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Risk factors and missing persons: advancing an understanding of 'risk'

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This study seeks to advance an understanding of 'risk' for persons going missing—a phenomenon also known as missingness. There is a need to clarify terms used to describe correlations or statistical associations between variables that are identified as risk factors for missing person incidents to understand the mechanisms influencing this phenomenon. Without such research, policies and preventative strategies cannot be adequately offered to begin to reduce missingness. To do so, a review is first provided of the current risk factors identified internationally for missing persons. Then, the Kraemer and colleagues (Arch Gen Psychiatry 54:337–343, 1997; Kraemer et al., Am J Psychiatry 158:848–856, 2001) risk factor classification system and MacArthur framework are applied to the risk factors to identify the ways in which these may be overlapping, proxy, mediating, and/or moderating factors. This clarification on risk terminology attempts to offer a common language for communicating about risk factors associated with missing persons. Suggestions are then provided for how these factors may overlap and/or work together to form risk pathways. The application of this framework highlights that 'going missing' may have multiple risk pathways that transgress the current risk factor categorical boundaries. The article then concludes that consistent use of terms and additional research on risk factors will enhance investigations of missing persons and understandings of low- and high-risk groups.

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Introduction

Missingness, or the phenomenon of 'going missing,' has endured as a significant social issue across the globe for decades. Despite this, scholars have historically paid little attention to this phenomenon (Ferguson and Soave, 2021). Recent research has attempted to understand missingness by studying a number of correlating factors, termed 'antecedents' and/or 'risk factors,' that are said to be influencing mechanisms preceding and/or contributing to missing episodes (Taylor et al., 2014; Kraemer et al., 1997). For example, in a Canadian context, Kiepal and colleagues (2012) examined who is at risk of going missing based on the concept of social exclusion to explore how to prevent individuals from going missing. In their study, the following groups emerged as disproportionately represented among Canadian missing person reports: disadvantaged youth, Indigenous peoples, women, those not in the labour force, homeless people, and those who are unemployed. The authors subsequently argued that the people who occupy these categories are at high risk of going missing (Kiepal et al., 2012).

International literature on missing persons has also uncovered several risk factors, risk markers, antecedents, or causes (different terms used interchangeably, albeit inconsistently, in the missing persons risk literature) that indicate which individuals are more likely to go missing. The focus in previous research has predominantly been on uncovering various demographic and psychopathological factors that place an individual at high risk for going missing to reduce and prevent these incidents through risk assessments and targeted interventions (e.g., Bonny et al., 2016; Hayden and Shalev-Greene, 2016; Hirschel and Lab, 1988; Muir-Cochrane et al., 2011; Sowerby and Thomas, 2017). Some scholarship has attempted to account for the social and environmental impacts, classified as 'push' and 'pull' factors, that may influence a missing event (e.g., Tarling and Burrows, 2004). These researchers argue that combining the attributes affecting missingness (the 'push' and 'pull' factors) and the missing persons' level of risk can help with developing a standardized checklist for a missing person police investigation in terms of how responses to these cases can be focused and triaged (Tarling and Burrows, 2004). Altogether, the recognition that some people and/or case types may be more likely to go missing has elucidated many factors that are said to contribute to missing person events.

Nevertheless, the limited amount of literature examining the risk for missingness is rife with unfocused results. Some scholars find evidence for some risk factors in certain studies, and others fail to support the same risk factors in additional studies. These findings are, therefore, convoluted across the risk literature on missing persons, which inhibits the development of clear and informed procedures, plans, and policies regarding this matter. Additionally, the emphasis in empirical literature presently places the risk factors said to influence the phenomenon of 'going missing' as fixed objects in time and place. Mainly, there is evidence that the linkages between risk factors and missingness can vary depending on the particular population under study or as a function of other study attributes, such as location (Kraemer et al., 1997; Vogt et al., 2007). Thus, it is becoming increasingly apparent that there is no "magic bullet" or universal explanation that provides evidence for who will and will not go missing, nor for low- and high-risk groupings. Problematically, there is currently no research addressing the limitations above. Therefore, the dynamic processes and mechanisms that influence missingness are excluded from the conversation. Yet, by examining these factors in the context of all the others and applying concepts that account for the dynamicity, the complexities of these cases could be attenuated, and the mechanisms more fully understood.

The current approach to understanding this matter has consequences for missing persons reports are handled by the police, who are often the first to be called upon to locate missing individuals, as well as for social and public policy development. To expand on this, while the identified risk factors related to missingness can be informative, the current body of literature lacks clarity and connections across these factors to establish low- and high-risk groups for directing risk assessments and prevention measures for police. For example, identifying a range of independent predictive variables that places one at risk for going missing negates the potential pathways through which these factors may influence the outcome (i.e., how risk factors work together, overlapping risk factors, and pseudocorrelations/proxy risk factors). This approach also fails to account for the limitations researchers often face in their ability to draw conclusions from study findings (i.e., limited to a specific population, time, and/or place). Thus, prevention and reduction efforts aimed at those classified as at risk for going missing through risk factors require refining, and there is a need to organize any factors into coherent conceptual models that address the common risk factors for missing person incidents.

