Public Health Scotland

Needle Exchange Surveillance Initiative

Prevalence of blood-borne viruses and injecting risk behaviours among people who inject drugs attending injecting equipment provision services in Scotland, 2008 to 2020

GCU Glasgow Caledonian University Research Centre for Health (ReaCH)

NESI

West of Scotland SPECIALIST VIROLOGY CENTRE

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Contents

Key findings

- The average age of NESI participants has increased with each survey from 33 years old in 2008–09 to 41 years old in 2019–20, reflecting an ageing cohort of people who inject drugs (PWID) in Scotland.
- While heroin continues to be the most prevalent drug injected, cocaine injecting has increased in recent years, with 37% of those who had injected in the past six months reporting using it in 2019–20.
- Uptake of hepatitis C virus (HCV) and human immunodeficiency virus (HIV) testing has steadily increased over time with some of the highest rates reported in 2019–20, with 60% and 52% tested within the previous 12 months respectively.
- The proportion of participants who reported vaccination for the hepatitis B virus (HBV) is on a decreasing trend, with 68% reporting receipt of at least one dose in 2019–20 from a high of 77% in 2015–16.
- Whilst the majority of participants (63%) in 2019–20 had been prescribed a take-home naloxone kit in the past year, a minority (21%) were carrying naloxone at the time of interview.
- The prevalence of chronic HCV (i.e. active infection) has reduced markedly from 37% in 2015–16 to 19% in 2019–20, contemporaneous with the scale-up of HCV treatment among PWID in community settings. More than half (53%) of participants who would have been eligible for therapy (i.e. with evidence of either current or past chronic infection) reported having been treated for their HCV infection.
- Despite the reduction in chronic HCV prevalence, the incidence of infection remains high at 12 new HCV cases per 100 person-years in 2019–20.

- Seventy-three cases of HIV were detected in 2019–20, equating to a national prevalence of 3.1%. Most of these cases were interviewed at sites in NHS Greater Glasgow and Clyde (GGC) (n=49) and neighbouring NHS Lanarkshire (n=16). In NHS GGC (the setting of an HIV outbreak since 2015), the prevalence of HIV has stabilised at 4.8% in both the 2017–18 and 2019–20 surveys.
- More than half of participants in 2019–20 who were found to have chronic HCV or HIV (based on their anonymous dried blood spot test) reported that they were unaware of their infection.

1. Introduction

The aim of the Needle Exchange Surveillance Initiative (NESI) is to measure and monitor the prevalence of blood-borne viruses – hepatitis C virus (HCV) and human immunodeficiency virus (HIV) – and injecting risk behaviours among people who inject drugs (PWID) in Scotland. NESI provides information to evaluate and better target interventions aimed at reducing the spread of infection amongst PWID.

The initiative was initially funded by the Scottish Government as part of the Hepatitis C Action Plan,[1] which stated that efforts to prevent HCV in Scotland must focus on preventing transmission of the virus among PWID. More recently, however, the initiative has been funded under the auspices of the Scottish Government's Sexual Health and Blood Borne Virus Framework.[2,3] The most recent survey conducted in 2019–20 was supported by the National Institute for Health Research (NIHR) Programme Grants for Applied Research Programme (Grant Reference Number RP-PG-0616-20008) as part of the 'Evaluating the Population Impact of Hepatitis C Direct Acting Antiviral Treatment as Prevention for People Who Inject Drugs' (EPIToPe) study.[4]

This latest report presents the results at a Scotland level across seven surveys (from 2008–09 through to 2019–20), and at NHS Board level for the 2019–20 survey (for eight of the 11 mainland Scottish NHS Boards).

The impact of COVID-19 on NESI 2019–20

The World Health Organization declared SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) a global pandemic on 11 March 2020. On 23 March 2020, lockdown measures for Scotland and the rest of the UK were implemented with the aim of reducing transmission of COVID-19. The NESI 2019–20 survey was formally suspended on 17 March 2020, in response to guidance from NHS Scotland prohibiting face-to-face research.

Between July 2019 and March 2020, participants were recruited from eight of the 11 mainland Scottish NHS Boards (i.e. Ayrshire and Arran, Fife, Forth Valley, Greater Glasgow and Clyde, Highland, Lanarkshire, Lothian, and Tayside). Fieldwork was suspended midway through recruitment in NHS Lothian. Due to ongoing restrictions on face-to-face research since March 2020, it was not possible to initiate recruitment in the three remaining mainland Scottish NHS Boards (i.e. Dumfries and Galloway, Borders and Grampian). These three NHS boards combined account for approximately 10% of the total NESI sample (see **Appendix 1**). A total of 2,435 participants were nevertheless recruited to the 2019–20 survey, which relates entirely to the pre-pandemic period.

2. Overview of methods

A cross-sectional, voluntary, anonymous, bio-behavioural survey approach was used to recruit and interview PWID. Trained interviewers recruited participants from selected agencies and pharmacies that provide injecting equipment; these settings may also provide other harm reduction services, such as prescribed methadone. Clients attending these services were invited to take part if they had injected drugs on at least one occasion either recently or in the past, and if it was the first time they had participated in the current survey. However, recruitment of people who have injected in the past, but not in the previous six months, was limited to approximately 20–30% of participants during each survey. In addition, the number of individuals reporting injection of image and performance enhancing drugs (IPED) alone was capped at 5% of total recruitment in each NHS Board. More detailed methods are provided in **Appendix 1**.

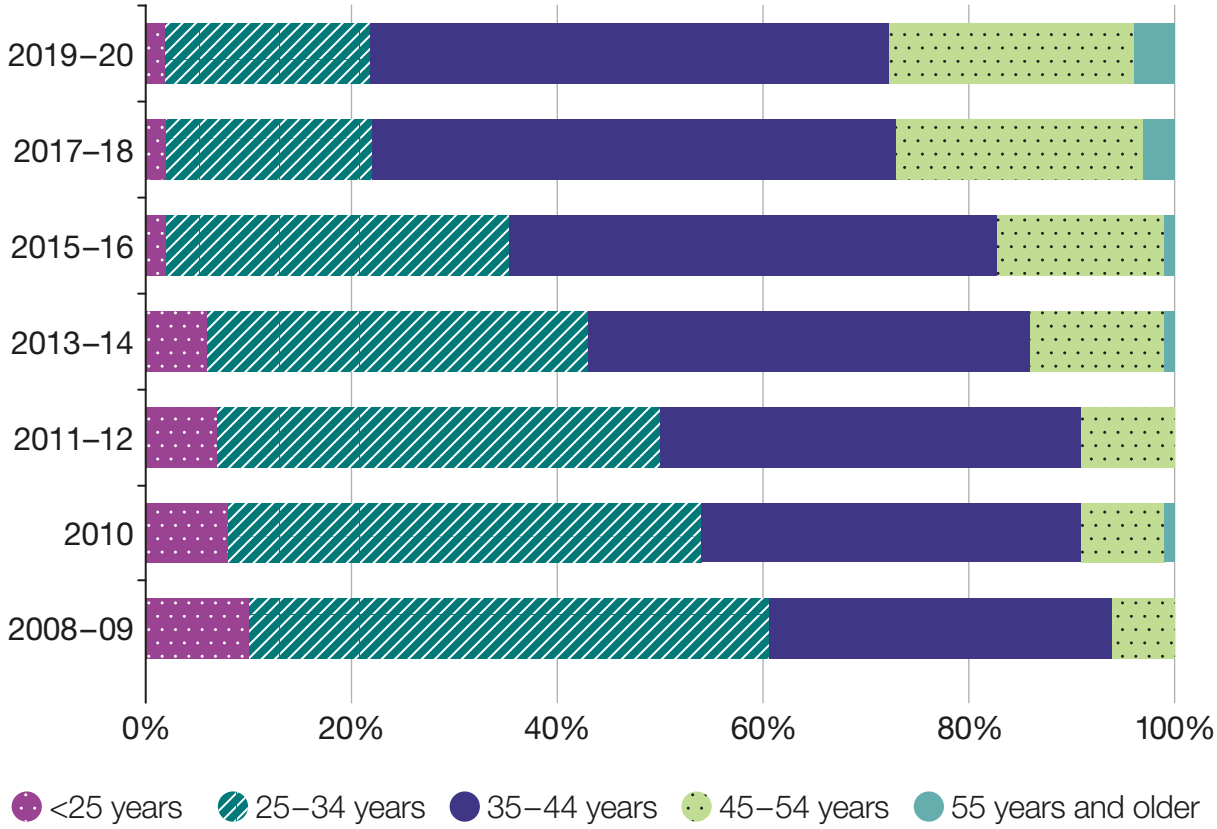
After providing informed consent, participants completed a short interviewer-administered questionnaire (**Appendix 2**) and then provided a voluntary blood spot sample for anonymous testing for blood-borne virus (BBV) markers. Participants who wished to know their HCV or HIV status were directed to the appropriate testing services.

3. Results

Demographics

An ageing cohort of PWID is evident in NESI over time with the proportion of those interviewed aged under 25 down from 10% (n=268) in 2008–09 to just 2% (n=45) in 2019–20 (**Table 1.1** and Figure 1). Correspondingly, the proportion of those aged 45 years and older has increased from 7% (n=171) in 2008–09 to 28% (n=685) in 2019–20. Additionally, age at first injection has remained largely static over time, which suggests that the increasing average age is a result of an ageing cohort of users, rather than simply new PWID who are starting injecting at an older age.

