How Far Do They Go?: A Spatial Examination of Missing Persons from Hospitals

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ABSTRACT

Missing person cases are a global issue impacting policing. Among these, those who abscond from hospitals are especially concerning because these reports require collaboration across services, often strain already limited police and hospital resources, and present an elevated level of possible harm due to the high prevalence of mental illness, disability, and/or addiction. Despite this, to date, there has been a lack of scholarly attention on this phenomenon from a policing perspective. The present study aims to fill this gap by exploring how far missing hospital patients travel and where they are commonly found. Using a sample of 731 closed case files (2014-2018) from one police service, we identify spatial behaviour patterns specific to this group of missing persons. Results suggest that most do not leave the hospital grounds or stay within a 5-kilometer radius. Others were found close to the hospital and within city limits and returned of their own volition. By identifying these spatial behaviour patterns associated with missing hospital patients, police can refine probable search areas, allocate resources more efficiently, find the missing faster, and develop better-informed responses and policies.

Keywords: Missing Persons; Police Investigations; Human Geography; Spatial Analysis

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Introduction

The origins of missing person incidents concentrate within and around a small proportion of spaces and places. Many police reports of missing individuals disproportionately originate from institutional locations, such as hospitals, group homes, mission centres, and shelters (Bartholomew, Duffy, & Figgins, 2009; Parr & Stevenson, 2013; Hayden & Shalev Greene, 2018; Ferguson & Huey, 2020; Ferguson, 2021). As a result, calls for police service to locate persons from such places hold the potential to draw upon and drive a sizable proportion of policing resources (Hayden & Shalev

Greene, 2018; Huey, Ferguson, & Kowalski, 2020). In the broader literature examining other occurrences similarly impacting policing (i.e., mental health-related service calls), recognizing the rise of austerity policing and dwindling police resources but increasing and expanding service demands has led police and researchers alike to investigate how police efficiency and effectiveness can be maximized when responding to significant service calls (Huey, Cyr, & Ricciardelli, 2016; Shore & Lavoie, 2019; Huey et al., 2020; Koziarski, 2020). In the sphere of missing persons, one way to achieve these aims is to focus upon those locations that disproportionately drive police reports and resources.

A critical way to concentrate on specific locations is with spatial analysis. First, investigating the spatial behaviour patterns of missing individuals from places representing significant drivers of police service calls is likely to assist police with the construction of refined and probable search areas, leading to the timelier location of missing persons and thus, increasing the likelihood of finding these persons safe and unharmed (Shalev et al., 2008; Rossmo, Velarde, & Mahood, 2019). Second, identifying the spatial behaviour patterns can also be helpful for police to reduce the number of resources allocated to, and the strain associated with, search and investigation efforts for missing person cases that originate from institutional locations. For example, this can occur through directed and informed response efforts. Similarly, such research provides evidence that can better inform strategies aimed at preventing and reducing missing incidents from these locations. Next, given that many cases originate from hospital settings (Hayden & Shalev Greene, 2018; Ferguson, 2021), there would be an incentive on the part of the police to increase collaboration and partnerships with hospitals to reduce these calls for service and empower hospitals to attenuate missing person occurrences within their grounds and care. In this way, such attention can bridge successful collaborations to strategically address the issue of missing persons from these places with sector-specific knowledge, training, and expertise, which assists in improving police efficiency and effectiveness. Lastly, targeting such distinct locations presents an opportunity to provide a range of protective strategies for individuals at risk of going missing from such places (Hayden & Shalev Greene, 2018; Ferguson & Huey, 2020).

In light of this, the objective of the present study is to examine how far individuals reported missing from a hospital setting travel before being found. While there is a need to examine all identified institutional locations that persist as significant contributors to police missing person reports (like group homes and mission centres), this study serves as the first attempt at doing so and beginning to address the

prevalence of missing reports from such location types. To this end, our research represents the first empirical investigation into missing persons from hospital settings through a spatial perspective. To do so, we draw upon police closed missing person case files from over a five-year period from a Canadian municipal police service. Through descriptive statistical and spatial analyses, we determine the distance between the hospital a given individual was reported missing from and the location of where they were eventually found. We then discuss the implications of our findings and present areas for future research. To begin, the following section first situates this study within the body of literature.

