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1 **Frequency of injecting among people who inject drugs: a systematic review and**
2 **meta-analysis**

3
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16 **Abstract**

17 **Background:** People who inject drugs (PWID) do so at varying frequencies. More frequent injecting
18 is associated with skin and soft tissue infection, blood borne viruses, and overdose. The aims of this
19 review are to estimate the prevalence of injecting frequency among PWID and compare these
20 estimates to current needle-syringe distribution coverage estimates, and identify socio-demographic
21 and risk characteristics, and harms associated with daily or more injecting.

22 **Methods:** We conducted a systematic review of the peer-reviewed and grey literature from 2008 to
23 2018 and extracted needle-syringe distribution coverage data from a recent systematic review. We
24 generated country-, region-, and global-level estimates of daily or more injecting. We also ran meta-
25 regression analyses to determine associations between daily or more injecting and socio-demographic
26 characteristics, injecting risk behaviour, non-fatal overdose, injection site skin infection, and blood
27 borne virus prevalence.

28 **Results:** Our search resulted in 61,077 sources, from which 198 studies were eligible for inclusion in
29 this review. There were 74 countries with estimates for injecting frequency. Globally, we estimated
30 that 68.1% (95% CI 64.5, 71.6%) of PWID, equating to approximately 10.5 (95% UI 6.8-15.0) million
31 people, inject daily or more frequently. There was a higher percentage of participants reporting daily
32 or more injecting among samples with shorter injecting careers, more male participants and higher
33 reporting of opioids as their main drug injected. Daily or more injecting was also associated with
34 samples reporting a higher prevalence of HIV and hepatitis C antibody (anti-HCV), non-fatal
35 overdose, and receptive needle sharing in the previous month.

36 **Implications:** WHO recently recommended a needle-syringe distribution target of 300 needles per
37 PWID per year which is unlikely to be sufficient for the majority of PWID injecting daily or more
38 who are out of drug treatment.

39 **Funding:** The Australian National Drug and Alcohol Research Centre, Australian National Health
40 and Medical Research Council, University of New South Wales

41 **Keywords:** injecting drug use, people who inject drugs, population size, injecting behaviour, needle
42 and syringe programmes, harm reduction, needle-syringe distribution coverage

43

44 **Introduction**

45 Globally, there are an estimated 15.6 million people who inject drugs (PWID) (Degenhardt et al.,
46 2017). People who inject do so at varying frequencies. More frequent injecting has been associated
47 with higher-risk injecting practices such as re-using and sharing injecting equipment and injecting into
48 the neck and femoral vein (Darke, Swift, Hall, & Ross, 1994; Rafful et al., 2015; Tarján et al., 2015;
49 Wilson, Brener, Mao, & Treloar, 2014), which also increases risk of severe harms such as blood borne
50 viral infections and thrombophlebitis (Corneil et al., 2006; Miller et al., 2006; Rafful et al., 2015;
51 Schoenbaum et al., 1989; Todd et al., 2011). More frequent injecting is also independently associated
52 with several health harms including injection site skin infection and overdose (Blackburn et al., 2017;
53 Brugal et al., 2002; Kinner et al., 2012; Lafferty, Smith, Coull, & Shanley, 2016; Larney, Peacock,
54 Mathers, Hickman, & Degenhardt, 2017; Noroozi et al., 2018; Robinson et al., 2017).

55 Multiple factors may contribute to the variation in injecting frequency. For example, PWID with
56 longer injecting careers who have an increased tolerance, or are transitioning from experimental drug
57 use to dependence, may be injecting higher doses but also more frequently (National Institute on Drug
58 Abuse, 2007). Similarly, drug type can mediate injecting behaviour; relative to an opiate, cocaine has
59 a short half-life (approximately 30 minutes) and therefore injecting may occur more frequently in
60 order to sustain a high (Korsmeyer & Kranzler, 2009; van Beek, Dwyer, & Malcol, 2001). In contrast,
61 PWID in opioid agonist treatment (OAT) typically inject less frequently than those out of treatment
62 (Mattick, Breen, Kimber, & Davoli, 2009; Platt et al., 2018; Scott, Caulkins, Ritter, & Dietze, 2015).

63 As well as individual factors, local societal factors can also contribute to variation in injecting
64 frequency. These might include drug market characteristics and drug policy that govern the
65 availability of different drug types and the provision of drug treatment and other harm reduction
66 services (Day, Degenhardt, Gilmour, & Hall, 2004; MacArthur et al., 2012).

67 Measuring injecting frequency is important for informing harm reduction services, such as needle and
68 syringe programs (NSPs). NSPs distribute sterile injecting equipment to PWID and are an important
69 part of the global response to reduce the transmission of blood borne viruses. The World Health
70 Organization (WHO) (2016) recently suggested a target of 300 needles distributed per PWID per year

71 to improve coverage and reduce the transmission of blood borne virus infection; however, this target
72 assumes less than daily frequency of injecting for PWID. Identifying frequency of injecting across
73 countries is critical to understand sufficiency of this target distribution, yet to our knowledge there has
74 been no systematic review of frequency of injecting by country and globally. Therefore, we aimed to:

- 75 ○ Estimate country, regional, and global-level injecting frequency among PWID;
- 76 ○ Identify socio-demographic and injecting characteristics associated with frequency of
77 injecting among PWID;
- 78 ○ Evaluate the associations between frequency of injecting and engaging in injecting
79 risk behaviour, non-fatal overdose, HIV prevalence, hepatitis C antibody (anti-HCV)
80 prevalence and recent skin and soft tissue infection; and
- 81 ○ Compare country-level injecting frequency estimates to country-level NSP coverage.

82

83 **Methods**

84 *Data source*

85 Data for this review comes from a broader systematic review investigating prevalence of injecting,
86 socio-demographic and risk characteristics of PWID (defined henceforth as people who have injected
87 drugs within the previous year), and blood borne virus prevalence among PWID globally (Degenhardt
88 et al., 2017). The review protocol is registered with PROSPERO (record number CRD42016052853)
89 and reported according to PRISMA (Moher, Liberati, Tetzlaff, Altman, and The (2009); Appendix 1)
90 and GATHER guidelines (Stevens et al. (2016); Appendix 2). In 2016, peer-reviewed literature
91 (Medline, Embase, and PsycINFO), grey literature and online databases were systematically searched,
92 and data requests were sent to international experts and agencies for literature published from 2008
93 onwards. Peer-reviewed literature searches were updated in June 2017 and July 2018. We searched
94 for sources with estimates of injecting drug use (IDU) prevalence, characteristics of PWID including
95 socio-demographic and risk characteristics, frequency of injecting, injecting-related injuries and
96 diseases, and serologically confirmed blood borne virus prevalence. Search terms included keywords
97 with explosions of terms for IDU and epidemiology, IDU and HIV, and IDU and infections
98 (Appendix 3 and 4).

99 *Screening and study selection*

100 Two researchers independently screened studies for inclusion, and all conflicts were resolved in
101 discussion or consultation with a third researcher. Data were extracted into a Microsoft Access
102 Database, and exported and cleaned in Microsoft Excel. Where there were multiple studies reporting
103 on the same sample, the study with the most complete information was included. In the current
104 review, studies with data on frequency of injecting by PWID (self-report) were included, unless: a)
105 there were fewer than 40 (PWID) participants in the sample, b) the sample was a subpopulation (e.g.
106 samples of PWID who were HIV-positive or incarcerated), c) the inclusion criteria specified daily (or
107 more frequent) injecting, d) the most frequent category for injecting was monthly or more (or less
108 frequent), e) the study was an earlier iteration of a more recent study, or f) there was an age restriction
109 on the sample (i.e. other than restricting to adult PWID).