Interestingly, however, some investigators have pointed to the potential interrelatedness of risk factors, suggesting that there may be an awareness of the overlapping, intertwined nature of these factors (Huey, 2019; Kiepal et al., 2012; Pearce, 2013), despite the absence of literature making the necessary connections. The previous example offers one such instance of this. Kiepal et al. (2012, p. 137) further noted that "people occupying the intersections of multiple high-risk categories are at particularly high risk of being reported missing." What this statement represents is the acknowledgement that those placed within a high-risk grouping, such as disadvantaged youth or Indigenous peoples, can encounter multiple avenues of risk, so risk factors may not be singular variables but instead can coincide and be interconnected. Yet, few studies have examined or used analytic procedures to identify interactions between risk factors that may reflect distinct risk pathways. This limitation is not specific to missing persons research but instead has been noted across other fields when examining risk factors (e.g., Willson and Shuey, 2016; Masten and Narayan, 2012). The absence of such research can result in conclusions that may be misleading (Willson and Shuey, 2016). Thus, there is also a need to explore the potential application of risk pathways for missingness.

The current study

Considering these limitations and gaps, this research attempts to provide a common language for communicating about risk factors for missingness and outline how these risk factors may overlap and/or work together[1]. Throughout, this paper will reason that going missing may be unlikely to have a single cause, trigger, or factor but may instead have multiple risk pathways that transgress the current risk factor categorical boundaries. To do this, missing persons risk studies are first reviewed. The Kraemer et al. (1997) risk factor classification system is then presented, and the factors shown in existing scholarship as influencing missingness are applied to this schema. This framework is employed as it is expansively used as a means to understand risk and factors and establish low- and high-risk groups across various domains of enquiry, particularly for prevention and intervention efforts aimed at achieving change (i.e., public health and behavioural interventions)[2]. Lastly, five ways to model risk pathways are then provided, as supplied by the MacArthur framework from Kraemer and colleagues (1997, 2001; Kraemer, 2010). This paper, therefore, attempts to move beyond the question of "What are the risk factors related to going missing?" to "What are the pathways through which risk factors are associated with going missing?"

This research can advance an understanding of the mechanisms associated with missingness and who is at high risk of going missing, which can assist with developing targeted risk profiles and prevention strategies, as well as reducing missing incidents. It is hoped that clarification of risk terminology and the risk factors in the extant literature can contribute to providing a common language for thinking and applying risk to research and data and offer clarity not yet supplied within the present body of knowledge for improvements in future investigations of missing persons.

Literature review on risk factors for missing persons

Risk factors for missingness can be classified into demographic, psychopathological, and environmental categories. Demographic factors include the sex/gender and race/ethnicity of the missing individual. Psychopathological factors involve mental illnesses, mental disorders, or mental distress, and the resulting manifestation of behaviours and experiences related to cognitive or psychological impairment. This can consist of factors like the presence or diagnosis of mental illness, suicidal ideation, or experiences of self-harm. Lastly, environmental impacts encompass a wide range of topics, such as social, cultural, political, and economic factors. Examples of these might be social setting, occupation (or lack thereof), and current living status (i.e., housed or homeless).

There is evidence that the following demographic characteristics may serve as risk factors for missingness: *female* (Cohen et al., 2008, 2009; Kiepal et al., 2012; NWAC, 2010; Puzyreva and Loxley, 2017; RCMP, 2015; Welch, 2012); *male* (Kiernan and Henderson, 2002; Newiss, 2005; Perkins et al., 2011); *Indigenous identity* (Cohen et al., 2008, 2009; Kiepal et al., 2012; NWAC, 2010; Puzyreva and Loxley, 2017; RCMP, 2015); and *young age* (Biehal et al., 2003; Cohen et al., 2008; Huey et al., 2020; Kiepal et al., 2012; Newiss, 2005; NWAC, 2010; Puzyreva and Loxley, 2017; Shalev et al., 2009; Tarling and Burrows, 2004). To note, research on demographic factors and missingness has generally failed/been unable to include other demographics. This information is not often readily available or collected within police data on missing persons reports, and, for example, there is a lack of national statistics collected on missingness in Canada annually, which may explain why other associations have not yet been explored. Although the present factors have been quite illuminating in terms of who may be at high risk, little is known about the predictive association between other existing attributes that could be contributing to missingness. For instance, there is evidence in emerging research that family conflicts, specifically spousal arguments, render an individual more at risk for going missing (Huey and Ferguson, 2020b). Current research suggests that, as a result, the incidence of missing persons may be reduced by intervening on family tensions and breakdowns, as well as marital relationship issues (Henderson et al., 1999, 2000; Huey and Ferguson, 2020b; Payne, 1995; NPIA, 2007; Newiss, 1999; Samways, 2006; Yoder et al., 2001; Zerger et al., 2008). This suggests that other unexplored demographic variables could influence one's risk for a missing episode.

While a few factors have emerged as increasing the risk of going missing, researchers have similarly been unable to explore and have paid less attention to other missing person characteristics. Current risk factors are *physical disabilities* (Ferguson, 2021; Ferguson and Huey, 2020; Pearce, 2013); *mental disabilities/ cognitive capacity*, i.e., Alzheimer's or dementia (Bantry White and Montgomery, 2015; Bowen et al., 2011; Chung and Lai, 2011; Holmes et al., 2015; Houston et al., 2011; Rowe et al., 2011; Rowe and Glover, 2001); and *medical conditions*, such as diabetes, eating disorders, and thyroid conditions (Cohen et al., 2008).

