

**The role of risk and protective factors in the modification of risk for sexual victimization,  
sexual risk behaviors and survival sex among homeless youth: A meta-analysis.**

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## Abstract

Youth homelessness is a multifaceted and significant social problem. For many homeless youth, the risk for exposure to sexual exploitation is high, with the experience of sexual victimization and engaging in sexual risk behaviors and survival sex commonplace. This meta-analysis appraised internationally published literature to investigate the role of risk and protective factors in modifying the occurrence of sexual victimization, sexual risk behaviors, and survival sex among homeless youth. A comprehensive search of psychology, sociology, medicine, health and criminology electronic abstraction databases was conducted for the period 1990-2016. Search terms included 'homeless', 'rape', 'sexual victimization', 'unsafe sex' and 'survival sex'. The perpetration of sexual offences was included in the search strategy. Eighteen studies, examining sexual victimization, sexual risk behavior and survival sex, met the inclusion criteria and were included in the meta-analysis. All but two studies were conducted in the United States. No retrieved studies examined sexual offending; hence this could not be included in the meta-analysis. Findings showed that substance use, exposure to violence and crime (as victims and perpetrators), childhood abuse, sexual behavior, and peers' antisocial and sexual behavior were unique factors increasing the likelihood for each of sexual victimization, engagement in sexual risk behavior, and engagement in survival sex. Protective factors were peer and family social support. Moderator analyses showed that the influence of risk factors may differ based on study design, sample size, study country of origin and participant age and gender. Findings suggest that risk and protective factors may be important mechanisms by which to modify the occurrence of

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adverse sexual behavior outcomes and better contextualize prevention and early intervention strategies for homeless youth.

KEYWORDS: homelessness; meta-analysis; sexual victimization; sexual risk behavior; survival sex; youth.

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## Introduction

Youth homelessness is a multifaceted and significant social problem. It is commonly acknowledged that homeless youth have often experienced maltreatment and abuse in their family of origin (Bearsley-Smith, Bond, Littlefield, & Thomas, 2008; Hyde, 2005; Martijn & Sharpe, 2006), and some have been required to make an early transition to an adult-level of independence through their emancipation from out-of-home care settings or the care of child protective services (citations removed for blind review). For these youth, the experience of homelessness creates additional vulnerability to negative physical, psychological and social, health and behavioral outcomes that do not occur in isolation from one another (citations removed for blind review; Kennedy & Baron, 1993; Pears & Noller, 1995).

In the United States, it is estimated between 1.6 and 1.8 million youth (13-21 years) were homeless in 2009 (Terry, Gurpreet, & Patel, 2010), including those who were living unsupervised on the streets, in abandoned buildings, and with friends or with strangers. In 2016 over \$5 billion was allocated to homelessness services (including specialist youth homelessness) in the United States (United States Interagency Council on Homelessness, 2016). Homeless youth commonly experience substantial marginalization, social and health problems (citation removed for blind review; Hyde, 2005; Kidd, 2003; Martijn & Sharpe, 2006). With homeless youth having inadequate access to health care, undetected health problems, and low rates of effective help-seeking, this issue is directly and indirectly responsible for high levels of health and social problems for youth. Adolescents (10–24 years of age) comprise 27% of the global

population (Gore et al., 2011). Due to the requirement to make transitions within cognitive, physical, and social domains, adolescence is recognized as the period of peak incidence for mental health problems (e.g. depression) and problem behaviors (e.g. violence); with these problems and behaviors among the top causes of morbidity and mortality for youth today (Gore et al., 2011). For homeless youth, these problems and behaviors are compounded by the disruption homelessness causes to healthy adolescent physical, emotional, social and psychological development (Farrow, Deisher, Brown, Kulig, & Kipke, 1992), as well as their prior their experiences of maltreatment and abuse (Bearsley-Smith et al., 2008) and revictimization while homeless (citations removed for blind review).

One approach to addressing these problems and developing adequate prevention approaches is to understand the influence of risk factors (that increase the probability of experiencing health, social and behavioral problems) and protective factors (that decrease, mediate or moderate the effect of risk factors; Catalano & Hawkins, 1996; Pollard, Hawkins, & Arthur, 1999) on the occurrence of perpetrating sexual offences, and exposure to sexual victimization, sexual risk behavior and survival sex. In this meta-analysis, we seek examine the role of risk and protective factors in modifying the occurrence of sexual offences, sexual victimization, sexual risk behaviors and survival sex among homeless youth. Specifically, we sought to collate and statistically appraise evidence from internationally published studies reporting on associations between homelessness and perpetration of sexual offences, experience of sexual victimization, and engagement in sexual risk behaviors and survival sex among

homeless youth that also control for risk and protective factors. To the authors' knowledge, there have been no studies statistically appraising extant literature using a meta-analytic approach to examine if risk and protective factors modify associations between homelessness and these sexual behavior outcomes.

### **Defining homelessness, sexual offences, sexual victimization, sexual risk behavior and survival sex**

*Homelessness.* Although definitions of homelessness vary internationally they generally emphasize a person's lack of access to safe and suitable physical shelter, coupled with experiences of social marginalization, exposure to violence both as perpetrators and victims, intensified risk for revictimization, and potential engagement in health risk behaviors (e.g. substance use). In line with the published studies retained for analysis in this review, the definition of homelessness utilized herein is informed by those definitions used in the United States and Canada: Homeless persons include individuals who have no suitable and permanent occupancy at a residence and who may be unsheltered (living directly on the streets or other spaces not intended for habitation) in emergency shelters or temporary accommodation or at risk of homelessness (Canadian Homelessness Research Network, 2012; National Coalition for the Homeless, 2011).

*Sexual offences, sexual victimization, sexual risk behavior and survival sex.* As studies retrieved for inclusion in this study were conducted in the United States and Canada, definitions of sexual offences, sexual victimization, and sexual risk behavior and survival sex used within

this review are informed by descriptions of offences and victimization proposed by the US Department of Justice and the Crown Prosecution Services in Canada (Office of Justice Programs, 2014a, 2014b; Office on Violence Against Women, 2013). *Sexual offences* are defined as sexual behavior performed by an individual(s) against another person without consent, and include rape (penetration of the vagina, mouth or anus by a penis, or another part of the body, or an object), sexual assault (forms of inappropriate touching of the genital area or a woman's breasts), or other sexual behaviors (e.g., coerced sexual activity). *Sexual victimization* is defined as the threat of sexual harm or nonconsensual sexual handling experienced by an individual at the hands of another person(s) and includes experiencing those behaviors defined as sexual offences. *Sexual risk behavior* is defined as sexual behavior which increases an individuals' susceptibility to sexually transmitted infections or other unintended outcomes (e.g. pregnancy) such as engaging in unprotected sexual behavior, engaging in sexual behavior at an early age, having sex with multiple partners, and engaging in sexual behaviors whilst under the influence of drugs or alcohol (Eaton et al., 2010). *Survival sex* is defined as the exchange of sexual acts or practices by an individual in exchange for a commodity (or commodities), such as food, shelter, money, alcohol or drugs, or other goods from another person(s), and includes sex work (i.e., the consensual exchange of sexual services for payment or reward), survival sex (i.e., consensual or nonconsensual exchange of sexual practices for money, food, shelter, alcohol, or drugs), and street prostitution (the exchange of sex for money, gifts, drugs, a place to sleep, or other materials).

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## **Sexual offences, sexual victimization, sexual risk behavior and survival sex among homeless youth**

Extant research has shown homeless youth are at high risk for sexual exploitation, and commonly describe being sexually victimized (e.g. sexually assaulted, raped) and engaging in sexual risk behavior (e.g. unprotected sex), street prostitution and survival sex (citations removed for blind review). Research examining the perpetration of sexual offences among homeless youth is less common (citations removed for blind review). Variation in definitions of sexual offences, sexual victimization experiences, sexual risk behavior and survival sex among homeless youth results in difficulty in producing definitive prevalence estimates of the number of homeless youth experiencing and engaging in these behaviors, however estimates of sexual assault among homeless youth reportedly range between 15 and 30%, rates of rape between 11 and 43%, and rates of engagement in street prostitution and survival sex between 3 and 46% (citations removed for blind review).

Prior studies have generally examined rates of sexual victimization and behavior and associated health and social problems (e.g. substance use), or examined correlations between homelessness and these outcomes, without considering the influence of risk and protective factors. There exists a paucity of studies among homeless youth that have sought to understand the factors that may contribute to, exacerbate or reduce adverse sexual behavior outcomes, including perpetration of sexual offences, experience of sexual victimization, and engagement in sexual risk behavior and survival sex. Where such studies exist, although the importance of

examining contextual (risk and protective) factors has been highlighted (e.g. Baron, 2004), few have accounted for risk and protective factors in their analyses (citations removed for blind review). In a small number of studies where risk and protective factors have been investigated, those factors experienced by young people prior to their entry into homelessness, and those encountered by young people while homeless, have been acknowledged as influencing a range of behaviors engaged in by homeless youth such as use of health care and engagement in criminal activity (e.g. Farrow et al., 1992; McCarthy & Hagan, 1991). Thus, there is a need for a comprehensive understanding of the influence of risk and protective factors on the sexual behavior outcomes described here (sexual offences, sexual victimization, and sexual risk behavior and survival sex) in order to better contextualize prevention and early intervention strategies. One approach to achieving this enhanced understanding is through integrating the results of previous individual studies to estimate the size of the influence of risk and protective factors on associations between homelessness and these sexual behavior outcomes, using a meta-analytic approach.

