la criminalité, Hamilton (Ontario), London (Ontario)

Introduction

The image of a detective sticking pushpins into a map is an iconic symbol of police work. Today, crime maps are predominantly produced online rather than on paper, but they remain an integral part of policing. Their widespread popularity and use continue to grow in North America and abroad, showing that online crime maps are considered useful and necessary tools by a vast majority of police forces. Literature in the field of critical cartography questions the "acceptance of maps as universal and necessary," but crime maps specifically have largely avoided this line of questioning (Wood 2010, 19). Blindly accepting the necessity of crime maps, however, limits critique as to what crime maps represent and potentially omits important considerations on their social effects. Crime maps therefore represent an underexplored area of modern critical cartography.

 Cartographica 52:2, 2017, pp. 108–115 doi:10.3138/cart.52.2.5101

Online crime maps represent one of the first forays into greater public access to police data. The dissemination of public crime data via maps has been facilitated by third party companies such as RAIDS Online in many cities across the United States. Comparatively, Canadian cities have been slower to adopt online public crime mapping. Currently, only police in Hamilton, ON and London, ON are using RAIDS Online to map crimes. However, other cities such as Toronto and Vancouver have similar maps hosted on different platforms.

As crime maps become more widely distributed, moving from the hands of law enforcement to the public, the interplay between the design and assumptions embedded within crime maps and the communities they represent is an important area of inquiry. This paper attempts to address this issue by exploring both historic and recent developments in the field of crime mapping, as well as the social implications of cartographic choices used in the dissemination of crime-related information. It discusses these concepts especially in the context of Hamilton and London's crime mapping initiatives and explores the implications of manipulations of colour, choice of crime variables, and other map elements on public perceptions of crime.

History of Police Mapping

Place has always been an integral component of police work. As the old adage goes, the killer always returns to the scene of the crime. While the veracity of this statement is open to question, what is undeniable is that most crimes have a location. Knowing this location is important, as very often it is close to the home or workplace of the perpetrator (Frisbie and others 1977). Chainey and Ratcliffe (2005) emphasize its significance when they explain that "virtually everything we do as a police department revolves around an address or location. All of our dispatch records, incident reports, citations, intelligence reports have a place." For this reason, maps depicting crime scenes and their locations have been an important part of police work for nearly two centuries (Chainey and Ratcliffe 2005).

The early practice of crime mapping had its beginnings in France, where Adriano Balbi and Michel Guerry first mapped the relationship between violent crimes and educational levels in 1829 (Dent 2000) (Figure 1). The practice of geographically displaying crime rates spread through the rest of Europe within a few decades. In North America, crime maps were famously used in Chicago in the 1920s and 1930s to display the location of male delinquents' homes over a span of six years. Though there was a high rate of residential mobility in Chicago at that time, results showed that the distribution of the 10,000 delinquents' homes remained stable over that period, leading to the belief that crime is very much connected to community and neighbourhood variables such as land use and the number of families on social assistance (Chamard 2006). This pervasive belief remains an important part of police work and police profiling.

While the reasoning behind mapping crime data has not changed, the methods used to display such data certainly have. Pushpin maps had many limitations, including the limitation of wall space, and their static nature made archiving difficult, making it cumbersome to track long-term crime patterns (Harries 1999). With the advent of computers and GIS technology, police work has come a long way from sticking pins into walls, and the mapping of crime has become increasingly digitized. This has been expedited in recent years through GIS's popularity as it relates to crime mapping and the initiatives of the Mapping Analysis for Public Safety program in the United States in the early 2000s (Chainey and Ratcliffe 2005). This powerful technology is now a major part of investigative and preventive police work, and its role is continuing to grow.

One of the new frontiers of police mapping is the rise of publicly available police maps. Public crime mapping allows the general public to view the approximate locations of crimes and sort crimes by date, location, the nature of the crime, and other variables. One of the first North American cities to utilize public crime mapping was Chicago, where third party developers were allowed to map locations of crimes using data from local police forces. Their Web site, chicagocrime.org, first began publishing these records in April 2005, and since then the practice has spread to other cities across North America (Arthur 2011).

