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Review

Supervised injection services: What has been demonstrated? A systematic literature review☆

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ABSTRACT

Background: Supervised injection services (SISs) have been developed to promote safer drug injection practices, enhance health-related behaviors among people who inject drugs (PWID), and connect PWID with external health and social services. Nevertheless, SISs have also been accused of fostering drug use and drug trafficking.
Aims: To systematically collect and synthesize the currently available evidence regarding SIS-induced benefits and harm.
Methods: A systematic review was performed via the PubMed, Web of Science, and ScienceDirect databases using the keyword algorithm [("SUPERVISED" OR "SAFER") AND ("INJECTION" OR "INJECTING" OR "SHOOTING" OR "CONSUMPTION") AND ("FACILITY" OR "FACILITIES" OR "ROOM" OR "GALLERY" OR "CENTRE" OR "SITE")].
Results: Seventy-five relevant articles were found. All studies converged to find that SISs were efficacious in attracting the most marginalized PWID, promoting safer injection conditions, enhancing access to primary health care, and reducing the overdose frequency. SISs were not found to increase drug injecting, drug trafficking or crime in the surrounding environments. SISs were found to be associated with reduced levels of public drug injections and dropped syringes. Of the articles, 85% originated from Vancouver or Sydney.
Conclusion: SISs have largely fulfilled their initial objectives without enhancing drug use or drug trafficking. Almost all of the studies found in this review were performed in Canada or Australia, whereas the majority of SISs are located in Europe. The implementation of new SISs in places with high rates of injection drug use and associated harms appears to be supported by evidence.
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1. Introduction

Injection drug use represents a source of numerous harmful effects on both the health conditions of people who inject drugs (PWID) and their social environment. Drug injection is one of the main factors in the dissemination of blood-transmissible viral infections such as human immunodeficiency virus or the hepatitis B and C viruses (EMCDDA, 2008; Joint United Nations Programme on HIV/AIDS, 2002; WHO, 1997). In addition, numerous other physical problems can result from drug injection, including other viral and bacterial infections, cutaneous lesions, locomotive disorders, and hepato-gastroenterological pathologies (INSERM, 2010; Klee and Morris, 1995; Palepu et al., 2001). Psychiatric disorders are also more frequent in PWID (EMCDDA, 2008), who are subject to reduced access to medical services (Kerr et al., 2005b). Moreover, PWID exhibit enhanced marginalization from society, which increases their exposure to social precariousness, unemployment, homelessness, crime, and prostitution (DeBeck et al., 2007; EMCDDA, 2008). Thus, injection drug use induces considerably higher mortality. Partly because of its illegal nature, injection drug use is also responsible for numerous societal consequences, e.g., violence, traffic, crime, and public space degradation (Kerr et al., 2005a; Renn and Lange, 1996; Singer et al., 2001). For these reasons, injection drug use places a heavy burden on society.

During the early 1980s, PWID had to face the HIV epidemic. Preventing viral infection became crucial, and, therefore, care professionals had to consider the damage caused by drug use rather than focusing on drug use itself. Moreover, in face of the failure of public policies that aimed to eradicate drug use and drug trafficking (Drucker, 1999) and in consideration of the number of PWID who were not ready to enter into classical abstinence care, new prevention and care paradigms emerged, constituting the 'harm reduction' approach (MacPherson, 2001; Wodak and Owens, 1996). The first aim of these new care systems was to reduce the social and medical consequences of injection drug use and to stop the marginalization spiral to which PWID were exposed (Berridge, 1999; MacPherson, 2001). In this context, the first syringe exchange programs and the development of opiate maintenance therapies were implemented (WHO, 1998).

Similarly, new facilities emerged at the end of the 1980s, and the first objective was to allow PWID to inject self-provided drugs within a supervised framework in enhanced aseptic conditions with medical monitoring and no risk of police control (EMCDDA, 2008; Jozaghi, 2012; Semaan et al., 2011). These facilities have had different appellations, including 'safer injection facilities,' 'supervised injecting centers/sites/rooms/facilities,' 'drug consumption rooms,' and 'supervised injection services' (SISs) (Hedrich, 2004; Noël et al., 2009). Throughout the present article, we will indistinctly use the term 'SISs' to designate these facilities. The concept of SISs rapidly spread in Western countries, and in 2010, there were more than 90 identified SISs in Canada, Australia, Norway, Germany, Switzerland, Spain, the Netherlands and Luxembourg (Semaan et al., 2011).

SISs were implemented complementarily to other harm reduction measures for the following purposes (EMCDDA, 2009; INSERM, 2010; Noël et al., 2009): (1) to reach the most marginalized populations of PWID, who are least likely to obtain access to medical and social support, and connect them with health and social services; (2) to reduce overdose-induced morbidity and mortality; (3) to educate PWID to enhance their health behaviors; (4) to reduce injection-related risks by promoting the prevention and education of safe self-injecting practices; (5) to improve the global health conditions of PWID by promoting the prevention, screening and medical orientation of viral infections; (6) to foster the initiation of dependence care programs among PWID; and (7) to reduce the nuisances triggered by injection drug use in public spaces, e.g., urban violence and crime, drug trafficking and drug-use waste.

SIS access is usually restricted and regulated (Hedrich, 2004; INSERM, 2010). Most SISs are forbidden to subjects under 18 years of age, pregnant women, irregular or unidentified PWID, and individuals who wish to experience their first drug injection. Internal rules also forbid violence and drug selling. Moreover, many SISs prohibit drug sharing or helping other users with drug injection. However, SISs have endured criticism. Some official organizations have argued that "*any national, state or local authority that permits the establishment and operation of drug injection rooms or any outlet to facilitate the abuse of drugs (by injection or any other route of administration) also facilitates illicit drug trafficking*" (INCB, 1999). The detractors of SISs often argue that SIS implementation is equivalent to the tacit acceptance of injection drug use by public authorities, which will foster drug use, attract drug traffickers and increase drug-related consequences in the surrounding area (Boyd, 2013; Elliott et al., 2002; Gandey, 2003; Parliament of New South Wales, 1998). This perception has often been shared by groups of local residents and politicians in cities where new SISs were implemented (Elliott et al., 2002) and has sometimes led to long court procedures (Health Canada, 2006; Small, 2010; Wodak et al., 2003; Wood et al., 2007).

Twenty-eight years after the first legal opening of an SIS (Zobel and Dubois-Arber, 2004), we have performed a systematic review of the literature to collect the published data currently available on SISs and to synthesize these data to determine whether SISs have achieved their objectives and whether the fears raised against them are justified.

2. Materials and methods

A systematic search for relevant articles was conducted and is presented herein according to the PRISMA statement (Liberati et al., 2009). The research was performed using the PubMed, Web of Science, and ScienceDirect databases. To avoid selection bias, an inventory of the different English appellations for SIS was conducted, which led to our use of the following keyword algorithm: ("SUPERVISED" OR "SAFER") AND ("INJECTION" OR "INJECTING" OR "SHOOTING" OR "CONSUMPTION")

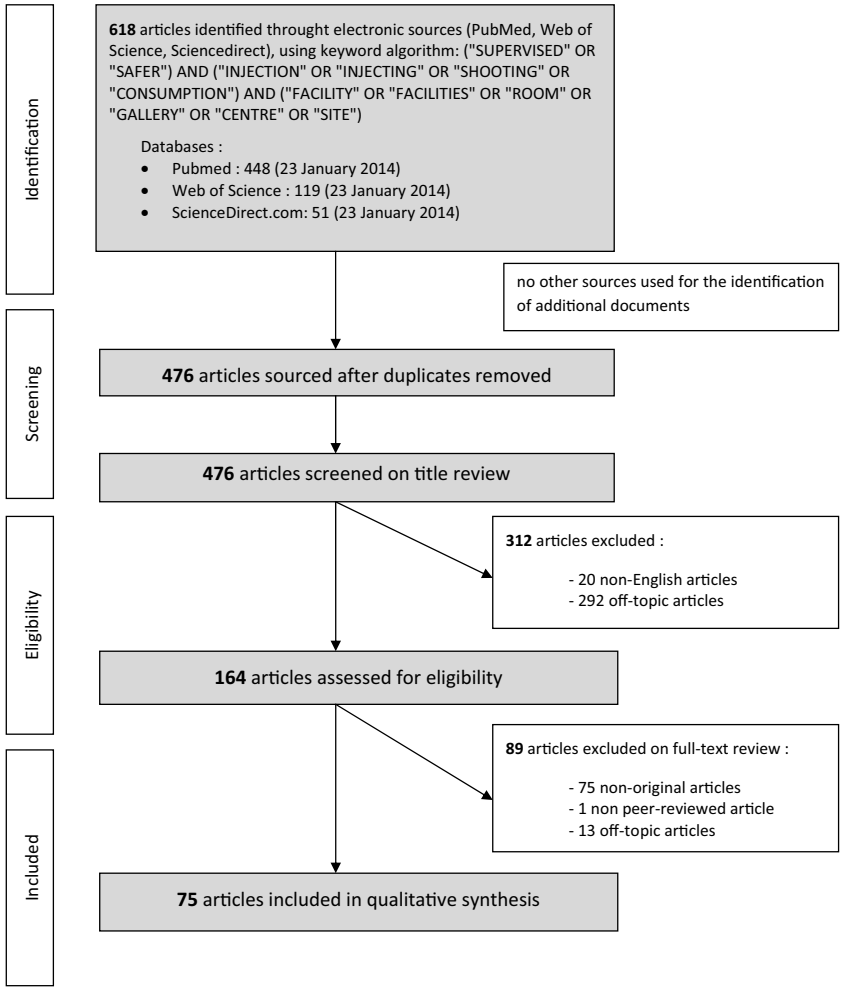

Fig. 1. Systematic selection process of relevant articles used for performing the review.

AND ("FACILITY" OR "FACILITIES" OR "ROOM" OR "GALLERY" OR "CENTRE" OR "SITE"). All results up to January 26, 2014 were examined in the article selection process.

The article selection algorithm is described in Fig. 1. After eliminating duplicates, relevant publications were chosen through the individual and independent selection of titles by three authors (C.P., B.R., V.L.). The articles selected had to be written in English and be related to SISs. In cases of disagreement between the authors during the selection process, the three authors discussed the article until a consensus to include it or exclude it was reached.

A second selection round was performed upon full-text reading. The selection criteria were as follows: (1) peer-reviewed articles that (2) contained original data on SIS assessment. The full texts of all selected articles were independently read by two authors (C.P. and B.R.). If one of the readers believed that the full-text article did not fit the eligibility and inclusion criteria, a final round of selection was performed through a consensual decision that included the same three authors identified above.