Trauma exposure was also revealed as a risk factor amongst some studies, whereby ongoing trauma, including physical, sexual, or domestic abuse, increases the risk of going missing (Foy, 2006; Henderson et al., 1999, 2000; Hirschel and Lab, 1988; Payne, 1995; Samways, 2006; Shalev Greene and Hayden, 2014; Stevenson et al., 2013; Tarling and Burrows, 2004; Yoder et al., 2001; Zerger et al., 2008). Within this grouping, one area does represent a relatively significant body of literature. This research concentrates on an individual's cognitive capacity specific to the elderly population and its impact on missingness. This focus is likely the result of the global population aging leading to a growing number of adults with cognitive impairments (Woolnough et al., 2016).

Concerning psychopathological factors, researchers have primarily focused on the presence of *mental health issues/mental illnesses* as risk factors that may increase the likelihood of going missing. For example, Wilkie et al. (2014) found that patients with a schizophrenia diagnosis were disproportionately more likely to go missing, therefore placing these individuals within a high-risk grouping. Other investigators have revealed that, specific to missing episodes from mental health settings, younger, male patients with a diagnosis of schizophrenia are at high risk for going missing (Dickens and Campbell, 2001; Gerace et al., 2015; Hearn et al., 2012; Nurjannah et al., 2009; Simpson and Bowers, 2004). Researchers have also established that *existing mental health problems*, both diagnosed and undiagnosed, and *self-harm* and *suicidal ideation* serve as risk factors for missingness (Bayliss and Quinton, 2013; Biehal et al., 2003; Blakemore et al., 2005; Bonny et al., 2016; Clarke, 1997; Cohen et al., 2008; Foy, 2006; Fyfe et al., 2015; Gibb and Woolnough, 2007; Henderson et al., 2000; Hirschel and Lab, 1988; Holmes et al., 2013; Huey et al., 2020; Payne, 1995; Perkins et al., 2011; Samways, 2006; Shalev Greene and Hayden, 2014; Stevenson et al., 2013; Sowerby and Thomas, 2017; Tarling and Burrows, 2004). Many studies have also highlighted *drug and alcohol use and abuse* as prominent factors associated with missingness (Blakemore et al., 2005; Bonny et al., 2016; Cohen et al., 2008, 2009; Ferguson and Huey, 2020; Foy, 2006; Fyfe et al., 2015; Hirschel and Lab, 1988; LePard et al., 2015; Payne, 1995; Perkins et al., 2011; Puzyreva and Loxley, 2017; Shalev Greene and Hayden, 2014; Stevenson et al., 2013; Welch, 2012; Wilkie et al., 2014; Yoder et al., 2001; Zerger et al., 2008). Given the abundance of research on these associations, it can be said that the presence of mental illness and/ or addiction is an established pattern in that this factor renders an individual at a high risk of going missing.

Lastly, an expanding area of risk literature suggests that environmental factors can impact missingness. This indicates that risk research on missing persons is discovering that there are factors outside of characteristics of the missing individual that can place an individual at risk for a missing episode. For example, Kiepal et al. (2012) noted that *people who are unemployed* or are *not currently in the labour force* (i.e., students delaying entry) face a disproportionate risk of being reported as missing. Other researchers have uncovered that one's *economic state*, including financial pressures/strains and lack of employment opportunities, can place an individual at a high risk of going missing (Biehal et al., 2003; Hirschel and Lab, 1988; James et al., 2008; Payne, 1995; Puzyreva and Loxley, 2017; Samways, 2006; Tarling and Burrows, 2004; Zerger et al., 2008). The remaining risk factors within this category are *relationship breakdown*, *family abuse/ conflict*, and *family rejection* (Henderson et al., 1999; Henderson et al., 2000; Payne, 1995; NPIA, 2007; Newiss, 1999; Samways, 2006; Yoder et al., 2001; Zerger et al., 2008); *experiencing life strains/worries* and *immediate social pressure* (Payne, 1995; Huey and Ferguson, 2020b); *homelessness* or a *transient lifestyle*, such as being temporarily housed (Cohen et al., 2008, 2009; Huey, 2019;

Huey and Ferguson, 2020a; Kiepal et al., 2012; Puzyreva and Loxley, 2017; RCMP, 2015; Welch, 2012); and *sex trade work* (Cohen et al., 2008, 2009; LePard et al., 2015; NWAC, 2010; Puzyreva and Loxley, 2017; Welch, 2012).

Application of Kraemer and Colleagues' (1997) risk factor framework to the missing persons literature

The above review of the literature demonstrates that there are several recorded risk factors related to missing persons. While there are some patterns across the scholarship, it remains undetermined what risk pathways may exist. To begin, below, the Kraemer et al. (1997) framework for classifying risk factors is reviewed, and examples from the above literature are provided. The purpose of this is first to outline what constitutes risk and a risk factor, as risk pathways cannot be understood without such context. Then, the ways in which risk pathways can be studied are presented, the conditions that must be met to make a strong case for causality and/or correlation for each scenario are described, and examples of each potential setting from the missing persons risk literature are offered. Through this, it is the hope that avenues for future investigations in the field of missing persons can be illuminated.