In Canadian cities, RAIDS Online is one such Web site that allows citizens to view local crime data. It uses software from BAIR Analytics, a company specializing in public safety, to connect citizens with crime information about their communities. RAIDS is currently being used by the police departments of Hamilton and London. This service allows online users to freely view crime activity ranging from homicide to shoplifting, though the information available varies by city. The Web site even allows users to get updates on crime sent directly to their cell phones. The London map was unveiled in January 2014, followed by Hamilton in November of that same year.

Information regarding when and where certain types of crimes have happened in these cities is open for anyone to view. A statement on the Hamilton police Web site reads, "crime mapping helps the public get a better understanding of the crime activity of their area so they can make more informed decisions about how to stay safe" (Huang 2014). London police say that "the software has helped them forecast and prevent a range of offences," and that further public engagement with the map could help reduce policing costs (O'Brien 2015). The public are also able to submit anonymous "tips" through the mapping service, which include details about the suspect and vehicles involved in a crime.

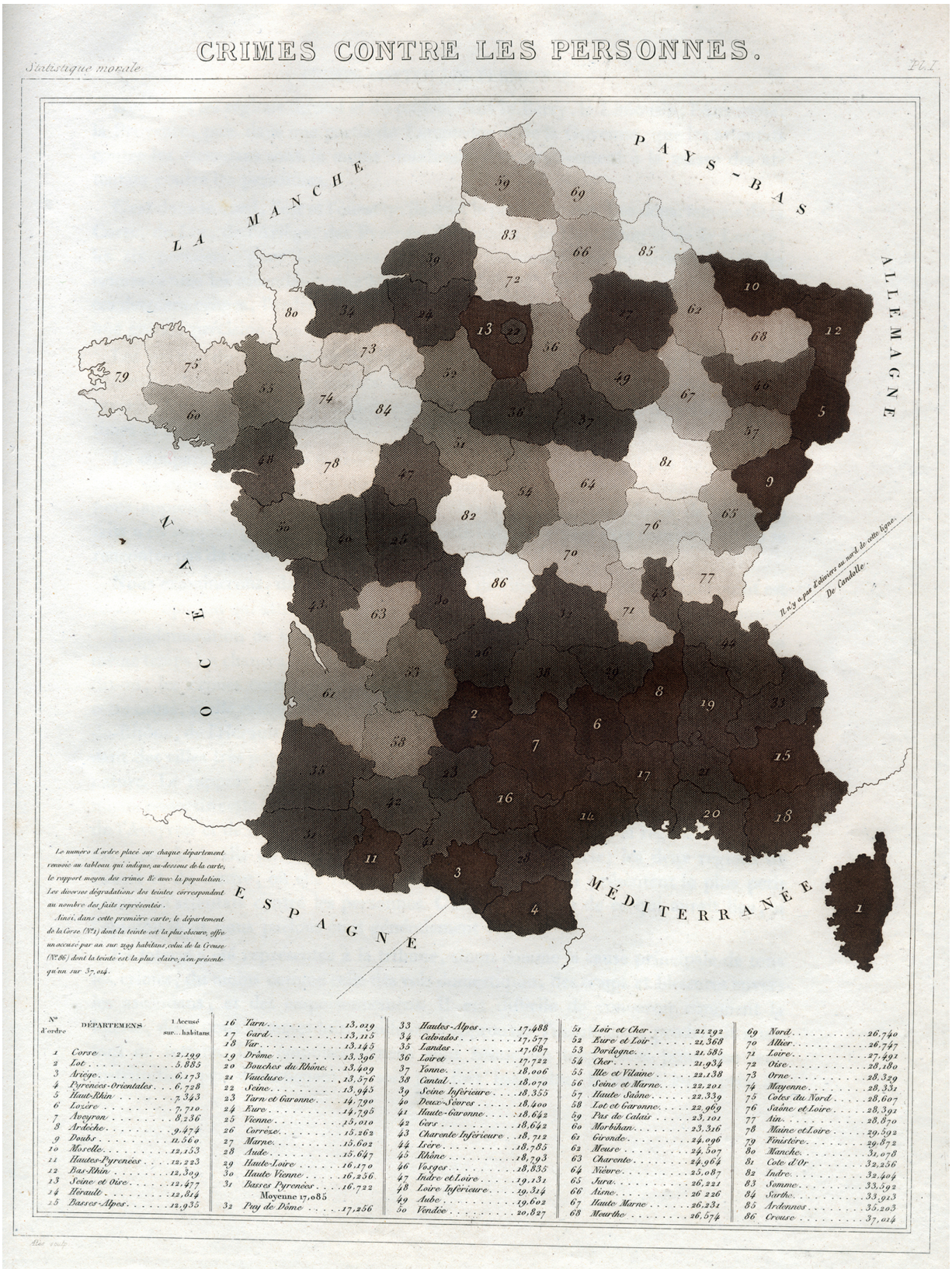

Figure 1. An early crime map of France, entitled *Crimes Contre Les Personnes* [Crimes against persons], from Guerry's *Essai sur la statistique morale de la France* [Essay on the moral statistics of France].
Source: Guerry (2012).

 Cartographica 52:2, 2017, pp. 108–115 doi:10.3138/cart.52.2.5101

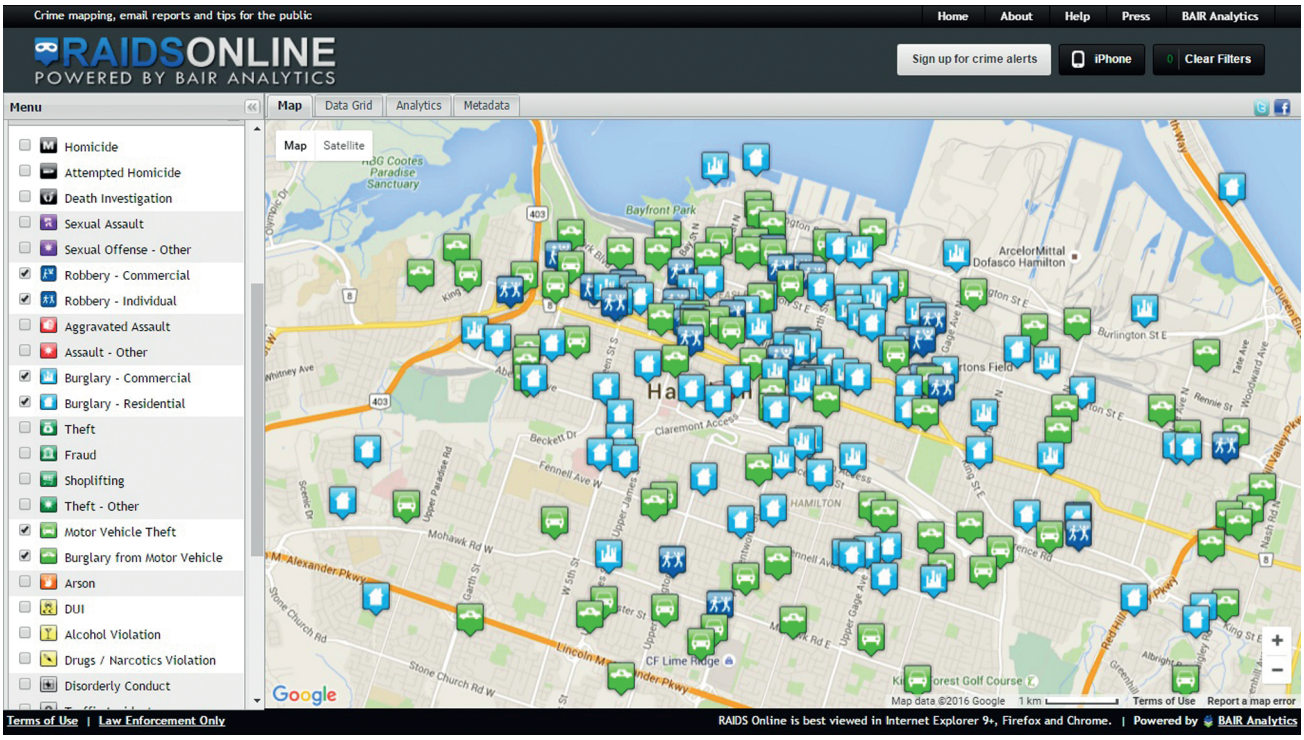

Figure 2. Screenshot of the general display interface on the RAIDS Online map of Hamilton, ON. Source: © LexisNexis, used with permission; taken 4 April 2016 from raidsonline.com.

