Policing and mental health: An investigation into police interactions with emotionally disturbed persons
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Final Report

Policing and mental health: An investigation into police interactions with emotionally disturbed persons

Executive Summary

The research in this Report on the interactions between the police and those with mental illness can be organized into three general research areas: spatial analysis, temporal analysis, and resource analysis. The first two Reports involve the spatial analysis of police interactions with emotionally disturbed persons. The first Report was included in the Interim Report (May 2016), but is included here as well because it is part of the overall research program. The third and fourth Reports investigate the temporal dimension of police interactions with the mentally ill. The temporal dimensions considered are the year-to-year trends, seasonal trends, monthly trends, daily trends, and hour-to-hour trends. The fifth, and last, Report investigates the resourcing implications of the police interacting with the mentally ill. In this last Report, we estimate the number of full-time equivalent police officers necessary to provide service to this sub-population.

In Reports 1 and 2, we investigated a number of different spatial relationships for emotionally disturbed persons. The first aspect to note here is that events that relate to emotionally disturbed persons are highly concentrated in space. Specifically, only 1.17 percent of the street blocks in a city were necessary to account for 50 percent of the events police attended; this is more than twice as concentrated as the criminal events in this city. The second to note is that approximately 20 percent of events that involved emotionally disturbed persons were related to criminal events. Most often, events were related to the Mental Health Act, disturbing the peace, and general assistance. Third, the events that related to emotionally disturbed persons occurred in areas distinct from non-emotionally disturbed person events. Though the hot spots for both types of events appear to be in similar places, they are different enough that those involved with providing them service should be cognizant of these differences. Specifically, events involving emotionally disturbed persons cluster near places that are expected to attract this population: alcohol points-of-sale, criminal justice services, pharmacies, public health offices, walk-in clinics, and mental health, substance use, and/or addition service offices. And fourth, there are notable differences between males and females when it comes to the spatial patterns Mental Health Act, criminal, and non-criminal contacts with the police for this population. For both males and females, Mental Health Act events occur in spatially distinct places than both criminal and non-criminal events, whereas criminal and non-criminal events tend to occur in the same places. Moreover, females and males tend to have their criminal and non-criminal events occurring in the same places, but their Mental Health Act events occur in different places: females are more likely to have their Mental Health Act events in residential settings, whereas males are more likely to have their Mental Health Act events occur in commercial settings.
The temporal analysis of Mental Health Act related interactions with the police are covered in Reports 3 and 4. Report 3 considers the hourly and day-to-day patterns of Mental Health Act police contacts, comparing these events with domestic violence. We found that domestic violence events had the expected temporal pattern of Friday and Saturday evenings representing the highest volume of events. Mental Health Act related events, however, peaked in the middle of the week (Wednesday, on average) and in the late afternoon. There is still a high volume of calls during the weekend and during the later hours of the day, but this is not the highest volume. Report 4 reiterates the importance of the time of the day and the day of the week, but also shows a clear upward trend from 2009 to 2015, but using a more sophisticated statistical methodology.

Finally, Report 5 investigates the resource implications of the police interacting with the mentally ill. Considering the number of hours police interact with the mentally ill, measured in PRIME incident and calls-for-service data, we estimated the equivalent number of full-time police offers are necessary to serve this population in two contexts: only enforcing the Mental Health Act, and all interactions with those who have been arrested or detained under the Mental Health Act. Regarding the first estimate, we calculate that 26 full-time police offers are necessary in the Fraser Health Authority; and for the second estimate, 171 full-time police officers are necessary to address all Mental Health Act, criminal, and non-criminal events in the Fraser Health Authority. This has significant resource implications for the various police services in the Fraser Health Authority. Moreover, the top 10 heavy users of police services in the Fraser Health Authority require almost 10 full-time police officers to deal with all of their police-recorded events. The highest user of police service requires almost 2.5 full-time police officers to deal with all of his police-recorded events.

Overall, we have been able to show that police events that involve the mentally ill have distinct spatial and temporal patterns that have implications for the deployment of general duty officers as well as those specifically trained to serve those who present with mental illness. And responding to these events has significant resource implications for policing.
Acknowledgements

The mental health research team from ICURS acknowledges the contributions of all participants in this report who provided their time to assist with the completion of this project. We would also like to thank the following agencies and primary contacts for their support and assistance:

Dr. Nigel Fisher  
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Tom Chesley  
Inspector  
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Abbotsford Police Department

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Additional technical/data assistance was provided by Justin Song from the Department of Geography and SFU’s IT associates Wolfgang Richter and Lixin Liu.
Police interactions with Emotionally Disturbed Persons (EDP) occur every day and everywhere. From the psychotic episode outside a commercial establishment that led to an assault to someone who has decompensated as a result of being off their anti-depressant medication to someone who requires general police assistance, the number of types of interactions and the roles that police must play are plentiful and are not well-captured in traditional crime statistics. The impact of police interactions with EDP are not inconsequential as this highlights a larger societal challenge of providing appropriate mental health and additions services, housing, employment and other supports that are likely to improve the well-being of EDP (and ultimately reduce police contacts and emergency room visits).

The Institute for Canadian Urban Research Studies (ICURS) at Simon Fraser University undertook the task to explore the nature and quality of police interactions with Emotionally Disturbed Persons (EDP) though records management system data that was provided by all police agencies that were contained within the Fraser Health Authority in B.C. This health authority is unique as the population demographics covers a series of densely populated urban settings and large rural and remote portions of B.C. Within this geography there are a large number of RCMP detachments with some being responsible for provincial police duties. There are also five independent/regional police forces that also operate within the Fraser Health Authority.

The report involved:

- An overview of the pertinent literature
- A brief discussion on data considerations/challenges
- Study 1: Qualitative inquiries into data collection and management
- Study 2: Quantitative exploration of the data
- Study 3: Gender and spatial factors

In general, primary finding from this report indicates a difference between what is qualitatively known by police officers and what is quantitatively reported in Police Records Information Management Environment (PRIME). That is, proportionally speaking, police anecdotally respond to a large number of calls-for-service with EDP, but our quantitative analyses does not identify this volume in PRIME (i.e., they are ‘hidden’ or not readily available for from analyses using traditional data querying methodologies). This discrepancy between what is believed to be in the data, versus what exists in the PRIME is not a shortcoming of police responses to the needs of the EDP community, but more likely a result of:

1) The challenges facing front-line members to know that the nature of a subject’s behaviour was in fact caused by mental illness, substance use, or a combination of the two when police training in qualifying their assessments is highly limited;
2) An RMS platform that was never intended to capture health-related information for the purposes of future analysis and research.

3) The taxing nature of these calls in terms of time and psychological impact has implications for perceptions regarding the actual volume of these calls.

Other results from this study can be found in the qualitative findings found in Report 3, descriptive quantitative findings from Report 4, and geospatial and gender results from a specific jurisdiction in Report 5. Qualitative interviews and focus groups were conducted with 29 front-line and supervisory police officers, crime analysts, and other civilian staff and results indicate that police contacts with EDP are similar but highly linked to the local context. Quantitative findings highlight the vast number of police contacts with EDP that are distributed all over the Fraser Health Authority but highly concentrated in the major urban settings. In terms of the events EDP are associated with, they are primarily involved in the Mental Health Act though they will also will be involved in criminal and non-criminal events. Only considering a subjects EDP events under represents their presence in the data. As expected there is a small proportion of persons with a large number of contacts with some persons having hundreds of contacts. Lastly, EDP are a highly mobile population, impacting many police jurisdictions. As such, coordination across jurisdictions much like the mental health liaison policing program is critical to help to improve communication between agencies and ultimately to better respond to this population.

As with all studies, there are will be some limitations to the results. For example, in Report 4 and 5, we used the subject identifier “EDP” to segue to all other analyses. The results form Study 3 indicate this is not likely an accurate starting point though it can be argued that it is likely an underreported subject identifier rather than one that is improperly used by members and file readers. Other approaches for studying the population could be explored as well as made more accurate with additional data from the PRIME Data Warehouse.

**Other Limitations**

To help in the development a better understanding of the nature of police interactions with this population, ICURS presents three recommendations, all of which are related to data collection:

A. As a starting point, it is recommended that individual subjects continued to be coded as “EDP” and events should be ‘flagged’ for mental health. All Mental Health Act calls should also list the appropriate number of EDP subjects in the event.

B. At the same time, it is recommended that the EDP definition be reworded or another subject code be added to PRIME to allow members, readers/scorers and other clerical staff, and supervisors to identify subjects that their behaviour—regardless of the level of risk to themselves or others—is suspected to be primarily associated with an underlying mental illness, substance use/misuse, or a combination of the two.

In addition, it is recommended to upgrade the user interfaces that work with PRIME to enable the extraction of data in a full and useable form from the data warehouse.
Specific to the current study, but most certainly applicable to the study of other groups of clients/offenders, would be the benefit to analysts to download the narrative synopses from PRIME files, and the address history for subjects, as these are currently unavailable.

C. It is recommended that additional data warehouse RMS data be made available to civilian and third party collaborators (i.e., ICURS) to allow for the inclusion of additional pertinent data (e.g., event synopses) for aggregate data analysis. Furthermore, additional data from the Fraser Health Authority would also be an asset to have as this would allow for cross-referencing of police data to improve the accuracy of identifying EDP.
Report 1: Exploring the role of the environmental context in the spatial distribution of calls-for-service associated with emotionally disturbed persons

Background

Evidence suggests that a subset of persons with mental illness (PMI) is at risk for becoming involved with the criminal justice system (CJS) (Becker, Andel, Boaz, & Constantine, 2011; Fisher et al., 2011). Research also suggests that a subset of this population will have multiple and/or habitual contact over their life course, leading to their entrenchment within the CJS, particularly with the police (Akins, Burkhardt, & Lanfear, 2014; Reuland, Schwarzfeld, & Draper, 2009). Some scholars suggest that the police act as “street corner psychiatrists”, controlling access to the CJS and the mental healthcare system for many PMI (Teplin & Pruett, 1992). Police involvement with PMI often does not result in criminal charges but a wide range of other outcomes such as persons being a victim or witness to a crime (Brink et al., 2011). In other interactions, some have argued that the police may conduct mercy arrests or the provision of some form of mental healthcare within the confines of police cells when a local health authority is unable, or unlikely, to provide service (Adelman, 2003). When PMI do offend, they are arrested for the same reasons as other offenders (Becker et al., 2011). In other words, mental illness is not traditionally interpreted as a criminogenic factor. Taken together, this leads one to question whether PMI and non-PMI are actually heterogeneous groups, but also whether their other, non-criminal police contacts, are similar in nature as well. With such a wide range of potential interactions between PMI and the police, the contextual factors underlying why this population might come into police contact requires investigation.

Situational factors between PMI and police encounters are highly relevant in determining the nature of the interaction. These factors often include the characteristics of the officer, the subject/patient, and the environment or situational context. In addition to the officer’s years of experience (Green, 1997), his/her demeanor and decision-making processes are correlated with the outcome of an interaction with a PMI. For instance, being respectful, kind, and listening to the mentally ill person during the interaction, as well as less rushed and forceful approaches by police, are likely to deescalate situations (Watson, Angell, Morabito, & Robinson, 2008). Another factor that can determine the nature of an interaction is the subject’s behaviour at the time of police encounter (Teplin & Pruett, 1992). Independent of the severity of the underlying mental illness, when the seriousness of the alleged offence increases, with a lack of alternative diversion options, PMI are more likely to be detained in police custody to ensure public safety and security (Lamb & Weinberger, 1998).

Despite the underlying factors that both PMI and the police bring to an interaction, the significance of the environment is often not considered. In the event that the environment is considered, social disorganization theory (Shaw & McKay, 1942) is often used to explain the intersection of PMI and police calls-for-service. Hiday (2006) highlights that those PMI
who are involved in CJS often reside in socially disorganized urban communities where they tend to be entrenched in poverty with limited access to physical and social resources. In an effort to survive the challenges presented in these communities, the activity patterns of PMI may also come to the attention of the police. The current study moves beyond the impact that aggregate socio-environmental factors have on the quantity and quality of PMI-police interactions, and instead determines how the physical environmental landscape (i.e., transportation networks, commercial, non-governmental, and governmental offices) influences where PMI interactions with the police take place. Using the street segment as the unit of analysis, these environmental features provide an empirical foundation from which a better understanding of what may have caused the initial contact with police can be made. As such, this study examines a series of relevant place attractors to determine what influence, if any, they have on the locations of calls-for-service pertaining to behaviour that may have been caused by mental illness.

Theoretical Background

Although the patterning of event locations associated with PMI who were involved in both criminal and non-criminal police contacts has not been the subject of much research attention thus far, it is possible to draw upon the theoretical frameworks underscoring environmental criminology to better understand this phenomenon. Environmental criminology focuses on the influence that the environment, including the immediate context, has on criminal activity. The three theoretical underpinnings of this approach—rational choice theory, routine activities theory, and the geometry of crime—are instructive for understanding the locations chosen for health-related events as these perspectives provide a framework for analyzing the decision-making behind why people travel to and from certain locations, and how this results in particular outcomes—see Downes and Rock (2011) for critical discussions of these theories.

The rational choice perspective presumes that rationality underscores human action in both criminal and non-criminal contexts (Clarke & Cornish, 1985; Cornish, 1993). This rationality is often considered ‘bounded rationality’ (Simon, 1957; Simon, 1982) because it is often constrained by limits of time, ability, and the availability of relevant information (Cornish & Clarke, 1986). Individuals will consciously or unconsciously weigh the potential rewards versus costs of engaging in certain behaviours and, thus, discriminate between choices that maximize their potential rewards while minimizing their level of risk (Cornish & Clarke, 1986). Although it can be argued that PMI may not typically weigh up the costs with the benefits of an action/behaviour in the same way as non-PMI, this is not to say that they are irrational. Instead, PMI still make rational decisions, but they are just ‘bounded’ by different constraints (e.g., challenges associated with mental illness) than non-PMI—their choices are rational from their perspective, that is the essence of rational choice theory because not all individuals (PMI and non-PMI) choose to commit criminal offences. For instance, PMI may ask themselves: which benefits do they obtain from traveling to certain locations (e.g., having a prescription filled at a nearby pharmacy), and do they outweigh the costs associated in doing so (e.g., the time and monetary cost to travel)? Because the potential rewards and risks vary across situations, individual decision-making will vary
accordingly. Because of this, the unit of analysis needs to be individual events (i.e., police contacts) rather than individual people.

Routine activities theory stresses the role that the environment plays in order to understand criminal events between a motivated offender and a suitable target in the absence of a capable guardian (Cohen & Felson, 1979). The usefulness of routine activities theory for the current study lies in the fact that it can explain why individuals are in certain locations at particular times of the day. For instance, individuals engage in everyday, routine activities, and these activities vary depending on the profile of the individuals in question. Thus, the places where individuals travel to in order to engage in work, school, or leisure are also the most likely locations for criminal or non-criminal events to take place. In the case of PMI, the places in which these individuals routinely travel because of leisure (e.g., bars), or out of need (e.g., hospitals), are also the locations where they are the most likely to come into contact with other people and with the police.

Similar to the routine activities framework, the geometry of crime (Brantingham & Brantingham, 1993; Brantingham & Brantingham, 1981) provides a more detailed and spatial account of the ways in which individuals move throughout their environments while engaging in their routine activities. In this sense, the geometry of crime is concerned with where events occur given the opportunities available within the limited routine activity space, and slightly broader awareness space, that individuals develop. The environment is crucial in shaping the locations individuals travel to and the pathways used to get there, impacting the spatial distribution of events. It becomes possible to identify specific locations where PMI would be expected to frequent due to the nature of their mental illness, amongst other lifestyle factors, as well as the pathways they would likely take to travel between them. These aggregate activity spaces are where PMI spend much of their time and where they are also likely to come into contact with the police as well as other people.

Extending the work of previous scholars who have argued that there are few differences in the types of criminal acts involving mentally ill and non-mentally ill individuals (Becker et al., 2011), we hypothesize this is true for non-criminal police contacts. The first aim of the study is to empirically test whether the places in which PMI come into contact with police services differ from other individuals. This is a necessary first step in terms of the deployment of both police and health resources because if interventions are needed for specific types of calls, it will be of practical utility to know if they occur in distinct places. The second aim of this study is to determine whether or not police contacts associated with PMI cluster in space. Lastly, using rational choice, routine activities, and the geometry of crime theory, this study seeks to identify individual place factors contributing to this patterning.
**Methods**

**Data**

**Event data**

The data used in the analysis are all police calls-for-service during 2006 for a medium-sized urban Canadian setting—the most recent and geographically-referenced data available. These calls are obtained from the Police Information Retrieval System, a police database used by the Royal Canadian Mounted Police containing information on all contact occurrences as well as the individuals involved in these events. All individual names were de-identified from these police records, and data have been aggregated to non-identifiable levels before being publicly released.

A dataset of 140,748 police calls-for-service was obtained for this one-year period. From these police contacts, all records that involved emotionally disturbed persons (EDP) subject identifiers (n = 2,847) are identified and separated from all other calls-for-service (n = 137,901). The ‘EDP’ subject identifier describes subjects who appear to be mentally unstable and who might pose a threat to an investigator or others during a police-related call-for-service. The definition of EDP does not differentiate the causality of the behaviour, but is based on the police officer’s assessment of the suspect at the time of the event (White & Ready, 2007). In lieu of official health records (e.g., urinalysis or blood tests), EDP is a useful proxy for identifying a subset of persons whose behaviour is likely to be associated with mental illness or substance use. The proportion of event types that involve EDP subjects is presented in Table 1.1.

<table>
<thead>
<tr>
<th>Event Classification</th>
<th>Count</th>
<th>Proportion of Total Events (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC Mental Health Act</td>
<td>1610</td>
<td>56.6</td>
</tr>
<tr>
<td>Disturbing the peace, threats, harassment, breach of conditions, etc.</td>
<td>391</td>
<td>13.7</td>
</tr>
<tr>
<td>Assistance</td>
<td>254</td>
<td>8.9</td>
</tr>
<tr>
<td>Violent crime</td>
<td>229</td>
<td>8.0</td>
</tr>
<tr>
<td>Other events</td>
<td>161</td>
<td>5.7</td>
</tr>
<tr>
<td>Property crime</td>
<td>114</td>
<td>4.0</td>
</tr>
<tr>
<td>Theft</td>
<td>52</td>
<td>1.8</td>
</tr>
<tr>
<td>Controlled Drugs and Substances Act</td>
<td>21</td>
<td>0.7</td>
</tr>
<tr>
<td>Traffic offences</td>
<td>15</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2847</td>
<td><strong>99.9</strong></td>
</tr>
</tbody>
</table>

*Does not equal 100% due to rounding

---

1 EDP calls-for-service comprise 2.02% of the overall calls-for-service. This finding is consistent with prevalence rates of police-involved calls-for-service found in police databases of other mid-size Canadian cities (Hartford, Heslop, Stitt, & Hoch, 2005).
**Boundary data**

Dissemination areas are used as the spatial unit of analysis in the current study. Defined by Statistics Canada, dissemination areas are smaller than census tracts, containing a residential population between 400 and 700 persons, composed of one or more blocks—this census unit is similar in size to the census block group in the United States Census. The 2006 dissemination boundaries are used for the analyses: a total of 559 disseminations areas within this jurisdiction.

**Testing Methodology**

**Spatial concentration of EDP and non-EDP calls-for-service**

In order to identify the spatial concentration of EDP and non-EDP calls-for-service, we use the street segment, the portion of each street that falls between two intersections. This unit of analysis has become a common choice for identifying spatial concentrations of crime because its small size shows how concentrated (or not) with high precision. In order to perform such calculations, each call-for-service was geo-referenced to the street segment it was geocoded to. Using this information, the number of calls-for-service was counted per street segment in order to make a number of calculations regarding spatial concentrations, described below.

