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A systematic review of injecting-related injury and disease among people who inject drugs

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Abstract

Introduction:

Methods:

Results:

Conclusions:

Keywords:

Although the transmission of blood-borne viral infections such as HIV and hepatitis C virus among people who inject drugs has garnered substantial attention, there has been less focus on other injecting-related injuries and diseases (IRID) in this population. These commonly include soft tissue infections such as abscesses and cellulitis, which occur as a result of micro-organisms (i.e. bacteria and fungi) in the injecting environment. Other infections may include bone and joint infections, infective endocarditis, and sepsis; these can arise as a result of direct introduction of bacteria to the bloodstream, or as complications of untreated of soft tissue infections.[1]

In addition to infections, repeated injecting and poor injecting technique may lead to vascular injury and poor venous access; furthermore, drug solutions may contain inactive ingredients that are not water soluble, leading to particles in the vasculature that can cause inflammation and formations of clots.[2, 3] The likelihood of vascular injury can be further exacerbated by the delivery method (e.g., intravenous versus intramuscular injection), injecting site (e.g., subcutaneous tissue and muscle, major vessels), and type of equipment used.[4]

Some IRID necessitate urgent medical care, and all can result in poorer health outcomes for people who inject drugs, including risk of mortality, if untreated.[5] From an economic perspective, the costs of hospital care for IRID can be substantial.[6, 7] A clearer understanding of the prevalence of IRID is needed to determine the scale of the problem and guide the development of evidence-informed responses. This review aimed to assess prevalence of non-viral IRID among people who inject drugs.

Method

This review is reported in line with the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) checklist.[8]

Search strategy and study selection

We searched MEDLINE, Embase and CINAHL for relevant literature using search strings developed in consultation with a specialist drug and alcohol librarian (see supplementary materials). Searches were undertaken in February 2014 and updated in July 2015. Search results were catalogued using Endnote X6. Titles and abstracts were independently screened by SL and a research assistant to produce a shortlist of potentially relevant reports. The full text of each shortlisted report was retrieved and read to determine eligibility for inclusion in the review. For articles in languages other than English, eligibility for the review was determined based on information available in English translations of abstracts.

Reports were eligible for inclusion in the study if they included data on the prevalence of, or risk factors for, any non-viral IRID in a sample of people who injected illicit drugs. Reports could include data on any IRID, but data were required to be specific to a named infection, injury or disease, rather than a combination of different types of IRID. Where there was clearly overlap between reports in terms of the study sample (e.g. multiple reports from one study, sometimes using sub-samples of a larger sample) and types of IRID reported, we included only the study with the largest sample size. If multiple reports from the same study reported the same IRID over different prevalence periods, all reports were included.

Articles that reported on specific sub-groups of people who inject drugs, such as HIV-infected injectors, or groin injectors, were excluded. Reports based on samples of people who exclusively injected performance and image-enhancing drugs were excluded, as this group is distinct from people who inject illicit drugs in terms of frequency of injecting, intravenous versus intramuscular

injecting, and the environmental and social contexts of injecting. Reports that included data on pathology within people who inject drugs, that was not directly linked to injecting, were excluded.

Data extraction

Data were independently extracted by SL and a research assistant, with discrepancies resolved through discussion and consultation with BM. Data extracted from each article included sampling approach; demographic characteristics of the sample; types of IRID assessed; whether IRID ascertainment was based on self-report, clinical examination, or medical records; denominator and numerator for each IRID reported; and measures of association between IRID and other factors.

Risk of bias assessment

There is no 'gold standard' for the assessment of risk of bias in systematic reviews of epidemiological or observational studies. We considered two existing tools, one designed for use with population-based epidemiological surveys,[9] and the other for assessing HIV prevalence and risk in convenience samples of men who have sex with men.[10] These were adapted to produce a five-item risk of bias tool. This assessed sampling approach; response rate; whether data were based on self-report or clinical examination/medical records; in the case of self-reported data, whether steps were taken to increase the validity of self-reports (e.g. providing participants with a definition of the IRID in question; symptom checklists); and completeness of reporting (i.e. all numerators and denominators reported). The findings of the risk of bias assessment informed interpretation of the quantitative data and meta-analyses.

Data synthesis and analysis

The various IRID that were identified through the literature search were categorised *post hoc* into the following categories: skin infections at injection sites (e.g. abscess, cellulitis); infective endocarditis; sepsis/septicaemia; bone and joint infections (e.g. osteomyelitis, septic arthritis); other infections; thrombosis and emboli; and other pathology and dysfunction associated with injecting

drug use. Given wide variation between studies in reported prevalence estimates, data were not synthesised. Results for each study are presented graphically, by prevalence period.

We had planned to do stratified meta-analyses by sex, age, duration of injecting, injection frequency, primary drug injected, and engagement in harm reduction strategies (i.e., opioid substitution treatment (OST); needle and syringe programs (NSPs); and supervised injecting facilities) in order to identify potential risk and protective factors for IRID. However, many studies did not report the necessary data (i.e. insufficient information on group numerators and denominators), or only that there was a lack of a statistically significant association between the variable and outcome (without an odds ratio or numerators/denominators). Consequently a narrative review is presented for each IRID where data were available in reference to the selected risk/protective factors.

Results

The literature searches returned 3,578 unique records. Of these, 3,254 were deleted following screening of titles and abstracts, leaving 324 reports to be reviewed in full. Thirty-two reports met the inclusion criteria; 29 reports provided data on IRID prevalence, and 16 provided data on IRID risk factors (Figure 1). Included studies were largely from high-income countries, and participants were typically recruited from needle and syringe programs and drug treatment clinics. The IRID most frequently included in reports was skin infections (Table 1).

