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MAJOR ARTICLE

Reaching Hard-to-Reach People Who Use Drugs: A Community-Based Strategy for the Elimination of Hepatitis C

Nicolas Nagot,[1] Morgana D'Ottavi,[1] Catherine Quillet,[1] Anne Debellefontaine,[1,2] Joëlle Castellani,[1] Nicolas Langendorfer,[3] Bertrand Hanslik,[3] Sylvain Guichard,[4] René Baglioni,[3] Vincent Faucherre,[3] Edouard Tuaillon,[1] Georges-Philippe Pageaux,[5] Didier Laureillard,[1,6] and Hélène Donnadieu-Rigole[1,3]

[1]Pathogenesis and Control of Chronic & Emerging Infections, University of Montpellier, Montpellier, France, [2]Groupe SOS Solidarité, Montpellier, France, [3]Department of Addiction Medicine, Montpellier University Hospital, Montpellier, France, [4]Association of Marginality and Drug Addiction (AMT), Montpellier, France, [5]Department of Hepatology and Gastroenterology, Montpellier University Hospital, Montpellier, France, and [6]Department of Infectious Diseases, Caremeau University Hospital, Nimes, France

Background. Elimination of hepatitis C virus (HCV) among people who use drugs (PWUD) remains a challenge even in countries in which HCV care is provided free of cost. We assessed whether an innovative community-based, respondent-driven sampling (RDS) survey, coupled with HCV screening and immediate treatment, could be efficient to detect and cure current PWUD with chronic HCV in a large city of Southern France.

Methods. At a community site with peers, PWUD (cannabis not included) were enrolled after confirmation by a urine drug test. Participants were then screened for hepatitis B virus, HCV, and human immunodeficiency virus and benefited from onsite HCV treatment evaluation and prescription. Peer support was provided during treatment, and a systematic visit was scheduled 12 weeks after the end of treatment. The cost of the intervention was estimated.

Results. Five hundred fifty-four participants were enrolled. Most were male (78.8%) with a median age of 39 years (interquartile range, 33–46). Cocaine (73.1%) and heroine (46.8%) were the main drugs consumed. Overall, 32.6% of PWUD ($N = 181$) were HCV seropositive, 49 (27.1%) of which had detectable HCV ribonucleic acid and were thus eligible for treatment. Ten of these patients had severe fibrosis. Hepatitis C virus treatment was initiated for 37 (75.5%) patients, 30 (81.1%) of whom completed their treatment and 27 (73.0%) achieved sustained viral response at week 12. The total cost was 161 euros € per screened patient and 1816€ per patient needing treatment.

Conclusions. A community-based RDS survey approach, involving peers, proved efficient and cost-effective to reach and cure PWUD for HCV. This innovative strategy could be key for the final step of HCV elimination.

Clinical trial registration. ClinicalTrials.gov, NCT04008927.

Keywords. Costs and cost analysis; drug users; hepatitis C; intervention; mass screening.

In Europe, people who use drugs (PWUD) remain an important at-risk group for hepatitis C virus (HCV) infection [1]. Estimates from a modeling exercise with a 2018–2030 timeframe shows that people who inject drugs (PWID) could represent over 80% of HCV transmission in the Western European population [2]. Hepatitis C virus seroprevalence in PWUD ranges from 14% in the Czech Republic to 84% in Portugal, with various countries reporting rates exceeding 50% in 2015 [3–6]. To meet the goal of HCV elimination by 2030 [7], ie, reducing new infections and deaths by 90% and 65%, respectively, and treating 80% of those eligible, the World Health Organization and several expert associations highlight the urgent need to focus on HCV treatment in PWUD to prevent further HCV transmission from untreated individuals [2, 7, 8].

