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# Police Service Crime Mapping as Civic Technology: A Critical Assessment

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## ABSTRACT

It is increasingly common for municipal police services in North America to make online crime maps available to the public. This form of civic technology is now so widely used that there is a competitive private sector market for crime mapping platforms. This paper considers the crime maps made available by three Canadian police forces using platforms developed by U.S.-based private sector corporations. The paper considers how these crime maps present particular narratives of crime in the city, evaluates the quality of the mapped data, and explores how laws shape and constrain the use and reuse of crime data. It considers as well the problems that may arise in using off-the-shelf solutions – particularly ones developed in another country. It asks whether this model of crime mapping advances or limits goals of transparency and accountability, and what lessons it offers about the use of private sector civic technologies to serve public sector purposes.

## KEYWORDS

Crime Data, Crime Maps, Data Ownership, Law, Police, Privacy

## INTRODUCTION

This paper offers a critical assessment of crime maps as a form of civic technology. Publicly-accessible crime maps offer an interactive visual display of criminal activity within a municipality. Typically, they display multiple categories of crime plotted according to time and geographic location. There is a growing trend in Canada and elsewhere for police forces to use crime maps as tools for some form of civic engagement. In theory, at least, the provision of information to the public increases public confidence (Sampson & Kinnear, 2009), and promotes transparency and accountability (Janssen, 2012; O'Hara, 2012). In practice, the extent to which these goals are realized depends upon how they are approached and implemented.

This paper examines the results of partnerships between police services and private sector data analytics companies to produce public-facing crime maps for three Canadian cities. There has been considerable uptake by police services of crime mapping in the last decade, leading to a relatively well-developed private sector market for crime mapping platforms. In North America, crime mapping is dominated by three companies based in the United States that offer their services in both the U.S. and Canada. This paper considers the crime maps available in the cities of Ottawa (Ontario), London (Ontario), and St John (New Brunswick). These cities are chosen because each contracts with a different one of the three main U.S.-based crime data analytics service-providers, and as a

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result, each uses a different crime mapping platform. Not only are there differences between each of the mapping platforms, different police services implement crime mapping in different ways. This paper offers a comparison of the major platforms, but also examines their local customization. Points of comparison include the stated goals of the maps as expressed by both police services and crime mapping services; the data points made available for mapping and those actually mapped; and issues of data quality, ownership and control. These issues are considered through an analysis of the maps, the supporting documentation provided by both mapping companies and police services, and the website terms of use.

Part I of this paper explains what crime maps are. Part 2 offers a closer look at the practice of crime mapping. It considers what data are used in these visualizations, and introduces the three mapping platforms that are the focus of this paper. Part 3 looks at the stated objectives for offering publicly-available crime maps, and it considers the extent to which crime mapping achieves these objectives. Part 4 considers the data used in crime maps and examines its limitations. Part 5 looks at issues of ownership and control of crime data and examines how ownership issues may impact open data goals of transparency and accountability. The paper concludes with an assessment of crime maps as a form of civic technology.

## **CRIME MAPS**

Crime maps provide visual representations of urban crime, and are a means by which police services can communicate information about crime to the community (Chainey & Tompson, 2012). Police services may create their own maps using commercially available mapping templates; alternatively, they may use the services of a private sector company in the crime analytics sector. Such companies also offer a variety of other data analytics services that may include predictive analytics, data management tools, and dashboards for internal police use. In some cases, crime mapping companies offer publicly accessible crime maps to police forces for free – perhaps in the hope that other for-fee data analytics services or enhancements to the map will be chosen for use by the force (Paulsen & LeBeau, 2012). Even where fees are charged for the crime maps, these are relatively low. For example, Wisnieski (2014) reports that crime mapping companies can charge fees that range from \$600 to \$2400 (USD) per year depending upon the size of the police force. Cost and convenience may be motivating factors for police services to choose to contract with private sector companies for crime mapping services.

In a review of online crime mapping companies carried out for the U.S. Department of Justice, Paulsen & LeBeau (2012) identified 7 companies that offered some form of crime mapping services in the U.S. Three of these companies also offer crime mapping services to Canadian police forces. These are: Bair Analytics (Raids Online™), Public Engines (Crime Reports™) and The Omega Group (Crimemapping.com™). While private sector crime mapping services dominate the North American market, some police forces in Canada have opted to develop their own in-house crime maps using more generic mapping platforms that they customize for their purposes. This is the case, for example, with the Vancouver Police Department (Vancouver Police Department, 2016); the Calgary Police Service (Calgary Police Service, 2016); the Halifax Regional Police (Halifax Police, 2016) and the Winnipeg Police Service (Winnipeg Police Service, 2016). This development is interesting, as it may in part be a response to some of the issues identified with the private sector maps and discussed below. It also underlines the fact that there are a range of mapping options that may offer greater flexibility and responsiveness to local needs.