110 *Measures*

111 Frequency of injecting was extracted as categorised in the source and then coded to our definitions to
112 create consistency across studies (the definitions are provided in Appendix 5). We originally intended
113 on presenting the data in the detailed categories defined in Appendix 5; however, frequency categories
114 and definitions varied greatly between studies. These broader definitions were therefore combined to
115 create binary ‘daily or more’ and ‘less than daily’ estimates for each study. We based our definitions
116 on the most commonly reported injecting frequency categories. Several studies did not conform to our
117 definitions of injecting frequency, and our decision process for including studies in our analyses is
118 reported in Appendix 6.

119 There were nine study-level exposure variables that we aimed to investigate: year of data collection;
120 median (or mean if median was not reported) duration of injecting (in years); and self-report
121 proportion of the sample that were female, young (defined as ≤ 25 years), reported current engagement
122 in opioid agonist treatment (OAT), opioids as their main drug injected, stimulants as their main drug
123 injected, unstable housing or homelessness within the previous 12 months, and incarceration within
124 the previous 12 months. Region and country-level income class (low, lower-middle, upper-middle,
125 and high) (World Bank, 2018) were also extracted into the dataset.

126 Considering frequency of injecting as the predictor variable, there were also five outcome variables
127 we aimed to investigate: the proportion of participants engaging in recent risky injecting behaviour
128 (defined as receptive needle or syringe sharing in the previous month); serologically confirmed HIV
129 and anti-HCV prevalence; self-reported non-fatal overdose in the previous 12 months; and self-
130 reported skin and soft tissue infection (in the previous 12 months).

131 *Data analysis*

132 Estimates of injecting frequency by country

133 To create frequency of injecting estimates among PWID by country we drew on methods used in
134 previous reviews (Degenhardt et al., 2017). Eligible injecting frequency estimates were selected and,
135 where multiple estimates for a country were available, pooled by country via random-effects meta-

136 analysis models in STATA using the metaprop command. To create estimates that were the most
137 temporally relevant, we included all estimates that were within 5 years of the most recent estimate. To
138 generate the estimated number of PWID based on the daily or more and less than daily estimates, we
139 multiplied the prevalence of IDU (as reported in Degenhardt et al. (2017)) by the proportion reporting
140 daily or more and less than daily injecting. The product was multiplied by the country's adult
141 population aged 15-64 years as of 2015 (UN Population Division, 2016). We estimated 95%
142 uncertainty intervals (UIs) using Monte Carlo simulation taking 100,000 draws. We used a binomial
143 distribution because our parameters of interest were proportions (the products of IDU proportion
144 among population and frequency proportions among PWID). Estimated sample sizes were derived
145 from the 95% UIs and standard errors of the proportion estimates for each country.

146 Estimates of injecting frequency by region

147 Countries were grouped according to UNAIDS, WHO and United Nations Office on Drugs and Crime
148 regions. We computed region-specific, weighted estimates of injecting frequency using all the
149 observed estimates and 95% UI of estimates in each country within that region and deriving a
150 weighted estimate and UI, based on country population size. Where regions had one (or zero) country
151 with an estimate (unless that country accounted for >50% of the region population), the global
152 estimate was imputed for the countries with evidence of IDU but without an injecting frequency
153 estimate. Otherwise, the regional estimate was imputed. We used these regional estimates to estimate
154 the global prevalence of daily or more and less than daily injecting.

155 Evaluating associations between daily or more injecting and study-level characteristics

156 We examined the study-level association between socio-demographic variables and daily or more
157 injecting and, in turn, daily or more injecting and negative health outcomes. Using meta-regression
158 analysis in STATA 15, we first built models for the 10 predictor variables and daily or more injecting
159 as the outcome variable, adjusting for region. We conducted the same analyses with daily or more
160 injecting as the predictor variable, and HIV prevalence, anti-HCV prevalence, proportion reporting
161 non-fatal overdose and skin and soft tissue infection as the independent outcome variables. We

162 excluded predictor variables from this analysis that were available for fewer than 25% of the total
163 studies. Thus, self-reported engagement in OAT, stimulants as their main drug injected, recent
164 incarceration, and skin and soft tissue infections were excluded from the analyses.

165 Injecting frequency and NSP coverage

166 To compare estimated percentages of daily or more injecting and NSP coverage by country we used
167 Tableau 2018.2. Using country-level estimates for daily or more injecting from this study and
168 country-level NSP coverage data (specifically, estimated number of needles and syringes distributed
169 per PWID per year for 2015) drawn from Larney, Peacock, Leung, et al. (2017) we presented data for
170 countries that had an estimate for both variables.

171

172 **Results**

173 Our search resulted in 61,077 sources, from which 198 studies were eligible for inclusion in this
174 review (flowchart presented in Appendix 7). Of 179 countries with recorded evidence of injecting,
175 there were 74 countries that had one or more estimates of injecting frequency. The studies covered
176 data collected from 1997 to 2017; over a third of the samples were from studies that specifically
177 recruited participants who had injected in the previous month. Recruitment criteria for recency of
178 injecting, study and method grade, and other study-level characteristics are presented in Appendix 8.

179 Regional and global estimates for frequency of injecting are displayed in Table 1. Globally, we
180 estimated that 68.1% (95% CI 64.5-71.6%) of PWID, equating to approximately 10.5 (95% UI 6.8-
181 15.0) million people, inject daily or more frequently. Latin America (95.0%; 95%CI 93.4, 96.1%),
182 South Asia (85.2%; 95%CI 81.8, 89.0%), and East and Southeast Asia (86.3%; 95%CI 84.6, 88.0%)
183 had the highest estimated percentage of daily or more injecting, and Eastern Europe had the lowest
184 percentage (41.8%; 95%CI 38.3, 45.3%).

185 < Table 1 here >

186 Figure 1 displays a map of grouped country-level estimates of daily or more injecting. Existing
187 studies suggest that Pakistan (100.0%; 95% CI 99.7-100.0%), Colombia (99.8%; 95% CI 99.0-
188 100.0%), Romania (99.7%; 99.2-100.0%), and Viet Nam (98.6%; 95% CI 98.0-99.1%) had the
189 highest percentage reporting daily or more injecting, while Georgia (2.1%; 95% CI 0.8-3.4%), Taiwan
190 (4.9%; 95% CI 2.7-8.1%) and Moldova (8.9%, 95% CI 0.8-17.1%) had the lowest. All country-level
191 estimates are presented in Table 2. Definitions and frequency estimates by study are presented in
192 Appendix 9.

193 < Figure 1 here >

194 < Table 2 here >

195 Table 3 presents the results of the univariable and multivariable meta-regression analyses with daily
196 or more injecting as the outcome variable and socio-demographic characteristics and income-class as
197 the explanatory variables. Greater proportion of participants reporting opioids as their main drug

198 injected (meta-regression coefficient [β]=0.47; 95% confidence intervals [CI] 0.23, 0.71, $p<0.001$)
199 and studies from low- and middle-income class countries ($\beta=0.03$; 95% CI 0.03, 0.15, $p=0.004$) were
200 associated with higher levels of daily or more injecting. Longer average duration of injecting ($\beta=-0.02$
201 per year; 95% CI -0.03, -0.01, $p<0.001$), more recent calendar period ($\beta=-0.01$ per year; 95% CI -0.02,
202 0.00, $p=0.009$), and a higher proportion of female PWID in the sample ($\beta=-0.20$; 95% CI -0.37, -0.02,
203 $p=0.032$) were associated with lower levels of daily or more injecting; however, after adjusting for
204 region there was no longer a relationship between proportion of female PWID in the sample ($\beta=-0.05$;
205 95% CI -0.22, 0.12, $p=0.551$) or income-class ($\beta=0.03$; 95% CI -0.07, 0.13), $p=0.530$) and daily or
206 more injecting. There was no evidence that the proportion of the sample who were young, or who had
207 recently experienced unstable housing were associated with level of daily or more injecting.
208 Scatterplots displaying the results of the meta-regression analyses are presented in Appendix 10.