Risk factors: terminology. Kraemer et al. (1997) necessitate that generating a sufficient understanding of the role of any given factor in increasing the risk for missingness must precede valid causal inference, scientific communication, and suitable research and policy application. That is, clarifying the term *risk factor* is an essential first step to ensuring that investigators accurately and consistently apply risk terminology to their research and data. According to Kraemer and colleagues (1997, p. 338), to constitute a factor as a "risk factor," it must be able to divide the studied population into two distinguished groups (low and high risk) and involve "measurable characteristics of each subject in a specified population that precedes the outcome of interest." In applying this classification standard to missing persons risk literature, a factor that demonstrates a positive association with a missing person incident/case might and might not qualify as a risk factor. The factors, as identified in the above literature review, stand currently without temporal precedence affirmed for these variables. If this were not possible, researchers should not classify the attribute as a risk factor, but instead, it ought to be termed as either a "consequence" or "concomitant" (Kraemer et al., 1997). That is, if investigators cannot demonstrate that the correlate precedes the outcome, then the variable must be alternatively classified (Kraemer et al., 1997). To the extent that temporal precedence can be demonstrated, as might be the case, for example, within the qualitative data available across police missing person reports, then the factor can be appropriately labelled as a "risk factor." Therefore, the first step required to document a risk factor status for a characteristic is establishing it as an antecedent correlated to the outcome.

Once this status is established, several additional distinctions are purposeful for clarity, preciseness, and consistency (Kraemer et al., 1997). Next, there are two classifications of risk factors that must be addressed. One is that factors placing an individual at high risk of a missing episode that does not vary within individuals over time, so cannot be altered to effect change in the outcome, are to be termed "fixed markers" (Kraemer et al., 1997). Examples of this, as demonstrated within missing person risk literature, would be factors such as race/ethnicity and sex/gender. The next classification is "variable risk factors," which are factors that either change within individuals naturally over time or can be manipulated in some way (Kraemer et al., 1997). Examples of variable risk factors among the risk literature on missingness

might be one's age or mental health problems. When it is possible to establish that the factor is a variable risk factor, such as through significance tests, Kraemer and associates (1997) assert that only then can "causal risk factor" status be claimed.

Importantly, however, even when a risk factor meets the above criteria for causal risk factor status, there may be uncertainty regarding the actual causal mechanism underlying the observed relationship (Kraemer et al., 1997). This means that because causality is a probabilistic notion, investigators can never be sure of the precise causal mechanism affecting associations (Vogt et al., 2007). To apply this to risk literature on missing persons, Bonny et al. (2016, p. 309) assert that "If an individual known to social services has mental health issues [MHI], takes medical drugs, has suicidal ideation, has attempted suicide, often drinks or uses other drugs, spends time in hospital, and has been known to walk around aimlessly usually alone, they would be deemed high risk of becoming a missing person." Yet, there are likely several confounding variables influencing these relationships. To illustrate, the connection between "walking around aimlessly usually alone" and missingness may have other mechanisms accounting for the relationship, such as depression or escaping dysfunctional home environments, among others (Martias et al., 2011; Tse and Bond, 2004; Gibb and Woolnough, 2007; Stevenson et al., 2013).

Although the assumption is that current risk factors for missingness appear to represent some type of change in the risk for going missing, the majority of risk factors are unlikely to meet the requirements established by Kraemer and colleagues (1997) to be classified as risk factors. In fact, it is likely that several commonly asserted risk factors do not even meet the criteria for risk factor status. Any proposed risk factor that has only been evaluated in cross-sectional studies and in which temporal precedence cannot be established (that does not precede missingness) would also more accurately be classified as either a consequence or concomitant. For example, no studies were located that applied/were able to apply a longitudinal design in the Canadian context. This is likely because police often do not retain missing person data for more than a designated number of years (i.e., 5 years) (Ferguson and Picknell, 2021). Consequently, the confidence in the potential causality of the documented risk factors is weak. To illustrate, many youths are noted as at high risk of going missing due to self-harm and suicidal ideation, which often leads to them becoming adult missing persons (Biehal et al., 2003; Bonny et al., 2016; Foy, 2006; Henderson et al., 2000; Perkins et al., 2011; Stevenson et al., 2013). But the question of whether reports of self-harm and suicidal ideation as youths represent a concomitant of missingness rather than a risk factor remains unsolved. This is because there is also an increased risk of self-harm and suicidal ideation proceeding a missing event amongst this population (Biehal et al., 2003; Blakemore et al., 2005; Bonny et al., 2016; Newiss, 1999; Shalev et al., 2009; Smith and Shalev Greene, 2015; Stevenson et al., 2013; Tarling and Burrows, 2004).

Other factors from the literature that may be best-considered concomitants rather than risk factors for missingness might be, for example, mental health problems, addictions, trauma exposure, and relationship breakdown/issues, among others. These factors may coincide with missingness, but it cannot be decisively determined from the present risk literature whether they either precede or result from missingness or accompany missingness. Specifically, most studies concluding these as risk factors employ cross-sectional designs that limit conclusions about their temporal precedence. An example of this could be mental health problems and addiction. A great deal of risk literature has centred on the relationship between mental illnesses, such as depression, and addictions, such as alcoholism, with missingness, whereby these factors are said to both precede

and proceed this matter. Yet, for instance, Biehal et al. (2003, p. 21) note that "some people with mental health and/or drug or alcohol problems may be at risk of [going missing] through a transient lifestyle." What this finding suggests is that the relationship of these factors to missingness cannot be shown as either preceding or resulting from missingness, but instead may be more so to do with a related factor: transient lifestyles. Indeed, other studies, such as research by LePard et al. (2015), provide some support for this possibility. These authors found that part of the risk for missingness related to substance use and abuse is that the cases had unstable and/or transient lifestyles, which created linkages across their risk categories (LePard et al., 2015; Quinet, 2007). Given that the causal links between these variable factors and missingness remain unclear (i.e., Is it that mental health problems lead to missingness, and then, in turn, missingness causes an impact on mental health, or are they simply co-occurring with or consequences of a third variable, exposure to transient lifestyles?), further insight is necessary. While this is one such example with ambiguity regarding the factor's relationship to missingness, the same issue is consistent across the risk literature for missingness.