Figure 1 approximately here

Table 1 approximately here

Skin infections at injecting sites

Twenty-two reports presented data on the prevalence of skin infections at injecting sites (Figure 2 and Supplementary Table 2). Terminology for skin infections varied across reports. The majority referred specifically to abscesses, but some used terms such as “injection site infection”.

Seven reports provided estimates of current/past month abscess prevalence, which ranged between 6.1% (95% CI: 4.6%, 7.9%) and 32.0% (25.0-39.6%); four of these included a physical examination to confirm the presence of infection (prevalence estimates in these studies ranged from 10.0-32.0%). Eleven reports provided estimates of 6-12 month prevalence, which ranged between 6.9% (4.6-9.8%) and 37.3% (34.1-40.6%); and 12 reports estimates of lifetime prevalence, which ranged between 6.2% (5.8-6.7%) and 68.6% (56.4-79.1%) (Figure 2).

Figure 2 approximately here

Women generally had greater odds than men of skin infections at injecting sites, with six studies finding this association, although three additional studies showed no statistically significant association (two following adjustment for confounders) (Table 2). Seven of eleven studies showed no significant association between age and current/past 6-12 month skin infection; the remaining

studies reported greater odds of skin infection with older age (typically ≥30 years). Of seven studies examining duration of injecting, two had insufficient evidence of an association with skin infections; four reported greater risk of skin infection with increasing duration of injecting; and one reported only p<.001, without indicating the direction of the association. The literature was divided in regards to frequency of injection as a risk factor for skin infection (Table 2). Only one study directly compared injectors of specific drug types; compared to people who injected only opioids in the past year, people who had injected only stimulants had lower odds (OR 0.49; 95% CI: 0.34, 0.71), and people who had injected both opioids and stimulants had greater odds (OR 1.24, 95% CI: 1.09, 1.40) of past 12-month skin infections at injecting sites (data not shown).[11]

While there was no significant association between always injecting in a supervised injecting facility and skin infection after adjustment for confounders (one study), contradictory findings were evident for NSP and OST involvement. Specifically, two studies found no significant association between NSP use and skin infection; one study showed increased odds of skin infection with past 12-month use of NSP services; and one study reported lower odds of skin infection with a greater number of needles exchanged at a NSP. For OST, one study showed greater odds of past 12-month skin infection with lifetime OST involvement relative to no involvement; another found greater odds of past 12-month skin infection with previous OST involvement (but not no OST involvement) relative to current involvement; and another showed no significant association.

Table 2 approximately here

Infective endocarditis

There were eight reports assessing prevalence of infective endocarditis (Supplementary Table 3; Figure 3). All studies relied on self-reported data.[12] 6-12 month prevalence was 1.3% (two studies) and lifetime prevalence ranged between 0.5% (0.06-1.8%) and 11.8% (4.4-23.9%). One study found increased risk of infective endocarditis with older age and longer injecting career; no significant association was observed with participant sex.[12]

Figure 3 approximately here

Sepsis/septicaemia

Six reports contributed data on the prevalence of sepsis or septicaemia (Supplementary Table 4). Reported 6-12 month prevalence was 1.0% (0.1-3.6%) and 1.3% (0.4-2.9%) in two studies. Lifetime prevalence varied between 2.0% (951.7-2.3%) in an Australian sample and 9.8% (3.3-21.4%) in a US sample (Figure 4). No studies were identified reporting on the association between the chosen risk factors and prevalence of sepsis/septicaemia.

Figure 4 approximately here

Bone and joint infections

Two reports were identified that provided data on bone and joint infections; specifically, septic arthritis and osteomyelitis (Supplementary Table 5). Self-reported lifetime prevalence of septic arthritis was 1.0% (0.3-2.6%) in an Australian convenience sample[5], and 2.0% (0.05-10.4%) in a US convenience sample[13]. In the same reports, lifetime prevalence of osteomyelitis was 0.5% (0.006-1.8%) [5] and 0%[13]. No studies were identified reporting on the association between the chosen risk factors and prevalence of bone and joint infection.

Other infections

Three reports provided data on other infections (Supplementary Table 6). In an Australian sample of PWID, Dwyer[5] reported 12 month and lifetime prevalence of internal abscess of 1.1% (0.3-2.6%) and 3.1% (1.6-5.3%), respectively. Nearly one-third (32.8%; 28.2-37.6%) of a convenience sample of 400 Iranian PWID reported lifetime history of mycotic aneurysm, as confirmed by medical record review[14]. Lifetime prevalence of botulism, necrotizing fasciitis, and tetanus was 3.9% (0.5-13.5%), 3.9% (0.5-13.5%) and 1.9% (0.005-10.4%) amongst a convenience sample of PWID from the United States[13]. No studies were identified reporting on the association between the chosen risk factors and prevalence of other infections.

Thrombosis and emboli

Nine reports provided data on thrombosis and emboli, including venous thromboembolism, thrombophlebitis and deep vein thrombosis. Three studies reported 6-12 month prevalence of thrombosis, which ranged between 1.3% (0.4-2.9%) and 9.0% (5.4-13.9%; Figure 5). Lifetime prevalence based on six studies (five of which were conducted with Australian convenience samples) varied between 3% (2%- 6%) and 27% (14-44%). No studies were identified reporting on the association between the chosen risk factors and prevalence of thrombosis and emboli.

Figure 5 approximately here

Other and non-specific pathology and dysfunction

Three reports explored other pathology and dysfunction associated with injecting drug use. Point prevalence of chronic venous insufficiency was estimated at between 87.7% (82.4-91.9%) and 93% (86.1-97.1%) in the United States among people who inject drugs recruited from methadone clinics[15, 16] (Supplementary Table 8). A longer history of injecting was strongly associated with more severe chronic venous insufficiency.[15] Other identified pathology included venous ulcer; hand oedema ('puffy hand syndrome'), and injecting sinus (Supplementary Table 8).