The three municipal police services chosen for this analysis – those of Ottawa, London and St. John – have each adopted crime mapping. Each of them has contracted with one of the three major crime analytics companies identified above. The municipalities, the platforms adopted and the date of adoption are set out in Table 1. In Canada, the service that has been relied upon most often is Crime Reports™ (Public Engines). As of January 2016, RaidsOnline™ (Bair Analytics) maps crime in four

Table 1. Police force crime mapping choices

Municipality	Crime Analytics Company	Name of Crime Mapping Platform	Date of Launch of Crime Map
Ottawa	Public Engines	Crime Reports™	October 2008
St. John, NB	The Omega Group	Crimemapping.com™	September 2011
London, ON	Bair Analytics	RaidsOnline™	January 2014

municipalities (three in Ontario and one in B.C.), and Crimemapping.com™ (The Omega Group) has only one Canadian client, the St John Police Service.

Each police service offers a link from its own website through which citizens can access their crime map. The police services' own introductory pages describe the crime maps, and identify some of their limitations. For example, they explain what data are used, their reliability, what the purpose of the map is, and uses to which the information should *not* be put. They also, to greater or lesser extents, identify their objectives in making the maps publicly available. It is important to note, however, that each of the maps can also be accessed via the main platform operated by the private sector company. When this is done, the content specific to the contracting police service (i.e. the terms of use and other descriptions and limitations) is not visible. When accessed via the host company web site, the only terms of use, explanatory information and meta data available are those provided by the analytics company.

## MAPPING CRIME

Although Paulsen and LeBeau (2012) suggest that crime mapping dates back to the 1800's, the use of digital urban crime maps for public consumption is relatively recent. Chainey and Tompson (2012) date the use of computer-generated crime maps in the U.K. to the late 1990s, and internet-based crime maps to the early 2000's. In their baseline review of crime mapping companies and services, Paulsen and LeBeau (2012) suggest that contemporary crime mapping platforms "offer the potential to allow citizens access to data and tools that were once only the purview of those within law enforcement." (p. 5). Paulsen and LeBeau identified and evaluated seven companies that provide online crime mapping services in the U.S.; three of which also offer services in Canada. They focussed on companies offering services from a single site that were capable of being viewed from multiple locations rather than mapping companies that enabled police forces to develop in-house solutions. The use of "pre-packaged" crime maps offers a level of convenience; it also limits customization and may have other consequences, as discussed in greater detail below.

In general, crime data visualizations offer the public a means by which they can zoom in on particular neighborhoods in order to see at a glance the types of criminal activity taking place in the chosen area within a defined temporal period. They do this by typing a particular street address into the search window for the map. They can choose which crimes are of interest to them from a menu, and they can also select a particular temporal window. These temporal periods are selected by the user, but they may be constrained by features of the site. For example, Crime Reports™ provides 6 months of data; users can search up to a 30-day window of data within that six-month period (although multiple searches using different parameters are possible). Crimemapping.com™ provides up to 180 days of data. RaidsOnline™ permits searching of up to the preceding 365 days of data.

Incidents are represented on the maps by icons, with different icons for different types of crime. Site filters will typically allow users to narrow their searches to focus on particular crimes – for example, a user who is planning to park overnight in a particular neighborhood might be interested to know how many thefts from vehicles have recently taken place in that neighborhood. When a user

moves their cursor over an icon on the map, the basic details of each incident are revealed. These typically include the date and time of the offence, and location information (usually a street name and number at the 100-block level (e.g. 17XX Main St.)).

