ABSTRACT

Background: Many youth initiate illicit drugs at a high level. Further, despite the application of preventive interventions to reduce this phenomenon and related harms, there is little evidence that current efforts to prevent illicit drug use and problematic drug use are effective. This research project was therefore undertaken to investigate determinants of, and popular responses to, the initiation of illicit drug use among youth.

Methods: Meta-analytic techniques were used to quantify the evidence on the effectiveness of anti-illicit drug public service announcements. Further, data from the At-Risk Youth Study (ARYS), a prospective cohort of homeless and street-involved youth between the ages of 14 and 26, were analyzed using linear regression analysis to determine factors associated with residing in Vancouver’s downtown eastside (DTES), the location of a large open air illicit drug market, and in the downtown south (DTS), an adjacent neighbourhood. Specifically, between September 2005 and December 2007, participants completed a baseline questionnaire which elicited information on income sources, drug use behaviours, sexual behaviours, and the initiation of illicit drugs.

Results: We identified 7 randomized trials (n = 5,428) and 4 observational trials (n = 17,404). A meta-analysis of eligible randomized trials demonstrated no significant effect, while observational studies showed evidence of both harmful and beneficial effects. Further, among 222 youth participants, having a primary illicit income source and injection heroin use were significantly associated with residing in the DTES in multivariate analysis. No significant differences in risk of drug trade and sex trade involvement, crack use, injection cocaine use, and injection crystal methamphetamine use were found between youth residing in each neighbourhood.

Conclusions: Our findings suggest that current approaches to the prevention of the initiation of illicit drug use among youth may be limited. Further, the results of our linear regression analysis suggest that a consideration of social and structural factors may increase the effectiveness of current preventive interventions. As such, policymakers should consider reorienting current approaches to illicit drug prevention among youth.
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DEDICATION

To my family
CO-AUTHORSHIP STATEMENT

This statement is to certify that the work presented in this thesis was conceived, conducted, written, and disseminated by Dan Werb (DW). The co-authors of the manuscripts, including Drs. Evan Wood (EW), Jane Buxton (JB), and Chris Richardson (CR) made contributions only as is commensurate with committee, collegial or principal investigator duties.

With substantive input from supervisors EW and JB, DW designed the studies and wrote the research protocols. With guidance and input from EW, JB, and CR, DW performed the research and conducted the data analyses. The manuscripts contained in this thesis were prepared and written by DW, and were revised and submitted for publication based on the suggestions of EW, JB, and CR. Final drafts of the manuscripts were prepared following the inclusion of material based on comments from the co-authors, the journal editors, and external peer reviewers.
CHAPTER 1

Background and research objectives

Despite numerous efforts to circumvent the use of illicit drugs, many youth continue to initiate and regularly consume illicit drugs such as marijuana, cocaine, and crystal methamphetamine (1, 2). This is of concern, given that the consumption of some illicit drugs is associated with severe health harms. Specifically, while consensus has not been reached regarding the population-level health harms associated with the consumption of certain illicit drugs such as marijuana and ecstasy (3-5), researchers have identified severe health harms specific to the use of heroin, cocaine, and crystal methamphetamine. In particular, these drugs have been shown to produce high levels of dependence (6-8), and have been implicated in a variety of health harms, particularly fatal overdose and the transmission of sexually transmitted diseases, including HIV (9-11). These harms are particularly pronounced among illicit drug-using youth (12).

1.1 Initiation of problematic drug use and injection drug use use among youth

Given that illicit drug use is associated with many severe health risks, the reduction of “problematic drug use” by youth is a primary concern of policymakers in a variety of settings (13). Problematic drug use is distinct from experimental or occasional use, and researchers have noted that risk factors for experimental or occasional use do not necessarily predict transition to problematic use (13). Problematic use is of particular concern as, in addition to

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1 A version of this chapter will be submitted for publication: Werb D., Buxton J., Wood E., 2010. The causes of the initiation of illicit drug use among youth.
the harms mentioned above, it has been implicated in the transition from non-injection modes of consumption to injection drug use, particularly among heroin, cocaine and crystal methamphetamine users (14, 15).

Injection drug use is an efficient mode of HIV transmission, and massive resources and a large body of literature are devoted to reducing its incidence (16, 17). While estimates vary, researchers have estimated a transmission probability of as high as 1 incident HIV seroconversion event for every 150 injections with a contaminated needle (18). Globally, injection drug use accounts for 10% of all new HIV infections, and when considering only infections outside of sub-Saharan Africa, this estimate rises to over 30% (19). Further, estimates suggest that over 80% of all HIV infections in the Russian Federation, and over 60% of those in Ukraine, are attributable to injection drug use (20). In Canada, 13% of all HIV infections in 2007 were attributable to injection drug use (21). Beyond HIV transmission, research has demonstrated that injection drug use is also a key risk factor for a variety of other health harms. For instance, this practice has been implicated in both fatal and non-fatal overdose (22, 23), and is associated with increased sexual risk-taking and other risky behaviours such as involvement in the drug trade and commercial sex trade work (24-26).

The health harms associated with injection drug use are particularly pressing among youth, as research from North America and Europe suggests that young injection drug users (IDU) are at higher risk for a variety of injection-related harms, including HIV infection, compared with their older counterparts (27-29). Additionally, in some settings, young people make up a large proportion of IDU populations. For example, in St. Petersburg, Russia, more than 30% of IDU are under 19 years of age, while in Ukraine, teenage IDU make up 20% of
the IDU population (30). As a result, researchers have called for the prioritization of the prevention of injection drug use under the Infection Risk Reduction Hierarchy of the US Public Health Service (31). One key subpopulation at high risk of initiating injection drug use is at-risk youth.

1.2 Environmental-structural factors as determinants of initiation of problematic drug use among at-risk youth

While definitions of at-risk youth vary, for the purposes of this thesis project this term will refer to youth that operate within social networks distinguished by their involvement in an urban street scene. This definition of at-risk youth is in accordance with that proposed by UN-HABITAT, the United Nations agency overseeing human settlements (32). At-risk youth constitute a hard to reach subpopulation that are particularly vulnerable to the initiation of problematic drug use, and they are often disproportionately burdened by histories of trauma, sexual and physical violence, lack of education, homelessness, mental illness, and poverty (14, 33-38). Further, at-risk youth often operate within social networks that heighten risk behaviours for HIV transmission through injection drug use and risky sexual practices (39), with a recent study in Vancouver showing HIV and HCV rates of 11.1% and 52.1% respectively in a sample of an at-risk youth subpopulation (40). Although the initiation of problematic drug use occurs at particularly high rates among at-risk youth, responses to this phenomenon appear to be inadequate, given that levels of heroin, cocaine, and crystal methamphetamine among this subpopulation remain at high levels (2, 41).
Researchers have identified a variety of factors associated with the initiation of problematic drug use among youth populations. Specifically, a family history of illicit drug use, as well as early exposure to illicit drugs, have been widely observed to be one of the strongest predictors of subsequent initiation (42). Low levels of family attachment (43), as well as a history of family violence and sexual assault are also strong predictors of subsequent problematic drug use (44). Individuals may also be genetically predisposed to drug dependence (44).

While the identification of individual factors is important in the development of policy responses to illicit drug use, researchers have begun to gravitate towards a consideration of the risk environment experienced by at-risk youth (45). The risk environment is defined as a set of social, environmental, policy, and physical factors that work together in the micro and macro settings experienced by populations to shape and limit the range of choices and risks experienced by individuals (46). In the context of at-risk youth, the risk environment experienced by individuals is posited to be a pervasive influence on the likelihood of initiating problematic drug use (15, 47).

Risk environment theory has informed investigations of the risk of HIV infection and has yielded insight into the role of a variety of simultaneous factors in increasing the risks of negative health harms among vulnerable populations in general, and among injection drug users (IDU) in particular (48). Despite being primarily used as a theoretical framework for investigations of the risks experienced by IDU (49), this approach is also well-suited to the investigation of at-risk youth populations. Indeed, investigations of the initiation of problematic drug use and injection drug use among at-risk youth suggest that the risk of
these phenomena is primarily shaped by structural factors, such as the availability of stable housing (50), and by social factors, in particular the social networks that at-risk youth participate in (51).

1.3 Interventions for the prevention of illicit drug use and drug scene involvement among youth

Given the many harms attributable to problematic drug use, governments and public health officials in diverse settings have diverted considerable resources towards interventions for the prevention of illicit drug use among youth (41). Broadly, these interventions conform to four basic types: drug law enforcement, education, social marketing, and community-based interventions (52-55). While the latter three types are targeted at reducing demand for illicit drugs, drug enforcement interventions are aimed at both reducing supply by disrupting illicit drug markets (56) and reducing demand by criminalizing use (57).

All four of these major intervention types use an abstinence-based theoretical framework in which effectiveness is defined as the prevention of all drug use (55). Recently, experts have begun to question this approach. Efforts have been made to broaden the scope of demand reduction interventions to include the prevention of drug-related harm along with the prevention of drug use. Under this revised preventive framework, interventions fall under three basic categories: primary prevention interventions, which aim to reduce the incidence of illicit drug use initiation; secondary prevention interventions, which aim to encourage safer consumption of illicit drugs and reduce disease transmission; or tertiary prevention interventions, which seek to reduce the long-term negative health harms associated with illicit drug use (58). This tripartite
framework was developed to take into account the fact that a variety of factors, both proximal and distal, play a role in shaping the risk of initiation of illicit drug use and the risk of ongoing drug-related harm among problematic users (see Figure 1) (58). Considering the harms associated with problematic drug use among youth, investigating the determinants of these proximal and distal predictors may aid policymakers in developing more effective interventions across all three levels of prevention.

1.4 Study objectives, setting and outline

The primary objectives of this thesis are to investigate the determinants and public health responses to illicit drug use among high risk youth. This will be effected through a review of current interventions to reduce the initiation of illicit drug use, followed by a systematic review and meta-analysis of the effectiveness of anti-illicit drug public service announcements and an epidemiologic investigation of factors associated with drug use among at-risk youth in a Canadian urban setting. This latter portion of the thesis project was undertaken as part of a larger cohort study of at-risk youth in Vancouver known as the At-Risk Youth Study (ARYS).

The ARYS Study

Data for the investigation of risk factors associated with drug use (Chapter 4) were conducted using data from the At-Risk Youth Study (ARYS), a Vancouver-based cohort study of street youth aged 14 to 26 (14). ARYS participants are recruited using street outreach and self-referral, and eligible study participants reported using illicit drugs other than marijuana in the last 30
days. Once recruited, participants complete an interviewer-administered questionnaire and a physical and mental health assessment that includes blood samples for diagnostic testing. Participants are provided with a $20 CND honorarium. The ARYS questionnaire solicits detailed demographic data (i.e., neighbourhood of residence, age, ethnicity) as well as data on drug use behaviors, income sources, housing situation, experiences with incarceration, involvement in the sex trade and the illicit drug trade, and perceptions of the efficacy and accessibility of health and social services. The study has been approved by the University of British Columbia/Providence Health Care Ethics Review Board, and all study participants provide written consent prior to enrolment.

This thesis project has three main objectives:

**Objective 1. To review several recent interventions aimed at the reduction of illicit drug use among youth.** Chapters 2 and 3 explore current approaches to the reduction of illicit drug use initiation among youth. Specifically, Chapter 2 investigates the current state of evidence on the effectiveness of education, social marketing, community-based, and law enforcement interventions. Chapter 2 also provides a summary of the theoretical foundations of each of these major types of preventive interventions. Chapter 2 also includes an assessment of current barriers to the optimization of preventive interventions, and discusses policy implications based on the current state of scientific evidence on the likely effects of each type of intervention. This review delineates effective approaches to preventing illicit drug use and related harms among youth.
Objective 2. To evaluate the effectiveness of a widely used anti-illicit drug intervention, known as anti-illicit drug public service announcements. Anti-illicit drug public service announcements (PSAs) are commercials that provide advice, information, or promote activities regarded as serving community interests and they are produced for a variety of media including television, radio, print, and the internet (54, 59, 60). Generally, evaluations of anti-illicit drug PSAs focus on high sensation seeking youth. Sensation seeking is a personality trait that determines an individual’s need for novel, complex, ambiguous, and emotionally intense stimuli (61). Individuals who are identified as high sensation seekers may be more willing to take risks to obtain such stimulation (62). However, while such a focus may be helpful in broadly differentiating between levels of risk among a particular subpopulation, this focus may also minimize the contribution of a variety of sociodemographic factors such as housing status, social networks, ethnicity, and family history that play a role in the production of risk of initiation of illicit drug use (15, 63). Given that the Canadian federal government has devoted $10 million CND towards the implementation of these interventions (64), as well as their ubiquity as a primary method of disseminating anti-illicit drug information, a rigorous appraisal of these interventions is required. As such, Chapter 3 consists of a systematic review and meta-analysis of the effectiveness of anti-illicit drug PSAs in modifying attitudes towards illicit drug use and in reducing actual use of illicit drugs among youth.