209 < Table 3 here >

210 < Table 4 here >

211 Daily or more injecting was associated with a range of study-level behaviours and health outcomes,
212 both univariable and multivariable results are presented in Table 4. There were associations between
213 level of daily or more injecting in the sample and proportion of the sample reporting recent receptive
214 needle sharing ($\beta=0.31$; 95% CI 0.19, 0.43, $p<0.001$) and non-fatal overdose in the past 12 months
215 ($\beta=0.18$; 95% CI 0.09, 0.27, $p<0.001$), and the prevalence of HIV ($\beta=0.17$; 95% CI 0.09, 0.25,
216 $p<0.001$) and anti-HCV ($\beta=0.25$; 95% CI 0.12, 0.37, $p<0.001$) in the sample.

217 < Figure 2 here >

218 Figure 2 presents the available country-level daily or more injecting estimates with their
219 corresponding country-level NSP coverage. There were 48 countries where both estimates were
220 available. Country NSP coverage estimates clustered close to zero, including many of the countries
221 reporting more frequent injecting. Figure 3 displays the same information for the top 25 countries by
222 estimated number of PWID. The United States, China and Russia held over a third of the global IDU
223 population injecting daily or more yet distributed less than 50 needle-syringes per PWID per year.

224 < Figure 3 here >

225 **Discussion**

226 We estimated that the majority of PWID injected daily or more (68.1%; 95% CI: 64.5-71.6%),
227 equating to over 10 million people. In Europe, the Middle East and North Africa sampled PWID were
228 more likely to inject less than daily. Higher levels of daily or more injecting were associated with
229 higher prevalence of receptive needle-syringe sharing, HIV and anti-HCV prevalence, as well as
230 higher levels of non-fatal overdose in the previous year. Notably, among countries with higher
231 estimates of daily or more injecting, there was very low NSP coverage reported for 2015 (Larney,
232 Peacock, Leung, et al., 2017).

233 There is inconsistency across studies in definitions of injecting frequency. These differences may be
234 arbitrary, or they may be region specific, inasmuch as frequency definitions used by researchers in
235 different countries or regions may be decided based on previously observed injecting behaviour. For
236 example, two of the three included studies from Tehran, Iran, asked participants whether they were
237 injecting one to three, three to six, or more than six times a day, suggestive of local knowledge of
238 pervasive high-frequency injecting among PWID (Asli, Kandelouei, Rahimyan, Davoodbeglou, &
239 Vaezjalali, 2016; Kandelouei et al., 2013). Frequency definitions may also differ according to
240 research questions or aims. For instance, the Australian Illicit Drug Reporting System aimed to recruit
241 participants with knowledge of recent drug trends. As a result, the inclusion criteria comprised at least
242 monthly injections in the previous six months (Peacock et al., 2018). The variability of frequency of
243 injecting variables between research studies complicates investigating and comparing injecting
244 behaviour geographically.

245 To our knowledge, this is the first systematic review of frequency of injecting among PWID, which
246 has generated estimates of global, regional and country-level frequency of injecting among PWID.
247 There are, however, several limitations. Firstly, survey data may be inherently biased towards people
248 who inject more frequently, and therefore is not necessarily an accurate representation of the entire
249 PWID population. Although recruitment techniques such as respondent driven and snowball sampling
250 are effective in reaching hidden populations, they commonly initiate recruitment from low-threshold

251 harm reduction services such as NSPs and drop in centres. Surveys recruiting from such services are
252 likely to sample PWID with more frequent injecting (Brienza et al., 2000), while other service-based
253 recruitment (e.g. drop in centres) may exclude particularly marginalised populations, or people
254 concerned about being identified as someone who injects drugs. To reduce the risk of bias we
255 excluded all studies that specified daily or more frequent injecting in the inclusion criteria; however,
256 that does not eliminate inherent bias in recruitment strategies. Our results found that studies from five
257 countries reported estimates of >98.0% for daily or more injecting, and it is difficult to determine
258 whether the estimates are an accurate reflection of the injecting behaviour among PWID in that
259 country or whether recruitment of participants was conducted such that people who inject more
260 frequently were overrepresented.

261 Second, frequency data is typically reported categorically, and we were unable to calculate point
262 estimates. Thus, there is limited detail to compare needle-syringe distribution coverage estimates to a
263 more specific injecting frequency. Further, the results of this review do not reflect, and cannot discern
264 between, regular and episodic injecting, including so-called “binge” patterns of injecting (i.e. high
265 intensity IDU that differs from typical injecting practices). Binge injecting is independently associated
266 with injecting risk behaviour, abscess wounds, non-fatal overdose and HIV transmission (Kerr et al.,
267 2007; Kinner et al., 2012; Miller et al., 2006; van Beek et al., 2001; Van Hout & Bingham, 2012);
268 however, might represent a sub-population of people who are injecting frequently.

269 Third, our regional and global estimates of the proportion of PWID engaging in daily or more
270 injecting are limited by the country-level frequency data that is available. Of the 74 countries with
271 frequency of injecting data, 47 (64%) country estimates were based on data from a single source, and
272 34 (46%) country estimates were based on a single estimate (compared to multiple estimates from the
273 same source). The frequency estimates reported for Sri Lanka, Croatia, and Switzerland are
274 presumably over-estimated (as they capture PWID who are injecting less frequently than ‘daily or
275 more’) and Israel, Palestine, Afghanistan and Sweden are presumably under-estimated. We conducted
276 a sensitivity analysis (presented in Appendix 11) excluding those seven countries and found that the
277 confidence intervals of the estimated regional and global frequency of injecting largely overlapped

278 with the estimates presented in Table 1. The exception was the Middle East and North African
279 regional estimate which, although overlapped, was much lower in the sensitivity analysis (47.3%
280 [95%CI 42.0-52.7%] and 38.5% [95%CI 33.6-43.6%]). We would assume the three country-level
281 estimates from this region are an underestimate of the “true” frequency estimates according to our
282 definition. Therefore, we concluded that our presented findings are a more accurate representation of
283 the available data.

284 Some regional estimates were informed by very little empirical evidence. Notably, regional estimates
285 for the Caribbean, Latin America and Central Asia are driven by only four studies from four
286 countries: Puerto Rico, Chile, Mexico, and Tajikistan; none of which are nationally representative.
287 Figure 1 is a clear visualisation that highlights the need for good quality surveillance data that recruits
288 PWID from multiple sites and covers a wider geography. National, regional and global estimates of
289 the epidemiology of IDU and associated behaviours and characteristics are important for informing
290 drug and harm reduction policy; however, for informative surveillance estimates to be generated there
291 needs to be higher quality studies conducted in these missed regions where there is evidence of
292 injecting.

293 While investigating the prevalence of daily or more injecting at a national level is informative, there is
294 much sub-national variation in injecting behaviours within countries. For example, the report
295 informing the country-level estimate for the Philippines has data from four sites, and daily or more
296 injecting ranged from 4.0% in Zamboanga to 90.0% in Cebu (HIV and AIDS Data Hub for Asia-
297 Pacific, 2011). The report from Azerbaijan reported similar sub-national variation, with 18.0%
298 reporting daily or more injecting in Masalli whereas 91.0% reported daily or more injecting in Baku
299 (Ministry of Health the Republic of Azerbaijan, 2008).

300 Finally, the meta-regression results may be subject to ecological fallacy, in that sample averages
301 across studies may not be the same as the association for participants within a study (Thompson &
302 Higgins, 2002). Relationships are more easily interpreted when there is high variation across studies
303 compared to within studies. Therefore, the results of the meta-regression analyses should be
304 interpreted with caution.