Figure 1: Proportion of NESI respondents by age group, 2008–2020



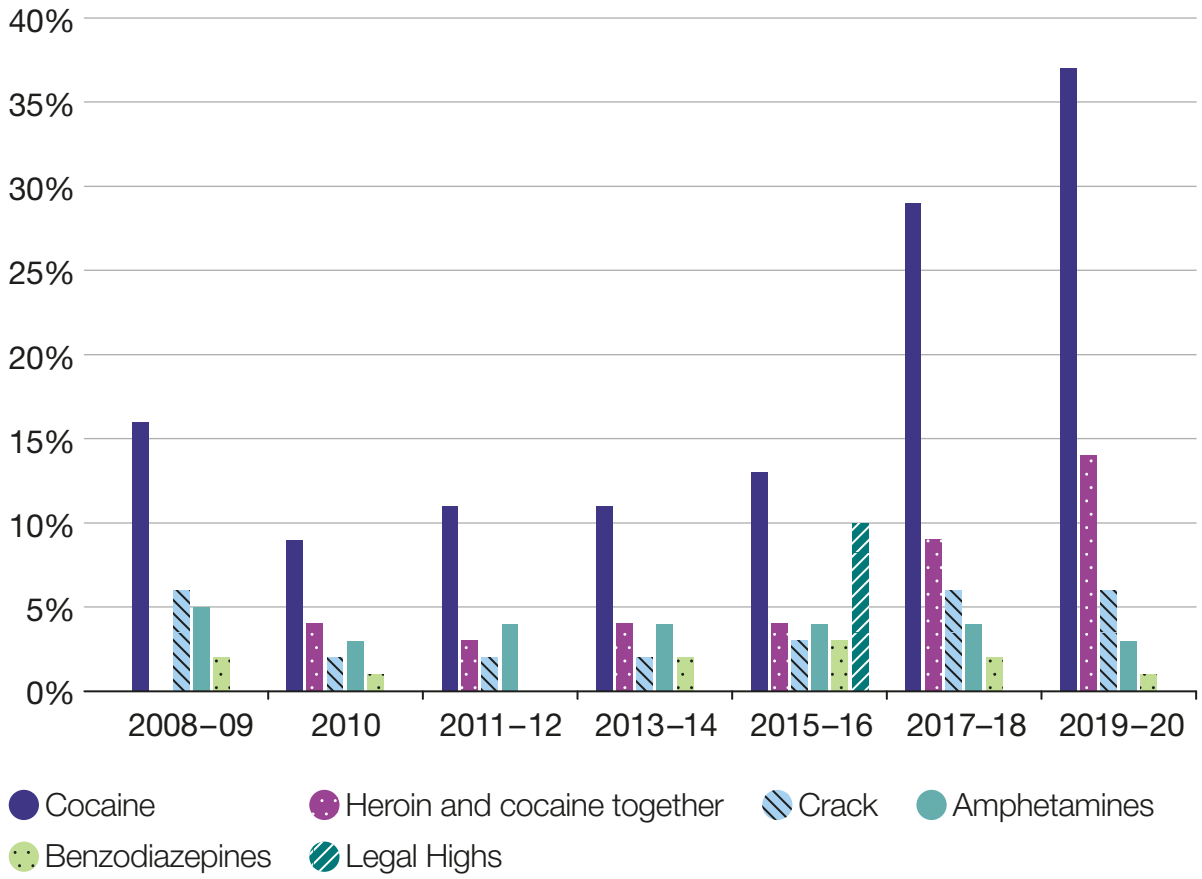
The proportion of male participants in NESI 2019–20 remained largely unchanged from previous surveys at 72% (n=1,746), as did the proportion who had been homeless at some point in the past six months (24%; n=586).

Drug trends

Heroin continues to be the most prevalent drug injected with 89% of those interviewed in 2019–20 reporting having injected it in the past six months, similar to levels in previous NESI surveys (**Table 1.1**). Reported injecting of cocaine has increased markedly over time from 9% in 2010 (n=217) to 37% (n=619) in 2019–20 (Figure 2), with levels highest in NHS GGC (54%; n=388) (**Table 2.1**). Cocaine injecting has been linked to an outbreak of HIV among PWID in GGC.[5]

The practice of injecting heroin and cocaine together, sometimes referred to as 'snowballing', also showed a marked increase, with a prevalence of 14% (n=239) in 2019–20, up from 9% (n=128) in 2017–18 and 4% (n=91) reported in 2015–16. Injection of 'legal highs' (i.e. novel psychoactive substances [NPS]), associated with increases in SSTIs and HCV in parts of Scotland in recent years,[6,7] was rare within the 2019–20 survey, reported by less than 10 participants.

Figure 2: Proportion of NESI respondents reporting injection of various drugs in the last six months, 2008–2020 (among those who reported injecting in the last six months), excluding heroin



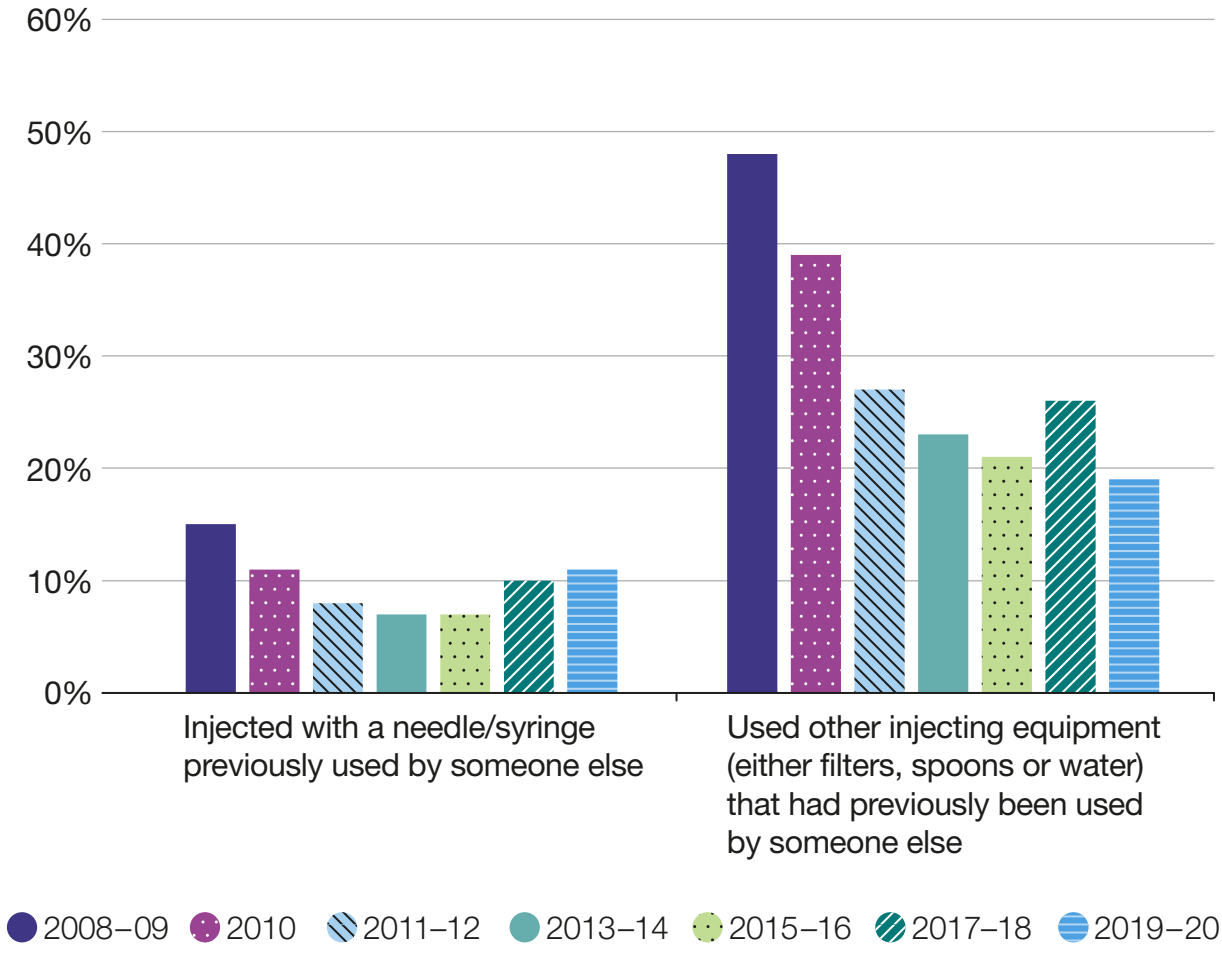
Injecting risk behaviour

Among respondents who had injected in the past six months, the proportion reporting 'daily or more' injecting (55%; n=907) has remained relatively stable over time accounting for around half of respondents in each survey (**Table 1.1** and Figure 3). Trends in reported personal re-use of their own needles and syringes decreased from 58% (n=848) in 2017–18 to 44% (n=726) in 2019–20 (**Table 1.2** and Figure 3).

Figure 3: Proportion of NESI respondents who reported injecting daily, and proportion who reported re-using their own equipment, 2008–2020 (among those who reported injecting in the last six months)

Levels of reported needle and syringe sharing in the past six months have increased slightly from a low of 7% (n=149) in 2015–16 to 11% (n=180) in 2019–20 (**Table 1.2** and Figure 4). Reported sharing of other injecting equipment (spoons/cookers, filters, water) in the past six months has continued to decline, from 26% (n=380) in 2017–18 to 19% (n=318) in 2019–20.

