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RESEARCH REPORT

Synthetic Cannabinoid Use in Correctional Populations – An Emerging Challenge for Offender Health and Safety? A Brief Review

2017 Nº R-397

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Synthetic Cannabinoid Use in Correctional Populations – An Emerging Challenge for Offender Health and Safety? A Brief Review

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This report was written under a contract managed by the Correctional Service of Canada, Research Branch, and is presented in the language and format submitted by the authors. The views expressed in this report are those of the authors and do not necessarily reflect those of the Correctional Service of Canada.

> Correctional Service of Canada July, 2017

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Acknowledgements

The authors would like to thank Ms. Cayley Russell who assisted in finalizing the report and to Lynn Stewart and An-Tâm Tremblay for providing valuable comments on earlier versions of this report.

Executive Summary

Key words: Canada, corrections, drug use, health, offenders, prisons, synthetic cannabinoids, new psychoactive substances

Synthetic cannabinoids (SCs) have become increasingly popular among various user populations, and have arisen as common alternatives to organic cannabis products. SCs are an emerging category of drugs under the umbrella of New Psychoactive Substances (NPS). They belong to a continually evolving series of synthetic psychoactive product groups, based on successive structural modifications, commonly marketed as herbal mixtures which mimic cannabis' psychoactive effects, and are classified as 'legal highs'. SCs, however, have been associated with a variety of distinct adverse health outcomes (especially acute), some of which are considered more severe than those which result from the use of natural cannabis products. Compared to natural cannabis products, SCs pose threats to users' health, including: elevated levels of cardio-vascular problems, kidney problems, seizures, acute hallucinations, psychosis and anxiety, among others. Various jurisdictions have reported high numbers of presentations to emergency departments, as well as cases of mortality, directly related to the use of SCs. While all forms of SCs are banned in correctional institutions, existing evidence suggests that they have become increasingly popular among offenders, and as such, pose distinct novel challenges for correctional administrations charged with the responsibility for offender health and safety.

SC use results in potentially powerful stimulant effects which may make them attractive for use by offenders, but may also result in adverse outcomes which come with potentially undesirable or hazardous consequences for offender behaviour and safety. Moreover, SCs evade major routine drug interdiction and drug testing systems in operation in correctional systems, and hence are attractive for illicit use, trade, and import in correctional settings.

To better understand SC use, and the possible health and safety consequences for offenders, this report reviewed pertinent national and international literature on SC use, availability, and related health outcomes among general and correctional populations. Research data on SCs in the context of Canadian correctional systems are currently limited, and are thus urgently required. Educating offenders and correctional staff on the risks of SC use is imperative, and correctional systems should prepare for the potential health and safety consequences of increased SC use while awaiting the results and guidance offered by future research.

Introduction

Drug Use among Correctional Populations

Correctional institutions house the highest per-capita proportion of persons with substance misuse problems in society, and as such, drug users are over-represented in corrections, in comparison to the general population¹. In addition, it has been found that those who are released into the community after incarceration with untreated drug addictions are more likely to recidivate as a result of their addiction².

The health of correctional populations has been documented to be disproportionally worse compared to general populations, and drug use among offenders is specifically associated with increased levels of drug-related health consequences and harms³. For instance, health problems, particularly communicable diseases (e.g., HIV, hepatitis B and C, tuberculosis) and psychiatric co-morbidities are especially prevalent among offenders who use drugs⁴. Offenders may initiate drug use for a number of reasons, such as to cope with the stress associated with increarceration, to seek improvements in sleep patterns and psychological well-being, and for enjoyment of the drugs' calming and anxiolytic effects⁵. Offenders who have a history of drug misuse are also susceptible to transitioning into other, often more risky, drug use (primarily due to lack of availability of the preferred drug),^{6,7} and to engaging in poly-substance use during incarceration⁸. For example, one study found that more than one-third of drug-using offenders in Belgium began using an additional drug during incarceration⁶.

While data on the prevalence of current drug use and related health consequences among correctional populations are limited, various international and national studies examining drug misuse and dependence prior to, and during incarceration, exist.

Drug Use and Health Effects among Correctional Populations: International Data

According to a systematic review of 13 international studies among offenders (n=7,563), the prevalence of illegal drug misuse and dependence ranged from 10% to 48% among men, and 30% to 60% among women $(2006)^7$. Other international studies based in England/Wales and Australia have documented high levels of past-year drug use among incarcerated men (cannabis: 54%-62%; cocaine: 16%-25%; heroin: 27%- 31%)⁹⁻¹¹.