**Spatial point pattern test**

In order to determine whether or not the locations differ between calls-for-service associated with EDP versus non-EDP, a spatial point pattern test is used (Andresen, 2009). The spatial point pattern test is area-based and concerned with the similarity between two different spatial point patterns (e.g., EDP versus non-EDP calls-for-service) at the local level—see Andresen and Malleson (2011) for a detailed account of the testing methodology. The output of the test consists of two parts. First, there is a global parameter that ranges from 0 (no similarity) to 1 (perfect similarity), known as the index of similarity. This $S$-Index represents the proportion of spatial units that have a similar spatial pattern within both datasets. Following the work of previous studies (Andresen & Malleson, 2011; Andresen & Linning, 2012), 0.80 is used as the cut-off value indicating two spatial point patterns are similar. Second, the test generates mappable output to show where statistically significant change occurs (i.e., which dissemination areas within a given area boundary have undergone a statistically significant change). The spatial point pattern test is freely available in a graphical user interface: <http://code.google.com/p/spatialtest/>.

**Kernel density estimate**

Focusing specifically on the EDP calls-for-service, the second aim of this study is to determine whether or not these police contacts cluster in space. Kernel density estimates are used to provide a visual interpretation of the variation in the density of EDP events across a geographic area. The intensity in which these events occur is measured at every
point, and it creates a smooth surface of risk (Chainey & Ratcliffe, 2005). This method requires that two parameters be specified prior to its execution: the grid cell size and bandwidth (sometimes known as search radius). It has been argued that the most important criterion for determining an appropriate density surface is the bandwidth. The size of the bandwidth determines the size of the hotspots (Bailey & Gatrell, 1995; Fotheringham, Brunsdon, & Charlton, 2000). In the current study, the grid cell size is set to 70 meters, and the bandwidth is set to 750 meters. However, it is important to note that a sensitivity analysis varying these parameters did not change the qualitative nature of the results.

Environmental place attractors for EDP

To better understand why there may be patterning, or clustering, of EDP calls-for-service in particular areas, the addresses of place attractors specific to EDP (health care services, criminal justice services, and alcohol outlets) that were present during 2006 were collected and geocoded: pharmacies, treatment and/or addictions centers, mental healthcare providers, hospitals, liquor stores, and so on. These place attractors were geocoded onto a 2006 road network with a success rate of 97% that is well above the commonly accepted threshold of 85 percent (Ratcliffe, 2004). Once geocoded, these place attractors were overlaid the kernel density output to count the number of factors contained within the hotspots. Higher counts may indicate why these individuals were present in these areas in the first place, and as such, may explain some of the variation in the patterning of these types of police contacts.

Results

Street segments

Following the work of previous scholars in the crime and place literature (Andresen & Linning, 2012; Sherman, Gartin, & Buerger, 1989; Weisburd, Bushway, Lum, & Yang, 2004), a series of calculations are first performed that measure the spatial concentration of both EDP and non-EDP calls-for-service using the street segment as the unit of analysis. Three measures of spatial clustering are examined, with each one measuring a finer degree of concentration: (a) the percentage of street segments that account for 50 percent of calls-for-service; (b) the percentage of street segments that have any calls-for-service; and, (c) the percentage of street segments with any calls that account for 50 percent of total calls-for-service. In reference to the first measure, Table 1.2, column a, suggests that a small percentage of street segments account for 50 percent of both EDP police contacts (1.17 percent) and non-EDP contacts (3.40 percent), indicating a high degree of spatial concentration within this city for both classifications within this one-year period that is consistent with the crime and place literature, cited above. As shown in column b, the second measure demonstrates an even higher degree of spatial clustering for EDP contacts, as only 7.40 percent of the street segments that have had any calls-for-service have had police contact with EDP. In other words, almost 92% of the total street segments within
this city are free of police contacts with EDP. A higher percentage of street segments (7.75) experience non-EDP calls-for-service, indicating that these calls are similarly spread out across the city in comparison to their EDP counterparts. Still, approximately 92 percent of the city for this one-year period was free from any type of reported crime. Lastly, column c displays the percentage of street segments with any call that accounts for 50 percent of calls. Findings indicate that of street segments that experience any EDP calls, 15.69 percent of them account for 50 percent of all EDP calls. In terms of non-EDP police contacts, within street segments that experience any non-EDP calls-for-service, 5.79 percent of them account for 50 percent of calls. Taken together, these three measures confirm that both EDP and non-EDP calls-for-service cluster in space, and even within these concentrated areas there is a high degree of spatial clustering (i.e., a hotspot within a hotspot). Specifically, EDP calls-for-service are more spatially concentrated, but more dispersed within that concentration than non-EDP calls-for-service. This is already an indication that EDP and non-EDP calls-for-service are spatially distinct.

Table 1. Percent of spatial units accounting for 50 percent of calls.

<table>
<thead>
<tr>
<th></th>
<th>(a) Percent of Street Segments that Account for 50 Percent of Calls</th>
<th>(b) Percent of Street Segments that Have Any Calls</th>
<th>(c) Percent of Street Segments with Calls that Account for 50 Percent of Calls</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDP contacts</td>
<td>1.17</td>
<td>7.40</td>
<td>15.69</td>
</tr>
<tr>
<td>Non-EDP contacts</td>
<td>3.40</td>
<td>7.75</td>
<td>5.79</td>
</tr>
</tbody>
</table>

Spatial point pattern results

Although the findings from the street segment analysis indicate a high degree of spatial clustering for the two types of calls analyzed in this study, the question then becomes: is the spatial patterning of these two types of calls-for-service similar? In other words, are the chronic EDP contact locations the same as those for non-EDP contacts? To address this question, we use the spatial point pattern test described above. Referring to Figure 1.1, the S-Index of 0.295 suggests that the dispatch locations occur in very different areas. This means that just under 30 percent of the dissemination areas have similar percentages of calls. Previous research has considered 0.80 to be a threshold of similarity (Andresen & Linning, 2012), but our result is quite clearly well below that threshold.
Figure 1. Comparison of the spatial point patterns between EDP and non-EDP calls-for-service, 2006 (SIndex = 0.295).
Kernel density estimate and place attractors

The kernel density estimate is used to qualitatively identify the most concentrated areas within the city for EDP police contacts. Referring to the kernel density surface (Figure 1.2), there are several hotspots where EDP calls-for-service cluster in space. More specifically, findings indicate that the most chronic areas for this type of police contact are located in the northwest part of the city. An area-based calculation indicates that all of the EDP police contacts during this one-year period take place in a vicinity of only 24.5 square kilometers, approximately 7.5 percent of the city’s total area.

To determine why these EDP hotspots might exist, a series of place attractors specific to EDP are mapped. Findings indicate that many of them are contained within the identified hotspot areas (see Table 1.3). In total, 65 percent (i.e., 89 of 136) of these place attractors are contained within 7.5 percent of the city’s total area (i.e., 26 percent of the dissemination areas within this city). The sole hospital within this city (100 percent) is contained within the identified hotspot areas. It is also seen that a large proportion of public health units (80 percent), private and public substance use and/or addiction services (73 percent), pharmacies (69 percent), and walk-in clinics (67 percent) are found within these concentrated areas. Similarly, more than half of the alcohol points-of-sale (56 percent) and criminal justice services (55 percent) are located in the identified areas. Findings also indicate that city hall (0 percent) is not located within these high-density locations.

Table 1.3. Proportion of environmental place attractors found within the hotspot areas.

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Number within hotspot</th>
<th>Total</th>
<th>Proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol-Points-of-Sale</td>
<td>14</td>
<td>25</td>
<td>56</td>
</tr>
<tr>
<td>City Hall</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Criminal Justice Services</td>
<td>6</td>
<td>11</td>
<td>55</td>
</tr>
<tr>
<td>Hospital</td>
<td>1</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Pharmacies</td>
<td>37</td>
<td>54</td>
<td>69</td>
</tr>
<tr>
<td>Public Health Offices</td>
<td>4</td>
<td>5</td>
<td>80</td>
</tr>
<tr>
<td>Mental Health, Substance Use, and/or Addiction</td>
<td>11</td>
<td>15</td>
<td>73</td>
</tr>
<tr>
<td>Services (Private &amp; Public)</td>
<td>16</td>
<td>24</td>
<td>67</td>
</tr>
<tr>
<td>Total</td>
<td>89</td>
<td>136</td>
<td>65</td>
</tr>
</tbody>
</table>
Figure 1.2. Kernel density surface of EDP calls-for-service, 2006.
Discussion

Overall, a high degree of spatial concentration was found for both EDP and non-EDP calls-for-service. Using three different measures of spatial concentration, a relatively small number of street segments account for the majority of the police contacts with both EDP and non-EDP. In terms of police contacts regarding criminal matters, this is something that has been found in previous studies as well (Weisburd & Amram, 2014). Perhaps, not surprisingly, the same phenomenon was found for non-criminal police contacts that highlights the importance of place rather than the identity of the person involved in the event.

We found the spatial patterning of EDP calls substantially differs from all other types of police contacts that did not involve an EDP subject. This finding was interesting in and of itself because despite the versatility in the types of police contacts that characterized both EDP and non-EDP, they were still happening in very different locations throughout the city. Although there were several types of event classifications associated with EDP calls, such as disturbing the peace, threats, harassment, breach of conditions, violent acts, and property crime, it was found that the majority of EDP calls-for-service were classified under the Mental Health Act (British Columbia Mental Health Act, 1996). This may explain why different patterns were found across the two groups, as perhaps Mental Health Act calls-for-service take place in different areas than criminal calls for the EDP population.

Because of the observed difference between the locations of where EDP and non-EDP calls-for-service take place, the next logical step was to explore where EDP police contacts occur specifically, and why they might be occurring in these areas. The kernel density surface pinpointed chronic areas throughout the city that experienced a high volume of EDP calls-for-service during this one-year period. A rational choice perspective (Clarke & Cornish, 1985) posits that certain situations have different choice-structuring properties. Because of this, certain places, in theory, should experience particular types of events simply because the features of those places enhance individuals’ abilities to engage in specific criminal or non-criminal behaviours (Sherman, 1995).

To the authors’ knowledge, this is the first study to apply the theoretical frameworks of rational choice, routine activities, and the geometry of crime to explain the spatial distribution of both criminal and non-criminal police contacts with a subset of PMI. A series of place attractors were operationalized as the activity nodes that EDP would theoretically frequent throughout the course of their routine activities. In doing so, it was found that a large proportion of healthcare facilities were contained within the hotspots as well as the dissemination areas characterized by greater EDP than non-EDP calls-for-service. The centrally-located hospital is worthy of further discussion as there are pertinent implications for both criminal justice and healthcare practitioners. With the event location alone, making inferences to the causal nature of this phenomenon is difficult. However, one possibility is that the calls themselves originated in the hospital to assist with the security and safety of a mentally ill patient, or an event that was associated with the BC Mental Health Act. Among other things, the hospital in this study is flanked by medical offices in all
directions. It is not unreasonable to assume that some of the police interactions were related to an EDP visiting one of these facilities for outpatient evaluation or treatment. Lastly, the hospital’s location within the city’s road network is worthy of discussion. Centrally positioned at an intersection of two major highways, and serviced by numerous lines of public transportation and pedestrian traffic, it is plausible that these transportation routes are the pathways that some EDP use to travel to and from this densely populated healthcare area. As such, these place attractors may manifest into the probable locations where police services intersect with EDP.

Outpatient treatment services free up costly hospital resources and, at times, provide a more appropriate level of care to patients. Approximately 73% of treatment centers for mental health, substance use, and addictions were contained within the hotspots. Though these facilities were not densely contained around the hospital, it is reasonable to suggest that outpatient facilities are likely to draw in EDP for treatment, counseling, and other services. Outpatient referrals are likely to emerge from the healthcare system but they can also come from the CJS. For example, courts may order offenders to adhere to a drug treatment program as a component to their sentence. If an offender breaches his/her conditions by failing to attend treatment, the police may be asked to apprehend the offender to return him/her to court for processing. Along with disturbing the peace, threats, and harassment, this study indicates that breaching conditions of a sentence occurs 13.7% of the time.

For some PMI, the combination of drugs and/or alcohol exacerbates underlying mental and physiological illness(es) (Gomez et al., 2000). This mixture of symptoms has the potential to bring some PMI to the attention of local police authorities. In extreme cases, it has been noted that interactions involving the use of lethal force by the police were likely to involve “a combination of alcohol, substance abuse, mental disorder, and suicidal tendencies [that add] to the complex picture of irrational behaviour” (Parent & Verdun-Jones, 1998, p.439). Although rare in Canada, the use of lethal force by police demonstrates how situations involving intoxicated PMI may escalate to a point where police intervention is necessary. In this study, 69% of pharmacies and 56% of alcohol point-of-sale businesses were captured within the identified EDP hotspots, with a large proportion of these facilities being concentrated in the northwest portion of the city. With approximately 50 percent of individuals with severe mental illnesses either developing a substance use disorder or exhibiting substance use or dependence (Regier et al., 1990; Kessler et al., 1996), a dense area of pharmacies, pubs and liquor stores appears to be related to the most prone hotspot for EDP-police interaction; however, because of the known relationship between clusters of alcohol outlets and clusters of violence in the general population (Grubesic & Pridemore, 2011), we must be cautious with any inferences for causation specific to EDP-police interactions at this point.

Conclusions

These findings have implications for law enforcement officials and those involved in mental healthcare not only in Canada, but also in other urban settings around the world.
Notwithstanding the differences in urban layouts between medium-sized cities, it is reasonable to hypothesize that there will be similar patterning in other urban settings where similar distributions of place attractors exist. These findings may help to direct police resources to the identified hotspot areas to help with EDP calls-for-service not only as a preventative measure, but to also help with the volume effect. Coupled with the finding that the majority of events involving EDP tend not to require law enforcement or involves the *Mental Health Act*, it is argued that police administrators would benefit from knowing some of the social determinants of mental health, their relationship to place attractors, and the potential for a clustering of calls associated with EDP within their city. It is possible, though not certain, that some of these calls-for-service were associated with the same client or groups of clients who were coming into contact with the police on multiple occasions in the same areas of the city. Identifying these persons with a high frequency of EDP calls-for-service through police records and collaborating with local health authorities to provide proactive mental health and/or substance use services may decrease the need for some police interventions.

The finding that many healthcare establishments meant to serve as protective factors for those with mental health and substance abuse issues (e.g., treatment centers) are located in the identified EDP hotspot areas highlights the potential risk for police involvement at these facilities. We found that the locations of certain facilities, such as pharmacies and walk-in clinics, tended to cluster together within the city, effectively acting as place attractors for EDP calls. In some instances, these “medical” place attractors could be found within the same building, further adding to the complexity of the phenomenon of spatial clustering. As such, it becomes necessary to better understand how the space is being used by EDP both within, and in the area around, these place attractors to determine if current deployment patterns and staff training is sufficient to meet the needs of this population from a non-law enforcement perspective, as well as to adequately service this population in the event that a crime has been committed.

Of course, our study is not without its limitations. First, while the use of the EDP subject identifier is the best proxy measure of mental illness that is available to police officers given that the ability to formally diagnose individuals lies outside the skillset of frontline constables, it is possible that some events were recorded as involving PMI when in fact the cause of the behaviour was something else entirely (e.g., the result of substance use). Even for those events that were correctly recorded as involving PMI, it is important to note that the nature of EDP is very complex as each condition is unique and multifaceted. Afflictions can range from depression, to schizophrenia, to dementia, and everywhere in between. As such, it is important to be mindful of the challenges in trying to understand the behaviour of EDP generally, let alone trying to explain it. Second, each EDP call-for-service is considered independent, but it could be that one individual may be involved in multiple EDP-related events. However, the same is true for the criminal event data. Lastly, although every effort was made to include all of the theoretically relevant place attractors for this group of individuals, there may be others that are equally as relevant that have not been considered. For instance, data were not available for residential place attractors such as recovery houses, halfway houses for recently released offenders from the correctional
system, and facilities that house discharged offenders from a forensic psychiatric hospital. As a result, these place attractors are not included in the present study.

Our results also provide guidance for future research in this area. First, because of the spatial differences found between non-EDP and EDP calls-for-service, the next logical step would be to compare different EDP event types (e.g., criminal violations versus health-related contacts), or event classifications (e.g., property crime, theft, or violent acts), to see if they are taking place in similar places. Second, similar to the “journey to crime” literature that examines the distance between the offender’s home base and his/her choice of crime site location, it would also be of interest to examine EDP “journey to police interactions” to see how it compares to other types of calls or police interactions. And third, (count-based) regression analyses could be undertaken to predict the number of EDP contacts by the police considering factors such as socioeconomic status, healthcare establishments, and the number of EDP living in the area. Such information would allow for a better understanding of the types of activities that EDP are involved in, and where they are taking place, prior to coming into contact with the police.
Report 2: The importance of gender in the spatial distribution of police interactions involving emotionally disturbed persons: An examination of call types

Introduction
Prior research has indicated that a subset of persons with mental illness (PMI) is at risk of coming into contact with the criminal justice system (CJS) (Becker, Andel, Boaz, & Constantine, 2011; Fisher et al., 2011). An even smaller subset is at risk of having multiple and/or habitual contacts over their life course, leading to their entrenchment within the CJS, particularly with police services (Akins, Burkhardt, & Lanfear, 2014; Reuland, Schwarzefeld, & Draper, 2009). Much like criminal events in general, there are a variety of contextual factors that add to the complexity of PMI-police interactions when criminal laws are to be enforced. However, PMI are also frequently involved with police services in other roles, such as in the case of requiring general police assistance or when they require specific assistance for a mental-health-related crisis (Brink et al., 2011; Vaughan, Hewitt, Andresen, & Brantingham, 2016). In some of these non-criminal interactions, the police may take PMI into custody for the provision of social services; these may include temporary shelter within police facilities as well as the opportunity to receive some form of medical treatment and/or court-ordered mental-health assessment when local health agencies are unable, unwilling, or unlikely to provide appropriate services on an immediate basis (Adelman, 2003).

The current study extends the knowledge-base by considering all types of contact with PMI (i.e., criminal, noncriminal, and the application of the British Columbia Mental Health Act). Because PMI are suspected to be a mobile and heterogeneous population, we consider additional contextual considerations such as place, and how the types of locations that police officers come into contact with PMI may differ by gender. These considerations add an additional layer of understanding regarding the nature of police contacts with PMI that may be inferred anecdotally by front-line police officers, but has yet to be tested empirically.

Related research
Some scholars have suggested that rates of police interactions with PMI can vary from less than 1% (Charette, Crocker, & Billette, 2014) to 1 to 2% (Hartford, Heslop, Stitt, & Hoch, 2005). Others have suggested significantly higher rates of police contacts, with figures reaching as high as 25 to 31% (Szkopek-Szkopowski et al., 2013; Wilson-Bates, 2008). Moreover, results from a recent study suggest that approximately 57% of police contacts with PMI are to enforce state/provincial mental health law followed by minor offences (approximately 14%), and general police assistance (9%) (Vaughan et al., 2016). Violent crime, theft, and drug offences composed approximately 20% of the total volume of calls. If one considers the wide range of rates and types of police contact with PMI within a given setting, policies and programs that are designed to reduce calls for service/improve the
well-being of patients in the community more generally, may not be effective. Two understudied factors that may be relevant to better understanding the diverse size and nature of PMI-police interactions are gender and environmental factors.

**Gender**

Policing contacts with PMI highlight important differences between the genders. According to Crocker et al. (2009), women and men living with mental illness are 18.3 and 12.6 times more likely, respectively, to be involved in a violent offence compared to their counterparts without mental illness. Additionally, recidivism rates were 35% and 45%, respectively, for women and for men compared to individuals without mental illness. Becker et al. (2011) continued this line of comparative research to examine the longitudinal odds of recidivism and the predictive risk factors that increased the rate of re-arrest for women and men with mental illness. Findings from this study highlight that housing, age, underlying mental illness and mental health treatment usage may explain lower arrest rates in women, though many of these risk factors were also applicable to men as well. Overall, men had higher re-arrest rates compared to women, but involuntary psychiatric examination and homelessness increased these odds even further.

Other research has highlighted that males are slightly more likely than females to be brought to an Emergency Department (ED) under a state-sanctioned mental health legislation that allows police to apprehend and transport a patient (Al-Khafaj, Loy, & Kelly, 2014). Victimization is often cited as being substantially high in populations living with mental illness (Silver, Arseneault, Langley, Caspi, & Moffitt, 2005), with rates of violent victimization approximately 11 times higher than that in the general population (Teplin, McClelland, Abram, & Weiner, 2005). Comparative studies on the victimization of PMI also highlights that women living with mental illness are more likely to be sexually victimized whereas men are more likely to be physically victimized (Goodman et al., 2001). These studies clearly highlight that the quality and quantity of contacts that PMI have with the CJS is different for men and women.