Turning to the next steps in the risk factor classification process, there are three ways in which risk factors can be categorized (fixed marker, variable risk factor, and causal risk factor) only after it has been established that the factor precedes the outcome. To expand on this, several of the risk factors in the present missing persons literature represent factors that do not vary within individuals over time, or as Kraemer et al. (1997) termed them, they are "fixed markers." Specifically, demographic factors such as sex/gender and race/ethnicity are good examples of fixed markers for missingness. However, any factor outside demographics that can be regarded as stable over time could be considered a fixed marker. These factors are helpful for identifying who may be most likely to go missing, but they cannot be manipulated (Kraemer et al., 1997). On the other hand, factors that would be classified as variable risk factors are those associated with missingness that can change within an individual over time but have not been (and may never be) demonstrated to effect a change in the outcome (Kraemer et al., 1997).

Whether a factor is considered a fixed marker or a variable risk factor also depends mainly on the population under study (Kraemer et al., 1997). For example, if the population under study includes those who experience(d) trauma, critical aspects of trauma experience (e.g., trauma severity), as well as some pre-trauma attributes (e.g., psychiatric history), could be considered fixed markers. However, for instance, if those under study involves youth at group homes removed from their family units due to various types of neglect and/or abuse, thus exposing each individual to different forms of trauma, then variables such as the severity of trauma exposure may instead be classified as variable risk factors as they can change within an individual over time (Vogt et al., 2007). This shows that some factors noted as risk factors may not be appropriately classified without context. This, again, speaks for how risk factors cannot act as singular variables but instead must be considered amongst other factors and with the context of the missing person/event.

To conclude this section on risk factor terminology, most of the risk factors identified in the current literature cannot be coined risk factors, and many others may be misclassified in terms of their risk factor status also. As well, some of the missing persons risk factors are likely best considered fixed markers that identify individuals who may be at risk for going missing but cannot, according to Kraemer and colleagues (1997) framework, be labelled as causal risk factors. These observations have clear implications for policy because risk reduction interventions that focus on achieving changes in specific risk factors for which

evidence is weaker (e.g., variable risk factors) may be less useful than efforts aimed at treating factors for which substantiation of causality is more robust (e.g., causal risk factors) (Vogt et al., 2007). Also, efforts to influence variables that are better-considered concomitants or consequences of missingness to lessen the risk of going missing are, plainly, futile. In contrast, fixed markers might be best used to identify those most at risk for going missing and most likely to require intervention efforts.

Risk factors: pathways. The focus of the previous section was to outline the different types of factors that may be implicated in missingness and risk pathways. However, in this section, the attention will be on the probable pathways through which risk factors may be linked to this matter. As noted previously, consideration for these pathways is critical given that there is an awareness, albeit limited with little empirical or theoretical application, that no single factor is associated with missingness. Instead, there are likely to be multiple risk pathways of influence. The below section summarizes five different ways risk factors may work together to influence an outcome and the conditions that must be met for each, as proposed by Kraemer and associates (2001; Kraemer, 2010). To note, even when these conditions are not met, it is still possible that the variables may work together. In this latter case, the support for the suggested pathway should be low until further evaluations are carried out. The below processes of examining risk pathways are not exhaustive but instead provide a starting point for future investigation and other analyses.

For each scenario, examples are provided from the previously reviewed literature on risk factors for missingness to suggest ways that these factors may work together to influence the phenomenon of going missing. Also, Kraemer and colleagues (1997) risk terminology is also integrated throughout this discussion to provide a clear understanding and application of this framework. This discussion of the different ways that risk factors may work together to inform on who is at high risk for missingness can forward greater sophistication in the research designs and terminology implemented in future studies of missing persons and generate a more precise interpretation of existing missing persons research findings (Vogt et al., 2007).

Variables may be independent risk factors. When two risk factors are unrelated, but both demonstrate associations with the outcome, they can be deemed independent risk factors (Kraemer, 2010; Kraemer et al., 2001). According to Kraemer and associates (2001), two variables, A and B, could be considered independent risk factors for an outcome, O, if (1) they are not correlated; (2) there is no temporal precedence of A or B in relation to each other; and (3) they are codominant (i.e., the strongest association with O is accomplished by using A and B together) (Vogt et al., 2007). Given the requirement for no temporal precedence between them, both independent risk factors must be fixed markers, or both must be variable or causal risk factors (Kraemer et al., 2001; Vogt et al., 2007). That is, one variable cannot be a variable risk factor when the other is a fixed marker. An example of two independent risk factors for missingness might be female and Indigenous identity. To the degree that these factors are seemingly unrelated and multivariate analyses indicate that both are risk factors for missingness, investigators could deduce that they are independent risk factors. Thus, occupying both a female and an Indigenous identity might characterize the high-risk group for missingness.