Cannabis has been consistently documented to have the highest prevalence of lifetime use,

ranging from 12% to 70% among offenders who have used any illicit drugs. Studies conducted in 15 European Union (EU) countries similarly documented cannabis as the drug most frequently used by offenders, followed by cocaine and heroin⁴. Furthermore, between 2% and 31% of offenders reported injection drug use (IDU) while incarcerated in the EU (since 2000)⁴.

Opioids (e.g., prescription opioids, heroin) are also commonly used among offenders. In the United States, over 200,000 opioid-dependent offenders pass through correctional facilities annually¹²⁻¹⁴. Upon entering a correctional institution, many opiate users stop injecting and resort to obtaining drugs through other means, including opiates prescribed in the correctional setting. This is largely due to security processes that disrupt trafficking within institutions. In the United Kingdom (UK), there has been a significant increase in the prescribing of opiate substitution treatment in correctional settings – typically either methadone or buprenorphine – which has resulted in an elevated risk of prescription medication misuse and diversion among offenders¹⁵. For example, in England, buprenorphine was identified as the most misused drug among eleven correctional institutions, and the third most misused drug overall¹⁶. A qualitative study among (n=30) former offenders with a history of IDU in the UK found that diversion of correctional-prescribed buprenorphine was widespread¹⁶.

Alcohol misuse is also common in correctional settings, and high rates of alcohol-related problems among correctional populations have been documented⁶. For instance, among offenders, prevalence of alcohol misuse and dependence ranged from 18% to 30% among men, and 10% to 24% among women, according to an international systematic review⁷. Similarly, a Scottish study found that 73% of offenders had an alcohol-use disorder, with 36% possibly being alcohol-dependent¹⁷.

Drug Use and Health Effects among Correctional Populations: Canadian Data

In Canada, Correctional Service Canada (CSC) reported that almost 80% of offenders arrive at federal institutions with a substance misuse problem^{18,19}. Additionally, 11% of federal offenders in Canada have reported IDU while incarcerated²⁰.

Results from random drug testing in correctional settings have also been reported for several jurisdictions. In 2000, the national rate of positive results from random drug tests in Canadian federal institutions was 12%; of these, 77% of tests were positive for cannabis, 9.8% for opiates and 1.9% for cocaine²¹. More recently, a 2007 survey conducted among federal

offenders in Canada found that 57% of men used non-injection drugs; 34% reported illicit drug use during incarceration, with substantial proportions reporting IDU and needle-sharing^{9,22}. In a sample of provincial offenders from six Ontario correctional facilities (n=597), 45% reported drug use while incarcerated, and 19% reported using drugs other than cannabis (2003)²³.

In Canada, among 85% of all reported suicides in correctional facilities between 2000-2001 and 2009-2010, the offender had a history of drug misuse²⁴. Similarly, 19.1% of the total 338 deaths-in-custody across three Canadian provinces (Alberta, British Columbia, and Ontario; 2000-2009) were caused by drugs or alcohol¹⁸. Furthermore, there were four reported drug overdoses in federal correctional facilities between April 2010 and March 2011²⁴.

Method

The present literature review on SC use, availability and related health outcomes was based on electronic searches of both peer-reviewed and grey publications in primary scientific and general databases (i.e., PubMed, Google Scholar, etc.). The search strategy, which focused on SCs in correctional facilities, included pertinent keywords such as "synthetic cannabinoids", "health outcomes", "corrections", "offender", and related terms and variations. The databases were searched (between January to March, 2017) for English-language studies. Studies were included if they contained information on prevalence and/or health outcomes related to SC use, availability, and health/safety consequences both nationally and internationally, and specifically among correctional offenders. Titles and abstracts were screened and organized by themes based on SC use among general and correctional populations, both internationally and nationally. Relevant data was extracted and narratively summarized.