Objective 3. To examine geographic and social factors that shape the risk environment for the initiation of problematic drug use and drug scene involvement among at-risk youth. A growing body of scientific literature has
identified geographic factors as a primary determinant of drug-related harm, particularly among mobile populations (46, 65). One geographic factor strongly influencing the intensity of use and involvement in illicit drugs and the drug trade among youth in a variety of urban settings is the physical proximity of an open air illicit drug market (66-68). However, it is not known how geographic factors affect youth involvement in a drug scene, and particularly whether area of residence is associated with initiation of particular forms of illicit drug use. In an effort to provide policymakers with data on how geographic factors may affect problematic drug use and drug scene involvement among at-risk youth, Chapter 4 presents a study investigating the influence that neighbourhood of residence may have among at-risk youth in two adjacent neighbourhoods in Vancouver. Explanatory regression models, in which factors are entered into a regression analysis in order to determine which ones are associated with the outcome of interest, were constructed in order to determine whether current neighbourhood of residence affects illicit drug use and drug market involvement among a sample of at-risk youth after adjustment for known sociodemographic risk factors. Given that residence in Vancouver’s downtown eastside, which features an open-air illicit drug market, has been previously identified as an independent risk factor for drug-related harms (69), it is hypothesized that those youth residing in the downtown eastside will be at higher risk of illicit drug use and drug market involvement compared with youth in the downtown south, an adjacent mixed-income neighbourhood. This neighbourhood was chosen based on previous qualitative research that identified it as home to a substantial at-risk youth population (51). Further, it is hypothesized that a larger proportion of
youth will report having initiated crystal methamphetamine and injection drug use in the downtown eastside compared with the downtown south.

The remainder of this thesis is divided into 4 chapters, composed of three manuscripts prepared for publication (Chapters 2, 3 and 4), and a conclusion (Chapter 5). Chapter 2 consists of a literature review of current interventions to reduce the initiation of illicit drug use among youth. Chapter 3 consists of a systematic review and meta-analysis of the effectiveness of anti-illicit drug PSAs. Chapter 4 consists of a cross-sectional analysis of risk of drug scene involvement and the initiation of hard drug use and injection drug use among a cohort of at-risk youth in Vancouver, Canada. Chapter 5 summarizes results from this thesis project and contextualizes this research within the larger body of literature on the initiation of illicit drug use among youth. This chapter also provides an assessment of current approaches to the reduction of illicit drug use initiation and outlines the implications for policy and future research areas indicated by the results of the studies that comprise this thesis project.
Figure 1.1 Determinants of substance use initiation and severity among youth
1.5 References


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Chapter 2

Preventing the initiation of illicit drug use among youth: A narrative review

2.1 Introduction

Illicit drug use is a widespread phenomenon that occurs throughout the world. The United Nations recently estimated that approximately 4% of the human population consumes illicit drugs in any given year (1). While illicit drug use occurs among diverse subpopulations, youth consistently report higher than average levels of illicit drug use compared with other subpopulations (2). While data suggest that youth most often initiate cannabis use, a minority of young illicit drug users also report using a variety of ‘harder’ illicit substances, including crystal methamphetamine, cocaine, and heroin, among others (3, 4).

Certain youth subpopulations of youth are at particularly high risk of health harms associated with the use of illicit substances. The term ‘at-risk’ can be broadly defined as denoting a set of cause-effect dynamics that increase vulnerability for specific negative outcomes among individuals in a particular subpopulation (5). For the purposes of this review, at-risk youth will refer to youth particularly vulnerable to entrenchment within a street-based illicit drug scene, a phenomenon that has known risks for drug overdose and participation in the drug trade (6, 7). Additionally, at-risk youth are at particularly high risk of transitioning from non-injection to injection drug use, a practice that carries significant health risks including HIV transmission, fatal and non-fatal overdose, and chronic dependence (8-14). Given the potential for the manifestation of such

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health harms, a key objective of many national drug control strategies has been the prevention of drug use (15-18). However, despite a consistent allocation of substantial government resources towards drug prevention interventions, surveillance data indicate that illicit drug use among youth remains at high levels (1). This is particularly of concern in the United States, where studies suggest that levels of illicit substance use among youth have, paradoxically, remained high and relatively stable despite the existence of longstanding and well-resourced drug prevention strategies aimed at youth (2). Given the significant resources allocated towards preventive interventions, the present narrative review was undertaken to critically evaluate the effectiveness of current approaches to the prevention of illicit drug use among youth.

2.2 Methods

Studies were identified through searches of MEDLINE, PubMed, PsycINFO, Cochrane CENTRAL, and Web of Science (from inception to November 15, 2009). Search terms used included: “prevention,” “youth drug use,” “initiation,” “adolescent drug use,” “preventive interventions,” and “social marketing”. Major conference websites were also searched for published abstracts. Additional references were found through hand searching of eligible studies. No date limits were placed on the search, but it was restricted to English language studies.

We structured the current review based on an exploratory literature review that identified an a priori categorization of preventive interventions into four major types: social marketing, education-based, community-based, and drug law enforcement (19).
2.3 Results

2.3.1 Social marketing

One of the most popular approaches to preventing illicit substance use among youth is the implementation of social marketing campaigns. These campaigns can take a variety of forms, though they most commonly feature the dissemination of anti-illicit drug public service announcements (PSAs) via television and radio. Recently, however, social marketing campaigns have expanded in scope to take advantage of new media. For example, internet-based videos and web pages devoted to conveying anti-illicit drug messages have become an increasingly important and sophisticated aspect of many interventions (15). The vast majority of social marketing interventions, including anti-illicit drug PSAs, are based on social cognitive theory (20) and its derivations, including the theory of reasoned action (21) and the theory of planned behavior (22), all of which are based on a specific contiguous relationship between intention and behavior.

The results of this review indicate that anti-illicit drug PSAs have been evaluated using both observational and randomized control trial study designs. Studies have employed a variety of methodological approaches and outcomes, including use of illicit substances, intention to use, drug-related curiosity, self-perceived drug avoidance efficacy, and perceived drug use norms. The largest of these campaigns is the U.S. Office of National Drug Control Policy’s (ONDCP) National Youth Anti-Drug Media Campaign (23). The main pillar of this campaign is the dissemination of anti-drug PSAs using radio, television and the internet, as well as the delivery of teacher- and parent-targeted anti-drug messaging kits. The ONDCP budgeted $100 million to the campaign in FY2008
and as of 1998, over $1.3 billion has been spent on the effort (24). However, concerns exist regarding the campaign’s effectiveness. Specifically, an observational study commissioned by the National Institute on Drug Abuse (NIDA) that evaluated results from the campaign between September 1999 and June 2004 found that the Campaign had no effect on youth who had already initiated marijuana use; that higher exposure to the campaign may have significantly increased the rate of initiation of drug use among targeted youth; that the campaign may have weakened the perception of anti-marijuana norms among targeted youth; and that while other favorable and unfavorable changes in drug using behavior were observed among targeted youth, there was no indication that the campaign itself was responsible for these changes (23). While the ONDCP disputed these findings, a US Government Accountability Office audit declared the initial evaluation sound (25).

The results of a number of randomized control trials and observational studies suggest that anti-drug PSAs may have the potential to increase curiosity in illicit drugs among targeted youth. One randomized control trial that tested the attitudes to marijuana use among a cohort of youth observed that exposure to anti-marijuana PSAs decreased the negative attitudes of cohort participants to the drug, and that these attitudes approached neutral after PSA exposure (26). These results have been corroborated by findings from another randomized control trial that found that, among a cohort of youth exposed to anti-drug PSAs through the ONDCP’s National Youth Anti-Drug Media Campaign, selected PSAs made youth more likely to report that they were willing to try drugs as well as indicating that they were less confident about handling drug-related situations, as compared with a control group of youth who did not view the
PSAs (27). This potential negative ‘boomerang’ effect has been reported previously in the scientific literature (28, 29).

2.3.2 School-based drug prevention interventions

School-based anti-drug interventions have been evaluated extensively, particularly in the United States, since at least the 1970s (30-33), though their inclusion in the education system of the United States dates back as far as the 19th century according to some researchers (34). Drug Abuse Resistance Education, commonly known as DARE, was introduced in 1983 and is the largest of these programs, now operating in over 75% of all American school districts as well as in 43 countries internationally (35). DARE is based on the gateway theory of drug use (36) as well as on theories of self-efficacy, which promote the development of interpersonal and social skills that reduce the vulnerability of youth to peer influence for the initiation drug use (37).

A number of DARE evaluations investigated effects of the program in the short term, or immediately following program completion. For example, a randomized control trial that measured the effect of DARE on a range of drug-using and behavioral attitudes among youth in the seventh grade one year after they had received the program found that, compared to a control group, youth exposed to DARE had significantly lower rates of alcohol, cigarette, and other drug use. These results were found particularly among boys in the study (38). A separate observational study that evaluated the effects of DARE immediately after the completion of the program used the school class as a basic unit of measurement ($n = 440$) and employed a study design that attempted to account for the negative behavioral and attitudinal trends associated with maturation among youth. In this evaluation, those students in school classes that completed
DARE were significantly more likely to report increased self-esteem, institutional bonding, and a decreased endorsement of risky behaviors immediately after program completion (39). These significant positive effects of DARE were found despite the fact that maturation among students was associated with lower self-esteem and decreased bonds to family, police and teachers over time (39). Finally, a randomized control trial conducted among fifth and sixth grade students shortly after exposure to DARE found that those students who completed the DARE program were five times less likely to initiate smoking compared to a control group of students who were not exposed to the program (40).

Despite these findings, a number of evaluations have observed limited effects of DARE programs in the long-term and there is widespread scientific consensus regarding the limited effectiveness of the DARE approach. One 5-year randomized control trial, which observed the drug habits of high school seniors exposed to DARE in the seventh grade as compared to a control group, found no significant differences between the DARE-exposed group and the non-exposed group in terms of frequency, recency, and prevalence of the use of a variety of drugs after 5 years; the only statistically significant exception was a higher rate of hallucinogen use in the last 30 days among the DARE-exposed group compared with the non-exposed group (11% vs. 4%, \( p = 0.002 \)) (41). Another 6-year DARE evaluation was carried out across 36 elementary schools and 300 high schools and employed a randomized control trial design (42). In this evaluation, elementary schools were randomly allotted DARE programs and were then paired with demographically matched elementary schools without DARE programs; sixth grade students from these schools were then observed over the
next six years. The authors found that while there were limited short term benefits (i.e., under 2 years) related to student exposure to DARE in terms of attitudes about drugs and resistance skills, these dissipated by the time at which rates of drug experimentation began to increase in high school (42). The authors also found no statistically significant relationship between youth drug use and exposure to the DARE program when measured over the entirety of the 6-year study period (42). A number of rigorous scientific studies, including a 10-year observational study on the effects of DARE (43), as well as a long-term observational study that investigated the effects of previous DARE exposure among undergraduates, have corroborated these results (33, 39, 44-51). As well, multiple meta-analyses of DARE studies have concluded that the program’s positive effects are negligible or non-existent (52, 53).