305 There may be many factors that influence the current and future frequency at which PWID are
306 injecting. Firstly, drug market trends may limit the supply of certain drugs while increasing the
307 availability of others. A recent example of this is the widespread cathinone injection among PWID in
308 Hungary and Romania, and increasingly so in parts of Ireland and Scotland, resulting in binge and
309 high frequency injection (Lafferty et al., 2016; McAuley et al., 2019; Rácz et al., 2016; Tarján et al.,
310 2015). There is also evidence for the opposite relationship, in so much that the unavailability of
311 certain drug types results in less frequent injecting (Day et al., 2004). Similarly, PWID in treatment, in
312 hospital or in recovery may not be injecting as frequently or at all. The appearance of abscess wounds
313 motivates some people to reduce their injecting to allow the wound to heal (Dunleavy, Hope, Roy, &
314 Taylor, 2019), potentially moderating the relationship between skin and soft tissue infection and
315 frequency of injecting. Treatment engagement may also influence injecting frequency, which has been
316 repeatedly shown for PWID engaged in OAT. Demonstrated in a recent cohort of PWID was that
317 those on OAT were injecting 35% less frequently than those not on OAT (Scott et al., 2015).

318 These findings have important implications for harm reduction services that supply needles, syringes
319 and other injecting equipment. The WHO recently increased “high” NSP coverage from ≥ 200 to ≥ 300
320 needles per PWID per year (World Health Organization (WHO), 2016). Considering there is an
321 estimated 33 needle-syringes distributed per PWID per year and 16 OAT recipients per 100 PWID
322 globally, current coverage is clearly far from satisfactory. Further, in countries with the highest
323 estimated percentages of daily or more injecting there was very poor or no NSP coverage. However,
324 even in Australia, where NSP coverage is ‘high’ and frequency of injecting is moderate, a recent
325 estimate determined sufficient coverage to be when 550 syringes were distributed per PWID per year
326 (Kwon et al., 2019), almost double the WHO recommendation. Insufficient needle and syringe
327 distribution coverage is associated with PWID reusing their own needles and sharing injecting
328 equipment which can lead to blood borne virus transmission, bacterial infections, and vein damage
329 (Bluthenthal, Anderson, Flynn, & Kral, 2007; O’Keefe et al., 2018; Tarján et al., 2015). Our review
330 offers a foundation to inform more robust and country specific NSP coverage targets based on actual
331 PWID injecting behaviour.

332 Our results represent a broad picture of injecting patterns among PWID globally and indicate that the
333 majority of PWID are injecting daily or more frequently. Understanding injecting frequency is
334 important for informing adequate NSP coverage, and we highlight the need for better surveillance
335 data to achieve this. There is poor availability of surveillance data from many parts of the world,
336 particularly lower socioeconomic and vulnerable populations. Finally, evidence-based harm reduction
337 programs must be nuanced and responsive to the local drug market in order to effectively reduce the
338 risk of harms this population is vulnerable to.

339

340 **Authors' Contribution**

341 LD, SL, MH, AP, JG, PV, ML and JL conceived the conception and design of the scope and methods
342 of the original systematic review. SC, LD, SL and AP conceived and designed the present study. All
343 authors made substantial contributions to the acquisition of data. SC, LD, SL, AP and JL contributed
344 to the study methods and analysis plan. SC conducted the analysis and generated the estimates. SC
345 produced figures. SC, LD, SL and AP contributed to the interpretation of data for the manuscript. SC
346 drafted the first iteration of the manuscript. All authors contributed to revising the manuscript
347 critically for important intellectual content. All authors approved the final version of the study to be
348 published and are accountable for all aspects of the work.

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368 **Declaration of interests**

369 In the past three years, LD has received investigator-initiated untied educational grants for studies of
370 opioid medications in Australia from Indivior, Mundipharma, and Seqirus. SL has received
371 investigator-initiated untied educational grants from Indivior. AP has received investigator-initiated
372 untied educational grants from Mundipharma and Seqirus. JG is a consultant and adviser for and has
373 received research grants from Abbvie, Cepheid, Gilead Sciences, and Merck/MSD. MH reports
374 personal fees from Gilead, Abbvie, and MSD. JS reports non-financial support from Gilead Sciences.
375 All other authors declare no competing interests.