Results

Emergence of Synthetic Cannabinoids

Synthetic cannabinoids (SCs) have become increasingly popular for use in general populations and have emerged as common alternatives to organic cannabis products^{25,26}. SCs are often considered to fall under the 'New Psychoactive Substances' (NPS) drug class. There are four different categories of NPS: SCs; Depressants; Stimulants; and Hallucinogens. They are marketed as natural herbal incense mixtures which mimic the effects of cannabis, and are

available under various brand names²⁷. More than 140 different SC products have been identified to date, and there are over 500 street names 29,30 , some of which include, but are not limited to: Spice, K-2, fake weed, Green Giant, Bliss, Red Dawn X, Blaze, Skunk, Yucatan Fire, Moon Rocks, JWH-018, and -073³¹. SCs belong to a continually growing and evolving series of synthetic psychoactive products. Successive structural modifications are developed to maintain an ambiguous legal status, while simultaneously retaining the desired effects of the prototypical cannabinoid component, delta-9-tetrahydocannabinol (THC) (the main psychoactive ingredient in cannabis)⁴⁶. As such, SCs are defined as 'designer drugs', whereby producers tweak the chemistry of existing drugs to create new drugs that can successfully circumvent drug laws, and are undetectable in urine tests²⁸. SCs are coated with manmade chemicals that act on the same brain cell receptors as THC³². However, SCs are more powerful compared to natural cannabis products and their potency and effects on the human brain and body can be unpredictable and life-threatening. The psychoactive substances are typically mixed with plant material, dissolved in liquid and then applied to plant material, dissolved in liquid for use in e-cigarettes, or dissolved in liquid that users can ingest or mix with another substance for consumption³³. The typical modes of ingestion are smoking through pipes, water pipes/bongs, cigarettes and blunts, although some can be consumed via vaporization and oral ingestion³⁴.

Synthetic Cannabinoid Use Among General Populations

Among general populations, patterns of use appear to be shifting from other drugs to NPS, such as SCs. This is due, in part, to their variable purity and cost, in addition to perceptions of their legal status. As such, SCs continue to present challenges both internationally and nationally due to their chemical diversity and speed of emergence^{6,35}.

According to an analysis of the 'Global Drugs Survey' (an international anonymous online survey of n=14,966 drug-using participants), 16.8% reported SC use (2011); among recent users, the median age of SC initiation was 21^{49} . Similarly, 12% of American high school students reported SC use $(2013)^{32,36}$, while the US-based 'Monitoring the Future' study found an annual prevalence of 11.4% for SC use among 12^{th} grade students (2012)³⁷. In Florida, 8% of (n=852) college students reported SC use, and use was more common among men than women (2012)³⁸. Data from Australia suggests SC use is not common. For example, only 1.2% of the Australian population reported (past-year) SC use in 2013, with slightly elevated prevalence (2.5%) among

those under the age of 25^{39} .

Minimal research has been conducted on SC use among the Canadian general population. According to the 'Ontario Student Drug Use and Health Survey' (OSDUHS), 1.3% of Ontario students in grades 7-12 reported (past-year) SC use in 2015, which was a slight decrease from $2013 (1.8\%)^{32,40}$.

Health Effects of Synthetic Cannabinoids

Information of the nature and extent of the health effects associated with the consumption of SCs is limited due to the complex nature of the chemical compounds that comprise SCs. However, the number of SC-related calls to emergency departments and poison control centres, as well as records of SC-related fatalities, has been steadily increasing, indicating negative health consequences associated with SC use. Evidence suggests that SCs are linked to a number of negative physical and cognitive health effects^{25, 41}, and that the adverse health effects resulting from SC use can be more pronounced and harmful than those from cannabis use⁴². The main documented health risks and effects are summarized below.

Physical Health Effects

A 2014 systematic review of 4,000 documented cases of health-related side effects associated with SC consumption found that some of the major complications included myocardial infarction/stroke, seizures, hyperemesis and acute kidney injury (AKI)⁴². Other general physical effects associated with SC use have included nausea, vomiting, and tachycardia³⁰.

Case studies have found that there are specific cardiovascular-related side effects associated with SC use. For example, an investigative team from the Colorado Department of Public Health and Environment reviewed emergency department visits and medical reports of patients suspected of having a negative reaction to SCs and found that high systolic blood pressure and heart rate were the main reported side effects⁴³. Another case study reported symptoms of seizures and tachyarrhythmia in a 48 year old man after the ingestion of a SC product^{44,45}, which are commonly reported short-term side effects of SC use^{25,32}. Moreover, case studies have found that strokes are also associated with SC use. For example, two healthy young siblings were reported to have experienced acute ischemic stroke after the consumption of Spice⁴⁶.