The quality of all of the finally selected articles was evaluated using specific tools. Observational studies were evaluated using the "Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement" (Vandenbroucke et al., 2007), and medical economic studies were evaluated using the "Consolidated Health Economic Evaluation Reporting Standards (CHEERS)" (Husereau et al., 2013). Because there is currently no consensual assessment method for either qualitative studies or surveys (Bennett et al., 2011), we did not score these types of articles in our review.

3. Results

3.1. Overall results

We initially found 618 articles using the aforementioned keyword algorithm, among which 75 articles were finally included in the review (cf. Fig. 1).

Table 1 lists the final selection of articles, which were clustered according to the specific subject they addressed: (1) the description of SIS users; (2) the impact of SISs on overdose-induced mortality and morbidity; (3) the impact of SISs on injection behaviors and their consequences; (4) the impact of SISs on the adherence to care of PWID; (5) the impact of SISs on the nuisances induced by drug use in public spaces; (6) the impact of SISs on local drug-related crime, violence, and trafficking; (7) the impact of SISs on the number of local PWID; (8) the medico-economic assessment of SISs; (9) the opinion of PWID on SISs; and (10) the impact of SISs on the opinions of local residents and local police.

Approximately 68% of the articles came from SISs in Vancouver ($n = 51$), 17% from SISs in Sydney ($n = 13$) and 3% from SISs in Europe ($n = 2$). Approximately 12% of the studies do not come from a SIS ($n = 9$).

Different study designs were found.

Of the 75 finally selected articles, 32 articles were about cohort studies, among which 3 were descriptive studies (Kerr et al., 2006b; Marshall et al., 2009; Stoltz et al., 2007a), 13 were analytical studies (Bravo et al., 2009; Hadland et al., 2014; Kerr et al., 2005c; Lloyd-Smith et al., 2010, 2009, 2008; McKnight et al., 2007; Milloy et al., 2010, 2009; Wood et al., 2005d, 2003, 2008, 2005a), 12 were evaluative studies (DeBeck et al., 2008; Kerr et al., 2007c; Kimber et al., 2008a; Milloy et al., 2008a; Petrar et al., 2007; Reddon et al., 2011; Richardson et al., 2008; Stoltz et al., 2007b; Wood et al., 2006d, 2005c, 2007, 2006c), 1 was both a descriptive and an analytical study (DeBeck et al., 2011), and 3 were cross-sectional

Table 1
Comprehensive result synthesis of the systematic literature review. Articles are arranged by clusters, then by date of publication.

Authors and publication date	Population	Total of participants	Study design	Study purposes	Study period	Main findings of the study	Studies quality assessment with STROBE (S) or CHEERS (C) scores
Reach the target population, PWID's profile:							
Hadland et al., 2014	Cohort "ARYS' (At-Risk Youth Study), Vancouver	414	Analytical, longitudinal, prospective study	Factors associated with SIS use among young (16–24 years) street PWID	From 09/2005 to 03/2012	Mean age: 22.8 years (±2.7 years), 33.8% female. Approximately 42.3% of youth used the Vancouver's SIS at least once. Factors associated: having lived or spent time weekly in the Downtown Eastside neighborhood surrounding the SIS (aOR = 3.29, 95%CI = [2.38–4.54]), having injected in public (aOR = 2.08, 95%CI = [1.53–2.84]) and having engaged in daily drug injection (aOR = 2.44, 95%CI = [1.34–4.45] for cocaine – aOR = 2.36, 95%CI = [1.72–3.24] for heroin).	(S): 21/28 (6 NAIs)
Reddon et al., 2011	PWID of ACCESS cohort, Vancouver	395	Descriptive and analytical, prospective study	Description and factors associated with SIS use in PWID HIV+	From 12/2005 to 05/2008	Approximately 26% of attendants used the site for >25% of injections. Factors associated with attending SISs included the following: homelessness (aOR = 1.90, 95%CI = [1.30–2.77]), and daily injection of heroin (aOR = 1.56, 95%CI = [1.08–2.25]) or cocaine (aOR = 1.59, 95%CI = [1.05–2.42]). The major reasons not to attend SISs included injection at home (31%), already having a safe place (21%), and willingness to inject in private (10%).	(S): 19/29 (5NAIs)
Salmon et al., 2009b	MSIC users (exhaustive population)	9778	Descriptive and analytical, prospective study	Measure of self-reported prevalence, of HIV testing and research of associated factors	From 05/01/2001 to 04/30/2007	Self-reported prevalence of HIV: +2%. Screening in the previous year: 94%. Factors associated with HIV+ male sex (aOR = 3.33, 95%CI = [1.96–5.56]), injection of psychostimulants (aOR = 2.02, 95%CI = [1.38–2.96]), use of local health services (aOR = 1.56, 95%CI = [1.07–2.27]), age >30 years (aOR = 2.38, 95%CI = [1.21–4.67]), homosexuality (aOR = 20.43, 95%CI = [13.21–31.59]) and bisexuality (aOR = 5.30, 95%CI = [3.13–8.93]).	(S): 24/29 (5NAIs)
Bravo et al., 2009	Itinere cohort, Barcelone and Madrid (Spain)	249	Analytical study	Factors associated with SIS use among PWID in Barcelona and Madrid		Approximately 39% of subjects used the SIS. Factors associated with SIS use: male sex (OR = 2.3, 95%CI = [1.2–4.3]), a source of illegal income (OR = 1.9, 95%CI = [1.1–3.1]), injection> 1x/week (OR = 4.9, 95%CI = [2.7–8.8]), speedball injection (OR = 2.5, 95%CI = [1.5–4.3]), and HCV + (OR = 3.1, 95%CI = [1.4–7.1]). The borrowing of used syringes is not associated with SIS use (OR = 0.4, 95%CI = [0.2–0.9]).	S: 22/33 (1NAI)
Dubois-Arber et al., 2008	PWID of Drug Consomtion Room (DCR), Geneva	509	Descriptive cross-sectional prospective study	Description of injection profiles and DCR use by PWID	2002	Average age: 33 years, 28% women. Four types described: type 1 (58%): regular users, small/medium number of injections and few days on which they inject, especially cocaine; type 2 (13%): few injections and days of injection, especially heroin; and type 3 (4%): large number of injections and large number of days of injection, especially cocaine.	(S): 23/30 (4NAIs)

Table 1 (*Continued*)

Authors and publication date	Population	Total of participants	Study design	Study purposes	Study period	Main findings of the study	Studies quality assessment with STROBE (S) or CHEERS (C) scores
Kimber et al., 2008a	MSIC users who live in King Cross (=2 km^2 around MSIC)	761	Evaluative observational study	To compare indirect estimation methods to obtain mean PWID prevalence for a confined geographic location and to use these estimates to calculate PWID and injection coverage of a MSIC	From 11/01/2001 to 10/31/2002	Indirect calculated prevalence of PWID in King Cross was estimated between 2.9% and 4.3% of the local population. The coverage of the MSIC on PWID was estimated at 70.7% (range = [59.1–86.7]). The adjusted rate of coverage of the MSIC on injections was estimated at 8.8% (range = [7.3–10.8]). Approximately 11.3% of the total PWID population were estimated to be new entrants to the population per month.	(S): 27/32 (2NAIs)
Richardson et al., 2008	Participants of SEOSI cohort	1090	Evaluative observational study	SIS's impact and factors associated with PWID employment	From 12/01/2003 to 12/31/2005	Approximately 36.3% had +/− regular employment in last 6 months. Regular attendance of SIS has no impact on employment (aOR = 1.06). Only binge consumption was associated with employment status (aOR = 1.27, 95%CI = [1.06–1.52]).	(S): 21/29 (5NAIs)
Stoltz et al., 2007a	Participants of VIDUS cohort	135	Descriptive, prospective study	Epidemiological characteristics of PWID under 29 years attending SIS	From 12/01/2003 to 05/01/2005	Unstable housing (OR = 5.24, 95%CI = [1.99–13.71]), history of incarceration (OR = 2.88, 95%CI = [1.29–6.40]), daily heroin consumption (OR = 2.16, 95%CI = [1.07–4.37]); history of overdose(OR = 2.55, 95%CI = [1.02–6.19]) and needle sharing (OR = 10.52, 95%CI = [1.33–83.46]).	(S): 19/29 (5NAIs)
Tyndall et al., 2006a	SIS of Vancouver users	4764	Descriptive, exhaustive study	PWID epidemiological characteristics and patterns of SIS attendance	From 10/03/2004 to 04/30/2005	Approximately 73% male, median age: 36–40 years. Patterns of attendance: injection (80%), meeting caregivers (10%), and obtaining an injection kit. Injected drugs: heroin (40%) and cocaine (28%).	(S): 23/29 (5NAIs)
Tyndall et al., 2006b	Participants of SEOSI cohort	1035	Descriptive, cross-sectional study	Study of the prevalence of seropositivity for HIV among PWID attending SIS	From 12/01/2003 to 03/31/2005	Approximately 17% were seropositive for HIV. Associated factors: aboriginal PWID (OR = 2.38, 95%CI = [1.65–3.44]), daily cocaine injection (OR = 1.50, 95%CI = [1.07–2.10]), needle sharing (OR = 2.13, 95%CI = [1.49–3.06]), addiction treatment (OR = 1.56, 95%CI = [1.12–2.17]), current use methadone (OR = 1.57, 95%CI = [1.08–2.28), and history of incarceration (OR = 2.04, 95%CI = [1.24–3.35]).	(S): 19/25 (9NAIs)
Wood et al., 2006c	Participants of SEOSI cohort	904	Descriptive and evaluative study	Epidemiological characteristics of PWID attending the SIS and factors associated with SIS daily attendance	From 12/01/2003 to 06/30/2004	Approximately 30% women, 39% involved in prostitution, 18% HIV, and HCV 88% [. . .]. Factors associated with SIS daily attendance: homeless (OR= 2.39, 95%CI = [1.57–3.63]), needing help injecting (OR = 0.61, 95%CI = [0.43–0.86]), daily injecting heroin (OR = 3.44, 95%CI = [2.50–4.73]) or cocaine (OR = 2, 95%CI = [1.44–2.78]), no methadone use (OR = 0.47, 95%CI = [0.32–0.69].	(S): 17/30 (4NAIs)