Recognizing that not all PMI will interact with the police, there are important gender correlates to both physical health and mental illness. First, causes/correlates to mental illness are different between the genders (Emslie et al., 2002; Kidd et al., 2013). The responsibilities of raising a family can lead to women experiencing more stress and, for some, they turn to substance use to cope with family pressures and the demand for providing basic necessities to their family (e.g., housing) (Whitzman, 2006). Second, the diagnoses themselves may also be gender-specific. Women are more likely than men to be diagnosed with anxiety and insomnia (Freeman & Freeman, 2013), and for those who have been institutionalized, women have been found to have much higher rates of depression, along with higher rates of bipolar disorder and rates of drug abuse (Alleyne, 2006). Men, on the other hand, are more likely to display higher rates of schizophrenia and other psychotic disorders. Such findings lead to the argument for gender-specific programs that recognize that gender may play a significant role in how well a patient will respond to a care plan and/or prevention programs (Kulkarni, 2008). Lastly, women are consistently more likely
to seek out treatment services in the community (Addis & Mahalik, 2003; Kessler, Brown, & Broman, 1981). Reasons for this are likely associated with the general propensity for women to seek healthcare, and that their attitudes towards psychiatric services are more positive (Leaf & Bruce, 1987).

The environment

The environment is another important determinant for levels of mental health (Faris & Dunham, 1960; Silver, Mulvey, & Swanson, 2002). The social quality of the neighbourhood environment is more important for both mental and physical self-reported health in women, while the physical environment is more important for men (Molinari, Ahern, & Hendryx, 1998). For example, Cummins et al. (2005) found that neighbourhoods with poor social integration and social cohesion, but not within the family, negatively affected the mental and physical health of women, as did a poor physical environment (e.g., waste, fumes). They also found that between-neighbourhood differences significantly affected women but not men (Molinari et al., 1998).

Along with the general socioeconomic characteristics of neighbourhoods being crucial for mental wellness, a lack of stable housing often amplifies the likelihood for police contacts with PMI (Roy, Crocker, Nicholls, Latimer, & Ayllon, 2014). At the neighbourhood level, Krishan et al. (2014) found that neighbourhood characteristics (income, stability, and proportion of immigrants) did not influence the likelihood for referral to services/transportation to a designated treatment facility, arrest, and use of force; however, neighbourhood factors did matter when it came to who initiated the call and the suspected cause to the call (substance use versus mental illness)—police also may make more referrals or transportation to mental health services in neighbourhoods that were impoverished or lacking available services. Vaughan and colleagues (2016) found that not only is there a higher degree of spatial clustering for EDP (Emotionally Disturbed Persons) calls-for-service in comparison to non-EDP calls, but that EDP calls take place in substantively different locations in comparison to all other police contacts. In order to understand why calls involving PMI differ, at least spatially, from non-PMI police contacts, these researchers mapped a series of place attractors, or service-locations, that are likely to be frequented by EDP throughout the course of their everyday, routine activities (e.g., pharmacies, hospitals, walk-in clinics, substance use and/or addiction services). Vaughan et al. (2016) concluded from their exploratory study that the environment may play a role in determining where EDP come into contact with police services, emphasizing that this is something that needs to be taken into account in future studies with this population; however, these authors did not consider the role of gender in their analyses.

Aim of the study

The aim of the current study is to explore the intricate and highly complex relationship between gender, the environment, and incidents where PMI are in crises. Our study

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2 Given the nature of the data, EDP is used as a proxy for PMI
differentiates between police contacts with PMI that are classified as criminal, non-criminal, and health-related, and how these classifications may or may not be associated with gender and place. In line with recent developments in the crime at places literature that has emphasized the need to analyze phenomena at disaggregate spatial scales of analysis (Andresen & Linning, 2012), this study seeks to address three research questions:

1. When PMI do interact with police, do the types of calls-for-service—criminal, noncriminal, and Mental Health Act (MHA) calls-for-service—occur in spatially distinct areas?
2. Do the macro locations of criminal events, noncriminal events, and MHA apprehensions differ between men and women?
3. Do the micro locations of criminal events, noncriminal events, and MHA apprehensions differ between men and women?

**Methods**

**Data**

The police incident data in the current analysis were obtained from a medium-sized city in British Columbia. The event data used in the analyses below are the police incidents that occurred over a three-year period, 2010 – 2012. We chose to proceed with a three-year period to avoid analyzing any particular year of data that might contain an aberrant spatial pattern. From these police incident data, we identified all individuals who had come into contact with the police during the three-year period in the context of the MHA. We then obtained all incidents that involved these individuals: MHA, criminal incidents, and noncriminal incidents. This data set consists of 2807 subjects (1538 males and 1269 females) and a total of 4341 police incidents, of which 3436 were related to the MHA. Descriptive statistics of the number of events within each call type, differentiated by gender, are presented in Table 2.1.

**Table 2.1. Descriptive statistics of the number of calls-for-service classified as MHA, criminal, or non-criminal involving an EDP (2010-2012).**

<table>
<thead>
<tr>
<th>Call Type</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>MHA</td>
<td>1696</td>
<td>1740</td>
<td>3436</td>
</tr>
<tr>
<td>Criminal</td>
<td>323</td>
<td>225</td>
<td>548</td>
</tr>
<tr>
<td>Non-Criminal</td>
<td>184</td>
<td>173</td>
<td>357</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>2203</td>
<td>2138</td>
<td>4341</td>
</tr>
</tbody>
</table>

*Note: $X^2(2) = 17.46, p < .001.*

Although point-event data are analyzed below, we report results aggregated to the dissemination areas defined in Statistics Canada’s 2011 census of population, $n = 592$. As defined by Statistics Canada, dissemination areas are smaller than census tracts, containing a residential population between 400 and 700 persons, comprised of one or more blocks—this census unit is similar in size to the census block group in the United States Census.
Testing methodology

Macro spatial units

In addition to discussing some descriptive statistics of the data, we tested for the similarity of spatial point patterns using Andresen’s (2009) spatial point pattern test. This spatial point pattern test was developed to identify the degree of spatial similarity between two or more sets of spatial point patterns. The spatial point pattern test may be described as follows: first, identify one point-based data set as the base (MHA incidents, for example), then calculate the percentage of points within each dissemination area; second, the other point-based data set is deemed the test data (criminal incidents, for example), and randomly sampled (with replacement) for 85 percent of the test data in order to calculate the percentage of points within each dissemination area; third, repeat this sampling process 200 times in order to generate a nonparametric confidence interval; fourth, generate a 95 percent nonparametric confidence interval by calculating 200 percentages of points within each dissemination area, ranking them, and removing the top and bottom 2.5 percent; fifth, if the value within a dissemination area for the base data set (MHA incidents) falls within the confidence interval, that dissemination area is deemed similar; and sixth, repeat step five for all dissemination areas.

The output of the spatial point pattern test has two parts. The first part is a global index, \( S \), that ranges from 0 (no similarity) to 1 (perfect similarity). This \( S \)-Index represents the proportion of dissemination areas (in the current context) that have a similar spatial pattern within both datasets. Similar to previous work that has used this test (Andresen, 2009; Andresen, 2016), we use .80 as a cut-off value to indicate similarity between two spatial point patterns. The \( S \)-Index is calculated as follows:

\[
S = \frac{\sum_{i=1}^{n} s_i}{n}
\]

where \( s_i \) is equal to 1 if the pattern of two datasets are similar (0, otherwise) and \( n \) is the number of areas. The \( S \)-Index, therefore, represents the percentage of areas that have a similar pattern. The second part of the output may be mapped to show where statistically significant differences in the spatial patterns occur. A graphical user interface (GUI) was developed for the application of the spatial point pattern test that is freely available at the following web site: https://github.com/nickmalleson/spatialtest. We used this GUI for performing all of these tests. We use the spatial point pattern test across four dimensions: MHA events, criminal events, noncriminal events, and gender. This results in a total of 13 pairwise tests of similarity.

Micro spatial units

Following the spatial point pattern analyses, we use the street segment, or the portion of each street that falls between two intersections, to identify the spatial concentration of the micro level patterning of EDP calls-for-service. This unit of analysis has become a common choice for identifying spatial concentrations of EDP and it shows how concentrated (or not) they are with a high degree of precision. To perform such calculations, each call-for-service
was geo-referenced to the street segment it was geocoded to. Using this information, the number of EDP events were counted for each call type, and then further differentiated by gender, to make a number of calculations regarding spatial concentrations, described below. Micro units of space were also tested at the dwelling level for both genders using a difference in proportions z-test. For this study, locations were aggregated to four location types: private and commercial residences (e.g., apartments, hotels), business and public buildings (e.g., gas stations, hospitals), public spaces and transit lines (e.g., park spaces, subway lines), and unknown.

Results
Counts and percentages of events
There was a total of 1538 male and 1269 female subjects in the study. For males, the count total for each subject ranged between 1 and 23 events over the time period of the study. In contrast, the counts for females ranged between 1 and 46 events. Research has suggested that a small proportion of EDP in British Columbia have a high number of contacts with the CJS (Somers, Rezansoff, Moniruzzaman, & Zabarauckas, 2015). The results from the current study support and extend this conclusion. For example, the top 5% of the most active male EDP were involved in 18% (n = 402) of the 2203 events. On the other hand, the top 5% of the most active female EDP were involved in 29% (n = 621) of the 2138 events. These results confirm that a large number of calls-for-service with EDP are concentrated in a small proportion of the population; however, there are important gender differences within these figures. The data suggest that subgroups of females are more likely to have habitual or repeated contacts with the police in comparison to males.

Table 2.2 provides descriptive statistics of the counts of events disaggregated by call type and gender, as well as the percentage of dissemination areas within the city that have any event, the percentage of dissemination areas that account for 50 percent of the events. The percentage of dissemination areas with events is used as a measure of the prevalence of these various police incidents, and the percentage of dissemination areas that are necessary to account for 50 percent of the events is used as a measure of concentration—if any set of events is uniformly distributed across the municipality, it would take 50 percent of dissemination areas to account for 50 percent of the events.

It is clear from Table 2.2 that the majority of events – almost 80 percent – are related to the MHA. This is not surprising given the nature of the sampling, but it shows that as a group these individuals are not a predominantly criminal population that occasionally has mental health issues; rather, it is a population that has mental health issues and occasionally commits crimes. With regard to the gender distribution, a little more than 50 percent of the events are associated with males. Females, on the other hand, account for more than 50 percent of the MHA events, a little less than 50 percent of the noncriminal events, but less than one-third of the criminal events. As such, any analysis that does not consider women as a distinct population will miss a substantial amount of information regarding EDP.
Table 2.2. Counts and concentrations of events, 2010 – 2012.

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Count</th>
<th>% DAs with events</th>
<th>% DAs that account for 50% of events</th>
</tr>
</thead>
<tbody>
<tr>
<td>All events</td>
<td>4341</td>
<td>91.5</td>
<td>13.70</td>
</tr>
<tr>
<td>All MHA events</td>
<td>3436</td>
<td>88.5</td>
<td>11.10</td>
</tr>
<tr>
<td>All criminal events</td>
<td>548</td>
<td>37.3</td>
<td>4.22</td>
</tr>
<tr>
<td>All noncriminal events</td>
<td>357</td>
<td>35.3</td>
<td>8.45</td>
</tr>
<tr>
<td>Female events</td>
<td>2138</td>
<td>74.8</td>
<td>10.90</td>
</tr>
<tr>
<td>Male events</td>
<td>2203</td>
<td>79.6</td>
<td>11.82</td>
</tr>
<tr>
<td>Female MHA events</td>
<td>1740</td>
<td>71.8</td>
<td>11.66</td>
</tr>
<tr>
<td>Male MHA events</td>
<td>1696</td>
<td>72.8</td>
<td>12.33</td>
</tr>
<tr>
<td>Female criminal events</td>
<td>173</td>
<td>18.9</td>
<td>5.24</td>
</tr>
<tr>
<td>Male criminal events</td>
<td>323</td>
<td>26.3</td>
<td>3.89</td>
</tr>
<tr>
<td>Female noncriminal events</td>
<td>173</td>
<td>8.9</td>
<td>5.24</td>
</tr>
<tr>
<td>Male noncriminal events</td>
<td>184</td>
<td>22.1</td>
<td>6.59</td>
</tr>
</tbody>
</table>

Insofar as prevalence is concerned, MHA events are present in almost all dissemination areas across the city. In contrast, criminal and noncriminal events (reported to the police) are only present in just over one-third of the municipality. Although the prevalence of MHA related events is similar for both males and females, this is not the case for criminal events and noncriminal events. In both cases, females are involved in these events in far fewer areas. Turning to the last column of Table 2.2, there is strong evidence for concentrations of all types of events. For all events, only 13.7 percent of dissemination areas account for 50 percent of the events. MHA related events are similar at 11.1 percent, but criminal and noncriminal events are more concentrated at 4.22 and 8.45 percent, respectively. When differentiating between males and females, there are only minor differences with regard to concentrations; females are slightly more concentrated than males for all events, MHA events, and noncriminal events, whereas males are more concentrated for their criminal events.

To address the second research question of whether or not these concentrations occur in similar locations, a series of spatial point pattern tests are conducted. Table 2.3 displays the results at the most aggregate level from the first three comparisons that refer to whether or not the spatial point patterns are similar between MHA, criminal, and non-criminal calls-for-service involving both males and females. Because none of the S-Indices approach the threshold of .80, which would indicate similarity (Andresen & Linning, 2012), this suggests that the spatial point patterns of these three comparisons are actually quite different, with the locations of MHA and non-criminal calls showing the highest degree of dissimilarity (S-Index = .267). In other words, the locations in which MHA apprehensions take place by the police appear to be quite different from the locations in which the police are called for non-criminal contacts. Of these three comparisons, the locations of criminal and non-criminal calls-for-service appear to be the most similar (S-Index = .706), followed by MHA versus criminal calls (S-Index = .291), although these values still do not approach the threshold of
similarity of .80. From these findings, it appears that when police contacts are not
discriminated according to gender, the spatial distribution of MHA apprehensions is very
different to those of all other calls-for-service.

Table 2.3. Indices of similarity, dissemination areas, population – MHA, criminal, and non-
criminal calls-for-service, 2010-2012.

<table>
<thead>
<tr>
<th></th>
<th>X1</th>
<th>X2</th>
<th>X3</th>
</tr>
</thead>
<tbody>
<tr>
<td>MHA, X1</td>
<td>.291</td>
<td>.267</td>
<td></td>
</tr>
<tr>
<td>Criminal, X2</td>
<td></td>
<td>.706</td>
<td></td>
</tr>
<tr>
<td>Non-Criminal, X3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To examine the spatial distribution of the different types of calls more specifically, a sample
of police contacts involving only males was chosen. Referring to Table 2.4, the results are
very similar to what is found above insofar as the spatial point patterns for MHA, criminal,
and non-criminal calls-for-service involving males take place in different locations.
However, it is clear from the S-Index values that the locations of criminal calls are more
similar to the locations of non-criminal calls (S-Index = .780) than they are to MHA calls-
for-service (S-Index = .472). Similar to the indices of similarity found when both males and
females are grouped together (see Table 2.3), non-criminal calls-for-service involving only
males are shown to be the most dissimilar to MHA police contacts as indicated by the S-
Index value of .465.

Table 2.4. Indices of similarity, dissemination areas, males only – MHA, criminal, and non-
criminal calls-for service, 2010-2012.

<table>
<thead>
<tr>
<th></th>
<th>X1</th>
<th>X2</th>
<th>X3</th>
</tr>
</thead>
<tbody>
<tr>
<td>MHA, X1</td>
<td>.472</td>
<td></td>
<td>.465</td>
</tr>
<tr>
<td>Criminal, X2</td>
<td></td>
<td></td>
<td>.780</td>
</tr>
<tr>
<td>Non-Criminal, X3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2.5 displays the spatial point pattern findings for MHA, criminal, and non-criminal
calls-for-service involving females only. Overall, a similar trend to that of the male sample
is found for the female sample. Specifically, the spatial point patterns of criminal and non-
criminal calls also display the highest degree of similarity among the three call types (S-
Index = .819). Although this overall trend is similar to what is found with the male only
sample, the spatial point patterns of female criminal versus non-criminal calls are
statistically more similar because the S-Index of .819 exceeds the cut-off value of .80 (in
comparison to what is found with the males – S-Index = .780). Findings also indicate that
the spatial point patterns of MHA and criminal calls and MHA and noncriminal calls are
equally dissimilar (S-Indices = .500 and .501, respectively).
Table 2.5. Indices of similarity, dissemination areas, females only – MHA, criminal, and non-criminal calls-for-service, 2010-2012.

<table>
<thead>
<tr>
<th></th>
<th>X1</th>
<th>X2</th>
<th>X3</th>
</tr>
</thead>
<tbody>
<tr>
<td>MHA, X1</td>
<td></td>
<td>.500</td>
<td>.501</td>
</tr>
<tr>
<td>Criminal, X2</td>
<td></td>
<td></td>
<td>.819</td>
</tr>
<tr>
<td>Non-Criminal, X3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Finally, Table 2.6 displays the findings from the spatial point pattern tests that compare whether or not the locations in which males and females come into contact with the police differ when all of their contacts are considered together, and then specifically for each of the three types of calls-for-service. It is noteworthy that when the focus is placed solely on the gender component, notwithstanding the type of call, it is clear that males and females come into contact with police services in very different locations (S-Index = .336). This finding is also true when the spatial point patterns of male MHA and female MHA apprehensions are tested, as they too take place in different locations throughout the city (S-Index = .383). However, this finding is not evident when comparing the spatial point patterns of male versus female criminal calls (S-Index = .780) and male versus female noncriminal calls-for-service (S-Index = .775), where males and females come into contact with the police for both criminal and non-criminal reasons in relatively similar locations. To show these results visually, the mappable output from the spatial point pattern test for each of the comparisons between males and females for all events, MHA, criminal, and noncriminal calls using dissemination areas are shown in Figures 2.1-2.43.

Table 2.6. Indices of similarity, dissemination areas, males versus females – all events, MHA, criminal, and non-criminal calls-for-service, 2010-2012.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>All events</td>
<td>.336</td>
</tr>
<tr>
<td>MHA</td>
<td>.383</td>
</tr>
<tr>
<td>Criminal</td>
<td>.780</td>
</tr>
<tr>
<td>Non-Criminal</td>
<td>.775</td>
</tr>
</tbody>
</table>

3 These four comparisons are shown because they allow for visual interpretation of the findings for differences among genders for each of the call types examined in the current study. The dissemination area results are shown because they show the greatest visual variation that is easy to interpret. Output from any of the other spatial point pattern tests is available from the authors to the interested reader.
Figure 2.1. Mapped output, all calls-for-service – males versus females, dissemination areas, 2010-2012.
Figure 2.2. Mapped output, MHA calls-for-service – males versus females, dissemination areas, 2010-2012.
Figure 2.3. Mapped output, criminal calls-for-service – males versus females, dissemination areas, 2010-2012.
Figure 2.4. Mapped output, noncriminal calls-for-service – males versus females, dissemination areas, 2010-2012.
To address the third research question that asks whether there are differences in call-for-service locations between the genders for the three different call types at the micro level, two sets of calculations were completed. The first set of micro spatial calculations determined if the type of location (e.g., building/land use) of an EDP call-for-service was statistically different between males and females. Results indicate that females are more likely to have an EDP contact with the police in private and commercial residences ($p < 0.01$), whereas EDP men are more likely to come into contact with police in commercial business settings and public buildings ($p = 0.02$). Insignificant differences were found between the genders in terms of calls-for-service taking place in public spaces and transit lines ($p = 0.28$) and unknown locations ($p = 0.92$).