Risk of bias assessment

The complete risk of bias assessment is provided in Supplementary Table 1. The majority of included reports (24/32; 75%) used non-probability sampling methods such as convenience sampling. Response rates were rarely reported, but were above 65% in those studies that noted the response rate. IRID were confirmed through clinical assessment or medical record review in 6 reports, with the remaining 26 reports relying solely on self-reported history of IRID. Of the latter, nearly half (n=12) noted steps that were taken to enhance the validity of self-reports, such as asking participants to describe signs and symptoms, or providing participants with clear definitions of specific IRID.

Discussion

This review has shown that IRID are a common consequence of injecting drug use. Existing studies have found that between 6-32% of people who inject drugs may have experienced injections at injecting sites within the previous month. Serious complications of injecting are also a risk, with studies finding that 0.5-11.8% may have experienced infective endocarditis and 2-9.8%, septicaemia, at some point in their lives.

Although risk factors for skin infections were not able to be formally meta-analysed, IRID appear more common among women than men, and with increasing duration of injecting drug use. Conflicting evidence was identified with regards to the impact of harm reduction interventions such as needle and syringe programs and opioid substitution therapy on injecting-related injuries and diseases; there is a need for research focusing upon the potential impact of injecting risk reduction interventions on these consequences of injecting.

Studies were largely from high-income countries, with participants typically in contact with services for people who inject drugs, such as needle and syringe programs and drug treatment clinics. These factors should be borne in mind when considering the generalisability of findings to other settings.

The majority of studies relied on self-reported data on injecting-related injuries and diseases, although 12 studies did incorporate measures designed to improve the reliability of self-reports. Estimates from studies using those strategies were similar to those relying solely on self-report.

There was variation between studies in how specific injecting-related injuries and diseases were defined. These inconsistencies contribute to difficulties in synthesising data. Other studies reported only ‘composite’ variables that combined mild, non-specific problems (e.g. soreness at injecting sites) with more severe concerns such as infective endocarditis, obscuring the extent of more serious injecting-related injuries and diseases.

Given the wide variation in prevalence estimates between studies, it was not possible to develop summary estimates of specific injecting-related injuries and diseases. Further, we were unable to formally synthesise data on risk factors for injecting-related injuries and diseases due to a lack of data suitable for meta-analysis.

Implications

There is an obvious opportunity for research examining correlates and potential risk and protective factors for the range of injecting-related injuries and diseases. These studies should adopt a consistent list and operationalised definition of specific injecting-related injuries and diseases. An alternative to cross-sectional surveys would be to identify population cohorts of people who inject drugs via administrative data (e.g. drug treatment registrations) and link these to hospitalisation and mortality data. This would allow for generation of incidence and mortality rates and comparisons to the general population.

There is a very high likelihood that not all people who inject drugs will have the same level of risk for injecting-related injuries and diseases. Differential risk may arise as a result of the types of drugs injected; in the United States, cities dominated by black tar heroin have twice the rate of hospitalisations for opiate-related skin and soft tissue infections compared to cities where powder heroin predominates.[17] People who inject pharmaceuticals may be more likely to experience vascular harms given insoluble particles in drug solutions.[3] Intensive periods of frequent injecting, often associated with methamphetamine and cocaine use, may also impact on risk. These questions all require further exploration to assist in targeting prevention activities for injecting-related injuries and diseases.

The data presented here were not able to clearly identify risk or protective effects of harm reduction interventions on injecting-related injuries and diseases. Positive associations between needle and syringe program attendance or opioid substitution therapy and skin infections at injecting sites may

reflect higher risk injectors making use of these services, or help-seeking following an infection. Population-level impacts of needle and syringe programs on injecting-related injuries and diseases have been reported elsewhere. In one study, for every eight visits to a needle and syringe program, one fewer abscess was treated at community health centres.[18] Harm reduction services may also offer opportunities to provide treatment for injecting-related injuries and diseases.[19] There is a clear need to assess the impact of needle and syringe programs and opioid substitution therapy on injecting-related injuries and diseases, including cost-benefit analyses.

Conclusion

IRID appear to be highly common among people who inject drugs, but there is suggestive evidence that prevalence varies widely according to context. There is a need for robust, reliable data on the range of injecting-related injuries and diseases among people who inject drugs, particularly in low- and middle-income countries. Studies should adopt consistent definitions of injecting-related injuries and diseases and ensure transparent reporting of prevalence estimates and risk analyses.

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Figure 1: Study flow diagram