Wood et al., 2005a	Participants of SEOSI cohort	691	Analytical study	Epidemiological characteristics of PWID infected with HCV, attending the SIS	From 12/01/2003 to 07/30/2004	Approximately 88% of individuals (N = 605) in the study were HCV+ Risk factors for HCV infection: prostitution (aOR = 3.7, 95%CI = [2.1–6.1]), syringe borrowing (aOR = 1.8, 95%CI = [1.1–2.9]), and history of incarceration (aOR = 2.6, 95%CI = [1.5–4.4]). Protective factor: daily injection of heroin (aOR = 0.6, 95%CI = [0.3–0.9]).	(S): 17/25 (9NAIs)
Wood et al., 2005c	Participants of VIDUS cohort	400	Evaluative, observational study	Epidemiological characteristics of PWID attending the SIS	From 12/01/2003 to 05/01/2004	Age <30 years (OR = 1.6, 95%CI = [1.0–2.7]), unstable housing (OR = 1.7, 95%CI = [1.2–2.7]), public injection (OR = 2.6, 95%CI = [1.7–3.9]), daily injection of heroin (OR = 2.1, 95%CI = [1.3–3.2]) or cocaine (OR = 1.6, 95%CI = [1.1–2.5]), history of overdose (OR = 2.7, 95%CI = [1.2–6.1]), and HIV infection (30%).	(S): 17/28 (6NAIs)
Kimber et al., 2003	MSIC users (exhaustive population)	2696	Descriptive prospective study	Epidemiological characteristics of PWID attending the SIS	From 06/05/2001 to 04/30/2002	Approximately 70% male, age 31 years, 11% involved in prostitution, 43% inject daily, 40% injection in public areas, 56% live with social allowances, 45% history of overdose, 19 years-old at first injection, 53% injected heroin.	(S): 21/28 (6NAIs)
Reduce morbidity and mortality related to OD:							
Marshall et al., 2011	SEOSI cohort + BCCS register	290 overdoses	Analytical, retrospective cross-sectional repeated study	Impact of SIS opening on overdose mortality	From 01/01/2001 to 09/20/2003 and from 09/21/2003 to 31/12/2005	Significant reductions in the number of overdoses within 500 m of the SIS (35%) were observed compared with the rest of Vancouver (9.3% reduction).	Scores: NA (experimental study)
Salmon et al., 2010	NSW ambulance service patient report data collection, Sydney		Evaluative study "before and after"	MSIC impact on the number of calls of ambulances for overdoses near the MSIC	36 months before to 60 months after MSIC opening (from 05/1998 to 05/2006)	During the open hours of the MSIC, the number of calls decreased by 68% in the vicinity of the SIS (area = 1.5 km^2).	Scores: NA (experimental study)
Milloy et al., 2008b	Users of Vancouver's SIS	766,486 injections	Simulation study	Estimate number of overdoses avoided since the opening of the SIS	From 03/01/2004 to 02/06/2008	SIS avoided 1004 overdoses, including 453 life-threatening overdoses. There were no deaths. Between 1.9 and 11.7 overdose deaths have been avoided.	Scores: NA (experimental study)
Milloy et al., 2008a	Participants of SEOSI cohort	1090	Evaluative observational study	SIS's impact and factors associated with overdoses	From 12/01/2003 to 12/31/2005	Approximately 58.53% reported a history of overdose, and between 8 and 12% reported an overdose in the last six months. Factors found: prostitution (aOR = 1.45, 95%CI = [1.07–1.99]) and public injection (aOR = 1.50, 95%CI = [1.09–2.06]). SIS attendance for more than 75% of injections was not associated with an increase in overdoses (OR = 1.05).	S: 18/25 (9NAIs)
Kerr et al., 2007b	Participants of SEOSI cohort	50	Qualitative study, representative sample	Evaluation of the impact on overdoses according to PWID	From 11/2005 to 02/2006	Speed and quality of care, advice given, and injection in safety conditions.	Scores: NA (Qualitative study)
Kerr et al., 2006b	Participants of SEOSI cohort	1046	Descriptive study	Incidence and care of overdoses at SIS	From 03/01/2004 to 02/06/2008	There were 336 overdoses in 90 different individuals. There were no deaths. Administration of oxygen in 87% of cases, of naloxone in 27% of cases, and transfer to the hospital in 21% of cases.	S: 24/26 (8NAIs)

Table 1 (*Continued*)

Authors and publication date	Population	Total of participants	Study design	Study purposes	Study period	Main findings of the study	Studies quality assessment with STROBE (S) or CHEERS (C) scores
Van Beek et al., 2004	MSIC users	3747	Descriptive prospective study	Incidence, characteristics and care of overdoses at MSIC	From 05/06/2001 to 10/31/2002	Approximately 409 overdoses, no deaths. Heroin injection in 80% of cases and 67% in combination with alcohol or benzodiazepines, a quantity greater than the daily dose, and a recent period of abstinence. Oxygen in 70% of cases, naloxone in 25% of cases. Supported in five minutes in 76% of cases.	S: 17/27 (7NAIs)
Reduce the risks associated with the injection and educate to safe injection:							
Milloy and Wood, 2009	Studies (22) (23) (24)		Evaluative observational meta-analysis	SIS impact on syringe sharing		Global estimation calculated a 69% reduction in needle sharing among PWID attending the SIS.	Scores: NA (meta-analysis)
Salmon et al., 2009a	MSIC users (exhaustive population)	9552	Descriptive and analytical, prospective study	Estimate of the rate problems related to injection and associated factors	From 05/01/2001 to 04/30/2007	Approximately 29% had problems related to the injection. Approximately 10% had an injury or illness related to the injection. Main problems: difficulty finding a vein (18%), scarring or bruising (14%), and swelling of hands/feet (7%). Major diseases: abscess or cutaneous infection (6%), thrombosis (4%), sepsis (2%), and endocarditis (1%). Factors associated with disorders: female injecting the drug (except heroin), antecedent of dependence program, and history of overdose, prostitution, recent public injecting, and sharing needles.	S: 23/29 (5NAIs)
Fast et al., 2008	Participants of SEOSI cohort	50	Qualitative study, representative sample	SIS's impact of education on injection practices	From 11/2005 to 02/2006 to 03/2007	SIS has corrected or fills gaps in the hygienic and safe handling of the injections.	Scores: NA (Qualitative study)
Wood et al., 2008	Participants of SEOSI cohort	1087	Analytical study	Factors related to the request of an education for safe injection	From 03/01/2004 to 03/01/2005	Factors associated: female gender (aOR = 1.55, 95%CI = [1.18–2.4], needing help injecting (aOR = 1.52, 95%CI = [1.26–1.84], binge consumption of drugs (aOR = 1.37, 95%CI = [1.14–1.64]) and the use of an SIS for more than 75% of injections(aOR = 1.47, 95%CI = [1.22–1.77]).	S: 23/29 (5NAIs)
Stoltz et al., 2007b	Participants of SEOSI cohort	760	Evaluative observational study	SIS's impact on injection practices	From 07/10/2004 to 06/30/2005	SIS use is associated with positive changes in injecting practices: decreased the reuse of syringes (aOR = 2.04, 95%CI = [1.38–3.01]), decreased injections in public places (aOR = 2.79, 95%CI = [1.93–3.87]), taking the time needed (aOR = 2.7, 95%CI = [2.03–3.85]), use of clean water (aOR = 3, 95%CI = [2.13–4.18]), cooking/filtering drugs (aOR = 2.76, 95%CI = [1.84–4.15]), tie off prior to injection (aOR = 2.6, 95%CI = [1.58–4.37]), and safe disposal of syringes (aOR = 2.13, 95%CI = [1.47–3.09]).	S: 21/27 (7NAIs)
Kerr et al., 2005c	Participants of VIDUS cohort	431	Analytical, comparative, cross-sectional study	Factors associated with syringe sharing	From 12/01/2003 to 06/01/2004	In logistic regression analyses, use of the SIF was independently associated with reduced syringe sharing (aOR = 0.30, 95%CI = [0.11–0.82], $p = 0.02$) after adjustment. In univariate analyses, significant factors associated was: need help to inject (aOR = 2.94, 95%CI = [1.59–5.42]), binge consumption (aOR = 2.04, 95%CI = [1.05–3.95], and regular injection of heroin(aOR = 1.72, 95%CI = [0.95–3.13]) or cocaine(aOR = 1.70, 95%CI = [0.93–3.06]).	S: 25/29 (5NAIs)

Wood et al., 2005b	Participants of SEOSI cohort	582	Analytical comparative, study	Factors associated with needle sharing according to HIV seropositivity	From 03/22/2004 to 10/22/2004	Factors associated: HIV-: public injecting (OR = 7.07, 95%CI = [2.16–23.13]) and the need help to inject (OR = 2.59, 95%CI = [1.42–4.74)); HIV+ daily injection of cocaine (OR = 3.42, 95%CI = [1.15–10.2]) and shooting gallery use (OR = 6.16, 95%CI = [1.75–21.70]). Among HIV-, exclusive SIS use is associated with a decrease in needle sharing (OR = 0.14, 95%CI = [0.00–0.78]), which is not observed to be statistically significant in HIV+ (OR = 0.94, 95%CI = [0–7.90]).	S: 21/29 (5NAIs)
Wood et al., 2005d	Participants of SEOSI cohort	874	Descriptive and analytical l study	Incidence and factors associated with receiving an education on the safe injection practice at SIS	From 05/31/2003 to 10/22/2004	Approximately 33.5% received an education. Factors associated: need help to inject (aOR = 2.20, 95%IC = [1.62–2.98]), prostitution(aOR = 1.54, 95%CI = [1.09–2.16]) and a few years of experience(aOR = 0.99, 95%CI = [0.97– 1.00]).	S: 18/29 (5NAIs)
Provide primary health care and improve the health of PWID:							
Lloyd-Smith et al., 2010	Participants of SEOSI cohort	1083	Descriptive and analytical study	Incidence and factors associated with hospitalization due to cutaneous infection or other cutaneous complication, owed to injection	From 01/01/2004 to 12/31/2005	Approximately 9% of participants were hospitalised, including 49% for cutaneous disorders caused by injection. Associated factors: HIV seropositivity (aOR = 1.79, 95%CI = [1.16–2.75]), orientation by an SIS nurse (aOR = 5.38, 95%CI = [3.39–8.55]). The hospital stay was significantly shorter among participants sent by an SIS nurse compared with those who were not sent by one (4 days (95%CI = [2–7]) vs. 12 days (95%CI = [5–33])).	S: 27/33 (1NAI)
Lloyd-Smith et al., 2009	Participants of SEOSI cohort	1080	Descriptive and analytical study	Incidence and factors associated to health care provided to a cutaneous infection due to injection	From 12/01/2003 to 01/31/2008	Approximately 27% received care, 65% of whom attended the SIS for this purpose. Factors associated with receiving this care included female gender (aOR = 1.87, 95%CI = [1.32–2.64]), unstable housing(aOR = 1.39, 95%CI = [1.02–1.88]), and daily heroin injection(aOR = 1.52, 95%CI = [1.13–2.4]).	S: 27/30 (4NAIs)
Marshall et al., 2009	Participants of SEOSI cohort	794	Descriptive study	Condom use during sexual relations among PWID	From 12/2003 to 12/2005	The proportion of individuals using a condom during every act of intercourse increased by 8% over the two years of the study. The main predictive factor was HIV seropositivity (aOR = 2.23, 95%CI = [1.51–3.31]).	S: 26/33 (1NAI)
Small et al., 2009	Participants of SEOSI cohort	50	Qualitative study, representative sample	PWID Interests of the site, qualitative study	From 11/2005 to 02/2006	Access to a primary care facility with a competent and experienced staff, devoid of judgment, and a wide variety of care. Social assistance.	Scores: NA (Qualitative study
Lloyd-Smith et al., 2008	Participants of SEOSI cohort	1065	Analytical study	Factors associated with risk of developing a cutaneous injection-related infection	From 01/01/2004 to 12/31/2005 to 12/31/2005 to 02/2006	Approximately 6–10% of participants reported cutaneous injection-related infections. Factors associated: female gender (aOR = 1.68, 95%CI = [1.16–2.43]), unstable housing (aOR = 1.49, 95%CI = [1.10–2.03]), borrowing used syringes (aOR = 1.60, 95%CI = [1.03–2.48]), requiring help to inject (aOR = 1.42, 95%CI = [1.03–1.94]) and daily cocaine injection (aOR = 1.41, 95%CI = [1.02–1.95]).	S: 23/29 (5NAI)