Given the above findings, the second set of calculations determined whether there are geographic differences and evidence of spatial clustering amongst the genders and call types at the street segment level. More specifically, three measures of spatial clustering were examined, with each one measuring a finer degree of concentration: (a) the percentage of street segments that account for 50% of calls-for-service; (b) the percentage of street segments that have any calls-for-service; and, (c) the percentage of street segments with any calls that account for 50% of total calls-for-service. Referring to the first measure, Table 2.7, column a, suggests that a small percentage of street segments account for 50% of all EDP contacts for both men and women (range = .14 – 1.21%). This indicates a high degree of spatial concentration within this city over the 3-years of data. As shown in column b, the second measure demonstrates an even higher degree of spatial clustering for EDP criminal and noncriminal contacts. For example, calls-for-service involving EDP males that were criminal in nature took place in only .93% of street segments. In other words, 99% of the total street segments within the city were free of police contact with EDP persons who were involved in criminal activity during this three-year period. Mental health calls for both genders were distributed more widely throughout the city, but still showed a high degree of spatial concentration. Specifically, male MHA calls occurred in 4.48% of street segments, and female MHA calls were slightly more concentrated, taking place in 4.31% of street segments. Lastly, column c displays the percentage of street segments with calls that account for 50% of calls. Findings indicate that of the street segments that experience any EDP calls, only 13.81% of them account for 50% of all EDP calls. In terms of all male calls-for-service, 17.98% of street segments account for 50% of calls, whereas for females, the locations of their calls are slightly more concentrated (15.74%). Given their call volume, EDP-MHA calls are of particular concern. Again, it is seen that these calls cluster in space, with a small percentage of street segments accounting for 50% of calls-for-service for males (20.24%) and females (18.71%). However, noncriminal calls were more widely distributed for both males (42.86%) and females (35.82%). Taken together, these three measures of spatial concentration confirm that in general, EDP calls-for-service cluster in space for both males and females, and for all call types, but that in comparison to males, calls involving female subjects tend to experience slightly more spatial clustering.
### Table 2. Percent of spatial units accounting for 50 percent of calls.

<table>
<thead>
<tr>
<th>Call type</th>
<th>(a) Percent of spatial units that account for 50% of calls</th>
<th>(b) Percent of spatial units that have any calls</th>
<th>(c) Percent of spatial units with calls that account for 50% of calls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both genders – All calls</td>
<td>1.21</td>
<td>8.75</td>
<td>13.81</td>
</tr>
<tr>
<td>Males – All calls</td>
<td>.96</td>
<td>5.33</td>
<td>17.98</td>
</tr>
<tr>
<td>Females – All calls</td>
<td>.77</td>
<td>4.90</td>
<td>15.74</td>
</tr>
<tr>
<td>Males – MHA</td>
<td>.91</td>
<td>4.48</td>
<td>20.24</td>
</tr>
<tr>
<td>Females – MHA</td>
<td>.81</td>
<td>4.31</td>
<td>18.71</td>
</tr>
<tr>
<td>Males – Crime</td>
<td>.19</td>
<td>.93</td>
<td>20.69</td>
</tr>
<tr>
<td>Females – Crime</td>
<td>.14</td>
<td>.65</td>
<td>21.68</td>
</tr>
<tr>
<td>Males – Non-crime</td>
<td>.31</td>
<td>.73</td>
<td>42.86</td>
</tr>
<tr>
<td>Females – Non-crime</td>
<td>.22</td>
<td>.61</td>
<td>35.82</td>
</tr>
</tbody>
</table>

### Discussion and conclusion

Building upon previous research that has used the spatial distribution of police calls-for-service as a measure by which differences between persons with and without mental illness can be identified (Vaughan et al., 2016), the current study used the same methodology to test for possible differences within a subset of EDP that focused on gender and types of calls-for-service. Overall, the findings of this study further emphasize that EDP are involved in many different types of contacts with the police, the majority of which are apprehensions under the British Columbia *MHA* followed by criminal and non-criminal interactions. From a spatial perspective, the findings also highlight the need to differentiate between genders as well as event types. For instance, the results of the z-score dwelling type test as well as the street segment concentrations indicate that females and males encounter police services on different street segments, for different types of events, and within these streets calls-for-service take place at different dwelling/land uses. These findings have implications not only for police services but also emergency medicine, mental health, and substance use practitioners.

The overall findings from this study highlight both within- and between-group similarities and differences when it comes to police interactions with EDP. First, considering the similarities, we found the raw counts of police interactions to be comparable between males (2203 contacts) and females (2138 contacts). Such a finding is unique to the literature as it shows that females are just as active as males in terms of coming into contact with police services, while also encompassing all of their police contacts. Previous studies often focused exclusively on criminal recidivism, victimization or other interaction types with the CJS, while also finding that males were likely to have higher rates of contact. Despite this, minor differences were found between the genders when it came to specific interaction types. For example, women had 44 (less than 1%) more *MHA* events as compared to males, and although the counts are relatively comparable, this presents a different finding from that of Al-Khafaji and colleagues (2014) who suggested that males...
are more likely to be apprehended and brought to an ED. We also found that male EDP were 15% more likely to be involved in criminal interactions, which supports the findings from previous research (Becker et al., 2011). Together, these results show the highly complex interaction between police and EDP over time. Based on descriptive results alone, this information may be beneficial for introductory or initial recruit training for police officers insofar as the educational material should mention that the odds an EDP contact with the police will be roughly the same for females as it is for males.

In terms of the within- and between-group differences, our latter analyses revealed that there are substantial differences of where males and females come into contact with police when we examine their spatial patterns. Looking first at the macrospatial level, the battery of spatial point pattern tests highlight that EDP contacts occur in different dissemination areas, with some of the greatest differences existing between males and females when calls involve the MHA. This finding was anticipated as previous research highlights that there are different rates of mental illness between the genders (Michalski, 2017), and that neighbourhoods are correlated with the degree of mental wellness and the likelihood for police contacts (Roy et al., 2014). It is perhaps neighbourhood differences, or environmental factors, that provide the greatest insight into what causes, or is correlated with, a police call-for-service in the first place. If police are the first responders to a mental health crisis that requires transportation to a designated facility, proactive policies should examine those social-environmental factors that may also be increasing the odds for the police to intervene.

Neighbourhood factors appear to vary for the genders, and thus policy changes, if any, should reflect this characteristic of the population. For example, providing additional mental health services in one neighbourhood where women are more likely to have a MHA contact should have some additional focus on services that benefit female patients in addition to more generic services for male patients. MHA calls from repeat patients as well as overall number of presentations are also of great concern. The EDP MHA calls in this study represent a proportion of the total number of mental health presentations to the ED that occur on a daily basis. An alternative and effective solution that can build on these policy changes lies outside of emergency mental healthcare and policing. Studies have shown that by providing supportive housing to EDP (i.e., the patient resides in a private rental, they are assigned to an Assertive Community Treatment (ACT) Team, receive weekly visits from healthcare and social services), their rates of contact with the ED can be significantly reduced (Russolillo, Patterson, McCandless, Moniruzzaman, & Somers, 2014).

Additional training and resources for communities in need of community mental health services will only go so far. In crisis situations, the availability of psychiatric staff and hospital beds will be crucial at preventing a feedback loop or bottlenecks in the system. Though more research is needed on the number of civil presentations to the ED, when it comes to EDP who arrive to the ED via police custody, the findings from this study would indicate that there should be the same number of psychiatric beds available for females as there would be for males.
Additional neighbourhood-level research is needed to ensure that policy changes are more appropriately aligned with the patients who require these services. The efficacy of any problem-solving initiative that uses police services should be measured, at a minimum, by the reduction of police contact and improvement in mental wellness of EDP. To do so, it is necessary to focus on micro spatial neighbourhood trends to identify problematic streets for MHA, criminal, and noncriminal contacts so that interventions can be appropriately implemented to not only reduce the volume of calls for police services but also improve mental well-being for persons in these areas. Targeting police resources to known crime locations or hotspots is known to be highly effective at reducing crime (Braga, Papachristos, & Hureau, 2014). With the ever evolving role of front-line police officers, this idea of geographically targeting police resources to the known street segments with the highest volume of MHA calls to reduce EDP contacts could be used proactively. For instance, targeting police resources to provide support and information for patients and others in the community and to liaise with local healthcare partners regarding problem areas within the city could be highly beneficial. Taken further, one could target gender-specific police resources for specific street segments. For male EDP, this could be as simple as visiting commercial businesses and public buildings and providing information to proprietors about the existing trends in their area. For female EDP, their calls-for-service are more likely to occur in residences. Police and outreach healthcare providers could enhance their visibility in known street segments with high volumes of private and commercial residences to increase their presence in the community and to provide basic information to community members. In addition to the ACT Team, mentioned above, other such programs that are operated by the RCMP include the Police Mental Health Intervention Unit, the Mental Health Care Team, and Car 67, a program that provides on-site emotional and mental health assessments, crisis intervention and referrals to appropriate services—see Diakiw (2013) for a discussion of such programs.

Of course this study is not without limitations. First, we did not have the home location of the EDP in our sample, making it difficult to appropriately implement interventions, especially for females, without knowing whether or not the majority of their police contacts were taking place in their own homes. Second, using EDP as a subject identifier does not differentiate the causality of the behaviour, but is based on the police officer’s assessment of the suspect at the time of the event (White & Ready, 2007). Consequently, some individuals may have been incorrectly placed into our sample based on the front-line officer’s subjective interpretation of their behaviour at the time of contact. And third, future research should attempt to replicate these findings in different cities and countries where the geographies may be different to see if these same trends remain. It might also be beneficial to drill down even further and differentiate subjects by age groups in order to have a more complete picture of the differences and similarities between gender, location, and call-type, and how this information can be used by police in reactive and proactive ways.
Introduction
Research considering the temporal dimension of crime dates back 175 years to the work of Adolphe Quetlet (1842), analyzing the seasonal patterns of property and violent crime in France. He found that violent crime peaked in the summer months, whereas property crime had the opposite pattern. This long history of temporal crime analysis continues today using police-recorded data, considering many crime types (Andresen & Malleson, 2013; Cohn & Rotton, 1997, 2000; Field, 1992; Uittenbogaard & Ceccato, 2012), different types of cities (Lewis & Alford, 1975; McDowall et al., 2012; Tompson & Bowers, 2013), and many countries around the world (Breetzke & Cohn, 2012; Field, 1992; Landau & Fridman, 1993; Uittenbogaard & Ceccato, 2012; van Koppen & Jansen, 1999; Yan, 2004). Despite this long history of studying temporal crime patterns, there is no research on the temporal patterns of mental health related calls for police service. As discussed further below, mental health related calls for police service have become an area of increased research in recent years (Brink et al., 2011; Fisher et al., 2011; Vaughan et al., 2016). As such, we investigate the temporal patterns of these calls for police service for days of the week and hours of the day using the temporal patterns of crime as a control group.

With regard to the criminological literature, there is little consistency in the research on temporal patterns aside from the crime type of assault (Breetzke & Cohn, 2012), there is a fair degree of consistency when it comes to explanations for the various temporal patterns of crime. The two common theories that are used to explain these temporal patterns are routine activity theory and temperature-aggression theory (Hipp et al. 2004). Temperature-aggression theory cites the impact of hot weather on the development of aggression in individuals leading to more (violent) crime during the summer months (Hipp et al. 2004). Routine activity theory (Cohen & Felson, 1979), on the other hand, posits that crime occurs when a suitable target and a motivated offender converge in time and space. Because routine activity theory is applicable to both property and violent crime, it is more commonly used in the temporal crime analysis literature. In short, routine activity theory is invoked to explain changes in the temporal patterns of criminal activity from changes in our routine activities: people are out more in the warmer spring and summer months, as well as weekends, leading to more available targets and, subsequently, more criminal victimization.

The empirical support for routine activity theory is present for violent- and property-related crime (Tompson & Bowers, 2015) as well as established seasonal patterns of crime in places with little temperature variation (Ceccato 2005; Pereira et al., 2016). Additionally, at finer scales of temporal resolution (day of the week and hours of the day), research has found that criminal events peak on the weekend and in the evening (Andresen & Malleson, 2015; Ceccato & Uittenbogaard, 2014; Uittenbogaard & Ceccato, 2012), lending support to
routine activity theory—criminal events vary by the days of the week within a season and are more common at night when it is cooler (Tompson & Bowers, 2015).

A gap in this literature relates to overall police activity. The research discussed above considers a variety of crime types, but recent research has established that directly dealing with criminal code violations is only a fraction (20-30 percent) of what the police actually do, based on both the count of police activities and their time spend on those activities (Her Majesty’s Inspectorate of Constabulary, 2012). One aspect of the academic policing literature that has received increased attention recently is how police deal with those deemed to have mentally health issues (see, for example, Akins et al., 2016; Becker et al., 2011; Brink et al., 2011; Fisher et al., 2011; Vaughan et al., 2016).

In this paper, we contribute to the literature on the temporal patterns of police activity more generally, with a temporal analysis (day of the week and time of day) of police calls for service relating to the Mental Health Act. This subset of police calls for service are important because the majority of calls related to those with mental illness are not criminal in nature (Brink et al., 2011; Vaughan et al., 2016): approximately 57% of police calls associated with these individuals involved apprehensions under the British Columbia Mental Health Act (MHA) or general assistance (8.9%). Given the various types of events in which these individuals are involved, paired with the amount of police resources required to respond to these calls-for-service more generally, we argue that it would be beneficial to police agencies to know the time of day and day of the week that these calls most often take place. At an aggregate level it would be of interest to know when individuals with serious mental illness are involuntarily transported to a designated medical facility by police services to, for example, identify when specialized policing resources, such as the availability of police mental health liaison officers and/or mobile outreach units, should be deployed. In addition, it would also be beneficial to determine the intra-week variation for MHA calls as they may have some similarities (or dissimilarities) to non-MHA calls for service such as criminal events. In this paper, we extend the previous crime-temporal knowledge-base to study one type of non-criminal call for service, namely MHA. Using the assertion that these calls should follow the same temporal patterning as criminal events (i.e., that they are not random, but that they occur on specific times/days of the week), this paper seeks to answer the following research questions:

1) Are there significant intraweek differences between MHA calls?
2) Are there significant intraday differences between MHA calls?

Our working hypotheses are that there are no differences between mental health related calls for police service and intimate partner/domestic related calls for police service. In order to provide context in addition to the extant literature, we compare the temporal patterns of Mental Health Act calls for police service with calls for service that are intimate partner/domestic related; intimate partner/domestic related is an interpersonal incident...
that occurs in a similar volume within our police data, providing a good comparison group.4

**Temporal patterns of crime: day of the week and time of day**

There is a large volume of research that considers the seasonal patterns of criminal events—see references, listed above. The literature that considers the day of the week and the time of day, however, is much sparser. Regarding the day of the week, the general finding is that criminal activity peaks on the weekend, dominantly Friday and Saturday night. In research that considered the importance of alcohol sales and violent crime, Newton and Hirschfield (2009) found that violent crime was more frequent on the weekend, but also in particular places. Uittenbogaard & Ceccato (2012) considered the day of the week in Stockholm, Sweden and found that violent crimes (assaults and threats) as well as property crimes (burglary, robbery, and theft) peaked on the weekend. Specifically, in the context of Stockholm’s underground transit system, Ceccato and Uittenbogaard (2014) replicated these results. And Andresen and Malleson (2015) found a variety of temporal intra-week patterns, depending on the crime type. Generally speaking, criminal events did not peak on the weekends, but during the week; the only exceptions were: assault (clear peak on the weekend), robbery (peak on Saturday), sexual assault (peak on Saturday), and theft of vehicle (peak on Saturday).

Regarding hour of the day, Ahlberg and Knutsson (1994) found a significant difference in the volume of criminal events throughout the day in Stockholm, Sweden. Their context was police resourcing, crime clearance rates, and the criminal justice system (there are not many criminal events occurring from 2am to 6am, for example), but is important overall. Both Uittenbogaard and Ceccato (2012) and Ceccato and Uittenbogaard (2014) found that criminal events reached their highest volume from the late afternoon until midnight, with a peak around 9 pm.

Most relevant to the current analysis because of the use of circular statistics, Brunsdon and Corcoran (2006) investigate the hourly patterns of criminal damage. These crimes were most active from 6pm to midnight, peaking around 11pm. In a comparison of arson and burglary, also using circular statistics, Wuschke et al. (2013) found some interesting results. Burglaries were most common during the day (8am - 7pm) and during the week. Such a temporal pattern makes sense within the routine activity approach because homes are largely vacant during the day and the week because most people work during that time.5

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4 Because our focus is on mental-health-related calls for service, we do not review the literature regarding the temporal nature of domestic violence; see Cohn (1993) and Ceccato (2014) for this literature.

5 Ashby and Bowers (2013) also use circular statistics but in the context of estimating the time of a criminal event when only a time range is known.
Because of the nature of records management systems and data availability issues, a methodological issue has emerged with such an analysis: how does one measure the day? This may appear to be a simple question resulting in using the calendar day, but with much of police activity, their “day” does not end at midnight. Felson and Poulsen (2003) argue that the criminological day should begin at 5am, whereas Tompson and Townsley (2010) have argued for 7am. Additionally, compounding this issue is when the crime, or incident more generally, is reported to the police; there may be several hours or even days between the time a crime occurs and when it is reported to the police (Greenberg & Ruback, 2012). Because of these issues, we use the calendar day for day of the week analyses, but actual time of day for the time of day analyses.

Data and methods
Data for this study represent all calls for service that occurred within the City of Surrey, primarily patrolled by the Surrey Detachment (police department) of the Royal Canadian Mounted Police in British Columbia, Canada—this includes calls for service that have been attended to by other police services, most often the Transit Police. The City of Surrey is the second largest municipality in the Metro Vancouver area: 508,404 persons in 2014. Surrey has been one of the fastest growing regions in the Metro Vancouver Area with a regional hospital, post-secondary institutions, a central business district, and a light rail rapid transit system. Surrey has an authorized strength of 673 sworn officers plus the presence of any Transit Police officers, primarily due to the light rail rapid transit system. The mental health sample was extracted from all calls for service related to mental health that were entered in to PRIME-BC, the records management system used by police departments in British Columbia over a six-year period from January 1, 2009 to December 31, 2014. All mental health related events (n = 19,330) and intimate partner/domestic related events (n = 18,645) were cleaned to ensure each event had an exact date and time that police were dispatched to the call.

Temporal analyses explored MHA and intimate partner/domestic related events by hour of the day and day of the week for each of the four sets of data. We use mental health and domestic violence calls primarily because they are more likely to be accurate with regard to the time of the occurrence and the time of the police call for service. Such information is critical for a temporal analysis of this scale and all events entered into PRIME-BC have a date and time stamp that is inputted automatically. However, it is important to note that we must assume the event occurred at or very near the time of the call for service; given the nature of these types of calls for police service and that the finest temporal resolution we analyze.

6 There are a number of different ways in which mental health related calls for police service can be coded. We used the most comprehensive list of codes available at the time for data extraction. However, data recording practices do change and PRIME-BC is a “live” system that can be updated with new information. As such, these counts can be expected to change, but by no more than 1 to 2 percent.
In order to illustrate the non-linear and continuous nature of the temporal data (i.e., the fact that patterns do not begin nor end at the end of the day), the data are displayed in circular plots with hypothesis testing done using circular statistics. Circular statistics is a branch of statistics that considers data that are “circular” in their nature (Mardia, 1975). An example of such data is temporal data because hours, days, months, and years repeat on a regular cycle. An example of why such a consideration is importance is in the context of the average time of a set of events. Consider a set of events that are temporally clustered around midnight, measured on a 24-hour clock—a 12-hour clock would have a similar issue. Although the actual average time would be around midnight, traditional statistics would assign the average time to be midday, 12:00 hours. Circular statistics consider the periodicity of temporal measurements in its calculations (Brunsdon & Corcoran, 2006). Although these plots provide a visual aide for the reader, they do not provide a statistical ‘test’ of similarity or dissimilarity of the number of MHA or intimate partner/domestic related calls within a measurement of time. Similar to previous research, we use Rayleigh’s test or a test to determine if a circular distribution of MHA and intimate partner/domestic related calls for service is randomly or non-randomly distributed and Watson’s $U^2$ test to provide a non-parametric test to indicate if the distributions of two circular sets of data are statistically different (Wuschke et al., 2013). Much like Rayleigh’s test, comparisons will be made between each of the four datasets across hourly and weekly counts.