### **The present study**

This meta-analysis seeks to address current gaps in the literature through its focus on investigating the influence of risk and protective factors on the occurrence of perpetration of sexual offences, experience of sexual victimization, and engagement in sexual risk behaviors and survival sex among homeless youth. Meta-analyses offer the opportunity to critically evaluate extant studies through the statistical aggregation of findings from these studies to produce an

estimate of the effect of an association (Fagard, Staessen & Thijs, 1996). Given existing homelessness research has been limited by its cross-sectional nature, small sample sizes and high rates of attrition in longitudinal studies, using a meta-analytic approach enables the maximization of sample size as well and increases the power to estimate study effects, and improves the precision of estimates (strength of associations) (Fagard et al. 1996). Insight into the range of risk and protective factors influencing homeless youths' perpetration of sexual offending, experience of sexual victimization and engagement in sexual risk behavior, and survival sex, would enhance understanding of specific factors that may be targeted in prevention and early intervention approaches to reducing such behaviors and experiences. Such insight is attainable through the conduct of this meta-analysis.

## **Methods**

### **Systematic literature searches and retrieval of studies**

This systematic search and meta-analysis were conducted in accordance with the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Moher, Liberati, Tetzlaff, Altman, & Group, 2009). Fourteen databases were searched using database specific controlled subject vocabulary (that is, subject headings) and/or keywords in the title and abstract to ensure the consistency of search terms was maintained across each database. Search terms spanned five specific subject areas (a) homeless youth, (b) perpetration of sexual offences, (c) experience of sexual victimization, (d) engagement

in sexual risk behaviors and (e) engagement in survival sex. Table 1 provides a complete list of databases and subject headings/keywords used in conducting the systematic review.

Insert Table 1 here

### **Inclusion criteria**

In accordance with the PRISMA statement (Moher et al., 2009) inclusion criteria were established prior to conducting the systematic search, in order to obtain published studies of highest relevance to the aims of the meta-analysis. Figure 1 presents the PRISMA diagram of published studies. To be eligible for inclusion in the meta-analysis published studies were required to: (a) report on a sample of homeless youth (12-24 years of age); (b) be published in English language; (c) contain a study abstract; (d) be published between 1990 and 2016; (e) report findings describing the influence of risk and/or protective factors on associations between homelessness and (i) perpetration of sexual offences, (ii) experience of sexual victimization, (iii) engagement in sexual risk behaviors, and/or (iv) engagement in survival sex. The systematic search was first conducted in early 2013, and conducted again in March 2016 to locate newly published papers over the period 2013-2016. Minimum sample sizes were not stipulated. No restrictions were placed on the country of origin of publications; however due to interest in analyzing the most up-to-date research conducted relevant to the focus of this meta-analysis, the date range for publications was restricted to those published from the year 1990 to present.

Insert Figure 1 here

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Retrieved papers that were not consistent with the inclusion criteria for the meta-analysis were discarded, including those where the content did not examine the influence of risk and/or protective factors in relation to sexual offences, sexual victimization, sexual risk behaviors or survival sex, and those where specific forms of sexual offences, victimization, sexual risk behavior and survival sex were included within broad aggregate measures of behavior such as offending or victimization. Other discarded studies presented findings for: samples of youth who were not experiencing homelessness, fell outside the stipulated age range (e.g. too young or old at baseline) or were clients of rehabilitation programs (e.g. drug use), and evaluations of school-based prevention programs (e.g. dating violence, sexual health). Abstracts detailing qualitative analyses, systematic or narrative reviews, dissertations, book reviews, or non-scholarly publications (e.g. 'grey' literature and reports) were also discarded from the review. Dissertations were excluded from this meta-analysis on the basis that high quality dissertations were considered to have been converted into studies published in peer-reviewed journals that would have been identified through the systematic search.

The first author conducted the systematic search, examined all retrieved abstracts and obtained relevant articles. The content of each article was inspected to determine its relevance for inclusion in the meta-analysis. The first author thoroughly read and assessed each article for final inclusion in the meta-analysis. Articles were also identified through scanning the citations of retrieved papers and systematic reviews arising in the literature search. Both authors thoroughly read, assessed and discussed any articles where the preliminary relevance of the

article was unclear, to determine its inclusion in the meta-analysis. Further, the second author checked the content of 30% of retrieved papers to ensure the accuracy of extraction and interpretation of relevant information. The accuracy of data extraction was confirmed by the second author and did not result in the exclusion of any retrieved studies. To accurately present the specific risk and protective factors, and forms of sexual offences, victimization, risk behavior and survival sex examined in the included studies, this meta-analysis utilizes the terms and concepts employed within each reviewed study.

### Meta-analysis

It was the intention of this meta-analysis to examine studies that reported analyses describing the influence of risk and/or protective factors on associations between homelessness and (i) perpetration of sexual offences, (ii) experience of sexual victimization, (iii) engagement in sexual risk behaviors, and/or (iv) engagement in survival sex. No retrieved study examined perpetration of sexual offences by homeless youth; hence a meta-analysis on this outcome could not be completed. Where the same outcomes were examined across multiple studies, effect sizes were averaged across the studies. Two studies reported analyses using the same dataset (Tyler, Hoyt, Whitbeck, & Cauce, 2001a; Tyler, Hoyt, Whitbeck, & Cauce, 2001b). Sufficient data were available in 18 studies which were included in the meta-analysis (40% of all full-text articles assessed for eligibility and inclusion in the meta-analysis). Data across retrieved studies were included in the meta-analysis regardless of whether or not the results presented were statistically significant. Given that effect size is not affected by sample size, and non-statistically significant

results may display large effect sizes, the inclusion of all results in the meta-analysis is appropriate as overall estimates are a weighted average of the significant and non-significant estimates contained across analyzed studies (Schuit, Roes, Mol, Kwee, Moons & Groenwold, 2015).

Results in each included study were coded for their inclusion in the meta-analysis. This information included experience of sexual victimization, and engagement in sexual risk behavior and engagement in survival sex, contained in the 18 studies where sufficient data were available to conduct the analysis. The reviewed studies employed a diverse range of statistical techniques using group designs including correlations, odds ratios, hazard ratios and chi-square analyses. The meta-analysis was performed using Comprehensive Meta-Analysis, version 2.2.064 (BioStat, 2013). In order to use a common effect size measure across all studies, and congruent with current recommendations (Moher et al., 2009), study statistics were converted to an odds ratio (OR) with reference to the arithmetic mean (Higgins, White & Anzures-Cabrera, 2008). The meta-analysis was performed by transforming effect sizes using Fisher's  $Z_r$  weighted by the degrees of freedom ( $n - 3$ ). This weighting takes into consideration differential estimates across studies with varying sample size. Effect sizes were then transformed back to an OR for ease of interpretation in reporting results. ORs represent an indicator of association between an exposure (in this case the risk or protective factor), and an outcome (in this case sexual victimization, sexual risk behavior or survival sex). In accordance with current recommendations, an OR equal to one indicates no effect of the exposure, an OR greater than one indicates an increase in the

outcome following exposure, and an OR less than one indicates a decrease in the outcome following exposure (Tabachnick & Fidell, 2013).

To account for observed and unobserved variance, random effect models were used for effect size analyses (Lipsey & Wilson, 2001) and weighted mean effect sizes (ORs) with 95% confidence intervals were calculated.  $Q$ -statistics for tests of heterogeneity were used to examine effect size distributions. Statistically significant  $Q$ -statistics indicate sources other than sampling error may result in differences in effect sizes (Longman, Hawes, & Kohlhoff, 2016). Random effects models were used to examine categorical moderators and regression analyses used to examine continuous moderator variables. To examine whether the study samples analyzed were representative of the total sample across studies, publication bias was examined through the meta-analysis using Rosenthal's fail-safe  $N$  (Rosenthal, 1979).

*Moderator variables.* A number of factors may account for differences in the influence of risk and protective factors on homeless youths' experience of sexual victimization and/or engagement in sexual risk behavior and survival sex. It has been suggested (citation removed for blind review) differences in levels of social exclusion experienced by homeless youth and associated homelessness and social policies may vary by country and influence the sexual behaviors of homeless youth. For instance, legislation pertaining to engagement in street prostitution and sex work (and associated legal penalties) may impact engagement in sexual risk behavior and survival sex (citation removed for blind review). Prior studies have reported gender differences in health risks among homeless youth with females in comparison to males often

reported as experiencing higher levels of trauma and injury resulting from victimization or assault (Barry, Ensign, & Lippek, 2002; Bearsley-Smith et al., 2008), and engaging in unprotected sex and being diagnosed with sexually transmitted infections (Tevendale, Lightfoot, & Slocum, 2009). From a developmental perspective, the age of the young person may influence their sexual behavior. From an experimental research paradigm perspective, study designs using longitudinal data allow for inferences to be made regarding the temporal ordering of risk and protective factors in modifying the likelihood of adverse sexual behavior outcomes (Ruspini, 2012). Similarly, study sample size (Tabachnick & Fidell, 2013) may influence differences in modifying the occurrence of sexual victimization and behavior outcomes across studies. These factors (study country of origin, gender, age, study design and sample size) will be examined as moderators which may account for differences observed across the studies included in the meta-analysis.