Understanding the Crime Data behind the Map

While the public nature of this service facilitates greater general awareness of crime in Hamilton and London and may even improve overall security in these regions, it also has implications for the map's interpretation. If the acknowledged aim of online crime maps, such as the RAIDS Online maps, is to equip the public to make informed decisions regarding their safety, then transparency of both what is shared and what is omitted is crucial.

On the RAIDS platform, under the "event" menu item, 27 selectable checkboxes are present, each representing a different crime type. This gives the impression that information on all of these types of crimes is available for all cities. Taking Hamilton as an example, however, shows that fewer than half of the selectable crime types actually have data from the Hamilton police. Figure 2 depicts several crime types selected for a period of one year and the resulting map, which appears oddly void of criminal activity. If individuals are not critical when using the map, they may mistakenly assume that sexual assault or shoplifting has not been committed in Hamilton for the past year simply because the data were not supplied to the mapmakers.

The metadata tab on the RAIDS maps does provide some information on the data, including their source, for example, the Hamilton Police Service, as well as the types of crimes submitted by the police to the mapping service. However, this information is inconsistent with the map itself and at times appears to be inaccurate. For the Hamilton map, the metadata tab lists certain crimes, including robbery and homicide, as not submitted to the map by the police. However, if these crimes are selected in the "event" menu, some instances do appear on the map. Out of the 8 crimes it claims are not submitted, all but one still appear when selected. On the other hand, 17 crimes, including DUIs, sexual assault, and vandalism, are not listed as unavailable, despite the fact that there are no data for these crimes on the map. Similarly, the metadata for the London map states that all crime types are reported to the map service, despite certain crimes such as sexual assault not being shown. These apparent contradictions and inconsistencies reduce the effectiveness of the crime maps, as the public are not adequately informed about past criminal activity.

Although it is reasonable to assume that some crimes are not submitted to the map due to privacy concerns regarding ongoing investigations, the discrepancies between the metadata tab and the data points visible on the maps raise questions over what information is being omitted and why. A further area of concern is the lack of transparency in police criteria for which crimes are submitted or whether all crimes of a particular nature are reported. By failing to describe the process through which records are uploaded to the map and how individual agencies decide which data to upload, the public are at best left questioning why and

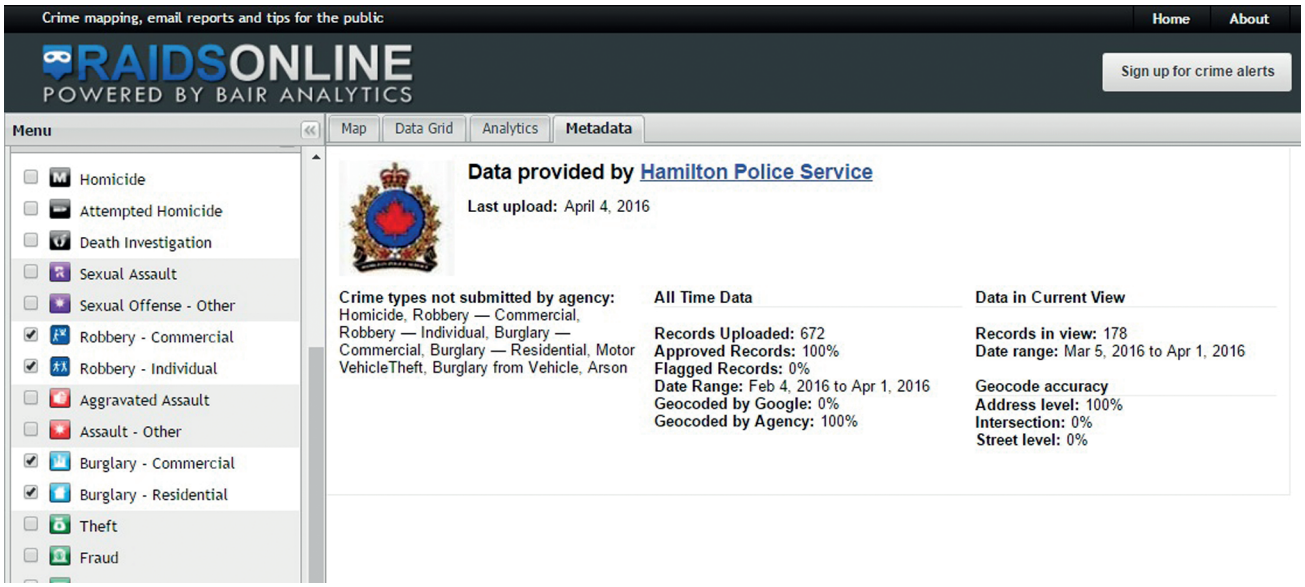

Figure 3. Screenshot of the event menu on the RAIDS Online map of Hamilton, ON, showing that data on certain crime types are not submitted by the Hamilton Police Service, a detail not included on the crime map itself.
Source: © LexisNexis, used with permission; taken 4 April 2016 from raidsonline.com.

how these decisions are made, and at worst left assuming that they are seeing maps of all crimes committed in their cities.