Table 1 (*Continued*)

Authors and publication date	Population	Total of participants	Study design	Study purposes	Study period	Main findings of the study	Studies quality assessment with STROBE (S) or CHEERS (C) scores
Small et al., 2008	Participants of SEOSI cohort	50	Qualitative study, representative sample	SIS's impact on access to care and treatment of infections following injection		SIS seemed to favor access to care. Its advantages: competent staff and non-judgmental, transfer to a hospital if necessary, availability, education/safe injection, and transfer to other medical and social structures.	Scores: NA (qualitative study)
Access to addiction treatment/program:							
DeBeck et al., 2011	SEOSI cohort	1090	Evaluative observational, analytical and study	SIS impact in the establishment of a withdrawal program, including treatment with methadone	From 12/01/2003 to 06/01/2006	The cumulative incidence of injection cessation was 23% (95%CI = [16.2–29.9]). Factors associated with the initiation of addiction treatment: regular attendance at the SIS (aHR = 1.33, 95%CI = [1.04–1.72]), interviews with an addiction counselor (aHR = 1.54, 95%CI = [1.13–2.08]) and the use of methadone treatment, (aHR = 1.57, 95%CI = [1.02–2.40]). The cumulative incidence of entry into addiction treatment was 57.21% (95%CI = [50.9–63.5]).	S: 22/29 (5NAIs)
Milloy et al., 2010	Participants of SEOSI cohort	889	Analytical study			On average, 21% of individuals wanted but were unable to access this dependence treatment. The main obstacle in access was the waiting list. Factors associated with this inability: homelessness (OR = 1.47, 95%CI = [1.09–1.98]), daily heroin consumption(OR = 1.47, 95%CI = [1.13–1.90]), recent incarceration(OR = 1.62, 95%CI = [1.25–2.09]), and sharing needles(OR = 1.67, 95%CI = [1.09–2.56]).	S: 21/30 (4NAIs)
Kimber et al., 2008b	MSIC users (exhaustive population)	3715	Descriptive and analytical study	Study of processes and predictive factors of orientation to medical and social care, in particular to a addiction treatment	From 05/2001 to 10/2002	Approximately 16% (577 PWID) have received counseling, 12% (443) for addiction treatment (77% of PWID oriented). Entering into a detoxification program was confirmed for 20% of PWID oriented. Factors associated with receiving a written orientation for a detoxification program: frequent use of the MSIC(aOR = 1.6, 95%CI = [1.2–2.2]), majority heroin injection (aOR = 1.9, 95%CI = [1.2–2.2]), and obtaining a high school diploma (aOR = 1.6, 95%CI = [1.2–2.2]). Factors associated with treatment entry: prostitution (aOR = 2.6, 95%CI = [1.1–5.8]) and daily injection (aOR = 2.3, 95%CI = [1.1–5.2]). A psychiatric history was negatively associated with entry into treatment (aOR = 0.2, 95%CI = [0.5–0.7]).	S: 23/31 (3NAIs)
Wood et al., 2007	Participants of SEOSI cohort	1031	Evaluative observational study	SIS's impact on the use of an detoxification service by PWID	From 12/01/2003 to 03/01/2005	Attendance service detoxification use (OR = 1.32, 95%CI = [1.11–1.58]), initiation of methadone treatment (RR = 1.56, 95%CI = [1.04–2.34) and addiction treatment (RR = 3.73, 95%CI = [2.57–5.39]) increased one year after the SIS opening. SIS attendance declined in the months following the initiation of addiction treatment.	Scores: NA (experimental study)
Wood et al., 2006d	partIcipants of SEOSI cohort	1031	Evaluative observational study	SIS's impact and factors associated with the use of a detoxification program	From 12/01/2003 to 03/01/2005	Approximately 18% started a detoxification program. Factors associated: weekly SIS attendance (aOR = 1.72, 95%CI = [1.25–2.38]) interview with addiction counselor (aOR = 1.98, 95%CI = [1.26–3.10]), history of contact with a detoxification service (aOR = 2.43, 95%CI = [1.41–4.22]) and unstable housing (aOR = 1.42, 95%CI = [1.06–1.90]).	S: 14/27 (7NAIs)

Reduce public nuisances:							
McKnight et al., 2007	Participants of SEOSI cohort	714	Analytical study	Factors associated with public injection	From 06/02/2004 to 07/2005	Factors found: homelessness (aOR = 3.1, 95%CI = [1.46–6.58], recent incarceration (aOR = 1.77, 95%CI = [1.15–2.73]), needle sharing (aOR = 5.39, 95%CI = [1.96–14.78]), the need for help injecting (aOR = 1.60, 95%CI = [1.01–2.54], daily heroin injection (aOR = 2.71, 95%CI = [1.84–3.98]) and waiting time at the SIS (aOR = 3.26, 95%CI = [2.11–5.6]).	S: 23/33 (1NAI)
Wood et al., 2004	PWID in the 10 city blocks surrounding the Vancouver's SIS		Evaluative comparative prospective study	SIS's impact on nuisances related injections into surrounding public areas	From 6 weeks before to 12 weeks after SIS opening	Statistically significant reductions were found when comparing the before and after opening of SIS in: the daily mean numbers of PWID injecting in public (4.3, IQR = [4.0–4.3] vs. 2.4 IQR = [1.5–3.0]; $p = 0.022$), publicly discarded syringes (11.5, IQR = [7.3–14.3] vs. 5.3, IQR = [3.0–8.0]; $p = 0.010$) and injection related litter (601.7, IQR = [490.0–830.3] vs. 305.3, IQR = [246.3–387.0]; $p = 0.014$). Using the unadjusted regression model, estimations of the predicted mean daily level of each public order measure in the periods before and after the opening of the safer injecting facility were: number of people injecting in public 4.3, (95%CI = [3.5–5.4]) vs. 2.4 (95%CI = [1.9–3.0]), dropped syringes 11.5 (95%CI = [10.0–13.2]) vs. 5.4 (95%CI = [4.7–6.3]) and injection-related waste outside the SIS 601.7 (95%CI = [590–613]) vs. 305.3 (95%CI = [305–317]).	Scores: NA (experimental study)
Impact of SISs on local drug-related crime, violence and drug trafficking:							
Fitzgerald et al., 2010	Computerized reports of NSW police, King Cross		Evaluative observational, longitudinal, retrospective study,	Impact of the SIS opening on local crime (King Cross (KC) area) compared to the rest of the city	From 01/1999 to 03/2010	Overall, there was no significant difference in the drug crimes in the vicinity of the SIS. Discordant trends with the rest of Sydney were as follows: theft with a firearm (stable at KC, vs. downward trend in the rest of Sydney) and retail theft (up at KC vs. steady in the rest of Sydney). Arrests for possession or trafficking of drugs remained stable at KC unlike the rest of Sydney (increase in amphetamine possession and cocaine trafficking; decreased traffic and possession of narcotics).	S: 10/21 (13NAIs)
Milloy et al., 2009	Participants of SEOSI cohort	902	Analytical study	Connection between the SIS use and recent incarceration, and factors associated with incarceration	From 07/01/2004 to 11/30/2005	The recent incarceration rate remained stable between 25 and 33% throughout follow-up, and frequent use of the SIS was not associated with this rate (aOR = 0.99, 95%CI = [0.79–1.23]). Associated factors included the following: precarious housing (aOR = 3.63, 95%CI = [2.70–4.88]), public injection (aOR = 1.60, 95%CI = [1.11–2.31]) and frequent heroin injection (aOR = 1.38, 95%CI = [1.11–1.71]).	S: 20/32 (2NAIs)
Wood et al., 2006a	Vancouver Police Department statistics		Evaluative observational study	Study of crime around the SIS before and after opening	From 10/01/2003 to 09/30/2005	No increase in the rate of drug trafficking (124 [SD = 94] vs. 116 [SD 24]; t-stat = 0.26, df = 11, $p = 0.803$) or the number of assaults or robberies (174 [SD = 25] vs. 180 [SD = 21]; t-stat = -0.59, df = 11, $p = 0.565$). Decrease in the number of thefts and car burglaries (302 [SD = 57] vs. 227 [SD = 48]; t-stat = 4.22, df = 11, $p = 0.001$).	S: 15/32 (2NAIs)

Table 1 (*Continued*)

