Progress towards elimination of hepatitis C infection among people who inject drugs in Australia: The ETHOS Engage Study

Heather Valerio,[1] Maryam Alavi,[1] David Silk,[1] Carla Treloar,[2] Marianne Martinello,[1] Andrew Milat,[3,4] Adrian Dunlop,[5,6] Jo Holden,[7] Charles Henderson,[8] Janaki Amin, [1,9] Phillip Read, [1,10] Philippa Marks, [1] Louisa Degenhardt, [11] Jeremy Hayllar,[12] David Reid,[13] Carla Gorton,[14] Thao Lam,[15] Gregory J Dore[1], and Jason Grebely[1] on behalf of the ETHOS II Study Group

[1] The Kirby Institute, UNSW Sydney, Sydney, NSW, Australia
[2] Centre for Social Research in Health, UNSW Sydney, Sydney, NSW, Australia
[3] Centre for Epidemiology and Evidence, NSW Health, NSW, Australia
[4] School of Public Health, University of Sydney, NSW, Australia
[5] Centre for Translational Neuroscience and Mental Health, Hunter Medical Research Institute & University of Newcastle, Newcastle, NSW, Australia
[6] Drug and Alcohol Clinical Services, Hunter New England Local Health District, Newcastle, NSW, Australia
[7] Population Health Strategy & Performance, NSW Health, NSW, Australia
[8] NSW Users and AIDS Association, NSW, Australia
[9] Macquarie University, Sydney, NSW, Australia
[10] Kirketon Road Centre, Sydney, NSW, Australia
[11] National Drug and Alcohol Research Centre, UNSW Sydney, Sydney, NSW, Australia
[12] Alcohol and Drug Service, Metro North Mental Health, Metro North Hospital and Health Service, Brisbane, QLD, Australia
[13] The Orana Centre, Illawarra Shoalhaven LHD, Wollongong, NSW, Australia
[14] Cairns Sexual Health Service, Cairns, QLD, Australia
[15] Drug Health, Western Sydney Local Health District, Sydney, NSW, Australia

Corresponding author:
Heather Valerio
The Kirby Institute, UNSW Sydney,
Sydney, New South Wales, Australia
Wallace Wurth Building, High Street, Kensington, NSW, 2052, Australia.
Email: hvalerio@kirby.unsw.edu.au

Summary: Among this population of people who inject drugs in Australia, 24% were currently infected with hepatitis C virus. Of those who were ever infected, 66% had received treatment. Enhancing treatment uptake in key subpopulations is required to achieve elimination.

ABSTRACT

Background & Aims Evaluating progress towards HCV elimination is critical. This study estimated prevalence of current HCV infection and HCV treatment uptake among people who inject drugs (PWID) in Australia.

Methods ETHOS Engage is an observational study of PWID attending drug treatment clinics and needle and syringe programs (NSP). Participants completed a questionnaire including self-reported treatment history and underwent point-of-care HCV RNA testing (Xpert® HCV Viral Load Fingerstick).

Results Between May 2018-September 2019, 1,443 participants were enrolled (64% injected drugs in the last month, 74% receiving opioid agonist therapy [OAT]). HCV infection status was uninfected (28%), spontaneous clearance (16%), treatment-induced clearance (32%), and current infection (24%). Current HCV was more likely among people who were homeless (adjusted odds ratio: 1.47; 95%CI: 1.00, 2.16), incarcerated in previous year (2.04; 1.38, 3.02), and those injecting drugs ≥daily (2.26; 1.43, 2.42). Among those with previous chronic or current HCV, 66% (n=520/788) reported HCV treatment. In adjusted analysis, HCV treatment was lower among females (0.68; 0.48, 0.95), participants who were homeless (0.59; 0.38, 0.96), and those injecting ≥daily (0.51; 0.31, 0.89). People aged ≥45 (1.46; 1.06, 2.01) and people receiving OAT (2.62; 1.52, 4.51) were more likely to report HCV treatment.

Conclusions Unrestricted DAA access in Australia has yielded high treatment uptake among PWID attending drug treatment and NSPs, with a marked decline in HCV prevalence. To achieve elimination, PWID with greater marginalisation may require additional support and tailored strategies to enhance treatment.

Keywords:

Hepatitis C virus, Direct acting antivirals, People who inject drugs, Hepatitis C elimination

INTRODUCTION

The World Health Organization (WHO)'s goal to eliminate hepatitis C virus (HCV) infection as a public health threat aims to reduce HCV incidence and related mortality by substantially increasing diagnosis and treatment [1]. Globally, an estimated 71 million people are infected with HCV, including an estimated 6.1 million who have recently injected drugs and a large population having injected drugs in the past [1-3]. Mathematical modelling has demonstrated the importance of rapid treatment initiation to reduce population-level HCV infection and prevent onward transmission among people who inject drugs (PWID) [4, 5]. Despite favourable treatment outcomes among PWID [6], system, societal, provider, and individual barriers persist and hinder optimal HCV care [7].

Since March 2016, adults infected with HCV have access to government reimbursed direct-acting antiviral (DAA) therapy with no drug, alcohol, or fibrosis stage restrictions [8]. This public health approach in the provision of unrestricted DAA therapy engendered one of the highest HCV treatment uptakes globally, with Australia named as one of few countries on track to achieve the WHO target of reducing new infections by 2030 [9, 10].