Impacts of Crime Map Design Choices

As has been seen, public crime maps may have an impact on the communities in which they are based. Not only may they affect the community simply by being generated and used, but also their specific visual features may determine what impact they have. By applying insight gained in the field of critical cartography to crime mapping, it is possible to further examine the interplay between crime maps and public perceptions of crime.

Scholars of critical cartography generally maintain that maps not only represent reality, but also in fact help to make reality (Crampton and Krygier 2006, 15). This is because maps are not the purely scientific and objective representations of spatial data that they are taken to be. Inevitably, cartographers must make design choices, adding a subjective interpretation of the data that, under the guise of being a "mirror of nature," exerts power over society by solidifying and normalizing certain representations of knowledge (Harley 1989, 4). This is postulated in Brian Harley's "Deconstructing the Map": "the steps in making a map – selection, omission, simplification, classification, the creation of hierarchies, and 'symbolization' – are all inherently rhetorical" (Harley 1989, 11). The process of selection and omission of data to represent spatially, when not transparent, has the potential to mislead the public and skew perceptions of crime.

Extending past these choices of selection and omission, how might the design of RAIDS Online reflect certain biases or values and affect the perceptions of map users? This section will examine the use of Google Maps as a basemap, the colour choices used for the heat map, and the symbols chosen to represent crime.

The choice of Google Maps as a basemap is not necessarily a neutral one. Google Maps, with satellite imagery and Street View, gives the impression of representing the world without projection, interpretation, or omission. Not only have these online maps garnered this scientific reputation, they have, along with digital maps generally, become increasingly ubiquitous. This is causing a "qualitative and pragmatic shift" in cartography (Kindynis 2014, 231). The implications of this shift are directly relevant to online crime maps. Given a more pervasive interweaving of maps into our day to day lives, crime maps are "implicated in crime and its control, and embroiled in political struggles as never before" (Kindynis 2014, 231). Crime maps such as RAIDS Online co-opt a level of authority and trust, deserved or not, simply by using the recognizable Google Maps as a base.

The colour choice used on RAIDS Online's "density map" function (Figure 3) can also sway understandings of crime. Generally, colour use on maps can have a significant impact on the perceptions of map users because "map reader[s] [are] able to understand that specific colours on the map represent or stand for something in the real world" (Harrower and Brewer 2003, 28). As can be seen in Figure 3, this crime map represents areas of highest crime density with red and lower crime density with blue.