## Results

A description of the 18 studies meeting the eligibility criteria and retained for inclusion in this meta-analysis is presented in Table 2. The 18 studies involved 7,217 participants. With the exception of two studies (Haley, Roy, Leclerc, Boudreau, & Boivin, 2004; Weber, Boivin, Blais, Haley, & Roy, 2004) all studies were conducted in the United States. All but one reviewed study (Weber et al., 2004) were cross-sectional in nature. In the majority of studies, analyzed samples were obtained through recruitment strategies utilized across a mixture of service- (e.g. organizations delivering programs to homeless persons) and street-based sites (e.g. street

corners). Three studies recruited participants only from service-based sites (Haley et al., 2004; Simons & Whitbeck, 1991; Weber et al., 2004). All studies only analyzed data from homeless youth without a comparison group (i.e. non-homeless youth within a general population sample), hence, the results presented within this meta-analysis refer only to homeless youth. The 18 studies included in the meta-analysis examined the outcomes of sexual victimization (e.g. sexual assault), sexual risk behavior (e.g. unprotected sex), and survival sex (including prostitution and trading sex). No studies were located that examined perpetration of sexual offences; hence the findings contained herein relate only to sexual victimization, sexual risk behavior and engagement in survival sex.

Insert Table 2 here

#### **Modifying the occurrence of sexual victimization, sexual risk behaviors and survival sex**

Random effects models, adjusted for sampling error, were produced to examine how risk and protective factors influenced associations between homelessness and the occurrence of sexual victimization, sexual risk behavior and survival sex. Risk factors included alcohol and substance use, exposure to violence [both as perpetrators and victims], demographics and child abuse, sexual behavior, peer relationships, health and homelessness experience. Protective factors included family relationships and social support (Refer Online supplementary material, Tables 1-7 present for odds ratios [ORs] and 95% confidence intervals [95% CIs] for each risk and protective factor). Given the paucity of studies that have sought to understand the factors that may contribute to, exacerbate or reduce sexual victimization, sexual risk behavior and survival

sex among homeless youth, the selection of risk and protective factors analyzed in this meta-analysis was data driven, and hence, covers the exhaustive list of all risk and protective factors included in the analyses of retrieved studies.

The combined random effects model across all risk factors showed statistically significant effects for increased likelihood of sexual victimization and engagement in both sexual risk behavior and survival sex (OR = 1.70, 95% CI = 1.58, 1.83,  $p < .001$ ), suggesting that homeless youth exposed to all risk factors were over one and half times more likely to experience sexual victimization or engage in either sexual risk behavior or survival sex. The analysis showed a failsafe number of 244, which is greater than the critical number of 60 described by Rosenthal (1979), indicating no publication bias. As shown in Figure 2, the funnel plot of standard error was generally symmetrical indicating little effect of publication bias. The random effects model showed a statistically significant heterogeneity statistic ( $Q = 2,213.54$ ,  $p < .001$ ,  $df = 24$ ,  $I^2 = 89.02$ ) suggesting the effect of risk factors on the association between homelessness and youths' experience of sexual victimization and engagement in sexual risk behavior or survival sex across studies (Higgins, Thompson, Deeks & Altman, 2003) may be influenced by moderator variables.

Insert Figure 2 here

Combined random effects models examining the influence of risk factors on associations between homelessness and each type of sexual behavior were also investigated. Table 3 presents these findings (including odds ratios [OR] with confidence intervals [95 % CI]). Results showed the likelihood of being sexually victimized while homeless or engaging sexual risk behavior

were increased by at least one and half times (OR = 1.53, 95% CI = 1.38, 1.69,  $p < .0001$  and OR = 1.66, 95% CI = 1.30, 2.12,  $p < .0001$  respectively), while risk for engagement in survival sex was almost doubled (OR = 1.90, 95% CI = 1.72, 2.10,  $p < .0001$ ) where homeless youth were exposed to all risk factors.

Although a small number of studies examined protective factors, the combined random effects model showed effects for reduced likelihood of victimization and engagement sexual risk behavior and survival sex (OR = .75, 95% CI = .56, .99,  $p = .045$ ), suggesting that the odds of homeless youth being sexually victimized or engaging in sexual risk behavior or survival sex were decreased by 25% where these youth were exposed to all of the examined protective factors. The failsafe number of 13 is lower than Rosenthal's (1979) critical number indicating some publication bias. This is supported by the asymmetrical funnel plot of standard error presented in Figure 3. The statistically significant total heterogeneity statistic for the random effects model ( $Q = 107.67$ ,  $p < .001$ ,  $df = 12$ ,  $I^2 = 88.86$ ) suggests variation in the influence of protective factors on associations between homelessness and the examined outcomes (sexual victimization, sexual risk behavior and survival sex) across studies (Higgins, Thompson, Deeks & Altman, 2003) which may be a result of moderator variables. Further analyses of the combined random effects models investigating the influence of protective factors on the occurrence of each type of sexual behavior among homeless youth showed a statistically significant effect for survival sex, such that protective factors decreased the likelihood of homeless youth engaging in this behavior by over half (OR = .69, 95% CI = .57, .83,  $p < .0001$ ).

Although not statistically significant, the combined random effects models for the influence of protective factors on experience of sexual victimization (OR = .85, 95% CI = .38, 1.09,  $p = .698$ ) and engagement in sexual risk behavior among homeless youth (OR = .74, 95% CI = .34, 1.64,  $p = .462$ ), showed tendencies for reduced likelihood of these experiences and behaviors (refer Table 3)

Insert Table 3 and Figure 3 here

**The role of specific risk and protective factors in modifying associations between homelessness, sexual victimization, sexual risk behaviors and survival sex.**

Table 3 also presents the odds ratios (OR) and 95% confidence intervals (95% CI), adjusted for sampling error in random effects models, examining the influence of specific groups of risk and protective factors on modifying associations between homelessness and each of sexual victimization, sexual risk behavior and survival sex. Specific risk and protective factor groupings examined include: substance use, exposure to violence, demographics and experience of childhood abuse, sexual behavior, peers' deviant and sexual behavior, health and homelessness experience, and social support from peers and family members.

*Substance use.* Findings showed alcohol use modified the association between homelessness and both sexual victimization and survival sex, increasing the odds of both outcomes by a factor of two (OR = 2.25,  $p < .0001$  and OR = 2.78  $p < .0001$  respectively; Refer Table 3). Although alcohol use also showed a significant effect on reduced engagement in sexual risk behavior this result is interpreted with caution as only one included study examined this

outcome. Similar to alcohol use, statistically significant effects were evident for substance and other drug use outcomes. Specifically, findings showed homeless youth who reported substance/drug use (e.g. hard drug use [such as cocaine, injectable drugs], marijuana use, Refer Table 3) were at greater risk of being sexual victimized (OR = 1.20,  $p = .049$ ) and engaging in survival sex (OR = 2.97,  $p < .0001$ ). No effect was evident for substance/drug use and homeless youths' risk for engagement in sexual risk behavior (OR = 2.73,  $p = .077$ ).

*Exposure to violence both as perpetrators and victims.* The models examining the influence of the risk factor, exposure to violence (e.g. non-sexual street victimization, crime perpetration and engagement in antisocial behavior), showed several statistically significant effects (Refer Table 3). The odds of sexual victimization were at least doubled when youth reported having been either victimized while homeless (e.g. physical victimization or assault) or having perpetrated a crime (e.g. theft, selling drugs, carrying a weapon), and increased by almost one and a half times when youth had engaged in antisocial behavior (e.g. deviant subsistence strategies). Increased likelihood of engagement in sexual risk behavior was also evident for these predictors (e.g. OR = 1.80,  $p < .0001$ ). The largest effect was observed for engagement in survival sex, such that having been victimized while homeless tripled the odds of this behavior. Having perpetrated a crime, but not having engaged in antisocial behavior, almost doubled the likelihood for engagement in survival sex. Table 2 (refer online supplementary material) shows the specific findings across included studies for the influence of types of violence exposure

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(victimization and perpetration) on associations between homelessness and each of sexual victimization, sexual risk behavior and survival sex.

*Demographics and experience of childhood abuse.* Age and gender were the most commonly investigated demographic variables modeled as correlates of sexual victimization, sexual risk behavior and survival sex among homeless youth. These correlates commonly showed risk effects for sexual victimization (e.g. OR = 4.05,  $p < .0001$  for older age and OR = 2.10,  $p = .021$  for being female), sexual risk behavior (e.g. OR = 1.87,  $p < .0001$  for older age) and engagement in survival sex (e.g. OR = 1.94,  $p < .0001$  for older age and OR = 2.02,  $p < .0001$  for being female) (Refer Table 3 online supplementary material). However, as shown here in Table 3, the combined random effects model examining the influence of all exposure to demographic factors (age, gender, and race/ethnicity) showed statistically significant effects only for the association between homelessness and engagement in survival sex. Over 60% of reviewed studies examined the influence of having experienced childhood physical and sexual abuse. In some analyzed studies, experience of early physical and/or sexual abuse showed statistically significant effects for increased odds of sexual victimization (e.g. OR = 9.65,  $p < .001$ ) and greater odds for engagement in sexual risk behavior (OR = 2.27,  $p < .0001$ ) and survival sex (OR = 3.60,  $p < .0001$ ) (refer Table 3 online supplementary material). The overall combined random effects models showed that having experienced childhood physical and sexual abuse was a statistically significant correlate in the association between homeless and each of:

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sexual victimization (OR = 2.92,  $p < .0001$ ), sexual risk behavior (OR = 2.07,  $p < .0001$ ) and engagement in survival sex (OR = 1.75,  $p < .0001$ ).