In addition to visual representations of crime in the city, crime maps may also have other features. Typically, there is an option for users to subscribe to email alerts. The user specifies a particular geographic area and provides contact information; emails are then sent to them with current information about relevant incidents in that area. Some features specifically encourage interactions between citizens and local police. For example, all three companies considered in this paper allow users to submit tips regarding particular incidents. The hyperlink for tip submission forms is provided in each dialogue box that opens when a user's cursor is placed over a specific mapped incident. Police service websites that introduce crime maps may also provide static information about how users may protect themselves. In some instances police forces encourage the public to contact them about community safety programs operating in collaboration with local police. Paulsen and LeBeau (2012) note that Crimemapping.com™ and RaidsOnline™ also offer other analytic services to users from the general public. For example, RaidsOnline™ has an “analytics” tab that allows users to see the crimes they have been viewing plotted according to day of the week, time of day, day of the week by hour, and according to type or category of crime. At the time of writing, Crimemapping.com and RaidsOnline both offer mobile apps, although these are only for the iPhone. Crime Reports has apps for both Android and iPhone systems. The OPS, which uses Crime Reports, has customized this app, which includes the crime map as one of its features, along with general information and alerts.

Although there are a number of different ways in which citizens can interact with crime maps, civic engagement is still generally limited to information communication. The maps provide information to citizens in particular ways; interaction from citizen to police is limited to information-seeking or sharing of tips with police. The maps studied do not offer the opportunity to comment on or add to or challenge mapped data. Given the potential legal challenges in moderating a site that might allow this kind of interactivity in a public way (including issues of defamation and privacy breaches) this is perhaps not surprising. Nevertheless, it remains the case that citizen engagement through these maps is limited.

## OBJECTIVES OF CRIME MAPPING

Government open data and proactive disclosure programmes have explicit transparency and accountability goals (Conroy & Scassa, 2015; Janssen 2012). Unsurprisingly, therefore, public-facing crime maps have some transparency dimensions. Evaluating the U.K. experience with crime mapping, Chainey & Tompson (2012) suggest that transparency and accountability were both important public policy goals motivating the release of more crime data to the public. An important question in this context, however, is whether the ‘transparency’ offered by police service crime maps is with respect to the activities or performance of the police service or with respect to the nature and occurrence of crime in the city. Chainey and Tompson argue that along with transparency goals, crime mapping “permits [citizens] to get involved, and by being aware of the risks to their own safety (and that of their neighbours) it encourages them to take measures to reduce the risk and report suspicious activity to the police” (p. 231). Wartell and McEwen (2001) suggest a number of motivations for crime mapping, including reducing costs and the efficiency of providing information to the public, and increasing citizen engagement in working with police. Wallace (2009), however, is critical of crime maps, noting that the form of citizen involvement they foster “is not one of political engagement in local affairs but rather of self-preservation” (p. 7).

Crime maps – particularly those provided by police services are a form of top-down information provision. As will be explained in more detail below, in these models the police services retain control not only over what subset of data is made available, but also over the manner in which it is presented. This is quite different from releasing data for independent reuse and analysis, which is more consistent

with open data (Janssen et al, 2012). In fact, one concern is that rather than enhancing openness, police crime maps may become a substitute for open crime data (Lofaro 2015), thus limiting the ability of others to use the data to present alternative narratives. None of the three cities considered in this paper provide the data shared with the mapping companies to the public as open data. The implications of this are considered in greater detail in Part 5 below.

In the three cases under study in this paper, each urban crime map is presented to the public with two slightly different sets of objectives. The user will see one or the other, depending on whether they arrive at their city's map through the private sector company's crime mapping portal, or whether they arrive at it from the website of their own police service. Access via police service websites typically requires the user to view a disclaimer and to accept terms of use before proceeding to the map. Access via the private sector companies' websites does not include this step. To obtain information about the maps and the accessed data from the company portals, the user must actively search for it. Any information found on the private sector company's website is not tailored to the specific data provided by individual police services.

Police services may explain their motivations for providing a public crime map on their websites. For example, the Ottawa Police Service (OPS) website refers to "the value of sharing information on community safety and security" (OPS 2015) as a motivating factor in making the crime map available to the public. The site speaks of the goal: "to further community awareness and improve accessibility to calls-for-police-service occurring in the community." (OPS 2015) By contrast, those who access the Ottawa crime map through the Crime Reports™ platform receive no messaging about the purpose of the map. The company behind Crime Reports™ (Public Engines) offers a single message on its website (which can be accessed via link from the bottom of the Crime Reports™ home page) relating to crime mapping goals. This message is aimed at its clients – police forces – and not the public more generally. It states: "Clear, transparent, and timely communication increases public confidence and reduces requests for information — saving your agency time and money" (Motorola Solutions 2016). While there is a transparency dimension to this stated goal, the emphasis in the statement is on efficiency and cost savings for the police service.