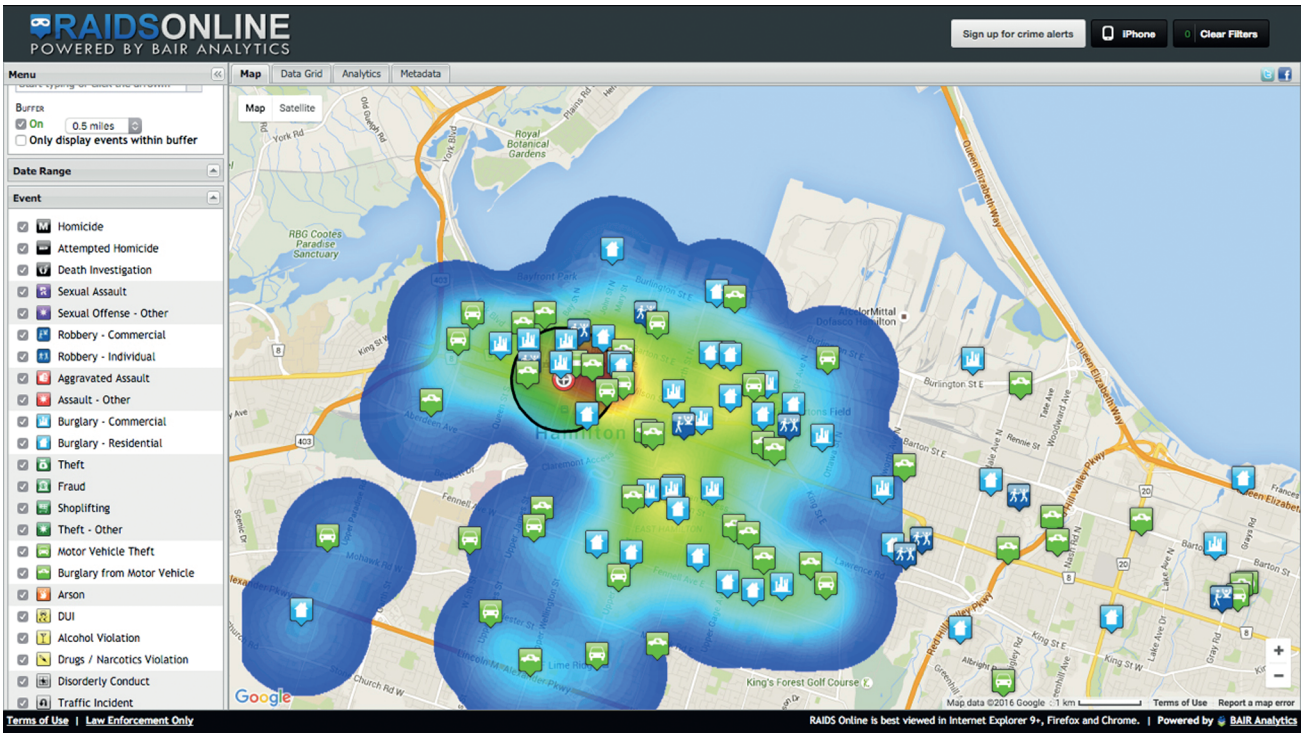

Figure 4. Screenshot of the density map feature on the RAIDS Online map of Hamilton, ON. Crime density is highest downtown, shown in red, and lowest in the regions shown in dark blue.
Source: © LexisNexis, used with permission; taken 31 March 2016 from raidsonline.com.

The diverging colour scheme used on this heat map may imply that areas represented in red are dangerous, which is not necessarily the case. For example, many places with higher numbers of instances of crime are merely places with a higher population in general. These areas would appear red on a crime heat map and might be perceived as less safe than neighbouring regions with lower populations.

The symbols chosen to represent crime also serve to limit the public's perceptions of crime types. For example, the symbol representing individual robbery (Figure 4) shows a man pointing a gun at another man. This symbol, used in both Hamilton and London crime maps, is charged with many assumptions about robberies, for example, that they are violent crimes committed with weapons and that they are committed by men. This is not true of all individual robberies; however, this symbol choice may imply that this is generally the case. All of these map design choices can impact public perceptions of crime and law enforcement, and the recognition of this power can help to foster a better understanding of the role of crime maps.

Social Implications of Crime Maps

Geared for communal use, public crime maps certainly have an impact on society. According to RAIDS Online, the social implications of their public crime maps are increased safety of the public through their ability to make more informed decisions and increased trust and communication between law enforcement and the public ("About the Crime Map" 2011). While these intended uses are for society's benefit, critics have suggested the potential for more negative consequences.

One of the recurring critiques of public crime mapping is that it breaches the privacy of victims and perpetrators. However, all North American crime maps, including RAIDS Online, protect the privacy of victims by randomly offsetting a crime's location. In further compliance with Canadian law, RAIDS Online does not provide information on the identities of perpetrators. In comparison, in some American cities, photographs and the address blocks, offence types, full names, and birthdates of some perpetrators are made accessible to the public via the data grid tab.