2.3.3 Community-based prevention programs

Community-based prevention programs often involve a number of stakeholders and multiple components, either applied in sequence or simultaneously. These programs generally find their theoretical basis in models of community action for social change (54, 55), which seek to not only change specific behaviors but also have broader goals oriented towards comprehensive community empowerment and change (19). This broad set of goals is consistent with the large set of stakeholders needed to implement such a program. While the makeup of those involved varies between communities, a variety of youth and family organizations, media, community groups, schools, law enforcement, faith-based organizations and government are all often involved as stakeholders in many of these programs (19). The creation of such coalitions enable the pursuit of community empowerment goals that seek to create agency among community
participants, in contrast with the notion of community members as passive recipients of public health prevention programs (55-57).

One guiding theoretical framework for community-based prevention strategies is the public health model. This model, which also serves as the foundation for some social marketing interventions, uses the classical notion of vectors within a population as a basis for the dissemination of positive behavioral change (58). Public health models of community-based prevention strategies posit a host, agent, and environment as the main determinants of behavioral change within a community (19). In this model, an illicit substance can be viewed as the agent, and the intervention may work to transform overarching environmental factors that reinforce the susceptibility of individuals (i.e., hosts) to the agent or may focus directly on changing the behavior of individuals (19). One example of a community-based intervention targeting environmental factors is the Positive Futures program, which was implemented in the United Kingdom by Sport England, The Youth Justice Board and the United Kingdom Anti-Drugs Coordination Unit in 2000. This program utilized sport and other activities to engage with youth aged 10-19 identified as at-risk of initiating illicit drug use (59). An evaluation of Positive Futures found that young people enrolled in the program reported improved social relations, higher educational performance, and higher levels of employment (59). However, the evaluation did not perform a statistical analysis on the effect of the program on these outcome variables, and little is known regarding the mechanism of change and actual effect of the intervention (59). Further, given the lack of data presented in the evaluation on recruitment of participants, selection bias may have been introduced into the evaluation. Specifically, youth who chose to enroll in Positive
Futures may have also been significantly more likely to be motivated in their education and in their pursuit of employment compared with those youth who opted not to enroll in the program. As such, the generalizability of the evaluation’s findings may be severely limited. Finally, no data on the effect of Positive Futures on drug use patterns among youth have been reported (59).

Despite the popularity of community-based approaches for the reduction of illicit drug use among youth, a lack of monitoring of the effectiveness of community-based interventions is widespread in the scientific literature (19, 59, 60). This limitation may be related to the fact these interventions are concerned primarily with building skills that can be used towards community empowerment. As such, it may be difficult for evaluators to identify specific outcomes amenable to quantitative analysis. Specifically, because community empowerment is a diffuse, long-term outcome, observational studies may not be properly equipped appropriate for evaluating community-based prevention programs, except crudely through ecological studies (61). Additionally, because community-based prevention strategies often include a complex set of components, disentangling the independent effects of a particular component is difficult and may in some cases be impossible (61). Researchers have suggested that evaluations of complex community-based interventions may benefit from incorporating a mixed-methods study design (61). Nevertheless, evaluators still face problems in quantifying the effectiveness of these programs and this may therefore limit their acceptability to policymakers.
2.3.4 Drug law enforcement

One of the most popular approaches to reducing youth uptake of illicit drug use is the application of drug law enforcement. Given the criminalization of drugs as dictated by the global United Nations drug conventions (62), the vast majority of UN member countries have devoted substantial resources to drug law enforcement. Further, drug law enforcement overwhelmingly represents the most popular approach to illicit drug use prevention (63), and drug law enforcement interventions often consume a large majority of resources allocated towards reducing drug-related problems (24, 64). Drug law enforcement is guided by a theory of deterrence, in which drug use is hypothesized to decrease if penalties on its use are applied (65). Generally, drug law enforcement takes the form of increased police presence in areas known to be illicit drug markets, and periodic crackdowns on drug users and those involved in the drug trade (66-68). Since youth are disproportionately involved in illicit drug markets (7, 69, 70), such drug law enforcement naturally targets young people at risk of becoming entrenched within intense illicit drug-using scenes. While specific enforcement strategies differ in each micro-setting, the threat of arrest and violence are commonly used to disincentivize illicit drug use (68).

Despite this reliance on enforcement, little evidence exists to suggest that enforcement has resulted in a reduction in the initiation of illicit drug use among youth (71). For example, in the United States, where drug law enforcement receives billions of dollars in annual funding (72), research from the long-running Monitoring the Future study, which collects data on drug use indicators among high school students in the United States, does not indicate that increased drug law enforcement contributes to a reduction in use (2). Conversely,
as demonstrated in Figure 1, the prevalence of heroin use among high school students appears to have paradoxically increased during a time of increasing funding for drug law enforcement (1).

Drug law enforcement may also take the form of community policing, which is a strategy designed to create overlap between community and law enforcement goals (73). In particular, goals related to problem-solving, communication between affected communities and police, enforcement responses to community concerns and civilian inclusion in enforcement strategies are all hallmarks of community policing approaches. In general, community policing strategies are most effective in areas of high socio-demographic homogeneity, as community goals in such settings often serve the needs of a majority of individuals. However, in communities that are socio-demographically diverse, community needs may be disparate and community policing may therefore prioritize the needs of some community members over others (74). In these situations, increasing community participation may be difficult, and the capacity of community policing strategies to meet specific objectives may be limited.

Community policing emerged in the 1980s without a formal theoretical framework (75), though a broad goal of this approach is the optimization of the delivery of police services to communities (76). Since its emergence, theories of social organization such as the broken windows theory and social-structural approaches to the prevention of crime have been employed in the implementation of community policing interventions (77, 78). Regardless of the theoretical framework, community policing strategies prioritize police-community relations and attempt to address community concerns (76). This
strategy often results in the prioritization of policing strategies to prevent public disorder stemming from illicit drug use among youth (19). However, scientific evaluations conducted to date have not provided evidence of effectiveness in terms of reducing illicit drug use, though these programs appear effective in improving the perception of police performance among community residents (74, 79). This is consistent with evidence, as described above, suggesting that prohibitive drug policies that rely primarily on drug law enforcement may be ineffective at modifying levels of community drug use (1). This may be explained by research demonstrating that issues of perception – such as the level of fear that community members report feeling – may be more important within the context of community policing strategies than actually decreasing potential sources of danger (78).

2.4 Discussion

Illicit drug use among youth is a widespread phenomenon with the potential for severe negative health outcomes, and its prevention is thus an important priority for affected communities, governments, and other stakeholders. This review outlined the four types of interventions commonly used to reduce the consumption of illicit drugs by young people, which included education-based, social marketing, community-based, and drug law enforcement. Existing research suggests that each of these approaches have important limitations that reduce their effectiveness in addressing illicit drug use among youth. Additionally, methodological concerns, particularly in the evaluation of long-term interventions and interventions with distal outcomes (i.e., effect of community-based interventions on community empowerment), have also limited the existing evidence base.
As summarized above, a vast amount of literature exists evaluating the effectiveness of school-based preventive interventions, including multiple systematic reviews and meta-analyses of DARE (53, 80). By contrast, because community-based responses inherently involve multiple processes, components, and stakeholders, few evaluations of these programs have been conducted and more research is therefore required. Further, research to date on drug law enforcement suggests that such an approach may have a limited impact on the levels of illicit drug use among youth (2, 81). Policymakers should therefore re-evaluate law enforcement and public health goals in order to ensure a clear synthesis of the two in responses to problems associated with illicit drug use. Finally, while experts have performed a number of evaluations of the effectiveness of anti-illicit drug public service announcements, no systematic reviews or meta-analyses of these programs have been undertaken.

Researchers have observed that scientific evidence appears to have little effect on drug policy (82, 83). In the case of preventive interventions, little evidence suggests that any of the four major types of preventive interventions have resulted in sustained and quantifiable positive reductions in initiation or use of illicit drugs. Despite this lack of data, current approaches to prevention remain popular with both the general public and the majority of governments. However, in order to achieve effectiveness, further research into the component causes of initiation of illicit drug use among youth is needed in order to inform current preventive interventions.

One potential strategy to improve the effectiveness of future interventions may be to engage in a reassessment of the broad theoretical framework of prevention. While the particular preventive interventions reviewed in this
manuscript differ substantially, all adhere closely to an abstinence-based model, which creates a dichotomy between use (failure) and non-use (success) of illicit drugs among individuals in target populations (19). This reliance on an abstinence-based model may be the key mechanism by which such preventive interventions may be limited in producing ‘successful’ outcomes. Instead of delineating success strictly through an increase in abstinence, policymakers may achieve higher levels of effectiveness by considering preventive interventions within a spectrum of primary, secondary, and tertiary prevention, as has been proposed by experts in the field (84). As noted earlier in Chapter 1, primary prevention is defined as a reduction in use and initiation; secondary prevention as a reduction in misuse; and tertiary prevention as a reduction in drug-related harm (84). By adopting this theoretical framework, policymakers would be able to evaluate the impact of preventive interventions more comprehensively and ultimately develop more effective interventions. Given that, at a global level, research has demonstrated that settings with abstinence-based illicit drug policies do not have lower levels of use than countries with more liberal drug policies, such a reevaluation of current approaches to the prevention of illicit drug use appears warranted (86).

This review contains a number of limitations. First, because of the diverse set of interventions reviewed, a systematic review was not practical, though it is noteworthy that Chapter 3 of this manuscript consists of a systematic review and meta-analysis of the effectiveness of anti-illicit drug PSAs. Secondly, we restricted this analysis to English-language peer-reviewed studies and included grey literature, which may have limited the search. Third, publication bias may have limited the number of published studies, as findings of non-effectiveness,
particularly in the area of illicit drug prevention, may not have been published (85, 86). Fourth, the possibility exists that we did not include relevant grey literature in our study, as such literature is often unindexed and therefore difficult to identify.

In summary, despite a large body of scientific research outlining various preventive interventions, the existing evidence does not support the current approach and that further research on existing and new approaches to preventing illicit drug use among youth is needed. Additionally, difficulties in applying observational research techniques to large-scale interventions for the reduction of illicit drug use likely limit existing research. Finally, the fact that few interventions have produced evidence of effectiveness in reducing illicit drug use among youth suggests that the theoretical framework for evaluating effectiveness may need to be reassessed (19). Further, it is likely that such a reassessment of the theoretical framework for prevention will not only lead to different evaluation results but also to the development of new interventions. In sum, while future research is needed, the evidence to support current popular approaches to drug prevention interventions appears limited. Given the large amounts of resources devoted to prevention, preventive interventions require greater systematic evaluation. By considering the inclusion of theoretical frameworks that incorporate social and structural risk factors in the development of preventive interventions, the effectiveness of these interventions may be increased.
Figure 2.1 Annual prevalence of heroin use among high-school students in the United States, 1980-2007

2.5 References


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CHAPTER 3

The effectiveness of anti-illicit drug public service announcements: A systematic review and meta-analysis

3.1 Introduction

Illicit drug use continues to pose a serious threat to public health in a number of settings, and the prevalence of marijuana use among youth continues to be of particular concern (1-4). As well, the consumption of drugs such as methamphetamine, heroin and crack cocaine present complex public health challenges (5-7). Given their potential for harm, the effective prevention of the consumption of such drugs among vulnerable populations requires the development of policies guided by the best available scientific evidence.

One increasingly popular response to illicit drug use has been the dissemination of anti-illicit drug public service announcements (PSAs) through media campaigns, generally targeted at youth. PSAs are commercials that provide advice, information, or promote activities regarded as serving community interests and they are produced for a variety of media including television, radio, print, and the internet (8-10), and anti-tobacco PSAs appear to have been effective in modifying attitudes towards tobacco use among targeted populations (11). In the United States, anti-illicit drug PSAs have been a cornerstone of the country’s drug policy since at least the 1970s (12), and a national anti-illicit drug use media campaign has been operating since 1999 (8).

1 A version of this chapter has been submitted for publication: Werb D, Wood E., 2010. The effectiveness of anti-illicit drug public service announcements: A systematic review and meta-analysis.
Canada, Australia, and the United Kingdom have all recently embraced anti-illicit drug PSAs as part of their national drug control strategies (9, 10, 13, 14).