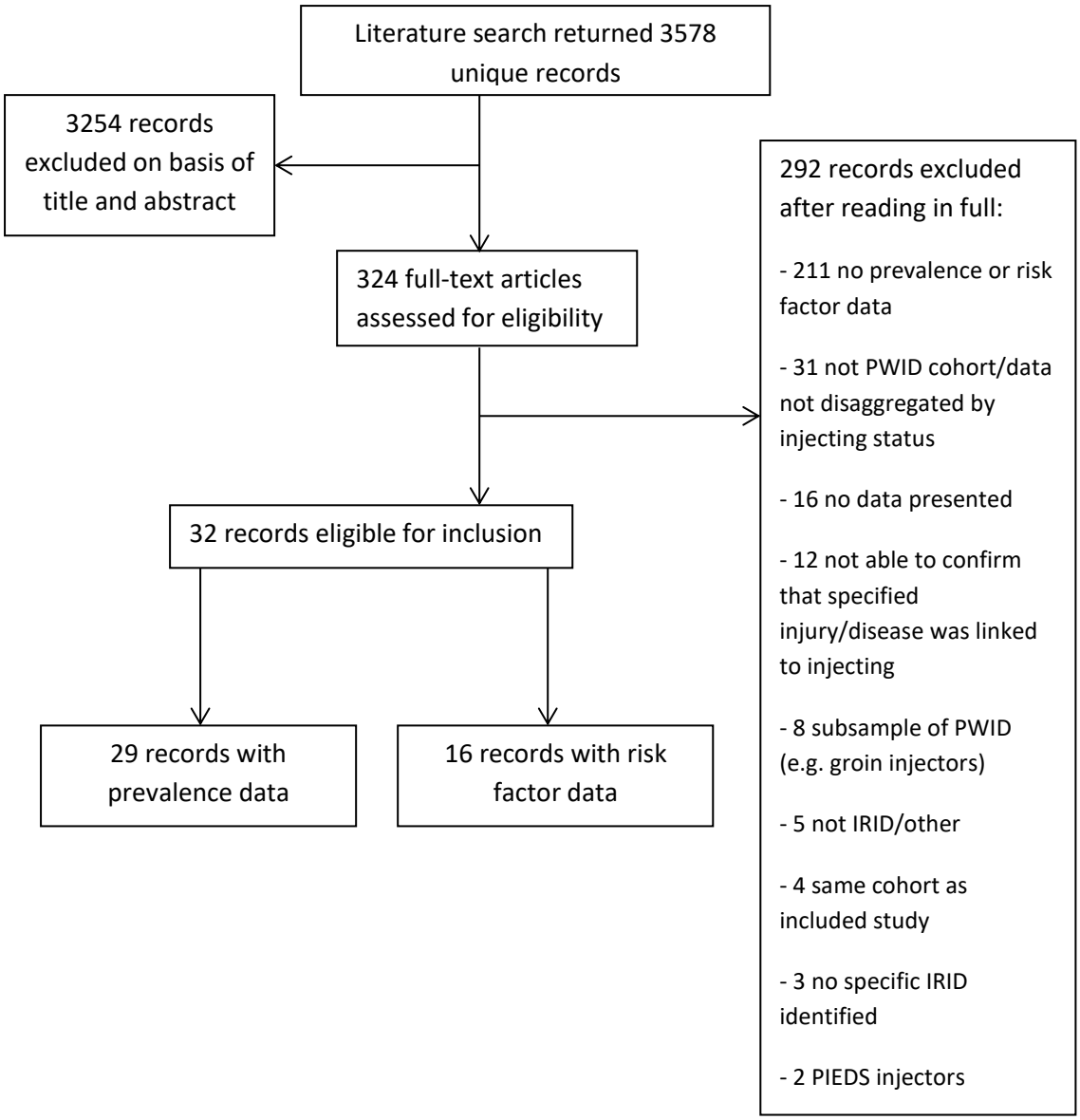


Table 1: Characteristics of included studies

Study	Country	Sample size	Source of participants	Prevalence data	Risk factor data
Abdali (2005)[14]	Iran	400	People who inject drugs in contact with the Isfahan Anti-Drug Campaign Center	Skin infections; infective endocarditis; other infections	Skin infections
Andresz (2006)[20]	France	66	Methadone clinics	N/A	Other pathology and dysfunction
Axelsson (2014)[12]	Denmark	206	Supervised drug consumption facilities	Infective endocarditis	Infective endocarditis
Barocas (2013)[21]	USA	553	Needle and syringe programs	Skin infections; infective endocarditis	N/A
Binswanger (2000)[22]	USA	169	Community settings	Skin infections	Skin infections
Blondin (2008)[23]	Canada	1065	Harm reduction services	N/A	Skin infections
Buchanan (2006)[24]	USA	924	Community settings	Skin infections	N/A
Conrad (2000)[25]	Switzerland	1035	Heroin-assisted treatment sample	Skin infections	N/A
Coull (2014)[26]	Scotland	200	Needle and syringe programs and methadone clinics	Skin infections	N/A
Darke (2001)[27]	Australia	200	Needle and syringe programs and community settings	Skin infections; thrombosis and emboli; Sepsis	N/A
Dwyer (2009)[5]	Australia	393	Needle and syringe programs and community settings	Skin infections; infective endocarditis; sepsis; bone and joint infections; other infections; thrombosis and emboli; other pathology and dysfunction	N/A
Fink (2013)[28]	USA	858	Needle and syringe programs and community settings	Skin infections	Skin infections
Hope (2008)[29]	England	1058	Drop-in centres, needle and syringe programs and community settings	Skin infections	Skin infections
Hope (2010)[11]	England	5209	Needle and syringe programs, drug treatment providers and other services for people who inject drugs	Skin infections	Skin infections
Hope (2014)[30]	England	855	Respondent-driven sampling; initial recruits identified using street outreach and key informants	Skin infections	Skin infections
Hope (2015)[31]	England	855	Respondent-driven sampling; initial recruits identified using street outreach and key informants	Skin infections; infective endocarditis; sepsis	Skin infections
Hope (2015)[32]	England	855	Respondent-driven sampling; initial recruits identified using street outreach and key informants	Thrombosis and emboli	N/A