Although studies have explored DAA treatment among PWID, they are limited with respect to reimbursement restrictions, population size, single/homogenous settings, or insufficient virological data [6, 11-14]. This study evaluated progress towards HCV elimination among PWID in Australia among a large, national cohort of PWID recruited from drug treatment and needle and syringe programs (NSPs) during an unrestricted HCV treatment era. The primary aim of this study was to evaluate the proportion of people with current HCV infection and associated factors. A secondary aim was to evaluate the proportion of people who had received HCV treatment and associated factors.

PATIENTS AND METHODS

Data sources

ETHOS Engage is an observational cohort study. Participants were enrolled between 28 May 2018 and 06 September 2019 from 25 sites, including opioid agonist therapy (OAT) clinics (n=21) and NSPs (n=4); in New South Wales (n=17), Queensland (n=4), South Australia (n=2) and Western Australia (n=2).

Inclusion criteria were informed consent, age ≥18 years, history of injecting drug use, and either injection drug use in the previous 6 months or current OAT. Pregnant women were excluded given FibroScan® was contraindicated with at time of study protocol approval. The study protocol was approved by the Human Research Ethics Committees at St Vincent's Hospital, Sydney and the Aboriginal Health and Medical Research Council (HREC Ref: HREC/17/SVH/113).

Procedures

ETHOS Engage was advertised in the weeks preceding recruitment with posters, information cards distributed with injecting equipment, and word of mouth. Recruitment spanned two to five days at each site. Peer-support workers were on-site encouraging participation.

Participants provided 100 µl finger-stick capillary whole-blood sample to test for HCV RNA using the point-of-care Xpert HCV Viral Load Fingerstick assay (Cepheid, Sunnyvale, United States, lower limit of quantification 100 IU/mL; upper limit of quantification 10^8 log10 IU/mL) [15] and self-completed a computer tablet-based questionnaire collecting demographic, behavioural risk, previous HCV testing, infection status, and treatment information. Fibrosis stage was assessed using transient elastography (FibroScan®, Echosens, Paris, France) and median stiffness (kPa) was discussed with appropriate clinical staff. Participation was compensated with a shopping voucher (AUD$30).

HCV RNA results were returned to clinics after quality assurance checks. Staff were encouraged to contact participants with current HCV infection to initiate treatment. Post-campaign treatment initiation and outcomes will be assessed in the three years proceeding campaign days.

Outcomes

The primary outcome was current HCV infection (HCV RNA detected with the Xpert HCV Viral Load Fingerstick assay). Previous work has demonstrated the high sensitivity (100%) and specificity (100%) of this assay in HCV RNA quantification [15, 16] and fingerstick testing acceptability among PWID [17].

The secondary outcome was self-reported history of HCV treatment among participants with either previous (self-reported history of HCV treatment) or current HCV infection (in participants who have been treatment eligible). Participants who were never infected (HCV RNA undetectable and self-reported as never having been diagnosed with HCV) and who had spontaneously cleared (HCV RNA undetectable, self-reported as having been diagnosed with HCV, and not having received HCV treatment) were also identified (Figure 1).

Statistical analysis

Logistic regression models were used to estimate the unadjusted and adjusted odds ratio (aOR) for: 1) factors associated with current HCV infection among the total cohort; and 2) factors associated with a history of HCV treatment among those with evidence of previous chronic or current HCV infection.

Demographic and behavioural factors hypothesised to be associated with current HCV infection and HCV treatment were determined *a priori*, comprising: (i) age at survey (stratified around median: <45, ≥45), (ii) gender, (iii) Indigenous ethnicity (Aboriginal and/or Torres Strait Islander), (iv) homelessness, (v) OAT status (never, past, within the last month/current), (vi) incarceration history (never, >1 year ago, within the last year), (vii) recency and frequency of injection drug use (> 1 year ago, within 1-12 months ago, within the last month <daily, and ≥daily), (viii) main drug injected in the last month (none, heroin, other opioids, methamphetamine, other) and (ix) hazardous alcohol consumption in the previous year, defined by the Alcohol Use Disorders Identification Test (AUDIT-C) [18].

All exposures were analysed in unadjusted analyses and considered for adjusted models if no collinearity was observed. Collinearity was assessed using variance-covariance matrices, with variables removed from adjusted models if ≥0.5 correlation was identified.

Each outcome was assessed for the overall eligible population, and subsequently restricted to participants with recent (last month) injecting drug use. In analyses restricted to participants with recent injecting drug use, injecting-related variables were re-categorised as: recency and frequency of injecting (<daily, ≥daily); and main drug injected in the last month (heroin, other opioids, methamphetamine, other). In post-hoc analysis, predictors of HCV treatment were stratified by gender. Analyses were conducted using Stata 14.0 (StataCorp, College Station, TX, USA).

RESULTS

Sample characteristics

Among 1,468 participants in ETHOS Engage, 5 (<1%) had insufficient questionnaire data, 16 (1%) withdrew participation, and 4 (<1%) duplicate enrolments were identified across sites, resulting in 1,443 participants (98%) eligible for analysis (Figure 1).

Median age was 43 (IQR: 37, 50), 65% (n=932) were male, 74% (n=1,070) were receiving OAT, and methamphetamine was the commonest main drug injected (31%, n=449). Nearly two-thirds (64%) of participants injected drugs in the last month, and 30% ≥daily, (Table 1). Characteristics stratified by recent injecting drug use, OAT status, and gender are presented in Supplementary Tables 1, 2, and 3.