Figure 1: Map of daily or more injecting by country

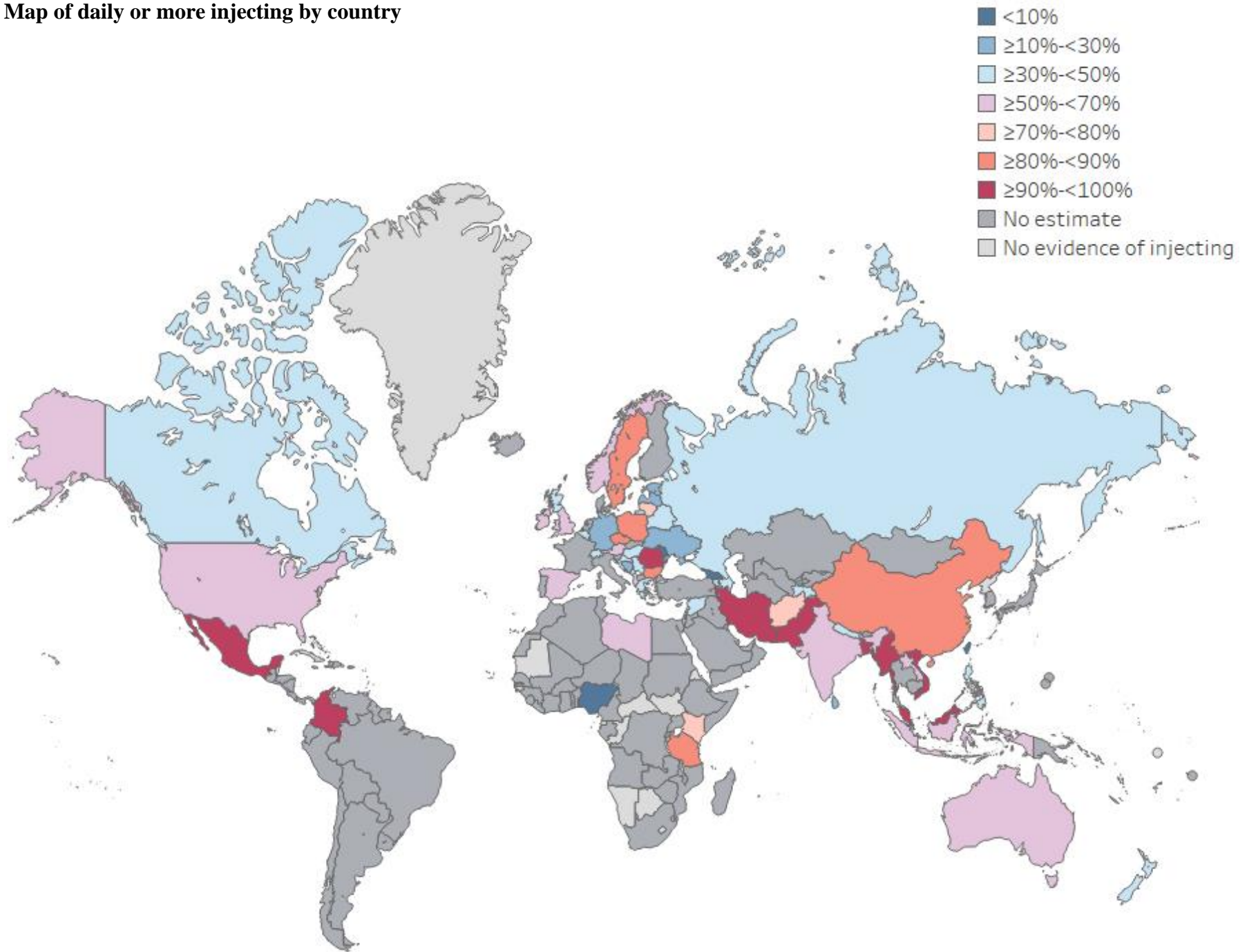
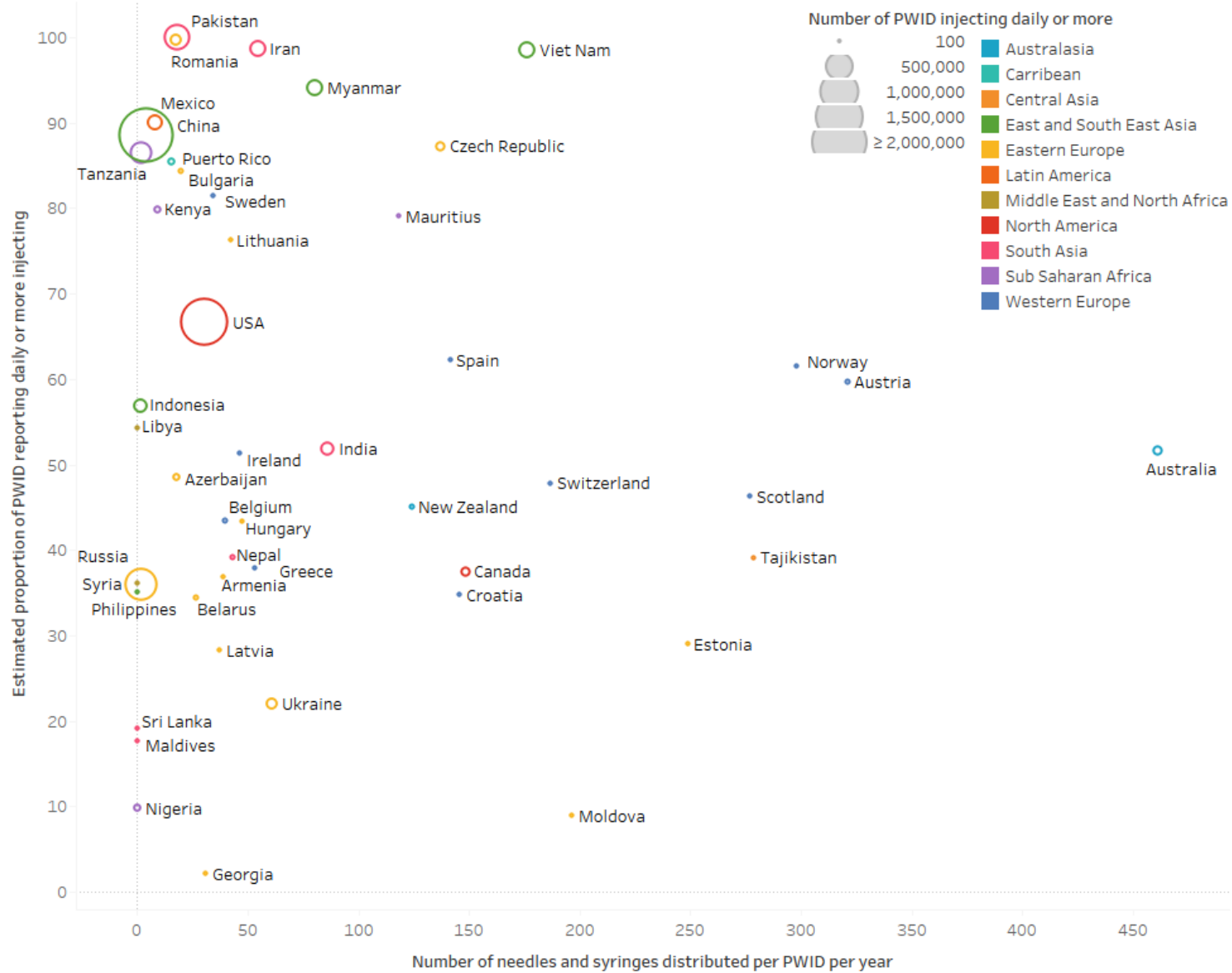
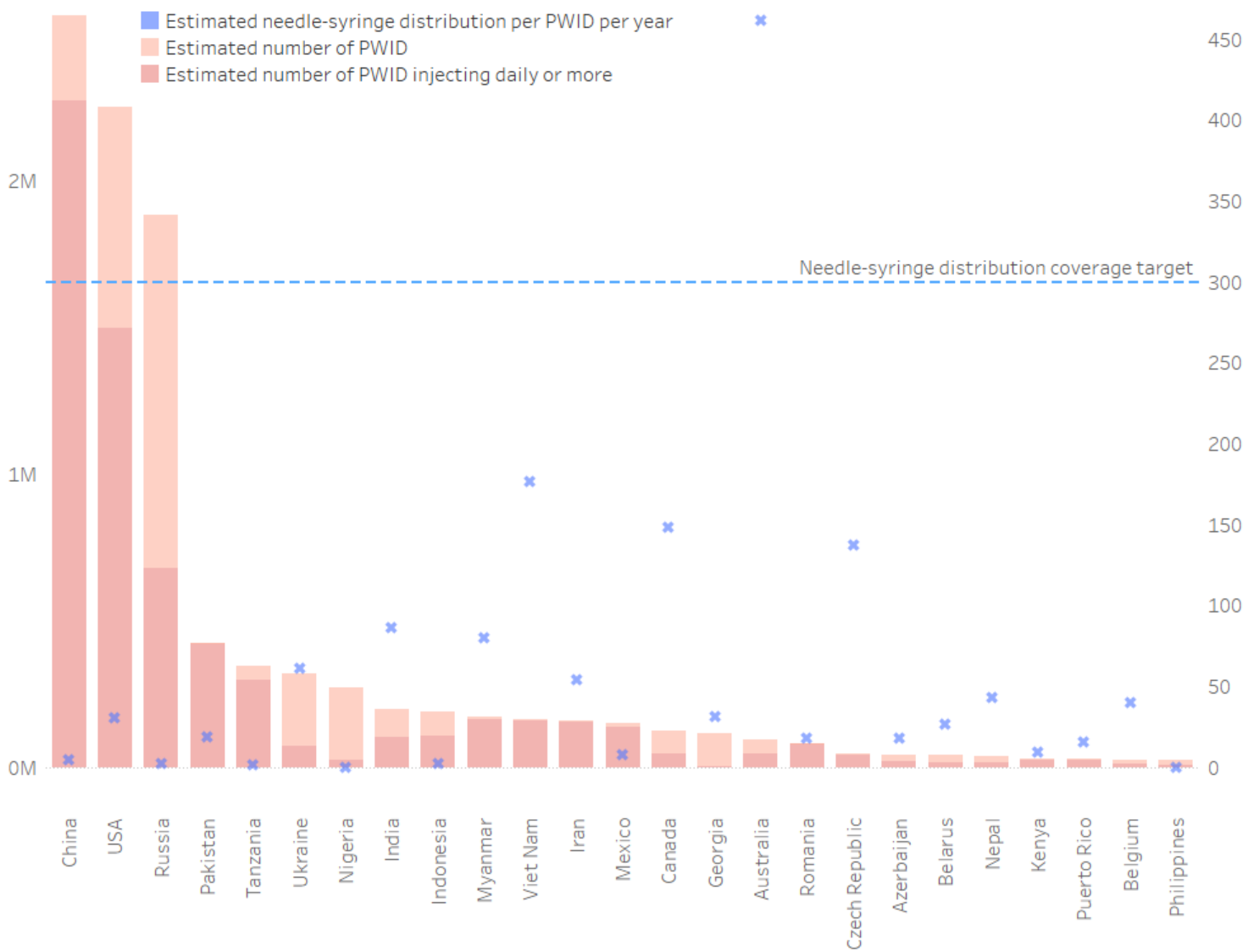


Figure 2: Daily or more injecting estimates and needle-syringe distribution coverage by country



Note: Needle-syringe distribution coverage estimates sourced from Larney, Peacock, Leung, et al. (2017).