Literature Review

The Scope of Missing Persons

Millions of people across the globe are reported missing each year, thus resulting in not only increased attention given to this phenomenon but also a growing recognition of a need for research on missing persons (Shalev, Schaefer, & Morgan, 2008). In Canada, it is noted that there are approximately 70,000 to 100,000 missing person cases reported every year (Canada's Missing, 2020; CCIMA, 2012; Ferguson & Soave, 2020); Australia documents around 40,000 (Wayland & Ferguson, 2020); the United States (U.S.) police records about 600,000 (FBI, 2020); and the United Kingdom (U.K.) reports over 300,000 (U.K. Missing Persons Bureau, 2017). Despite these elevated numbers, there is a lack of research examining missing persons. Existing literature on missing persons is often outdated and largely consists of basic descriptive and demographic data – such as age and number of days missing – risk, and/or fatal outcomes, thus leaving several gaps needing to be addressed and situated within a contemporary context (Shalev et al., 2008; Petonitio et al., 2012; Harris & Greene, 2016; Huey, 2019).

Of the few studies generated on this issue to date, it can be said that in most cases, persons reported missing will return of their own volition, with common locations found being their home or neighbourhood (Cohen, McCormick, & Plecas, 2008; Huey, 2019; Huey & Ferguson, 2020). Others will be located by police, family, and/or friends through search and rescue efforts (Huey, 2019; Ferguson, Gaub, & Huey, 2021). Much less frequently, they will be victims of foul play, self-harm, accident, misadventure, or will not be found (Cohen et al., 2008; Huey, 2019). While such worst-case scenarios fuel the public imagination and drive public policy and policing responses, it is important to remember that these are, statistically speaking, rare cases. Instead, missing persons are more likely to be located alive and reasonably well (Huey &

Ferguson, 2020). Further, missing persons are typically located within a brief period of time – usually within a day or up to a week of being reported as missing (Payne 1995; Shalev et al., 2008; Canada's Missing, 2020). For instance, Canadian figures show that of the 60,000 or so missing person cases in 2020, 61-63% of missing cases were concluded within 24 hours, and 89-92% were located within a week (Canada's Missing, 2020).

Missing Persons and Hospitals

Persons disappearing from hospitals and being subsequently reported missing to the police is an issue impacting policing known to involve complexity and high police resource demands. First, existing literature highlights that missing persons from hospitals is a substantial problem in and of itself due to the variety of related factors and actuating and contributing mechanisms. Many studies report a range of antecedents and risk factors related to going missing from these locations, such as being a vulnerable person (Welch, 2012; LePard et al., 2015; Puzyreva & Loxley, 2017; Sowerby & Thomas, 2017; Ferguson & Huey, 2020), having mental health issues (Biehal et al., 2003; Stevenson et al., 2013; Holmes, 2017; Ferguson & Huey, 2020; Ferguson, 2021), substance use issues (Shalev Greene, 2011; Ferguson & Huey, 2020; Ferguson, 2021), and an array of medical conditions/dependencies (Cohen et al., 2008; Ferguson & Huey, 2020; Ferguson, 2021). Research has also found that the phenomenon of 'going missing' from hospitals is distinctly gendered and age-related, with the most at-risk groups from this place type being youth, teenagers, and elderly persons, along with females (Bowers, Alexander, & Gaskell, 2003; Muir-Cochrane & Mosel, 2008; Ferguson & Huey, 2020; Ferguson, 2021). This range of related factors suggests that particular people and groups are more likely to go missing from these location types, and specific influences add additional complications and nuances to such cases. These matters often render these police service calls high-risk (i.e., by way of police risk assessment) due to increased chances of harm and victimization during missing occurrences, coupled with the variety of states and capacities persons are in when missing from hospitals (Hayden & Shalev Greene, 2018; Huey & Ferguson, 2020; Ferguson, 2021).