Study	Country	Sample size	Source of participants	Prevalence data	Risk factor data
Jenkinson (2005)[33]	Australia	156	Needle and syringe programs and community settings	Skin infections; thrombosis and emboli	N/A
Johnson (2013)[34]	USA	81	Needle and syringe program	Skin infections	N/A
Lloyd-Smith (2005)[35]	Canada	1585	Unclear	Skin infections	Skin infections
Lloyd-Smith (2008)[36]	Canada	1065	Supervised injecting facility	Skin infections	Skin infections
Maloney (2010)[37]	Ireland	70	Methadone clinics	Skin infections	N/A
Phillips (2010)[13]	USA	51	Drop-in centre, drug treatment centre and community settings	Skin infections; infective endocarditis; sepsis; bone and joint infections; other pathology and dysfunction	Skin infections
Pieper (2001)[15]	USA	204	Methadone clinics	Other pathology and dysfunction	Other pathology and dysfunction
Pieper (2003)[16]	USA	100	Medical clinic and methadone clinic	Other pathology and dysfunction	N/A
Pollini (2010)[38]	Mexico	623	Respondent-driven sampling; initial recruits were selected to be diverse in age, sex and neighbourhood of residence	Skin infections	Skin infections
Robertson (2010)[39]	Mexico	1056	Respondent-driven sampling; initial recruits were selected to be diverse in age, sex and neighbourhood of residence	Skin infections	N/A
Salmon (2009)[1]	Australia	9552	Supervised injecting facility	Skin infections; infective endocarditis; sepsis; thrombosis and emboli	N/A
Tomolillo (2007)[18]	USA	62	Former PWID attending a 12-step meeting	N/A	Skin infections
Topp (2008)[40]	Australia	1961	Needle and syringe programs	Skin infections; infective endocarditis; sepsis; thrombosis and emboli	N/A
Williams (2006)[41]	England	37	Drug treatment clinics	Thrombosis and emboli	N/A
Yen (2015)[42]	Taiwan	802	Methadone clInics	Skin infections	N/A

Figure 2: Prevalence of skin infections at injecting site in people who inject drugs, by prevalence period

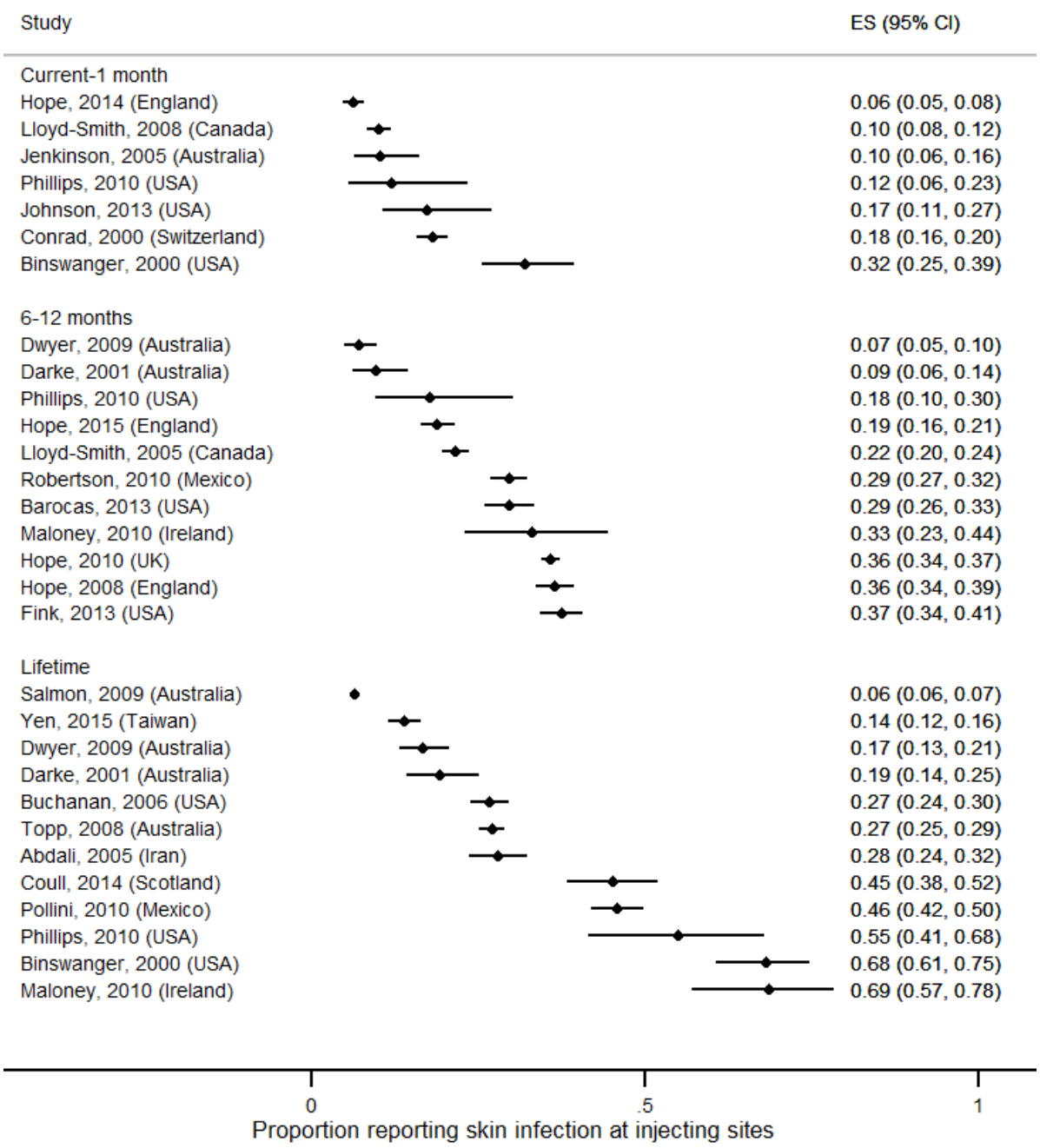


Table 2: Associations between skin infections at injection sites and demographic factors, injecting characteristics, and harm reduction service use among people who inject drugs