Factors associated with current HCV infection

Among all participants (n=1,443), 1,388 (96%) had valid Xpert Viral Load Fingerstick point-of-care results. Invalid results (n=55, 4%) included early withdrawal (n=16, 1%) and operator/machine error (n=39, 3%). Among those with valid results, 24% (n=331) were currently infected with HCV (HCV RNA detectable). The prevalence of current HCV infection stratified by characteristics is shown in Figure 2 and Table 2.

In adjusted analyses, factors associated with current HCV infection included homelessness (aOR: 1.47, 95%CI: 1.00, 2.16), incarceration history (vs. never, >1 year ago: aOR: 1.79, 95%CI: 1.30, 2.45; within the last year: aOR: 2.03, 95%CI: 1.38, 3.01), and ≥daily injecting drug use (aOR: 2.29, 95%CI: 1.45 – 3.62) (Table 3). In adjusted analyses among people with injecting drug use in the previous month, factors associated with current HCV infection were unchanged (Supplementary Table 4).

Factors associated with HCV treatment

Overall, 55% (n=788) of participants had evidence of previous chronic (n=457) or current HCV infection (n=331). Among these (n=788, 55%; Table 3, Supplementary Figure 1), 66% (n=520) had self-reported ever initiating HCV treatment. (Table 2). The majority (85%) had initiated treatment in the DAA era (2016-2018) and 31% (n=162) reported receiving HCV treatment at a drug treatment clinic, 28% (n=148) from a hospital-based specialist clinic, 19% (n=100) from a general practitioner, 16% (n=85) in prison, 3% (n=14) within other community-based clinics, and 2% (n=9) within a NSP.

HCV treatment was lower in females (vs. males, 60% vs. 69%), those who were homeless (48% vs. 68%), those who never received OAT (vs. those currently receiving OAT, 42% vs. 70%), and those with ≥daily injecting drug use in the last month (vs. ≥1 year ago, 56% vs. 78%) (Table 3, Figure 3).

In adjusted analyses, HCV treatment was less likely among females (aOR: 0.68, 95% CI: 0.48, 0.96), people who were homeless (aOR: 0.59, 95% CI: 0.36, 0.96), and people with ≥daily injecting drug use (vs. no injecting in last year, aOR: 0.51, 95%CI: 0.30, 0.86). People aged ≥45 (vs. <45, aOR: 1.47, 95%CI: 1.07, 2.02) and people receiving OAT (aOR: 2.60, 95% CI: 1.51, 4.49) were more likely to receive HCV treatment (Table 3). In analyses restricted to people with recent injecting drug use (n=921), main drug injected in the last month was assessed in regression models. The factors associated with treatment were unchanged among this group (Supplementary Table 5).

To further investigate the association between gender and HCV treatment, stratified analyses were performed (Supplementary Table 3, 6). In adjusted analyses among males with evidence of HCV infection (ever) (n=543/932, 58%), HCV treatment was less likely among those who were homeless (aOR: 0.49, 95%CI: 0.27, 0.8), and those with ≥daily injecting drug use (aOR: 0.49, 95%CI: 0.25, 0.95). HCV treatment was greater among males

who had ever received OAT either in the past (aOR: 2.51, 95%CI: 1.13, 5.58) or currently (aOR: 2.86, 95%CI: 1.50, 5.49) (Supplementary Table 6). Age was not associated with HCV treatment (aOR: 1.14, 95% CI: 0.77, 1.70).

In adjusted analyses among females with evidence of HCV infection (ever) (n=242/508, 48%), the only factor independently associated with HCV treatment was age, with females aged ≥45 years more likely to have received treatment compared to those <45 years (aOR: 2.62, 95%CI: 1.47, 4.66) (Supplementary Table 6).

DISCUSSION

In this national, well-characterised sample of PWID attending drug treatment clinics and NSPs in Australia, 24% were currently infected with HCV and 66% of people who had previous chronic or current HCV infection had ever received HCV treatment. Indicators of higher marginalisation were negatively associated with HCV treatment, and positively associated with current HCV infection. This study provides important insight into the impact of unrestricted DAA access and will inform policies and targeted strategies to further facilitate HCV elimination in Australia and globally.

Current HCV infection was higher (31%) in participants who reported ≥daily injecting drug use. Given the potential for HCV treatment to prevent onward transmission of infection [5, 19], treatment scale-up among people with frequent injecting drug use combined with harm reduction (OAT and NSP) will be critical for HCV elimination, particularly in countries where the majority of new infections occur among PWID. Enhanced support within low-threshold and targeted primary health settings, including individualised, tailored adherence support and peer-to-peer education and has been positively associated with treatment uptake and adherence among people with frequent injecting drug use [20-24]. These strategies should be explored in the context of HCV treatment as prevention.

Treatment uptake was lower (56%) in those injecting ≥daily, consistent with previous studies [14, 25]. Despite an increased association with serious injection-related injury and blood borne virus infection, people who frequently inject drugs are more likely to experience barriers to healthcare access due to discrimination [26]. Such discrimination is associated with lower uptake of OAT and less access to a general practitioner [27, 28], both associated with enhanced HCV knowledge and engagement[23, 29-31]. Overcoming these barriers may be possible through partnerships with peer-based organisations in primary health and harm reduction settings. Enhancing these partnerships may facilitate psychosocial support

mechanisms, leading to improved healthcare-related communication between PWID and healthcare professionals, and greater treatment-related knowledge [24].