Despite the popularity of anti-illicit drug PSAs as a means of combating illicit drug use among youth, the impact of these strategies in reducing consumption of, and modifying intentions to use, illicit drugs remains unknown. We therefore conducted the following systematic review and meta-analyses to investigate the state of the research related to the effectiveness of anti-illicit drug PSAs in modifying behaviour and intention to use illicit drug use among target populations.

3.2 Methods

We referred to PRISMA guidelines for reporting of systematic reviews and meta-analyses in this analysis (15).

3.2.1 Eligibility Criteria

Our primary outcome of interest was the effectiveness of anti-illicit drug PSAs in modifying intentions to use and/or reducing self-reported use of, illicit drugs. We reviewed both randomized controlled trials (RCTs) and observational studies, but placed primary emphasis on RCTs. We considered all studies published in peer-reviewed journals, abstracts from international conferences and governmental reports. We did not include evaluations of anti-licit drug (i.e., tobacco or alcohol) PSAs in our review as alcohol and tobacco are government sanctioned. Studies of illicit drug prevention campaigns that included multi-component interventions (i.e., school-based and media-based interventions) were only included if the impacts of anti-illicit drug PSAs were evaluated independently.
3.2.2 Search Strategy

We searched the following 10 electronic databases (from inception to July 29, 2008): PubMed, PsycINFO, EMBASE, Cochrane CENTRAL, CINAHL, Web of Science, TOXNET, AIDSLine, AMED, and ERIC. We searched for all English-language articles and abstracts and set no date limits. Search terms included “anti-drug,” “anti-marijuana,” “national anti-drug youth media campaign,” “youth,” “drug prevention,” “adolescent,” “public service announcement” and “PSA”. We also examined references from relevant articles.

3.2.3 Study Selection

Using a predefined protocol (available from corresponding author on request), 2 investigators (D.W., E.W.), working independently, scanned all of the abstracts and obtained the full text of articles and reports that evaluated a measure of effectiveness. We assessed validity in duplicate using the following criteria: 1) study design and 2) measure of effectiveness. After obtaining the full reports of the candidate studies (either a full peer-reviewed article, conference abstract, or non-peer-reviewed report), the same reviewers independently assessed eligibility. After all potentially relevant full-text articles and abstracts were identified, 3 of the authors (D.W., EM, E.W.) met to achieve consensus regarding eligibility.

3.2.4 Data Extraction

Between May 1, 2007, and July 29, 2009, we conducted data extraction independently, in duplicate, using a standardized form. Data abstractors collected information about the study design, sample size, methods of effectiveness measurement, and outcomes. The data were entered into an electronic database such that duplicate entries existed for each study; when the
two entries did not match, we reached consensus through discussion (D.W., E.W.).

3.2.5 Meta-Analysis

The primary meta-analysis considered all RCTs used random effects, which is an approach that recognizes and anchors studies as a sample of all potential studies, and incorporates an additional between-study component to the estimate of variability. In trials that evaluated multiple interventions (i.e., more than one anti-drug campaign), we included the outcomes for the sub-studies as separate entries within the meta-analysis. In cases where study samples were stratified between particular groups, we conducted subgroup analyses and entered each subgroup as a separate data point in our meta-analysis. Because studies reported primary outcomes as continuous, we applied the weighted mean difference as the primary outcome. We used the $I^2$ to detect heterogeneity between studies in our meta-analysis. We also reviewed all observational studies and conducted a second meta-analysis of observational studies again using a weighted means difference design with random effects. Analyses were conducted using StatsDirect version 2.5.2 (StatsDirect Ltd, Cheshire, England) (16).

3.2.6 Role of the funding source

This was an investigator-initiated study without external funding support. No external funder played a role in the collection, analyses, interpretation of data, writing of the report or decision to publish. All authors had complete access to all data and all had final responsibility to submit for publication.
3.3 Results

We identified 49 possible articles for inclusion in our review. Thirteen studies were excluded because they were neither peer-reviewed nor published by a governmental agency. A further 18 studies were excluded because they did not directly evaluate the effect of anti-illicit PSAs on intention to use illicit drugs or on self-reported illicit drug use. Four studies were excluded because they only evaluated the effectiveness of anti-drug media interventions in reducing licit drug use (i.e., tobacco or alcohol). Two studies were excluded because they investigated multi-component interventions and did not provide separate findings for anti-illicit drug media interventions. Twelve studies published between 1989 and 2008 met the eligibility criteria for our review (8, 9, 17-26). However, 1 was excluded because it reported duplicate findings (18) and we opted to include the more recent version of this study (17). Of the remaining 11 studies, 7 (n = 5,428) employed an RCT design (17, 19-24), and 4 (n = 17,404) employed observational study designs (8, 9, 25, 26).

3.3.1 Systematic Review of RCTs

Eligible studies are presented in Table 1. As shown, studies used diverse methodologies to examine the impact of anti-illicit drug PSAs on intention to use illicit drugs and levels of illicit drug use among targeted populations. Of 7 RCTs, 6 compared individuals exposed to anti-illicit drug PSAs with individuals exposed to a control program (17, 19-23), while 1 study employed a between-groups design in which individuals exposed to different types of anti-illicit drug PSAs were compared (24). Sample sizes ranged from 28 to 3,608 (Median: 284, IQR: 46.5 - 80). Three RCTs exposed individuals to marijuana-specific anti-illicit drug PSAs (19, 21, 24), and 4 RCTs exposed individuals to a variety of anti-illicit
drug PSAs (17, 20, 22, 23). Two RCTs reported positive effects of anti-illicit drug PSAs corresponding to a -0.01 reduction in intention to use illicit drugs on a 1-7 scale of intention, and to a 0.06 increase in intention to call a drug abuse hotline on a 1-5 scale of intention (17, 19). Five RCTs reported both non-significant and/or negative effects of such interventions (20-24).

Fishbein et al. conducted an RCT in which they evaluated the relative effectiveness of 30 anti-illicit drug PSAs in modifying the intention of targeted individuals to use illicit drugs (23). Randomly assigned participants (n = 3,608) that viewed 6 of the possible 30 anti-illicit drug PSAs or a control program reported that 16 PSAs were more effective than the control program in reducing intention to use illicit drugs among study participants, 8 did not differ significantly from the control, and 6 were significantly less effective than the control in reducing intention to use illicit drugs (i.e., these PSAs significantly increased participant intention to use illicit drugs). In this study an effect size of 0 represented a null effect, and the 5 most effective PSAs were those with content focusing on heroin and methamphetamine, with relative effect sizes ranging from 0.597 to 0.938. By contrast, the 5 least effective PSAs addressed marijuana use or focused on building the self-esteem of viewers, with relative effect sizes ranging from -0.089 to -0.286 (23).

Additionally, Yzer et al. observed no significant effects of exposure to anti-illicit drug PSAs among a sample of youth (n = 418) compared with a control program in decreasing intention to use marijuana (22). However, individuals exposed to anti-illicit drug PSAs that explicitly mentioned the gateway theory of drug use (i.e., that marijuana use leads to the use of ‘harder’ drugs such as
cocaine and heroin) reported significantly weaker anti-marijuana norms than the control group (22).

Finally, the possibility that the effectiveness of anti-marijuana PSAs is mediated by group interaction was investigated using an RCT by David et al., who conducted a post-test only between-subjects study of seventh- and twelfth-grade students in the Philadelphia area (n = 535), in which group interaction was measured through the observation of online ‘chatting’ (i.e., participation in an online chat room environment) between study participants (24). The authors found that individuals who participated in online chatting after exposure to anti-marijuana PSAs reported significantly weakened anti-marijuana beliefs compared with those study participants that did not engage in online chatting (24).

3.3.2 Systematic Review of Observational Studies

Among the 4 observational studies that investigated the effectiveness of anti-illicit drug PSAs in reducing levels of illicit drug use, sample sizes ranged from 1,490 to 4,803 (Median: 3,186, IQR: 3142 – 4795) and study periods ranged from 1 to 5 years. All observational studies observed the effects of anti-illicit drug PSAs within the context of either a community- or national-based media campaign, and two studies examined the effects of the U.S.-based National Youth Anti-Drug Media Campaign (8, 26). Two observational studies conducted by Palmgreen et al. in the state of Kentucky found that anti-illicit drug PSAs were associated with significant 8.8% and 10.7% reductions in illicit drug use (25, 26), 1 observed a 3% reduction in use among study participants but did not report on levels of significance (9), and as will now be described, 1 five-year
study observed a non-significant 0.4% increase in use as well as potential negative effects on attitudes towards illicit drugs (8).

Specifically, the U.S. Office of National Drug Control Policy’s (ONDCP) National Youth Anti-Drug Media Campaign, ongoing since 1999, constitutes the largest PSA-based anti-illicit drug intervention in the world. A 5-year observational study using a national sample of youth as well as county-level observational studies were conducted in order to determine its potential effectiveness in modifying drug use patterns among youth. It is noteworthy that those observational studies conducted by Palmgreen et al. in two counties in Kentucky concluded that components of the National Youth Anti-Drug Media Campaign appeared to be effective in reducing rates of illicit drug use among youth, as mentioned above (25, 26). However, when campaign effects were investigated at the national level by Orwin et al., there was no evidence that the dissemination of anti-illicit drug PSAs had a significant effect on reducing levels of illicit drug use (8). Further, the authors found that higher exposure to the campaign was significantly associated with the negative effect of weaker anti-illicit drug norms among study participants corresponding to a 6.29 decrease in negative attitudes and beliefs related to marijuana on a scale with a baseline mean and standard deviation of 100 each (8).

Phase 2 of the Australian government’s National Drugs Campaign, targeted towards youth aged 13-24 years old, was also evaluated using a prospective observational study design (9). According to the evaluators, modest attitudinal changes were observed among the entire sample during the one-year study period. Specifically, significant increases were observed among youth believing that amphetamine and ecstasy use can lead to paranoia, depression,
aggression, and lethargy. However, no significant differences in rates of illicit drug use were observed (9).

Findings of effectiveness in both RCTs and observational studies in our systematic review were generally restricted to subpopulations identified as high sensation seekers. High sensation seeking is a personality trait characterized by the need for novel, complex, ambiguous, and emotionally intense stimuli, and the willingness to take risks to obtain such stimulation. Individuals identified as high sensation seekers are believed to be at higher risk of initiating illicit drug use compared with low sensation seekers (25).

3.3.3 Meta-Analysis

Three RCTs were reviewed but were ineligible for inclusion in our meta-analysis because, while they evaluated the effect of PSAs on intention to use illicit drugs, they did not present the required outcome data (17, 23, 24). As well, because the study by Wagner & Sundar included two separate RCTs we considered these trials independently in the meta-analysis. As shown, when we conducted a weighted means difference meta-analysis of RCTs using random effects, we found a non-significant effect size of 0.29 (95% CI: -0.17, 0.75 [p = 0.217], I² = 66.1%; 95% CI = 0%, 84.9%). The study by Harrington et al. stratified participants into high and low sensation seeking youth, and we therefore conducted a subgroup analysis among these subgroups in the meta-analysis. This meta-analysis generated a non-significant effect size of 0.15 (95% CI: -0.19, 0.49 [p = 0.382], I² = 53.2%; 95% CI = 0%, 80.8%). Effect sizes and findings of the subgroup meta-analysis are presented in Figure 1.

Observational studies included in our systematic review were subject to a second meta-analysis. Because certain studies included multiple evaluations of
separate interventions or stratified findings by sensation seeking status (25, 26), we entered these findings separately in our meta-analysis (full data available from the corresponding author). When we conducted a meta-analysis of the 4 observational studies, we found an effect size of -0.04 (95% CI: -0.06, -0.01 \([p = 0.004]\), \(I^2 = 100\%, 95\% \text{ CI} = 100\%, 100\%\)), corresponding to an estimated 4% reduction in use of illicit drugs among individuals exposed to anti-illicit drug PSAs, though it is noteworthy that we observed the maximum level of heterogeneity in this analysis. Effect sizes and findings of the meta-analysis of observational studies are presented in Figure 2.