Risk factor/ prevalence period	Study	Risk factor level	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Sex				
Current-1 month	Lloyd-Smith, 2008	Male Female	- 1.9 (1.4, 2.6)	- 1.7 (1.2, 2.4)
6-12 months	Blondin, 2008	Male Female	- Not reported	- 0.7 (0.5, 1.0)
6-12 months	Fink, 2013	Male Female	- 1.7 (1.3, 2.3)	- 1.4 (1.0, 2.0)
6-12 months	Hope, 2008	Male Female	- 1.4 (1.1, 1.9)	- 1.7 (1.2, 2.4)
6-12 months	Hope, 2010	Male Female	- 1.3 (1.1, 1.5)	- 1.4 (1.3, 1.6)
6-12 months	Hope, 2015	No data reported; "An abscess was not associated with gender"		
6-12 months	Lloyd-Smith, 2005	Male Female	- 2.4 (1.9, 3.0)	- 1.7 (1.4, 2.4)
6-12 months	Pollini, 2010	Male Female	- 2.3 (1.4, 3.6)	Not reported
6-12 months	Safaeian, 2000	Male Female	- 2.2 (1.6, 2.8)	- 2.0 (1.5, 2.8)
Age				
Current-1 month	Lloyd-Smith, 2008	per year increase	1.0 (1.0, 1.0)	Not reported
6-12 months	Blondin, 2008	No data; report states no significant association		
6-12 months	Fink, 2013	<30 years 30-39 years 40-49 years 50+ years	Not reported	- 0.7 (0.3, 1.6) 1.1 (0.5, 2.2) 1.0 (0.5, 2.1)
6-12 months	Hope, 2008	<=24 years 25-29 years 30-34 years 35+ years	- 1.8 (1.2, 2.7) 2.1 (1.4, 3.2) 1.9 (1.3, 2.9)	- 1.6 (1.0, 2.6) 2.0 (1.3, 3.2) 1.9 (1.2, 3.0)
6-12 months	Hope, 2010	<30 years 30+ years	- 1.3 (1.2, 1.5)	Not reported
6-12 months	Hope, 2015	<30 years 30+ years	- 1.7 (1.2, 2.4)	Not reported
6-12 months	Lloyd-Smith, 2005	No data; report states significant association		
6-12 months	Phillips, 2010	per year increase	1.0 (0.9, 1.0)	Not reported
6-12 months	Pollini, 2010	Median age of those with/without abscess: 39 years/37 years, p=0.14		
6-12 months	Safaeian, 2000	<34 years >34 years	- 1.4 (1.0, 1.8)	Not reported
Lifetime	Abdali, 2005	No data; report states no significant association		
Duration of injecting				
Current-1 month	Binswanger, 2000	<10 years 10+ years	- 0.5 (0.2, 1.2)	Not reported
Current-1 month	Hope, 2014	No data; report states no significant association		
6-12 months	Fink, 2013	<10 years 10+ years	- 1.6 (1.0, 2.4)	Not reported
6-12 months	Hope, 2008	<10 years 10+ years	- 1.3 (1.0, 1.7)	Not reported

Risk factor/ prevalence period	Study	Risk factor level	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
6-12 months	Hope, 2010	<5 years 5-9 years 10-14 years 15+ years	Not reported	- 1.3 (1.1, 1.5) 1.4 (1.2, 1.6) 1.7 (1.5,2.1)
6-12 months	Hope, 2015	<10 years 10+ years	- 1.9 (1.3, 2.7)	Not reported
Lifetime	Abdali, 2005	"p<.001" but direction of association not reported		
Injection frequency				
Current-1 month	Hope, 2014	N days injected past 28 days: <14 days 14-27 days 28 days	Not reported	- 2.5 (1.0, 6.6) 4.3 (1.8, 10.0)
6-12 months	Hope, 2008	N days injected past 28 days: <14 days 14-27 days 28 days	- 2.0 (1.3, 3.1) 1.9 (1.3, 2.7)	- 1.8 (1.2, 2.9) 1.5 (1.0, 2.3)
6-12 months	Hope, 2010	N days injected past 28 days: <14 days 14-27 days 28 days	Not reported	- 1.1 (0.9, 1.3) 1.2 (1.0, 1.5)
6-12 months	Phillips, 2010	"Frequency of injecting" (not further defined)	14.0 (0.7, 2.4)	Not reported
6-12 months	Pollini, 2010	Past 6 months: < Daily injection Daily injection	- 1.3 (0.7, 2.4)	Not reported
6-12 months	Safaeian, 2000	Past 6 months: < Daily injection Daily injection	- 2.3 (1.4, 2.3)*	- 2.5 (1.9, 3.3)
Use of opioid substitution therapy				
6-12 months	Hope, 2008	Currently Previously Never	- 1.6 (1.2, 2.2) 0.6 (0.4, 0.9)	- 1.7 (1.3, 2.4) 0.9 (0.5, 1.3)
6-12 months	Hope, 2010	Never Ever	- 1.4 (1.2, 1.7)	Not reported
6-12 months	Lloyd-Smith, 2005	No data; report states no significant association		
Use of needle and syringe programs				
Current-1 month	Binswanger, 2000	Used NSP past 30 days: No Yes	- 1.0 (0.4, 2.2)	Not reported
6-12 months	Fink, 2013	"NSP client": No Yes	- 1.0 (0.8, 1.4)	- 0.9 (0.7, 1.3)
6-12 months	Hope, 2010	Used NSP past year: No Yes	- 1.6 (1.3, 2.0)	- 1.7 (1.4, 2.0)
Not reported	Tomolillo, 2007	"Self-reports of greater numbers of needles exchanges were significantly related to lower occurrences of abscesses"		

Risk factor/ prevalence period	Study	Risk factor level	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Use of supervised injecting facility				
Current-1 month	Lloyd-Smith, 2008	Inject at SIF: Not always Always	 - 0.5 (0.2, 0.9)	 - 0.6 (0.3, 1.2)

Unadjusted ORs calculated from published numerators and denominators, if available, or as published if not available. Adjusted ORs are as published. * Unadjusted OR is reported as published; no raw data available to recalculate.

Figure 3: Prevalence of infective endocarditis in people who inject drugs, by prevalence period.