Authors and publication date	Population	Total of participants	Study design	Study purposes	Study period	Main findings of the study	Studies quality assessment with STROBE (S) or CHEERS (C) scores
Freeman et al., 2005	Records of the King Cross local police, Australia		Evaluative observational study	Impact of the SIS opening on local crime compared to the rest of the city	From 09/1999 to 10/2002	No change in the incidence of theft or the influx of new users or dealers. Increased number of loiterers	Scores: NA (experimental study)
SISs' impact on local number of PWID:							
Kerr et al., 2007c	Participants of SEOSI cohort	1065	Evaluative observational study	SIS's impact on initiation and encouragement of injection drug	From 12/01/2003 to 10/21/2005	An individual was be injected in the SIS for the first time (extrapolation: 5 initiations in SIS, 95%CI = [2–12], 70 initiations outside SIS, 95%CI = [55–80]). Compared with the study of E. ROY (100 initiations in Vancouver street/year, 95%CI = [81–122]), the SIS did not seem to encourage the initiation of injection drug use.	S: 18/31 (3NAIs)
Kerr et al., 2006a	Participants of VIDUS cohort	871	Evaluative comparative, prospective, study	Impact of SIS's opening on addictologic history of PWID	From 03/22/2002 to 03/22/2003 and from 03/22/2003 to 03/22/2004	There was no significant difference in the relapse rate (17% vs. 20%), stopping injections (17% vs. 15%), or the introduction or discontinuation of methadone (11% vs. 7% and 13 vs. 11%, respectively).	S: 19/29 (5NAIs)
Cost-benefits and cost-effectiveness of SISs:							
Jozaghi et al., 2013	PWID Montreal	Between 4300 and 12,500 estimated	Evaluative study by mathematical modeling	Cost-benefits and cost-effectiveness analysis about HIV and HCV infections of a SIS in Montreal	2012	It was estimated that the addition of each SIS in Montreal (up-to a maximum of 3) will, on average, prevent 11 cases of HIV and 65 cases of HCV each year. There was a net cost saving of CDN$0.686 million for HIV and CDN$0.8 million for HCV for each additional SIS each year. Net average benefit-cost ratio of 1.21: 1 for both HIV and HCV.	Scores: NA (mathematical modeling)
Pinkerton, 2011	PWID of Downton Eastside area, Vancouver	5000 estimated	Evaluative study	Cost-benefit analysis of Vancouver's SIS		SISs were estimated to prevent 5–6 new HIV infections per year (95%CI = [4.0–7.6]).	Scores: NA (mathematical modeling)
Andresen and Boyd, 2010	PWID of Downton Eastside area, Vancouver	5000 estimated	Evaluative study by mathematical modeling	Cost-benefit analysis of Vancouver's SIS	Costs of 2007	The SIS would prevent 35 new HIV infections and 3 prevented deaths per year (absolute values).	C: 14/23 (4NAIs)
Pinkerton, 2010	Vancouver PWID	13,500 estimated	Evaluative study by mathematical modeling	SIS cost-benefits estimation about HIV infection	2008	Approximately 47 HIV infections are avoided, contributing to cost-effectiveness (cost HIV infections: $ 7.8 M; cost of Insite: $ 3 M).	Scores: NA (mathematical modeling)
Bayoumi and Zaric, 2008	Vancouver PWID infected with HIV and HCV	Estimated to be between 3000 and 20,000	Evaluative study by mathematical modeling	Evaluating the cost-effectiveness of the SIS in Vancouver for the next 10 years	Simulation about 10 years	Calculated savings: $ 14 million, 920 years of life, and 1191 new HIV and 54 new HCV infections.	C: 21/23 (4NAIs)
PWID's opinions about SISs:							
Jozaghi and Andresen, 2013	PWID Vancouver, Surrey, Victoria (Canada)	31	Qualitative study	PWID opinion about opening another SIS	10/2009 and 2011	SISs reduced overdose deaths, the risk of transmission of HIV and HCV, public injections, and the disposal of syringes in public areas and provided safe injection conditions (no violence, no police) and increase access to primary healthcare.	Scores: NA (qualitative study)

McNeil et al., 2013	Cohort VANDU	23	Qualitative study	PWID opinions and ethnographic observations about assisted injection practices	from 09/2011 to 12/2011	Women and people with disabilities were more likely to need help injecting and, therefore, could not use an SIS. Assisted injection practices at SISs would allow these individuals to reduce health risks (including HIV) and the violence suffered during assisted injections performed in unsafe conditions.	Scores: NA (qualitative study)
DeBeck et al., 2011	Cohort VIDUS	640	Cross-sectional repeated study	Estimating the probability to use the Vancouver's SIS	From 12/2001 to 05/2003 and from 12/2003 to 11/2005	Approximately 72% of PWID who reported being interested in SISs had secondarily attended one. Initial willingness to use a SIF was significantly associated with later use of the facility (OR = 2.20, 95%CI = [1.47–3.30]).	S: 26/32 (2NAIs)
Small et al., 2012	Participants of SEOSI cohort	50	Qualitative study, representative sample	PWID motivations to attend Vancouver's SIS	From 11/2005 to 02/2006	The purposes of PWID in attending SISs were as follows: seeking safety, receiving sterile equipment and adequate care in case of overdose.	Scores: NA (qualitative study)
Small et al., 2011b	Participants of SEOSI cohort	50 PWID interviews + SIS's database	Qualitative and descriptive cross-sectional study	Description of SIS functioning and of local traffic and drug use, and their impact on SIS use by PWID	Interviews: from 11/2005 to 02/2006; datas: from 09/01/2008 to 08/31/2009	Waiting time >15 min or >3 people causes a departure from SISs to inject in a public area. Waiting time is increased by the absence of limitation of time spent in the injection room and by the day of payment of social benefits. Consequence: PWID's suspension. Other obstacles to the use of the SIS: the prohibition of sharing drugs and of physical assistance to inject.	Scores: NA (qualitative study)
Small et al., 2011a	Participants of SEOSI cohort	50	Qualitative study, representative sample	PWID motivations to attend Vancouver	From 02/2005 to 02/2006	The purposes of PWID in attending SIS were as follows: seeking safety and receiving sterile equipment and adequate care in the case of overdose.	Scores: NA (qualitative study)
Kral et al., 2010	San Fransisco PWID	602 (representative sample)	Sample survey	PWID opinion about opening a SIS in San Francisco	2008	Approximately 85% of subjects would be willing to use the SIS, and 50% would go daily. Associated factors: injection in public areas (aOR = 2.6, 95%CI = [1.6–4.1]), speedball injection (aOR = 2.5, 95%CI = [1.4–4.5]). More than two-thirds agree with the settlement, except having to live close to the SIS and having to be monitored by cameras and prove one's identity.	S: 18/29 (5NAIs)
Fairbairn et al., 2008	Women of SEOSI cohort	25	Qualitative study, sample survey	SIS impact on violence suffered by women who inject in the street	from 11/2005 to 03/2007	Refuge against interpersonal and structural violence, theft, and arrest by the police. Provides a source of advice.	Scores: NA (Qualitative study)
Kimber and Dolan, 2007	PWID of shooting gallery (SG)	115 PWID + 8 health workers in connection with PWID	Qualitative and descriptive, prospective cross-sectional study	Willingness, motivation and obstacles to the MSIC's use. MSIC impact on attendance SG	From 01/2001 to 10/2001	Approximately 31 PWID used a SG in the previous 6 months; 68% wanted to use the MSIC. Motivations: free access, hygiene and injection safety, professional help in case of OD. Obstacles: fear of the police, lookout media, distance between the place of purchase and MSIC, smoking prohibition. 69% decrease of syringes collected in SG after 6 months of opening and after 3 months, number of visits to MSIC >number of syringes collected for SG.	S: 12/31 (3NAIs)

Table 1 (*Continued*)

Authors and publication date	Population	Total of participants	Study design	Study purposes	Study period	Main findings of the study	Studies quality assessment with STROBE (S) or CHEERS (C) scores
Petrar et al., 2007	Participants of SEOSI cohort	1082	Evaluative study	Evaluation of PWID satisfaction on SIS	From 12/01/2003 to 09/30/2005	Approximately 75% inject more safely. 71% inject less in public and 56% report less unsafe syringe disposal. Approximately 95% are satisfied with the SIS. Obstacles: waiting time (5%), opening hours (7%), police presence (5%), and the distance to the SIS (12%).	S: 14/31 (3NAIs)
Green et al., 2004	Montreal PWID in public (SurvUDI study)	251	Analytical prospective cross-sectional study	PWID willingness to use a SIS and factors associated with this use	From 04/2001 to 02/2002	Approximately 76% were willing to use an SIS when it was described to them. Factors associated: injection as the main mode of drug use (aOR = 3.08, 95%CI = [1.24–7.63]), PWID think that SISs give a feeling of relief (aOR = 5.06, 95%CI = [2.27–11.28]) or accountability (aOR = 4, 95%CI = [1.79–8.95]), and history of overdoses (aOR = 2.43, 95%CI = [1.07–5.79].	S: 20/33 (1NAI)
Navarro and Leonard, 2004	Ottawa PWID in public	506	Descriptive analytical prospective cross-sectional study	Characteristics of Ottawa PWID in public in order to deduce the implications for SIS opening	From 10/2002 to 01/2003	Approximately 65% are injected in public in the previous 6 months, and 17% do this frequently. Factors associated: male sex (aOR = 2.33, 95%CI = [1.24–4.42]), homelessness (aOR = 6.62, 95%CI = [3.79–11.55]), injecting with more 5 persons (aOR = 3.72, 95%CI = [2.41–5.73]), early injections <20 years (aOR = 2.36, 95%CI = [1.40–3.98]), main injection of opiates (aOR 3.37, 95%CI = [1.01–5.5]), Injecting with use syringe (aOR = 3.12, 95%CI = [1.62–6.00]), prostitution with male clients (aOR = 3.07, 95%CI = [1.18–7.99]), and severe dependence (aOR = 1.09, 95%CI = [1.03–1.16]). Main reasons for public injection: convenience, confidentiality/privacy and immediate need to inject.	S: 22/32 (2NAIs)
Wood et al., 2003	Participants of VIDUS cohort	587	Descriptive analytical prospective study	Estimate the PWID proportion wishing to use a SIS and associated factors to this use	From 06/2001 to 06/2002	Approximately 37% were interested in using an SIS, and 49% were not interested. Factors associated with willingness to use an SIS: difficulties in obtaining sterile syringes (aOR = 2.07, 95%CI = [1.35–3.17]), needing help injecting (aOR = 1.52, 95%CI = [1.01 -2.30]), injection in public areas (aOR = 2, 95%CI = [1.27–3.16]), heroin injection (aOR = 1.81, 95%CI = [1.22–2.68]) and prostitution (aOR = 2.02, 95%CI = [1.31–3.12]).	S: 24/32 (2NAIs)
Fry, 2002	Sample PWID of Melbourne (Australia)	215	Descriptive prospective, cross-sectional study	PWID expectations and willingness to go to SIS	From 12/1999 to 02/2000	Approximately 89% were interested in an SIS if it were located in the zone of their drug purchases, and more 80% agree with the settlement. Obstacles to attendance: the prohibition to help(18%) and share injection drugs (34%).	S: 12/31 (3NAIs)
Van Beek and Gilmour, 2000	Sydney PWID attending needle exchange program	178	Descriptive, cross-sectional study, sample survey	Estimate of willingness to use a SIS and characteristics associated	2 days in 08/1999	Approximately 71% of users wished to use an SIS for their most recent injection; 83% of the 29% who did injected in public compared to 66% of the 71% who did injected in a private area. Obstacles: distance between the SIS and place of drug purchase, police presence, and lack of anonymity.	S: 15/31 (3NAIs)
Opinions of local residents, police and local policies toward SISs:							
Watson et al., 2012	Ottawa and Toronto police officers	18	Qualitative study	Study of police perceptions about Centers Supervised Consumption (CSC)	From 12/2008 to 01/2010	The participants had a strong and unanimous position against SISs; they thought that SISs do not solve the problem of addiction, send confusing messages about the acceptability of the use of illicit drugs, undermine efforts to maintain order, fail to reduce disease transmission rates, and create or exacerbate existing public problems.	Scores: NA (qualitative study)