Figure 4: Proportion of NESI respondents who reported sharing injecting equipment, 2008–2020 (among those who reported injecting in the last six months)



In 2019–20, almost half of participants who had injected in the previous six months reported mainly injecting into the groin area (45%; n=741) and around a third into their arms (34%; n=571). Groin injecting was the most prevalent injecting site in all participating health boards except for NHS Highland (arms).

Uptake of harm reduction services

Blood-borne virus testing and vaccination

Hepatitis B (HBV) vaccination uptake fell again in 2019–20 after a steady increase between 2010 and 2016, with 68% of respondents in 2019–20 (n=1665) reporting having ever been vaccinated (**Table 1.3** and **Figure 5**). Previously, high coverage was attributed to the introduction of the universal prison vaccination in 1999, which has contributed to low levels of HBV infection among PWID in Scotland compared with other European countries.[8]

Uptake of HCV testing has increased consistently over time: the proportion of respondents who reported recent testing (i.e. in the last 12 months) increased from 35% in 2008–09 to 58% in 2019–20 (**Table 1.3** and **Figure 5**). When those who reported that they had been diagnosed with infection from a past test (that is, prior to 12 months ago) were excluded, the percentage of respondents who had been tested for HCV in the last year was 60%. This figure compares to 40%, 45%, 49%, 52%, 55% and 61% in 2008–09, 2010, 2011–12, 2013–14, 2015–16 and 2017–18 respectively.[i]

HCV testing rates were highest in NHS GGC (61%; n=627) and NHS Lothian (61%; n=97), and lowest in NHS Highland (50%; n=25) (**Table 2.3**) but may have been influenced by the sites used for NESI recruitment. For example, where NESI recruitment occurred at sites that routinely test for BBV, testing rates are likely to be higher. 54% of respondents (n=1193) reported receiving their last HCV test in a drug treatment centre, compared with 32% (n=629) in 2017–18. The next most frequent HCV testing locations were hospitals, GPs and prisons, with 14%, 13% and 13% of respondents reporting receiving their last HCV test in these locations, respectively (this compares with 20%, 16% and 16% recorded in 2017–18).

Similarly, consistent increases in uptake were observed for HIV testing: the proportion of respondents who reported recent testing (i.e. in the last 12 months) increased from 30% (n=766) in 2008–09 to 52% (n=1271) in 2019–20 (**Table 1.3** and **Figure 5**). Testing rates were highest in NHS GGC (58%; n=574) and NHS Lothian (55%; n=88) and lowest in

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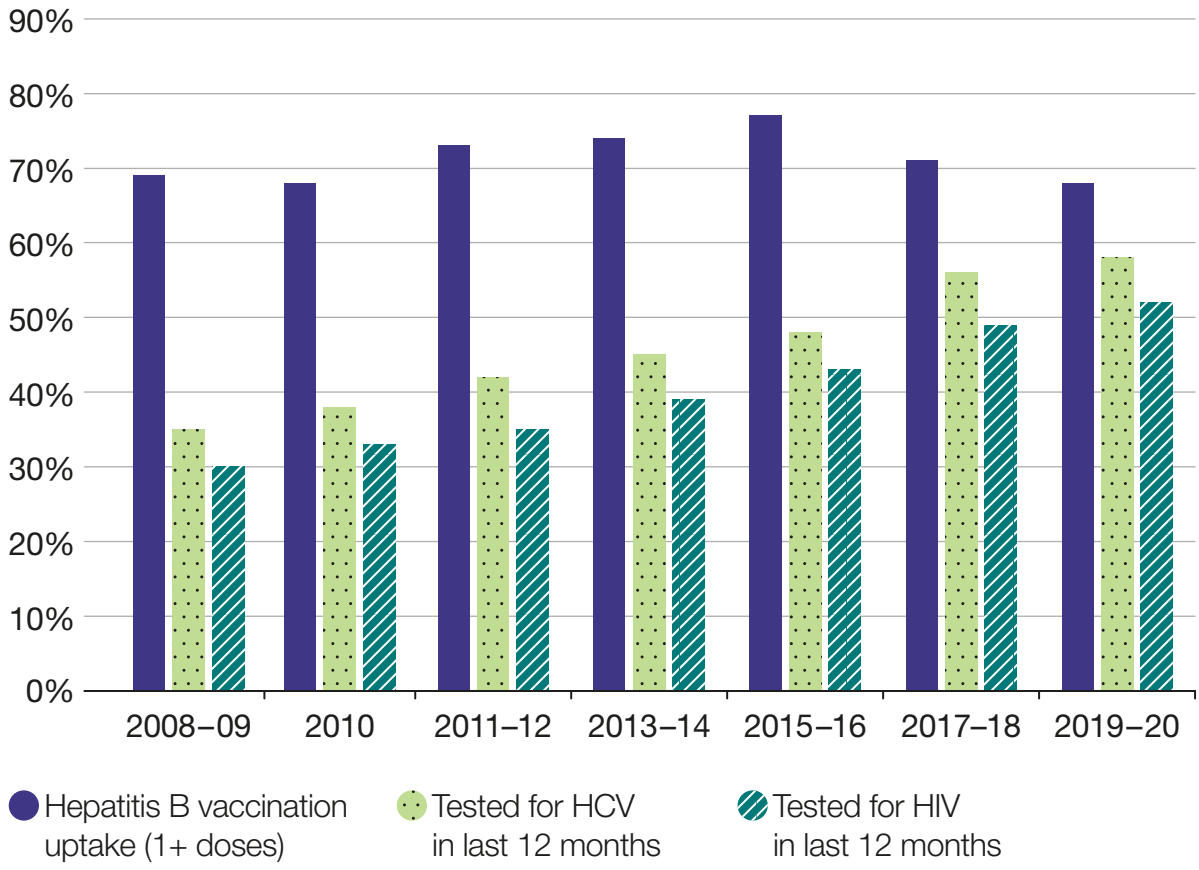
i The rationale for excluding those diagnosed from a past test is that they would not be eligible for continued routine testing. From the NESI data it is, however, not possible to determine whether those who reported testing positive in the last 12 months had been diagnosed previously. Therefore the figure of 60% may include some people who were ineligible for diagnostic testing in the last 12 months.

NHS Ayrshire and Arran (45%; n=116) and NHS Highland (40%; n=20) (**Table 2.3**). Again, HIV testing rates may have been influenced by the sites used for NESI recruitment. HIV testing rates in NHS GGC have also been enhanced recently in response to the ongoing outbreak.[9]

Figure 5: Proportion of NESI respondents who reported HBV vaccination and HCV/HIV test uptake, 2008–2020



Opioid agonist therapy

Self-reported uptake of methadone has fluctuated but remained high over the surveys, with 79% (n=1307) of participants in 2019–20 who were currently injecting (i.e. had injected in the last six months) reporting receipt of prescribed methadone in the last six months (**Table 1.3**). When restricted to participants who were visiting the service to obtain sterile injecting equipment (on the occasion of their recruitment into the study), the proportion who had received prescribed methadone in the last six months decreased to 66% (n=323). Less than one in 20 participants (4%; n=66) reported being prescribed buprenorphine within the last six months.

Sterile injecting equipment

The fluctuating trend in reported average numbers of sterile needles/syringes accessed by participants continued with a mean of 14 per week in 2019–20, down from 17 per week in 2017–18, but similar to the average reported in 2011–12 (**Table 1.3**). Respondents also reported uptake of filters (89%, n=1480) and spoons (89%, n=1481) in 2019–20, slightly less than in the 2017–18 survey year, and, on average, respondents reported receiving fewer of these items per week in 2019–20 (15 each) as compared to 2017–18 (19 each). Notably, 85% of participants (n=1403) reported uptake of sterile water in 2019-20 (which has steadily increased since 2 ml plastic ampoules were introduced from late 2012).