The strategy for HCV elimination in Europe relies almost exclusively on the healthcare system for testing and treating individuals. Hepatitis C virus screening and treatment (direct-acting antivirals [DAAs]) are free of charge in hospitals and addiction centers in most European countries for those covered by health insurance. The DAAs have proven to be very efficacious among PWUD and recorded a full recovery in 95% of cases [9]. However, many barriers (eg, structural, societal, etc) inhibit access to prevention, testing, and care among PWUD [10–13]. Therefore, many PWUD are left unscreened and untreated [14, 15], resulting in an uncontrolled HCV epidemic among PWUD [16]. Furthermore, in many countries—

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Correspondence: Nicolas Nagot, MD, PhD, 60 rue de Navacelles, 34394 Montpellier, France (n-nagot@chu-montpellier.fr).

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such as France—the absence of population-based data among PWUD makes it difficult to estimate progress towards HCV elimination in this particularly high-risk group [17].

A key challenge in HCV elimination can be attributed to PWUD being notably "hidden" and "hardly-reached" by the healthcare system. Innovative models for screening [18] and care, using new peer-led strategies, are therefore necessary [10, 19, 20]. To address this issue, recruitment of PWUD by other PWUD in their network has emerged as a promising strategy [21]. For instance, respondent-driven sampling (RDS) surveys, relying on both peer and financial incentives, have proven to be efficacious [22] for epidemiological purposes, or to control a large human immunodeficiency virus (HIV) outbreak as in Athens after the 2008 economic recession [23]. If the underlying assumptions of RDS surveys are met, the constituted sample can be considered representative of the study population [24].

Trust in healthcare workers is essential for marginalized populations. To build confidence and reach those who do not regularly (or ever) engage in healthcare services for HCV screening and care, the involvement of peers in the process as well as the designation of a neutral site (ie outside regular health services) may reduce stigma and reluctance to attend the habitual health/addiction care services. In addition, peers, when appropriately trained, can be very effective in delivering counseling and harm reduction activities [19].

The aim of our study was to assess whether a community-based RDS screening associated with immediate HCV treatment could be efficient in detecting and curing PWUD living with chronic HCV in a French city.

METHODS

Study Design

We implemented a demonstration project in the South of France to estimate the efficiency of our strategy, which aimed to identify and cure PWUD with chronic heaptitis C. We also estimated the PWUD population size using a capture-recapture method, and we calculated the cost of our intervention per person screened and per person treated (ClinicalTrials.gov Identifier NCT04008927).

Study Population

All current drug users aged 18 or above, living in the Montpellier metropolitan area (31 communes, $\pm$500 000 inhabitants), were eligible to participate. Current drug use was defined as self-report of misused medication (eg methadone, buprenorphine, opiate drugs, methylphenidate, ketamine) or any illicit substance other than cannabis within the past 3 days and at least 10 times per month, confirmed by a positive urine drug test. We excluded the following persons: those who did not consent, those who were not recruited by the RDS survey method; those who did not have the capacity to understand the research; or those who were under guardianship.

Outcomes

Our primary outcome was the proportion of treated and cured PWUD (achieving a sustained viral response 12 weeks after the end of their treatment) among those identified with detectable HCV ribonucleic acid (RNA). Our secondary outcomes included the following: estimating the number and proportion of participants infected with HCV; the HCV cascade of care produced by this type of screening and treatment technique; and the cost per PWUD screened, HCV-infected, and cured.

Study Site

The main activities (screening etc) took place in a disused building, rented and rehabilitated for the duration of the study, and composed of 3 rooms and a courtyard with an enclosed canopy tent. The building was located at the back of the local university hospital campus with direct access from the exterior.

Study Procedures

Population Size Estimate

A capture-recapture method was used to estimate the PWUD population in the Montpellier metropolitan area. Two weeks before the beginning of enrollment in the study, 76 nail clippers with the ICONE study logo were distributed in the target population (any person fitting the study's inclusion criteria) by local nongovernmental organizations (NGOs), and they were instructed to hold on to the object. For the recapture phase, RDS survey participants once enrolled were asked whether they had been given a particular object by a member of the community and whether they could produce the said object. In the case of a positive response, in which the participant was unable to present the nail clipper, he/she was asked to describe it or recognize it from a selection of photos.