Results
The counts of the intimate partner/domestic related calls are shown in Figure 3.1. What should be immediately obvious is that intimate partner/domestic related calls for police service follow an “expected” temporal pattern based on previous research: these calls are more frequent on Saturday and Sunday, as well as between 6pm and 2am; this is a common result in the temporal analysis of crime patterns in studies around the world (Ceccato & Uittenbogaard, 2014; Felson & Poulsen, 2003; Tompson & Townsley, 2010). This is relatively consistent for each hour of the day and day of the week comparison. This is an expected temporal pattern because of previous research and the corresponding temporal pattern of assaults, more generally, and that domestic partners are more likely to converge in time and space with the presence of alcohol at these times. As such, intimate partner/domestic related calls for police service not only have marked reliability for the time of the event and have similar numbers compared to mental health calls for police service, but are also consistent with previous research on the temporal patterns of (violent) crime.

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7 There are also kernel density estimation methods for circular statistics (Brunsdon & Corcoran, 2006; Ashby & Bowers, 2013), but similar to the spatial application of kernel density estimation, it involves interpolation between temporal units and we prefer to use the actual time recorded in the data for our analyses.
Figure 3.1. Count of domestic violence related calls, Surrey, by day of week and hour of day.
Figure 3.2. Count of mental health related calls, Surrey, by day of week and hour of day.
The counts of mental-health-related police calls for service are shown in Figure 3.2. Although the counts for any given day or hour within the day are comparable to intimate partner/domestic related, the temporal pattern is quite distinct. The differences are not as sharp, but Saturday and Sunday are the lowest volume days for mental-health-related calls for police service. Generally speaking, mental-health-related calls are a weekday phenomenon. Additionally, the time of day follows a very different pattern that is consistent for every day of the week. For all days of the week, mental-health-related calls begin to drop off at 11pm and do not pick up again until the morning, often at or around 11am. Moreover, the peak time for mental health-related calls occurs between 1pm and 10pm. This pattern is effectively the opposite of intimate partner/domestic related calls for police service and much of the extant literature that investigates temporal patterns, particularly violent crime types.

These results are also graphed in circular plots in Figures 3.3 and 3.4. Figure 3.3, mental health and intimate partner/domestic related by day of the week, clearly show different patterns; both Rayleigh's test (MHA = 17.38, p < 0.001; DV = 165.10, p < 0.001) and Watson’s $U^2$ test ($U^2 = 4.86, p < 0.001$) indicate temporal clustering that is distinct from a random distribution and each call type at the 1 percent level. The temporal pattern for intimate partner/domestic related is more extreme than mental-health-related calls, as noted above. Figure 3.4 displays mental-health and intimate partner/domestic related police calls for service by hour of the day. Once again, these circular plots mirror the patterns shown in Figures 3.1 and 3.2, but are more visually appealing, also having Rayleigh’s test (MHA = 1862.38, p < 0.001; DV = 1158.26, p < 0.001) and Watson’s $U^2$ test ($U^2 = 12.72, p < 0.001$) indicating temporal clustering that is distinct from a random distribution and each call type at the 1 percent level—much stronger differences are present when measured by the hour of the day. In the context of mental health, overall the peak for police calls for service is shown to be in the mid-afternoon, with a high volume from 2pm to 10 pm. Intimate partner/domestic related calls for police service show the peak to be between 9pm and midnight. Again, another method of showing the (statistically significant) differences in the temporal patterns.
Figure 3.3. Intra-week temporal patterns, MHA versus DV calls-for-service
Figure 3.4. Intra-day temporal patterns, MHA versus DV calls-for-service
Discussion
Because of the large volume of calls for service that the police have to address dealing with mental health, understanding the patterns of those calls for service is important. We have shown that mental-health-related calls for police service are more evenly distributed across the week than intimate partner/domestic related; intimate partner/domestic related calls, on the other hand, have temporal patterns more commonly found with violent crime, generally speaking, peaking on the weekend. However, as identified through the use of circular statistics, there is a statistical temporal pattern with mental-health-related calls for police service that peaks during the middle of the week. In the context of hours of the day, mental-health-related calls for police service peak earlier in the day than intimate partner/domestic related calls; intimate partner/domestic related calls are far more consistent with previous research on (violent) crime types, peaking late in the evening (Felson & Poulsen, 2003).

These differences are quite clear when considering Figures 3.3 and 3.4. Intimate partner/domestic related calls for police service quite prominently peak on the weekend with the highest volume of calls occurring on Sunday. Contrasted with mental-health-related calls for police service that have their lowest volume on these same days shows that the mean days are noticeably different. While there is little variation across the weekdays for mental-health-related calls for police service, the highest volume is on Monday. Though it is speculative at this point, this is potentially capturing a “Monday morning blues” effect that leads to a mental health crisis by the late morning or early afternoon. In the context of the time of day, the mean times are not only statistically different, but substantively different as well. Intimate partner/domestic related calls for police service peak during the evening, 9pm to midnight, whereas the mental-health-related calls for police service peak from 2pm to 8pm.

Mental-health-related calls for police service account for less than 5 percent of all calls for police service in our database. As such, the temporal patterns shown here should not be used to alter any police resourcing or deployment policies, generally speaking. However, these temporal patterns are instructive for any special teams or task forces related to mental health. If such teams or task forces are set up to aid those with mental health issues, the deployment of such resources when police activity levels are high (nights and weekends) would not be efficient use of scarce resources. Because of the time necessary to address mental-health related calls—Mental Health Act calls for police service may require hours at a hospital—special teams or task forces should not be scheduled to end their shifts when the peak of mental-health-related calls for police service is over: such professionals may be required for some time after the peak. Rather, what may be a misallocation of resources is not having such police support available earlier in the day and in the middle of the week. This shows the importance of temporal analyses in policing. Plotting out the temporal patterns, and testing for statistical differences from a random or specific temporal distribution, can aid in resourcing decisions and increased efficiency. And efficiency is key here and important when police budgets are under stress.
These results also show the importance of understanding that police services spend much of their time not directly addressing criminal activity. As noted by Her Majesty's Inspectorate of Constabulary (2012), direct criminal activity accounts for 20 to 30 percent of police activity. Consequently, basing all police resourcing and deployment policies on criminal event incidents will likely lead to a misallocation of resources as well. Showing how one (important) aspect of police calls for service does not follow the “traditional” temporal pattern of crime on weekends and at night mirrors research that shows crime patterns vary by crime type (Andresen & Linning, 2012). With the breadth of police activities increasing in recent years (Caputo & McIntyre, 2015), understanding the differences in patterns (temporal or otherwise) of police activity will become ever more important for the effective provision of police services.

This results here also have implications for future research. We have shown that mental-health-related calls for police service have distinct patterns, but we have not been able to show, because of data limitations, why the patterns are distinct. This is an important area of future research that will most likely require the gathering of qualitative data, either through police reports on the nature of the mental-health-related calls for police service that occur on different days and at different times, but also through interviews with police and health-care providers. Future research should also build on these temporal differences to investigate whether the severity of mental-health-related calls for police service different across time periods or if they differ only in volume; again, qualitative research will be necessary for such investigations. And, of course, there is the need for future research to replicate these results in other contexts. Only through replication can be better understand the general nature of these distinct patterns that can then be used to better inform policy.
Report 4: Temporal patterns of Mental Health Act calls to the police

Introduction
Within the environmental criminological literature, theorists have emphasized the role that both space and time play in the occurrence of crime (P. L. Brantingham & Brantingham, 1993; P. J. Brantingham & Brantingham, 1981; Cohen & Felson, 1979; Cornish & Clarke, 1986). Temporally speaking, recent research demonstrates that criminal events do not occur uniformly throughout the year; rather, the frequency of crime varies across seasons, months, during the week, and time of day according to crime type. At least a portion of this temporal variation is rooted in how we interact with the environment with a large segment of the population working standard office hours during the week (e.g., 9am-5pm and Monday through Friday), we can expect that many activities can be predicted at the weekly and hourly level such as in the case of identifying where and when areas will be targeted for burglary (Coupe & Blake, 2006). Although this has been found to the case in crime, for a variety of crime types, research has not yet looked at whether this is applicable to police contacts with persons with severe mental illness (PwSMI), specifically.

Despite the large and growing body of literature investigating temporal trends in crime, there is substantial variability in different jurisdictions and across crime types. For instance, some studies highlight that property crime increases in the summer months (Cohn & Rotton, 2000), others indicate winter peaks of crime (van Koppen & Jansen, 1999), and others report little to no seasonality impact (Linning, Andresen, Ghaseminejad, & Brantingham, 2017). Researchers have also examined the relationship between temperature and aggression in sporting events (Larrick, Timmerman, Carton, & Abrevaya, 2011) with subsequent comparative research providing mixed results on this phenomenon (Craig, Overbeek, Condon, & Rinaldo, 2016). Other researchers have looked at the temporal relationship of crime and deviance trends associated with less frequently occurring events like the Olympic games (Andresen & Tong, 2012; Decker, Varano, & Greene, 2007) and time-sensitive events such as natural disasters (i.e., hurricanes) (Spencer, 2016). Some scholars have even have argued that crime, assaults specifically, is more likely to occur during public holidays (Harries, Stadler, & Zdorkowski, 1984).

The reasons for the conflicting findings of how crime is (or is not) patterned are largely uncertain. However, Landau and Fridman (1993) suggested that they are related to the different ways in which time is operationalized, whereas Yan (2000) considered them to be related to the varying degree of geographical locations under investigation. Other causes to this phenomenon could be related to the crime data itself (missing data, inadequate counts for statistical tests, etc.). Notwithstanding these important factors, the data used for temporal studies are of vital importance. For example, if studies only focus on official crime data they would be omitting the potential temporal trends events in non-law enforcement events such as concerns for safety and/or welfare (Boulton, McManus, Metcalfe, Brian, & Dawson, 2017). Furthermore, these non-law enforcement events can result in a significant proportion of police work. For example, some suggest police spend only 10-25 percent of
their time conducting investigations and arresting criminals with the remaining 75-90 percent of their work related to maintaining order and providing service to the community (Whitelaw, Parent, & Griffiths, 2014). As a result, the temporal nature of non-crimes is important to understand for a wide variety of reasons, not the least of which can be resource allocation. Given the breadth of social welfare work that modern police officers are responsible for, identifying a specific area of police work like the intersection between persons with severe mental illness (PwSMI) and police is crucial to better understanding the macro and micro-temporal trends in calls-for-service, should there be any.

To date, only a handful of temporal studies exist in this domain with most publications focusing on the duration of calls-for-service and often within the context of some form of program evaluation (Heslin et al., 2017; Pizzigrilli, Hoffman, & Hirdes, 2015; Redondo & Currier, 2003; Szkopek-Szkopowski et al., 2013). In this paper, we contribute to the temporal study of police activity through an investigation of police calls for service that relate to the Mental Health Act (herein referred to as MHA) in British Columbia. These analyses were performed on one relatively large policing jurisdiction in British Columbia over a seven-year period to test the following hypotheses that are based on the temporal analysis of crime literature:

1. Mental health related police calls for service increase in the summer season and the summer months;
2. Mental health related police calls for service increase at the end of the month;
3. Mental health related police calls for service increase on the weekends; and
4. Mental health related police calls for service increase in the evenings.

**Related research**
The intersection of police services with PwSMI should be seen as a phenomenon that has been criminalized or that criminal justice stakeholders are used to provide de facto mental healthcare to patients, suspects, and offenders at all levels of the CJS, though there are opposing arguments on the criminalization hypothesis (Abramson, 1972; Engel & Sliver, 2001), there is undoubtedly the need for police to fulfill the role as a ‘gatekeeper’ to linking patients to services either through the CJS or mental healthcare system. When appropriate, the delivery of patients to an emergency department (ED) for evaluation is the least likely to be framed as criminalization (Lamb, Weinberger, & DeCuir, 2002).

**Empirical support for the temporal patterns of crime**
Research on the seasonality of crime dates back to the early nineteenth century in France. Quetelet (1842) found that in France crimes against persons (violent crimes) reach a maximum during the summer months (June) whereas crimes against property reach a maximum during the winter months (December), citing a lack of basic needs in the winter and problems with reasoning power from the heat and increased interactions with others in the summer. Quetelet’s (1842) theory was later supported in various ways by Sutherland (1947) and in the mid-1970s, by McPheters (1973) and Lewis and Alford (1975). One important extension that Lewis and Alford deduced was that the temporal trends under analysis occurred at the same time each year, regardless of latitude and...
reported temperature. In fact, it is relative changes of temperature that tends to result in people spending more time outside.

Field (1992) found that temperature had a positive relationship with violent and property crime types, but there was a statistically insignificant relationship for robbery—Sorg and Taylor (2011) found a similar result. Overall, if the temperature was one degree above normal, crime was expected to increase by two percent. In an investigation of robbery and homicide in Israel, Landau and Fridman (1993) found support for a seasonal relationship for robbery, but not for homicide. They claimed their results did not imply a deterministic relationship between seasons and crime, but that seasons had an impact on human interactions, some of which were criminal and that this is consistent with routine activity theory. For homicide, however, Landau and Fridman (1993) suggested that that it is almost always reported and, thus, present in criminal justice statistics, and that non-homicide victimizations from family or friends are less likely to be reported. Thus, increased time spent outside the relatively protective environment of the home may simply be leading to an increase in the reporting of violent crimes between strangers and/or not-so-close acquaintances. More recently, Linning (2015) found that the seasonal patterns of crime were far more evident in a climate that experienced greater temperature variation.

Considering other temporal scales, van Koppen and Jansen (1999) analyzed the daily, weekly, and seasonal variations of commercial robbery data in the Netherlands. Commercial robberies were greater in the winter months, relating to the greater number of dark hours in the day during the winter months and, thus, offenders are less likely to be observed. Using data from a survey of 576 respondents in Glasgow and Sheffield, Semmens et al. (2002) found that the fear of burglary and vehicle crime both peaked at the end of autumn when nights were longest, whereas mugging and vandalism did not appear to have any seasonal effect. Once again, this showed that the seasonality effect on crime varies, and not only by crime type and geography.

The literature investigating the relationship between the day of the week and crime, however, is relatively sparse. Generally speaking, criminal activity has been found to be at its peak on the weekend: Friday and Saturday night, in particular. This has been particularly the case in the context of alcohol and violence (A. Newton & Hirschfield, 2009) though unfavourable weather conditions (i.e., rain) may decrease the odds of a crime on the weekend (Tompson & Bowers, 2015). Considering the day of the week in Stockholm, Sweden, two studies have found that both violent and property crimes peak on weekends at the street level and in transit systems (Ceccato & Uittenbogaard, 2014; Uittenbogaard & Ceccato, 2012). And more recently, Andresen and Malleson (2015) found that the patterns across the week varied by crime type. For example, they found that assault, robbery, sexual assault, and theft of vehicle peaked on the weekend (usually Saturday) but other property crimes peaked during the week.

Empirical support for temporal patterning associated with mental illness and police response

Unfortunately, much like the criminological literature, the temporal patterns of mental illness are often mixed. For example, affective disorders have been shown to have temporal
patterns. Seasonal affective disorder (SAD), for example, has been shown to have an
association with time (i.e., winter months) and location (i.e., jurisdictions with more
northern latitudes), have prevalence rates anywhere from 0% to 9.7% (Magnusson, 2000).
Other mental illnesses are less closely linked with macro- and micro-measures of time
because there is no known association, or that the effect is confounded by other factors
such as gender/sex of the sample, and a wide variety of other climatic, biological, and social
variables. For example, temporal trends in hospitalizations—an area of interest for the
current study—have also been studied in a larger grouping of affective disorders (i.e.,
bipolar, depression). Though statistical findings have been shown, the results are mixed
depending on the age and sex of a patient and whether they were in a state of mania
(spring/summer), mixed episode (late spring and winter), or depression at the time of
hospitalization (Dominiak, Swiecicki, & Rybakowski, 2015). In other studies, scholars have
found no seasonal pattern of manic depressive illness (Whitney, Sharma, & Kueneman,
1999).

Focusing on the temporal trends associated with police responses to PwSMI with specific
illnesses may provide useful insight into how calls-for-service relate to time. However,
because this diagnostic information is not well-captured by police data, we focus on what is
likely to be available in police databases. More specifically, specific crises that are
associated with mental illness allow scholars to narrow down on specific events that can be
cross-referenced with existing datasets. Two areas of mental health crises are particular
instructive when considering the element of time: suicide and transfers for emergency
mental healthcare. On the one hand, suicide and suicide attempts have been shown to have
seasonal cycles that have short term fluctuations in monthly or daily data along with minor
circannual effects on holidays or birthdays (Ajdacic-Gross, Bopp, Ring, Gutzwiller, &
Rossler, 2010). Interestingly, the association between temperature and suicide is one of
the most robust relationships (H. Lee et al., 2006) and over the approximately the past two
decades (1993-2008), ED visits for attempted suicide and self-inflicted injury have
increased for all major demographic groups (Ting, Sullivan, Boudreaux, Miller, & Camargo,
2012). However, given the vast array of other factors at play, there is often a lack of hard
evidence that shows mixed findings for cyclical or temporal trending in suicides at the daily
level (Jessen, Jensen, & Steffensen, 1998; Kim, Kim, & Kim, 2011; Van Houwelingen &
Beersma, 2001). Though the temporal trends of suicide are useful at framing a type of
mental health crisis, SAD and other specific mental illnesses that can be temporally
modelled, suicide and suicide attempts can reflect as little as less than 1% of the police
calls-for-service with even fewer being attributable to a subject with a prior mental illness
(Lord, 2010). Furthermore, given the focus of the current research, a nexus point of
particular interest is the intersection between PwSMI, the police and the ED.

According to Klein (2010: 206), since the 1960s, researchers have found that “25–40% of
all psychiatric admissions to public hospitals are the result of police transports.” Some of
these presentations to the ED will be related to suicide (Zeppegno et al., 2015), but
generally speaking, patients are referred to the ED when they have multiple stressors to
their mental health such as aggression/violence, substance use, depression, anxiety, and/or
hallucinations (Klein, 2010). Research into understanding the relationship between the ED,
PwSMI and the involvement of police services tends to focus on descriptive elements about
the patient, police procedure, diagnoses and disposition (Broussard, McGriff, Neubert, D’Orio, & Compton, 2010; McNiel, Hatcher, Zeiner, Wolfe, & Myers, 1991; Redondo & Currier, 2003; Strauss et al., 2005). In terms of temporal research, some studies have included analysis that pertains to ED wait times (Way, Evans, & Banks, 1993) and developed programs and policies to reduce the amount of time police and patients spend in the ED (Pizzingrilli et al., 2015; Smart, Pollard, & Walpole, 1999). However, there are only a handful of studies that have looked at when mental health crises that require ED use will occur.

Using pediatric data, scholars have found that over a four-year period, “the number of children and youth presenting to the ED with a concern related to mental health increased by 4%” (A. S. Newton et al., 2009: 449). It is important to note that how patients were delivered to the ED in Newton et al. (2009) was not captured though non-temporally-based comparative research between youth referred to emergency services through police custody versus other sources does exist in the literature (Evans & Boothroyd, 2002). Similarly, regardless of how a patient arrived at the ED, Whitney and colleagues (1999) found significantly more admissions to hospitals in Canada in the summer months compared to the winter months. When examining mental health disorders separately though, Whitney did not find a significant result for each season, but did find that when broken down by month, mania was significantly more common to admit to hospitals in June than any other month. At the micro-temporal level, there is slightly more existing evidence of patterning. For example, a study comparing welfare payments and S.28 Mental Health Act apprehensions (one of four types of enforcement that fall under the Act), by the police in British Columbia, Picket et al. (2015) found that the number of mental health apprehensions significantly increased the week after welfare payments as opposed to weeks without those payments. Returning to pediatric visits to the ED for mental health reasons, there is evidence to suggest that the peak times for these presentations are evenings and in terms of the day of week during the work week is more common for mood, behavioural and stress related disorders whereas on the weekends substance use and self-harming behaviour were more common (Ali, Rosychuk, Dong, McGrath, & Newton, 2012).

To date, only one study has looked at patterns of patients who were transferred to the ED by police services. Much like other descriptive studies, Lee et al. (2008) highlighted the descriptive information about the population captured by police (e.g., patients were likely to have a history of previous contact with mental health services, most were unemployed males with substance use problems who were admitted for psychosis) but extended these findings to not only consider involuntary apprehensions but also warrants issued by a medical practitioner and the court system that requested the police apprehend a patient because they were in violation of some condition. With roughly 20% of all mental health presentations coming via police custody and 56% of these resulting in hospital admission (S. Lee et al., 2008), additional research is needed to identify any trends within this subset of all ED presentations. According to Lee (2006), 75% of patients brought to the ED occur after hours, with 25% during business hours or between 8:30am and 5:00pm Monday to Friday and excluding public holidays. Given that the bulk of mental health services are available during office hours yet most patients brought in by the police will come after
hours, these findings highlight the importance of matching service to times when there is a demand for said services.