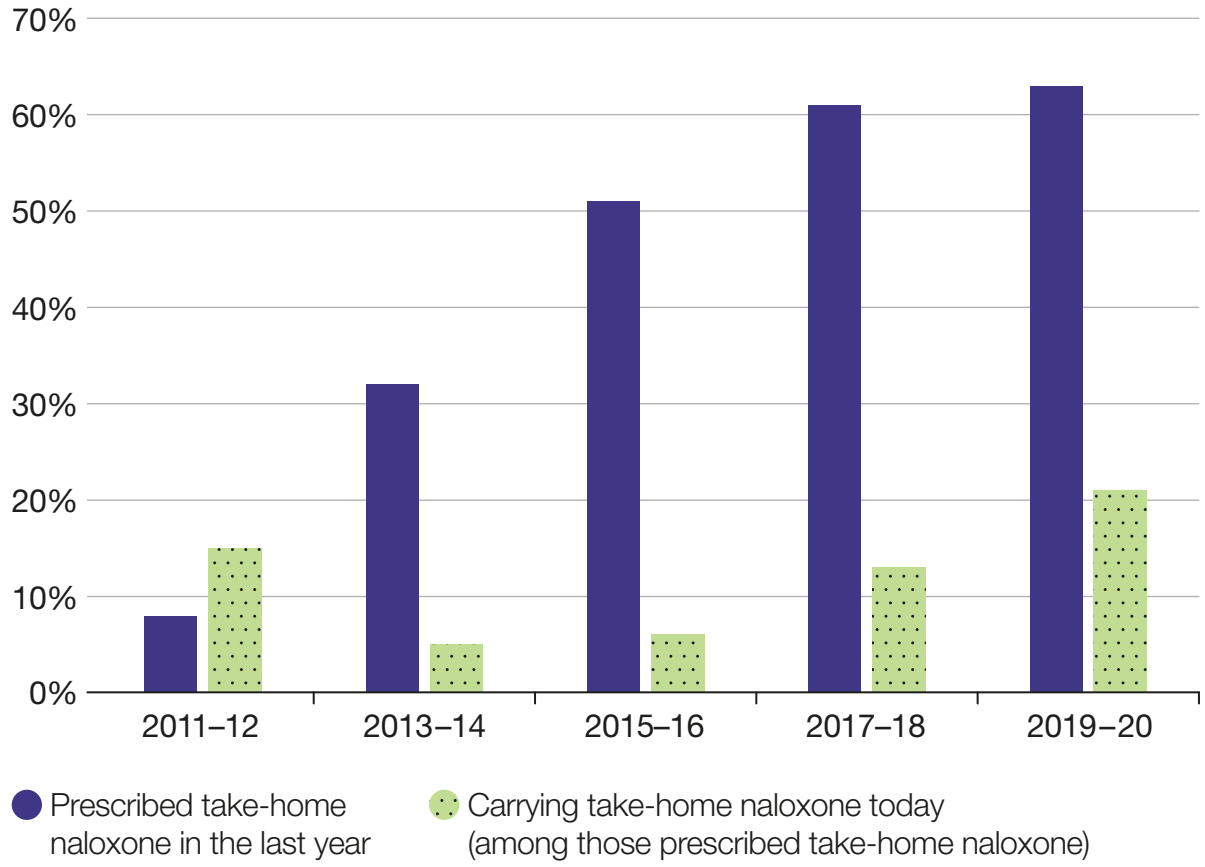
Foil

The 2019–20 data reflect increasing engagement with foil (for smoking drugs) since it was rolled out nationally from September 2016. In 2019–20, 45% of respondents (n=750) reported uptake of this item in the last six months, compared with 35% (n=513) of the sample in 2017–18. Foil uptake in 2019–20 varied between areas with the highest rates in NHS Highland (59%; n=20) and NHS Lanarkshire (51%; n=105), and lower rates in NHS Fife (38%, n=32), NHS Tayside (37%, n=83) and NHS Forth Valley (31%; n=36). Foil uptake in Scotland has been associated with smoking or snorting heroin and lower injecting frequency.[10]

Take-home naloxone

Naloxone is an opioid antagonist that is supplied to people who use drugs, their friends, family members and a range of health and other professionals likely to encounter overdose. It is commonly known as 'take-home naloxone'. The proportion of NESI participants who reported that they had been prescribed a take-home naloxone kit in the past year rose from 8% (n=175) in 2011–12 to 63% (n=1544) in 2019–20 (**Table 1.3** and **Figure 6**). Naloxone prescribing rates were highest in NHS Forth Valley (72%; n=115) and NHS Lothian (70%, n=112), but lower in NHS Lanarkshire (53%; n=180) and NHS Highland (54%; n=27) (**Table 2.3**). In contrast, the carriage rate (i.e. the proportion of people carrying naloxone at the time of their NESI interview) remained low at 21% (n=318), although this is an improvement from 13% (n=172) recorded in 2017–18 and 6% (n=85) recorded in 2015–16 (**Table 1.3** and **Figure 6**).

Figure 6: Self-reported naloxone prescribing and carriage rates among NESI respondents, 2011–2020



HCV therapy

In 2019–20, 70% (n=506) of those who self-reported as eligible for treatment[ii] had received therapy for their HCV infection, an increase from 50% (n=387) in 2017–18 and 28% (n=229) in 2015–16 (**Table 1.4**). Of those who had ever received therapy, 49% (n=248) had received it in the last year. This compares to 44% (n=170) in 2017–18 and 36% (n=82) in 2015–16. Self-reported treatment engagement may, however, overestimate treatment uptake as it only includes individuals who are aware of their infection (i.e. who report they have HCV or have cleared HCV through treatment). When all participants eligible for treatment (i.e. with evidence of either current or past chronic infection, based on a combination of their dried blood spot test result and self-report data) are included, 53% report having been treated for their HCV infection. More than half of respondents reported starting their most recent course of therapy in a community site (52%; n=265), an increase from 30% (n=117) in 2017–18. In 2019–20, the most common community sites for starting HCV therapy were pharmacy-based and non-pharmacy-based drug treatment settings (35% and 13%, respectively).

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ii i.e. answered they have HCV or had cleared HCV through treatment.

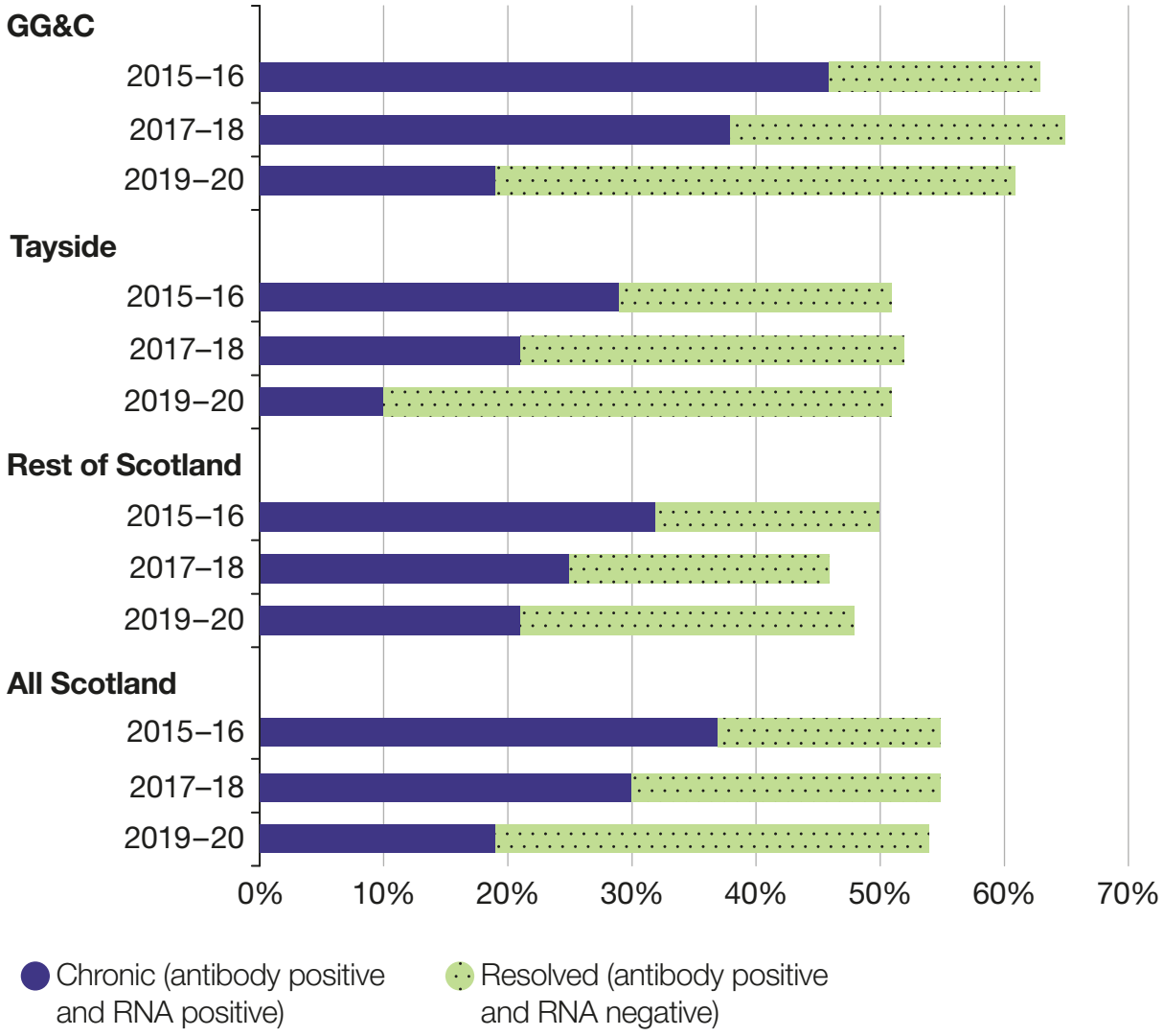
Blood-borne virus prevalence and incidence

HCV prevalence

In 2019–20, HCV antibody prevalence among PWID remained high at 55% (n=1320) (**Table 1.5**). Rates were highest in NHS GGC (62%; n=632) and NHS Ayrshire and Arran (56%; n=142) (**Table 2.5**). The prevalence of HCV antibodies, however, is only a marker of 'ever infection' and provides no information about whether an individual has an **active** infection or has **cleared** their infection.