Philbin et al., 2009	Key stakeholders who had direct or indirect interaction with PWID in Tijuana (Mexico)	40	Qualitative study	Exploring stakeholder perceptions of acceptability and feasibility of needle exchange program (NEP), syringe vending machines and SIS.	From August 2006 to March 2007	Approximately 66% of respondents supported at least one of the three programs. The most accepted program was the NEP (75%), which appeared feasible for 53% of respondents. The SIS was accepted by 58% of respondents and seemed feasible for 25% of them. Syringe vending machines were accepted by 65% of subjects and were 38% achievable. Many suggested raising awareness and education levels within the community, collaborating with religious and political leaders, and changing laws and policies.	Scores: NA (qualitative study)
DeBeck et al., 2008	SEOSI cohort	1090	Evaluative study	Impact of local police on SIS attendance	From 12/01/2003 to 12/31/2005	Approximately 16.7% were sent to the SIS by local police, and 2% learned of the SIS from the local police.	S: 18/33 (1NAI)
Cruz et al., 2007	Representative sample of the Ontario adult population	2411	Prospective study, sample survey	Public opinion regarding SIS's opening	2003	Approximately 60% are in favor. Expectations of the SIS: reduce deaths from overdose or infectious disease, reduce public nuisance associated with injection, and promote contact with the medical and social structures.	S: 27/32 (2NAIs)
O'Shea, 2007	PWID, key personnel and policy makers in the drug field	16 UDI +1 minister +9profession-nals	Qualitative study, without sampling	Evaluation of policy implications and acceptance of SIS opening in Dublin		Ten PWID felt it necessary to create an SIS to reduce the public nuisance of injections (also approved by professionals) and to inject in reassuring conditions. Thirteen PWID reported being willing to use an SIS. Professionals' responses were mixed, with those favorable believing that the SIS is part of the public health policy and those more cautious fearing the strength of public opinion.	Scores: NA (qualitative study)
Salmon et al., 2007	Random sample of local residents and business operators around the MSIC	Local residents: 540–326 business operators: 269–210	Descriptive, prospective, repeated cross-sectional study	Public opinion about SIS's opening	in10/2000, in10/2002 and in 11/2005	After the MSIC opening: less public injection (residents:33% vs 19%, $p < 0.01$; business operators: 38% vs 28%, $p < 0.03$), less syringes dropped (residents: 67% vs 40%, $p < 0.01$; business operators: 72% vs 57%, $p < 0.01$), and less complaints about PWID nuisances but no change in the number of drug deals (residents: 28% vs 26%, $p < 0.80$ et business operators: 33% vs 28%, $p < 0.26$). In 2005, the fears were as follows: encouraging drug use and attracting PWID and traffickers; inconveniences were as follows: negative image of the neighborhood, insecurity and crime, and dropping syringes.	S: 23/31 (3NAIs)
Thein et al., 2005	Sample of King Cross local residents and business operators, Sydney	Local residents: 540; business operators: 207	Prospective repeated cross-sectional study, sample survey	Public opinion about SIS's opening	in 10/2000 and in 10/2002	In 2000, approximately 58% (business operators) to 70% (residents) were in favor of the SIS. Views: SISs do not encourage drug use, do not complicate the drug enforcement, reduce public nuisances associated with injection, improve the health of users but do attract PWID.	S: 15/31 (3NAIs)

NA = Not Applicable; NAI = Not Applicable Item; OR = Odds Ratio; aOR = Ajusted Odds Ratio; 95%CI = 95%Confidence Interval; IQR = InterQuartile Range
ACCESS = AIDS Care Cohort to evaluate Exposure to Survival Services; BCCS = British Columbia Coroners Service; MSIC = Sydney Medically Supervised Injecting Centre; NSW = New South Wales; PWID = People Who Inject Drugs; SEOSI = Scientific Evaluation Of Supervised Injecting; SIS = Supervised Injection Services; UDI = Utilisateurs de Drogues Injectables (=injection drug users); VANDU = Vancouver Area Network of Drug Users; VIDUS = Vancouver Injection Drug Users Study.

studies (DeBeck et al., 2012; Green et al., 2004; Tyndall et al., 2006b). Among the 32 articles about cohort studies, 94% ($n = 30$) were performed in Vancouver, 3% ($n = 1$) in Sydney, and 3% ($n = 1$) in Barcelona.

Other non-cohort investigations consisted of 7 exhaustive population studies [4 descriptive studies (Fry, 2002; Kimber et al., 2003; Tyndall et al., 2006a; Van Beek et al., 2004), 3 descriptive and analytical studies (Kimber et al., 2008b; Salmon et al., 2009a, 2009b)], 13 articles about qualitative studies (Fairbairn et al., 2008; Fast et al., 2008; Jozaghi and Andresen, 2013; Kerr et al., 2007b; McNeil et al., 2013; O'Shea, 2007; Philbin et al., 2009; Small et al., 2009, 2008, 2012, 2011a, 2011b; Watson et al., 2012), 4 cross-sectional studies (Dubois-Arber et al., 2008; Navarro and Leonard, 2004; Salmon et al., 2007; Thein et al., 2005), 3 surveys (Cruz et al., 2007; Kral et al., 2010; Van Beek and Gilmour, 2000), 3 evaluative studies (Freeman et al., 2005; Kerr et al., 2006a; Wood et al., 2006a), 5 evaluative experimental studies (Kimber and Dolan, 2007; Marshall et al., 2011; Salmon et al., 2010; Small et al., 2011b; Wood et al., 2004), 1 meta-analysis (Milloy and Wood, 2009), 1 case-control study (Wood et al., 2005b), 2 mathematical modeling studies (Pinkerton, 2011, 2010), 3 cost-benefit/effectiveness studies (Andresen and Boyd, 2010; Bayoumi and Zaric, 2008; Jozaghi et al., 2013), and 1 simulation study (Milloy et al., 2008b).

Concerning the qualitative assessment of each study using the STROBE and CHEERS scales, the final score is reported in Table 1. This score was calculated from the sum of the applicable items for each study. The number of applicable items for each study can be found in the denominator. The details of each evaluation are available in the supplementary material. Twenty-two studies were not evaluated: 13 were qualitative studies, 6 were experimental studies, 2 were mathematical modeling studies and 1 was a meta-analysis.

3.2. Description of SIS users

We identified 14 articles that aimed to depict the profile of the most frequent SIS users. Eight of these studies were performed in a SIS in Vancouver (Hadland et al., 2014; Reddon et al., 2011; Richardson et al., 2008; Tyndall et al., 2006a, 2006b; Wood et al., 2006c, 2005a, 2005c), while the others were performed in SISs in Sydney (Kimber et al., 2008a, 2003; Salmon et al., 2009b; Stoltz et al., 2007a), Geneva (Dubois-Arber et al., 2008), Madrid and Barcelona (Bravo et al., 2009).

In these studies, it was found that the majority of SIS users were male, ranging from 30 to 35 years of age (Dubois-Arber et al., 2008; Kimber et al., 2003; Tyndall et al., 2006a; Wood et al., 2006c), with frequent housing insecurity and unemployment (Kimber et al., 2003; Richardson et al., 2008) and with a previous history of incarceration. Resorting to prostitution was identified in 10–39% of users (Kimber et al., 2003; Wood et al., 2006c). The most frequent drugs used were, in descending order, heroin, cocaine, opiates, amphetamines, and their derivatives (Kimber et al., 2003; Tyndall et al., 2006a). In Vancouver, compared with other PWID, SIS users exhibited more episodes of overdose (OR = 2.7, 95%CI = [1.2–6.1]) and a higher frequency of daily drug injection (heroin: OR = 2.1, 95%CI = [1.3–3.2]), cocaine: OR = 1.6, 95%CI = [1.1–2.5]) and of public injecting (OR = 2.6, 95%CI = [1.7–3.9]) before the opening of the SIS (Wood et al., 2005c). Eighty-eight percent of SIS users were seropositive for HCV (Wood et al., 2005a), and between 2% (Salmon et al., 2009b) and 30% (Wood et al., 2005c) of them were positive for HIV. For these PWID, syringe sharing was more regular before SIS use (OR = 2.13, 95%CI = [1.49–3.06])(Tyndall et al., 2006b) and was a factor associated with these blood-transmissible viral infections (aOR = 1.8, 95%CI = [1.1–2.9]) (Wood et al., 2005a).

3.3. The impact of SISs on overdose-induced mortality and morbidity

Seven studies evaluated whether SISs successfully reduced harm among SIS users (Kerr et al., 2006b, 2007b; Marshall et al., 2011; Milloy et al., 2008a, 2008b; Salmon et al., 2010; Van Beek et al., 2004). In the different studies, no death by overdose was ever reported within the SISs in which this parameter was evaluated (Kerr et al., 2006b; Milloy et al., 2008b; Van Beek et al., 2004). In Vancouver, SIS implementation led to a 35% decrease in the number of lethal overdoses in the vicinity of the SIS (Marshall et al., 2011); thus, it was evaluated that between 2 and 12 cases of lethal overdose might have been avoided each year (Milloy et al., 2008b). In Sydney, the number of calls for ambulances related to overdose was 68% lower during the operational hours of the SIS (Salmon et al., 2010; Van Beek et al., 2004).