Second, missing persons from hospitals have been found to frequently go missing multiple times. Existing studies document that persons disappearing from hospital locations commonly do so anywhere from one to well over one hundred times (Muir-Cochrane et al., 2011; Shalev Greene & Pakes, 2013; Sowerby & Thomas, 2017; Hayden & Shalev Greene, 2018; Huey et al., 2020). For example, Sowerby and Thomas

(2017), Australian scholars examining the linkages between missing persons and mental health service use, documented that people reported missing from hospitals go missing on average six times, with one individual being reported missing to the police around 130 times alone. These findings were mirrored in a recent study by Huey and colleagues (2020) in the Canadian context that found that missing individuals from hospitals ranged from one to 134 police reports, with one individual going missing 112 times from a hospital location in their sample. The significance of this pattern is that persons who disappear from hospitals often do so multiple times cannot be understated, particularly given the range of contributing factors and mechanisms discussed above. For example, multiple missing reports have been documented as adding to a person's increased risk of experiencing and exposure to harm, such as overdoses, assaults, sexual and physical assault, and self-harm when missing (Crammer, 1984; Niskanen et al., 1974; Muir-Cochrane & Mosel, 2008; Hunt et al., 2010; Ferguson & Huey, 2020).

Finally, these convolutions can exacerbate the many issues police face related to these cases, such as individuals being under the influence of substances or at-risk of dying by suicide and so may need medical attention, and can, therefore, increase the number of resources needed to resolve these cases. In other words, given the risky nature of these incidents, the complexities and nuances, and the multiple calls for service for the same or similar people, police resources can become strained as they respond on a case-by-case basis to meet the challenges each report presents. However, one notable consideration is that, through gathering intelligence about missing persons activities, behaviours, and associates, the incidence of missing and offending behaviour is proven to decline (Hayden & Shalev Greene, 2018). This is particularly relevant to institutional locations as such places are significant drivers of police missing person service calls (Ferguson & Huey, 2020; Ferguson, 2021). Specifically, there is a need to provide research evidence on where missing persons go, how far they travel, and where they are found related to institutional locations to better inform police responses and policies. This, and the previously mentioned issues, contributing factors, and potential resource strains, brings about a need to analyze the spatial behaviours of persons reported missing from hospitals.

Spatial Behaviours of Missing Persons

Literature specific to the spatial behaviours of missing persons indicates that many missing individuals are found at the very location where they went missing from – whereas others can travel abroad. For example, Biehal and colleagues (2003), who

completed a landmark study exploring missing children and adults in the U.K., found that 10% of missing adults stayed in the same town, 22% travelled abroad, and 45% moved to another region or country. Additionally, this study discovered that, while away, most adults stayed in one place (60%), whereas 9% moved around more than three times. Shalev et al. (2008), who similarly examined missing individuals across the U.K., discovered that 40% returned to the location where they went missing and that 41% were found abroad. Additional U.K.-based research suggests that most missing persons are found within fifty miles from where they went missing (Shalev, Schaefer & Morgan, 2009).

Another group of missing persons commonly studied in relation to spatial behavioural patterns is those classified as 'wanderers.' This group is primarily composed of individuals with diminished cognitive capacity and who are elderly in age. Findings specific to the spatial behaviours of missing persons living with dementia suggest that they typically take the path of least resistance when they wander or abscond. More specifically, studies have identified many were found close to or on roads, in large bushes, and creeks or drainage systems (Koester & Stooksbury, 1995; Harrington, Brown, Pinchin, & Sharples, 2018). In a U.S.-based retrospective study, Koester and Stooksbury (1995) discovered that missing persons living with dementia were typically found within a mile of their place last seen. As a result, recommendations were offered that when looking for persons with dementia, searchers should modify their strategy to involve a mile and a half radius and in dense brush or creeks (Koester & Stooksbury, 1995; Petonitio et al., 2016). These findings represent the usefulness of research on the identification of spatial behaviour patterns to assist with the development and refinement of search efforts. Importantly, however, despite the array of contributing factors, high chances for harm and victimization, strains on police resources and repeated calls for service, no studies exist in the global field of missing persons that examines the spatial behavioural patterns of missing persons from hospital locations and do so from a policing perspective. As such, this study provides first insights on this matter to attend to this significant research gap.