We conducted RNA testing on the HCV antibody positive samples to determine how many individuals had chronic HCV (i.e. had an active infection at the time of the survey) or had cleared HCV. The last three NESI surveys have seen a marked reduction in the prevalence of chronic HCV in Scotland overall, from 37% (n=909) in 2015–16 down to 19% (n=444) in 2019–20 (**Table 1.5** and **Figure 7**). This decline in chronic HCV prevalence, which has been observed predominantly in NHS Tayside and GGC, is most likely attributable to the increase in uptake of HCV therapy following the introduction of new direct-acting antiviral therapies (DAAs). In particular, the decline in chronic HCV can be associated with efforts to increase treatment for HCV infection among people who are actively injecting drugs by offering it in a range of community settings such as drug treatment centres, pharmacies and injecting equipment provision (IEP) sites.[11]

Figure 7: Proportion of NESI respondents with chronic and cleared HCV infection during the era of direct-acting antiviral therapy, 2015–2020



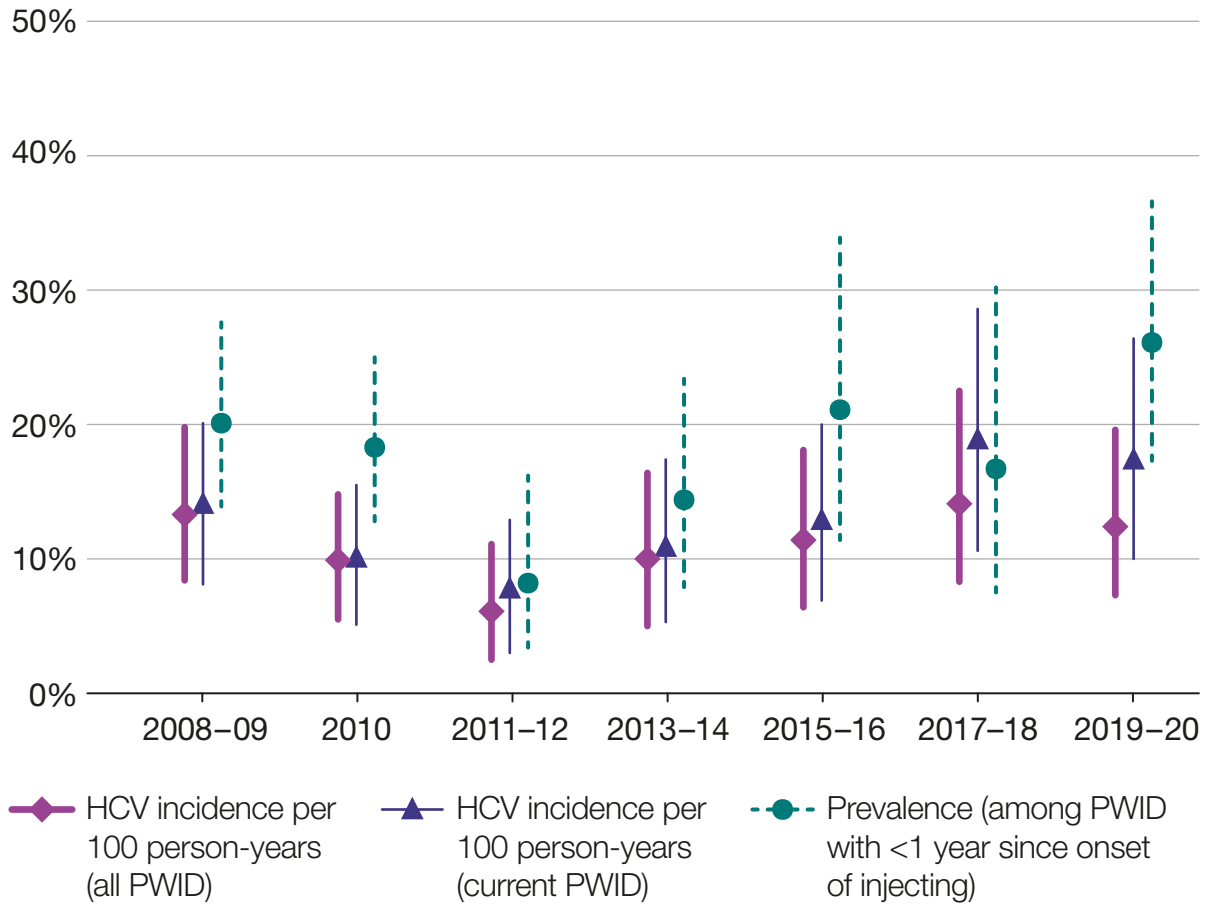
HCV incidence

An indicator of recently acquired HCV infection is HCV prevalence among those who had recently commenced injecting: in 2019–20, this was 26% (n=23), 31% (n=58) and 33% (n=98) among those who had been injecting for less than 1 year, 3 years and 5 years, respectively (**Table 1.5**).

In 2019–20, 20 respondents were found to be HCV RNA positive and HCV antibody negative, another indicator of recent infection. This translates into an incidence rate of 12.4 new HCV infections per 100 person-years (see **Appendix 1** for details on calculating this figure). HCV incidence reached a low point of 6.1 per 100 person-years in 2011–12, having declined from 13.3 in 2008-09. In 2017–18 the figure peaked at 14.1 per 100 person-years

(**Table 1.5**, Figure 8). HCV incidence among those who had injected in the last six months remained largely unchanged, with 16.9 new HCV infections per 100 person-years in 2019–20 (versus 18.4 in 2017–18) (**Table 1.5** and Figure 8).

Figure 8: Indicators of recently acquired HCV infection among NESI respondents, 2008–2020. The method for calculating HCV incidence is described in **Appendix 1**



Diagnosed and undiagnosed HCV infection

Among people who had a chronic HCV infection (i.e. HCV antibody positive and RNA positive) on dried blood spot (DBS) testing, 48% (n=215) in 2019–20 self-reported that they had been diagnosed (**Table 1.5**), a decrease from 60% in 2017–18.

HIV prevalence

HIV prevalence has been measured from 2011–12 onwards and has increased over time from 0.3% (n=6) across Scotland in 2011–12 to 3.1% (n=73) in 2019–20 (**Table 1.5**), driven primarily by an outbreak of HIV infection among PWID in GGC.[5] In 2019–20, HIV prevalence was 4.9% (n=16) in NHS Lanarkshire (compared with 1.2% in 2017–18) and 4.8% (n=49) in NHS GGC (compared with 4.8%, n=39 in 2017–18). In Glasgow City Centre, where the outbreak was initially identified and concentrated, HIV prevalence was 10.6% (n=25) compared with 10.8% in 2017–18).

Diagnosed and undiagnosed HIV infection

Among people who were positive for HIV antibodies on dried blood spot testing, 42% (n=31) self-reported that they were HIV positive, 34% (n=25) self-reported that they were HIV negative and a further 23% (n=17) were unaware of their status. Thus, in total, 58% (n=42) reported that they were unaware of their HIV infection (**Table 1.5**). In all boards where cases were identified, cases were detected that had not been self-diagnosed (i.e. self-reported that they were HIV negative or unaware of their status).

Other drug-related health harms

Severe soft tissue infections

In 2019–20, 16% (n=388) of respondents reported having a severe soft tissue infection in the last year. This compares with 20% (n=430) in 2017–18, 17% in 2015–16 and 24% in 2013–14 (**Table 1.6**). Medium to high uptake of IEP and opioid agonist therapy combined has been associated with lower risk of acquiring a severe soft tissue infection compared to those with low uptake.[12]

Non-fatal overdose

In 2019–20, 16% (n=385) of respondents reported having overdosed to the point of losing consciousness in the last year, similar to levels reported in 2017–18 (15%; n=312) (**Table 1.6**).

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Dumfries and Galloway

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Fife

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Grampian

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Lanarkshire

Ross Millar, Harm Reduction Team Leader

Staff at all participating pharmacies and IEP sites in NHS Lanarkshire

Lothian

Jim Shanley, Harm Reduction Team Leader

Staff at all participating pharmacies and IEP sites in NHS Lothian

Tayside

Donna Thain, Sexual Health and BBV Managed Care Network Manager

Staff at all participating pharmacies and IEP sites in NHS Tayside

Appendix 1: Survey methods

Participants, eligibility and setting

The first COVID-19 diagnosis in Scotland was notified on 1 March 2020. The World Health Organization declared COVID-19 a global pandemic on 11 March 2020. On 23 March 2020, lockdown measures for Scotland and the rest of the UK were implemented. NESI 2019–20 was formally suspended on 17 March 2020 in response to guidance from NHS Scotland prohibiting face-to-face research until further instruction. Fieldwork was suspended midway through recruitment in NHS Lothian. Participant recruitment could not be undertaken in the three remaining mainland Scottish NHS Boards (Dumfries and Galloway, Borders and Grampian). The 2019–20 sample therefore includes pre-COVID-19 data from eight boards originally included in the NESI sampling framework. The three 'missing' boards usually account for approximately 10% of the total NESI sample (**Table A1**).