### 3.4 Discussion

The present systematic review demonstrates limited evidence to support the use of PSAs for illicit drug prevention among youth. Our meta-analysis of RCTs demonstrated no significant benefit, and no studies reported long-term effectiveness of these interventions. Importantly, most RCT and observational studies reported non-significant results, and 3 RCTs and 1 observational study found that anti-illicit drug PSAs may have negative effects on anti-illicit drug use norms among targeted populations (8, 21, 23, 27).

These findings are of immediate importance in several settings, given the high costs of the production and dissemination of anti-illicit drug PSAs as well as high levels of drug use among youth in a variety of settings. The Government Accountability Office of the U.S. government recently recommended that “Congress should consider limiting appropriations for the [National Youth Anti-Drug Media] campaign, beginning in the 2007 fiscal year budget until ONDCP provides credible evidence of a media campaign approach that effectively prevents and curtails youth drug use.” (28) Despite this recommendation, a
funding increase to $130 million USD annually in FY2008 was requested by the ONDCP and subsequently approved (29), while $70 million USD was approved for the Campaign in both 2009 and 2010 (30). While it is noteworthy that a decline from 55% to 47% in the national prevalence of marijuana use was observed among youth in the U.S. between 1999 and 2007 (31), research to date has not demonstrated any association between this decline and the dissemination of anti-illicit drug PSAs (8). Elsewhere, the FRANK anti-illicit drug media campaign established by the Home Office of the United Kingdom has cost £24 million ($47 million USD) and has yet to be the subject of an independent, arms-length scientific evaluation (10). In Australia, over $60 million AUD has been spent on the National Drugs Campaign since 2001, though long-term effectiveness of the campaign has not been observed (9). The Canadian federal government also announced $10 million CND in new funding for the dissemination of anti-illicit drug PSAs in 2007 (13, 14), which may reflect a greater harmonization of North American drug policy (32).

The theoretical framework used to produce and evaluate anti-illicit drug media campaigns may partially explain the difficulty that scientists have faced in evaluating these interventions. Theories derived from social cognitive theory (33), such as the theory of reasoned action and the theory of planned behaviour (34, 35), serve as foundational models for a range of health behaviour communication interventions, including anti-illicit drug PSAs (36). While these theories are based on the notion of a specific contiguous relationship between intention and behaviour (37), research has demonstrated that socio-demographic, environmental and other variables may play a critical role in reducing an individual’s ability to act according to his or her intentions (38). In the context of
youth drug use, these theories may therefore be unable to explicate associations between behavioural interventions and behaviour, as intentions to use drugs may be mediated by a range of confounding factors. In particular, the exclusion of key sociodemographic variables on study participants such as ethnicity, neighbourhood of residence, income, housing situation, and others from the vast majority of anti-illicit drug PSA evaluations may critically limit the evaluation of these interventions.

Some evaluators have also suggested that the observed negative outcomes of the dissemination of anti-illicit drug PSAs may be a result of PSA content that increases the perception that drug use among youth is widespread. Specifically, the evaluators of the National Youth Anti-Drug Media Campaign stated that, “If the meta-message is that drug use is widespread, higher exposure to Campaign ads should cause an immediate effect on the perception that other kids regularly use marijuana...This perception eventually leads to a more generalized pro-marijuana social norm...and greater likelihood of actual initiation” (8).

Our study contains several important limitations, the first relating to the lack of published research on anti-illicit drug PSAs. This limitation is particularly acute with respect to the dearth of studies on the long-term effectiveness of these interventions. A recent commentary also noted that publication bias may have prevented the publication of a number of negative studies regarding the effectiveness of school-based anti-illicit drug interventions (39). Given that similarities exist between such interventions and anti-illicit drug PSAs, evaluations with null findings may be underreported reported in the literature. Second, it is noteworthy that the studies we considered used diverse designs and outcomes and that our meta-analysis of observational studies
contained the maximum level of heterogeneity. However, experts have recently stressed the importance of meta-analyses even when substantial heterogeneity between study designs exist (40). Nevertheless, we recognize that the results of this meta-analysis reflects only a crude estimate of the short-term effectiveness of published observational studies of anti-illicit drug PSAs. Finally, because two RCT studies only presented outcomes as ratios between groups (17, 24), and one RCT study only measured the effectiveness of 30 anti-illicit drug PSAs relative to each other (23), we were unable to include these studies in our meta-analysis. While these exclusions also likely affected our calculation of overall effect size, it is noteworthy that the majority of these trials reported non-significant or negative effects of anti-illicit drug PSAs (17, 23, 24). We stress, however, that our meta-analysis of RCTs contains important limitations related to the fact that, as previously noted, RCTs of anti-illicit drug PSAs often contain serious methodological problems that restrict their capacity to provide evaluations of effectiveness, particularly in the long-term.

In summary, the present review and meta-analysis indicates that insufficient data exist to support the conclusion that anti-illicit drug PSAs are effective in modifying intention to use illicit drugs and reducing self-reported illicit drug use among targeted youth. As such, novel methods of evaluating the effects of these interventions, and particularly their long-term effects, are urgently needed. Our findings should also help reinforce the need for evidence-based approaches to reducing drug-related harm and a re-evaluation of the use of existing modes of media-delivered illicit drug prevention messages. Although further research is necessary, several studies have suggested that these interventions may contribute to a weakening of anti-illicit drug norms and to
increased initiation of illicit drug use among exposed youth. Given the large knowledge gaps that continue to persist, the potential of anti-illicit drug PSAs to weaken anti-illicit drug norms among youth and the high cost of anti-illicit drug media campaigns, funding for these interventions should be contingent on scientific evidence of their effectiveness.
<table>
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<th>Author and year</th>
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<td><strong>RCTs</strong></td>
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<td>Palmgreen et al., 1991</td>
<td>207</td>
<td>Randomly recruited 18-22 year olds in Fayette County, Kentucky.</td>
<td>Immediate post-test</td>
<td>2 anti-illicit drug PSAs viewed twice over 10 minutes.</td>
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<td>Fishbein et al., 2002</td>
<td>3,608</td>
<td>Middle and high school students from 10 U.S. schools.</td>
<td>Immediate post-test</td>
<td>6 anti-illicit drug PSAs of a total of 30 viewed once.</td>
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<tr>
<td>Harrington et al., 2003</td>
<td>338</td>
<td>18-20 year olds recruited from a local college in Fayette County, Kentucky.</td>
<td>4 weeks</td>
<td>4 PSAs viewed once a week for 4 weeks for a total of 16 exposures.</td>
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<tr>
<td>Yzer et al., 2003</td>
<td>418</td>
<td>Students (mean age 14 years) from a middle school and a high school in Philadelphia.</td>
<td>Immediate post-test</td>
<td>2 anti-marijuana PSAs, 2 anti-'hard' drug PSAs and an anti-drug testimonial, 2 anti-marijuana and 2 anti-'hard' drug PSAs, or 4 anti-'hard' drug PSAs once.</td>
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<tr>
<td>David et al., 2006</td>
<td>535</td>
<td>7th and 12th grade students from 3 schools in Philadelphia.</td>
<td>Immediate post-test</td>
<td>Participants viewed 10 PSAs once, and were randomized to engage in online chatting immediately following viewing.</td>
</tr>
<tr>
<td>Wagner &amp; Sundar, 2008</td>
<td>65 (Trial 1); 28 (Trial 2)</td>
<td>High-school seniors aged 17-18 in Pennsylvania (Trial 1). Undergraduate students in Pennsylvania (Trial 2).</td>
<td>Immediate post-test</td>
<td>4 anti-illicit drug PSAs once.</td>
</tr>
<tr>
<td><strong>Observational</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Palmgreen et al., 2002</td>
<td>3,174 (Fayette County); 3197 (Knox County)</td>
<td>Public school students aged 12-16 in Knox County, Tennessee and Fayette County, Kentucky.</td>
<td>32 months</td>
<td>70% of sample exposed to a minimum of 3 anti-illicit drug PSAs per week for 4 months.</td>
</tr>
<tr>
<td>Orwin et al., 2004</td>
<td>3,142</td>
<td>Youth aged 9 to 18 surveyed through the National Survey of Parents and Youth.</td>
<td>5 years</td>
<td>Average of 2.5 anti-illicit drug PSAs viewed by sample over 58 months.</td>
</tr>
<tr>
<td>Penay et al., 2006</td>
<td>Pretest: 1,400 Post-test: 1,490</td>
<td>Youth aged 13-20 recruited into a national survey of youth.</td>
<td>1 year</td>
<td>3 anti-illicit drug PSAs over 9 weeks. Intensity not reported.</td>
</tr>
<tr>
<td>Palmgreen et al., 2007</td>
<td>4,795 (Fayette County); 4,803 (Knox County)</td>
<td>Public school students aged 13-17 in Knox County, Tennessee and Fayette County, Kentucky.</td>
<td>48 months</td>
<td>4 anti-marijuana PSAs. Intensity not reported.</td>
</tr>
</tbody>
</table>

**Table 3.1 Characteristics of available eligible studies**

*Note: PSA = Public Service Announcement; RCT = Randomized Control Trial; HSS = High Sensation Seekers; LSS = Low Sensation Seekers; HSV = High Sensation Value; LSV = Low Sensation Value; HCV = High Cognitive Value; LCV = Low Cognitive Value; ONCP = Office of National Drug Control Policy*
### Figure 3.1: Effect sizes in meta-analysis of RCTs of anti-illicit drug PSAs

Note: *RCT: randomized control trial; PSA = public service announcement; HSS = high sensation seekers; LSS = low sensation seekers*

<table>
<thead>
<tr>
<th>Trial</th>
<th>Mean Intention to use (n)</th>
<th>Mean Difference (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Experimental</td>
<td>Control</td>
</tr>
<tr>
<td>Harrington et al., 2003 (HSS)</td>
<td>1.51 (71)</td>
<td>1.52 (71)</td>
</tr>
<tr>
<td>Harrington et al., 2003 (LSS)</td>
<td>1.26 (68)</td>
<td>1.31 (68)</td>
</tr>
<tr>
<td>Yzer et al., 2003</td>
<td>1.6 (278)</td>
<td>1.52 (143)</td>
</tr>
<tr>
<td>Czyzewska &amp; Ginsburg, 2007</td>
<td>4.47 (107)</td>
<td>3.8 (119)</td>
</tr>
<tr>
<td>Wagner &amp; Sundar, 2008 (Trial 1)</td>
<td>0.7 (36)</td>
<td>-3.17 (29)</td>
</tr>
<tr>
<td>Wagner &amp; Sundar, 2008 (Trial 2)</td>
<td>5.30 (14)</td>
<td>0.14 (14)</td>
</tr>
</tbody>
</table>

**Total**
- Total events = 574 (Exposed to PSA), 444 (Control)
- Overall effect size = 0.15 (95% CI: -0.19 – 0.49)
Figure 3.2: Effect sizes in meta-analysis of observational studies of anti-illicit drug PSAs

Note: PSA = public service announcement; HSS = high sensation seekers; LSS = low sensation seekers
3.5 References


CHAPTER 4

Drug-related risks among street youth in two neighbourhoods in a Canadian setting

4.1 Introduction

Cities throughout the world are increasingly confronted with diverse health and social harms related to the use of illicit drugs (1-3). Commonly, these harms are most intense in areas where illicit drug markets are active (4-6), and studies have reported consistently high incidence of HIV and hepatitis C infection, incarceration, and fatal and non-fatal overdose among illicit drug-using individuals in urban centers that contain drug markets (7, 8). As a result, a variety of public health and law enforcement interventions have become clustered in urban illicit drug markets (9, 10) in an attempt to mitigate the negative impacts of illicit drug use and drug market involvement.