If the requirements for no temporal precedence were loosened, a "weaker" case for independent risk factor status could occur through additional possible scenarios (Vogt et al., 2007). For example, two independent risk factors for missingness might be

sex/gender and substance abuse problems. There may be little reason to expect sex/gender to be associated with the presence or absence of substance abuse problems, which might imply that they are independent risk factors. However, Kraemer et al. (2008) notes that when there is temporal precedence for two variables, one variable may moderate the effect of the other. This possibility should be explored before concluding the independent risk factor status. For instance, there may be higher numbers of substance abuse problems among either males or females, which would mean that the effect of substance abuse problems in increasing missingness could be weaker or stronger based on the individual's sex/gender.

To note, the search for risk factor status has become commonplace in missing persons risk research. While such research can help with the formulation of risk assessments and uncovering possible mechanisms underlying this phenomenon, causality and independence generally cannot be assessed from observational data sets or cross-sectional designs. This indicates that while the current research on missing persons mostly posits that the factors uncovered as increasing risk for missingness are independent risk factors or independent predictors for going missing, the evidence for such assertions is weak and muddied. Yet even when there is an indication (i.e., strong statistical support) that shows that a variable is an independent risk factor for this outcome, it may not necessarily indicate that the risk factor causally contributes to the outcome. This means that a variable may appear to be an independent risk factor for missingness but can also appear to not be so in another study, likely due to different study populations or differences in location, as argued previously. To apply this to risk pathways, the suggestion herein is that there should be fewer independent risk factors examined in missing persons research, given that most of the research designs utilized for such research are not appropriate according to this framework, and that alternatively, investigators should focus on examining how risk factors may be overlapping, proxy risk factors, mediators, and moderators.

Variables are overlapping risk factors. Risk factors are considered overlapping when two or more factors address a single, intersecting construct and are comparably linked to the outcome. According to Kraemer et al. (2001), examiners can confirm overlapping risk factor status for O when (1) A and B are associated; (2) neither A nor B has temporal precedence in relation to each other; and (3) A and B are codominant (i.e., the strongest association with O is accomplished by using A and B concurrently) (Vogt et al., 2007). Thus, researchers could generate a risk factor that more reliably addresses the shared concept by combining A and B. For example, financial pressures/strains and lack of employment opportunities could be noted as part of the broader construct of economic vulnerability, and, given that they are similarly related to missingness, both could be considered overlapping risk factors. Both measures greatly tap into the same construct of economic vulnerability. Still, because it cannot be determined which cause occurred before the effect, it cannot be concluded which is the reliable indicator. By combining these two factors, a resulting shared construct might explain the relationship between overlapping measures A and B. To provide another illustration, factors such as sex trade work and homelessness could, instead, be regarded as indicators of a broader "transient lifestyles" construct that might more accurately represent the mechanism producing the observed connections. In fact, there is evidence to suggest that these factors increase one's risk due to a transient lifestyle rendering them vulnerable, at an increased risk of harm (i.e., violence, victimization), and at high risk of going missing (Cohen et al., 2008, 2009; Huey, 2019; Kiepal et al., 2012; LePard et al., 2015; Puzyreva and Loxley, 2017; RCMP, 2015;

Welch, 2012). Given the potential for potency and reliability, investigators would be well advised to merge overlapping risk factors when they can. Doing so in meaningful ways can provide more reliable assessments of focal constructs and enhance the ability to detect effects (Vogt et al., 2007).

As this discussion should indicate, only factors that have meaning beyond their particular measurement can serve as overlapping risk factors. To expand on this, fixed markers that are not considered indicators of an underlying variable, such as sex/gender and race/ethnicity, are less likely to qualify as overlapping risk factors but are more likely to serve as proxy risk factors (discussed in the subsequent section) (Kraemer et al., 1997). Causal risk factors cannot typically constitute overlapping risk factors either, given that, by definition, overlapping risk factors are manifestations of some underlying latent variable that itself may serve as a causal factor (Vogt et al., 2007). To take the previous example of "transient lifestyles," having access to permanent lifestyle arrangements may not enhance one's resistance to going missing, nor may it reduce their vulnerability. Still, the benefits and resources available to an individual with the latter lifestyle situation (e.g., access to stable shelter) may be implicated in missingness. Altogether, overlapping risk factors illustrates a likely avenue for exploring risk pathways and how the additive or compound effect of multiple vulnerabilities/inequalities can increase the risk for missingness.

One variable could be a proxy risk factor for another variable. Some factors that initially appear as risk factors for missingness may turn out to be proxy risk factors, where the factor is correlated with another risk factor but is not causally involved in the same outcome. Thus, the only connection between the outcome and the correlate stands in the strong risk factor associated with both. As noted by Kraemer et al. (2001), one can operationally confirm that B is a proxy risk factor for variable A concerning O when (1) A and B are correlated; (2) either A precedes B, or there is no temporal precedence of both variables; and (3) A demonstrates a stronger relationship with O in the presence of B. That is to say that almost any variable linked with a robust risk factor may appear to be a risk factor itself (Kraemer et al., 2001). Lastly, proxy risk factors can be either fixed markers or variable risk factors, but they cannot, by definition, be causal risk factors (Vogt et al., 2007). For example, to the extent that minority racial/ethnic status, such as Indigenous identity, is related to less access to resources (e.g., financial, health, law enforcement, etc.), racial/ethnicity status may be noted as a risk factor for missingness when the actual risk factor is issues with accessibility to resources.