Citizens who access the London crime map through the London Police Service (LPS) website are given no statement regarding the purpose of the crime map. Instead, they are led to a disclaimer which identifies the limitations of the data and the map (London Police Service 2008). Those who access this same crime map via the website of the platform provider, RaidsOnline™ (Bair Analytics), will learn, through its "About" button on its main site, that the crime map "connects law enforcement with the community to reduce crime and improve public safety" (RaidsOnline 2011a). RaidsOnline™ goes on to assert that "Crime mapping helps the public get a better idea of the crime activity in their area so they can make more informed decisions about how to stay safe" (RaidsOnline 2011a). RaidsOnline™ also offers some data analytics functions to the public which include the ability "to create density analysis, buffers, trends, temporal topographies and several other features usually only seen in advanced desktop applications." (Paulsen & LeBeau 2012, p. 10) Perhaps because of these features, the RaidsOnline™ website states that it "empowers the public to make better decisions about crime by putting the same technology used by law enforcement to analyze and interpret crime activity into the hands of the public" (RaidsOnline 2011b).

If citizens access the St John crime map from the St John Police Service (SJPS) website, they are informed that the map serves goals of "openness and communication" (SJPS 2015a). Further, they are told that the goal of the crime map is "to keep citizens informed about crimes occurring in their neighbourhoods" (SJPS 2015a). In addition to this openness message there is also reference to citizen engagement goals. The site encourages members of the public to report crime to the police to help "to make your community a safer place to live, work, and play" (SJPS 2015a). Citizens are also told that "By using the crime mapping tool, you will become better informed about what is going on in your neighbourhood" (SJPS 2015a). Citizens who access the St John Police Service map through the host platform Crimereporting.com receive messaging that reflects similar goals. First, they are

told that crime maps aim “to help law enforcement agencies throughout North America provide the public with valuable information about recent crime activity in their neighborhood” (Crimemapping.com, 2016a). The crime maps help police by keeping citizens informed: “Our goal is to assist police departments in reducing crime through a better-informed citizenry” (Crimemapping.com, 2016a). In addition, the site claims that providing information through crime maps can help reduce crime: “Creating more self-reliance among community members is a great benefit to community oriented policing efforts everywhere and has been proven effective in combating crime” (Crimemapping.com, 2016b).

Wallace (2009) has been critical of crime maps as a vehicle for neo-liberal approaches that download responsibility for citizen safety to individual citizens, and which see “increasing faith in new technology as a crime-fighting panacea” (p. 22). Certainly some of the statements on the police websites appear to support this view. For example, the St John website states: “Having a greater awareness of the criminal activity in your area makes you better equipped to protect yourself and your family” (SJPS 2015a). It is interesting to note, as Wallace (2009) does, that at the same time that citizens are encouraged to use crime maps to enhance their safety, police service disclaimers warn them not to rely upon the mapped data. For example, the OPS site states “The user of the following pages should not rely on the information or data provided herein for comparison purposes over time, or for any reason. Any reliance the user places on such information or data is therefore strictly at the user’s own risk” (OPS 2015) [Emphasis added].

Openness and transparency goals in relation to urban crime data might include shedding light on police operations or helping the public assess whether appropriate resources are being allocated to crime. Such goals are not an obvious part of the crime map messaging. Crime mapping purpose statements from both police and the mapping companies reveal that crime maps are made available to the public largely to provide some level of information and possibly to engage the public with police either by allowing them to provide tips on specific crimes or by encouraging them to take steps to make their communities safer. While the OPS website does not emphasize personal responsibility for safety, and the LPS site is silent as to its goals, this theme is clearly evident on the St Johns Police Service (SJPS) map, with its reference to citizens being “better equipped to protect yourself and your family” (SJPS 2015a). It is also present in language used by the crime mapping companies, with such references as helping citizens to make “more informed decisions about how to stay safe” (RaidsOnline 2011a). In their study of crime mapping in the UK, Chainey and Tompson (2012) question the ability of crime maps to meet these objectives, noting that “the crime statistics that are currently published using crime maps offer little in a way that can sustain public engagement and empowerment” (p. 231).

## THE DATA

In any mapping exercise the nature and quality of the data used will have a significant impact on both the usefulness of the map and on the reliability of the narrative it conveys. The crime visualizations considered here rely upon relatively poor quality data. In addition, there may be significant differences from one police force to another in terms of the nature and type of data used, making cross-jurisdictional comparisons unreliable.