*Sexual behavior.* Self-reported sexual preferences (e.g. sexual orientation, heterosexual) and forms of sexual behavior (multiple sexual partners, unprotected sex) showed statistically significant effects in their influence on associations between homelessness and sexual victimization, sexual risk behavior and survival sex (refer online supplementary material, Table 4). For instance, identifying as heterosexual showed protective effects for sexual victimization, and engagement in sexual risk behavior and survival sex, such that the odds of these experiences and behaviors was reduced (e.g. OR = .33,  $p < .0001$ ). Conversely, participation in survival sex (OR = 3.00,  $p < .0001$ ) and having different sexual partners (OR = 4.24,  $p < .0001$ ) emerged as risk factors for sexual victimization and sexual risk behavior, respectively. In sum, as shown in Table 3, the combined random effects model showed statistically significant effects such that the odds of sexual victimization were increased by one and half times and the odds of engagement in survival sex doubled, when homeless youth reported exposure to the abovementioned types of sexual preference (e.g. sexual orientation, homosexuality) and behavior (e.g. having different sexual partners, engaging in unprotected sex, and engaging in survival sex).

*Peer relationships.* A small number of studies investigated the influence of peer relationships, specifically homeless peers' antisocial and sexual behaviors (e.g. selling sex), on sexual behavior outcomes (refer online supplementary material Table 5). Few individual studies showed statistically significant effects for peers' antisocial behavior, however some studies

showed risk for homeless youths' sexual victimization (e.g. OR = 3.71,  $p = .001$ ) and engagement in sexual risk behavior (e.g. OR = 2.02,  $p < .0001$ ) and survival sex (e.g. OR = 2.45,  $p < .0001$ ) were increased. Despite the mixed effects observed, Table 3 shows the combined random effects models for the influence of deviant peer relationships on associations between homelessness and sexual behavior showed statistically significant effects such that the odds for sexual victimization were increased (OR = 1.26,  $p = .030$ ) and odds of engagement in sexual risk behavior and survival sex almost doubled. Although a small number of studies examined the influence of homeless peers' sexual behavior (specifically selling or trading sex), findings showed these behaviors were significant correlates of homeless youths' own experience of sexual victimization, and engagement in sexual risk behavior and/or survival sex, with the odds for these experiences and behaviors at least tripled (refer Table 3). As shown in Table 3, comparable findings were evident in the combined random effects models investigating exposure to peers' sexual behavior, with the largest effect observed on likelihood of sexual victimization (OR = 3.71,  $p < .0001$ ).

*Health and homelessness experience.* The health status of homeless youth, including appearance and grooming, mental health problems, and sexual health (including pregnancy), in their association with sexual victimization and engagement in survival sex were examined in numerous studies (refer online supplementary material, Table 6). No reviewed studies examined exposure to these factors on the likelihood of homeless youth engaging in sexual risk behavior. Findings showed experience of sexual victimization and engagement in survival sex while

homeless were increased where youth reported mental health problems (e.g. post-traumatic stress disorder, OR = 2.27,  $p < .0001$ ) and poor sexual health (e.g. having a sexually transmitted infection, OR = 2.90,  $p < .0001$ ). As shown in Table 3, these findings were reflected in the combined random effects models examining the influence of these risk factors such that poor health status increased the odds for sexual victimization among homeless youth by almost one and a half times, and sexual risk behavior by the same margin.

Although many reviewed studies (refer online supplementary material Table 6) showed statistically significant effects for homelessness experiences on the odds of sexual victimization (e.g. length of time alone, OR = 1.94,  $p = .001$ ; prior homelessness experience, OR = 2.45,  $p = .005$ ) and sexual risk behavior (e.g. greater length of time homeless, OR = 1.61,  $p = .001$ ) no overall effect for prior exposure to homelessness was found in the combined random effects model examining experience of sexual victimization or engagement in either sexual risk behavior or survival sex (refer Table 3).

*Protective factors.* Few included studies examined the role of protective factors in their influence on associations between homelessness and each of sexual victimization, sexual risk behavior or survival sex (refer online material Table 7). Finding across these studies generally showed support from family members or positive relationships with parents were associated reduced sexual victimization and/or engagement in sexual risk behavior and survival sex among homeless youth. For instance, homeless youths' odds of sexual victimization were reduced by half, and likelihood of engagement in sexual risk behavior reduced by two thirds, where youth

reported having social support from home. Similar results were evident for the influence of positive relationships with parents in relation to engagement in survival sex. However, the combined random effects models showed no significant effect of protective factors on the association between homelessness and either sexual victimization or engagement in sexual risk behavior. In general, the influence of protective factors reduced engagement in survival sex by two thirds (OR = .69,  $p < .0001$ ; see Table 3).

#### **Moderator analysis of the influence of risk and protective factors on associations between homelessness, sexual victimization, sexual risk behaviors and survival sex**

Table 4 presents the odds ratios (OR) and 95% confidence intervals (95% CI) from categorical moderator analyses investigating the influence of risk and protective factors on associations between homelessness and sexual victimization, sexual risk behaviors and survival sex. Of the studies containing sufficient data from which the meta-analysis was conducted, moderator analyses could be conducted for five moderator variables. These variables included: study design, country of origin, sample size, age and gender. Given the small number of included studies with a longitudinal design, the influence of study design was able to be examined for sexual victimization, but not for engagement in sexual risk behavior or survival sex. Statistically significant effects were found, such that the odds for homeless youths' sexual victimization were greater in cross-sectional compared to longitudinal studies increasing the odds for this outcome by one and a half times (OR = 1.52,  $p < .0001$ ). Likewise, categorical moderator analyses examining the influence of country of origin were able to be conducted for engagement in

survival sex, but not for sexual victimization or sexual risk behavior. Findings showed the effect for studies conducted outside the United States was double (OR = 3.50,  $p < .0001$ ) that for studies conducted within the United States (OR = 1.74,  $p < .0001$ ). The influence of sample size was investigated across studies examining sexual victimization and survival sex. For both outcomes, analyses showed statistically significant effects, such that a larger sample size (greater than 500 participants) showed moderating effects. Finally, continuous moderator tests showed statistically significant moderating effects for mean age and percentage of female participants for each of experience of sexual victimization, engagement in sexual risk behavior and engagement in survival sex. Specifically, findings showed that greater mean age was associated with less experience of sexual victimization but greater engagement in sexual risk behavior and survival sex, while a higher percentage of female participants was associated with less likelihood of sexual victimization and greater engagement in survival sex. No statistically significant gender effect was found for engagement in sexual risk behavior.

Insert Table 4 here

### **Discussion**

This meta-analysis is unique in its examination of the influence of risk and protective factors on associations between homelessness and each of sexual victimization, sexual risk behaviors and survival sex among homeless youth. Eighteen studies were identified and analyzed. No studies examining the influence of risk and/or protective factors in modifying the association between homeless and perpetration of sexual offences were located so this could not

be examined in the meta-analysis as planned. Most studies were conducted in the United States and were cross-sectional in nature. The meta-analytic approach used here has enabled the maximization of sample size across studies of homeless youth to estimate (Fagard et al. 1996) the influence of a range of risk and protective factors influencing these youths' experience of sexual victimization and engagement in sexual risk behavior and survival sex. The results from the current study showed that exposure to a range of risk factors increased the likelihood of homeless youth experiencing sexual victimization and engaging in sexual risk behaviors and survival sex. Conversely, exposure to a range of protective factors was associated with a decreased likelihood of engagement in survival sex, but not experience of sexual victimization or engagement in sexual risk behavior.

There exists a paucity of studies that have sought to understand the influence of risk and protective factors in modifying the likelihood of sexual victimization, sexual risk behavior and survival sex among homeless youth. Hence, the selection of risk and protective factors examined in this meta-analysis was data driven. Findings showed risk factors displaying significant effects spanned the individual characteristics and behaviors of the young person themselves (e.g. mental health and substance use), risk and vulnerability associated with homelessness (e.g. exposure to crime), family factors (e.g. experience of childhood abuse) and peers' behavior (e.g. antisocial and sexual behaviors). Protective factors generally encompassed peer and family support. Findings of the meta-analysis showed that associations between homelessness and sexual victimization, engagement in sexual risk behaviors and survival sex may group with other health

risks and risk behaviors, including poor mental health, exposure to violence, and substance use, as well as risks associated with being homeless, and adverse family and peer contexts (e.g. childhood physical and sexual abuse and deviant peer relationships, respectively). While conclusive evidence was not obtained that these factors bring about homeless youths' experience of sexual victimization or engagement in sexual risk behaviors and survival sex, the findings suggest that modifying exposure to these factors is likely to reduce the occurrence of these sexual experiences and behavioral outcomes. Such findings make noteworthy contributions to increasing understanding of specific risk and protective factors that may be targeted in prevention and early intervention approaches aiming to reduce sexual victimization among homeless youths', as well as these youths' engagement in sexual risk behaviors, including survival sex.

A broad range of risk and protective factors for the development of homelessness has been established (e.g. Martijn & Sharpe, 2006; McMorris, Tyler, Whitbeck, & Hoyt, 2002; Shelton, Taylor, Donner, & van den Bree, 2015). However, the list is not exhaustive and further research into modifiable influences is needed. This study has attempted to contribute to this research gap. Literature on childhood and early adolescent experiences of homeless youth commonly show these youth have not received adequate family care and protection, reporting histories of family breakdown, violence, substance use, mental health problems, and poor peer relationships (Bearsley-Smith et al., 2008; Hyde, 2005; Martijn & Sharpe, 2006). The findings of this meta-analysis are important in showing that established risk factors for homelessness should also be

examined as modifiable risk factors for the experiences and behavior youth encounter, and engage in, while homeless.