Participants were recruited from selected agencies and pharmacies that provide injecting equipment. Services were selected if they were willing to take part in the initiative and if they had a private room in which interviews could be conducted. The 2019–20 survey was conducted from July 2019 through to March 2020 and participants were recruited from 76 pharmacies and 20 agencies providing fixed site, mobile or outreach IEP services across eight of the 11 mainland NHS Boards. In total, 34% of all services providing injecting equipment in mainland Scotland participated as recruitment sites in 2019–20 (**Table A2**).[13]

Table A1: Percentage of recruitment in the NESI survey (2008-20) shown by NHS Board

NHS Board	2008–09 survey	2010 survey	2011–12 survey	2013–14 survey	2015–16 survey	2017–18 survey	2019–20 survey
Ayrshire and Arran	136 (5%)	176 (6%)	124 (6%)	128 (5%)	168 (6%)	178 (8%)	256 (11%)
Borders	6 (0%)	25 (1%)	25 (1%)	27 (1%)	25 (1%)	30 (1%)	0 (0%)[a]
Dumfries and Galloway	67 (3%)	64 (2%)	53 (2%)	55 (2%)	54 (2%)	52 (2%)	0 (0%)[a]
Fife	105 (4%)	144 (5%)	121 (6%)	137 (6%)	107 (4%)	92 (4%)	125 (5%)
Forth Valley	89 (3%)	70 (2%)	74 (3%)	92 (4%)	107 (4%)	102 (5%)	159 (7%)
Grampian	469 (18%)	270 (9%)	221 (10%)	191 (8%)	226 (8%)	158 (7%)	0 (0%)[a]
Greater Glasgow and Clyde	1018 (39%)	1466 (46%)	927 (43%)	914 (39%)	944 (35%)	854 (40%)	1030 (42%)
Highland	37 (1%)	36 (1%)	61 (3%)	106 (5%)	107 (4%)	56 (3%)	50 (2%)
Lanarkshire	198 (8%)	301 (10%)	167 (8%)	205 (9%)	219 (8%)	184 (9%)	337 (14%)
Lothian	307 (12%)	392 (12%)	260 (12%)	280 (12%)	475 (18%)	213 (10%)	159 (7%)[b]
Tayside	197 (7%)	224 (7%)	121 (6%)	209 (9%)	264 (10%)	211 (10%)	319 (13%)
Scotland	**2,629[c]**	**3,168[c]**	**2,154[c]**	**2,344[c]**	**2,696[c]**	**2,130[c]**	**2,435[d]**

a Recruitment was not possible in 2019–20 in NHS Borders, NHS Dumfries and Galloway and NHS Grampian owing to the impact of the COVID-19 pandemic, which led to prohibitions on face-to-face research.

b Recruitment was suspended in NHS Lothian due to COVID-19 pandemic restrictions before target numbers were reached.

c Excludes island NHS Boards.

d Excludes island NHS Boards, NHS Borders, NHS Dumfries and Galloway and NHS Grampian.

Table A2: Number of recruitment sites included in the 2019–20 NESI survey, by NHS Board

NHS Board	Pharmacies Total (PHS survey 2019–20)[a]	Pharmacies NESI recruitment sites, 2019–20 (% of PHS total)	Agencies Total (PHS survey 2019–20)[a]	Agencies NESI recruitment sites, 2019–20 (% of PHS total)	Total Total (PHS survey 2019–20)[a]	Total NESI recruitment sites, 2019–20 (% of PHS total)
Ayrshire and Arran	10	7 (70%)	9	4 (44%)	19	11 (58%)
Borders[b]	7	0 (0%)	1	0 (0%)	8	0 (0%)
Dumfries and Galloway[b]	11	0 (0%)	3	0 (0%)	14	0 (0%)
Fife	19	5 (26%)	4	3 (75%)	23	8 (35%)
Forth Valley	16	6 (38%)	5	1 (20%)	21	7 (33%)
Grampian[b]	18	0 (0%)	12	0 (0%)	30	0 (0%)
Greater Glasgow and Clyde	59	28 (47%)	9	4 (44%)	68	32 (47%)
Highland	17	2 (12%)	6	2 (33%)	23	4 (17%)
Lanarkshire	24	17 (71%)	1	1 (100%)	25	18 (72%)
Lothian	16	4 (25%)	14	2 (14%)	30	6 (20%)[c]
Tayside	16	7 (44%)	2	3 (150%)	18	10 (56%)
Scotland[d]	**213**	**76 (36%)**	**66**	**20 (30%)**	**279**	**96 (34%)**

a See reference 13

b Recruitment was not possible in 2019–20 in NHS Borders, NHS Dumfries and Galloway and NHS Grampian owing to the impact of the COVID-19 pandemic, which led to prohibitions on face-to-face research.

c Recruitment was suspended in NHS Lothian due to COVID-19 pandemic restrictions before target numbers were reached.

d Excludes island NHS Boards, Borders, Dumfries and Galloway and Grampian.

Clients attending the service were approached by trained interviewers and assessed for eligibility: participants were eligible if they had injected drugs on at least one occasion and if it was the first time that they had participated in the current survey year. All eligible participants were invited to take part in the survey. The interviewers first informed them about the purpose of the survey and explained that it was voluntary, anonymous and confidential. Upon giving informed consent, participants were then asked to complete a short interviewer-led questionnaire to elicit key demographic and behavioural information and to supply a blood spot sample to be tested anonymously for HCV and other blood-borne viruses. An individual's blood spot sample was linked to the corresponding questionnaire through an assigned study number. Participants who wished to find out their HCV or HIV status were referred to the appropriate services. A £10 shopping voucher was provided to participants as compensation for their time.

Ethical approval to conduct the study was obtained from West Glasgow NHS Ethics Committee (REC Ref: 08/S0709/46). NHS Research and Development approval was obtained from all participating NHS Boards.

Participation

Where individuals participated more than once in the survey, the responses and blood sample results from their first participation were retained for analyses. Any subsequent questionnaires and blood samples taken were excluded from all analyses. Duplicate responses were identified where participants' initials, date of birth, sex and NHS Board of interview were identical. In the 2019–20 survey for example, while a total of 2,500 questionnaires were completed, 2,435 (97%) were completed by unique individuals and included in this report.

All respondents were asked the main reason for their visit to the service (recruitment site) on that day (**Table A3**). Overall, 21% of respondents reported attendance for the purpose of obtaining injecting equipment, 40% reported collection or consumption of a methadone prescription and a further 37% reported another reason. The 'other' reasons included: attending an appointment, to complete survey, using the drop-in service, to see the harm reduction team, accompanying someone else or other prescription collection.

Table A3: Self-reported reason for visit to service (recruitment site), 2019–20

NHS Board	Injecting equipment	Methadone	Other	Not reported	Total
Ayrshire and Arran	65 (25%)	94 (37%)	94 (37%)	3 (1%)	256
Borders[a]	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Dumfries and Galloway[a]	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Fife	31 (25%)	58 (46%)	34 (27%)	2 (2%)	125
Forth Valley	51 (32%)	70 (44%)	37 (23%)	1 (1%)	159
Grampian[a]	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Greater Glasgow and Clyde	181 (18%)	461 (45%)	377 (37%)	11 (1%)	1030
Highland	8 (16%)	11 (22%)	29 (58%)	2 (4%)	50
Lanarkshire	92 (27%)	123 (36%)	107 (32%)	15 (4%)	337
Lothian	46 (29%)	73 (46%)	40 (25%)	0 (0%)	159
Tayside	38 (12%)	90 (28%)	183 (57%)	8 (3%)	319
Total	**512 (21%)**	**980 (40%)**	**901 (37%)**	**42 (2%)**	**2,435**

a Recruitment was not possible in 2019–20 in NHS Borders, NHS Dumfries and Galloway and NHS Grampian owing to the impact of the COVID-19 pandemic, which led to prohibitions on face-to-face research.

Laboratory testing

For the 2008–09 through 2013–14 surveys, dried blood spots (DBS) were extracted and tested in a modification of the Ortho Save 3.0 EIA, as described by Judd et al.[14] Two 3mm discs were punched from DBS and eluted in 200µl of PBS/0.05% tween. Samples generating an optical density of <0.4, 0.4–0.79, and >0.8 were considered negative, weakly reactive and positive for HCV antibodies, respectively. The weak reactive samples were considered HCV antibody positive for this report. An aliquot of the eluted DBS was also tested on the Abbott Architect i2000sr using the Architect HIV Ag/Ab Combo assay. All HIV positives were confirmed by repeat testing on the Architect and by the ImmunoComb II HIV 1&2 BiSpot (Orgenics). The immunocomb detected antibody only and differentiated between HIV-1 and HIV-2.

From 2015–16 onwards, a slightly different method for HCV and HIV antibody detection was applied. Two 1cm DBS spots were added to 0.75ml of PBS/tween 0.05% buffer; the spots were left to elute either overnight at room temperature or at 4°C for 48 hours. The eluate was then spun for five minutes at 13,000rpm and tested on the Abbott Architect i2000sr using the following assays: Architect Anti-HCV assay and Architect HIV Ag/Ab Combo assay. HIV positive samples were confirmed by re-testing the eluate on the Architect and by using a supplemental antibody assay. In 2015–16 the supplemental assay was ImmunoComb II HIV 1&2 BiSpot (Orgenics) and from 2017 it was the Geenius HIV 1/2 (Bio-Rad).

For surveys up to 2018, HCV RNA was tested using an 'in-house' PCR (polymerase chain reaction) assay using the bioMerieux extraction protocol for DBS on the Easymag and a real-time PCR. The method of HCV RNA detection in DBS was described in Bennett et al.[15]

For the 2019–2020 survey, HCV RNA was extracted and amplified using a laboratory defined protocol on the Abbott m2000sp and m2000rt platform.[16] In all surveys, for participants who were HCV antibody negative, the PCR testing was carried out in pools of five and all positive pools were then tested individually. Both the in-house and the Abbott m2000 testing systems detect to 1000 IU/ml in DBS.