There have also been reported cases of kidney issues associated with SC consumption. For instance, 16 cases of AKI related to SC use were reported in six states (Wyoming, Rhode Island, New York, Oregon, Kansas and Oklahoma) in 2012⁴⁷. Similarly, a case series of nine hospitalized patients who consumed SCs in Oregon and southwestern Washington were diagnosed with AKI. The Centers for Disease Control and Prevention have concluded that there is an association between SC consumption and acute kidney failure⁴⁸.

According to the largest online survey of SC users (Global Drug Survey; n=14,966), harmful effects on the lungs, such as pulmonary toxicity, have also been documented⁴⁹⁻⁵¹. Other adverse physical effects have been reported. For example, among patients admitted to an emergency room in Georgia (n=22), there were 13 reported cases of hyperglycemia, and 9 reported cases of hypokalemia, both related to SC use^{48,52}.

Mental Health Effects

Systematic reviews have found associations between SC use and a variety of adverse cognitive effects and mental health problems^{30,53-55}. For instance, a recent systematic review on the clinical effects of SCs found that psychosis and acute anxiety are common consequences of SC use²⁷. Similarly, another systematic review documented psychosis, as well as suicidal ideation, as common adverse consequences of SC use⁴².

Case studies have reported other cognitive effects related to SC use. For example, a number of different case reports found that agitation and hallucinations (including delusions) and/or paranoia were common cognitive effects of SC use⁵⁶⁻⁶¹. An examination of (n=52) cases of patients presenting for SC-related intoxication at the Metropolitan Hospital in New York (2012-2013) also identified combative/assaultive behaviour as a common effect of SC consumption⁵³. Other case studies have confirmed associations between SC use and anxiety, depression and/or suicidal ideation^{53,56,59,61}.

In addition to systematic reviews and examinations of case reports, an anonymous online survey reported that 2.4% of (n=950) (past-year) SC users sought emergency medical treatment; panic and anxiety were the most common presentations, followed by paranoia and breathing difficulties⁶².

Emergency Department Visits and Calls to Poison Control Centres

Compared to cannabis use, it has been found that those who consume SCs are 30 times

more likely to seek medical attention⁶². This is reflective of the increase in both the number of visits to the emergency department (ED) and calls to poison control centres in the United States over the past few years^{44,45,61,62}. For instance, there were 11,406 ED visits related to problems involving the use of a SC product in the Unites States in 2010³². According to Substance Abuse and Mental Health Services (SAMHSA), this rate more than doubled (28,531) in one year (2011)⁶³. Other states have similarly reported high rates of ED visits. For example, The Mississippi State Department of Health reported more than 1,200 SC-related ED visits, while the Alabama Department of Public Health reported more than 1,000 ED visits related to SCs, in 2015³³. Likewise, physicians from the US-based Toxicology Investigators Consortium (ToxIC) treated 456 patients for SC intoxications during 2010-2015, 61% of which reported SCs as the sole toxicological agent ⁶⁴.

Moreover, an unprecedented number of calls to poison centres regarding adverse effects from SC use were reported by at least 12 states between mid-March and May 2015⁶⁵. Similarly, there was a 330% increase in SC-related calls to US poison centres in the first four months of 2015, from 349 in January to 1,501 in April⁶⁵. Furthermore, between January and May 2015, poison centres reported a total of 3,572 calls related to SC use; a 229% increase from 1,085 calls during the same period in 2014⁶⁵.

Mortality

There were approximately 20 documented SC-related deaths in the United States between August 2011 and April 2015; the deceased ranged in age from 13 to 56; seven deaths were among those aged 13 to 19^{33} . According to the National Poison Data System, of the 3,572 total calls received during the first four months of 2015, 15 (0.5%) resulted in death; among the calls where SCs were used in conjunction with other substances (n=626), one death was reported⁶⁵.

Synthetic Cannabinoid Use in Correctional Populations

In spite of SCs being referred to as 'legal highs', all forms of SCs are banned in correctional institutions. There is very little research on the use of SCs in correctional institutions, and as such, little is known about their true prevalence and reasons for use by offenders. The data that does exist suggests that SC use is becoming more popular in correctional facilities worldwide; however, better data is required⁶⁶.