Our meta-analysis findings showed exposure to specific groups of risk factors (including those related to adverse family experiences [e.g. abuse], substance use, violence exposure and peers' antisocial and sexual behaviors) increased the likelihood of homeless youth being sexually victimized, and engaging in sexual risk behavior or survival sex by at least one and half times. Examining the range of established risk and protective factors influencing the development of homelessness as risk factors for youths' experiences and behavior while homeless is integral not only to enhancing understanding of the development of these behaviors, but also for guiding prevention efforts that aim to reduce the health and social costs associated with homelessness (Farrow et al., 1992; citations removed for blind review; Kidd, 2003). Many of the risk and protective factors examined in this meta-analysis are amenable to change and as such the identification of these factors can assist in identifying youth at risk of developing health problems and risky behaviors (including sexual behaviors). Identifying these factors can also assist in directing prevention efforts to homeless youth that may aid the development of interpersonal skills and support networks required to reduce these health problems and behaviors.

Understanding the vulnerabilities of homeless youth in relation to their potential for victimization or engagement in sexual risk behavior and survival sex, requires consideration not only of exposure to risk and protective factors prior to entering homelessness, but also exposure

to specific groups of risk and protective factors experienced while homeless. It has been suggested that exposure to risk factors associated with experiencing homelessness may contribute to engagement in forms of sexual risk behavior (including survival sex) or increase the likelihood of sexual victimization (citations removed for blind review). The investigation of exposure to specific sets of risk factors in this meta-analysis showed substance use, exposure to violence (as victims and perpetrators), experience of childhood physical and sexual abuse, sexual behavior and peers' behavior (both deviant/antisocial and sexual) were unique risk factors for each of sexual victimization, engagement in sexual risk behavior, and engagement in survival sex. Although in some cases the number of studies investigated was small, the effect sizes are noteworthy given that, to the authors' knowledge, this is the first meta-analysis examining the influence of risk and protective factors on these experiences and behaviors among homeless youth.

This study makes an important contribution to the advancement of theory and practice in research examining risk and protective factors for the behaviors and experiences of homeless youth. Prior studies have generally examined rates of sexual victimization experiences and engagement in sexual risk behaviors, or examined correlations between homelessness and these outcomes (Ferguson, Bender, Thompson, Xie, & Pollio, 2011; Greene, Ennett, & Ringwalt, 1999; Walls & Bell, 2011), without considering the influence of risk and protective factors. There exists a paucity of studies that have sought to understand the factors that may contribute to, exacerbate or reduce sexual victimization and sexual risk behaviors. Importantly, although the

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risk factors examined here (substance use, exposure to violence, childhood abuse, sexual behavior and peers' behavior) have been previously highlighted in their role as potential risk factors for homelessness (Hyde, 2005; Martijn & Sharpe, 2006; McMorris et al., 2002; Shelton et al., 2015), the findings presented here add some weight to suggestions that these factors may also influence the experiences and behaviors of youth while homeless (including, but not limited to, sexual experiences and behaviors) (e.g. citations removed for blind review). For instance, substance use is a commonly cited risk factor for the development of homelessness (e.g. Farrow et al., 1992; Martijn & Sharpe, 2006; McMorris et al., 2002). It has also been suggested that being motivated to escape emotional distress and trauma experienced while homeless may subsequently escalate substance use, and other health and social problems, associated with homelessness (e.g. citations removed for blind review). Similarly, family-based harms (including low parental supervision, lack of parental affect, family violence, childhood physical and (or) sexual abuse and history of residence in out-of-home care) have been established as covariates for homelessness and engagement in risk (including sexual) behaviors (Farrow et al., 1992; citations removed for blind review; Hyde, 2005; Martijn & Sharpe, 2006; McMorris et al., 2002). Homelessness has also been associated with homeless youths' exposure to violence both as victims and perpetrators (citations removed for blind review). Not surprisingly, our findings are consistent with other existing studies suggesting that peers' sexual behavior (e.g. participation in trading sex) is a predictor of homeless youths' engagement in survival sex (e.g. Chen, Tyler, Whitbeck, & Hoyt, 2004; Tyler & Beal, 2010). There is a need for further investigation of

the role exposure to risk and protective factors may have in modifying risk for sexual victimization, sexual risk behavior and survival sex. Quantitative investigations which longitudinally investigate modifiable risk and protective factors for homelessness and subsequent behaviors and experiences in areas that include mental health problems, violence, victimization and substance use are warranted. Qualitative investigations may also be of benefit in providing a deeper understanding of the experiences of young people while homeless, and importantly the personal, behavioral, social, and health impacts of these experiences.

Less commonly investigated in homelessness research are the influences of exposure to protective factors. Our meta-analysis findings showed protective factors, namely social support from peers and family members, had a distinct impact on reducing engagement in survival sex, but not sexual victimization or engagement in sexual risk behavior. These findings may be the result of the small number of studies analyzed here, but nonetheless draw attention to the potentially important role of supportive adults in reducing engagement in this behavior. As noted earlier, risk factors encountered while homeless, coupled with adverse circumstances encountered prior to entering homelessness, may contribute to increased vulnerability among homeless youth, through conditions such as a lack of access to money for food or other commodities, a lack of appropriate shelter and clothing, and subcultures of violence (e.g. Kennedy & Baron, 1993). Engagement in survival sex may result as a consequence of these vulnerabilities, which may be modified by the availability of supportive adults. Prior studies have reported support from adults within a young person's home environment and attachment to

parent(s) are associated with reduced engagement in sexual risk behavior (including survival sex) (Stein, Milburn, Zane, & Rotheram-Borus, 2009; Whitbeck, Hoyt, Yoder, Cauce, & Paradise, 2001). Whether a lack of assistance from supportive adults may exacerbate risk for engagement in survival sex, sexual risk behavior and sexual victimization remains unclear. Further research examining the role of supportive adults in modifying risk for engagement in survival sex, sexual risk behavior, and reducing vulnerability for sexual victimization is warranted.

In considering the potential implications of this research it is important to note the influence of potential moderators in modifying associations between homelessness and each of: sexual victimization, engagement in sexual risk behavior and survival sex. Study design emerged as a significant moderating variable, such that the likelihood of sexual victimization was greater in cross-sectional compared to longitudinal studies. This is likely the result of the majority of studies included in the meta-analysis being cross-sectional. As such, it is recommended longitudinal studies investigating modifiable risk and protective factors for sexual behaviors (victimization, risk behavior and survival sex) are conducted to identify those factors which may be targeted in preventive efforts. The moderator analyses conducted here also suggested effects for country of origin in relation to survival sex, suggesting that modifying the occurrence of survival sex by exposure to risk and protective factors may vary as a function of place. Differences in factors such as Government financial support, social policy, and differences in legislation pertaining to engagement in street prostitution and sex work (and associated legal penalties) are likely to account for the observed country of origin effect, and may impact on

homeless youths' engagement in this behavior (citation removed for blind review). Variation in these factors across countries deserves attention in future studies investigating how risk and protective factors may be targeted as modifiable process by which to reduce engagement in survival sex (as well as other sexual behavior outcomes). Further, studies examining the influence of exposure to risk and protective factors on associations between homelessness and sexual victimization and engagement in sexual risk behavior in countries outside the US are warranted. Last, moderator effects were evident for age and gender, such that older age and being female were associated with each of sexual victimization, engagement in sexual risk behavior and survival sex. Consistent with prior research, gender differences have been highlighted in health risks among homeless youth, with females often cited as experiencing higher suicidality (Kidd & Carroll, 2007), substance use (Montgomery et al., 2002), trauma and injury resulting from victimization or assault (Barry et al., 2002; Bearsley-Smith et al., 2008), rates of unprotected sex and sexually transmitted infections (Tevendale et al., 2009), and unplanned pregnancy (Little, Gorman, Dzendoletas, & Moravac, 2007). Importantly, the majority of studies comprised greater numbers of female compared to male participants, however no reviewed studies specifically compared the influence of risk and protective factors in gender-segregated analyses. Analyses such as these are required to gain insight into whether, for example, female youth may be particularly at risk and warrant more intensive support and prevention services, compared to male youth for sexual health, victim support, and homelessness support services.

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## Study limitations

*Limitations of reviewed studies.* Several limitations to the included studies are noted. First, although a component of the systematic search conducted here focused specifically on perpetration of sexual offences, no studies were located which examined risk and protective factors for the association between homelessness and perpetration of sexual offences. Further, no studies were located comparing homeless youth to youth within the general population to compare the specific influences of risk and protective factors on experience of sexual victimization or engagement in sexual risk behavior or survival sex. Next, there were few studies that analyzed longitudinal data; hence, the findings of this meta-analysis are limited in their ability to make inferences regarding the temporal ordering of risk and protective factors in modifying the occurrence of sexual victimization and sexual behavior outcomes. There was variation across the studies in how the constructs of sexual victimization, sexual risk behavior, and survival sex were measured. For instance, some studies examined the broad construct of sexual victimization (including forced sexual contact, sexual assault and rape) while others examined sexual assault.