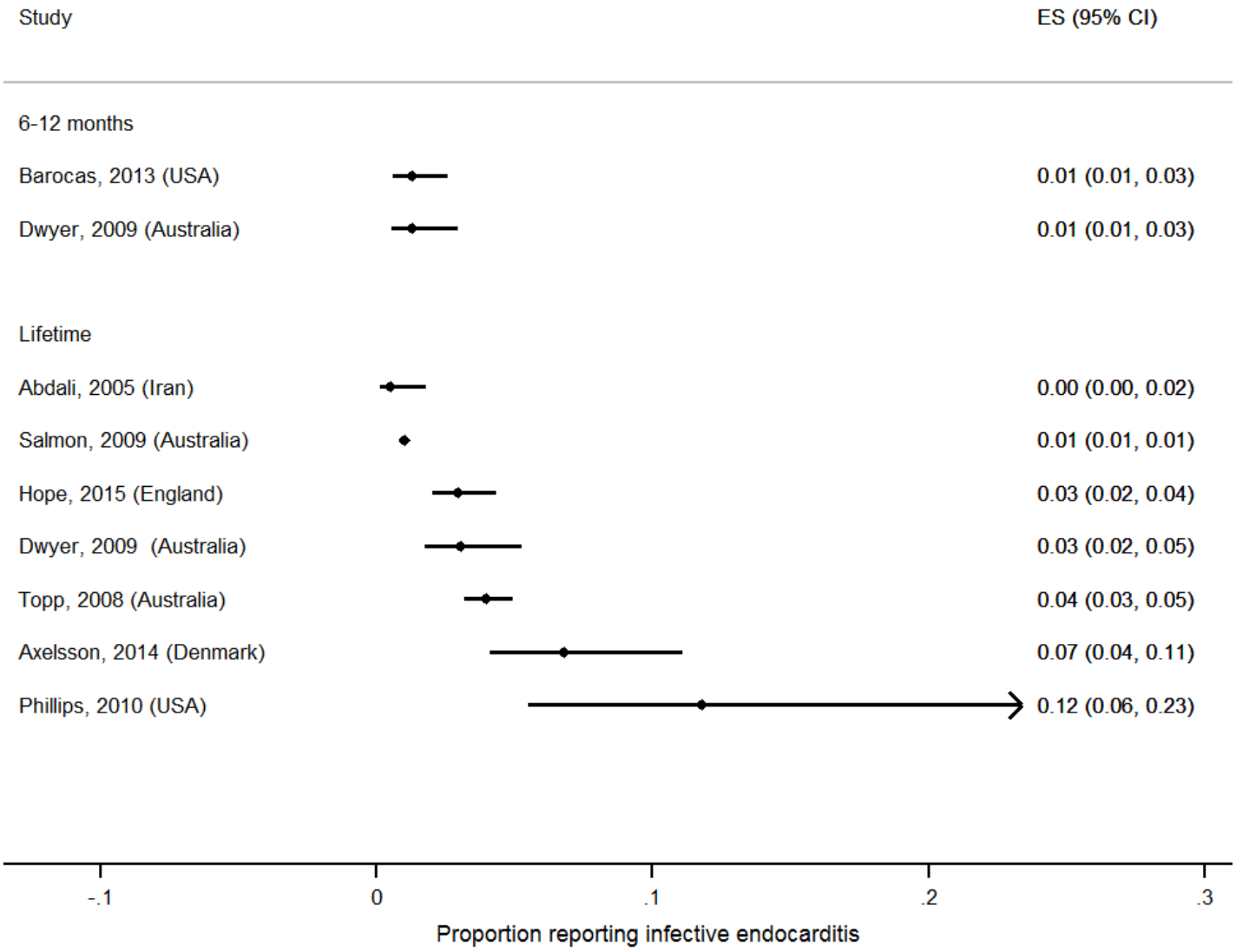


Figure 4: Prevalence of sepsis/septicaemia amongst people who regularly inject drugs, by prevalence period