Inside correctional facilities in some international correctional jurisdications, evidence

suggests that patterns of use are shifting from traditional illegal substances to NPS, and more specifically, to SCs⁶⁷. According to the Centre for Social Justice, positive tests for traditional cannabis fell by 59%, while there was a dramatic increase in NPS use in correctional institutions in England between 2003-2004 and 2013-2014². Similarly, the annual report of the Her Majesty's Chief Inspector of Prisons (2014) for England and Wales raised concerns regarding use of NPS in custody, specifically regarding the consumption of SCs, and reported that up to a third of offenders in the UK use SCs^{29,68}. In December 2015, a thematic report, *Changing Patterns of Substance Misuse in Adult Prisons and Service Responses*, pointed out that SCs were becoming more prevalent in correctional institutions in England, while problems of debt, bullying, self-harm and violence among offenders have become more widespread as a result⁶⁷.

According to drug seizure data from correctional institutions in England and Wales, the number of SCs seized has increased rapidly². In 2010, there were 15 recorded seizures; by 2014, this number had increased to 737; seizures of traditional drugs simultaneously decreased^{2,69}. These data suggest drug markets and availability profiles in correctional institutions may be transforming, and that the consumption of SCs is growing among correctional populations^{66,70}.

Other indicators of increased SC use in correctional institutions exist. For example, the Chief Inspector of Prisons' annual report documented that Spice use was a concern among 37% of adult male offenders in England $(2013-2014)^{67}$. In a UK-based peer-led inquiry conducted by an ex-offender's organization, 'User Voice', among (n=805) offenders, one third had used Spice during incarceration in the previous month; participants estimated that nearly all of their fellow prisoners had used SCs in prison, of which Spice was by far the most common. The inquiry also found the growing popularity of Spice had contributed to an increase in violence, bullying, mental and physical ill health, and even death (2015-2016)⁶⁸.

NPS-related Mortality in Correctional Populations

In May 2016, the Prisons and Probation Ombudsman of England reported that there were 39 deaths in custody linked to NPS between 2013 and 2015⁷¹; as of September 2016, the number of deaths where NPS was involved had risen to at least 58⁷². There were 19 deaths in custody specifically related to SCs between 2012 and 2014 in England⁷³.

Reasons for SC Use in Corrections

Reasons for SC use among correctional offenders vary. Offenders are subject to mandatory

drug testing (mostly by urine-toxicology based testing), which includes both random and suspicion testing⁷⁴. The purpose of these tests is to detect the use of illicit drugs, and if found positive, punishment or disciplinary action is enforced⁷⁵. The structure and makeup of SCs differs from that of THC, which means they will not trigger a positive test for cannabinoids in immunoassays of body fluid³⁰. As such, SCs have increasingly become the drug of choice in correctional institutions because current testing methods cannot detect them, and dogs are not able to sniff them out³⁴. In addition, SCs are manufactured in labs and are usually odorless, making it difficult for correctional staff to determine when offenders are using them. Although new tests are being developed, and special drug dogs are being trained to identify SCs, neither measures are currently available in most correctional institutions⁷⁰.

Qualitative interviews among (n=25) Spice users found that most people resorted to Spice as a legal-cannabis-alternative to avoid drug screening and penalties³⁴. Other reasons for Spice use, as found in an Internet survey among (n=169) Spice users, included: curiosity (78%), to enjoy the effects (58%) and to relax (48%); in addition, 30% of respondents also endorsed Spice to avoid drug testing detection⁷⁶. Other reasons for SC use that have been documented are boredom⁶⁶, and that offenders perceive time to go by more quickly when intoxicated by SCs, facilitating a desired lost sense of time⁵.

Supply Dynamics for Drugs in Corrections (not specific to SCs)

All drugs – illicit, NPS and medications – may become accessible in correctional institutions from a number of ways. Due to the fact that these methods are not reported or documented, it is difficult to quantify the frequency, intensity and method of use. Additionally, supply routes and methods may vary in correctional institutions. With regards to SCs, the literature has shown that SCs are attractive to supply since there is a low-risk of penalty for possession are relatively inexpensive outside of the correctional system. While there is little data on the supply of SCs specifically, the Blakey report (2008) noted that visitors, offenders, staff, and 'over the wall' methods were the primary sources of supplying drugs to correctional facilities⁷⁷.