*Limitations of the current review and meta-analysis.* Several limitations to this meta-analysis and the interpretation of the findings are acknowledged. Some papers captured through the search were excluded based on the study characteristics (e.g. those where the influence of risk and/or protective factors in modifying risk for sexual victimization/behavior outcomes was not examined). Although 45 studies were obtained for critical review from the systematic search,

only 18 studies contained sufficient data for inclusion in this meta-analysis. This number of papers is acceptable (Valentine et al., 2010). The findings of this meta-analysis are limited to the influence of risk and protective factors on associations between homelessness and each of sexual victimization, sexual risk behavior and survival sex, but not perpetration of sexual offences. Similarly, the meta-analysis findings may not be generalizable outside of the United States, given the lack of studies reporting analyses conducted on samples from outside this context. This meta-analysis was concerned with self-reported experiences of sexual victimization, or engagement in sexual risk behaviors and survival sex among homeless youth, and as such, studies reporting police contact were omitted. It is acknowledged that studies reporting police contact or arrest would be of interest in further research examining source effects. This meta-analysis used a conservative method of analyzing only those studies investigating specific forms sexual victimization, sexual risk behavior and survival sex among homeless youth, rather than other behaviors (e.g., physical or property offending and victimization), or broader measures of violence and victimization. However, it is likely that at least some participants in these studies were “versatile” victims, having experienced multiple forms of victimization, sexual risk behavior and/or survival sex.

### **Conclusion**

Homeless youth commonly report being sexually victimized while homeless, as well as engaging in multiple forms of sexual risk behavior and survival sex. The findings of this meta-analysis are unique in drawing attention to the potential benefit of targeting risk and protective

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factors in modifying the likelihood of these sexual experiences and behaviors, and associated health and social problems, in prevention and early intervention strategies. Across the analyzed studies, findings showed that risk factors including substance use, exposure to violence (as victims and perpetrators), childhood abuse, sexual behavior and peers' behavior (both deviant and sexual) increased risk for sexual victimization, and engagement in sexual risk behavior and survival sex. The protective factors, social support from family and peers, were associated with reduced engagement in survival sex. No retrieved studies examined the modification of risk for perpetration of sexual offences. Few studies have examined how the influence of exposure to risk and protective factors may differ for specific subgroups of homeless youth (e.g. males versus females) or youth outside the United States. Detailed and rigorous research is needed to understand the risk and protective factors that may contribute to, exacerbate or reduce sexual victimization experiences, sexual risk behaviors and survival sex among homeless youth, and the influence of these factors longitudinally. Thus, there is a need for a comprehensive understanding of the influence of exposure to risk and protective factors on sexual victimization experiences, sexual risk behaviors, and engagement in survival sex among homeless youth in order to better contextualize prevention and early intervention strategies.

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Table 1. Systematic search databases and terms

Discipline	Databases
Psychology	Proquest Psychology, PsycArticles, PsycInfo, Psychology and Behavioural Sciences Collection
Social Sciences	Proquest Social Sciences
Medicine	Medline
Health	Proquest Nursing and Allied Health Service, Cumulative Index to Nursing and Allied Health Literature (CINAHL)
Social Work	Social Work Abstracts, SocIndex
Criminology	Australian Criminology Database (CINCH), Criminal Justice Collection, Proquest Criminal Justice
Multidisciplinary	Academic Search Complete
Area	Search terms
Homeless youth	'homeless*', 'youth', 'adol*', 'abandoned children', 'homeless children', 'homeless persons', 'homeless families', 'homeless men', 'homeless students', 'homeless women', 'homeless youth', 'homeless teenagers', 'street youth', 'at-risk youth', 'runaway teenagers', 'runaway children' and 'street children'.
Perpetration of sexual offences	'indecent assault', 'indecent exposure', 'rape', 'sex offenders', 'sexual aggression', 'sexual harassment', 'acquaintance rape', 'gang rape', 'assault and battery', 'pornography' and 'sex crimes'.
Experience of sexual victimization	'sexual consent', 'criminal victimization', 'sexual victimization', 'victimization', 'crime victimization', 'victim' and 'victims of crime'.
Engagement in sexual risk behavior	'prostitution', 'unsafe sex'
Engagement in survival sex	'transactional sex', 'survival sex', 'trading sex' and 'sex industry'

Note. An extensive search of homelessness and each of perpetration of sexual offences, experience of sexual victimization, and engagement in sexual risk behavior and survival sex outcomes among adolescents was required as specific forms of homelessness and these outcomes were often embedded within the text of published studies.

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Table 2. Description of studies meeting review criteria: design, sampling, response rate, attrition and demographics.

Author	Country of Origin	Study design	Site of data collection	Sampling Framework	Date data collected	Sample Size (n: T1)	Gender (F: T1: %)	Age Range/ Average Age (T1: yrs.)
(Chen et al., 2004)	United States	Cross-sectional	Service & street-based sites	Structured interview	Not stated	361	100.00	Range: 12-22 Mean: 16.00 Range: 12-21 Mean (street): 17.90
(Greene et al., 1999)	United States	Cross-sectional	Service & street-based sites	Survey	1992	Street: 528 Shelter: 631	Street: 38.80 Shelter: 60.80	Mean (street): 17.90 Mean (shelter): 16.10 Range: 14-23 Mean (involved): 21.10 Mean (never involved): 20.50
(Haley et al., 2004)	Canada	Cross-sectional	Service-based sites	Structured interview	2001-2003	542	0.00	Range: 12-20 Mean: 17.00
(Rice, Stein, & Milburn, 2008)	United States	Cross-sectional	Service & street-based sites	Structured interview	Not stated	696	50.00	Range: 14-18 68%: 16-17
(Simons & Whitbeck, 1991)	United States	Cross-sectional	Service-based sites	Structured interview	Not stated	40	100.00	Range: 12-21 Mean: 17.00
(Stein et al., 2009)	United States	Cross-sectional	Service and street-based sites	Structured interview	Not stated	501	49.50	Range: 15-18
(Terrell, 1997)	United States	Cross-sectional	Service and street-based sites	Structured interview	Not stated	240	40.45	

(Tyler, Hoyt, & Whitbeck, 2000)	United States	Cross-sectional	Services and street-based sites	Structured interview	Not stated	361	100.00	Range: 12-22 Mean: 16.00
(Tyler, Whitbeck, Hoyt, & Yoder, 2000)	United States	Cross-sectional	Service and street-based sites	Structured interview	Not stated	602	60.00	Range: 12-22 Mean: 16.00
(Tyler et al., 2001a) #	United States	Cross-sectional	Service and street-based sites	Structured interview	1996-1998	372	45.40	Range: 12-21 Mean: 17.00
(Tyler et al., 2001b) #	United States	Cross-sectional	Service and street-based sites	Structured interview	1996-1998	372	45.40	Range: 12-21 Mean: 17.00
(Tyler, Whitbeck, Hoyt, & Cauce, 2004)	United States	Cross-sectional	Service and street-based sites	Structured interview	1996-1998	372	45.40	Range: 13-21 Mean: 13.30
(Tyler & Bear, 2010)	United States	Cross-sectional	Service and street-based sites	Structured interview	2004-2005	372	45.40	Range: 12-21 Mean: 17.00
(Tyler, Gervais, & Davidson, 2015)	United States	Cross-sectional	Service and street-based sites	Structured interview	2008-2009	249	55.00	Range: 14-21
(Tyler, Kort-Butler, & Swendener, 2014)	United States	Cross-sectional	Service and street-based sites	Structured interview	2004-2005	172	40.00	Range: 19-26
(Weber et al., 2007)	Canada	Longitudinal	Service-based sites	Structured interview	1995-2000	148	100.00	Range: 10-25 Mean: 18.80
(Whitbeck et al., 2001)	United States	Cross-sectional	Service and street-based sites	Structured interview	1995-1996	974	Midwest: 60.00 Seattle: 45.40	Mean (Midwest): 16.30 Mean (Seattle): 17.10
(Whitbeck, Hoyt, Johnson, & Chen, 2007)	United States	Cross-sectional	Service and street-based sites	Structured interview	Not stated	428	56.00	17.40

T1 = Baseline assessment; F = female; % = percent; # = study analyzed the same dataset

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Table 3. Meta-analysis results, including odds ratios (OR) with confidence intervals (95 % CI) for the influence of risk and protective factors on associations between homelessness sexual victimization, sexual risk behavior and survival sex.

Risk/protective factor	Sexual behavior	K	Odds ratio (OR)	95% CI	p-value	Q-statistic	df(Q)	I <sup>2</sup>	p-value
<b>Overall effects of risk and protective factors</b>									
Risk factors	Sexual victimization	113	1.53***	[1.38, 1.69]	<.0001	969.76***	112.00	88.45	<.0001
	Sexual risk behavior	24	1.66***	[1.30, 2.12]	<.0001	450.05***	23.00	94.89	<.0001
	Survival sex	107	1.90***	[1.72, 2.10]	<.0001	558.61***	106.00	81.02	<.0001
Protective factors	Sexual victimization	3	.85	[.38, 1.90]	.698	35.84***	2.00	94.42	<.0001
	Sexual risk behavior	3	.74	[.34, 1.64]	.462	56.43***	2.00	96.46	<.0001
	Survival sex	7	.69***	[.57, .83]	<.0001	8.58	6.00	30.07	.199
<b>Individual effects of risk and protective factor groups</b>									
<b>Substance use</b>									
Alcohol use	Sexual victimization	3	2.25***	[1.56, 3.24]	<.0001	4.33	2.00	58.60	.089
	Sexual risk behavior	1	.50***	[.39, .64]	<.0001	.00	.00	.00	1.000
	Survival sex	2	2.78***	[1.97, 3.92]	<.0001	.10	1.00	.00	.752
Substance and other drug use	Sexual victimization	6	1.20*	[1.00, 1.44]	.049	11.35*	5.00	55.95	.045
	Sexual risk behavior	3	2.73	[.90, 8.31]	.077	40.16***	2.00	95.02	<.0001
	Survival sex	13	2.97***	[2.23, 3.96]	<.0001	66.06***	12.00	81.83	<.0001
<b>Exposure to violence both as perpetrators and victims</b>									
Non-sexual street victimization	Sexual victimization	6	2.73***	[1.83, 4.09]	<.0001	19.77***	5.00	74.71	.001
	Sexual risk behavior	1	1.80***	[1.40, 2.31]	<.0001	.00	.00	.00	1.000
	Survival sex	4	3.58***	[1.91, 6.71]	<.0001	11.88**	3.00	74.75	.008
Crime perpetration	Sexual victimization	2	2.91*	[1.30, 6.54]	.010	2.93	1.00	65.78	.087