Participants who were homeless were more likely to have current HCV infection and less likely to report HCV treatment. These results are unsurprising given the strong associations between unstable housing and injection drug use [32] and the multiple barriers faced by people who are homeless in accessing healthcare: high prevalence of psychiatric comorbidities, competing priorities regarding day-to-day shelter and food security, increased stigmatisation, and lack of necessary identification for prescriptions [33, 34]. Interventions to address HCV in the context of these barriers are challenging. Previous work has indicated that housing complications were often cited as a common reason for missing appointments, despite being within models of care which integrate HCV therapy into specialised community medicine or within traditional low-threshold settings [35]. Higher marginalisation, such as experiencing homelessness, is associated with loss to follow-up and disengagement with HCV-related services [33, 34, 36]; however, treatment uptake among people who are homeless may be enhanced through one-stop-shop models which, utilise point-of-care testing, and offer immediate, same-day treatment initiation [20, 36] and policy interventions to improve housing stability [32]. Innovative, holistic strategies to engage people who are homeless with harm reduction and HCV care are required [33, 34].

Current OAT was associated with higher HCV treatment, consistent with published research [13, 14, 31, 33]. OAT engagement is associated with increased awareness of HCV therapy and its effectiveness [30]. Furthermore, OAT is associated with reductions across multiple health outcomes, including injecting risk behaviour [37], risk of HIV and HCV [38, 39], criminal activity [40], and all-cause and overdose [41] mortality. Ensuring high coverage and access to OAT is critical in achieving HCV elimination and improving health outcomes among PWID. Further, a significant proportion of PWID may not be opioid dependant, and efforts to increase HCV treatment among people who inject stimulants is warranted.

In line with previously published results, age was associated with HCV treatment [14]. Older PWID typically report less high-risk injection practices and increased uptake of health-related services, making this group generally easier to reach compared to younger PWID [42]. Surveillance suggests population-level ageing of PWID in Australia; however, in some settings there is a fast-growing population of younger PWID at risk of, or infected with, HCV and should therefore be considered a key population to engage in HCV care [43, 44]. While this study was insufficiently powered to analyse outcomes solely among younger PWID (<25, n=57), these results imply the importance of monitoring HCV and treatment initiation among this group.

The gender-specific differences in reported HCV treatment corroborate previous evidence, with females less likely to initiate treatment than males [45, 46]. Among women, the only independent factor associated with HCV treatment uptake was age, with older women more likely to have received treatment than younger women. Despite these results, gender was not associated with current HCV infection, related to the higher likelihood of spontaneous clearance among females [47]. Previous work has highlighted increased marginalisation among women who inject drugs, and the higher vulnerability in this population that contributes to disengagement with healthcare [45]. The intersectionality of gender, age and other factors—such as ethnicity and receipt of OAT—is associated with treatment deferral [45, 46]. Gender-specific interventions which reduce vulnerabilities and marginalisation among women who inject drugs are key. Further research is necessary to understand the complexity of treatment deferral among younger women.

Considering the criminalisation of drug possession in Australia, the proportion of participants who had a history of incarceration (68%) was unsurprising. While not a factor associated with HCV treatment, incarceration was significantly associated with current HCV infection,

highlighting prisons as key settings HCV prevention and treatment. Although injecting frequency attenuates following incarceration, among those who continue to inject, there is increased sharing of needles and syringes [48]. Increased coverage of harm reduction and novel person-centred strategies may be needed to ensure prevention, timely diagnosis, and initiation onto HCV therapy, both in prison and post-release [49, 50].

This study has limitations. Serological status was based on self-report and virology, potentially underestimating true HCV antibody prevalence; however, the inferred prevalence found here is similar to annual surveillance of PWID in Australia [43] and the utilisation of the Xpert Viral Load Finger-stick assay for HCV RNA has allowed characterisation of current HCV prevalence among vast majority of participants (>95%), differentiating these results from previous studies [13]. Furthermore, participation in ETHOS Engage was voluntary, and recruitment was performed in healthcare settings, the majority of which operated primarily as, or in conjunction with OAT. The annual Australian NSP survey indicates nearly half of PWID last injected methamphetamine (48%) and ≥daily (51%). While it is encouraging that this study was able to engage a large population of PWID who were mainly injecting methamphetamine (31%) and injecting drugs ≥daily (30%), these results may be under-representative of the wider injecting population. This oversampling PWID engaged in OAT has potentially introduced selection bias, possibly overestimating HCV treatment and underestimating current infection compared to a wider population of PWID. Finally, questionnaire data rely on recall and self-report. Although self-report is considered a reliable source of data collection among people who use drugs, some may not have provided accurate answers [51]. While recall bias could not be systematically minimised, we aimed to reduce social-desirability bias by providing self-administered surveys and ensuring anonymity.

Conclusions and implications

In the context of HCV elimination, high treatment uptake across sub-populations was encouraging. These results highlight the successes of an unrestricted HCV treatment strategy in reaching marginalised populations of PWID and suggest progress towards achieving incidence-related HCV elimination targets. It is estimated that among the 93,500 people who have recently injected drugs in Australia, an estimated 37,500 are infected with HCV [2, 52]. As such, it will be critical to enhance efforts to engage with the most marginalised PWID sub-populations, including people who are homeless or incarcerated, to maintain this progress. To engage those who remain untreated and those who may require follow-up and retreatment, interventions which reduce barriers to testing and treatment, including utilisation of dried blood spot and point-of-care technology and provision of financial incentives to initiate treatment within drug clinics should be further explored [53-55]. Additionally, the importance of a peer work force for the facilitation of HCV elimination should not be underestimated [22, 24].