Figure 3: Estimated number of people who are injecting daily or more and needle-syringe distribution coverage for the 25 countries with the largest number of people who inject drugs



Note: Needle-syringe distribution coverage estimates sourced from Larney, Peacock, Leung, et al. (2017).

Table 1: Frequency of injecting among people who inject drugs (PWID) by region

Region	Countries with data on frequency of injecting (n/N)	PWID injecting daily or more % (95% CI)	Number of PWID who are injecting daily or more N (95% UI)	PWID injecting less than daily % (95% CI)	Number of PWID who are injecting less than daily N (95% UI)
Eastern Europe	16/17	41.8 (38.3-45.3)	1,262,500 (647,000-1,984,000)	58.2 (54.7-61.7)	1,757,500 (817,500-2,861,000)
Western Europe	17/33	45.1 (40.8-49.5)	455,500 (321,500-622,000)	54.9 (50.5-59.2)	554,000 (361,000-784,500)
East and Southeast Asia	10/17	86.2 (84.5-88.0)	3,440,000 (2,631,500-4,296,500)	13.7 (12.0-15.4)	548,000 (410,500-702,000)
South Asia	8/9	85.2 (81.1-89.0)	871,500 (678,500-1,081,500)	14.7 (11.2-18.3)	150,000 (92,000-219,000)
Central Asia	3/5	64.0 (60.1-67.9)	180,000 (110,000-258,500)	36.0 (32.2-39.8)	101,500 (61,000-147,000)
Caribbean	1/15	73.1 (69.0-76.8)	58,000 (35,000-83,000)	26.9 (23.2-30.9)	21,500 (12,500-31,000)
Latin America	2/20	95.0 (93.4-96.1)	1,731,500 (1,276,500-2,218,000)	5.0 (4.0-6.4)	92,000 (61,000-129,000)
North America	2/2	65.1 (57.8-72.4)	1,544,500 (657,000-2,595,000)	34.9 (27.6-42.2)	827,000 (364,500-1,401,000)
Pacific Island states & terr.	0/17	NK	NK	NK	NK
Australasia	2/2	50.3 (45.0-55.6)	58,000 (41,500-76,500)	49.4 (44.2-54.6)	57,000 (40,500-75,000)
Sub-Saharan Africa	7/47	54.2 (50.3-58.0)	747,500 (262,000-1,467,000)	45.8 (42.1-49.7)	631,000 (135,500-1,358,500)
Middle East & North Africa	6/22	47.3 (42.0-52.7)	165,500 (88,000-255,000)	52.7 (47.3-58.0)	184,000 (98,000-283,500)
Global	74/206	68.1 (64.5-71.6)	10,529,000 (6,757,000-14,958,000)	31.9 (28.4-35.4)	4,930,500 (2,459,000-8,002,500)

Note. NK: Frequency estimates for this region are unknown

Table 2: Country-level estimates of frequency of injecting among people who inject drugs (PWID)

	Daily or more injecting		Less than daily injecting	
	Estimated percent % (CIs)	Estimated number N (UIs)	Estimated percent % (CIs)	Estimated number N (UIs)
Eastern Europe				
Armenia	36.9 (15.8-58.0)	5,000 (1,500-10,000)	63.1 (42.0-84.2)	8,500 (2,500-16,000)
Azerbaijan	48.5 (23.1-73.8)	21,000 (13,500-29,500)	51.5 (26.2-76.9)	22,500 (14,500-31,000)
Belarus	34.4 (19.3-49.5)	14,000 (5,000-26,500)	65.5 (50.4-80.6)	26,500 (11,000-47,000)
Bosnia & Herzegovina	20.3 (7.9-32.7)	7,000 (2,500-14,000)	79.7 (67.3-92.1)	27,500 (13,000-45,000)
Bulgaria	84.4 (81.8-86.7)	15,500 (12,500-19,000)	15.7 (13.3-18.2)	3,000 (2,000-3,500)
Czech Republic	87.2 (83.8-90.2)	41,000 (38,500-43,500)	12.8 (9.9-16.2)	6,000 (4,500-7,500)
Estonia	29.0 (20.6-37.3)	2,500 (1,000-4,500)	71.0 (62.7-79.4)	6,000 (3,000-10,000)
Georgia	2.1 (0.8-3.4)	2,500 (500-5,500)	97.8 (96.6-99.1)	112,500 (24,000-217,000)
Hungary	43.3 (39.8-46.8)	1,500 (1,000-2,500)	56.7 (53.2-60.2)	2,500 (1,000-3,500)
Latvia	28.3 (24.9-31.6)	4,000 (3,000-5,000)	71.7 (68.4-75.1)	10,000 (7,500-12,500)
Lithuania	76.3 (71.8-80.3)	3,500 (2,000-6,000)	23.8 (19.7-28.2)	1,000 (500-2,000)
Moldova	8.9 (0.8-17.1)	1,000 (<500-2,500)	91.1 (82.9-99.3)	11,000 (7,000-15,500)
Poland	84.6 (81.8-87.1)	307,000 (149,000-489,000)	15.4 (12.9-18.2)	56,000 (26,500-91,500)
Romania	99.7 (99.2-100.0)	81,000 (57,500-107,000)	0.2 (0.0-0.5)	<500 (<500-500)
Russia	36.0 (32.7-39.4)	677,000 (324,500-1,087,500)	64.0 (60.6-67.3)	1,204,000 (582,500-1,919,000)
Slovakia	NK	NK	NK	NK
Ukraine	22.0 (21.3-22.7)	70,500 (31,000-119,500)	78.0 (77.3-78.7)	249,000 (111,500-422,000)
Western Europe				
Albania	65.5 (58.5-72.1)	4,500 (3,000-6,000)	34.5 (27.9-41.5)	2,500 (1,500-3,500)
Andorra	NK	NK	NK	NK
Austria	59.7 (46.5-72.0)	11,000 (7,000-15,500)	40.3 (28.1-53.6)	7,500 (4,500-11,000)
Belgium	43.4 (36.7-50.2)	11,500 (7,000-16,000)	56.6 (49.8-63.3)	15,000 (9,500-21,000)
Croatia	34.7 (0.0-76.9)	2,000 (1,000-3,500)	65.3 (23.1-100.0)	4,000 (3,000-5,500)
Denmark	NK	NK	NK	NK
England	52.5 (51.1-54.0)	110,500 (102,500-119,000)	47.5 (46.0-48.9)	100,000 (92,500-107,500)
Finland	NK	NK	NK	NK
France	NK	NK	NK	NK
Macedonia	NK	NK	NK	NK
Germany	24.4 (20.2-28.6)	32,000 (6,500-65,000)	75.6 (71.4-79.8)	99,500 (20,500-200,000)
Greece	37.9 (36.3-39.6)	2,000 (1,500-2,500)	61.9 (60.2-63.5)	3,000 (2,500-4,000)
Iceland	NK	NK	NK	NK
Ireland	51.3 (45.6-56.9)	4,500 (3,000-5,500)	48.7 (43.1-54.4)	4,000 (3,000-5,500)
Italy	NK	NK	NK	NK
Luxembourg	NK	NK	NK	NK
Malta	NK	NK	NK	NK
Monaco	NK	NK	NK	NK
Montenegro	47.0 (43.2-50.9)	500 (500-1,000)	53.0 (49.1-56.8)	1,000 (500-1,000)
Netherlands	NK	NK	NK	NK
Northern Ireland	52.5 (51.1-54.0)	3,500 (1,500-5,500)	47.5 (46.0-48.9)	3,000 (1,500-5,000)
Norway	61.6 (59.9-63.3)	5,000 (4,500-6,000)	38.5 (36.7-40.2)	3,000 (2,500-4,000)
Portugal	NK	NK	NK	NK
San Marino	NK	NK	NK	NK
Scotland	46.3 (42.2-50.4)	7,500 (6,000-8,500)	53.7 (49.7-57.8)	8,500 (7,500-10,000)
Serbia	46.9 (42.6-51.2)	13,500 (11,000-16,500)	53.1 (48.8-57.4)	15,500 (12,500-18,500)
Slovenia	NK	NK	NK	NK
Spain	62.2 (35.3-89.2)	6,500 (2,500-11,500)	37.8 (10.8-64.7)	4,000 (1,500-7,500)
Sweden	81.5 (71.3-89.3)	6,500 (<500-26,500)	18.5 (10.8-28.7)	1,500 (<500-6,000)
Switzerland	47.9 (44.2-51.6)	6,500 (5,000-8,000)	52.2 (48.4-55.9)	7,000 (5,500-8,500)
Wales	52.5 (51.1-54.0)	5,500 (2,500-9,500)	47.5 (46.0-48.9)	5,000 (2,500-8,500)
East and South East Asia				
Brunei Darussalam	NK	NK	NK	NK