Similarly, an aggregate variable may appear to be an inherent risk factor when only one small element of the variable is actually associated with the outcome (Kraemer et al., 2001). For example, current research suggests that female identity is a risk factor for missingness (e.g., Kiepal et al., 2012); however, a closer examination might reveal that a particular component related to female identity (i.e., the phenomenon of missing and murdered Indigenous women, more sex trade work exposure) is linked to this matter and that sex/gender itself is unrelated. Similarly, there is evidence that economic vulnerability is related to missingness, and that women are more likely to experience precarious work situations and poverty (e.g., Young, 2010). These potential pathways suggest that female identity may be less relevant to going missing than other phenomena, highlighting a possible risk pathway for future exploration. This disaggregation, instead of the aggregation as suggested for overlapping risk factors, offers a way to examine a complex measure to inform on the development of effective reduction and prevention measures (Kraemer et al., 2001). Breaking down proxy risk factors can also

reveal fruitful, profitable directions for the search for causal factors in future examinations.

A variable mediates another variable. According to studies by both Baron and Kenney (1986) and MacKinnon et al. (2007), mediation explains why or how a variable affects an outcome, which is fundamental to developing causal claims. The reformulation of mediation as proposed by Kraemer and associates (2001; Kraemer, 2010) is based on Baron and Kenny's (1986) work in this area to recommend a "strong" case for mediation. According to Kraemer et al. (2001), one can state that a variable (*B*) is a mediator of the influence of another variable (*A*) on *O* if (1) there is a relationship between *A* and *B*; (2) *A* shows temporal precedence relative to *B*; and (3) when *A* and *B* are considered concurrently, there is either domination of *A* by *B* (the association between *A* and *O* disappears in the presence of *B*), or codomination by *A* and *B* concerning their correlation with *O*. Importantly, to test mediation requires the incorporation of an interaction term between *A* and *B*, as Kraemer (2010) argues that mediation may be displayed in both increases in the level of a proposed mediator (as addressed by an examination of the indirect effect of *A* on *O* through *B*), and a change in the nature of the relationship between the proposed mediator and the outcome (as addressed by the interaction term). To draw upon an example, in investigating the relationship between sex trade work and missingness for different sex/gender identities, one might expect that sex/gender (*A*) would increase the exposure to sex trade work (*B*), therefore, influencing a high risk for going missing for one group. Sex/gender could also change the nature of the relationship between sex trade work and missingness, such that this association could be stronger depending upon one's sex/gender.

Mediators must be variable or causal risk factors as they need to be free to change within an individual over time, either through influence or naturally (Kraemer, 2010). Fixed markers, thus, cannot be classified as mediators because they do not change within an individual and cannot be manipulated to effect a change in missingness. This suggests that studies cannot rely on cross-sectional designs to address the issues of temporal precedence. Consequently, no present missing persons research has assessed predictors and mediators at different points, and researchers face difficulties with applying/using longitudinal strategies. This leaves uncertainty about the temporal precedence of risk factors relative to proposed mediators and, as extensively noted, fails to account for the potential risk pathways. Future studies exploring these mechanisms can allow investigators to disentangle temporal precedence issues among predictors and mediators.

A variable moderates the effect of one variable on another. A moderator specifies on whom and under what conditions another variable will operate to produce an outcome (Baron and Kenny, 1986). That is, moderation implies that the relationship between a predictor and an outcome variable varies across different levels of the moderator. Both previous interpretations of moderation and the more recent reformulation proposed by Kraemer and associates (2001; Kraemer, 2010) suggest that for moderation (1) there must be statistical interaction between a moderator variable *A* and a predictor variable *B* in the prediction of *O*. Moreover, to meet the requirement for their "strong" case for moderation, Kraemer and colleagues (2001) further assert that (2) there is no correlation between *A* and *B*, or the association is trivial, and (3) the moderator *A* precedes the predictor variable *B*. In short, *A* somehow changes the relationship between *B* and *O* without directly affecting the probability of *B*.

Moderators are often fixed markers identifying different subgroups (e.g., men vs. women). However, moderators can

also be variable risk factors. To apply this to missing persons, research by Huey and Ferguson (2020b) discovered that coping style (e.g., emotion-focused vs. problem-focused coping) moderates the impact of the severity of life strains and worries, relationship breakdown and conflict/tension, and exposure to trauma, showing that there may be evidence for coping style as a moderator (Huey and Ferguson, 2020b). It can be said, therefore, that employing effective coping when faced with such experiences might lessen the risk of missingness. At the same time, moderators are not causal risk factors. That is to say that changing a moderator should not impact missingness directly, but manipulating a moderator could potentially reduce to impact of the focal risk factor on missingness. To expand on the preceding example, efforts aimed at changing coping strategies (i.e., from ineffective to effective, from emotion-focused to problem-focused) through, for example, education could reduce the impact of exposure to trauma and, thus, the risk for missingness.

As the above discussion of moderation should indicate, no single set of risk mechanisms operates across missing person case categories and populations. Significantly, the presence of moderation can obscure meaningful phenomena and lead to null results. For example, to the extent that the impact of a particular risk factor for missingness is different for women and men, and this effect operates in opposite directions (i.e., positive for women but negative for men), an investigator who does not consider sex/gender (and moderation) in the analysis of the association between that risk factor and missingness is likely to obtain null results (Vogt et al., 2007). Extensive evidence across disciplines on risk factors and moderation (e.g., Brewin et al., 2000) found significant heterogeneity among effect sizes for different subgroups, which suggests that researchers might best focus their efforts to carefully delineating potential moderators of associations between risk factors and missingness to uncover risk pathways (Brotman et al., 2005).