Data and Methods

This paper draws upon a police data set of 9,021 closed¹ missing person cases originating in an urban city in Ontario, Canada² from 2014 through 2018. In addition to demographic information, these data contain the locations where individuals were last seen (or their residential addresses if the last seen location was unknown) and the locations where they were found. Thus, these data represent missing person cases that

have been resolved (i.e., located, returned, recovered). A total of 7,946 cases were removed at the onset as they did not have one of the five hospitals in the study jurisdiction as the last seen location, thus reducing our data set to 1,075 cases. The quality of the last seen data field, however, was less than ideal. Some cases provided the full address for the hospital, whereas others provided a partial address, the full or partial name of the hospital, or a room or floor number within the hospital.

Considering this, we opted to review each case manually. Cases that were determined to have not originated from one of the five hospitals in the city were deleted, while those that did were modified to display the full address of the hospital as the last seen location.

The quality of the location found data was similar in nature. For instance, some cases only had partial addresses or had incorrect address information (e.g., 'Drive' instead of 'Boulevard'), whereas others contained non-specific data, such as 'found in park.' Numerous found locations outside of the study jurisdiction also lacked specificity as they were solely coded as found in the city they were in, without a specific address (e.g., 'found in Toronto'). All found locations within the study jurisdiction were also carefully reviewed, and modifications were made where required so that each location reflected the full address. At this stage, 344 cases were removed due to a lack of a found location (i.e., missing data) or having a non-specific location (e.g., 'found on sidewalk'). This resulted in a final sample of 731 cases with suitable information for geocoding and analysis.

Each address for the last seen and found locations were geocoded through Google's Geocoding Application Programming Interface (API). Google's Geocoding API is a hybrid geocoding approach as it geocodes addresses to their respective rooftops and uses street interpolation to geocode in instances where rooftop data is not available (Roongpiboonsopit & Karimi, 2010a; 2010b). Due to the thorough front-end review of both last seen and found locations, all 1,462 addresses were geocoded without any errors.

For calculating the distance traveled for each case, we drew upon Google's Distance Matrix API. This API enables one to calculate the distance between two points through a variety of travel modes, such as driving, walking, bicycling, or transit. In other words, the API does not calculate the distance in a straight path – otherwise referred to 'as the crow flies' – but rather through a street network, pedestrian paths and sidewalks, bicycle paths, or transit routes³. By using this method, we are able to

generate more realistic distance calculations that reflect possible paths between last seen and found locations for missing person cases in our sample.

For the present study, we use Google's Distance API to calculate the distance between each location in 'drive' mode as opposed to the method which is most common among our sample – 'pedestrian' mode. This was done for several reasons. First, most sidewalks already run alongside existing street networks, and in instances where there is no sidewalk, it is plausible to assume that one could still walk along the side of the street. Second, pedestrian paths and sidewalks are not available in all places, meaning that the API may have returned inflated travel distances as a result of exclusively remaining on a path/sidewalk network (or calculations may have failed where there is no path/sidewalk between the two points). Third, 'drive' mode allows us to better account for any potentially large travel distances that would otherwise be infeasible or unlikely on foot. Finally, scholars have long drawn upon street networks in previous research to represent paths of travel for *both* vehicles and pedestrians (see, e.g., Groff, 2011; Groff & Lockwood, 2014).

Results

As displayed in Table 1, within our sample of 731 missing person cases, the maximum distance traveled is 722km with a median travel distance of 4.6km ($SD = 36.2\text{km}$)⁴. Regarding demographic information, our sample is also disproportionately composed of white individuals ($n = 576$; 78.8%) and males ($n = 445$; 61%). There appears to be slightly more variation within our sample along the dimension of age, but the majority is nonetheless composed of younger adults aged between 18 and 34 ($n = 417$; 57%). Despite the variance in the distance traveled by groups along the dimensions of race/ethnicity, sex, and age, most groups appear to have traveled a median distance between 4.2km and 4.8km. Only those under the 'Other' (5.2km) and 'Unknown/Missing' (6.7km) race/ethnicity categories, as well as those less than 18 years of age (6.7km), traveled a further median distance.

[TABLES 1 & 2 ABOUT HERE]

With respect to distance traveled, Table 2 shows that nearly a quarter of our sample traveled 0km ($n = 179$; 24.4%). This, again, does not necessarily mean that these cases did not leave hospital property at any point while they were missing, but that they were ultimately located on hospital property. Notably, 25.5% ($n = 187$) were located within a kilometer from their hospital, nearly 30% ($n = 217$) were located between 1km and 4.9km, and another 30% ($n = 217$) were located between 5km and 9.9km. In

total, our findings show that just over half of our sample of missing persons from hospitals ($n = 404$; 55.2%) were found within 5km of their hospital, and an overwhelming majority were found within 10km ($n = 621$; 84.9%), with few traveling further than that ($n = 110$; 15%).