Because crime maps offer very current incident-related data (allowing users, for example, to view incidents reported in the preceding 24 hours), the crime maps considered here do not make use of statistical crime data. Statistical data are derived from police files, often in instances where there have been witness statements, interviews with victims, and the collection of at least some evidence. Because of these factors, statistical data are generally more accurate than call data (data derived from incidents as reported to the police), although statistical crime data have their own serious deficiencies (Yung, 2014; Eterno & Silverman, 2012; Lomell, 2011). Statistical data typically lack both the real-time dimension and the geographic precision necessary for this type of crime map.

In some U.S. cities served by the three private sector companies considered in this paper, the data provided by police services are updated regularly and can include investigative outcomes (Crimemapping.com 2016a). By contrast, the data used in Canadian crime maps are typically police call data. For example, the SJPS (2015b) describes its map data as “preliminary response data only” and the OPS characterizes its data as “call-for-service data”. (OPS 2015) Call or response data are imprecise for a number of reasons. First, it is possible that multiple calls are received by police regarding single events (OPS 2015). Although efforts might be made to consolidate these into one incident report, there is still the possibility that multiple calls might result in multiple reports on a map. A second flaw is that the location of a call may not necessarily correlate with the location of an incident. The OPS and the SJPS warn that incidents are mapped based on where they are reported rather than where they occur (OPS 2015; SJPS 2015b). As noted earlier, incident locations are also generalized to the 100-block level in order to offer some level of privacy protection. The point on the map may be close to where the incident took place, but it will certainly not be exact. Wallace (2009) also observes that where crimes occur in parks or other open spaces, they are geocoded to the 100-block level on the nearest street, creating the misleading impression that these public spaces are crime-free – and that the adjacent streets have more incidents of crime than is actually the case.

The mapped data are also imprecise in that some incidents will not amount to what would be considered a crime. For example, a reported assault may turn out to be a high-volume argument that does not result in criminal charges. A person who reports a theft from their vehicle may realize some days later that the item they supposed to have been stolen was merely lost. Simply because something is reported to police does not mean that a crime occurred. If the maps simply reflect call data and are not updated as more information about the incidents becomes available, this decreases the reliability of the information.

The difference between the data used in the U.S. maps and those used in the Canadian maps also means that those who access Canadian crime maps from a U.S. company’s main portal will not receive accurate information about the limitations of the data. The mapping companies tend to describe the data used in terms of what is typically provided by U.S. police services, and this in turn is influenced by data management protocols and software in use by the police in the U.S. Calls-for-service data are very different and Canadian police service portals are often explicit about their limitations. However, these warnings are only visible to those who access these maps through the Canadian police services’ portals. The problem with conflicting accounts of the crime map depending upon how citizens access the maps (through the company’s portal or via the police service’s web site) is thus also a factor when it comes to assessing the nature and quality of the mapped data. For example, RaidsOnline™ describes the data it maps as being derived from “a detailed report with information about the event including the location, people involved, related vehicles and other useful information” (RaidsOnline, 2011a). The London Police Service, which uses RaidsOnline™ describes the mapped data as “police occurrence information” that is “based upon preliminary information of police occurrence type” (LPS, 2008).

Another issue with the way in which data are presented to the public is tied to the nature of the platform. All three crime mapping companies offer a menu of crimes that can be included on the map (see Table 2). Indeed, in searching city maps for incidents of crime, users can check the boxes for the specific categories of crimes that are relevant to their search. However, the platform allows each police service to choose the crimes for which they wish to provide data. None of the Canadian cities considered in this paper, for example, provide data for all of the possible categories of crime available from the host platform (the mapped categories for each police service appear in bold font in Table 2). While police services list the categories of crimes for which data are provided on their own local sites as part of the terms of use, users who access the site through the host company’s portal will not see these terms of use. Further, no matter how the map is accessed, the full list of crimes still appears in the platform menu. A user can still click on a particular listed crime in order to filter their search results, even if the police service in question does not provide data for that crime. Thus,

Table 2. Categories of offenses that can be mapped by platform and that are mapped by police service (categories of crime indicated in bold font represent those for which data are provided by the relevant Canadian police service)