3.4. The impact of SISs on injection behaviors and their consequences

Eight studies addressed the reduction in other harms, especially syringe sharing during injection (Fast et al., 2008; Kerr et al., 2005c; Milloy and Wood, 2009; Salmon et al., 2009a; Stoltz et al., 2007b; Wood et al., 2005b, 2005d, 2008). Studies conducted in Vancouver and Sydney showed that the regular use of SISs was associated with decreased syringe sharing (aOR = 0.30, 95%CI = [0.11–0.82]) (Kerr et al., 2005c), syringe reuse (aOR = 2.04, 95%CI = [1.38–3.01]), and public-space injection (aOR = 2.79, 95%CI = [1.93–3.87]) (Stoltz et al., 2007b). In a meta-analysis, Wood and Milloy estimated that frequent use of SISs was associated with a 69% reduced likelihood of syringe sharing (Milloy and Wood, 2009). The main injection-related issues reported by PWID were difficulty finding a vein, the infectious aftermath of injections, and lack of education on safer injection practices (Fast et al., 2008; Salmon et al., 2009a). Concomitantly, regular SIS use fostered the use of sterile injection materials and the elimination of soiled materials (Fast et al., 2008; Stoltz et al., 2007b) and was associated with more frequent requests for education on safer injection practices (aOR = 1.47, 95%CI = [1.22–1.77]) (Wood et al., 2008).

3.5. The impact of SISs on reducing drug-related harms

We found 6 studies that addressed this issue (Lloyd-Smith et al., 2010, 2009, 2008; Marshall et al., 2009; Small et al., 2009, 2008). All of the studies were sourced from the Vancouver cohort of SIS users. There was no direct finding that SIS use induced a decrease in viral transmission. However, SIS use was associated with increased condom use during intercourse (8% in 2 years) (Marshall et al., 2009). Moreover, approximately 25% of the SIS users received care for injection-related cutaneous lesions (Lloyd-Smith et al., 2009). PWID reported that the SISs assessed, cared for and oriented them quickly, efficaciously, and without any judgment (Small et al., 2009, 2008).

3.6. The impact of SISs on access to addiction treatment programs

This issue was assessed in 5 studies, among which 4 were cohort studies from the Vancouver team and 1 was an exhaustive population study in Sydney. These publications stated that SIS attendance was associated with a global increase in diverse types of dependence care, i.e., referral to an addiction treatment center, initiation of a detoxification program (OR = 1.32, 95%CI = [1.11–1.58]; $p = 0.002$ (Wood et al., 2007)), and initiation of methadone therapy (aHR = 1.57, 95%CI = [1.02–2.40; DeBeck et al., 2011; Kimber et al., 2008b; Milloy et al., 2010; Wood et al., 2007, 2006d). Approximately 20% of PWID were interested in joining a dependence care

program (Milloy et al., 2010; Wood et al., 2006d), and in Sydney's SIS, 25% of the interested subjects started such a program (Kimber et al., 2008b). Among the PWID who used the Vancouver SIS, 18% secondarily engaged in a detoxification program (Wood et al., 2006d), 57% started an addiction treatment, and 23% stopped injecting drugs (DeBeck et al., 2011).

3.7. The impact of SISs on the nuisance induced by drug use in public spaces

Six studies addressed these questions, of which 4 were performed in the Vancouver SIS (McKnight et al., 2007; Petrar et al., 2007; Stoltz et al., 2007b; Wood et al., 2004) and 2 in the Sydney SIS (Salmon et al., 2007; Thein et al., 2005). In Wood et al. (2004), the number of syringes dropped in the hereabouts of the Vancouver SIS was counted and compared before and after the SIS opened. After the SIS was opened, the authors found a reduction in the daily mean number of PWID injecting in public (4.3, IQR = [4.0–4.3] vs. 2.4 IQR = [1.5–3.0]; $p = 0.022$), syringes dropped (11.5, IQR = [7.3–14.3] vs. 5.3, IQR = [3.0–8.0]; $p = 0.010$) and injection-related litter (601.7, IQR = [490.0–830.3] vs. 305.3, IQR = [246.3–387.0]; $p = 0.014$).

The other studies were surveys carried out among PWID in Vancouver (McKnight et al., 2007; Petrar et al., 2007; Stoltz et al., 2007b) or among non-drug users who lived or worked in the vicinity of the SIS in Sydney (Salmon et al., 2007; Thein et al., 2005). Between the periods before and after the opening of the Sydney SIS, this population noted less public injection (residents: 33% vs. 19%, $p < 0.01$; business operators: 38% vs. 28%, $p < 0.03$), less syringes dropped (residents: 67% vs. 40%; business operators: 72% vs. 57%, $p < 0.01$) and less complaints about PWID nuisances, but no change in the number of drug deals (residents: 28% vs. 26%, $p < 0.80$; business operators: 33% vs. 28%, $p < 0.26$) (Salmon et al., 2007). In Vancouver, SIS attendance was associated with a reduction in self-declared public drug injecting (aOR = 2.79, 95%CI = [1.93–3.87]) and syringe dropping (aOR = 2.13, 95%CI = [1.47–3.09]) (Petrar et al., 2007; Stoltz et al., 2007b).

3.8. The impact of SISs on local drug-related crime, violence, and trafficking

Four studies evaluated this issue in Vancouver (Milloy et al., 2009; Wood et al., 2006a) and Sydney (Fitzgerald et al., 2010; Freeman et al., 2005), among which 3 included local police data (Fitzgerald et al., 2010; Freeman et al., 2005; Wood et al., 2006a). In Vancouver, no increase in crime, violence or drug trafficking around the SIS was found after the opening of the SIS (Wood et al., 2006a). In Sydney, compared to the other cities, data collected over a period of 10 years also revealed no increase in offenses related to the trafficking or consumption of drugs in the areas that surrounded the SIS (Fitzgerald et al., 2010; Freeman et al., 2005).

3.9. Impact of SISs on the amount of local PWID

Two studies performed in the Vancouver SIS addressed whether the SIS induced an increase in the number of local PWID (Kerr et al., 2007c, 2006a). These studies reported that 25 months after the SIS opened, there was no increase in the local number of PWID (Kerr et al., 2007c), no decrease in the number of PWID who started methadone therapy (11% vs. 7%), and no increase in relapse rates (17% vs. 20%; Kerr et al., 2006a). Nevertheless, the opening of the SIS did not reduce the number of PWID who injected drugs (17% vs. 15%; Kerr et al., 2006a).

3.10. Medico-economic assessment of SISs

Four studies were performed to assess whether the SIS was a cost-saving system. All of them were carried out on the Vancouver SIS (Andresen and Boyd, 2010; Bayoumi and Zaric, 2008; Pinkerton, 2011, 2010). The authors calculated that the SIS could prevent 5–35 new HIV infections (Andresen and Boyd, 2010; Pinkerton, 2011) and 3 deaths by overdose per year (Andresen and Boyd, 2010). Over 10 years, this prevention would represent a cost savings of $14 million, a gain of 920 years of life, and an avoidance of 1191 new HIV infections and 54 new HCV infections (Bayoumi and Zaric, 2008). Similarly, a study that used mathematical modeling found that opening a SIS in Montreal may be viable in terms of the cost-benefit and cost-effectiveness (Jozaghi et al., 2013).

3.11. The opinion of PWID on SISs

Fifteen surveys aimed to evaluate the opinion of PWID on the pros and cons of SISs in numerous cities: Vancouver (DeBeck et al., 2011; Fairbairn et al., 2008; Jozaghi and Andresen, 2013; McNeil et al., 2013; Petrar et al., 2007; Small et al., 2012, 2011a, 2011b; Wood et al., 2003), Sydney (Kimber and Dolan, 2007; Van Beek and Gilmour, 2000), Ottawa (Navarro and Leonard, 2004), Montreal (Green et al., 2004), Melbourne (Fry, 2002) and San Francisco (Kral et al., 2010). Before the opening of the first SISs in Canada and Australia, between 54% and 89% of the local PWID declared that they were willing to use such services (Fry, 2002; Van Beek and Gilmour, 2000). One survey found that 72% of the same PWID interviewed actually visited the SIS (DeBeck et al., 2012). The main factors associated with visiting the SIS were the desire to inject safely and quietly, the desire to avoid public spaces, previous episodes of overdose, and the need for help to inject (Fry, 2002; Green et al., 2004; Van Beek and Gilmour, 2000). The main reasons reported for not visiting the SIS were the prohibitions against sharing drugs and helping other PWID inject drugs within the SIS (Fry, 2002; Van Beek and Gilmour, 2000).

Seven surveys were published regarding the opinions of PWID on SISs (DeBeck et al., 2012; Fairbairn et al., 2008; McNeil et al., 2013; Petrar et al., 2007; Small et al., 2012, 2011a, 2011b). Approximately 75% of the PWID in Vancouver reported that using the SIS induced positive changes in their behaviors, notably in terms of public nuisance and safe injection practices (Petrar et al., 2007). Qualitative studies in Vancouver revealed that their motivation for using the SIS were similar before and after visiting the SIS, i.e., to inject in safe and quiet conditions without suffering violence or having to share drugs with others and to avoid the police (Fairbairn et al., 2008; McNeil et al., 2013; Small et al., 2012, 2011a). The main concerns of PWID concerning the SIS were the length of the waiting time to access the SIS, the prohibition of sharing drugs and helping others inject, the suspensions of access in cases of non-compliance with the rules, their distance from the SIS, and the presence of police in the surrounding area (Kimber and Dolan, 2007; Petrar et al., 2007; Small et al., 2011a).

3.12. The impact of SISs on the opinions of local residents and police

Seven surveys sought the opinions of local residents, police and professionals in the drug field (Cruz et al., 2007; DeBeck et al., 2008; O'Shea, 2007; Philbin et al., 2009; Salmon et al., 2007; Thein et al., 2005; Watson et al., 2012). Although there was no SIS in Ontario, 60% of the local population favored the existence of an SIS (Cruz et al., 2007), whereas the police forces in Toronto and Ottawa predominantly opposed SISs (Watson et al., 2012). In Sydney, two random sample studies found that more than 70% of the local residents and 58% of the companies located around the SIS were in

favor of the SIS (Thein et al., 2005) and deemed that there was less drug use and syringe waste in public places (Salmon et al., 2007). However, a majority of the companies and residents nonetheless thought that the SIS contributed to a negative image of the district, fostered drug use, attracted drug users and dealers, and increased crime and insecurity (Salmon et al., 2007).

4. Discussion

The aim of this review was to depict the currently available evidence regarding the positive and negative consequences of SISs. Several literature reviews have evaluated the multiple impacts of SISs on PWID or on their local environment (Hyshka et al., 2013; Kelly and Conigrave, 2002; Kerr et al., 2007a; Semaan et al., 2011; Tyndall, 2003; Wood et al., 2006b). However, the present review is the first to systematically embrace the full scope of SIS-related issues using a reproducible keyword algorithm research.