Aim of the current research
It appears as though in the mental health temporal literature, mental health issues arise in the spring and autumn, (not just summer like crime) and around particular temporal events (ex: social assistance checks). However, this depends on type of mental illness and how these peaks are captured. Because the current study uses police calls for service, it is possible that we may find differing temporal and seasonal trends. Rather than using the recent research (S. Lee, 2006; S. Lee et al., 2008; Pickett et al., 2015), we hypothesize that the temporal patterns of mental health follow the traditional trends found in crime data. Thus, this paper aims to explore the temporal variation of MHA calls-for-service ranging from the seasonal and yearly levels to more specific weekly and hourly levels.

Data and methods
The data representing mental health related calls for police service, specifically police calls for service that invoke the Act, in the analyses that follow occurred with the City of Surrey, British Columbia, Canada, January 1, 2009 to December 31, 2015. Surrey is primarily patrolled by the Surrey Detachment (police department) of the Royal Canadian Mounted Police (RCMP). However, also included in the data used in the analyses below are those calls that occurred in Surrey but were responded to by the British Columbia Transit Police Department on the rapid transit system that travels through the business district of the city. The total sample of MHA calls for police service for this time period is 22,425, with the number of annual calls almost doubling from 2009 (2154) to 2015 (4192).

The City of Surrey is a fast-growing municipality in the Metro Vancouver region, growing from a population of 453,000 (2009) to 527,000 (2015), a 16 percent growth in population over the study period. As the second largest municipality in Metro Vancouver, Surrey is home to a regional hospital, post-secondary institutions, a central business district, and a light rail rapid transit system. The RCMP in Surrey has an authorized strength of 673 members, plus any of the Transit Police officers who are present because of the light rail rapid transit system.

Three sets of analyses are undertaken to answer this study’s hypotheses. The first provides six graphical representations of the distribution of the calls-for-service over the three macro-level and three micro-level units of time. The second test aims to understand the differences in counts of events for each unit of time. Because the data are count-based, a traditional one-way ANOVA would not be appropriate as the assumption of variance of homogeneity cannot be met. Instead, we used the Kruskal-Wallis H-test, an omnibus test that does not require the residuals to be normally disturbed. Furthermore, Kruskal-Wallis is an omnibus test that uses rank-based non-parametric testing to analyse statistical differences from two or more independent groups. In the case of the current study, there are six Kruskal-Wallis tests to be run for groups of 24 for hours, 31 for days of the month, 7 for days of the week, 12 for months of the year, 4 for seasons, and 7 for the total number of years. All data for the Kruskal-Wallis tests were aggregated to the hourly level. That is,
counts were calculated for 17,670 of the potential 61,320 hours that existed between Jan 1, 2009 at 12:01AM to 11:59PM December 31, 2015.

The third set of analyses uses a negative binomial model to the daily count data to assess the impact of the seasons, months, days of the week along with the impact of holidays and other environmental factors—the average temperature, precipitation, and snow—through data provided by Environment and Natural Resources Canada. Table 4.1 provides descriptive statistics for MHA calls for police service, average temperature, precipitation and snow.

<table>
<thead>
<tr>
<th></th>
<th>Mean (daily)</th>
<th>Standard deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental Health Act calls</td>
<td>8.8</td>
<td>3.75</td>
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<tr>
<td>Average temperature, C</td>
<td>10.6</td>
<td>5.89</td>
<td>-6.4</td>
<td>28.4</td>
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<tr>
<td>Precipitation, mm</td>
<td>3.1</td>
<td>6.14</td>
<td>0</td>
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<tr>
<td>Snow, mm</td>
<td>0.1</td>
<td>0.72</td>
<td>0</td>
<td>16</td>
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</table>

In the negative binomial model, we report the full model specification as well as the final model that only includes the remaining statistically significant variables after following a general-to-specific testing methodology: removing statistically insignificant variables both independently and jointly, undertaking likelihood ratio tests to ensure relevant variables were not removed because of multicollinearity. For these models, we pooled the yearly data as well as aggregated to the daily level. Thus, statistical inferences to time could only be made at the day of the week, monthly, seasonal, and yearly levels.

Results

For visualization purposes, the counts for all six units of time are shown in Figure 4.1. What should be immediately obvious is that the unit of time for analysis can show distinct temporal patterns while other units of time appear to be consistent over time or random in nature. For the patterned data, the time of day appears to begin increasing around 8am and peak between 3 and 6 pm. Day of the week data shows a consistent number of MHA calls occurring during the week with substantial drop over the weekend. Seasonal patterns were less salient with a moderately higher amount occurring in summer and fall months in comparison to the spring and winter seasons. Yearly patterns clearly show that there is an increase of MHA events occurring over time with an average yearly increase of 8.5% per year with an increase range from as low as 5.2% from 2011-2012 to as high as 15.75% from 2009-2010. Population growth in Surrey over this same time period averaged 2 percent, so there has been a clear net growth in MHA calls for police service. The day of the month patterns were essentially flat which contradicts previous research in this area (Pickett et al., 2015) which suggested that end of the month to coincide with the distribution of social assistance funds. The results from this paper suggest the counts by day of the month are relatively constant over the month. The month of the year count data
appears to be the most volatile data of all units of time. The hypothesized ‘peak’ of calls-for-service in the summer months appears to rise and fall between June and September. The Kruskal-Wallis test statistically confirmed some of the temporal patterns in the data while also highlighting a lack of statically significant differences between groups within times. For hourly counts, $\chi^2 (23) = 374.70$, $p < 0.05$, weekly counts $\chi^2 (6) = 30.50$, $p < 0.05$, and yearly counts $\chi^2 (6) = 131.78$, $p < 0.05$ all identified statistical differences between units of time within each measure. Day of the month, month of the year, and season were all insignificant.
As discussed above, in order to further investigate these (lack of) temporal patterns, we use negative binomial regression. As shown in Table 4.1, the daily counts of MHA calls for police service range from 0 to 24, with an average of almost 9. It is also important to note that the weather (temperature, precipitation, and snow) is temperate in Surrey with not a lot of variation throughout the year compared to some places investigated in previous research. The results from the negative binomial regressions (the full and final models are shown) are shown in Table 4.2. It should be clear from the results, that the general-to-specific testing methodology did not make any notable qualitative changes to the statistically significant results.
In the full model, all variables included in the regression, 5 variables are statistically significant at the 5 percent level: year, average temperature, precipitation, Saturday, and Sunday. There are also two more variables that are marginally significant at the 10 percent level: holiday and November. Year, average temperature, precipitation, and November all have positive statistical relationships with MHA calls for police service, whereas Saturday, Sunday, and holidays have negative relationships with MHA calls for police service. The results of the final model do change slightly, but the general interpretations are similar. Year, average temperature, precipitation, November, and December all have positive relationships with MHA calls for police service, whereas Saturday, Sunday, and June have negative relationships with MHA calls for police service.

Discussion
Results from this study highlight the clustered nature of MHA calls for certain units of time. At the finer temporal level, these calls appear to peak mid-day and mid-week. Such a finding is contradictory to previous criminological research that suggest crime (violent) peaks late in the evening and on weekends (Andresen & Malleson, 2015; Ceccato & Uittenbogaard, 2014; Uittenbogaard & Ceccato, 2012). Using the existing ED research, the hourly findings from this study are comparable to previous research. For example, Lee (2006) suggests that 75% of patients are brought to the ED after regular business hours and during the week. The findings from this paper would indicate that a sizable proportion of patients arrive to the ED during the latter half of the business day and these counts continue into the evening only to start to decrease at around 10 PM.
Table 4.2. Negative binomial regression results, full and final models

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Standard error</th>
<th>RRR</th>
<th>p-value</th>
<th>Coefficient</th>
<th>Standard error</th>
<th>RRR</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Full model</strong></td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Year</td>
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<td>0.004</td>
<td>1.103</td>
<td>&lt; 0.01</td>
<td>0.098</td>
<td>0.004</td>
<td>1.103</td>
<td>&lt; 0.01</td>
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<td>0.004</td>
<td>0.001</td>
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</tr>
<tr>
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<td>0.001</td>
<td>1.003</td>
<td>0.04</td>
<td>0.003</td>
<td>0.001</td>
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<tr>
<td>Snow, mm</td>
<td>-0.011</td>
<td>0.012</td>
<td>0.989</td>
<td>0.37</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tuesday</td>
<td>-0.033</td>
<td>0.027</td>
<td>0.967</td>
<td>0.22</td>
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<td>0.987</td>
<td>0.63</td>
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<tr>
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<td>0.978</td>
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<tr>
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<tr>
<td>Year</td>
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<td>Average temperature, C</td>
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<td>1.004</td>
<td>&lt; 0.00</td>
<td>0.001</td>
<td>0.001</td>
<td>1.004</td>
<td>&lt; 0.00</td>
</tr>
<tr>
<td>Precipitation, mm</td>
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<td>0.001</td>
<td>1.003</td>
<td>0.04</td>
<td>0.003</td>
<td>0.001</td>
<td>1.003</td>
<td>0.03</td>
</tr>
<tr>
<td>Snow, mm</td>
<td>-0.011</td>
<td>0.012</td>
<td>0.989</td>
<td>0.37</td>
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<td>0.967</td>
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<td>0.987</td>
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<td>0.978</td>
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<td>0.846</td>
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<tr>
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<td>1.002</td>
<td>0.96</td>
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<tr>
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<td>0.959</td>
<td>0.26</td>
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<tr>
<td>April</td>
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<td>0.044</td>
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<td>June</td>
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<td>0.26</td>
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<td>0.997</td>
<td>0.95</td>
<td></td>
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</tr>
<tr>
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<td>0.066</td>
<td>0.036</td>
<td>1.069</td>
<td>0.07</td>
<td>0.073</td>
<td>0.028</td>
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</tr>
<tr>
<td>December</td>
<td>0.054</td>
<td>0.036</td>
<td>1.056</td>
<td>0.13</td>
<td>0.055</td>
<td>0.029</td>
<td>1.056</td>
<td>0.06</td>
</tr>
</tbody>
</table>

2*Log-likelihood: -13146.35 - 13158.38
Furthermore, the results from the Kruskal-Wallis above gave an initial indication that seasonal and monthly patterns were not present but that there was an impact of the day of the week. The negative binomial regression results, however, show that there is a monthly pattern, in addition to the day of the week pattern (i.e., less likely to have a MHA call on the weekend), present in the data. This shows the importance of multiple methods of analysis, particularly because using seasonal and monthly counts that will have much lower sample sizes making statistical significance more difficult to identify. In addition to the monthly impact of November (plus June and December in the final model), a seasonal variable for Fall remained statistically significant in the final model, clearly being driven by the November and December result—most of December is technically in the Fall season. Turning to the interpretations of the estimated parameters, our discussion will focus on the relative risk ratios for ease of interpretation. The relative risk ratio for year shows a 10.3 percent increase for every year. This coincides well with 8.5 percent growth year-to-year identified above in the raw data. Average temperature and precipitation, though statistically significant, have low magnitude relative risk ratios. As such, these variables cannot be expected to have a large magnitude impact on MHA calls for police service. Compared to the base month of January, June has a 5.4 percent decrease in relative risk. On average this would lead to an increase of 0.5 MHA calls for police service during June. As such, this is not a large impact. A similar result is present for November and December, 7.5 and 5.6 percent increases in relative risk, respectively. This low magnitude impact is probably why the Kruskal-Wallis analyses for monthly and seasonal data were unable to identify statistically significant differences that data aggregated to daily level in the negative binomial results were able to identify.

The day of the week results have the largest effect sizes of all statistically significant variables in both the full and final models. Saturday and Sunday have 13.3 and 13.7 percent decreases in relative risk, respectively, compared to the based day of Monday for MHA calls for police service. This translates into one less call, over the average, for each weekend day. Though this may not sound like a significant impact on police resources, one extra MHA call for police service could take hours between the time necessary to apprehend the individual either by means of a warrant or involuntary arrest, take them to a designated facility/hospital, and have them assessed by a medical doctor and admitted to the facility. As such, in terms of practical implications, the findings from this paper may allow police officers responding to MHA calls for police service some time for mental health prevention activities if they are not over-taxed on a weekday and have the same number of officers on the weekend. However, it should be clear that such a difference should not be considered a large enough impact to alter police resources dedicated to mental health over the weekend. Incorporating the Kruskal-Wallis at the hourly level findings would suggest that police officers working evening shifts may end up spending more time in hospitals with PwSMI. Such a finding could result in day-shift police officers needing to work overtime (particularly when the patient is violent) to cover the member who are removed from patrol duty while awaiting the medical processing of the patient. Additional practical implications could be applied to the local health authority that operates the ED in Surrey. The hourly and weekly trends may not be salient to hospital administrators but having this information may assist in staffing and other administrative planning.
From a more theoretical perspective, these patterns are particularly interesting when compared to the temporal patterns that are generally found in (violent) crime data. Though there has been a fair bit of inconsistency in the temporal crime pattern literature, if any pattern is present it is an increase in criminal events during the summer and on the weekend. MHA calls for police service have an opposite pattern: more calls in the fall season and fewer calls on the weekend. Though the effect is not large, it is statistically significant and a meaningful magnitude for police workload, though not likely scheduling. In contrast, the seasonal changes in violent crime has been found to be as much as 40 percent greater in the warmer months than the colder months (Andresen & Malleson, 2013; Harries et al., 1984).

Though these analyses are instructive, they are not without their limitations. We only considered the impact on MHA calls for police service, so we do not consider the impact on police services from dealing with PwSMI that do not involve the MHA, or the other calls for police service that involve these individuals. Previous research would suggest that roughly 56.6% of police calls with PwSMI are associated with the MHA (Vaughan et al., 2016). Additionally, the data for this study is from one municipality in a large metropolitan area. Replication in other similar areas (similar in terms of size and diversity) is necessary as well as other contexts.

Directions for future research first involve the limitations outlined above. An analysis of actual police resources for this population is in order. Such an analysis, however, must go beyond just identifying the change in the number of MHA calls for police service. The time necessary to address these calls for police service relative to the other types of calls for police service that this population generates needs to be identified. Such a police resourcing study should also be undertaken in a number of other similar, and different, contexts for the purposes of replication. Another area for future research would be to combine the temporal modelling of when these events occur at the micro/macro temporal level with how long these events take to process (see: Redondo & Currier, 2003). It would be useful for police and ED administrators to know that for example, if the peak times for MHA calls are mid-week/mid-day (along with some seasonal patterning), do the processing of these calls take longer than the off-times or times where the processing in the ED should not theoretically be impacted by other MHA patients? Lastly, it would be useful to study the ED admissions data in this jurisdiction to see if the temporal trends parallel with patients who present to the ED without police assistance. Lee et al., (2008) highlight numerous difference between PwSMI who arrive to the ED via police custody and those who do not.

Overall, we have shown that the temporal patterns of MHA calls for police service are different from crime-related calls for police service. Based on the data, MHA calls for police service account for approximately 5 percent of police calls for service, whereas crime-related calls account for 20-30 percent of police calls for service. At best, investigating these temporal patterns only accounts for one-third of police call activity. More research is necessary along these lines to identify temporal (and spatial) patterns for these other call-related activities of the police. These other activities have been found to be related to crime prevention related activities (Her Majesty's Inspectorate of Constabulary, 2012) and,
therefore, important activities for police services. In order to better understand the demand for these services their patterns need to be analyzed as well.
Report 5: The cost of mental health related calls on police service: an evidence-base from British Columbia

Introduction
According to Statistics Canada (Mazowita, Greenland 2016), in the 2014/2015 fiscal year, the expenditures for police services in Canada were $13.9 billion. These expenditures are comprised of salaries and wages (66%) for the roughly 69,000 police officers and 28,000 civilian employees across Canada’s ten provinces and three territories followed by benefits (e.g., the employer’s contribution to group medical plans, pension plans) (15%) and operating expenditures (e.g., equipment maintenance, office supplies) (19%). Canada’s population is primarily policed by independent municipal police services, followed by the RCMP which proves both municipal and provincial police service, and provincial police services in three provinces. Understanding where resources are allocated in various jurisdictions can be useful in developing an understanding of the local policing cost and trends over time that may assist in projected budgeting and future resource deployment. Moreover, knowing the costs of specific aspects of policing, such as mental health, can be used to inform policy decisions regarding the costs and benefits of various policing programs, supporting evidence-based policing practices (Sherman, 1998).

Literature review
Generally speaking, police budgets are managed at the local level, with a local community police board as well as other support staff working together to develop and amend a police department’s budget. The amount of resources in these budgets is generated using a variety of factors, but at its most basic level, it can be reduced to revenue streams (e.g., taxation, traffic and other fines) and expenses (e.g., salaries, equipment). With police services falling under the broad umbrella of public safety, local police budgets are likely to be associated in some manner to the local crime rates. These rates may be generated at the local level, but federally generated Uniform Crime Report (UCR) data may be used as a barometer for the crime trends in a given jurisdiction or more broadly in a province. Though these are not the only factors in police budgets, they can act as a measure of the demand for a portion of police resources. The relationship between crime rates/statistics and policing costs has also been included in these discussions with some noting the differences in trends over the past 20 years. For example, in Canada policing costs increased by 45.5% between 1986-2012 while Criminal Code of Canada incidents per police officer declined by 36.8% (Di Matteo, 2014). Other scholars also note the increase in police budgets over this time frame but highlight that other state services—health and education—have per capita rates that are six and four times higher than police services and are increasing at similar rates (Institute for Canadian Urban Research Studies, 2014).

To say that police budgeting has become a topic of public debate in the early twenty-first century is an understatement. Debates often encompass greater political pressure for fiscal and operational accountability, increasing costs of policing, declining police growth and
shrinking or stagnant police budgets (Griffiths et al., 2015). The expanding demands of police services, are of particular concern because in some jurisdictions, like rural and remote locations, the police are the only state-funded option to respond to social issues. Milne’s (2013) concept of ‘wide policing’, or the addition of more and more police duties to cover social problems that are not being addressed by other service providers, is important to consider in any discussion regarding police expenditures. In addition, Leuprecht (2014: 5) highlights that front-line uniformed officers in Canada spend a copious amount of time “waiting to give testimony in court, transcribing interviews, teaching CPR, transporting prisoners, or a hundred other duties that take them off the street.” Additional costs for policing are likely to be found in rural and remote locations where, generally speaking, the costs associated with these locations are much higher than in urban settings and much higher than the national average cost for policing (Ruddell et al., 2014).

One of the challenges for estimating the cost of “other duties” through crime statistics like the UCR is that they are not well-captured or identified at all. For example, previous research suggests that in police records management systems, roughly 20-30% of the police calls-for-service generated are reflected in some way in the UCR with almost 70-80% of other police files not being captured in the UCR (Institute for Canadian Urban Research Studies, 2014). As a result, estimates of costs of all calls-for-service—criminal and non-criminal-- are virtually absent in the literature.

Police responses to persons with severe mental illness
Since the early 1980s, an area that has increased in the demand for police services is the response to persons with severe mental illness (PwSMI) (Cotton, Coleman, 2010). Not surprisingly, this increase has also resulted in the use of more police resources with some studies suggesting that police interventions with PwSMI use 87% more resources compared to interventions with persons without mental illness (Charette et al., 2014). The range of police contacts, the different ways in which PwSMI can be found within police data, and the varying police contacts within Canada results in some wide-ranging results on how much police work and subsequent labour cost is tied to this population (Livingston 2016). In Canada, UCR data will capture the criminal activity of PwSMI, but there are a sizable number of police interactions with this population that are for non-criminal reasons (e.g., victimization, general assistance) (Vaughan et al., 2016). More generally, it has been established for a number of years that a large number of police encounters with PwSMI do not often involve law enforcement and “involve people who are neither a danger to themselves or others” (Chappell, 2010, 289). As a result, accounting for the amount of police work attributable to PwSMI is often anecdotal or based on a small subset of the available data. In the push for evidence-based policing, a natural next step is to estimate the amount of resources police use with this population longitudinally using empirical data.