Public Engines – Crime Reports™ (OPS)	Bair Analytics – Raids Online™ (LPS)	The Omega Group – Crimemapping.com™ (SJPS)
<b>Homicide</b> <b>Breaking and Entering</b> <b>Robbery</b> <b>Theft</b> <b>Theft of Vehicle</b> <b>Theft from Vehicle</b> Vehicle Recovery <b>Sexual Offense</b> <b>Assault</b> Property Crime <b>Other</b> <b>Quality of Life</b> <b>Traffic</b> Fire Emergency <b>Proactive Policing</b>	<b>Homicide</b> <b>Attempted Homicide</b> Death Investigation Sexual Assault Sexual Offense – Other <b>Robbery – Commercial</b> <b>Robbery – Individual</b> <b>Aggravated Assault</b> <b>Assault – Other</b> <b>Burglary – Commercial</b> <b>Burglary – Residential</b> <b>Theft</b> <b>Fraud</b> <b>Shoplifting</b> Theft – Other <b>Motor Vehicle Theft</b> <b>Burglary from Motor Vehicle</b> <b>Arson</b> <b>DUI</b> Alcohol Violation Drugs/Narcotics Violation <b>Disorderly Conduct</b> <b>Traffic Incident</b> <b>Vandalism</b> <b>Weapons Violation</b> All Other – Non-Criminal All Other Criminal	<b>Arson</b> <b>Assault</b> <b>Burglary</b> Disturbing the Peace Drugs/Alcohol Violations <b>DUI</b> Fraud Homicide <b>Motor Vehicle Theft</b> <b>Robbery</b> Sex Crimes Theft/Larceny <b>Vandalism</b> <b>Vehicle Break-in/Theft</b> Weapons

for example, if one clicks on ‘sexual offenses’ in a city that does not provide this data, the resulting map will show no sexual offences in the searched area – which might suggest to the user that no such crimes occurred during the specified time frame, rather than that the data are not available.

This structure for reporting crimes on crime maps reflects two layers of choices which directly impact the narrative of urban crime in each city. First, the private sector company makes an initial determination of what crimes may be included on its maps. The contracting police service then chooses the specific crimes it will map from the available categories. The data available on the map are therefore doubly mediated.

An individual police force’s choice to not map certain crimes or other policing activities can be affected by a variety of factors that may include the applicable laws or policy. For example, in many states in the U.S., the location of registered sex offenders is a matter of public record, and crime mapping platforms allow police services to choose to plot this data on their maps. Such data cannot be made public in Canada (Conroy & Scassa 2015). Privacy considerations may also influence the mapping of other crime data. For example, some police forces choose not to map crimes of domestic violence or child sexual abuse for privacy reasons. Such crimes often occur within the home, and mapping, even to the 100-block level may lead to the identification of either the victim or the perpetrator (or to harmful incorrect assumptions about their identities). Public sector data protection statutes – which would apply to the police services in this study – require public bodies to protect individual privacy by balancing privacy rights against the public interest in disclosure of personal information. In cases where the personal information is highly sensitive in nature, privacy rights generally prevail over disclosure. In the case of crime map data, names of victims and precise addresses for occurrences are never disclosed; the balance is thus between releasing anonymized data generalized to a 100-block level and withholding even that data because of the risk of reidentification. It is interesting to note

that the balance is not struck in the same way in each jurisdiction. As noted earlier, disclosure in the public interest is most likely to prevail in the U.S. Yet even within Canada there are differences.

For example, of the three police service crime maps considered in this paper, only the OPS provides sexual assault data. It is interesting to note that in the case of sexual assault, police services may face an interesting dilemma. The decision not to report such data could conceivably be part of a breach of a duty to warn the public, particularly where the sexual assaults may have been committed by a serial offender (Randall, 2000). On the other hand, the risks that disclosure may lead to the identification of a victim is also a serious concern. In those cases where crime maps have stated objectives of allowing citizens to take control of their personal safety, the failure to provide data about violent assaults seems counter-intuitive. Perhaps because of this, discourses of improving safety are also matched with disclaimers of liability for any reliance upon the data. For example, the OPS map disclaimer states: “The Ottawa Police Service will not be responsible for the use of, or the results obtained from the use of this information or data. The Ottawa Police Service shall assume no liability for any decisions made or actions taken or not taken by the user of the website in reliance upon any information or data furnished hereunder” (Ottawa Police Service, 2015).