Although largely indicative of a good news story on the path towards elimination of HCV among PWID, challenges remain. It is imperative that innovative strategies and holistic approaches to improve linkage to HCV-related care are adopted to further enhance engagement with people living with HCV who may delay treatment for competing priorities. There is an urgent need for increased efforts to address the gaps in care highlighted here to ensure HCV elimination is equitable across all PWID in Australia and globally.

AUTHORS' CONTRUBUTIONS

JG, GD, and PM conceived and designed the ETHOS Engage study, including construction of the participant questionnaire. HV, JG, GD, and MA contributed to these research aims, analysis, and interpretation of results. HV wrote the first draft of the manuscript, and all co-authors contributed to the critical review and development of this final manuscript for publication.

ACKNOWLEDGEMENTS

The authors thank all participants who took part in the ETHOS Engage study. We first give special acknowledgement to the following peer workers and organisations who helped invaluably with participant recruitment:

The NSW Users and AIDS Association (NUAA): Sara Adey, Rodd Hinton, Melanie Joyce

Youth Link Needle and Syringe Program, Cairns: Astrid Carthew

Hepatitis South Australia: Lisa Carter, Carol Holly

Harm Reduction Western Australia: Lyn Murphy

We also thank the contributions of members of the ETHOS Engage Study Group:

Protocol Steering Committee: Jason Grebely (Kirby Institute, UNSW Sydney), Gregory J. Dore (Kirby Institute, UNSW Sydney), David Silk (Kirby Institute, UNSW Sydney), Nicky Bath (LGBTI Health Programming and Development), Carla Treloar (Centre for Social Research in Health, UNSW Sydney), Andrew Milat (Centre for Epidemiology and Evidence, NSW Health), Adrian Dunlop (Hunter New England Local Health District), Janaki Amin (Macquarie University, Kirby Institute, UNSW Sydney), Jo Holden (Population Health Strategy & Performance, NSW Health), Charles Henderson (NUAA), Kyle Leadbeatter (Hepatitis NSW), Emma Day (ASHM), Nikitah Habraken (ASHM), Louisa Degenhardt (National Drug and

Alcohol Research Centre, UNSW Sydney), Clarke Scott (Centre for Addiction Medicine, Nepean Blue Mountains Local Health District), Phillip Read (Kirketon Road Centre).

Coordinating Centre (The Kirby Institute, UNSW Sydney): Jason Grebely (Co-Principal Investigator), Gregory J. Dore (Co-Principal Investigator), Maryam Alavi, David Silk (Clinical Project Coordinator), Heather Valerio (PhD candidate), Shane Tillakeratne (Data Manager), Pip Marks (Clinical Trials Manager), Indika Jayasinghe (Laboratory Coordinator), Hannah Reid, Valerie Gleeson, Jodi Van Dyk, Gerard Estivill Mercade, Alison D. Marshall, Stephanie Obeid, Samira Hosseini Hooshyar, Beth Catlett, Andrey Verich (campaign day implementation).

Site Principle Investigators: Nadine Ezard (Rankin Court), David Reid (Illawarra Shoalhaven Local Health District), Carla Gorton (Cairns Sexual Health Service), Jeremy Hayllar (Metro North Hospital and Health Service, Brisbane), Thao Lam (Western Sydney Local Health District), Adrian Dunlop (Hunter New England Local Health District), Prasun Datta (Nepean Blue Mountains Local Health District), Alex Wade (Mid North Coast Local Health District), Sally Spruce (Mid North Coast Local Health District), Vicky Cock (Drug and Alcohol Services, South Australia), Mark Cornwell (Northern NSW Local Health District), Michael Christmas (Next Step, Perth), Craig Connelly (Next Step, Perth), Angela Cooper (Townsville Hospital and Health Services), Mark Montebello (Northern Sydney Local Health District)

Site Coordinators: Robert Cherry (Rankin Court), Julie Dyer (Rankin Court), Shikha Arawal (Rankin Court), Nadine Horasak (Youth Link Needle and Syringe Program, Cairns), Rhondda Lewis (Cairns Sexual Health Service), Kathy Clark (Youth Link Needle and Syringe Program, Cairns), Daniel Morris (Youth Link Needle and Syringe Program, Cairns), Kathy Donohue (Youth Link Needle and Syringe Program, Cairns), Kathy Griffiths (Biala), Jason Dalla Lana (Biala), Sue Shin (Biala), Connie Graf (Illawarra Shoalhaven Local Health District), Adele Hampson (Illawarra Shoalhaven Local Health District), Carina Burns

(Southwest Sydney Local Health District), Ravina Raidu (Southwest Sydney Local Health District), Kylie Stolzenhein (Southwest Sydney Local Health District), Wanda Brabender (Southwest Sydney Local Health District), Nargis Abram (Nepean Blue Mountains Local Health District), Rick Turner (Nepean Blue Mountains Local Health District), Stuart Larter (Nepean Blue Mountains Local Health District), Fiona Goodberg (Nepean Blue Mountains Local Health District), Jennifer Luksza (Western Sydney Local Health District), Michelle Hall (Hunter New England Local Health District), Susan Hazelwood (Hunter New England Local Health District), Krista Zohrab (Mid North Coast Local Health District), Belinda McClurg (Mid North Coast Local Health District), Kate Salisbury (Northern NSW Local Health District), Julie Markham (Queensland Injectors Health Network, Townsville), Jacky Talmet (Drug and Alcohol Services, South Australia), Sandy Dunn (Drug and Alcohol Services, South Australia), Fionnualh Smyth (Western Sydney Local Health District), Lisa Snell (Western Sydney Local Health District), Elizabeth Laing (Next Step, Perth) Martin Clark (Next Step, Perth), Justin Dorigo (Next Step, Perth), Brent Fergusson (Townsville Hospital and Health Service), Bonny Puszka (Northern Sydney Local Health District), Gai Duncan (Northern Sydney Local Health District), Fiona Baker (Northern Short Local Health District), and Jayde Walsh (Northern Sydney Local Health District).