Resource use has been operationalized as the use of police time and/or the financial cost of responding to PwSMI. Studies from Canada suggest that the duration of a call involving PwSMI is approximately 90 minutes in length, though this duration can increase substantially when the police incident involves a criminal event (Charette et al., 2014). The Vancouver Police Department suggests that in 2012, their police officers were involved in
3043 events that fell under the BC Mental Health Act (herein referred to as the Act) which consumed 21,000 on-scene police hours (Szkopek-Szkopowski et al., 2013). A recent study from the UK has taken an additional step and provides estimates of the costs for a variety of interventions through mental health and police services (Heslin et al., 2017). The authors suggest that in 2012, the cost per police incident with persons with enduring mental health needs was, on average, £522. The authors go on to model service enhancements to represent alternative care pathways for patients to test the impact of a change in decision making on the overall cost of response. Findings indicate that enhancing services may decrease per incident costs by 8% but in other cases, the costs may increase by 6%. Clearly, there can be cost and benefits to changing the way PwSMI are serviced by health and policing services but it is crucial that any new programing and/or policy not only reduces recidivism (e.g., admissions to the ED, police contacts) but that they are also cost-effective for taxpayers.

The goal of this chapter is to extend this recent work by providing various estimates of the use of police resources when they respond to PwSMI. Using a longitudinal dataset covering multiple policing jurisdictions, we estimate:

1) The amount of resources police use to respond to PwSMI who fall under the Act;
2) The amount of resources used when police services respond to all calls with PwSMI; and
3) The resources consumed when police respond to “heavy users” or persons who habitually cycle through police custody.

**Methods**

**Study area**
The Fraser Health Authority (FHA) is a large health region in the south-west section of the province of British Columbia, Canada. This area currently contains approximately 1.7 million of the province’s population. The majority of the population resides along a major east-west highway. To the east of this catchment area lies Vancouver. To the north and west of the Fraser Health Authority are less densely populated rural areas followed by Washington State that buttresses to the southern portion.

**Data for analysis**
Data for this project were provided by all police services contained within the FHA. Within this catchment area, there are five independent-municipal police agencies, a regional transit police agency, and various contracted police forces by the Royal Canadian Mounted Police (RCMP). All police services in BC use the same records management systems for storing and maintaining their call-for-service data. Various datasets were created for analysis using the same initial number of PwSMI subjects (n = 37K). For research question 1, we looked only at Act-events and for research questions 2 and 3 we considered all police contacts that a participant may have had. All data used in this study were for a seven-year period from January 1, 2009 to December 31, 2015.
Costing model
For this chapter, resource usage is operationalized using multiple perspectives. We use costing estimates in terms of dollars spent on a call, the full-time equivalent (FTE) of the number of full-time police officer works in a year, and per capita cost estimates. Given the fact that pay scales can vary dramatically both within and between police services in Canada and that the data for analysis covers data from six regional or municipal police departments and 13 RCMP departments, the costing and FTE rates were standardized. However, the formulas used for calculating resources can be re-used in other jurisdictions with proportional adjustments.

The recent Statistics Canada report on policing services as a guide to produce costing estimates for police-involved calls-for-service with PwSMI (Mazowita, Greenland, 2016, 11) suggest that policing expenditures are comprised of “salaries and wages (66%), benefits (15%), and other operating expenditures (19%).” Here benefits refer to all payments made to employees which is not a component of their salary or wages. For example, a police department’s contribution to employment insurance, health insurance, and severance pay. Examples of operating expenditures includes, office furniture and vehicle purchases. Using these expenditure proportions, we extended this model, $C$, or an inflation adjusted estimate for the total cost for police services responding to PwSMI-related calls:

$$C = (X + Y + Z)T,$$

where $X$ represents the cost of one officer with benefits and operating expenses. In 2015, the total hourly cost with benefits and operating expenses for a 1st class constable (3-years of experience) in one of the municipalities in this study was $67.13/hour. $Y$ and $Z$ represent the cost for support and supervision (e.g., supervisors, dispatchers, clerical staff, and overtime) of Act and non-Act events respectively. Because Act calls are known to be laborious (Szkopek-Szkopowski et al., 2013), we estimate $Y$ to be 50% of $X$ (i.e., $33.57$/hour) and $Z$ to be 25% of $X$ (i.e., $16.78$/hour). $T$ represents the duration of a call-for-service measured in hours as recorded in the computer-aided dispatch (CAD).

To estimate the number of full time police officers required to respond to Act-related calls for police service, we consider one full time equivalent (FTE) officer to work 1720 hours per year. This count accounts for annual holidays, sick leave and statutory holidays and is based on a shift rotation of four days on and four days off. And the per capita estimate is simply the cost divided by the population. The population in the FHA in 2015 was approximately 1.7 million. Population estimates for the FHA were obtained from BC Statistics.

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9 [http://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-estimates](http://www2.gov.bc.ca/gov/content/data/statistics/people-population-community/population/population-estimates)
Results
Of the sample of PwSMI (n = 36,893), they were involved in 76,310 Act calls. The yearly increase was about 9.70% per year. As a consequence, the number of policing hours associated with these calls has also increased but at a slightly higher rate (11.84% per year). The resulting cost to police service and per capita costs are highlighted in Figure 5.1. Using $C$, the most expensive year for policing was 2015 where we estimate the cost to be $4.79 million across all police agencies with an average annual increase of roughly 13.56% (range 3.75-20.43%). In 2009, the per capita cost was $1.37 per person who resided in the FHA. In 2015 that amount doubles to $2.74 per person. In comparison to the national per capita costs for policing in Canada of $320 per person (Mazowita, Greenland, 2016, 11), these amounts are relatively small. However, the fact that the per capita costs for policing PwSMI in Canada have doubled over a 7-year period is concerning considering that since “2009/2010, operating expenditures have generally been declining, including a 0.9% decrease in 2014/2015” (Mazowita, Greenland, 2016, 11). Furthermore, though these calls-for-service do occur, the strict guidelines as written in the Act ensure that police officers only use the legislation when a patient is in danger of harming themselves or others.

![Figure 5.1. Policing and per capita cost to enforce the Act](image)

The number of FTE police officers (Figure 5.2), needed to enforce the Act over the seven-year period ranges from as low as 13.73 in 2009 to as high as 26.53 in 2015. Much like the per capita estimates, we see a doubling of the required police resources in seven years of data. Though 26.53 police officers may not sound like a lot (Surrey alone, the largest municipality in the FHA, has an authorized strength of over 600 police officers), this is still a sizeable number of police officers; for example, this is one-half of the authorized strength of Port Moody, a small municipality in the FHA region and part of Metro Vancouver.

Knowing that police work related to PwSMI involves a wide array of calls for service, we considered all of the police interactions for the PwSMI sample. This sample was involved in approximately 564,691 event files which is roughly 15.5% of all PRIME-BC event files.
within FHA. This rate is slightly higher to previous research that suggests 12% of all calls for police service involve the patient’s mental health care pathway (Livingston, 2016). With each patient having roughly 6-7 additional police contacts on top of their Act event, the cost for police services also increases. Using C, we estimate that at its lowest level in 2009, cost to policing services to respond to all calls-for-service with PwSMI across the FHA was roughly $14.8 million. Much like the other upward trends in the data, in 2015 the estimated cost increased to $24.6 million.

Given the large number of police hours associated with all calls-for-service, FTE estimates suggest that in 2009 and 2015, it would have taken roughly 113 and 170.5 police officers across all of the police services within the FHA, working fulltime, to respond to all calls associated with PwSMI. This is a large number of police officers who are “dedicated” to responding to a relatively small portion of the population. In order to provide some context, the City of Port Moody has a population that is approximately the same size as the PwSMI sample in our analysis. The Port Moody Police Department has an authorized strength of 51 sworn police officers. The number of officers in the FHA region as of 2015 to respond to this population is 3.33 times the authorized strength of the Port Moody Police Department. This is very clearly an expensive sub-population to serve.

![Figure 5. 2. Number of police officer hours and equivalent number of full-time police officers to respond to all calls-for-service with PwSMI](image)
With many programs and policies placing heavy emphasis on reducing recidivism and improving the well-being of PwSMI who are ‘frequent fliers’ or ‘heavy users’ of police service (Akins et al., 2016), we selected the top ten most frequent users in the dataset to estimate their police resource usage and to explore some of the basic trends in this group in terms of the types of police services they are accessing. Table 5.1 provides a general overview of the demographics of this group, the total number of police interactions, their mobility patterns (i.e., the number of different police services they were serviced by), the resources used, and the nature of their police interaction. It is important to note that all heavy users had continual contact with the police over the data collection period and, along with the high number of police contacts, we can predict that these individuals were not incarcerated or hospitalized for any prolonged period.

Though the patterns of the heavy users should not be interpreted as the trends for the population, there are some early indicators that there are differences of police contact in this group. For example, participant 29485, a middle-aged man with slightly fewer than 100 contacts per year, has had many encounters with the police for substance use such as public intoxication and other liquor related problems. Participant 36330 is a middle-aged female with roughly the same total number of contacts with the police. However, the roughly 2/3 of her police contacts are non-criminal in nature or the police were not enforcing or using criminal law. With all participants, the number of Act events was relatively modest. Over the 10 participants, we found only about 2.25% of their contacts were associated with the Act.

Notwithstanding the high volume of calls-for-service all heavy users have, the longitudinal pattern of participant 30414 is particularly concerning given his first contact with police occurred age 8. Comparable to other life-course research in criminology (Moffitt et al., 2002), previous research on the developmental etiology of criminality among persons with mental disorders results in three typologies: early starters, adolescent-limited offenders, and late or adult-start offenders. (Hodgins, Janson, 2002). At a quick glance, one may suggest that participant 30414 is an ‘early starter’ as his patterns of criminal behaviour have been stable in childhood to early adolescence. However, if we only include his criminal events, we overlook that roughly 49% of his other interactions with the police were calls for assistance and/or missing persons reports. In other words, his spectrum of CJS involvement is multifaceted, goes beyond crime and the direct application of the Act, and like most of the other heavy users in this study, he interacted with multiple (seven) police departments.

Of particular concern with this group is that, on average, each one of them requires their own full-time police officer to respond to their calls for police service, broadly speaking. The range is 0.6 to 2.5, so even having to require one-half of a full-time police officer is a huge economic cost. This points to the importance of considering increased, and more cost-effective, social services for this population aside from policing.
Table 5.1. Cost estimates for PwSMI who are heavy users of police services

<table>
<thead>
<tr>
<th>ID#</th>
<th>Sex</th>
<th>Age</th>
<th># of police unique PD</th>
<th># of events Act</th>
<th># of events crime</th>
<th># of events non-crime</th>
<th># of missing persons/assist</th>
<th># of substance use events</th>
<th>Total # of events</th>
<th>Total number of hours</th>
<th>FTE @ 1720 hr/yr</th>
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</thead>
<tbody>
<tr>
<td>11016</td>
<td>M</td>
<td>26-32</td>
<td>8</td>
<td>41</td>
<td>514</td>
<td>230</td>
<td>492</td>
<td>10</td>
<td>1287</td>
<td>4214.51</td>
<td>2.45</td>
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<tr>
<td>29485</td>
<td>M</td>
<td>46-52</td>
<td>5</td>
<td>13</td>
<td>224</td>
<td>68</td>
<td>128</td>
<td>234</td>
<td>667</td>
<td>1620.4</td>
<td>.94</td>
</tr>
<tr>
<td>36330</td>
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<td>8</td>
<td>23</td>
<td>166</td>
<td>409</td>
<td>33</td>
<td>3</td>
<td>634</td>
<td>1633.1</td>
<td>.95</td>
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<tr>
<td>15160</td>
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<td>54-60</td>
<td>5</td>
<td>1</td>
<td>368</td>
<td>48</td>
<td>63</td>
<td>85</td>
<td>565</td>
<td>1709.2</td>
<td>.99</td>
</tr>
<tr>
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<td>51-57</td>
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<td>2</td>
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<td>257</td>
<td>40</td>
<td>2</td>
<td>484</td>
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<td>8</td>
<td>2</td>
<td>274</td>
<td>128</td>
<td>55</td>
<td>5</td>
<td>464</td>
<td>1031.6</td>
<td>.60</td>
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<tr>
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<td>M</td>
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<td>4</td>
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<td>179</td>
<td>34</td>
<td>5</td>
<td>433</td>
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<td>.76</td>
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<td>M</td>
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<td>211</td>
<td>2</td>
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<td>67</td>
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<td></td>
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<td>1573</td>
<td>1158</td>
<td>496</td>
<td>579</td>
<td>16549.6</td>
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</table>
Discussion

It should be clear that the PwSMI population places a significant cost on our police services. Moreover, this population is involved with a disproportionate number of calls for police service and a corresponding number of police officers to respond to their calls for police service. Regardless of how the budgets change, crime rates decrease, the counts, costs, and proportion of budgets that go towards responding the Act has been going up over time. The slopes of the cost per year of the trend line for Figures 5.1 and 5.2 are always increasing. Heavy users consume enormous amounts of resources and implementing problem-solving/collaborative programs are crucial for reducing recidivism and getting them into a treatment plan that works for them. The 10 heavy users had many similar features but many more features that differed. As such, having different programs available, especially ones that do not require that a patient be already involved in the court/correction system, would likely work more effectively. Of course, there is also an ethical issue here given that the provision of mental health services should not only come after someone has been involved in the criminal justice system.

Though instructive, our analyses are not without limitations. First, we used truncated data (calls were capped at 12 hours/call). This was done to limit the time spent by a police officer to be an entire shift. Though this may be considered a long time for any given event, there will also be calls for police service that require continued attention by the police. Second, our cost estimates only include direct policing costs. We do not include any other costs (dollar costs or hours spent/FTE equivalents) associated with the services of other emergency personnel: hospitals, paramedics, fire department, and so on. We also do not consider the influence of substance use. Finally, we estimate the values of C as 1.5 for Act calls and 1.25 for all other calls based on the number of officers necessary to address each of these types of calls for police service. Future research should investigate exactly how many members responded to a call for service and how much time each call consumes as cases where a patient barricades themselves into a house or threatens to commit suicide will likely take up more than 1.5 or 1.25 members.

Despite these limitations, our estimates of costs and FTE police officers for the population of PwSMI in the FHA has shown to be instructive. Our estimates are at the lower bound because they only consider direct policing costs and assume only one member/event responds. Moreover, despite the relatively low percentage of police calls for service that are direct responses to mental health (2 percent), all of their interactions with the police comprise approximately 15 percent of their calls for service. Based purely on the population of the FHA, the mental health related calls for police service from this population is proportional to the number of calls to the police (both are approximately 2 percent). However, we must remember that a fraction of the population actually consumes any police services and that 2 percent of the FHA population accounts for 15 percent of the police calls for service when all of their police interactions are considered. This is a significant overrepresentation in police workload that deserves future considerations.

The importance of these calculations in the context of evidence-based policing relates to the costs and benefits, or cost-effectiveness, of any programs that the police implement to
better serve this population. Evidence-based policing is, in part, the application of research to find out which police practices at the agency, unit, and officer levels work best to better serve the public, but costs are a critical component of that research (Sherman, 1998; Lum & Koper, 2017). Presented with multiple options to address a policing (societal, in this case) issue, the relative costs of these options are important for the optimal allocation of scarce resources.

Knowing the costs to policing for police interactions with the PwSMI population, even what is likely an underestimate, provides an evidence-base for comparing various options in police practice: officer training, specialized units, and so on. These different options will have different costs and different outcomes. Though a more expensive option may initially be discarded because of the high up front costs, for example, knowing that the outcomes from that option outweigh the costs can provide for making better longer term decisions. In the case of the PwSMI population, such an evidence-base may be used to compare options outside of policing as well to support their social service needs. In short, an evidence-based approach to policing the PwSMI population will not only lead to this population being better served, but done so in the most cost-effective manner possible based on research.
References


Characteristics of patients referred to psychiatric emergency services by crisis intervention team police officers. *Community Mental Health Journal, 46*(6), 579-584.


*Mental Health Act, RSBC 1996, c 288*


Appendix A: Communities within the Fraser Health Authority

Abbotsford

There are 16 diverse communities served by the Fraser Health authority, one of which is Abbotsford. With a 2011 census population of 133,497, Abbotsford’s population is estimated to increase by 19 percent by 2024 (for more detailed community statistics, refer to). Abbotsford Regional Hospital and Cancer Centre serves Abbotsford and surrounding communities providing primary, secondary and tertiary care with 24/7 emergency care. Furthermore, Abbotsford Regional provides inpatient care supported by community services like home health, public health and community mental health. In 2013/14, Abbotsford Regional saw over 44,000 emergency room visits and provided inpatient care for over 19,000 clients (Fraser Health, 2016a).

Abbotsford has a community mental health office providing adult community support, short-term assessments, day and outpatient programs and more. Additionally, Abbotsford has a designated mental health and addictions facilities to provide support for those who suffer from mental illness and issues of substance use (Fraser Health, 2016c). Currently, a 50-bed facility for mental health patients who require inpatient care is undergoing construction. This facility is to replace the previous Sunrise Special Care facility which closed in June 2012. The new facility will provide assisted care services and support for patients who require it.

Abbotsford Police Department (APD) is an independent municipal police department serving Abbotsford since 1955 (APD, 2011). APD has 212 sworn members providing services such as patrol, operations support and criminal investigation.

Gladys Avenue Tent City

For more than two years, a homeless camp along Gladys Avenue in Abbotsford has been a semi-permanent home to a number of homeless people sleeping rough. In February of 2016, the homeless at Gladys Avenue were issued with eviction notices despite the fact that at the time, Abbotsford’s shelters were operating at 93 percent capacity (CBC News, 2016a). The City of Abbotsford has said, however, that construction of a 50-bed mental health facility is supposed to be finished sometime in the summer of 2016 (CBC News, 2016b).

Abbotsford Correctional Institutions

Abbotsford is also home to the Pacific Institution and Regional Treatment Centre, a 573-bed correctional institution with its own psychiatric care unit and health centre. Located on the same property are Fraser Valley Institution for Women, a 112-bed facility, and Matsqui, a 350-bed medium security prison (Correctional Service of Canada, 2014).

Agassiz

Agassiz, a small town within jurisdiction of Kent, has a population of 1,363 with an average family income of $65,395. Agassiz has a large male population in comparison to the female
population (Fraser Health, 2014a), which may because of the nexus to two prisons in the area. Mountain Institution, a 440-bed medium security institution for male offenders and Kent Institution, a 420-bed maximum security institution, are both located in Agassiz (Correctional Service of Canada, 2014).

Fraser Canyon Hospital is the nearest community hospital to Agassiz, which is located in the town of Hope. Fraser Canyon provides 24/7 emergency care to its patients as well as health promotion programs. The nearest general hospital within Agassiz is Chilliwack General Hospital, which provides services to Chilliwack, Hope and Agassiz. The majority of healthcare services provided for the local health area of Agassiz are done through community services including palliative care, mental health and substance use support. The community of Agassiz also contains an Aboriginal population, by which local and First Nations governments collaborate with community partners in providing health services. There is a mental health office located in Agassiz providing programs and services to those who require mental health support (“Agassiz Mental Health Office,” 2016). Agassiz is contracted with the RCMP for their municipal and provincial services. The detachment that serves Agassiz is known as the Upper Fraser Valley Regional detachment has 8 members serving Agassiz, the district of Kent, Village of Harrison Hot Springs, Harrison Lake, Hemlock Valley, Popkum and Ruby Creek (RCMP, 2015). Using data from the 2011 census, the present report estimates the population in the Fraser Valley rural area to be around 17,039.

**Burnaby**

The second largest municipality belonging to Fraser Health’s jurisdiction is the City of Burnaby, with a population of 233,218 that is expected to grow by 18 percent by 2024. Fraser Health at Burnaby Hospital provides mental health and substance use services, including community residential emergency short stay and treatment, outpatient treatment, and housing. Planning is also underway for a mental health zone in the Emergency department as well as enhanced outpatient services to allow for better access to services (Fraser Health, 2016). In addition to the Mental Health and Substance Use Centre located in Burnaby and funded by Fraser Health, Burnaby also has the Burnaby Centre for Mental Health and Addition (BCMHA), a provincial resource providing specialized inpatient treatment services for adults who have severe and complex co-occurring substance addiction and mental health disorders. The BCMHA has a multi-disciplinary team including psychiatrists, physicians, nurses, a social worker, mental health and addiction support workers, and so forth, who offer assessment, stabilization, treatment, as well as education and support (BC Mental Health & Substance Use Services, 2013a).