Crimes without a particular geographic dimension, and crimes that are typically not reported to police (but rather, are uncovered through investigative activities) will either not be good candidates for mapping or will not form part of the call data that are used to populate such maps in Canada. Thus, the Canadian crime maps typically do not feature computer or internet crimes, or white collar crimes such as fraud, or drug-related crimes that are the result of police investigations (as opposed to calls to police). The absence of such crimes from crime maps means that the maps offer a limited representation of urban crime. It has been argued that these representations privilege concerns about the protection of private property and personal security (Wallace 2009) rather than informing a broader discussion about criminal activity in the city. This, combined with the visual impact of crime maps, may contribute to the stigmatization of particular urban neighborhoods.

Crime maps will also not map criminal activity that is dealt with by a growing number of specialized or private police forces (Van Steden & Sarre, 2011) (e.g.: transit police, campus police, security guards and corporate security) unless incidents dealt with by these forces are reported to police. Call data are also not representative of criminal activity in instances where crimes are underreported. This may be a factor for certain types of crime (such as, for example, sexual assault or domestic violence) (Johnson, 2012) or for certain types of victims who may seek to minimize their contact with police (e.g. street involved persons). Underreporting may also be an issue in communities where there is a distrust of police or where there is a fear of retribution for reporting crimes to police. It is worth noting that those who access crime maps through their police service’s website will be warned to greater or lesser extents about the unreliability of the mapped data. The OPS is the most explicit about the limitations of its data, explaining in some detail what factors may skew the call data, and warning in general terms that “Ottawa Police Service cautions against using call-for-service data to make decisions, or comparisons, regarding the safety or crime levels for an area” (Ottawa Police Service, 2015). By contrast, the LPS site merely states that “This information does not reflect official statistics of the London Police Service” (London Police Service, 2008). A final issue regarding the quality of data available through crime mapping web sites relates to the temporal range of this data. As noted earlier, one year’s worth of data is the most that one can expect to access from one of these sites, and some offer data for a considerably shorter period of time. In addition to the temporal limitations of the host platform, police services may also choose to limit the amount of data available. The lack of historical data restricts the uses that can be made of the data provided. For example, it makes temporal comparisons of the kind that could be made with open data virtually impossible.

## OWNERSHIP AND CONTROL

The choice by a police service to use a commercial crime mapping service rather than to provide the mapped data as open data is highly relevant to the issue of civic engagement. Open data advocates argue that civic engagement is enhanced by open data because individuals or civil society organizations can make use of open data in critical or innovative ways (Sampson & Kinnear, 2009; Kitchin, 2014). In the case of the call data used in crime maps, this same data made available as an open data feed could be used by civil society groups or by private sector developers to provide maps that offer alternative narratives of urban crime. Open crime data could also be mashed up with other urban data to create interesting and useful apps or maps for a variety of different purposes.

In spite of the potential for reuse of open crime data, the data provided by police to crime mapping companies is generally not available to the public in the same easily reusable format as is made available to the private sector crime mapping companies. The data used in the crime maps of the three companies considered in this paper are provided to those companies directly by the contracting police force. While this same data may notionally be available to the public, in the sense that individuals can consult physical call logs, the ability to consult call logs is very different from the ability to access a digital data feed using an Application Programming Interface (API). In the U.S. open data advocates have unsuccessfully sought access to the same data feeds that are provided to private sector crime mapping companies (Wisniewski 2014). For some police forces, the cost and complexity of the task of providing open data may combine with the view that the crime maps meet any need for publicly available visualizations of crime data, with the result that police forces may choose not to make crime data open once crime maps are made available (Lofaro, 2015). This is also an issue in US cities that make use of crime mapping services (Wisniewski, 2014; Hochberg, 2013).

Exceptionally, some Canadian jurisdictions have begun to provide police data as open data but this is not the norm, and these data sets may still not be the equivalent of the call data provided to private sector mapping companies. In Vancouver, the Vancouver Police Services maintains its own crime map called the GeoDASH Crime Map (Vancouver Police Department, 2016a). The data used to populate this map are also made available as open data through the city's open data portal. While this is a positive step, it should be noted that these data are updated with less frequency than the official map (once a week instead of daily), which gives an advantage to the police-service produced map (Vancouver Police Department, 2016b). Nevertheless, historical mapping data are available through the open data portal, which is a significant advantage over the commercial mapping sites.