Calculating HCV incidence

After an individual has been exposed to HCV, there is a 'window period' wherein the virus (i.e. RNA) is detectable but the individual has not yet formed antibodies. Individuals in this window period, i.e. individuals with very recently acquired HCV infection, will therefore test HCV antibody negative and HCV RNA positive. An estimate of HCV incidence can then be derived using the formula:

$$I = \frac{(365/T)n}{(N-n)+(365/T)n}$$

where T is the estimated duration of the window period, n is the number of recently acquired infections and N is the number of susceptibles (i.e. HCV antibody negatives).[17,18] An estimate of the duration of the window period (51 days) was derived from the literature.[19]

Appendix 2: 2019–20 questionnaire

The questionnaire is available at: **https://publichealthscotland.scot/publications/needle-exchange-surveillance-initiative-nesi/**

Appendix 3: Participating sites

Ayrshire and Arran NHS board

Bentinck Centre, Kilmarnock

Boots Pharmacy, Irvine

Boots Pharmacy, Saltcoats

Care and Share, Ayr

Kilbirnie Health Centre

Kilwinning Pharmacy

Lloyds Pharmacy, Cumnock

Lloyds Pharmacy, Stevenston

Lloyds Pharmacy, Wellington Square, Ayr

Stevenston Health Centre

Toll Pharmacy, Prestwick

Fife NHS board

Addaction, Dunfermline

Addaction Outreach Van, Fife

Addaction, Leven

Dears Pharmacy, Dunfermline

Lloyds Pharmacy, Viceroy St, Kirkcaldy

St Clair Pharmacy, Kirkcaldy

Well Pharmacy, Dunfermline

Well Pharmacy, Lochgelly

Forth Valley NHS board

Graeme Pharmacy, Falkirk

Lindsay & Gilmour Pharmacy, Stirling

Lloyds Pharmacy, Alloa

Lloyds Pharmacy, Falkirk

Lloyds Pharmacy, Grangemouth

Signpost Recovery, Falkirk

Superdrug, Thistle Centre, Stirling

Greater Glasgow and Clyde NHS board

Abbey Pharmacy, Trongate, Glasgow

Abbey Pharmacy, Paisley

Alliance Boots Pharmacy, Hillington Road South

Boots Pharmacy, 200 Sauchiehall St, Glasgow

Boots Pharmacy, Alexandria

Boots Pharmacy, Buchanan Galleries, Glasgow

Boots Pharmacy, Clydebank

Boots Pharmacy, Crown Street, Glasgow

Boots Pharmacy, Duke Street, Glasgow

Boots Pharmacy, Johnstone

Boots Pharmacy, Neilston Road, Paisley

Boots Pharmacy, Queen Margaret Drive, Glasgow

Boots Pharmacy, Shettleston Road, Glasgow

Boots Pharmacy, Victoria Road, Glasgow

Dunnet Pharmacy, Glasgow

E.R. McAnearney Pharmacy, Greenock

Glasgow Drug Crisis Centre (West Street, Glasgow)

Glasgow Outreach Van, Glasgow

Harmony Row Pharmacy, Govan

Houlihan Pharmacy, Possilpark

John Gilbride Pharmacy, Ibrox, Glasgow

Lloyds Pharmacy, Abercromby Street, Glasgow

Lloyds Pharmacy, Drumchapel

Lloyds Pharmacy, Easterhouse

Lloyds Pharmacy, Knightswood

Lloyds Pharmacy, Maryhill Road, Glasgow

M&D Green Pharmacy, Port Glasgow

Partick Pharmacy, Glasgow

Renfrewshire Drugs Service

Rowlands Pharmacy, Springburn

Simon Community Hub, Glasgow

Highland NHS board

Boots Pharmacy, Eastgate, Inverness

Harm Reduction Service, Inverness

Osprey House, Inverness

Well Pharmacy, Dunoon

Lanarkshire NHS board

Alliance Boots Pharmacy, East Kilbride

Alliance Boots Pharmacy, Hamilton

Boots Pharmacy, Airdrie

Boots Pharmacy, Cambuslang

Boots Pharmacy, Coatbridge

Boots Pharmacy, Hamilton

Boots Pharmacy, Larkhall

Boots Pharmacy, Rutherglen

Gilbride Pharmacy, Blantyre

Lanarkshire Outreach Van

Lloyds Pharmacy, Coatbridge

Lloyds Pharmacy, Motherwell

Lloyds Pharmacy, Wishaw

M&D Green Pharmacy, Burnside

McIntyre Pharmacy, Wishaw

Monklands Pharmacy, Airdrie

New Stevenston Pharmacy, Motherwell

Village Pharmacy, Cumbernauld

Lothian NHS board

Boots Pharmacy, Shandwick Place, Edinburgh

Lindsay and Gilmour Pharmacy, Leith Walk, Edinburgh

MacKinnon Pharmacy, Calder Road, Edinburgh

Newington Pharmacy, Clerk St, Edinburgh

Spittal Street Centre, Edinburgh

Turning Point, Leith

Tayside NHS board

Addaction, Dundee

Cairn Centre, Dundee

Co-Op Pharmacy, Fisheracre, Arbroath

Co-Op Pharmacy, High Street, Arbroath

Davidsons Chemists, Forfar

Davidsons Chemists, Perth

Drumhar Health Centre, Perth

J&K Richardson Pharmacy, Dundee

Lloyds Pharmacy, Albert Street, Dundee

Lloyds Pharmacy, High Street, Dundee

Appendix 4: Peer-reviewed publications arising from NESI[iii]

Allen EJ et al. Association between harm reduction intervention uptake and recent hepatitis C infection among people who inject drugs attending sites that provide sterile injecting equipment in Scotland. Int J Drug Policy. 2012; 23(5): 346–352.

Aspinall E, Hutchinson SJ, et al. Uptake of paraphernalia from injecting equipment provision services and its association with sharing of paraphernalia among injecting drug users in Scotland. Drug Alcohol Depend. 2012; 126(3): 340–346.

Burton G, McAuley A, Schofield J, Yeung A, Matheson C and Parkes T. A systematic review and meta-analysis of the prevalence of take-home naloxone (THN) ownership and carriage. Int J Drug Policy. 2021 Oct; 96:103298.

Dunleavy K, Munro A, Roy K, Hutchinson SJ, Palmateer N, Knox T, et al. Association between harm reduction intervention uptake and skin and soft tissue infections among people who inject drugs. Drug Alcohol Depend. 2017; 174: 91–97.

Dunleavy K, Hutchinson SJ, Palmateer N, et al. The uptake of foil from needle and syringe provision services and its role in smoking or snorting heroin among people who inject drugs in Scotland. Int J Drug Policy. 2021 Jul 30; 98:103369.

Hickman M, Dillon JF, Elliott L, DeAngelis D, et al. Evaluating the population impact of Hepatitis C direct acting antiviral treatment as prevention for people who inject drugs (EPIToPe) – a natural experiment (protocol). BMJ Open. 2019 9:e029538.

McAuley A, Munro A, Bird SM, Hutchinson SJ, Goldberg DJ and Taylor A. Engagement in a National Naloxone Programme among people who inject drugs. Drug Alcohol Depend. 2016; 162: 236–240.

McAuley A, Yeung A, Taylor A, Hutchinson SJ, Goldberg DJ and Munro A. Emergence of Novel Psychoactive Substance injecting associated with rapid rise in the population prevalence of hepatitis C virus. Int J Drug Policy. 2019 Apr; 66:30–37.

McAuley A, Palmateer N, Goldberg DJ, Trayner K, et al. Re-emergence of injecting drug use-related HIV despite a comprehensive harm reduction environment: a cross sectional analysis. The Lancet HIV. 2019 May; 6(5): e315–e324.

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iii This list does not include papers that utilise NESI data indirectly, e.g. to parameterise mathematical models.

McDonald S, Hutchinson SJ, Palmateer N, Allen E, Cameron S, et al. Decrease in health-related quality of life associated with awareness of hepatitis C virus infection among people who inject drugs in Scotland. J Hepatol. 2013; 58(3): 460–466.

O'Leary MC, Hutchinson SJ, Allen E, Palmateer N, Cameron S and Taylor A, et al. The association between alcohol use and hepatitis C status among injecting drug users in Glasgow. Drug Alcohol Depend. 2012; 123(1-3): 180–189.

Palmateer N, Hutchinson SJ, McAllister G, et al. Risk of transmission associated with sharing drug injecting paraphernalia: analysis of recent hepatitis C virus (HCV) infection using cross-sectional survey data. J Viral Hepat. 2014; 21(1): 25–32.

Palmateer N, Taylor A, Goldberg DJ, Munro A, et al. Rapid decline in HCV incidence among people who inject drugs associated with national scale-up in coverage of a combination of harm reduction interventions. PLoS One. 2014; 9(8): e104515.

Palmateer N, Goldberg DJ, Munro A, Taylor A, Yeung A and Wallace LA, et al. Association between universal hepatitis B prison vaccination, vaccine uptake and hepatitis B infection among people who inject drugs. Addiction. 2018; 113(1): 80–90.

Palmateer N, et al. Reduction in the population prevalence of hepatitis C virus viraemia among people who inject drugs associated with scale-up of direct-acting anti-viral therapy in community drug services: real-world data. Addiction. 2021 Mar 2.

Trayner K, McAuley A, Palmateer N, et al. Increased risk of HIV and other drug-related harms associated with injecting in public places: national bio-behavioural survey of people who inject drugs. Int J Drug Policy. 2020 Mar; 77: 102663.