	Sexual risk behavior	-	-	-	-	-	-	-	-
Antisocial behavior	Survival sex	12	1.98***	[1.67, 2.35]	<.0001	22.12*	11.00	50.27	.023
	Sexual victimization	9	1.41**	[1.10, 1.81]	.008	26.24**	8.00	69.51	.001
	Sexual risk behavior	2	2.30***	[1.91, 2.77]	<.0001	.38	1.00	.00	.540
	Survival sex	3	1.67	[.98, 2.83]	.059	16.71**	2.00	81.31	.005
<b>Demographics and childhood abuse</b>									
Age, gender, ethnicity	Sexual victimization	15	1.39	[.94, 2.04]	.096	221.16***	14.00	93.67	<.0001
	Sexual risk behavior	4	1.26	[.94, 1.70]	.129	14.98**	3.00	79.97	.002
	Survival sex	14	1.65***	[1.39, 1.96]	<.0001	29.38**	13.00	55.75	.006
Childhood abuse	Sexual victimization	11	2.92***	[2.20, 3.88]	<.0001	39.00***	10.00	74.36	<.0001
	Sexual risk behavior	2	2.07***	[1.70, 2.51]	<.0001	.58	1.00	.00	.445
	Survival sex	13	1.75***	[1.47, 2.09]	<.0001	20.60	12.00	41.74	.057
<b>Sexual behavior</b>									
Sexual behavior	Sexual victimization	16	1.73*	[1.11, 2.72]	.016	121.05***	15.00	87.61	<.0001
	Sexual risk behavior	2	.805	[.143, 4.53]	.806	83.61***	1.00	98.80	<.0001
	Survival sex	7	2.51**	[1.32, 4.76]	.005	74.56***	6.00	91.95	<.0001
<b>Peer relationships</b>									
Deviant peer relationships	Sexual victimization	10	1.26*	[1.02, 1.55]	.030	47.04***	9.00	80.87	<.0001
	Sexual risk behavior	2	1.98***	[1.64, 2.38]	<.0001	.04	1.00	.00	.841
	Survival sex	4	1.75***	[1.34, 2.28]	<.0001	4.34	3.00	30.93	.227
Peers' sexual behavior	Sexual victimization	2	3.79***	[2.65, 5.40]	<.0001	.05	1.00	.00	.830
	Sexual risk behavior	1	3.41***	[2.48, 4.67]	<.0001	.00	.00	.00	1.000
	Survival sex	4	2.94***	[1.75, 4.95]	<.0001	9.11	3.00	67.08	.028
<b>Health and homelessness experience</b>									
Health	Sexual victimization	8	1.32*	[1.02, 1.72]	.033	18.25*	7.00	61.65	.011
	Sexual risk behavior	-	-	-	-	-	-	-	-
	Survival sex	10	1.55**	[1.14, 2.12]	.006	40.30***	9.00	77.67	<.0001
Homelessness experiences	Sexual victimization	24	1.03	[.91, 1.17]	.474	77.08***	23.00	70.16	<.0001

<b>Protective factors</b>	Sexual risk behavior	5	1.30	[.93, 1.82]	.132	31.96***	4.00	87.48	<.0001
	Survival sex	18	1.29	[.99, 1.68]	.061	104.79***	17.00	83.77	<.0001
General	Sexual victimization	1	.67	[.35, 1.27]	.221	.00	.00	.00	1.00
	Sexual risk behavior	-	-	-	-	-	-	-	-
Social support and coping	Survival sex	7	.69***	[.57, .83]	<.0001	8.58	6.00	30.07	.199
	Sexual victimization	2	.95	[.33, 2.68]	.916	34.79***	1.00	97.13	<.0001
	Sexual risk behavior	3	.74	[.34, 1.64]	.462	56.43***	2.00	96.46	<.0001
	Survival sex	-	-	-	-	-	-	-	-

Note. Random effects analyses are reported. Odds ratio (OR) is the observed odds ratio adjusted for sampling error. K = number of studies,  $Q$  = Cochran's heterogeneity statistic,  $df$  = degrees of freedom.

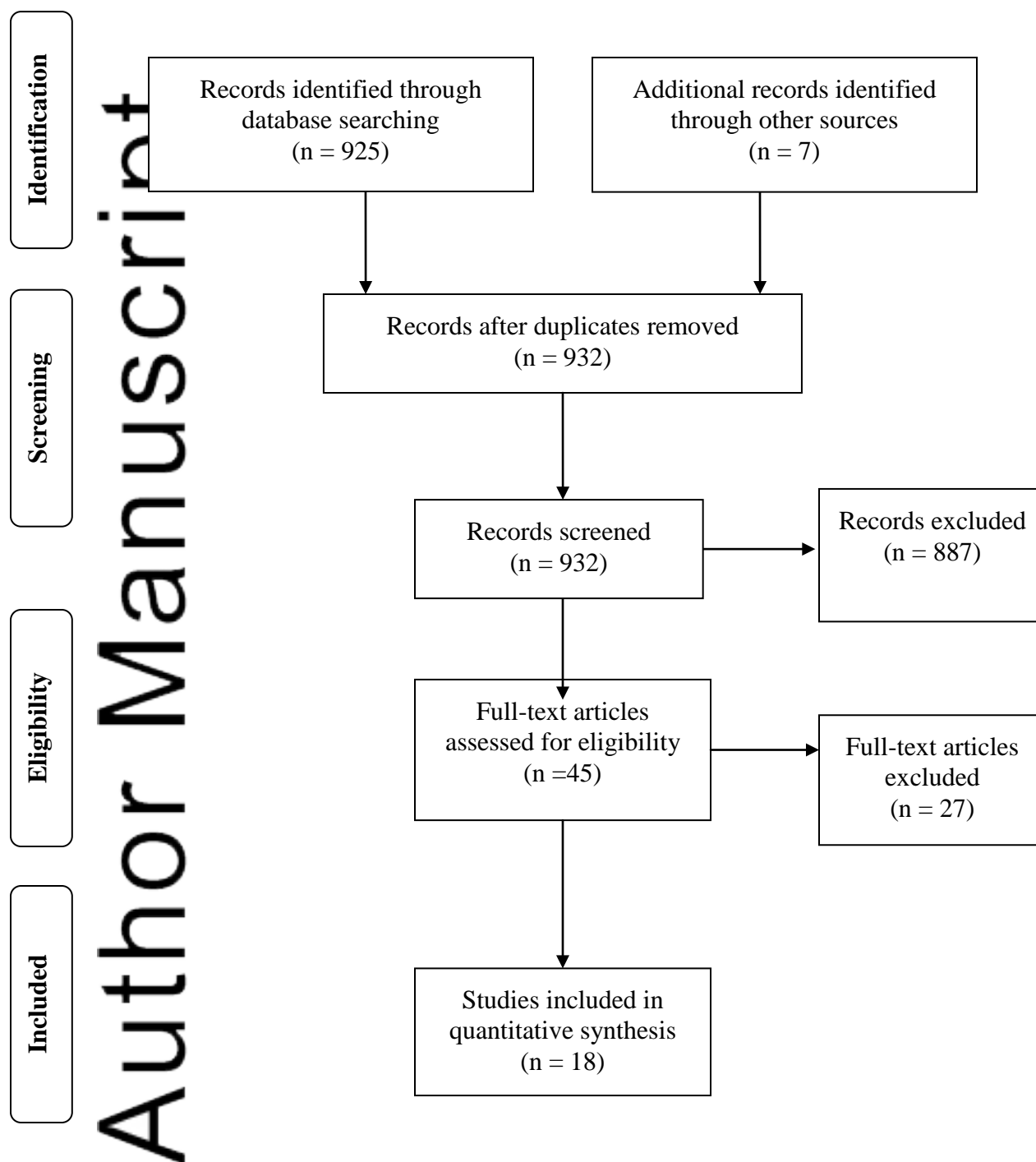
Table 4. Categorical moderator analysis, including odds ratios (OR) with confidence intervals (95% CI) for the influence of risk factors on associations between homelessness sexual victimization, sexual risk behavior and survival sex.