Recent efforts to disentangle urban health harms have focused on how environmental phenomena help to define the risk environments experienced by vulnerable populations in specific geographic areas (11, 12). For example, researchers using spatial analysis in Kwazulu-Natal found that in a mixed urban-rural study setting, residency near the National Road, a major regional transit hub, was associated with a significantly higher risk of HIV infection (13). In the context of illicit drug use, research from Vancouver recently identified residency in the city’s downtown eastside (DTES), a low-income neighborhood that hosts one of North America’s largest open-air illicit drug markets, as independently

1 A version of this chapter has been submitted for publication: Werb D, Buxton J, Wood E., 2010. Drug-related risks among street youth in two neighborhoods in a Canadian setting.
associated with a twofold risk of HIV seroconversion among a cohort of injection
drug users, despite adjustment for a variety of confounders (14). Further,
researchers have demonstrated that geographic proximity to an illicit drug
market, as well as neighborhood-level factors, help determine the severity and
scope of drug- and health-related risks that illicit drug users may face (15-17).

Preventing illicit drug scene entrenchment is critical to the reduction of a
variety of severe health risks, and experts have therefore urged a greater focus on
research into the prevention of injection drug use initiation (18). Street youth are
at particularly high risk of drug scene entrenchment and related risk behaviors
such as the initiation of injection drug use (19), and exposure to an adult illicit
drug injection scene has previously been shown to be associated with a variety of
health harms among this population (4, 20).

Recent qualitative and ethnographic research conducted among a cohort
of street youth in Vancouver suggests that a number of social dynamics play a
key role in increasing young people’s entrenchment in Vancouver’s local drug
scene, and that these social dynamics shape risk differently in the DTES
compared with an adjacent area known as the Downtown South (DTS), which is
characterized by both high- and (limited) low-income housing and a more
‘closed’ drug scene than that found in the DTES (21). Compared with the DTS,
which has a drug scene featuring younger and less street-entrenched individuals,
the DTES is well-known as an open-air adult injecting scene, characterized by a
large proportion of severely street entrenched individuals (21). Locally, concern
exists that the proximity of the DTS to the DTES (see Figure 1), coupled with the
mobility of the city’s street youth population across these distinct
neighborhoods, may contribute to a process of normalization of more intense
drug-related harms (21). This process of normalization could in turn lead to increased uptake of injection drug use and higher levels of street entrenchment among youth residing in both areas (in spite of the fact that open injection drug use is far less prevalent in the DTS than in the DTES) (22). This concern is informed by a large body of literature investigating the association between neighborhood-level influences and drug-related health risks (14, 16, 23-25).

The scope and density of the illicit drug market in Vancouver’s DTES, as well as the presence of a large street youth population spread out across multiple neighborhoods, affords a unique opportunity to investigate how exposure to an adult drug market may shape risk among street youth. We therefore sought to further quantify the health, behavioral and drug-related risks experienced by street youth residing in the DTES and the DTS neighborhoods in Vancouver, and to investigate geographic correlates of drug use initiation (i.e., crystal methamphetamine use) and drug market involvement among a street youth sample.

4.2 Methods

All data for these analyses were conducted using data from the At-Risk Youth Study (ARYS), a Vancouver-based cohort study of street youth aged 14 to 26 (26). ARYS participants are recruited using street outreach and self-referral, and eligible study participants reported using illicit drugs other than marijuana in the last 30 days. Once recruited, participants complete an interviewer-administered questionnaire and a physical and mental health assessment that includes blood samples for diagnostic testing. Thereafter, participants return to complete the interviewer-administered questionnaire semi-annually. Participants are provided with a $20 CND honorarium. The ARYS questionnaire
solicits detailed demographic data as well as data on drug use behaviors, income sources, housing situation, experiences with incarceration, involvement in the sex trade and the illicit drug trade, and perceptions of the efficacy and accessibility of health and social services. The study has been approved by the University of British Columbia/Providence Health Care Ethics Review Board, and all study participants provide written consent prior to enrolment.

For the present study, data were collected from participant interviews conducted between September 1, 2005 and December 31, 2007. Because we were interested in comparing drug-related behaviors and health risks among street youth in two well characterized neighborhoods (those in the DTES with those in the DTS), we restricted our sample to ARYS participants who reported currently residing in either of these two areas, and residency in the DTES vs. the DTS constituted our dependent dichotomous variable of interest. Our independent variables of interest were informed by previous qualitative and quantitative analyses conducted in our study setting (21, 26-28) and included the following: age, gender, ethnicity (Aboriginal vs. other), homelessness, amount of money spent on drugs per day ($50 or less vs. more than $50), having a primarily licit vs. illicit source of income, dealing drugs, recent crack smoking, recent non-injection crystal methamphetamine use, recent injection heroin use, recent injection cocaine use, recent injection crystal methamphetamine use, preferred location of illicit drug purchases (DTES vs. DTS vs. all other areas), unsafe sex (i.e., unprotected vaginal or anal sexual intercourse excluding commercial sex work), involvement in the commercial sex trade, having been assaulted, and being stopped, searched or detained by police. All behavioral variables refer to the 6 months prior to the participant interview.
We conducted univariate logistic regression analyses to determine factors associated with current neighborhood of residence (DTES vs. DTS). Categorical and explanatory variables were analyzed using Pearson’s $X^2$, while continuous variables found to be normally distributed were analyzed using t-tests for independent samples, and continuous variables found to be skewed were analyzed using Mann-Whitney $U$ tests. Variables found to be associated with the outcome of interest at $p \leq 0.05$ were then considered in a fixed multivariate logistic regression model. Finally, we solicited data on circumstances surrounding first injection drug use and first crystal methamphetamine use experiences among study participants residing in the DTES or the DTS. We then conducted separate univariate logistic regression subanalyses to determine factors associated with the initiation of crystal methamphetamine among our cohort participants. All statistical analyses were performed using SPSS software version 17.0 (SPSS, Chicago, IL).

### 4.3 Results

Overall, 222 street youth participated in the present study, including 65 (29.3%) women and 51 (23.0%) individuals who self-identified as Aboriginal. Median participant age was 23.6 years old (Interquartile Range: 20.1 – 27.1). Overall, 155 (69.8%) participants reported currently residing in the DTS, while 67 (30.2%) reported currently residing in the DTES. Further, 26 (38.8%) of those participants residing in the DTES reported injection drug use in the last 6 months, while 37 (23.8%) of those residing in the DTS reported such use in the last 6 months. Drug dealing among street youth occurred at comparably high levels among participants in both neighborhoods (DTS: 74.8%; DTES: 85.1%; $p = 0.091$).
Tables 1 and 2 present the results of our univariate analyses of sociodemographic, behavioral, and drug use variables associated with current neighborhood of residence. Table 3 presents the results of the multivariate analysis and, as can be seen, after intensive adjustment for potential confounders, reporting an illicit primary income source (Adjusted Odds Ratio [AOR] = 2.64, 95% Confidence Interval [CI]: 1.16 – 6.02, p = 0.021), injection heroin use (AOR = 4.25, 95% CI: 1.26 – 14.29, p = 0.019), and preferring to buy drugs in the DTES vs. the DTS (AOR = 6.93, 95% CI: 3.83 – 12.52, p < 0.001) were all independently associated with residence in the DTES. Further, non-injection crystal methamphetamine use (AOR = 0.39, 95% CI: 0.16 – 0.94, p = 0.037) was negatively associated with residing in the DTES.

Overall, 64 (28.8%) participants reported previously initiating injection drug use. Of these, 10 (24.4%) participants reported first injecting drugs in the DTES, while 20 (48.8%) reported first injecting drugs in the DTS. Further, among 72 (32.4%) participants who reported initiating crystal methamphetamine use, 43 (59.7%) reported initiating crystal methamphetamine use in the DTS, while 12 (16.7%) reported doing so in the DTES.

Finally, in a univariate logistic regression subanalysis, reporting initiating of methamphetamine use in the DTS compared with the DTES was significantly associated with reporting dealing drugs (OR = 5.43, 95% CI: 1.24 – 23.82, p = 0.030).

### 4.4 Discussion

Among a cohort of street youth, levels of initiation of injection drug use were over twice as high in the DTS than levels reported by youth residing in the DTES. We also found that study participants residing in the DTES were
significantly more likely to report having an illicit primary income source, report engaging in injection heroin use, and report preferring to buy drugs in the DTES compared with participants residing in the DTS. However, study participants living in the DTS were significantly more likely to engage in non-injection crystal methamphetamine use. Of concern, study participants reported initiating injection drug use in the DTS at a level twice as high compared with the DTES, and the initiation of crystal methamphetamine use was reported among study participants in the DTS at a level almost four times as high as the level of initiation reported in the DTES. Finally, in univariate analysis, individuals reporting initiating methamphetamine use in the DTS were more likely to report dealing drugs than those that reported initiating methamphetamine use in the DTES.

While preliminary, these results are surprising since we expected that residency within the DTES, which includes a large open-air illicit drug market, would be associated with substantially greater drug-related health risks. That we observed non-significant risks for a variety of types of drug use as well as for involvement in drug dealing and the sex trade between street youth residing in the DTS and the DTES may suggest that interventions to reduce youth entrenchment in an open-air illicit drug market should take into consideration the role of adjacent neighborhood street scenes in influencing drug use patterns (21). Specifically, while we found that participants residing in the DTES were more likely than those in the DTS to report having a primary illicit income source, we found no significant differences in risk of drug dealing, as well as comparably high levels of this illicit activity, among individuals residing in both neighborhoods. It is also of note that in univariate analysis, drug dealing was
associated with reporting initiating crystal methamphetamine use in the DTS. As such, our current findings and previous qualitative work from our study setting suggest that the DTS may be an introductory area for those youth drawn towards street-involvement and may uniquely facilitate transitions to the development of more intense risk behaviors as observed among youth in the DTES (21). For example, previous research in our study setting has hypothesized that non-injection crystal methamphetamine use may be predictive of the initiation of injection drug use among street youth (26), and as noted above we found that study participants initiated crystal methamphetamine use at much higher levels in the DTS compared with the DTES. While the DTES is the site of a variety of programs servicing that neighborhood’s large polydrug-using community, the street youth population in the DTS may contain a high number of individuals who are newly-recruited to street involvement and highly vulnerable to street entrenchment and initiation of injection drug use (21). This is particularly pertinent given that public health experts have suggested prioritizing the prevention of injection drug use among vulnerable populations (18).

These preliminary results build on previous research on geographic factors associated with drug market entrenchment and suggest areas of future research. Observers have noted the ways in which geographic migration can modify health risks among vulnerable populations in a variety of settings (29-31). While this research is often focused regionally, our findings suggest that considering micro-setting and intra-city migration may also be useful in identifying key opportunities for the reduction of risk for HIV and other blood-borne disease infection, the initiation of injection drug use, and street
entrenchment. For example, the sexual transmission of HIV infection in southern Africa has been linked to the migration of laborers and the expansion of commercial sex trade work along the transit routes connecting South Africa to its neighboring countries (31, 32). As a result, policymakers have therefore targeted these particular transit routes for preventive campaigns to reduce sexual transmission of HIV (33). In our study setting, like many other urban communities, street involvement appears to facilitate a range of high-risk behaviors among youth. Perhaps most relevant is our finding that participants report initiating crystal methamphetamine use at much higher levels in the DTS compared with the DTES. In this context, it is important to note that the DTS’ geographic proximity to the DTES and the mobility of street youth across these two areas appears to create a permeability that may facilitate further street entrenchment among youth in our study.

Our study has a number of important limitations. First, we are unable to infer causal associations between reported neighborhood of residence and the risk behaviors that we analyzed as a result of the cross sectional nature of our analyses. Specifically, we were unable to elucidate the mechanisms by which neighborhood of residence modifies risk, though it is noteworthy that previous qualitative investigations of such mechanisms are consistent with our current findings (21, 24). Second, ARYS is not a random sample and its generalizability to other samples of street youth may therefore be limited. Third, because we relied primarily on self-report, risk behaviors among study participants may have been underreported as a result of social stigma (34). Fourth, while we based our analyses on previous qualitative and quantitative research in our study setting and were therefore able to triangulate our findings, it is possible
that we were still unable to adjust for all variables that may have contributed to the differences that we observed between participants residing in the neighborhoods of interest. In this regard, it is important to note that the low power in our sample excluded the possibility of controlling for factors in our subanalysis of crystal methamphetamine initiation, and these results in particular should therefore be interpreted with caution.