FINANCIAL SUPPORT STATEMENT

The Enhancing Treatment of Hepatitis C in Opioid Substitution Settings (ETHOS) Engage study is funded by a National Health & Medical Research Council (NHMRC) Partnership project grant (1103165), including funding from New South Wales Health and Cepheid. This study was also supported in part by a research grant from Investigator-Initiated Studies Program of Merck Sharp and Dohme Corp. Cepheid and Merck Sharp and Dohme Corp were not involved in the study design, methodology, and writing of this manuscript. The opinions expressed in the paper are those of the authors and do not necessarily represent those of Cepheid or Merck Sharp and Dohme Corp. The Kirby Institute is funded by the

Australian Government Department of Health and Ageing. The views expressed in this manuscript do not necessarily represent the position of the Australian Government.

CONFLICT OF INTEREST STATEMENT

JG is a consultant/advisor and has received research grants from AbbVie, Cepheid, Gilead, Hologic, Indivior, and Merck, and personal fees from AbbVie, Cepheid, Gilead, and Merck, outside the submitted work. GJD is a consultant/advisor and has received research grants from Merck, Gilead, Bristol Myers-Squibb and AbbVie; and reports travel support from Gilead, Abbvie, and Merck, outside the submitted work; . CT has received speaker fees from Abbvie and Gilead, grants from Merck and Bristol Myers-Squibb, and an unrestricted education grant from Terumo. PR has received speaker fees from Gilead, Abbvie, and MSD, and research funding from Gilead. LD has received investigator-initiated untied educational grants for studies of opioid medications in Australia from Indivior, Mundipharma and Seqirus.JH has received travel, accommodation, speaker fees and WOWS support from Janssen, Lundbeck, Servier, and Invivior. A.D. reports grants from Braeburn/Camurus. J.H. received travel, accommodation, speaker fees and WOWS support from Janssen, Lundbeck, Servier, and Invivior. All other authors declare no conflict of interest.

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Table 1: Characteristics of participants enrolled in ETHOS Engage (n=1,443)

Characteristic		Total (col%)
Total (N)		1,443
Age at survey	<45	791 (55%)
	≥45	652 (45%)
Gender	Male	932 (65%)
	Female	508 (35%)
	Transgender	3 (<1%)
Indigenous ethnicity	No	1,106 (77%)
	Yes	337 (23%)
Homeless	No	1,286 (89%)
	Yes	157 (11%)
OAT status	Never	205 (14%)
	Past	168 (12%)
	Current	1,070 (74%)
Incarceration history	Never	469 (32%)
	>1 year ago	715 (50%)
	Within last year	259 (18%)
Recency of injecting	>12 months	215 (15%)
	Within 1-12 months	307 (21%)
	Within last month, <daily	494 (34%)
	Within last month, ≥daily	427 (30%)
Main drug injected in last month	None	522 (36%)
	Heroin	312 (22%)
	Other opioids	132 (9%)
	Methamphetamine	449 (31%)
	Other	28 (2%)
Excessive alcohol consumption[†]	No	915 (64%)
	Yes	525 (36%)

[†] Not reported for transgender participants

Table 2: Unadjusted and adjusted analysis of factors associated with current HCV infection all ETHOS Engage participants with available point-of-care HCV RNA results (n=1,388)

Characteristic		Total valid point-of-care result, n (col%)	Current HCV infection, n (row%)	OR (95% CI)	aOR (95% CI)
Total (N)		1,388	331 (24%)		
Age at enrolment	<45	760 (55%)	190 (25%)	-ref-	-ref-
	≥45	628 (45%)	141 (22%)	0.87 (0.68, 1.11)	0.92 (0.71, 1.20)
Gender	Male	891 (64%)	216 (24%)	-ref-	-ref-
	Female	494 (36%)	113 (23%)	0.93 (0.71, 1.20)	1.03 (0.78, 1.35)
	Transgender	3 (<1%)	2 (67%)	6.25 (0.56, 69.26)	omitted
Indigenous ethnicity	No	1064 (77%)	253 (24%)	-ref-	-ref-
	Yes	324 (23%)	78 (24%)	1.02 (0.76, 1.36)	0.93 (0.69, 1.26)
Homeless	No	1241 (89%)	282 (23%)	-ref-	-ref-
	Yes	147 (11%)	49 (33%)	1.70 (1.18, 2.45)	1.47 (1.00, 2.16)
OAT status	Never	199 (14%)	44 (22%)	-ref-	-ref-
	Past	160 (12%)	48 (30%)	1.51 (0.94, 2.43)	1.38 (0.85, 2.25)
	Current	1,029 (74%)	239 (23%)	1.07 (0.74, 1.53)	1.16 (0.78, 1.71)
Incarceration history	Never	455 (33%)	77 (17%)	-ref-	-ref-
	>1 year ago	685 (49%)	179 (26%)	1.74 (1.29, 2.34)	1.79 (1.30, 2.45)
	Within last year	248 (18%)	75 (30%)	2.13 (1.48, 3.07)	2.03 (1.38, 3.01)
Recency of injecting	>12 months	209 (15%)	31 (15%)	-ref-	-ref-
	Within 1-12 months	299 (22%)	67 (22%)	1.67 (1.04, 2.66)	1.54 (0.95, 2.49)
	Within last month, <daily	477 (34%)	109 (23%)	1.70 (1.10, 2.63)	1.54 (0.99, 2.41)
	Within last month, ≥daily	403 (29%)	124 (31%)	2.55 (1.65, 3.95)	2.29 (1.45, 3.62)
Main drug injected in last month	None	508 (37%)	98 (19%)	-ref-	omitted
	Heroin	296 (21%)	75 (25%)	1.42 (1.01, 1.99)	
	Other opioids	127 (9%)	44 (35%)	2.21 (1.44, 3.29)	
	Methamphetamine	431 (31%)	108 (25%)	1.40 (1.02, 1.90)	
	Other	26 (2%)	6 (23%)	1.25 (0.50, 3.20)	
Excessive alcohol consumption[†]	No	880 (64%)	197 (23%)	-ref-	-ref-
	Yes	505 (36%)	132 (26%)	1.25 (0.48, 3.20)	1.20 (0.92, 1.56)