Categorical Moderator	K	Odds ratio (OR)	<i>p</i> -value	95% CI	$Q$	$df(Q)$	$I^2$	<i>p</i> -value
<b>Modification of risk for sexual victimization</b>								
<i>Study design</i>								
Cross-sectional	108	1.52***	<.0001	[1.37, 1.68]	862.82***	107	87.60	<.0001
Longitudinal	8	1.24	.481	[.69, 2.22]	153.95***	7	95.45	<.0001
<i>Sample size</i>								
0-500	81	1.63***	<.0001	[1.44, 1.85]	441.66***	80	81.89	<.0001
501+	33	2.20***	<.0001	[1.84, 2.63]	233.00***	32	86.27	<.0001
<b>Modification of risk for survival sex</b>								
<i>Country of origin</i>								
Within USA	109	1.74***	<.0001	[1.57, 1.94]	687.84***	108	84.30	<.0001

Categorical Moderator	$\beta$	Standard Error (SE)	<i>p</i> -value	95% CI	<i>Q</i>	<i>df</i> ( <i>Q</i> )	<i>I</i> <sup>2</sup>	<i>p</i> -value
Outside USA	5	3.50***	<.0001	[2.00, 6.14]	12.60*	4	68.25	.013
Sample size								
0-500	81	1.63***	<.0001	[1.44, 1.85]	441.66***	80	81.89	<.0001
501+	33	2.20***	<.0001	[1.84, 2.63]	233.00***	32	86.27	<.0001
<b>Modification of risk for sexual victimization</b>								
Age	-.94***	.12	<.0001	[-1.17, -.70]	87.34***	1.00	-	<.0001
Female gender	-.24***	.07	<.0001	[-.37, -.11]	48.75***	1.00	-	<.0001
<b>Modification of risk for sexual risk behavior</b>								
Age	5.05***	1.15	<.0001	[2.78, 7.32]	16.29***	1.00	-	<.0001
Female gender	-.35	.32	.061	[-.99, .28]	5.14*	1.00	-	.030
<b>Modification of risk for survival sex</b>								
Age	.95***	.26	<.0001	[.44, 1.46]	2.57	1.00	-	.059
Female gender	.46***	.06	<.0001	[.35, .57]	3.06	1.00	-	.087

Note. Random effects analyses are reported. Odds ratio (OR) is the observed odds ratio adjusted for sampling error. *K* = number of studies, *Q* = Cochran's heterogeneity statistic, *df* = degrees of freedom,  $\beta$  = beta coefficient

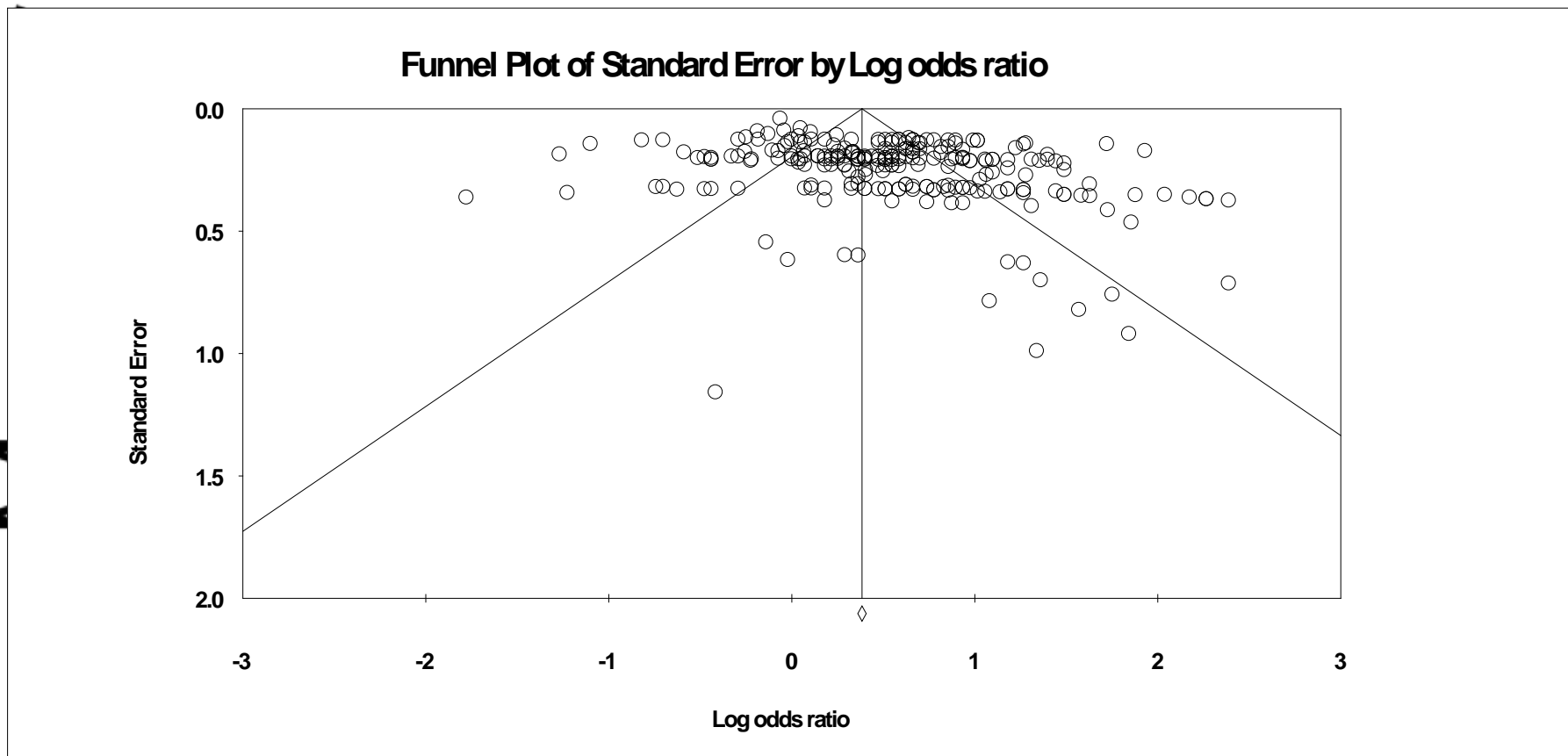
Figure 1. PRISMA diagram of published studies



*Note.* Quantitative synthesis in this context refers to the authors extracting information from eligible studies and describing and synthesizing the findings of these eligible studies in the meta-analysis.

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Figure 2 Funnel plot of standard error for publication bias for the influence of risk factors on associations between homelessness, sexual victimization, sexual risk behavior and survival sex.

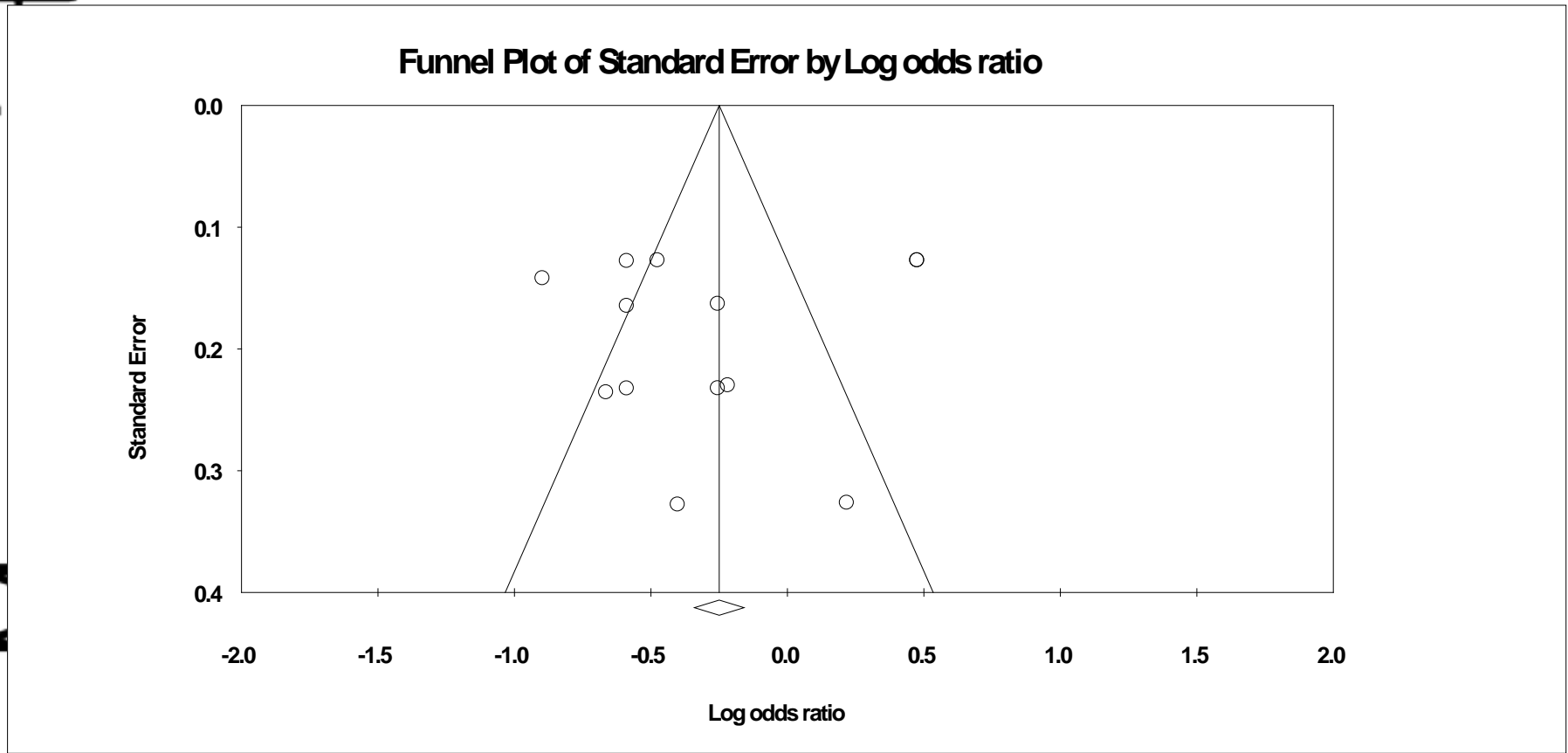


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Figure 3. Funnel plot of standard error for publication bias for the influence of protective factors on associations between homelessness, sexual victimization, sexual risk behavior and survival sex.

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