Peers

Five peers (former or current PWUD) from the community were recruited by community NGOs and trained on Good Clinical Practice, study procedures, risk reduction, and counseling for treatment compliance. Their role was to (1) welcome the participants, (2) inform them about the study, HCV transmission, and treatment, (3) administer a face-to-face questionnaire, and (4) provide individual support throughout the duration of HCV treatment uptake.

Seeds and Network Recruitment

The study was conducted according to standard RDS survey procedures [24]. Fifteen PWUD seeds, with distinct characteristics of interest (eg, gender, dwelling, age, sex work, and sexual behaviors), were identified in the community. They each needed to report a personal network size of at least 5 other PWUD.

Seeds were formally enrolled and participated in all study procedures. They then each received 3 coupons to distribute within their network for the recruitment of new participants. Participants arriving at the study site were required to present a valid coupon to be eligible for inclusion. Each new PWUD enrolled in the study subsequently received 3 coupons to continue recruitment of additional participants in their respective networks. Participants could only enroll once in the study. Dissuasive biometric measures (wrist circumference and forearm length) were taken and recorded as a means to protect against multiple participations. Participants received honoraria for participation (50 euros [€] for transportation cost to the study site; the time spent at the research site; compensation for blood draws) and for any coupons returned via their personal network (20€ each; maximum 60 euros total for coupons returned).

Questionnaire, Hepatitis C Virus Assessment, Treatment Initiation, and Counseling

Once written informed consent was obtained, a urine sample was tested using a DOA-10 test cup (MB Biomedicals, Eschwege, Germany). After confirmation of participant eligibility, a face-to-face standardized questionnaire, including sociodemographic characteristics and drug use behaviors, was administered.

Participants then underwent a rapid test screening for HIV (INSTI VIH 1/2; Nephrotek, Boulogne-Billancourt, France), hepatitis B surface antigen (HBsAg) (TOYO VHB; Nephrotek), and HCV serology (TOYO VHC; Nephrotek). All participants with a positive HCV rapid test benefited from onsite HCV viral load quantification (Xpert HCV VL; point-of-care testing) and a liver fibrosis evaluation by a portable FibroScan. The results of the different tests were available within 90 minutes. An onsite physician consulted the patient and, if eligible for treatment, decided to initiate treatment with either glecaprevir/pibrentasvir for 8 weeks or sofosbuvir/velpatasvir for 12 weeks. Counterindications for treatment were as follows: pregnancy or breastfeeding, anticipated relocation for any period longer than 4 weeks in the 3 months after treatment initiation, taking counterindicated medication(s), allergies to any of the molecules in the antiviral regimen, and/or prognosis of death within the last 6 months. Only participants that were affiliated to and covered by the healthcare system could receive treatment. Those without health insurance were assisted by a social worker to gain access to the universal coverage plan. Because DAAs could not be delivered onsite by law, participants, often accompanied by a peer, were required to personally pick up their tablets from the pharmacy of their choosing. Once they initiated treatment, follow-up visits at week (W)2, W4, W8, and—for those with a 12-week treatment regimen—W12 were scheduled. During these visits, peers provided counsel for participants facing any treatment compliance issues and for harm reduction education. A final visit was scheduled to measure the sustained viral response (SVR) at W12 posttreatment completion. After 4 weeks of treatment, the participants were given the option to be referred to 1 of the 2 nearby addiction centers to continue his/her treatment and engage in addiction care.

Sample Size

Based on an HCV prevalence of 40%, recruiting 400 participants would allow a precision of $\pm 5\%$ in estimating the HCV prevalence in this population. Assuming that a third of HCV seropositive PWUD would require treatment, this sample size would provide a precision of $\pm 3\%$ around an estimated rate of 13% of PWUD needing treatment.