Our findings suggest that while the DTES remains the epicenter of drug market activity among our sample, the adjacent DTS neighborhood may play a key role in the transition among street youth from lower-risk street involvement to high-risk street entrenchment, and may also be an important site of initiation into crystal methamphetamine. As well, on a number of indicators of drug-related behaviors, no differences existed between street youth residing in the DTES and those residing in the more affluent DTS. These results suggest that future research is needed to investigate whether neighborhoods peripheral to illicit drug markets are sites of increased risk for drug use initiation and entrenchment within adult drug injecting scenes.
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Downtown South (n = 155)</th>
<th>Downtown Eastside (n = 67)</th>
<th>Odds Ratio (95% CI)</th>
<th>(p)-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median (and IQR)</td>
<td>23.2 (19.6–26.8)</td>
<td>24.1 (21.3–27.0)</td>
<td>1.25 (1.10 – 1.42)</td>
<td>0.001</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>114 (73.5)</td>
<td>43 (64.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>41 (26.5)</td>
<td>24 (35.8)</td>
<td>1.55 (0.84 – 2.87)</td>
<td>0.161</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>128 (82.6)</td>
<td>43 (64.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aboriginal</td>
<td>27 (17.4)</td>
<td>24 (35.8)</td>
<td>2.65 (1.38 – 5.07)</td>
<td>0.003</td>
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<td><strong>Homelessness</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>21 (13.5)</td>
<td>16 (23.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>134 (86.5)</td>
<td>51 (76.1)</td>
<td>0.50 (0.24 – 1.03)</td>
<td>0.061</td>
</tr>
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<td><strong>Income source</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primarily licit</td>
<td>82 (52.9)</td>
<td>22 (32.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primarily illicit</td>
<td>73 (47.1)</td>
<td>45 (67.2)</td>
<td>2.30 (1.26 – 4.19)</td>
<td>0.007</td>
</tr>
<tr>
<td><strong>Unsafe sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>33 (21.3)</td>
<td>16 (23.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>122 (78.7)</td>
<td>51 (76.1)</td>
<td>0.86 (0.44 – 1.70)</td>
<td>0.669</td>
</tr>
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<td><strong>Involvement in the sex trade</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>139 (89.7)</td>
<td>62 (92.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>16 (10.3)</td>
<td>5 (7.5)</td>
<td>0.70 (0.25 – 2.00)</td>
<td>0.506</td>
</tr>
<tr>
<td><strong>Having been assaulted</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>83 (53.5)</td>
<td>40 (59.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>72 (46.5)</td>
<td>27 (40.3)</td>
<td>0.79 (0.44 – 1.39)</td>
<td>0.398</td>
</tr>
<tr>
<td><strong>Jacked up by Police</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>107 (69.0)</td>
<td>39 (58.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>48 (31.0)</td>
<td>28 (41.8)</td>
<td>1.60 (0.89 – 2.90)</td>
<td>0.120</td>
</tr>
</tbody>
</table>

Note: CI = Confidence Interval; IQR = interquartile range.

Note: All behaviours refer to the previous six months.
Table 4.2 Univariate analysis of drug use behaviours associated with neighbourhood of residence among street youth in Vancouver ($n = 222$)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Downtown South $n = 155$</th>
<th>Downtown Eastside $n = 67$</th>
<th>Odds Ratio (95% CI)</th>
<th>$p$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Daily amount spent on drugs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\leq $50</td>
<td>76 (49.0)</td>
<td>23 (34.3)</td>
<td>1.84 (1.02 – 3.34)</td>
<td>0.044</td>
</tr>
<tr>
<td>$&gt; $50</td>
<td>79 (51.0)</td>
<td>44 (65.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Dealing Drugs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>39 (25.2)</td>
<td>10 (14.9)</td>
<td>1.92 (0.89 – 4.11)</td>
<td>0.095</td>
</tr>
<tr>
<td>Yes</td>
<td>116 (74.8)</td>
<td>57 (85.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Crack Use</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>66 (42.6)</td>
<td>19 (28.4)</td>
<td>1.87 (1.01 – 3.48)</td>
<td>0.047</td>
</tr>
<tr>
<td>Yes</td>
<td>89 (57.4)</td>
<td>48 (71.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Non-injection CM use</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>81 (52.3)</td>
<td>52 (77.6)</td>
<td>0.32 (0.16 – 0.61)</td>
<td>0.001</td>
</tr>
<tr>
<td>Yes</td>
<td>74 (47.7)</td>
<td>15 (22.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Injection heroin use</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>135 (87.1)</td>
<td>47 (70.1)</td>
<td>2.87 (1.42 – 5.80)</td>
<td>0.003</td>
</tr>
<tr>
<td>Yes</td>
<td>20 (12.9)</td>
<td>20 (29.9)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Injection cocaine use</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>143 (92.3)</td>
<td>55 (82.1)</td>
<td>2.60 (1.10 – 6.14)</td>
<td>0.029</td>
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<td>Yes</td>
<td>12 (7.7)</td>
<td>12 (17.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Injection CM use</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>129 (83.2)</td>
<td>58 (86.6)</td>
<td>0.77 (0.34 – 1.75)</td>
<td>0.531</td>
</tr>
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<td>Yes</td>
<td>26 (16.8)</td>
<td>9 (13.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Preferred location of drug purchase</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DTS vs. DTES</td>
<td>23 (14.8)</td>
<td>48 (48)</td>
<td>7.20 (4.24 – 12.25)</td>
<td>$&lt; 0.001$</td>
</tr>
<tr>
<td>DTES vs. Other</td>
<td>80 (51.6)</td>
<td>3 (4.5)</td>
<td>0.57 (0.40 – 0.82)</td>
<td>$&lt; 0.001$</td>
</tr>
<tr>
<td>DTS vs. Other</td>
<td>52 (33.5)</td>
<td>16 (23.9)</td>
<td>3.33 (2.15 – 5.16)</td>
<td>$&lt; 0.001$</td>
</tr>
<tr>
<td><strong>Preferred location of drug consumption</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DTS vs. DTES</td>
<td>16 (10.3)</td>
<td>46 (68.7)</td>
<td>7.03 (4.22 – 11.69)</td>
<td>$&lt; 0.001$</td>
</tr>
<tr>
<td>DTES vs. Other</td>
<td>89 (57.4)</td>
<td>6 (9.0)</td>
<td>0.58 (0.41 – 0.82)</td>
<td>0.002</td>
</tr>
<tr>
<td>DTS vs. Other</td>
<td>50 (32.3)</td>
<td>15 (22.4)</td>
<td>3.96 (2.47 – 6.33)</td>
<td>$&lt; 0.001$</td>
</tr>
</tbody>
</table>

Note: CI = Confidence Interval; CM = crystal methamphetamine.
Note: All behaviours refer to the previous six months.
Table 4.3 Multivariate logistic regression analysis of factors associated with residence in the DTES vs. the DTS neighbourhood among a cohort of street youth in Vancouver (n = 222)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Adjusted Odds Ratio</th>
<th>95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per year older</td>
<td>1.17</td>
<td>(0.98 – 1.40)</td>
<td>0.080</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>1.00</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>Aboriginal</td>
<td>2.08</td>
<td>(0.82 – 5.27)</td>
<td>0.123</td>
</tr>
<tr>
<td><strong>Income source</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primarily licit</td>
<td>1.00</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>Primarily illicit</td>
<td>2.55</td>
<td>(1.14 – 5.74)</td>
<td>0.023</td>
</tr>
<tr>
<td><strong>Non-injection CM use</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1.00</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>Yes</td>
<td>0.38</td>
<td>(0.16 – 0.92)</td>
<td>0.031</td>
</tr>
<tr>
<td><strong>Injection heroin use</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1.00</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>Yes</td>
<td>4.09</td>
<td>(1.24 – 13.49)</td>
<td>0.021</td>
</tr>
<tr>
<td><strong>Injection cocaine use</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1.00</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>Yes</td>
<td>0.98</td>
<td>(0.23 – 4.09)</td>
<td>0.974</td>
</tr>
<tr>
<td><strong>Preferred location of drug purchase</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DTES</td>
<td>1.00</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>DTS</td>
<td>0.47</td>
<td>(0.39 – 0.57)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

Note: DTES = downtown eastside; DTS = downtown south; CI = Confidence Interval
Note: All behaviours refer to the previous 6 months
Figure 4.1 Map of Downtown Vancouver
4.5 References


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CHAPTER 5

Discussion, implications, and directions for future research

5.1 Discussion and summary of findings

The primary objectives of this thesis were to 1) critically examine interventions aimed at the reduction of illicit drug use, 2) evaluate the effectiveness of a popular anti-illicit drug intervention, known as anti-illicit drug public service announcements, and 3) investigate geographic and social factors that shape the risk environment for problematic drug use, injection drug use, and adult illicit drug scene involvement among at-risk youth.

This thesis sought to describe and investigate determinants and responses to illicit drug use among youth. Using diverse analytic techniques, as well as a risk environment perspective, this work has identified gaps in the scientific literature that may negatively impact the development of preventive interventions aimed at reducing the use of illicit drugs among youth. Additionally, this project has identified specific geographic, structural, and social factors that may increase the likelihood of illicit drug initiation among at-risk youth. As discussed below, these findings may thereby be of utility to policymakers, law enforcement, affected communities, and other stakeholders.

This thesis project consisted of a review of current preventive interventions for the reduction of illicit drug use among youth. This included a discussion of the major theoretical frameworks that underpin these interventions, as well as a critical examination of the effectiveness of each of the

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1 A version of this chapter will be submitted for publication: Werb D, Buxton J, Wood E., 2010. The initiation of illicit drug use among youth: Potential responses.
four major types of interventions. Potential barriers to effectiveness were identified, and an alternate modality for the implementation of such interventions was described. It was also observed that the vast majority of preventive interventions were targeted at individual-level behavior change. This is despite the emergence of research that has posited that among vulnerable populations, the risk of negative health behaviors such as the initiation of problematic drug use and administration via injection are shaped primarily by a set of social, environmental, policy, and physical factors. These factors work together in the micro (i.e., immediate injecting environment) and macro (i.e., drug trade routes) settings experienced by populations to shape and limit the range of choices and risks of individuals (1). Specifically, among at-risk youth populations, research has demonstrated that some of the strongest determinants of initiation of problematic and injection drug use are environmental factors, such as the availability of stable housing and the social networks that at-risk youth are exposed to (2, 3). An investigation of the capacity of current preventive interventions to address such factors may therefore aid policymakers in effectively reducing the initiation of illicit drugs among youth.

5.1.1 Characteristics of current interventions for the prevention of illicit drug use among youth

This thesis identified four major types of preventive interventions in the scientific literature, including school-based (e.g., educational), social marketing, community-based, and law enforcement (4). The former three types are all based around altering intention to use and incorporate demand reduction techniques. However, preventive interventions based on law enforcement utilize both supply
reduction techniques, through the attempted disruption of illicit drug markets, as well as demand reduction, through the threat of arrest and incarceration of illicit drug users (5). This work found that a variety of methodological barriers in the design of these interventions may limit their effectiveness. First, despite divergent theoretical frameworks, all current preventive interventions adhere closely to an abstinence-based model in which effectiveness is defined dichotomously between the non-use of drugs (success) and the use of drugs (failure) (4). The reliance on an abstinence-based model in the development and evaluation of preventative interventions may limit the range and extent of ‘successful’ outcomes. By considering preventive interventions within a spectrum of primary, secondary, and tertiary prevention, in which effectiveness includes a reduction in total use as well as a reduction in drug-related harm and misuse, as has been proposed by experts in the field (6), the measurement of effectiveness may be optimized. Second, illicit drug use is the result of a variety of factors, some proximal and some distal (6), and because many evaluations employ observational study designs, they may be limited in their capacity to quantify the impact of preventive interventions on illicit drug use. As such, while the implementation of preventive interventions by policymakers consumes substantial resources, little evidence exists regarding their effectiveness.