The studies that depict the profile of SIS users were performed internationally, and their results were quite homogeneous among the different countries. PWID using SISs globally exhibited a similar profile of social precariousness and poor life conditions, which suggests that SISs were successful in attracting the most marginalized fringes of PWID. Nonetheless, some experts (Noël et al., 2009) and one study (McNeil et al., 2013) have noted that because there was no assistance for drug injection in SISs, PWID who are unable to self-inject, especially those whose conditions are too deteriorated, would be unable to frequent SISs. Moreover, because most SISs do not accept individuals under 18 or pregnant women, it remains difficult to conclude anything regarding these specific subpopulations, which are particularly vulnerable and require specific care and support. These conditions of accessibility have been discussed among the staff of a Swiss SIS (Solai et al., 2006).

Similarly ubiquitous and homogeneous were the findings that SISs allowed safer injection conditions and promoted enhanced health education among PWID regarding injection techniques and asepsis rules. Given the high rates of HIV and HCV infections in PWID, the reduction of syringe sharing in PWID using SISs indicates that SISs are effective tools against the spread of these epidemics. With the aim of promoting safer injection behaviors, SISs proposed or directed PWID to specific health and social services (Hedrich, 2004). Because these services varied significantly between SISs, it was difficult to globally compare and evaluate this subject. From analyzing different studies, it appeared that most PWID had used such services. However, the benefits of social services remained insufficiently assessed within the different SISs. Most SISs were linked to addiction care services, which were found to facilitate the start of addiction care among PWID. However, a proportion of PWID who attended SISs were already undergoing treatment with methadone, although they continued to self-inject drugs. This finding suggests that SISs and opiate replacement therapies are different, albeit complementary, measures for harm reduction among PWID.

Moreover, it was feared that SISs might foster the initiation of new users into intravenous drug use, but no study found any increase in the total number of local PWID, irrespective of the SIS studied. Equally univocal was the global satisfaction with the use of SISs among PWID in the different surveys (Jozaghi and Andresen, 2013; Kimber and Dolan, 2007; Petrar et al., 2007; Small et al., 2012, 2011a). However, most of the surveys were performed among SIS users, which may not reflect the overall population of PWID. No survey investigated the subjective assessment of SISs among PWID who no longer attended SISs; this population may exhibit different opinions on these facilities. On a medico-economic level, studies have demonstrated that SISs are economically cost-effective (Andresen and Boyd, 2010; Bayoumi and Zaric, 2008; Hadland et al., 2014; Pinkerton, 2011, 2010). Although Des Jarlais discussed the importance of achievable gains, he agreed that the SIS of Vancouver would continue to be cost-effective (Des Jarlais et al., 2008).

Some critics have argued that SISs, by promoting safer and thus more comfortable injection conditions, might foster risk-taking in PWID and thus expose them to increased risks of overdose (Selby et al., 2007). However, the global rate of overdoses in SISs was found to be very low (Kerr et al., 2006b; Van Beek et al., 2004), and the outcomes of overdose cases were improved due to the presence of healthcare workers (Kerr et al., 2006b, 2007b). In addition, different surveys that evaluated the number of overdoses have shown that the rates of overdoses did not increase after the implementation of SISs (Marshall et al., 2011; Milloy et al., 2008a; Salmon et al., 2010). However, no similar observation was found in our results concerning the European SISs. A German departmental report found the same results, but it has not been referenced in any database (Poschadel et al., 2003).

SISs were also implemented to reduce the problems induced by drug injection in public spaces. The Canadian studies (McKnight et al., 2007; Wood et al., 2004) found that SISs contributed to a significant reduction of drug injection in public spaces. This reduction was congruent with the results of surveys of local residents in Sydney (Cruz et al., 2007; Salmon et al., 2007) and with measures of the amount of waste resulting from drug injection in public spaces (Wood et al., 2004). In our results, we found no European studies on this issue; however, European studies have actually been performed and have found similar results (Hedrich, 2004; Kemmesies, 1999). In some European SISs, e.g., in Switzerland and Germany, however, the reduction in the amount of injection-related waste in the areas surrounding the SIS also resulted from active collection by both SIS users and SIS personnel (Benninghoff et al., 2003; Schu et al., 2005). Moreover, it has been noted that external factors without any link to SISs could also reduce drug use in public spaces, e.g., factors related to local homeless housing programs (Noël et al., 2009), local police surveillance, or local policy changes (Government of Canada, 2008). Therefore, the direct impact that SISs may have on reducing drug injection in public spaces was sometimes difficult to assess because the use of drugs in public spaces results from numerous factors that remain difficult to control within scientific studies. Furthermore, local or contextual features related to the function of the SIS may also influence outdoor drug injection practices. For example, the rates of outdoor drug injection increase with the average wait to access the SIS (Benninghoff et al., 2003; Small et al., 2011b). Consequently, if SISs can reduce injection practices in public spaces, this impact might largely depend on their accessibility (EMCDDA, 2009; Hedrich, 2004).

Another fear that emerged with the opening of SISs was the increase of drug trafficking and drug-related crime in the direct vicinity of the SIS. This effect was not highlighted in the studies found in our review, which were performed in Canadian and Australian SISs (Fitzgerald et al., 2010; Freeman et al., 2005; Milloy et al., 2009; Wood et al., 2006a). Furthermore, no European data were found in our review, whereas the European report on drug consumption rooms cited unreferenced studies that found no increase in acquisitive crime in Swiss or Dutch SISs (Hedrich et al., 2010). A few European studies reported small-scale drug trafficking in the immediate vicinity of the SISs (Hedrich, 2004). However, as noted by the European report, "*As many rooms are deliberately located near places where illicit drugs are sold, it is difficult to claim that the existence of such rooms leads per se to drug dealing*" (Hedrich, 2004). Moreover, there are numerous external factors that may influence drug trafficking and criminality. In Vancouver, for instance, the SIS and police services work in close collaboration, which may explain why there was no increase in drug trafficking in the related study (DeBeck et al., 2008; Hedrich, 2004). This

collaboration seems important for the effect on the level of the criminality around the SIS (Hedrich et al., 2010). The surveys among local residents have all noted that numerous prejudices against drug users accompanied the implementation of a SIS within the neighborhood and that these beliefs might last even after the implementation of the SIS. Consequently, it has been recommended that any implementation of a new SIS be preceded by a campaign that aims to inform and educate people living in the vicinity of the SIS (Hedrich, 2004; INSERM, 2010). It should be demonstrated that such preparation for the implementation of a SIS in a specific district is highly effective in facilitating its acceptance by local residents and police services. In addition, the implementation of a SIS is dependent on the political prejudgment of a country or city, which may be a hindrance to the development of SISs. The example of the SIS in Vancouver, where the accumulation of scientific evidence has had little influence on the elected political party (Hyshka et al., 2013; Small, 2010), reflects the controversy of SISs (Keller, 2008; Picard, 2008) and the need for local and national political support.

This systematic literature review on SISs has several limitations. First, encompassing the entire scope of the relevant articles concerning SISs was complex because there are many synonymous terms referring to SISs in the international literature. To date, no consensual appellation has been defined, which explains why we used such a complex keyword algorithm to include the most common appellations in the results. Despite this, a few articles that refer to SISs using more unusual terms might have been missed in this systematic review. Another limitation of the present work is the presence of important differences in the functioning of SISs around the world and gaps in the cultural and political contexts between countries. This fact could introduce important variations in what was synthesized with respect to the different studies selected herein.

Moreover, the types and designs of the studies themselves were highly variable, depending on the question addressed. Notably, there were significant disproportions in the quantity and features of the data published on the different active SISs around the world. Although most SISs are currently located in Europe (Hedrich et al., 2010), the majority of the systematically identified publications were related to the Canadian or Australian SISs, which have received significant means to evaluate their structures. Some subjects were addressed ubiquitously, i.e., the depiction of profiles of PWID, the effect of safety and hygienic conditions for injection, satisfaction surveys among PWID and residents, and the effects of the SIS on overdoses, injection in public areas and crime. Conversely, the imbalance in studies was particularly notable regarding other subjects, i.e., the morbidity secondary to injection-related problems and the economic efficiency of the SISs. However, there are European data on these subjects because they were mentioned in previous comprehensive reviews issued by different official institutions (EMCDDA, 2009; Hedrich, 2004; Hedrich et al., 2010; INSERM, 2010; Joseph Rowntree Foundation, 2006; Noël et al., 2009). The conclusions of these reports were globally similar to those we found in our review regarding each of the different questions. Regardless, if many investigations were performed in European SISs, the results of these investigations were not found in the databases used for the present review, although these databases are among the most commonly used for literature research. For example, 40 European studies that were identified in two main European reports (EMCDDA, 2009; Hedrich, 2004) were not found in the databases used for our review. This lack of inclusion in databases results in a lack of visibility of European data on SISs, although SISs are most numerous in Europe. Consequently, there is a noticeable geographic imbalance between the actual representation of the active SISs in the world and the places where the majority of data were collected. More studies on European SISs should be more easily accessible in the peer-reviewed literature, and more research should be funded in Europe to counterbalance the disproportion of the currently available data among centers and countries; thereby, if SISs continue to develop in Europe, their scientific legacy will be based on local evidence. Lastly, the well-known bias of "socially desirable answers" in surveys of PWID may limit the scope of the survey results on several subjects, e.g., overdose (Milloy et al., 2008a) and syringe sharing (Stoltz et al., 2007b). However, studies with data sources other than self-reports found approximately the same conclusions as the surveys. Consequently, this bias most likely had a weak impact on the overall findings of this review.

In conclusion, despite significant operating differences, SISs ubiquitously and effectively succeeded in attracting the most marginalized PWID, i.e., those who generally have not joined any already existing care system. However, some parts of this population still do not have access to the majority of SISs, especially people under the age of 18, pregnant women, and people who cannot self-inject. Their interest in SISs remains to be demonstrated, and further SIS developments are expected to address these subpopulations.

SISs were found to provide numerous benefits to PWID: safer injection conditions and safe injection equipment, efficacious overdose management, injection technique education, of blood-transmissible infection prevention, and enhanced connections with addiction and social services. Their interventions are deemed efficacious because they induce positive changes in risk behaviors of PWID.

Moreover, SISs generate public benefits such as a decrease in the number of PWID injecting in public and a reduction of dropped syringes in public places. Contrary to what was feared, SISs do not promote drug use and do not increase crime or drug trafficking or the number of PWID. In addition, they seem to be economically cost-effective. Thus, SISs can be considered effective measures complementary to other harm reduction interventions.

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Contributors

B. Rolland and C. Potier designed the study. C. Potier, B. Rolland and V. Laprevote conducted the literature searches and summaries of previous related work. C. Potier and B. Rolland wrote the first draft of the manuscript. F. Dubois-Arber, V. Laprevote and O. Cottencin corrected the first draft of the manuscript. All authors contributed to and have approved the final manuscript.

Conflict of interest

No conflict declared.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.drugalcdep.2014.10.012.

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