Conclusion
The application of the MacArthur framework developed by Kraemer and colleagues (1997, 2001; Kraemer, 2010) to the missing persons risk literature reveals several promising avenues for further investigation of risk pathways. This article focused on definitional issues with the risk factors currently established in missing persons literature, with the aim of establishing clarity on the types of determinants and correlates associated with low- and high-risk for going missing. Presently, the majority of missing persons risk literature is based on cross-sectional designs, so, consequently, questions remain regarding the extent to which the risk factors can be classified as causal risk factors or risk factors at all. Thus, the present statistical associations, especially from these cross-sectional analyses, should probably be termed 'correlates' of missingness. As discussed earlier, many of the factors that have received the greatest amount of empirical and theoretical attention are likely to turn out to be proxy risk factors, concomitants, or consequences. For example, there is ample evidence that sex/gender is somehow associated with missingness; however, sex/gender could be a proxy for other factors that put women at a higher risk for missingness, such as economic vulnerability or increased exposure to sex trade work. Arguably, a more fruitful avenue of enquiry would be identifying potential risk factors that underlie such associations. A better understanding of risk pathways can lead to advances in our understanding of who is or is not at high risk of going missing among particular populations. To this end, there are several ways in which risk pathways can be examined and applied to missing persons risk literature.

Importantly, attention is also drawn to the many different potential pathways through which risk factors may increase the risk for missingness, highlighting the need for researchers to move beyond research designs that involve regressing missing person cases on numerous risk factor candidates to testing theoretically-driven models of mediation and moderation. As discussed previously, several risk factors for missingness, such as economic vulnerability and sex trade work, may carry their risk through their impact on a shared construct, such as transient lifestyles. Other risk factors may carry risk by enhancing the likelihood that other factors will be associated with missingness. For example, there is evidence that relationship breakdown and conflict/tensions and exposure to trauma may be elevated as risk factors for missingness when an individual utilizes ineffective coping. This suggests that coping style enhances the risk of other factors and their relationship with missingness. Careful attention, therefore, must be paid to delineating possible pathways through which risk factors are associated with missingness.

This paper also describes the criteria that must be in place to confirm evidence for a number of scenarios that represent different ways variables may work together, according to the framework by Kraemer and colleagues (2001; Kraemer, 2010). It must be noted that the application of these criteria questions many studies in the missing persons risk literature, particularly regarding investigations of mediation and moderation, as they have relied mainly on cross-sectional designs and imprecise terminology. As noted previously, cross-sectional designs are often inappropriate for tests of mediation and moderation due to the uncertainty they leave regarding the temporal precedence of the mechanisms being tested. This raises the question of whether missing persons researchers should entirely abandon tests of mediation-moderation models in cross-sectional designs (except for studies that focus on moderators that are fixed markers and, therefore, by definition, demonstrate temporal precedence relative to proposed predictors). Instead, support for both mediation and moderation would be restricted to designs that allow for greater confidence in the correlational and causal mechanisms under study.

While there is great value in applying this framework to missing persons research to examine risk pathways, it appears that its requirements are generally much more challenging to meet for the research designs that are more typical of missing persons studies. For instance, certain police data is not retained for more than five years, which rules out the possibility of longitudinal designs. The risk factor framework was, it seems, initially developed in the context of randomized control trials (RCTs), thus restricting its applicability, such as to clinical trials where random assignment to treatment conditions is feasible for many topics (Kraemer et al., 1997). Therefore, the evidence base is likely to suffer from challenges in establishing the causal criteria necessary to meet the requirements of mediation and moderation according to this framework. Nonetheless, applying this framework to examining risk pathways for missingness can be purposeful with the acknowledgement by investigators (and appropriate recognition in study results) that observational designs are likely not to draw causal conclusions. Thus, abandoning observational studies is not recommended. Still, just because researchers are limited in the designs that they can reasonably apply, this does not offer a "free pass" on the issues discussed herein (Vogt et al., 2007). As outlined in detail throughout this paper, it is argued that investigators should be careful in their use and application of risk factor terminology and should be thoughtful in outlining the limitations of cross-sectional design for affirming causality and establishing temporal precedence. It was also shown that the terminology employed throughout missing persons research should be more sensitively utilized. This is noted as the current risk literature on

missing persons does not sufficiently address these issues, along with not offering any linkages across the risk factors provided. In closing, it should be reiterated that there is a strong need for missing persons risk research studies to move beyond the question of "What are the risk factors for missingness?" to the question "What are the pathways through which risk factors impact and are associated with missingness?"

Notes

1 To further scientific discussion about risk factors and risk pathways, this article replicates Vogt et al. (2007) and extends it to the field of missing persons.
2 See, for example, Bauman et al. (2002) on intervention effects on physical activity, Jacobi et al. (2004) on eating disorders, or Taft et al. (2005) on partner violence.

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Competing interests

The author declares no competing interests.

Ethical approval

Following university ethics guidelines and guidelines established by the Canadian Tri-
Council on Research, ethical approval statement is not applicable to this work as it
consists of a review of published literature.

Informed consent

Following university ethics guidelines and guidelines established by the Canadian Tri-
Council on Research, informed consent statement is not applicable to this work as it
consists of a review of published literature.

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