It is worth noting that, according to their terms of use, none of the three crime mapping companies considered here, claim any proprietary rights in the data. The police services could, therefore, provide the same data feeds to others or could release similar data as open data. Hochberg (2013) notes that in the U.S., in spite of their ability to do so, many police services do not grant broader access to crime data feeds. At the same time, the mapping companies prohibit, in their terms of use, the scraping and reuse of data hosted on their platform (Wisniewski 2014). In the U.S., a company behind an alternative crime mapping service, SpotCrime™, faced legal action after it scraped data from the RaidsOnline™ site. The developer behind SpotCrime™ had initially approached the Minneapolis Police Department (MPD) seeking access to the same data feeds provided by the MPD to RaidsOnline™. When access was denied, he began scraping the data from the RaidsOnline™ map. The lawsuit launched against him by RaidsOnline™ for this activity was eventually settled. One of the terms of the settlement was an agreement that the developer would cease scraping data (Hochberg, 2013). This case raises serious issues about the lack of open data in this sector. It was reported that the MPD had refused to provide the data feed to the developer because of a preference for RaidsOnline™ and a dislike of some of the advertising content on SpotCrime™ (Wisniewski 2014). The desire on the part of police services to exercise control over messaging in relation to crime data raises serious issues about transparency and

accountability – both goals intended to be served by open data. Sampson & Kinnear (2009) suggest that excessive police control over crime data may, at the very least, undermine public confidence. In this context, it is crucial to remember that a police service providing data to the public via an online map is fundamentally different from a police service making the same data available as open data.

To the extent that there is any copyright in police calls-for-service data (Scassa, 2010), that copyright would rest with the provincial Crown. A Canadian developer who scraped the data from one of the commercial platforms would not only be in breach of the terms of use of that site (Scassa & Deturbide, 2012), he or she might conceivably be sued by the Crown for breach of copyright. Government copyrights have been asserted in the past as a means of maintaining control over the dissemination of information (Judge, 2010) and concerns over the accuracy and quality of information made available to the public are sometimes raised by public authorities as a reason for asserting copyrights (Scassa, 2014). Although open data reflects a government's decision to loosen control in the name of reaping the advantages of openness, open data is still a work in progress in Canada.

## **CONCLUSION: CIVIC TECHNOLOGY AND CRIME MAPPING**

If civic technology involves both the transfer of information between citizens and government and citizen engagement in identifying or solving problems, then contemporary crime mapping is at best a work in progress. Crime maps provide information to the public, and typically invite users to engage with police in different ways via the crime maps and their associated tools. In the cases examined here, most of these forms of engagement involve contacts between individuals and the police, rather than broader, community-based interactions. By using the crime maps users receive information about crime in their community, they are given an opportunity to provide tips or feedback to the police, and they may register for email alerts regarding new incidents. While this supports civic engagement at a very basic level, the maps have significant drawbacks as well. The data provided is of relatively poor quality; it is incomplete, potentially inaccurate, and presented in ways that can be misleading. The narratives of urban crime remain under the control of police services and are constrained by the data frameworks of the U.S.-based private sector companies. The framing of the data through top-down and technology-driven constraints also imposes limitations on citizen engagement.

Crime mapping on commercial platforms also raises issues of ownership and control over the underlying data. Although none of the crime mapping companies considered here claim ownership rights in the mapped data, there is no independent means of access to the data by other developers or researchers. Further, the private sector companies prohibit the scraping of data from their sites, effectively barring reuse of the data. To compound the problem, the existence of a public-facing crime map may lead to a bureaucratic decision that the same data provided to the mapping platform need not also be made available as open data. If there is no public access provided to the raw digital data as open data, the ability of users to independently assess and evaluate the data, to combine it with other data, or to make use of it in research, analysis, maps or apps is significantly limited.

Crime maps are an example of civic technology that highlights the importance of how such technology is conceived and deployed. Private sector-sourced maps featuring top-down data provision, tightly controlled narratives and limited scope for citizen engagement are not an ideal model for civic technology. Even where cost and convenience drive public authorities towards pre-packaged solutions, these should not preclude a simultaneous move towards making the same data available as open data. The feasibility of a hybrid approach is illustrated in the case of Vancouver's in-house crime map combined with open access to the mapped data.

The crime maps considered in this paper also reveal the importance of ensuring that pre-packaged solutions are compatible both with the available data, the objectives of the police service, and the legal and policy limitations on sharing of the data. The examples considered here reveal important

inconsistencies between data descriptions by the platform providers and those of the local police services, as well as inconsistencies in how the public is notified of these limitations. They suggest a need for municipal bodies to more closely examine both the goals and the implementation strategies for making data available to the public.

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