	Daily or more injecting		Less than daily injecting	
	Estimated percent % (CIs)	Estimated number N (UIs)	Estimated percent % (CIs)	Estimated number N (UIs)
Cambodia ^a	42.0 (33.0-51.4)	4,500 (2,000-7,500)	58.0 (48.6-67.0)	6,000 (2,500-10,500)
China	88.6 (87.3-90.0)	2,272,500 (1,753,000-2,816,000)	11.4 (10.0-12.7)	291,500 (218,500-373,000)
Indonesia	56.8 (55.4-58.3)	108,000 (89,000-128,500)	43.2 (41.7-44.6)	82,000 (67,500-97,500)
Japan	NK	NK	NK	NK
Lao	61.1 (56.9-65.2)	6,500 (5,000-8,000)	39.1 (35.0-43.3)	4,000 (3,000-5,500)
Malaysia	91.1 (89.2-93.0)	256,500 (213,500-302,000)	8.9 (7.0-10.8)	25,000 (18,500-32,500)
Mongolia	NK	NK	NK	NK
Myanmar	94.1 (91.8-96.3)	163,000 (110,000-222,000)	6.0 (3.7-8.2)	10,500 (5,500-16,500)
Philippines	35.1 (0.0-74.1)	9,000 (5,000-14,000)	65.1 (26.3-100.0)	16,500 (11,500-22,500)
South Korea	NK	NK	NK	NK
Singapore	NK	NK	NK	NK
Taiwan	4.9 (2.7-8.1)	2,000 (1,000-3,500)	95.1 (92.0-97.3)	43,500 (33,000-54,000)
Thailand ^a	59.8 (55.4-64.2)	31,000 (11,500-54,000)	40.2 (35.8-44.6)	20,500 (7,500-36,500)
Timor L'Este	NK	NK	NK	NK
Viet Nam	98.6 (98.0-99.1)	158,500 (121,500-198,000)	0.8 (0.4-1.1)	1,000 (500-2,000)
South Asia				
Afghanistan	78.8 (65.8-91.8)	109,500 (68,500-156,500)	21.1 (8.0-34.1)	29,500 (11,500-53,000)
Bangladesh	96.8 (95.7-97.6)	66,500 (61,500-71,500)	3.3 (2.4-4.3)	2,000 (1,500-3,000)
Bhutan	NK	NK	NK	NK
India	51.9 (46.9-57.0)	102,500 (66,500-142,000)	47.8 (44.1-51.5)	94,500 (62,000-130,000)
Iran	98.7 (96.9-100.0)	156,000 (108,500-208,000)	0.6 (0.0-1.9)	1,000 (<500-3,000)
Maldives	17.6 (13.2-22.1)	500 (-500)	82.4 (77.9-86.8)	1,000 (500-2,000)
Nepal	39.1 (15.4-62.8)	14,000 (8,500-19,000)	60.9 (37.2-84.6)	21,500 (16,000-27,000)
Pakistan	100.0 (99.7-100.0)	422,500 (364,000-483,500)	0.0 (0.0-0.2)	<500 (<500-500)
Sri Lanka	19.1 (15.0-23.9)	<500 (<500-<500)	80.9 (76.2-85.0)	500 (500-500)
Central Asia				
Kazakhstan ^a	79.9 (76.2-83.3)	90,000 (55,000-128,500)	20.1 (16.7-23.9)	22,500 (13,500-33,500)
Kyrgyzstan ^a	76.7 (72.9-80.3)	22,000 (13,500-31,500)	23.3 (19.7-27.1)	6,500 (4,000-9,500)
Tajikistan	39.1 (34.8-43.6)	9,000 (5,500-13,500)	60.9 (56.4-65.2)	14,500 (8,500-20,500)
Turkmenistan	NK	NK	NK	NK
Uzbekistan	NK	NK	NK	NK
Caribbean				
Bahamas	NK	NK	NK	NK
Bermuda	NK	NK	NK	NK
Puerto Rico	85.4 (81.0-89.1)	24,000 (14,500-34,500)	14.6 (10.9-19.0)	4,000 (2,500-6,500)
Dominican Republic	NK	NK	NK	NK
Haiti	NK	NK	NK	NK
Jamaica	NK	NK	NK	NK
Latin America				
Argentina	NK	NK	NK	NK
Bolivia	NK	NK	NK	NK
Brazil	NK	NK	NK	NK
Chile	NK	NK	NK	NK
Colombia	99.8 (99.0-100.0)	153,000 (112,000-196,500)	0.1 (0.0-0.4)	<500 (<500-500)
Costa Rica	NK	NK	NK	NK
Ecuador	NK	NK	NK	NK
El Salvador	NK	NK	NK	NK
Guatemala	NK	NK	NK	NK
Guyana	NK	NK	NK	NK
Honduras	NK	NK	NK	NK
Mexico	90.1 (87.7-92.1)	136,000 (88,500-187,000)	10.1 (8.0-12.5)	15,000 (9,500-22,000)
Nicaragua	NK	NK	NK	NK
Panama	NK	NK	NK	NK
Paraguay	NK	NK	NK	NK
Peru	NK	NK	NK	NK
Suriname	NK	NK	NK	NK