Another critique often heard in reference to crime mapping is the increased fear of crime it may elicit in the public. At the unveiling of the mapping service in November 2014, crime analysis coordinator Kristi Tayles of the Hamilton Police Service explained that certain crimes were excluded, claiming that mapping them "could cause a false sense, a perception of fear" (Dunphy 2014). While studies have found no correlation between local crime rate and fear (Taylor and Hale, 1986), they have found fear to be correlated positively with an area's "incivilities" and the "indirect victimization" experienced by its inhabitants (Covington and Taylor, 1991). *Incivilities* refers to visual

and audible signs of disorder and *indirect victimization* refers to the experience of victimhood internalized when hearing personal stories from crime-affected neighbours. In this way, pervasive fear within a community with regard to criminal activity encompasses more complex factors than crime rates. Incivilities, which would be apparent in walking through a graffiti- and litter-filled neighbourhood, are absent in crime maps. That is not to say that crime maps have no effect on fear. Indirect victimization can still potentially arise from the content presented in a crime map, despite this content not being as detailed or personally relevant as it might otherwise be when expressed by an acquaintance. Thus, further research remains to be conducted in this area, specifically on the relationship between crime mapping and an area's fear of crime.

The effects of crime maps on the perceptions of an area held by other areas or by institutions has also been of concern. As noted by the federally funded report *Privacy in the Information Age: A Guide for Sharing Crime Maps and Spatial Data* (Wartell and McEwen 2001), public crime maps may result in the increased use of redlining practices by bankers and insurers, with the final detrimental effect of "residential flight." It has been observed that residents lose confidence in their neighbourhoods when financial institutions begin to continually deem them too high-risk for investment, and that this in turn leads to the more affluent leaving and to those unable to do so giving up on a neighbourhood's improvement (Duncan, Hood, and Neet 1975). Crime rates and crime statistics are a factor often considered in discussing the quality of life of residents in different regions and are often an indicator of a greater problem. However, processes such as redlining reduce the chance of these potentially underdeveloped and underfunded regions getting the investment they need to fight the seemingly cyclical problem of poverty and crime.

Conclusion and Recommendations

As more and more cities across Canada adopt the use of publicly accessible crime maps, this paper represents a first look into the limitations and biases of such maps. While looking only at data from RAIDS Online, specifically from the cities of Hamilton and London, the observations of this study hold true for virtually any other city in Canada. Both Hamilton and London crime maps demonstrated inconsistency in the omission and inclusion of various types of crimes, which can alter public and private opinion of a region. Even if the data contained in the maps were completely accurate, misleading and misclassified information in the maps' metadata can potentially deceive map readers in regard to which types of crimes are actually available for viewing. Furthermore, the maps of Hamilton and London that were examined for the purpose of this paper contained many non-neutral choices of colour and symbology that can skew perceptions of crime. All of these potential consequences complicate the general acceptance of crime maps as beneficial and necessary.

Moving forward, more research must be conducted to expand the body of literature on how the use and design of online crime maps may affect society and its perceptions of crime. One such area of research should be the correlation between the mapping of crime and potential changes in public fear of crime at the individual and community levels, as this can have wide-ranging implications for poverty and investment. Both purported benefits of public crime mapping – their ability to increase communication between police forces and the populations they serve and their ability to help individuals make more informed choices in regard to their safety – are worthwhile goals. For them to be reached, however, more research must be conducted to ensure that the data behind the maps are accurate and do not mislead the public.

Acknowledgements

We thank Dr John Maclachlan for his ongoing guidance and support, as well as his commitment to engaging undergraduate education, which made this possible. We also thank our classmates for their work in editing and providing feedback.

Author Information

Alexander Eikelboom is an undergraduate student currently completing a Combined Honours degree in Arts and Science and Psychology, Neuroscience, and Behaviour at McMaster University in Hamilton, ON. His research interests include auditory and motor development in children and social psychology. E-mail: eikelba@mcmaster.ca.

Elysia Martini is completing an Honours Bachelor of Arts and Science at McMaster University in Hamilton, ON. Her academic interests focus on health policy and maternal healthcare. E-mail: martined@mcmaster.ca

Luisa Ruiz is an undergraduate student currently completing an Honours Bachelor of Arts and Science at McMaster University in Hamilton, ON. Her research interests include child education and end-of-life care. E-mail: luisa.ruiz.guti@gmail.com

Alison D. St. Pierre is an undergraduate student currently completing an Honours Bachelor of Arts and Science at McMaster University in Hamilton, ON. Her research interests include critical histories of mapping and interdisciplinary education. E-mail: alison.d.stpierre@gmail.com

Ali Tejani is an undergraduate student currently completing a Combined Honours degree in Arts and Science and Economics at McMaster University in Hamilton, ON. His research interests include data analytics, development economics, and the social function of law. E-mail: Ali.S.Tejani@gmail.com

References

"About the Crime Map." 2011. *BAIR Analytics*. Available at http://raidsonline.com/overview/about.html.