[FIGURE 1 ABOUT HERE]

Figure 1 expands upon the above findings presented in Table 2 by disaggregating the distances traveled by race/ethnicity, sex, and age to further examine the spatial behaviour across missing individuals' distinct social groups. Within this visual presentation, each respective bar reflects the frequency of each subgroup within the respective distance bracket, whereas the percentage reflects the proportion from each subgroup that falls within the respective distance bracket. Beginning with race/ethnicity and consistent with the fact that those who are white comprise a large majority of our sample, this subgroup exhibits the highest frequencies across all distance brackets. However, the proportion of each race/ethnicity within respective distance brackets varies from bracket-to-bracket. More specifically, within the 0km distance bracket, while only 23.4% of white people are found within this distance, a higher proportion of Indigenous peoples (32.9%) are found at this distance. Black individuals, on the other hand, have a lower proportion found at this distance (21.6%). Shifting to the 1km-4.9km distance bracket, the proportions of those who are white (30.9%), Indigenous (27.1%), and Black (29.7%) are similar within this bracket. At the 5km-9.9km bracket, however, a much larger proportion of Black people (37.8%) are found within this bracket relative to white (29.2%) and Indigenous peoples (27.1%). Notably, given that a large majority of our sample was found within 10km from the hospital they were reported missing from, the frequencies and race/ethnicity proportions within the remaining distance brackets are very low. Interestingly, with the exception of 2.7% of Black people being found within the 35km-39.9km distance bracket, only white people were found between 15km and 34.9km, as well as between 40km and 49.9km. All races/ethnicities are represented in the 50km+ distance bracket, but the frequencies and proportions within this bracket are minimal.

Shifting to distances traveled by sex, it is clear that males--across all distance brackets, with exception to the 15km-19.9km bracket--have the highest frequencies within each distance bracket. This comes as no surprise given that our sample is nearly two-thirds male; however, it is interesting to note that in spite of the unevenness of our sample based on sex, the proportion of each sex within across distance bracket is similar. Take, for example, the 0km distance bracket. It is clear that

far more males are found within this bracket than females, but the proportion of each sex found within this bracket is identical: 24.5%. Again, as with the aggregated data presented in Table 2, the frequencies and proportions drop between 15km and 49.9km, with some brackets only being comprised of either sex.

Finally, with respect to age, given that those between 25 to 29 years of age comprise over a quarter of our sample, it is not unexpected that this age category has the highest frequency among the distance brackets under 15km. Interestingly, the proportion of each age category--particularly for the 0km, 1km-4.9km, and 5km-9.9km distance brackets--largely appear to be relatively in line with one another, with approximately one-fifth to two-thirds of each age category found within these particular brackets. There are, however, notable differences on this front. For instance, while only 5.3% of those less than 18 years of age are found at 0km--which is a significantly lower proportion than the other age categories within this distance bracket--a striking 57.9% of those younger than eighteen are found within the 5km-9.9km distance bracket, which, on the other hand, is a much higher proportion relative to the other age categories in this bracket.

[TABLE 3 ABOUT HERE]

[FIGURES 2 ABOUT HERE]

As may be suggested by these travel distances, Table 3 indicates that most cases were found within city boundaries ($n = 695$; 95%; see Figure 2). This means that few were found outside city boundaries ($n = 36$; 5%), but as Figure 3 points out, many were located in the city's vicinity and southern Ontario more generally. Only one case was found in another province (i.e., Quebec), and no cases were found outside Canada.