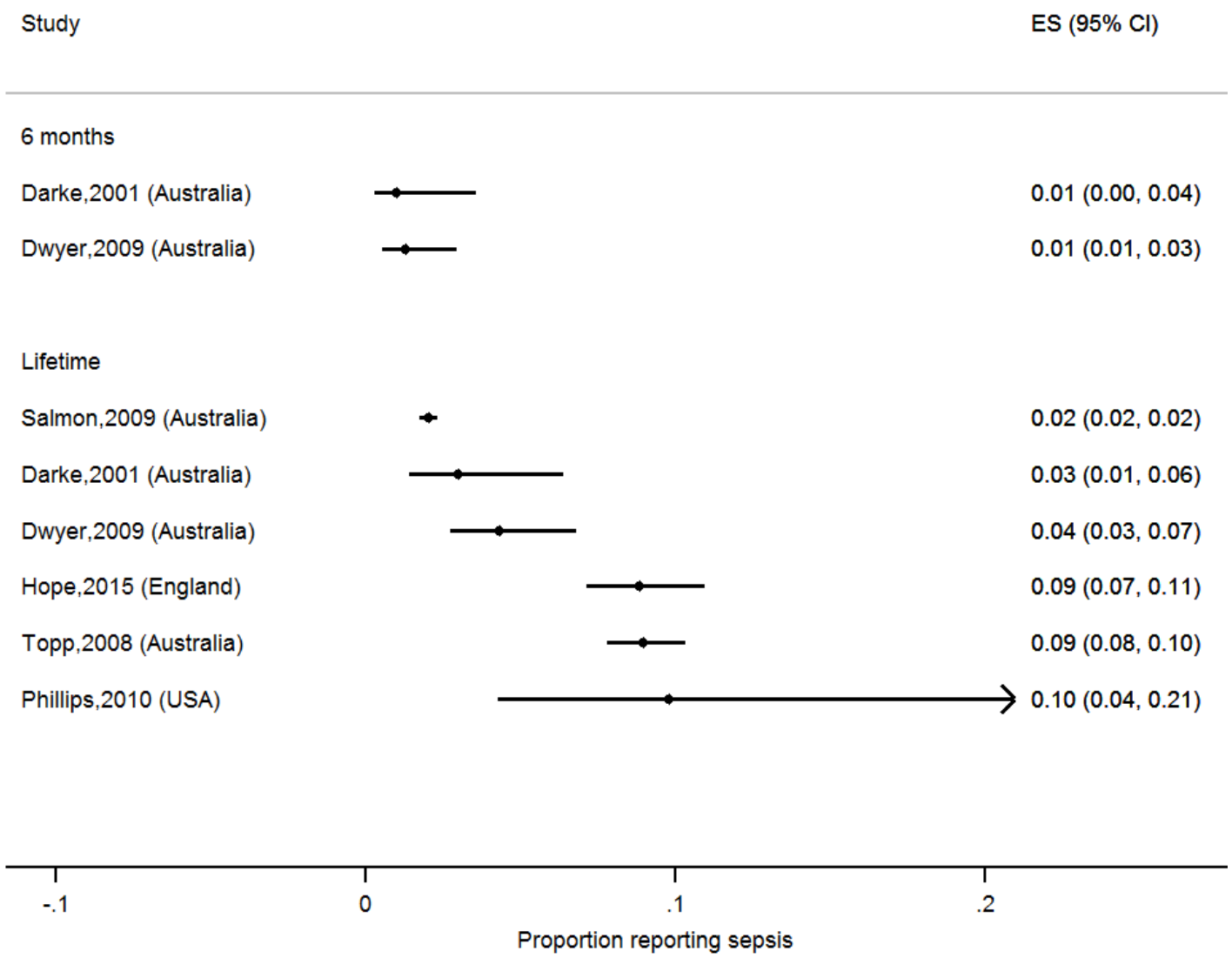
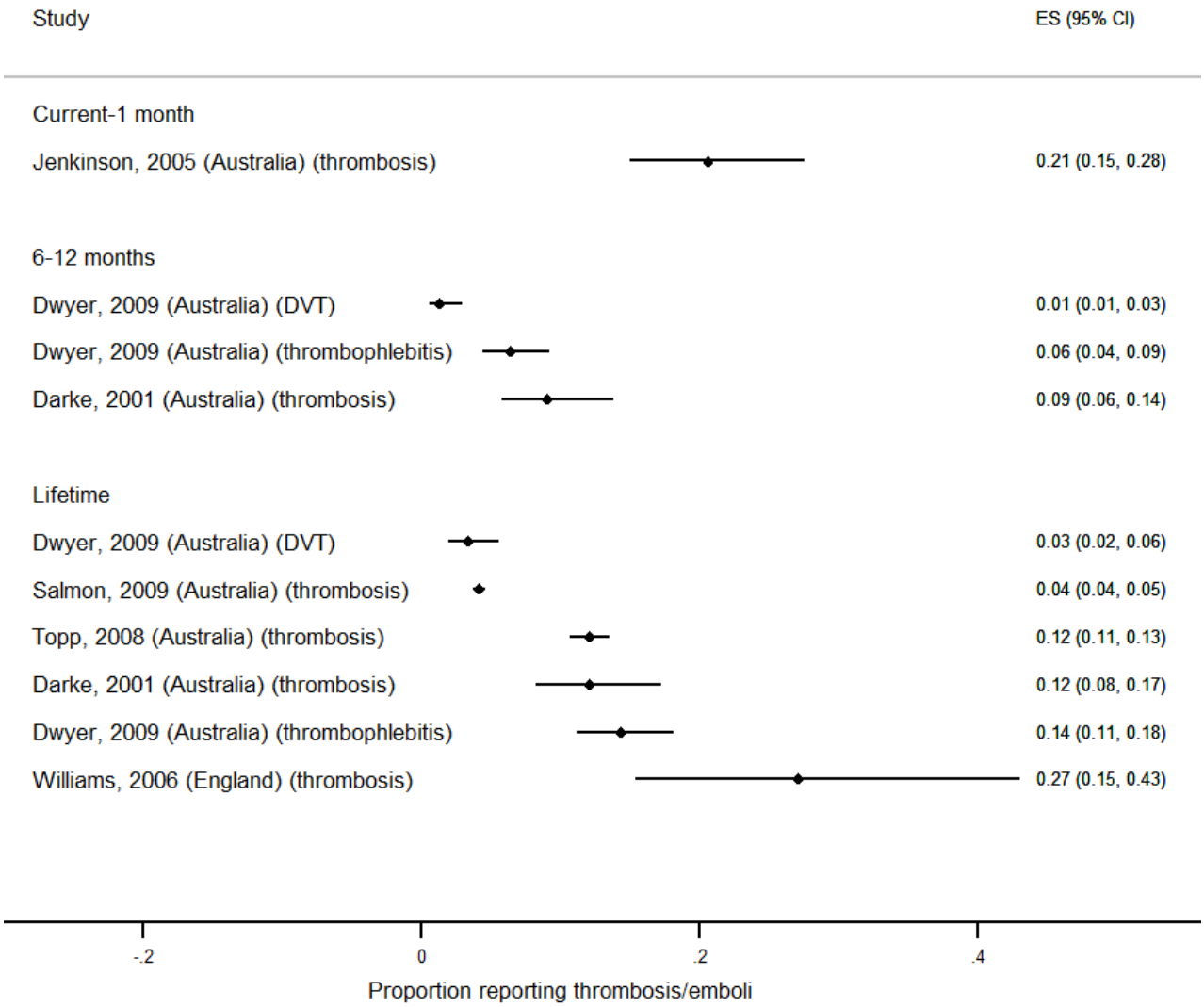


Figure 5: Prevalence of thrombosis and emboli in people who inject drugs, by prevalence period



Note: DVT, deep vein thrombosis