Arthur, C. 2011. "Crime Maps Are 'Worse Than Useless', Claim Developers." *The Guardian*. 2 February. Available at http://www.theguardian.com/technology/2011/feb/02/uk-crime-maps-developers-unhappy.

Chainey, S., and J. Ratcliffe. 2005. *GIS and Crime Mapping*. Chichester: Wiley. https://doi.org/10.1002/9781118685181.

Chamard, S. 2006. "The History of Crime Mapping and Its Use by American Police Departments." *Alaska Justice Forum* 23(3): 1, 4–8.

Covington, J., and R.B. Taylor. 1991. "Fear of Crime in Urban Residential Neighborhoods: Implications of between- and within-Neighborhood Sources for Current Models." *Sociological Quarterly* 32(2): 231–49. https://doi.org/10.1111/j.1533-8525.1991.tb00355.x.

Crampton, J.W., and J. Krygier. 2006. "An Introduction to Critical Cartography." *ACME: An International E-Journal for Critical Cartographies* 2(1): 11–33.

Dent, B.D. 2000. "Brief History of Crime Mapping." In *Atlas of Crime: Mapping the Criminal Landscape*, ed. L.S. Turnbull, E.H. Hendrix, and B.D. Dent, 4–21. Phoenix, AZ: Oryz Press.

Duncan, M., E.T. Hood, and J.L. Neet. 1975. "Redlining Practices, Racial Resegregation, and Urban Decay: Neighborhood Housing Services as a Viable Alternative." *Urban Lawyer* 7(3): 510–39.

Dunphy, B. 2014. "Localized crime maps." *The Hamilton Spectator*. 14 November. Available at http://www.thespec.com/news-story/5073544-localized-crime-maps/.

Frisbie, D.W., G. Fishbine, R. Hintz, M. Joelson, and J.B. Nutter. 1977. *Crime in Minneapolis: Proposals for Prevention*. St Paul, MN: Community Crime Prevention Project, Governor's Commission on Crime Prevention and Control.

Guerry, A.M. 2012. "Crimes contre les personnes. Digital Image from Historic Maps Collection." Princeton University Library. Available at http://libweb5.princeton.edu/visual_materials/maps/websites/thematic-maps/quantitative/sociology-economics/guerry-map-crimes-against%20people.jpg.

Harley, J.B. 1989. "Deconstructing the Map." *Cartographica* 26(2): 1–20. https://doi.org/10.3138/E635-7827-1757-9T53.

Harries, K. 1999. *Mapping Crime: Principle and Practice*. Washington, DC: U.S. Department of Justice Office of Justice Programs.

Harrower, M., and C.A. Brewer. 2003. "ColorBrewer.org: An Online Tool for Selecting Colour Schemes for Maps." *Cartographic Journal* 40(1): 27–37. https://doi.org/10.1179/000870403235002042.

Huang, S. 2014. "Hamilton Police Launch Online Crime Map." CBC. 17 November. Available at http://www.cbc.ca/news/canada/hamilton/news/hamilton-police-launch-online-crime-map-1.2837957.

Kindynis, T. 2014. "Ripping up the Map: Criminology and Cartography Reconsidered." *British Journal of Criminology* 54(2): 222–43. https://doi.org/10.1093/bjc/azt077.

O'Brien, J. 2015. "An Interactive Crime Map Launched a Year Ago by London Police Is Helping the Force Identify Crime Trends." 18 March. Available at http://www.lfpress.com/2015/03/17/an-interactive-crime-map-launched-a-year-ago-by-london-police-is-helping-the-force-identify-crime-trends.

Taylor, R.B., and M. Hale. 1986. "Testing Alternative Models of Fear of Crime." *Journal of Criminal Law and Criminology* 77(1): 151–89. https://doi.org/10.2307/1143593.

Wartell, J., and J. T. McEwen. 2001. "Privacy in the Information Age: A Guide for Sharing Crime Maps and Spatial Data." U.S. National Institute of Justice. Available at https://it.ojp.gov/documents/d/188739.pdf.

Wood, D. 2010. *Rethinking the Power of Maps*. New York: Guilford Press.