[FIGURES 3 ABOUT HERE]

Discussion

The present study provides an analysis of 731 closed missing person case files over the five-year period of 2014 to 2018 from a Canadian municipal police service. The purpose of this is to examine where persons reported missing from hospitals travel to and are found. As such, we visualize and analyze the spatial behaviour patterns of this selection of missing persons. By identifying and employing such patterns, police agencies can refine their search and investigation efforts to more probable areas. Ultimately, this can help with allocating police resources, concentrating police responses, and informing policy formation. In other words, police efficiency and

effectiveness, particularly with respect to resources, have the ability to be maximized. To achieve these aims, we focus on one institutional location type – hospitals – that represents a significant driver of police missing person occurrences. In other words, hospital locations are consistently associated with hotspots of reported missing persons. We conducted descriptive statistical and spatial analysis of all closed missing person files originating from this place type over five years. This study offers critical findings that build upon the existing (but limited) body of literature examining the spatial behaviour patterns of missing persons and contributes first insights on patterns specific to hospital locations.

One of the main results of this study is that missing person cases from hospital locations exhibit notable patterns of spatial behaviour. Specifically, while some missing persons are found at the location they were reported missing from, we find that most of those reported missing from one hospital location are, more often than not, found at another location. This is consistent with previous research, which shows that missing person cases more generally are often found in a location other than where they were initially reported missing (Biehal et al., 2003; Shalev et al., 2009). However, although most of our sample was found away from hospital grounds, an overwhelming majority of our sample was still found within city limits. These occurrences thus require local police resources to be available to locate missing hospital patients. Reasons for why patients left hospital grounds to travel to other places cannot be offered from this study. Thus, future research should consider *why* people reported missing from hospitals largely stay within city limits: Is it because they were drawn to the particular location they were found? Or because they perhaps lacked the means to travel further?

In terms of *where* within the city police resources would be required, we discovered that a considerable proportion of our sample did not travel far within the city from the hospital locations. More specifically, we found that just over half of our sample traveled 5km or less from their hospital location, with nearly 85% of our sample traveling less than 10km. This means that missing person cases from hospitals do not broadly disperse across the city but do so within close proximity. These findings suggest that missing people may exhibit similar spatial behaviour. For instance, previous research on missing persons with dementia similarly found that most of these individuals are found close to where they initially went missing from (Koester & Stooksbury, 1995). What this – and existing studies – however, cannot speak for is *why* this may be the case, suggesting that future research on the spatial behaviours of missing people from particular locations and what draws a missing person to the location where they were found is worthwhile.

These findings suggest that initiating search and investigation efforts outside the hospital location will likely influence a greater resolution of missing person cases from hospitals than on-the-grounds. Police can use such insights to help expedite the efficient, cost-effective, and safe location of missing persons. For instance, focusing police response efforts within the vicinity in which the majority of missing hospital patients travel to and are found (i.e., 5km from hospital address) provides probable bounds for allocating and concentrating police resources and demonstrates this is a gainful enterprise. In other words, police, when called upon to respond to missing hospital patients, could set up a search range featuring a 5km vicinity of the hospital for the initial, immediate, and targeted response efforts, with the following 5km thereafter being a secondary search area. By doing so, police can reduce the amount of time spent searching for these cases, assisting in finding the missing individual sooner. This is notable given the intersecting factors significantly present in these cases, namely increased chances of exposure to harm and the more substantial police resources often required for such reports (Hayden & Shalev Greene, 2018; Ferguson, 2021). Therefore, our findings can help police reach missing persons from hospitals sooner (and more likely before experiencing harm) and save valuable policing resources (e.g., money and time) with efficient and effective search and investigation radii if employed in practice and policy. This said, additional research is warranted from other locations known to represent significant drivers of police missing person reports, such as group homes, homeless shelters, and mission centers (Gibb & Woolnough, 2007; Shalev et al., 2009; Huey & Ferguson, 2020).

Our analyses also revealed interesting findings regarding the between-groups spatial behaviour of persons reported missing from hospitals. Specifically, this study shows that depending on the particular social grouping of the missing individual, the changes in the spatial patterns of missingness can be different, particularly when considering race/ethnicity. As described above, with exception to the 1km-4.9km distance bracket where the proportion of those who are white, Indigenous, and Black is relatively similar, a much higher proportion of Indigenous peoples are found at 0km relative to other race/ethnicity categories, and the same is true for Black individuals at the 5km-9.9km bracket. Above 15km, however, we almost exclusively found white people traveling longer distances before being found. When considering sex and age, on the other hand, few distinct patterns came to light. In terms of the former, despite males comprising a larger proportion of our sample, similar proportions of both males and females were found across distance brackets, with very few of either sex traveling further than 15km. The same can be said for all age groups. Interestingly though,

nearly 60% of those under 18 years of age were found within the 5km-9.9km distance bracket--a much higher proportion than any age bracket at any distance.