Selling SCs in correctional institutions has become a lucrative and thriving market with huge profit gains. According to Ralph et al., (2016), a gram of SCs can be sold for 33 times the street price in English correctional institutions⁶⁶. Furthermore, the report suggested that

following release, offenders would often break their conditions in order to end up back in corrections on short sentences, simply to bring SCs into correctional institutions to sell⁶⁶.

Canadian federal correctional institutions are equipped with ion scanners used to check individuals on entry into correctional institutions, as well as drug dogs who routinely conduct searches of visitors⁷⁸. Although there are measures to search visitors and vehicles visiting correctional institutions, and to oversee activities to reduce opportunities to smuggle drugs, manual searches fail to detect substances that are concealed internally or have been swallowed. In 2013/2014, there were 296 incidents of visitors in the UK being arrested by police on the suspicion of bringing drugs (any type) into correctional institutions – an increase by a tenth over the past three years². Some reports indicated that visitors would conceal the substance in their underwear or internally (vagina, rectum, or back of the throat)⁷⁷.

Another method of supply is through mail. Offenders are allowed to receive regular mail from family and friends; and correctional staff, apart from exceptional situations, are not allowed to open or read any mail². Synthetic cannabis is very versatile and can be sprayed onto papers, and then smoked as part of a roll-up cigarette. One article discussed how offenders accessed K2 via postal carrier or through visitation. A letter would be dipped in chemical Spice, dried and sent to the offender. Once received, the offender can rip up the paper and either smoke it, or sell the Spice-saturated paper to other offenders. According to officials, a 1-inch square of Spice paper sells for around \$5 and a whole sheet of paper can sell up to as much as \$250, which can be a very lucrative business⁷⁹. Other methods include visitors concealing the drugs in clothing, cellphone packages, or in ballpoint pens with the ink cartridge removed⁷⁸.

Corrupt staff have also been noted as a common method of bringing drugs into correctional facilities; some staff may be coerced or threatened into bringing in contraband. It has been reported that correctional staff smuggle drugs and drug paraphernalia into the correctional institutions in a variety of ways, including but not limited to, sports equipment, hollowed-out books, garment linings and photographic equipment⁷⁴.

Some drugs are also brought in over the walls of correctional institutions, depending on the size and the monitoring of the facility⁷⁷. Items thrown over have included tennis balls, dead birds or stuffed animals with drugs inside. Larger packages have been supplied by catapults, or in some cases, drones. Arrangements to access these packages are made easily with access to illicit cellphones⁷⁷.

Discussion

Synthetic cannabinoids (SCs) are an emerging category of drugs under the umbrella of New Psychoactive Substances (NPS), which have become increasingly popular among general populations. It appears that these SC use preferences are extending also into correctional populations – including Canada – though systematic and specific epidemiological data is extremely sparse. Compared to natural cannabis products, SCs pose distinct, and overall more serious (especially acute) challenges for user health, including: elevated levels of cardio-vascular problems, kidney problems, seizures, psychosis and anxiety, among others. Various jurisdictions have reported high numbers of presentations to emergency departments, as well as cases of mortality, directly related to the use of SCs.

While concrete evidence on use in correctional populations – except for the UK – is limited, there is good reason to assume that SC use in Canadian corrections will rise, while also posing a number of new and distinct challenges for both offender health and safety. First, SC's seem to evade major routine drug interdiction and (offender) drug testing systems in use by correctional jurisdictions worldwide, and hence are attractive for use due to these reasons, and thus may also have high illicit trade values. Second, different from cannabis' largely sedative effects, SC use results in potentially powerful stimulant effects, which may make them attractive for use by offenders, yet may also result in adverse outcomes such as aggravation, psychosis/hallucinations, and violence, all of which comes with potentially undesirable or hazardous consequences for offender behavior and safety. In addition, other acute SC-related health problem outcomes (e.g., severe cardio-vascular problems or seizures) can be extreme to the point of death, and thus pose further substantial health challenges for offender health and health systems. Clearly, basic data and information on the prevalence, use, and availability dynamics as well as health outcomes of SC use in Canadian correctional facilities needs to be generated. Prevention and education on the risks of SC use needs to be facilitated, and correctional systems need to prophylactically prepare for the potential health and behavior/safety consequences of increased SC use in Canadian correctional facilities until more systematic empirical information is available.

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