Main drug injected in last month was not included in adjusted analyses due to collinearity with recency and frequency of injecting
[†] Not reported for transgender participants

Table 3: Unadjusted and adjusted analysis of factors associated with self-reported historical HCV treatment among total ETHOS Engage participants who had evidence of previous or current HCV infection (n=788)

Characteristics		Previous or current HCV infection, n (row%)*	Treated, n (row%)	OR (95% CI)	aOR (95% CI)
Total (N)		788 (55%)	520 (66%)		
Age at enrolment	<45	395 (50%)	237 (60%)	-ref-	-ref-
	≥45	396 (61%)	283 (71%)	1.63 (1.22, 2.06)	1.47 (1.07, 2.02)
Gender	Male	543 (58%)	372 (69%)	-ref-	-ref-
	Female	242 (48%)	147 (61%)	0.71 (0.52, 0.98)	0.68 (0.48, 0.96)
	Transgender	3 (100%)	1 (33%)	0.23 (0.02, 2.55)	omitted
Indigenous ethnicity	No	613 (55%)	410 (67%)	-ref-	-ref-
	Yes	175 (52%)	110 (63%)	0.84 (0.59, 1.19)	0.87 (0.60, 1.26)
Homeless	No	707 (55%)	481 (68%)	-ref-	-ref-
	Yes	81 (52%)	39 (48%)	0.44 (0.27, 0.69)	0.59 (0.36, 0.96)
OAT status	Never	69 (34%)	29 (42%)	-ref-	-ref-
	Past	90 (54%)	53 (59%)	1.97 (1.04, 3.73)	1.88 (0.97, 3.63)
	Current	629 (59%)	438 (70%)	3.16 (1.90, 5.25)	2.60 (1.51, 4.49)
Incarceration history	Never	196 (42%)	130 (66%)	-ref-	-ref-
	>1 year ago	435 (61%)	291 (67%)	1.02 (0.72, 1.47)	0.91 (0.61, 1.34)
	Within last year	157 (61%)	99 (63%)	0.87 (0.56, 1.34)	0.85 (0.52, 1.39)
Recency of injecting	>12 months	117 (54%)	91 (78%)	-ref-	-ref-
	Within 1-12 months	159 (52%)	105 (66%)	0.56 (0.32, 0.96)	0.65 (0.37, 1.14)
	Within last month, <daily	273 (55%)	189 (69%)	0.64 (0.39, 1.07)	0.82 (0.48, 1.39)
	Within last month, ≥daily	239 (56%)	135 (56%)	0.37 (0.22, 0.61)	0.51 (0.30, 0.86)
Main drug injected in last month	None	276 (53%)	196 (71%)	-ref-	omitted
	Heroin	188 (60%)	132 (70%)	0.96 (0.64, 1.44)	
	Other opioids	83 (63%)	45 (54%)	0.48 (0.29, 0.80)	
	Methamphetamine	227 (51%)	139 (61%)	0.64 (0.44, 0.94)	
	Other	14 (50%)	8 (57%)	0.54 (0.18, 1.61)	
Excessive alcohol consumption†	No	495 (54%)	337 (68%)	-ref-	-ref-
	Yes	290 (55%)	182 (63%)	0.80 (0.59, 1.08)	0.85 (0.62, 1.16)

Main drug injected in last month was not included in adjusted analyses due to collinearity with recency and frequency of injecting
* proportion of overall population (N=1,443)
† Not reported for transgender participants

Figure Legends

Figure 1: ETHOS Engage participant flowchart, current HCV status (N=1468)

*determined by self-report

Figure 2: Current HCV prevalence among ETHOS Engage participants with known point-of-care HCV RNA result (n=1,388)

Abbreviations: M, male; F, female; OAT, opioid agonist therapy; m, month(s)
*Main drug injected in the last month. Data for participants injecting other drugs (n=24) not shown.

Figure 3: Self-reported historical HCV treatment among ETHOS Engage participants with evidence of previous or current HCV infection (n=788)

Abbreviations: M, male; F, female; OAT, opioid agonist therapy; m, month(s)
*Main drug injected in the last month. Data for participants injecting other drugs (n=24) not shown.