These findings, as a result, point to the fact that in order to better understand the spatial behaviour of missing persons, social grouping characteristics should be analyzed and considered. Doing so is especially pertinent for police response to missing persons as our findings illuminate differences in distances traveled before being found, particularly on the basis of race/ethnicity. Explanations for these findings cannot be offered from the current study, and the existing literature on the spatial behaviour patterns of missing people is so limited that conclusions cannot be drawn. Speculatively, such patterns may be related to risk and vulnerabilities (i.e., particular social groups being more at-risk when missing so police front-load resources and resolve cases quicker before they travel far), a number of social and health issues the social groups interact with affecting these incidents (e.g., differences in mental, physical, and cognitive capabilities affecting travelling), policing response to each case differing, and, ultimately, a slew of other potential reasons (Gibb & Woolnough, 2007; Shalev et al., 2009; Hansen & Dim, 2019; Doyles & Barnes, 2020; Ferguson & Huey, 2020; Ferguson, 2021). This points to the need for additional research unpacking the mechanisms impacting the spatial behaviour patterns of missing people, especially from hospitals. For example, given that some of the factors related to 'going missing' from hospitals locations include various mental, emotional, and physical issues and disabilities, understanding how far people that occupy these groupings and other possible relevant conditions travel to and are found would be useful to begin to understand any potential mechanisms affecting the spatial behaviour of missing persons from hospitals.

What *is* noted in the available studies is that missing people can be found at the location they went missing, or within their city, or the country, or even abroad (e.g., Gibb & Woolnough, 2007; Shalev et al., 2009; Parr & Fyfe, 2013; Fyfe et al., 2015; Parr et al., 2015). In other words, the body of literature does not offer discriminating findings with valuable insights to direct police response (i.e., radii development, targeted areas) but instead discusses all eventualities for missing occurrences in terms of found locations. Given this, additional work is needed, particularly with respect to understanding *why* people travel in particular ways to particular spaces and also regarding any potential influencing factors on missing persons' spatial behaviour. Indeed, the point being made is that this first exploratory study, along with the existing literature, highlights the need for more studies undertaking spatial analyses on missing persons to inform policy and practice. Given that this study contributes to the

limited body of literature indicating that missing persons *are* spatially distributed in particular ways, future research should thus seek to contribute to this field and build an evidence base of information to establish patterns that the police and other health and social services – specifically, in this case, hospitals – can draw from to begin to develop and refine potential search areas, focused and triaged search and investigation efforts and appropriate policy for missing occurrences from hospital locations.

Limitations

As with all research, our paper, however, is not without limitations. Principally, as discussed earlier, the quality of our data was less than ideal. The location information for many of our cases needed to be manually cleaned, with other cases having absent or incomplete location information, which resulted in their exclusion from our analysis. Other data limitations were present relating to the variables available for analyses that restricted our research, such as the history of the missing individual (i.e., repeat vs. first-time occurrence) and probable cause explanations (i.e., reasons why the person went missing and was found at a particular location). Our limitations are consistent with previous research that examined the travel distance of general missing person cases where it was emphasized that the lack of information documented within missing person reports presents a particular problem (Shalev et al., 2008), as well as broader police missing persons data restrictions (Duncan, 2020; Ferguson & Picknell, 2021).

The data used for the analyses presents an additional limitation as the cases only involve those located, returned, or resolved. This means that our study is also absent of information on the spatial patterns of open, cold, and long-term missing persons (i.e., unfound individuals). This data choice was necessary to extract information on the locations found, but such details are therefore excluded from our insights drawn. Our limitations speak to a need for improving the quality of data by paying attention to the collection of information about locations, especially locations found, whenever possible, such as noting exact locations found. To that end, the general argument for more detailed intelligence gathering about missing persons' activities can be made because, as our study notes, it can assist in allocating police resources effectively and efficiently. Thus, efforts must be made for increasing the scope and quality of information gathered on missing persons' activities to address such data limitations. While this is emphasized, it is also understood that there are issues with gathering data from the end of the police (e.g., problems with gathering information from the

missing individual via interviews and phone calls) (Pfeifer, 2006; Huey 2019; Epstein, 2021).