	Daily or more injecting		Less than daily injecting	
	Estimated percent % (CIs)	Estimated number N (UIs)	Estimated percent % (CIs)	Estimated number N (UIs)
Uruguay	NK	NK	NK	NK
Venezuela	NK	NK	NK	NK
North America				
Canada	37.5 (30.6-44.4)	46,000 (34,500-59,000)	62.5 (55.6-69.4)	77,000 (61,000-94,500)
United States	66.6 (59.3-74.0)	1,498,500 (622,000-2,536,000)	33.4 (26.0-40.7)	750,000 (303,500-1,306,500)
Pacific Island States & Territories				
American Samoa	NK	NK	NK	NK
Federated States of Micronesia	NK	NK	NK	NK
Fiji	NK	NK	NK	NK
French Polynesia	NK	NK	NK	NK
Guam	NK	NK	NK	NK
Kiribati	NK	NK	NK	NK
Marshall Islands	NK	NK	NK	NK
New Caledonia	NK	NK	NK	NK
Northern Mariana Islands	NK	NK	NK	NK
Palau	NK	NK	NK	NK
Papua New Guinea	NK	NK	NK	NK
Samoa	NK	NK	NK	NK
Solomon Islands	NK	NK	NK	NK
Tonga	NK	NK	NK	NK
Vanuatu	NK	NK	NK	NK
Australasia				
Australia	51.6 (45.9-57.3)	48,000 (35,000-62,500)	48.1 (42.5-53.6)	44,500 (32,500-58,500)
New Zealand	45.0 (41.3-48.7)	10,000 (7,000-13,500)	55.0 (51.3-58.7)	12,500 (8,500-16,500)
Sub Saharan Africa				
Angola	NK	NK	NK	NK
Benin ^a	22.9 (18.8-27.5)	4,000 (1,000-7,500)	77.1 (72.6-81.2)	13,000 (2,500-25,500)
Burkina Faso	NK	NK	NK	NK
Burundi	NK	NK	NK	NK
Cameroon	NK	NK	NK	NK
Cape Verde	NK	NK	NK	NK
Chad	NK	NK	NK	NK
Cote d'Ivoire	NK	NK	NK	NK
Democratic Republic of Congo	NK	NK	NK	NK
Djibouti	NK	NK	NK	NK
Ethiopia	NK	NK	NK	NK
Gabon	NK	NK	NK	NK
Gambia	NK	NK	NK	NK
Ghana	NK	NK	NK	NK
Guinea	NK	NK	NK	NK
Kenya	79.9 (74.5-84.5)	24,500 (9,500-43,000)	20.2 (15.5-25.5)	6,000 (2,000-11,500)
Liberia	NK	NK	NK	NK
Madagascar ^a	4.2 (0.0-8.8)	500 (<500-3,500)	95.8 (91.2-100.0)	15,000 (<500-67,500)
Malawi	NK	NK	NK	NK
Mali	NK	NK	NK	NK
Mauritius	79.0 (76.5-81.5)	5,500 (1,500-10,000)	21.0 (18.5-23.5)	1,500 (500-2,500)
Mozambique	NK	NK	NK	NK
Niger	NK	NK	NK	NK
Nigeria	9.8 (4.7-14.9)	26,500 (5,000-60,000)	90.2 (85.1-95.2)	244,000 (49,500-485,000)
Rwanda	NK	NK	NK	NK
Senegal	NK	NK	NK	NK

	Daily or more injecting		Less than daily injecting	
	Estimated percent % (CIs)	Estimated number N (UIs)	Estimated percent % (CIs)	Estimated number N (UIs)
Seychelles ^a	46.5 (41.2-51.9)	500 (500-1,000)	53.5 (48.1-58.8)	1,000 (500-1,000)
Sierra Leone	NK	NK	NK	NK
Somalia	NK	NK	NK	NK
South Africa	NK	NK	NK	NK
Swaziland	NK	NK	NK	NK
Togo	NK	NK	NK	NK
Uganda	NK	NK	NK	NK
Tanzania	86.5 (83.5-89.1)	296,500 (178,500-426,000)	13.6 (11.0-16.5)	46,500 (26,500-70,000)
Zambia	NK	NK	NK	NK
Zimbabwe	NK	NK	NK	NK
Middle East and North Africa				
Algeria	NK	NK	NK	NK
Bahrain	NK	NK	NK	NK
Cyprus	NK	NK	NK	NK
Egypt	NK	NK	NK	NK
Iraq	NK	NK	NK	NK
Israel	65.3 (58.3-71.9)	4,000 (2,000-6,000)	34.7 (28.1-41.7)	2,000 (1,000-3,000)
Jordan	NK	NK	NK	NK
Kuwait	NK	NK	NK	NK
Lebanon ^a	51.9 (40.5-63.1)	2,500 (1,500-4,000)	48.2 (36.9-59.5)	2,500 (1,000-3,500)
Libya	54.3 (48.7-59.8)	1,000 (500-1,500)	45.7 (40.3-51.3)	1,000 (500-1,500)
Morocco ^a	91.5 (86.9-94.9)	28,000 (14,500-42,500)	8.5 (5.1-13.1)	2,500 (1,000-4,500)
Palestine	55.6 (51.3-60.0)	2,000 (1,000-2,500)	44.4 (40.0-48.7)	1,500 (500-2,000)
Oman	NK	NK	NK	NK
Qatar	NK	NK	NK	NK
Saudi Arabia	NK	NK	NK	NK
Sudan	NK	NK	NK	NK
Syria	36.1 (31.3-41.1)	4,500 (2,500-7,000)	63.9 (58.9-68.7)	8,500 (4,500-12,500)
Tunisia	NK	NK	NK	NK
Turkey	NK	NK	NK	NK
United Arab Emirates	NK	NK	NK	NK
Yemen	NK	NK	NK	NK

Note. ^a The estimates for injecting frequency deviated from our definition by 3 injections and were therefore excluded from estimating the regional prevalence of frequency. The definitions can be found in Appendix 8.

NK: There is evidence of injecting in this country but there were no estimates of injecting frequency available.

For the following countries there is no reported evidence of injecting: (Western Europe) Greenland and Liechtenstein; (East and Southeast Asia) North Korea; (Caribbean) Antigua and Barbuda, Barbados, Cuba, Dominica, Grenada, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago; (Latin America) Belize; (Pacific Island States and Territories) Nauru and Tuvalu; (Sub Saharan Africa) Botswana, Central African Republic, Comoros, Equatorial Guinea, Eritrea, Guinea Bissau, Lesotho, Mauritania, Namibia, Republic of the Congo and Sao Tome and Principe; (Middle East and North Africa) South Sudan.

Table 3: Univariable and multivariable study-level exposure variables associated with daily or more injecting among people who inject drugs

Study-level exposure variables	N	Univariable models				Multivariable models ^e			
		β^a	SE ^b	95% CIs	<i>p</i>	β	SE	95% CIs	<i>p</i>
Proportion of the sample who are female	269	-0.20	0.09	(-0.37, -0.02)	0.032	-0.05	0.09	(-0.22,0.12)	0.551
Proportion of the sample reporting opioids as main drug injected	104	0.47	0.12	(0.23, 0.71)	<0.001	0.36	0.13	(0.10,0.62)	0.007
Year of data collection	329	-0.01	0.00	(-0.02, 0.00)	0.009	-0.01	0.00	(-0.02,0.00)	0.033
Proportion of the sample reporting unstable housing/homelessness ^c	111	0.21	0.12	(-0.03, 0.46)	0.085	0.19	0.12	(-0.04,0.43)	0.097
Proportion of the sample who are young ^d	201	0.12	0.10	(-0.08, 0.32)	0.229	-0.09	0.09	(-0.27,0.10)	0.370
Duration of injecting of the sample	169	-0.02	0.00	(-0.03, -0.01)	<0.001	-0.01	0.00	(-0.02,0.00)	0.025
Income level ^f (vs. High-income)									
Low- and middle-income class	329	0.09	0.03	(0.03, 0.15)	0.004	0.03	0.05	(-0.07,0.13)	0.530

Note. ^a Meta-regression coefficient

^b Standard error

^c In the previous 12 months

^d Aged <25 years

^e Adjusted for region

^f Country-level income class

Table 4: Study-level outcome variables associated with daily or more injecting among people who inject drugs

Study-level outcome variables	N	Univariable models				Multivariable models ^e			
		β^a	SE ^b	95% CIs	<i>p</i>	β	SE	95% CIs	<i>p</i>
Injecting risk behaviour ^c	124	0.31	0.06	(0.19, 0.43)	<0.001	0.34	0.06	(0.21, 0.47)	<0.001
HIV prevalence	218	0.17	0.04	(0.09, 0.25)	<0.001	0.18	0.04	(0.09, 0.27)	<0.001
Anti-HCV prevalence	173	0.25	0.06	(0.12, 0.37)	<0.001	0.38	0.07	(0.25, 0.50)	<0.001
Non-fatal overdose ^d	36	0.18	0.04	(0.09, 0.27)	<0.001	0.24	0.06	(0.13, 0.36)	<0.001

Note. ^a Meta-regression coefficient

^b Standard error

^c Self-report receptive sharing of needles and/or syringes in the previous month

^d Self-reported non-fatal overdose within the previous 12 months

^e Adjusted for region

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