Trayner K, Palmateer N, et al. High willingness to use drug consumption rooms among people who inject drugs in Scotland: findings from a national bio-behavioural survey among people who inject drugs. Int J Drug Policy. 2021 Apr; 90: 102731.

Trayner K, Palmateer N, McAuley A, Metcalfe R, Goldberg DJ, Peters E, Craik J, et al. Evaluation of the scale-up of HIV testing among people who inject drugs in Scotland in the context of an ongoing HIV outbreak. Int J Drug Policy. 2021 Jul 26.

Turner K, Hutchinson SJ, Vickerman P, Hope V, et al. The impact of needle and syringe provision and opiate substitution therapy on the incidence of hepatitis C virus in injecting drug users: pooling of UK evidence. Addiction. 2011; 106(11): 1978–88.

Valerio H, McAuley A, Innes H, Palmateer N, Goldberg DJ and Munro A, et al. Determinants of hepatitis C antiviral effectiveness awareness among people who inject drugs in the direct-acting antiviral era. Int J Drug Policy. 2018; 52: 115–122.

Appendix 5: NESI Steering Group Membership 2019–20

Name	Affiliation
Chris Biggam	Glasgow Caledonian University and Public Health Scotland
John Campbell	NHS Greater Glasgow and Clyde
Prof David Goldberg	Public Health Scotland and Glasgow Caledonian University
Dr Rory Gunson	West of Scotland Specialist Virology Centre
Prof Sharon Hutchinson	Glasgow Caledonian University and Public Health Scotland
Dr Andrew McAuley	Public Health Scotland and Glasgow Caledonian University
Dr Duncan McCormick	NHS Lothian and Public Health Scotland
Dr Alison Munro	University of Dundee
Dr Norah Palmateer	Glasgow Caledonian University and Public Health Scotland
Dr Duncan Stewart	NHS Lothian
Prof Avril Taylor	University of the West of Scotland
Jason Wallace	Scottish Drugs Forum
David Williams	Edinburgh ADP
Leon Wylie	Hepatitis Scotland

References

1 Scottish Government. Hepatitis C Action Plan for Scotland. Phase II: May 2008–March 2011. Edinburgh: Scottish Government; 2008. Available at: **https://www.eurosurveillance.org/content/10.2807/ese.13.21.18876-en** (accessed 8 February 2022).

2 Scottish Government. The Sexual Health and Blood Borne Virus Framework 2011–2015. Edinburgh: Scottish Government; 2011. Available at: **https://ssha.info/the-sexual-health-and-blood-borne-virus-framework-2011-2015/** (accessed 8 February 2022).

3 Scottish Government. Sexual Health and Blood Borne Virus Framework: 2015–2020 Update. Edinburgh: Scottish Government; 2015. Available at: **https://www.gov.scot/publications/sexual-health-blood-borne-virus-framework-2015-2020-update/** (accessed 8 February 2022).

4 Hickman M, Dillon JF, Elliott L, De Angelis D, Vickerman P, Foster G, Donnan P, Eriksen A, Flowers P, Goldberg D, Hollingworth W, Ijaz S, Liddell D, Mandal S, Martin N, Beer LJZ, Drysdale K, Fraser H, Glass R, Graham L, Gunson RN, Hamilton E, Harris H, Harris M, Harris R, Heinsbroek E, Hope V, Horwood J, Inglis SK, Innes H, Lane A, Meadows J, McAuley A, Metcalfe C, Migchelsen S, Murray A, Myring G, Palmateer NE, Presanis A, Radley A, Ramsay M, Samartsidis P, Simmons R, Sinka K, Vojt G, Ward Z, Whiteley D, Yeung A and Hutchinson SJ. Evaluating the population impact of hepatitis C direct acting antiviral treatment as prevention for people who inject drugs (EPIToPe) – a natural experiment (protocol). BMJ Open. 2019 Sep; 9(9): e029538.

5 McAuley A, Palmateer N, Goldberg D, Trayner K, Shepherd SM, Gunson R, Metcalfe R, Milosevic C, Taylor A, Munro A and Hutchinson SJ. Re-emergence of injecting drug use-related HIV despite a comprehensive harm reduction environment: a cross sectional analysis. The Lancet HIV. 2019 May; 6(5): e315–e324.

6 Yeung A, Weir A, Austin H, Morrison K, Inverarity D, Sherval J, Henderson N, Joshi S, Ure R and McAuley A. Assessing the impact of a temporary class drug order on ethylphenidate-related infections among people who inject drugs in Lothian, Scotland: an interrupted time-series analysis. Addiction. 2017 Oct; 112(10): 1799–1807.

7 McAuley A, Yeung A, Taylor A, Hutchinson SJ, Goldberg DJ and Munro A. Emergence of Novel Psychoactive Substance injecting associated with rapid rise in the population prevalence of hepatitis C virus. Int J Drug Policy. 2019; 66: 30–37.

8 Palmateer NE, Goldberg DJ, Munro A, Taylor A, Yeung A, Wallace LA, Mitchell A, Shepherd SJ, Gunson RN, Aitken C and Hutchinson SJ. Association between universal hepatitis B prison vaccination, vaccine uptake and hepatitis B infection among people who inject drugs. Addiction. 2018 Jan; 113(1): 80–90.

9 Trayner KMA, Palmateer NE, McAuley A, Metcalfe R, Goldberg DJ, Peters E, Craik J, Gunson RN, Thain D, Carter D and Hutchinson SJ. Evaluation of the scale-up of HIV testing among people who inject drugs in Scotland in the context of an ongoing HIV outbreak. Int J Drug Policy. 2021 Oct; 96: 103304.

10 Dunleavy K, Hutchinson SJ, Palmateer N, Goldberg D, Taylor A, Munro A, Shepherd SJ, Gunson RN, Given S, Campbell J and McAuley A. The uptake of foil from needle and syringe provision services and its role in smoking or snorting heroin among people who inject drugs in Scotland. Int J Drug Policy. 2021 Jul; 98: 103369.

11 Palmateer NE, McAuley A, Dillon JF, McDonald S, Yeung A, Smith S, Barclay S, Hayes P, Shepherd SJ, Gunson RN, Goldberg DJ, Hickman M and Hutchinson SJ. Reduction in the population prevalence of hepatitis C virus viraemia among people who inject drugs associated with scale-up of direct-acting anti-viral therapy in community drug services: real-world data. Addiction. 2021 Mar.

12 Dunleavy K, Munro A, Roy K, Hutchinson S, Palmateer N, Knox T, Goldberg D and Taylor A. Association between harm reduction intervention uptake and skin and soft tissue infections among people who inject drugs. Drug Alcohol Depend. 2017 May; 174: 91–97.

13 Public Health Scotland. Injecting Equipment Provision in Scotland 2019/20. Edinburgh: NHS National Services Scotland; Jul 2020. Available at: **https://www.publichealthscotland.scot/publications/injecting-equipment-provision-in-scotland/injecting-equipment-provision-in-scotland-201718-201819-and-201920/** (accessed 1 February 2022).

14 Judd A, Parry J, Hickman M, McDonald T, Jordan L, Lewis K, Contreras M, Dusheiko G, Foster G, Gill N, Kemp K, Main J, Murray-Lyon I and Nelson M. Evaluation of a modified commercial assay in detecting antibody to hepatitis C virus in oral fluids and dried blood spots. J Med Virol. 2003 Sep; 71(1): 49–55.

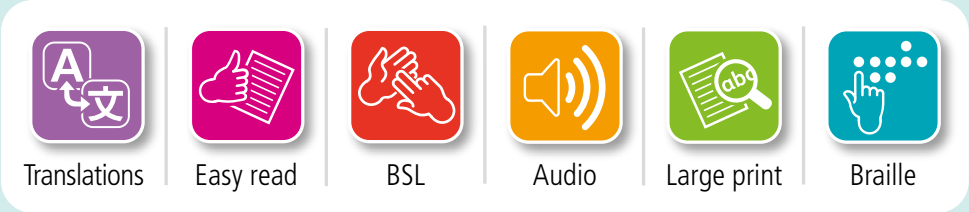
15 Bennett S, Gunson RN, McAllister GE, Hutchinson SJ, Goldberg DJ, Cameron SO and Carman WF. Detection of hepatitis C virus RNA in dried blood spots. J Clin Virol. 2012 Jun; 54(2): 106–9.

16 Shepherd SJ, Baxter RE and Gunson RN. Evaluation of the Abbott m2000 system for dried blood spot detection of hepatitis C virus RNA. J Clin Virol. 2019; 110: 7–10.

17 Hope VD, Hickman M, Ngui SL, Jones S, Telfer M, Bizzarri M, Ncube F and Parry JV. Measuring the incidence, prevalence and genetic relatedness of hepatitis C infections among a community recruited sample of injecting drug users, using dried blood spots. J Viral Hepat. 2011; 18: 262–270.

18 Allen EJ, Palmateer NE, Hutchinson SJ, Cameron S, Goldberg DJ and Taylor A. Association between harm reduction intervention uptake and recent hepatitis C infection among people who inject drugs attending sites that provide sterile injecting equipment in Scotland. Int J Drug Policy. 2012; 23: 346–352.

19 Page-Shafer K, Pappalardo BL, Tobler LH, Phelps BH, Edlin BR, Moss AR, Wright TL, Wright DJ, O'Brien TR, Caglioti S and Busch MP. Testing strategy to identify cases of acute hepatitis C virus (HCV) infection and to project HCV incidence rates. J Clin Microbiol. 2008; 46: 499–506.



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