5.1.2 Systematic review and meta-analysis of the effectiveness of anti-illicit drug public service announcements

One increasingly popular response to the use of illicit drugs among youth has been the social marketing strategy of disseminating anti-illicit drug public service announcements (PSAs) (7). Despite their popularity, and the substantial
resources allocated towards their dissemination in a variety of settings (7-10), Chapter 3 of this thesis project represents the first systematic analysis of the evaluative literature on the effectiveness of this intervention. In a systematic search, guided by PRISMA guidelines for systematic reviews and meta-analyses (11), this thesis identified 11 studies of the effectiveness of anti-illicit drug PSAs, including 7 randomized control trials (RCTs) (12-18) and 4 observational studies (7, 10, 19, 20). Among the RCTs, which used various measures of intention to use illicit drugs among individuals exposed to anti-illicit drug PSAs, 2 RCTs reported significant positive effects, and 5 RCTs reported non-significant or negative effects. Additionally, in a meta-analysis of all RCTs, a non-significant effect size was derived, suggesting that PSAs are not effective in reducing the intention to use illicit drugs among youth. Similarly, while 2 observational studies reported significant decreases in the use of illicit drugs among samples of youth in the short-term, a meta-analysis of observational studies found a 4% overall decrease in use. These findings suggest that the dissemination of anti-illicit drug PSAs may have a limited impact on the intention to use illicit drugs or the patterns of illicit drug use among youth. Further, large knowledge gaps persist, particularly in the long-term impact of these interventions, and as such more research. Finally, the potential for anti-illicit drug PSAs to weaken anti-illicit drug norms among youth, as observed in multiple RCTs and observational studies, suggests that policymakers should use caution in implementing these interventions.
5.1.3 Geographic and social determinants of risk of problematic drug use, injection drug use initiation, and adult illicit drug scene involvement among at-risk youth

In Chapter 4, confounding models are presented that investigate differences in risk for drug-related behaviors and initiation of illicit drug use among at-risk youth in two adjacent neighborhoods in Vancouver, one of which (the downtown eastside [DTES]) is the site of a large open-air illicit drug market, the other of which (the downtown south [DTS]) is a mixed-income area that is the site of the city’s business district. While it was hypothesized that those youth that reported residing in the DTES would report significantly higher risks for a variety of drug-related behaviors, the results of the analyses suggest that differences between youth in each neighborhood may be more complex. Specifically, youth residing in the DTES were more likely to have a primary illicit income source and report recently engaging (i.e., < 6 months) in injection drug use. However, youth residing in the DTS were at significantly higher risk of recently engaging in non-injection crystal methamphetamine use, and there were non-significant differences in risks for drug dealing, sex trade involvement, crack use, and injection cocaine use. Further, of 64 sample participants that reported initiating injection drug use, 20 reported initiating injection drug use in the DTS and 10 reported initiating in the DTES. Finally, in univariate analysis investigating crystal meth initiation, individuals reporting initiating methamphetamine use in the DTS were at higher risk of reporting dealing drugs than those that reported initiating methamphetamine use in the DTES.

These results, while preliminary, are surprising since it was hypothesized that residency within the DTES would be associated with significantly greater
drug-related health risks. These results suggest that interventions to reduce youth entrenchment in an open-air illicit drug market should take into consideration the role of adjacent neighborhood street scenes in influencing drug use patterns and drug scene involvement among at-risk youth, particularly considering that we found significantly higher risk for crystal methamphetamine use among sample participants living in the DTS.

5.2 Unique contributions and impact

This thesis project makes a number of important contributions. First, it reviews the four major types of preventive interventions, provides a critical analysis of the theoretical framework underpinning these interventions, and provides an assessment of alternative frameworks that may improve effectiveness. Second, it includes the only meta-analysis and systematic review of the effectiveness of anti-illicit drug PSAs conducted. Third, the geographic analysis presented in Chapter 4 contains a unique analysis of initiation of crystal methamphetamine by neighborhood. In this analysis, at-risk youth in Vancouver reported initiating crystal methamphetamine in an area adjacent to the city’s drug market at levels twice as high than in the drug market itself. The thesis has also applied a risk environment framework to review and critically appraise current preventive interventions. The use of this framework in the evaluation of the effectiveness of current approaches to the prevention of illicit drug use among youth may be of use to policymakers working to implement and evaluate future preventive interventions in a variety of urban settings.

This project also contributes to a growing literature aimed at informing the development of scientific evidence-based drug policies. While researchers have
noted the historical discordance between scientific research and drug policy (21), recent calls by scientists (22-24) and policymakers (25, 26) suggest that governments may be becoming more willing to inform policy through evidence.

5.3 Implications for policy and programming

The studies included in this thesis project suggest that current preventive interventions, which rely primarily on promoting individual-level behavioral change, are ineffective in significantly modifying rates of illicit drug use among youth. Further, the thesis identifies specific factors associated with drug-related behaviors among a sample of at-risk youth in two neighborhoods in Vancouver, as well as factors associated with the initiation of crystal methamphetamine among this sample. These findings suggest that policies and interventions aimed at reducing illicit drug use among youth should consider the structural and social factors, such as neighbourhood of residence, social network participation, and involvement in the illicit drug trade and sex trade, that shape the risk of initiation and use among particular subpopulations. Because many of the strongest predictors of the most harmful forms of illicit drug use are structural (3, 27), resources should be reallocated towards interventions that focus on the modification of these factors. Further, if policymakers continue to provide funding for interventions that work to modify individual behavioral change, interventions should be implemented and evaluated using an expanded theoretical framework that utilizes a more comprehensive definition of effectiveness. Specifically, such interventions should be considered within a spectrum of primary (reduction of use), secondary (reduction of misuse), and tertiary (reduction of related harms) strategies (6), instead of utilizing the
traditional dichotomy of success through abstinence and failure through use that has underpinned the vast majority of preventive interventions to date (4).

5.3.1 Interventions to reduce the initiation of illicit drug use among youth

Preventive interventions implemented at the population level, such as social marketing campaigns and anti-illicit drug PSAs in particular, are limited by an inability to effectively target particular subpopulations that may be at higher risk of initiation as a result of specific structural or social factors. As such, evaluations of effectiveness of such interventions should control for confounding by such factors. Further, evaluations should consider the relative effect of structural and social factors compared with that of the intervention in question. This method of evaluation would facilitate the implementation of cost-benefit analyses that could better guide policymakers in their decisions to fund particular preventive interventions.

Further, as noted above, prioritizing the reduction of drug misuse and drug-related harms as opposed to focusing exclusively on abstinence may greatly increase effectiveness, particularly with respect to anti-illicit drug PSAs. Researchers have noted that anti-illicit drug PSAs that rely on fear appeals are significantly less effective than a control program, and may encourage greater use of illicit drugs (18). Additionally, a recent meta-analysis suggests that public health PSAs are most effective when they include high-efficacy messages (28). High-efficacy messages are those that market specific responses that an individual believes will avert the threat in question and are also perceived to be within the individual’s capacity to undertake (28). Within the context of primary, secondary and tertiary prevention, anti-illicit drug PSAs that include secondary
and tertiary prevention messages that provide not only information on harms but specific and reasonable responses to limit negative drug-related behavior may be more effective than abstinence-only messages, and evaluations of such an approach are warranted.

5.3.2 Interventions to reduce illicit drug-related harms among at-risk youth

Consistent with the findings presented in Chapter 4 of this thesis project, interventions aimed at reducing drug-related harm and street entrenchment among at-risk youth should consider the geographic and social factors that play a role in shaping risk among this subpopulation. Specific to Vancouver, the DTS appears to play a critical role in the initiation of crystal methamphetamine use and injection drug use among at-risk youth, and consistent with previous qualitative research (2), these findings suggest that the DTS may be an introductory area that facilitates further entrenchment in the adult injection drug scene of the DTES.

Policymakers should consider identifying geographic settings that may be introductory areas into further street entrenchment and interventions should then be put in place to modify the structural factors, such as unstable housing, that are the strongest predictors of future problematic drug use and street entrenchment (3, 29), and should address the multiple reasons that youth use illicit drugs (i.e., self-medication, prolonged wakefulness, etc) (30). Further, considering that use of illicit drugs, and multiple forms of illicit income generation such as sex trade involvement and drug dealing are often highly prevalent among at-risk youth subpopulations (31), interventions should aim to provide employment and life skills training to youth that exhibit risks for further
street entrenchment. Considering the strong role of social networks in shaping drug-related behavior among at-risk youth (2, 32), interventions should also aim to modify risky drug using practices such as sharing of drug paraphernalia and should provide information on the increased risks of particular forms of drug use such as injection drug use or polydrug use. These interventions could take the form of ‘peer helpers’ that provide information on safer injection practices. This may be particularly effective as youth and young drug users often report low levels of knowledge on drug-related risks (33-35).

5.4 Directions for future research

The present research project includes the first meta-analysis and systematic review of the effectiveness of anti-illicit drug PSAs. However, this undertaking was limited by the dearth of scientific evaluations of anti-illicit drug PSAs. Additionally, the research that has been undertaken in this area suffers from methodological shortcomings that limit findings of effectiveness. While further research is needed, this research builds on the existing body of literature in three specific ways. First, as noted in section 5.3.1, a reorientation of the definition of effectiveness should accompany any new evaluations (6). Second, future research should adjust for potential confounding from social and structural factors such as neighborhood of residence, ethnicity, exposure to illicit drugs, and family history. Thirdly, while research on the short-term effectiveness of anti-illicit drug PSAs has been undertaken, a major knowledge gap exists with respect to the effectiveness of anti-illicit drug PSAs in the long-term. Given the utility of long-term observational studies in the evaluation of school-based preventive interventions (36), researchers should endeavor to carry out long-term
randomized control trials of the effectiveness of PSAs to investigate their effect on levels of drug use among youth.

Chapter 4 of this thesis project included an analysis of the initiation of crystal methamphetamine use among at-risk youth, dichotomized by neighborhood of initiation. While this approach to the investigation of illicit drug use initiation is to my knowledge unique, a small sample size and the cross-sectional nature of the study is a crucial limitation. Future research into the geographic determinants of initiation should be longitudinal in nature in order to investigate how the geographic setting of initiation may be predictive of future drug-related risk behaviors and drug scene involvement. Additionally, given the close correlation between drug market involvement (i.e., drug dealing) and drug use initiation, further study is needed into how drug scene involvement may be predictive of illicit drug use initiation. Finally, the study described in Chapter 4 was limited by a dichotomous measure of neighborhood of residence and neighborhood of initiation. Future research using a categorical dependent variable that can include multiple neighborhoods is therefore needed to further delineate how geographic proximity to a drug market may shape risk of initiation of illicit drugs.

5.5 Conclusions

The present research project was undertaken to describe and investigate determinants and responses to illicit drug use among youth, and among at-risk youth in particular. In a critical review of current preventive interventions, it was observed that the vast majority employs a dichotomous definition of effectiveness that may hamper both delivery and evaluation. Further, in a
systematic review and meta-analysis of anti-illicit drug PSAs, it was found that the dissemination of this intervention appears to have a limited impact on the intention to use illicit drugs or the patterns of illicit drug use among targeted youth populations. Policymakers should reconsider allocating resources towards these interventions until scientific evidence of effectiveness is provided.

Finally, the thesis also investigated the variation in risk profiles for drug scene entrenchment and initiation among at-risk youth residing in two adjacent neighbourhoods. Specifically, this work found that while youth residing in Vancouver’s DTES, the site of a large open-air illicit drug market, reported higher levels of drug scene entrenchment, youth residing in the DTS reported initiating injection drug use at twice the level, and initiating crystal methamphetamine at almost four times the level, of those youth residing in the DTES. Further, there were non-significant differences between youth residing in each neighborhood on risk of drug dealing, sex trade involvement, crack use, and injection cocaine use. Policymakers should consider how structural interventions may reduce the incidence and severity of drug scene involvement among this vulnerable population, and researchers should further investigate how social networks may influence drug scene entrenchment.
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