Figure 1

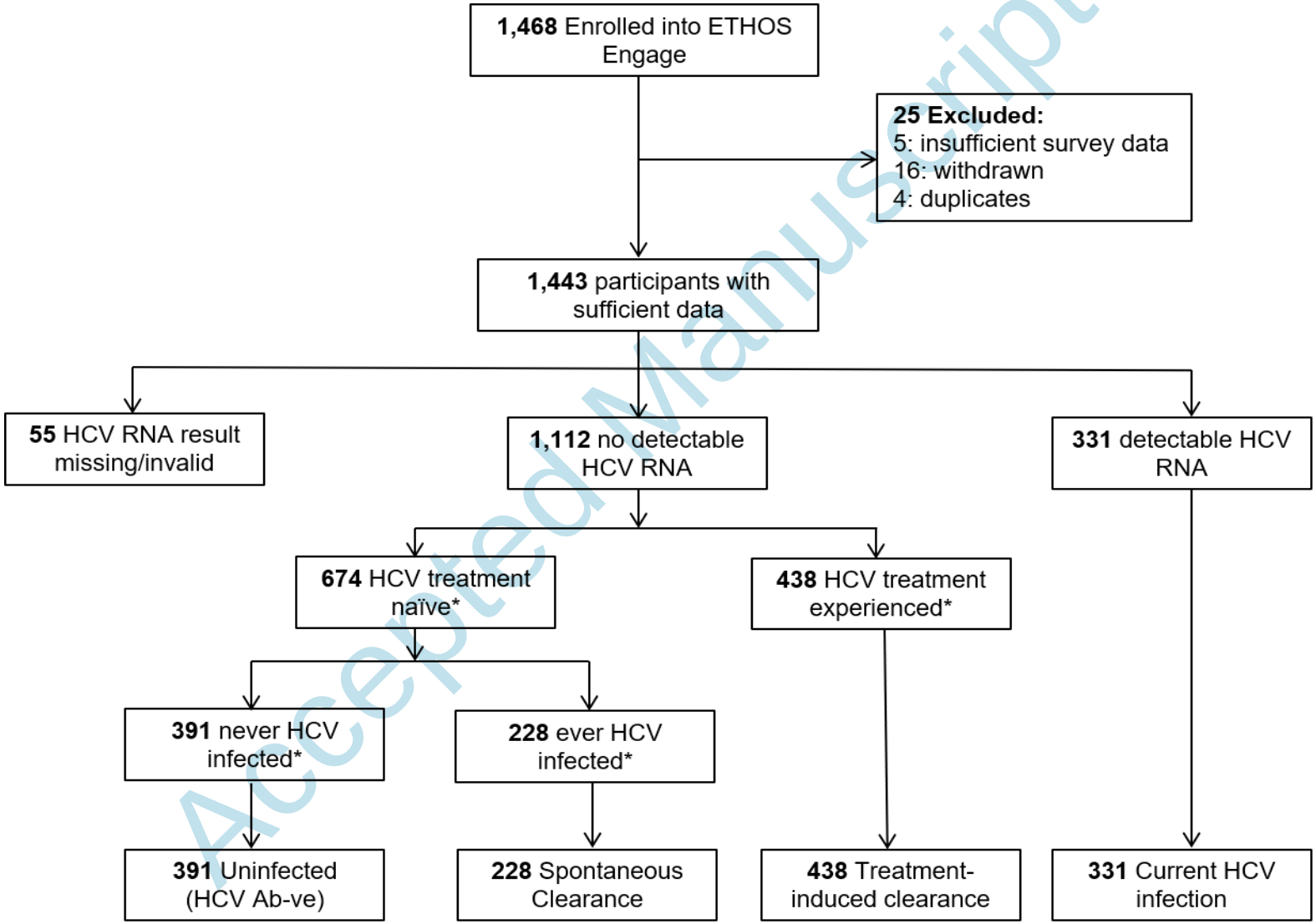

Figure 2

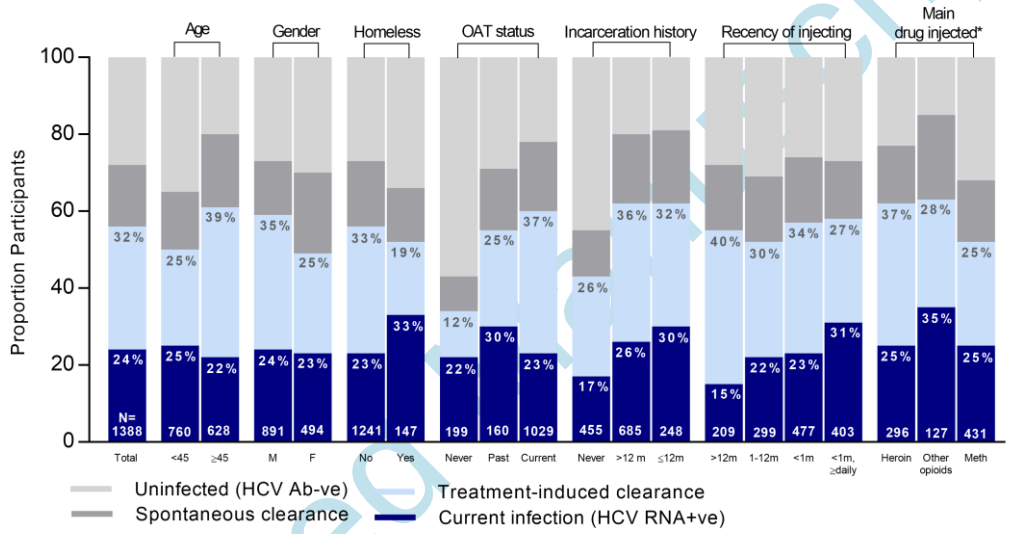

Figure 3