Burnaby is policed by the Royal Canadian Mounted Police (RCMP) who have a 277-member presence in the city – the second largest in Canada. In identifying the need for improving services for people living with mental illness, and with the goal of reducing repetitive calls for services for persons with mental illness, the Burnaby Detachment has established the position of a designated Mental Health Intervention Coordinator. This partnership, which includes Fraser Health, involves a designated outreach nurse and uses an integrated
approach involving management plans for clients who had been frequent users of the system. Burnaby RCMP reported that in 2012 there were over 1400 mental health related calls, and that the introduction of the Mental Health Intervention Coordinator reduced calls for service from the nine clients with management plans by 85 percent (Burnaby RCMP, 2012, p. 17). Also of note, South Burnaby is home to a Youth Custody Centre, an 84-bed facility for offenders aged 12-18 who are remanded or sentenced from across B.C.

**Chilliwack**

The population of Chilliwack is 92,308 with an expected growth of 16 percent by 2024. Chilliwack General Hospital serves the communities of Chilliwack, Hope and Agassiz, providing inpatient psychiatric for adults along with outpatient detox for adults with substance use issues. In 2013/14, Chilliwack General saw 55,029 emergency room visits and provided 8,471 inpatient care services (Fraser Health, 2016a). Chilliwack currently has a community mental health care centre, providing various services and programs to those who are suffering from mental illness of all ages. Further, Chilliwack has a Mental Health and Substance Use Centre to provide resources for those who suffer from mental illness and substance use issues. Over the next three to five years, Chilliwack General plans on providing enhanced mental health and substance use services through the development of community based Integrated Health Network with increased psychiatry support (Fraser Health, 2016a).

Municipal police services are provided by the Municipality of Chilliwack by the RCMP under contract, and the detachments consists of a provincial police unit as well. The detachment which serves Chilliwack and surrounding area is the Upper Fraser Valley Regional detachment. The Chilliwack RCMP detachment has an authorized municipal strength of 107 officers, as well as an additional 8 officers that serve the rural Fraser Valley Regional District (Police Services Division, 2015).

**Coquitlam**

Although Coquitlam has a population of 171,179 people, it does not have its own hospital or mental health facilities. Known as the Tri-Cities, Coquitlam, Port Coquitlam and Port Moody share a Mental Health and Substance Use Centre located in Port Coquitlam (see Port Coquitlam for a discussion of the centre), and are connected to the aforementioned Integrated Transition of Care Team out of Royal Columbian Hospital.

Coquitlam’s RCMP has 152-sworn members, making it the third largest RCMP detachment in Canada. The Coquitlam RCMP Detachment is a 67-member detachment providing services to the municipalities of Coquitlam and Port Coquitlam and the surrounding areas with the provincial policing jurisdiction. The Coquitlam RCMP has begun to address the issue of persons with mental illness by way of a mental health portfolio. The objective of creating a portfolio of frequent system users is to reduce the impact of mental health calls on police resources and to collaborate with partners in the community to streamline information sharing (City of Port Coquitlam, 2015).
It is impossible to understand the history of mental health in Metro Vancouver without a discussion of Riverview Hospital, located in Coquitlam. The Riverview Lands are a 405-hectare site located within the City of Coquitlam, originally purchased in 1904 for the construction of the hospital and neighbouring forensic psychiatric hospital, Colony Farm. In its early days, Riverview was recognized as a model of psychiatric health care due to its revolutionary therapeutic paradigm, reflected in the natural setting of the hospital, horticulture features, and botanical gardens, which provided patients with outdoor recreation and valuable job skills. At its peak year in 1956, Riverview had over 4300 patients and 2200 staff members.

By the 1960s, however, patient numbers were declining, attributed to the opening of regional hospitals with psychiatric units as well as to the development of anti-psychotic medications. By the 1980s, the Social Credit provincial government closed and sold off parts of the hospital to developers, intending to move more patients into regional care and integrate mental health patients back into the community. The site has been sitting mostly empty since the massive closure, save for three small mental health facilities operated by Fraser Health (Laanela, 2014). These three tertiary care lodges with 60 beds provide specialized mental health support, including psychosocial rehabilitation for patients who need assistance in managing their mental illness (Renewing Riverview, 2016).

Also located on the Riverview Lands is Colony Farm Forensic Psychiatric hospital, a secure, 190-bed facility that houses and treats offenders who have been deemed unfit to stand trial or have been found not criminally responsible on account of a mental disorder. The hospital has 9 clinical units, of which 3 are closed, 1 is open, and 5 are secure. The goal of Colony Farm is to restore fitness to stand and/or to eventually safely reintegrate patients back into the community by supporting patients with specialized clinical services and comprehensive vocational and rehabilitative programs (BC Mental Health & Substance Use, 2013).

The population of Hope is 5,969, and it is expected that the population of Hope will increase by 1.5 percent by 2024. Fraser Canyon Hospital is a 10-bed community hospital which provides 24/7 emergency care and a network of community programs and services. Fraser Canyon primarily serves rural communities like Hope and Agassiz, transferring patients to Abbotsford Regional Hospital and Cancer Centre or Royal Columbian in New Westminster for trauma and cardiac care. Over the next three to five years, Fraser Canyon plans to provide enhanced mental health and substance use services with increased psychiatric support and to provide access to outpatient rehabilitation services (Fraser Health, 2016c). Within Hope, there is also a Mental Health Community Office which provides resources and services to those who have mental illness.
Policing in Hope is contracted through the RCMP for both municipal and federal policing. The detachment which covers the area of Hope is the Upper Fraser Valley Regional detachment. The Hope Community Police Office serves different sections of the highways in the Fraser Valley, including Highway 5, Highway 1, Highway 3 and Highway 7 (RCMP, 2015).

**Boston Bar**
North of Hope, the Fraser Health Authority Region extends to Boston Bar, an unincorporated place with a 2011 population of 206 persons. Because of Boston Bar's situation on the Trans-Canada Highway, however, the town provides services for travelers passing through, which includes the CN and CP railways who maintain bunkhouses and crew switching facilities in Boston Bar, and for those who travel to Boston Bar for recreational activities (Boston Bar/North Bend Enhancement Society, n.d.). A small RCMP detachment, part of the Upper Fraser Valley Detachment is also located in Boston Bar.

**Langley**
The City of Langley and the Township of Langley have a combined population of 129,258, expected to grow 30 percent by 2024. Langley has its own hospital, Langley Memorial, and like other communities in the Fraser Health Region, Langley has a dedicated Mental Health and Substance Use Centre, providing a connection to resources for persons with mental illness.

Langley is also policed by the RCMP, a 50-member detachment with one officer dedicated to working with people with mental health issues who are in regular contact with the police (Bucholtz, 2014).

**Maple Ridge & Pitt Meadows**
The Maple Ridge Local Health Area (LHA) consists of two major population centres: Maple Ridge and Pitt Meadows (Fraser Health, 2010). Maple Ridge has a population of 80,714 with a projected population of 118,000 by 2040 (Maple Ridge, 2014), while Pitt Meadows has a population of 18,673 with a projected population growth of 16 percent by 2024 (“Pitt Meadows”, 2016). The hospital within the Maple Ridge local health area is Ridge Meadows Hospital, providing inpatient and outpatient services (Fraser Health, 2010). The Maple Ridge Mental Health Office provides mental health and substance use care services and programs for children, adults and the elderly (assessments and resources for those who suffer from problems with mental health and substance use (Fraser Health, 2016). Beckman House, a mental health care residential facility, was built for mental health assisted living (Juma, 2014). Finally, there is housing available for those who have problems in mental health. Additionally, there is the Maple Ridge Treatment Centre for men who have problems with substance use (MRTC, n.d.).

Maple Ridge and Pitt Meadows are currently policed under contract with the RCMP for municipal policing (Maple Ridge Detachment) (Ridge Meadows RCMP, 2015), and there is a provincial area within the detachment policed by the RCMP under the Provincial Policing Services Agreement. Within this detachment, there is also a community police office that
serves to the city of Pitt Meadows. The Maple Ridge detachment is made up of 112 police members and 50 civilian staff. Maple Ridge Detachment works in conjunction with the Lower Mainland District Regional Police Service, ensuring quality service is provided to the Lower Mainland (Ridge Meadows RCMP, 2015).

**Mission**

Mission has a population of 36,426 with a projected population increase of 21 percent by 2024. The hospital within the district of Mission is Mission Memorial Hospital. Mission Memorial is integrated with the community support providing care for home health, public health, mental health and substance use, and residential and hospice care. The closest regional hospital is the Abbotsford Regional Hospital and Cancer Centre (ARHCC), which provides secondary acute care for local residents. Mission has a Community Mental Health Office which allows those who suffer from mental illness to have access to various programs and support, like the Mental Health and Substance Use Centre (Fraser Health, 2016c). Mission Memorial recently opened a residence in 2014 for patients suffering serious mental health issues, also known as the Pleasant View Campus of Care. This residence provides assisted living care for those who have live with a mental illness, allowing them to have a place called home Campus of Care offers a variety of services and programs available for patients in Mission, some of which includes enhanced mental health and substance use services, the Psychosis Treatment and Optimization Program (PTOP), and outpatient rehab services (Fraser Health, 2016a).

Mission is policed under contract with the RCMP for municipal policing (Mission RCMP, 2015). There is also a provincial policing component to the detachment. Currently in the Mission detachment, there are 48 municipal and 6 provincial members (Mission RCMP, 2015).

**New Westminster**

New Westminster, with a population of 69,860, is expected to grow by 18 percent by 2024. New Westminster's Royal Columbian Hospital (RCH) is a regional centre for several highly specialized services, acting as a referral centre for patients from community hospitals requiring higher levels of care. Because of RCH, New Westminster has a disproportionate number of specialists per 100,000 people (330 versus the Fraser Health average of 62). The RCH psychiatry program, in conjunction with the Tri-Cities and New Westminster Mental Health Centres, has introduced a new Integrated Transition of Care Team which provides enhanced support for individuals who have been discharged from hospital into the care of their community and mental health centre. Over the next three to five years, RCH also plans to develop a Psychosis Treatment Optimization Program, which will provide enhanced mental health and substance use services, as well as redeveloping the Sherbrooke building for acute inpatient and outpatient mental health and substance use services (Fraser Health, 2016a).

Policing in New Westminster is provided by an independent police department, the New Westminster Police Department (NWPD). With an authorized strength of 108 officers, NWPD has two mental health liaison officers, receiving around 80 to 150 referrals per
month from patrol officers. Similar to RCMP mental health liaison officers, NWPD assists clients in connecting with appropriate community resources, as well as liaising with local hospitals and Fraser Health, helping to aid in communication between organizations and assist clients in accessing care (Dobie, 2016).

**Port Coquitlam**

Port Coquitlam has a 56,342-person population, with expected growth of 24 percent by 2024. The Tri-Cities Mental Health Office, located in Port Coquitlam, offers a range of services for persons with mental health issues, including short-term assessment, treatment, crisis intervention, group therapy, and after-hours mental health support (Redbook, 2016). Additionally, Fraser Health has indicated that they will be opening 26 residential care beds for mental health clients at Nicola Lodge in April 2016 (Fraser Health, 2016).

**Port Moody**

Port Moody, with a population of 34,709, has the highest average family income of all the municipalities in Fraser Health. Port Moody’s local hospital, Eagle Ridge, also serves the cities of Coquitlam and Port Coquitlam. Port Moody does not have its own mental health office, however, rather the city shares the aforementioned Tri-Cities Mental Health Office. Port Moody is policed by a municipal police force, the 51-member Port Moody Police Department (PMPD). Of all Fraser Health municipalities, Port Moody has the lowest rate of reported crime, and the smallest number of cases per officer. Like other communities in Metro Vancouver, Port Moody had been experiencing an increase in the number of calls for service that included a mental health component in recent years. To combat this issue, PMPD announced in 2015 that they would be introducing an officer dedicated to helping people with mental health issues (Port Moody Police Department, 2015). This move is in line with the emerging trend in policing.

**Surrey**

Of the municipalities encompassed by Fraser Health, Surrey is the largest both in terms of population and geographic size. With an estimated population of 513,619 residents in 2011, Surrey’s population growth is projected to reach 630,120 by 2026 (City of Surrey, n.d.) To keep up with increasing demand, Surrey Memorial Hospital opened a new Emergency Department in 2013 and a Critical Care Tower with five floors of additional patient beds in 2014 (Fraser Health, 2016).

**Quibble Creek Detox**

Surrey provides the location for the only in-patient detoxification centre in the Fraser Health Authority, with 20 male and four female beds at Quibble Creek Detoxification Centre. Quibble Creek provides a temporary environment for people to sober up safely, up to a maximum stay of 23 hours. The centre accept self-referrals and processes intake of clients around the clock, but is exclusively for those who are not experiencing symptoms of withdrawal from drugs or alcohol, are not combative or aggressive, and do not require acute medical or psychiatric treatment (Redbook, 2016).
Car 67 Program
Surrey is policed by the largest RCMP detachment in Canada with 703 officers, five district offices and one main office. Despite having the largest police force in the Fraser Health Authority, Surrey also has the highest rate of crime and the heaviest caseload per officer outside of the Fraser Valley.

One of Surrey's unique features is the Car 67 program, a partnership between the Surrey RCMP and Fraser Health. Car 67, which began in 2001, is a team of a uniformed RCMP officer and a clinical nurse specializing in mental health that respond to calls involving mental health issues (Surrey RCMP, 2015). Car 67 provides on-site crisis intervention, mental health assessments, as well as referrals to mental health centres, addictions services, and counselling services. In 2014, Car 67 received over 1800 calls for service, conducting over 600 client assessments. Due to its success, the program has now become a model for other RCMP-policed communities in B.C., including both Kamloops and Prince George.

Assertive Community Treatment (ACT) Team
Fraser Health also offers an outreach mental health service called the Assertive Community Treatment (ACT) Team. ACT provides flexible, community-based support for adults living in Surrey with serious and persistent mental illness who have not responded well to traditional outpatient services. ACT's team is multidisciplinary, with services offered ranging beyond the traditional addictions counselling and psychiatrists to life skills support, grocery shopping, social and recreational events, and employment opportunities. ACT has received “substantial empirical support” for its work in facilitating community living and rehabilitation for this population of seriously mentally ill persons (Fraser Health, 2012).

White Rock
White Rock has a population of 19,197 expected to grow 15 percent by 2024. With an average annual family income of $84,120, White Rock is one of the wealthiest communities in the Fraser Health Region and has one of the highest rates of physicians per capita. Peace Arch Hospital, located in White Rock, houses the White Rock/South Surrey Mental Health and Addictions Office, which offers a range of community programs for persons with mental illness including community support, crisis intervention, concurrent disorders services, and after-hours mental health support (Redbook, 2016).

White Rock is policed by the White Rock RCMP, a small 23-member detachment that received a reported 240 mental health-related files in 2015 (White Rock RCMP, n.d.).

Transit Police
Another police force within the Fraser Health Authority are the Transit Police. A unique policing service, the 167-member South Coast British Columbia Transportation Authority Police Service, known colloquially as the Transit Police, are the only multi-jurisdictional police force in British Columbia. Tasked with providing “seamless” policing and security on
the transit system, Transit Police offer supplemental police services to the 22 municipalities in Metro Vancouver serviced by TransLink (including buses, SkyTrain, the Canada Line, SeaBus, and West Coast Express).

According to Transit Police’s 2014 Annual Report to the Community, Transit Police encounter an increasing number of vulnerable people with mental illness, up from 1464 files in 2013 to 2157 files in 2014 (a 47 percent increase). For 2014, one of the Chief’s four stated priorities was “helping vulnerable people in crisis,” and in achieving this, Transit Police have created strategic partnerships with Police Mental Health Liaison Officers, health teams, and community organizations across Metro Vancouver (TransLink, 2014, p. 17).
## Appendix B: Community Statistics

<table>
<thead>
<tr>
<th>City</th>
<th>Population</th>
<th>Average family income</th>
<th>Average family income (post-tax)</th>
<th>Unemployment Rate</th>
<th>Physicians Per Capita (100,000)</th>
<th>Specialists Per Capita</th>
<th>Avg Life Expectancy</th>
<th>Authorized strength</th>
<th>Pop. / Officer</th>
<th>Total CCC Offences</th>
<th>Crime Rate per 1000 residents</th>
<th>Case Load / Officer</th>
<th>Policing Cost / Capita</th>
</tr>
</thead>
<tbody>
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<td>Abbotsford</td>
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<td>$77,409</td>
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<td>86</td>
<td>69</td>
<td>81.8</td>
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<td>636</td>
<td>7971</td>
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<td>$308</td>
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<td>4</td>
<td>341</td>
<td>409</td>
<td>106</td>
<td>63</td>
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<td>$73,929</td>
<td>7.4%</td>
<td>83</td>
<td>61</td>
<td>83.4</td>
<td>277</td>
<td>779</td>
<td>14762</td>
<td>63</td>
<td>49</td>
<td>$218</td>
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<td>Chilliwack</td>
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<td>$69,783</td>
<td>$69,783</td>
<td>6.3%</td>
<td>107</td>
<td>46</td>
<td>80.5</td>
<td>107</td>
<td>728</td>
<td>8904</td>
<td>104</td>
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<td>$81,089</td>
<td>7.2%</td>
<td>72</td>
<td>22</td>
<td>83.4</td>
<td>152</td>
<td>871</td>
<td>8012</td>
<td>57</td>
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<td>$91,983</td>
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<td>21</td>
<td>83</td>
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<td>582</td>
<td>5267</td>
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<td>$59,853</td>
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<td>13</td>
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<td>136</td>
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<td>Maple Ridge</td>
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<td>$76,423</td>
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<td>330</td>
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<td>Pitt Meadows</td>
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<td>$80,397</td>
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<td>43</td>
<td>80.6</td>
<td>22</td>
<td>778</td>
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<td>Port Coquitlam</td>
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<td>$80,237</td>
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<td>72</td>
<td>22</td>
<td>83.4</td>
<td>67</td>
<td>831</td>
<td>4095</td>
<td>68</td>
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<tr>
<td>Port Moody</td>
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<td>$92,194</td>
<td>7.1%</td>
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<td>22</td>
<td>83.4</td>
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<td>667</td>
<td>1040</td>
<td>30</td>
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<td>$79,873</td>
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<td>800</td>
<td>1184</td>
<td>62</td>
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<td>$237</td>
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</tbody>
</table>

*Data retrieved from Fraser Health Community Profiles and Police Resources in BC, 2014.*
Appendix C: s.28 Mental Health Act Apprehension Flow Chart

1. Mental health/substance use report made to the police for a subject of complaint (SOC) in crisis
   a. SOC has committed a serious criminal offence
      Result: Processed as an offender
   b. SOC is behaviour is caused primarily by substance use
      Result: Transferred to appropriate facility
   c. SOC does not fit involuntary apprehension criteria
      Result: SOC are left as they were or left in the care of family/friends

If a-c are not fulfilled, and police establish the grounds exist for a s.28 apprehension under the BC Mental Health Act

6. Client is advised of reason for a s.28 apprehension and their charter rights may be read. Police decide if handcuffs are needed and prepare for transportation

2. Report is made and is dispatched to available officer, involving as much background information and security checks as possible

5. On basis of information provided on the SOC, police determine the next course of action
   Three non-exhaustive options:

3. Police attend scene; talk to witnesses/family etc. if no immediate safety concerns and they are available

4. Police speak with subject of complainant if they are able to be located

8. Police take SOC through triage for screening and wait until called into the ER for medical clearance

7. Transport SOC to hospital via police or paramedic services (accompanied by police)

9. SOC brought before psych/ER nurse for initial mental health check, gather history, etc.

11. Police turn SOC over to the care of physician (patient is certified)
    Result: Police leave and write up report in PRIME

10. Police wait with SOC until they are seen by ER physician

12. Patient has more tests and is admitted for treatment or they are released from hospital

Legend:
Red - Initial police investigation, Green - Decision-making, Blue - Hospital/ER