Conclusion

This study contributes to the limited body of literature on the spatial behaviour patterns of missing people by examining where missing people were located concerning missingness from hospitals. We highlighted areas for future research. We also discussed potential search areas that could assist police and hospital partners in their response efforts to manage persons disappearing from such locations. With this, there is the chance of locating persons reported from these locations quicker, thus increasing the chances of being found in a better condition and lessening the risk of harm.

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Tables and Figures

Table 1. Sample and Demographic Descriptive Statistics

	N	Min. (km)	Max. (km)	Mean (km)	Median (km)	SD (km)
Total Sample	731	0	722	10.2	4.6	36.2
Demographic Characteristics	n (%)	Min. (km)	Max. (km)	Mean (km)	Median (km)	SD (km)
<i>Race</i>						
White	576 (78.8)	0	198.0	9.3	4.6	25.4
Indigenous	70 (9.6)	0	181.0	10.3	4.2	28.4
Black	37 (5.1)	0	127.0	8.5	4.7	21.0
Other	35 (4.8)	0	722.0	25.5	5.2	121.2
Unknown/Missing	13 (1.8)	0	108.0	13.3	6.7	28.8
<i>Sex</i>						
Male	445 (61.0)	0	722.0	11.4	4.6	42.6
Female	286 (39.1)	0	191.0	8.4	4.6	23.4
<i>Age</i>						
Less Than 18	19 (2.6)	0	52.2	8.6	6.7	10.8
18-24	109 (14.9)	0	722.0	14.4	4.3	70.6
25-29	188 (25.7)	0	198.0	10.6	4.4	30.3
30-34	120 (16.4)	0	182.0	8.6	4.5	23.0
35-39	93 (12.7)	0	96.9	6.1	4.5	13.2

40-44	47 (6.4)	0	164.0	10.6	4.8	28.1
45-49	34 (4.6)	0	38.5	6.6	4.9	6.9
Older Than 50	123 (16.8)	0	191.0	11.7	4.7	32.5

Table 2. Distance Traveled

Distance Traveled (m/km)	Frequency	%	Cumulative %
0 m	179	24.4	24.4
0.1m - 99.9 m	0	0.0	24.4
0.1 km - 0.9 km	8	1.1	25.5
1 km - 4.9 km	217	29.6	55.1
5 km - 9.9 km	217	29.6	84.7
10 km - 14.9 km	71	9.7	94.6
15 km - 19.9 km	4	0.5	95.1
20 km - 24.9 km	1	0.1	95.2
25 km - 29.9 km	2	0.2	95.4
30 km - 34.9 km	1	0.1	95.5
35 km - 39.9 km	3	0.4	95.9
40 km - 44.9 km	1	0.1	96.0
45 km - 49.9 km	2	0.2	96.2
50 km +	25	3.4	100.0
Total:	731	100	

Note: 01.m-99.9m is included here as a distance bracket to: (1) show that no individuals were found in the areas immediately adjacent to the hospitals; and (2) provide a more gradual transition between meters and kilometers.

Figure 1. Frequency and Proportion of Distances Traveled, by Race/Ethnicity, Sex, and Age

Table 3. Locations Found

Location Found	Frequency	%	Cumulative %
Within City Boundaries	695	95	95
Outside City Boundaries	36	5	100
Total:	731	100	

Figure 2. Locations Last Seen and Found within Study Jurisdiction and Immediate Area

Figure 3. Locations Found Outside of Study Jurisdiction, Ontario & Quebec, Canada

Footnotes

1. 'Closed' missing person cases are those that have been successfully located or returned, or a body or human remains were recovered. This means that these data do not account for open files of unfound individuals (i.e., cold/long-term missing person cases). [↵](#)
2. Location has been anonymized as per a Memorandum of Understanding (MOU) with the police service from which these data were obtained. [↵](#)
3. See: https://developers.google.com/maps/documentation/distance-matrix/intro#travel_modes. [↵](#)
4. In light of the long distances traveled by some of the individuals in our sample, our data is unsurprisingly skewed. As such, where necessary, we report the median in lieu of the mean. [↵](#)