Data Analysis

People Who Use Drugs Population Size

The PWUD population size was estimated according to the Joint United Nations Programme for HIV/acquired immune deficiency syndrome recommendations [25]. Although the RDS survey was not implemented for epidemiological purposes, data are reported according to the relevant STROBE RDS recommendations [26]. To account for the study design and correlation between participants who were recruited by one another, RDS survey weighing is considered for the estimation of key outcomes [24]. Confidence intervals (CIs) for weighed estimates were obtained by a bootstrapping method. The RDS survey diagnostics, including homophily and equilibrium, were calculated and validated for the main participant characteristics.

The baseline participant characteristics and HCV viremia are described. Hepatitis C virus viremia, representing HCV transmission potential in the PWUD population, was defined as the proportion of PWUD with detectable HCV RNA among all participants, regardless of their HCV serology. The proportion of participants treated and cured (ie, achieving SVR12) among those identified with HCV, and among those who started treatment [27], were calculated.

Cost of the Intervention

All costs were collected by the research team, classified as variable (eg tests), fixed (eg rent) or staff (eg salaries). Costs related to research (eg data collection) were not considered. Costs for the tests and analysis devices (GeneXpert and Fibroscan) were depreciated over 10 years. The total cost of the RDS survey (with and without the follow-up visits) and the total cost per PWUD screened, HCV-infected, and cured were calculated. All costs were collected and presented in euros (2020).

Statistics

Statistical analyses were performed using both RDS Analysis Tool software (v7.1) and Stata software (version 16.1; StataCorp LP, College Station, TX).

Patient Consent Statement

The research protocol was approved by the "*Comité de Protection des Personnes Sud Est V*", France. Individual written informed consent was obtained from all participants before their participation in the study.

RESULTS

Participant Enrollment

Between September 15 and November 27, 2020—when recruitment stopped for financial constraints—634 candidates passed through the RDS survey site, and 554 were included in the study (Figure 1). The main reason for exclusion was a drug consumption not meeting the established eligibility criteria (Figure 2).

Respondent-Driven Sampling Survey Sample Validation

The RDS survey diagnostics were overall satisfactory. The number of waves to reach equilibrium was 2 for gender, 3 for HCV serology, and 3 for the type of PWUD (injecting drugs or not). Homophily, at a predefined threshold of 0.3, was reached for gender and HCV serology and was borderline for type of PWUD (injecting PWUD being more likely to recruit other injectors, which we considered appropriate given that injection is a major risk factor for HCV transmission in PWUD).

Population Size Estimate

The population of PWUD living in the Montpellier metropolitan area was estimated at 1559 (95% CI, 1099–2020).

Participant Characteristics

Most participants were male (78.8%) with a median age of 39 (interquartile range, 33–46), mostly coming from Western Europe (77.8%) and living from social benefits (62.8%) (Table 1). Cocaine (73.1%) and heroin (46.8%) were the main substances consumed according to participant self-declarations. Injection as a method of consumption was reported by 70.7% of HCV-seropositive, but only by 17.7% of HCV-seronegative, participants ($P < .001$). However, 82.6% of HCV-seronegative participants sniffed drugs versus 44.8% of HCV-seropositive PWUD ($P < .001$). More HCV-seropositive participants had previously been incarcerated (66.3% HCV-seropositive vs 45.3% HCV-seronegative; $P < .001$), took opioid replacement therapy (81.2% vs 50.1%, $P < .001$), and shared their injection materials (24.9% HCV-seropositive vs 5.1% HCV-seronegative; $P < .001$). Only 14.5% had no health insurance. Finally, more HCV-seropositive PWUD were infected with HIV (6.6% HCV-seropositive vs 1.3% HCV-seronegative; $P = .001$) and were HBsAg positive (3.9% HCV-seropositive vs 0.3% HCV-seronegative, $P = .001$). Overall, HCV seroprevalence

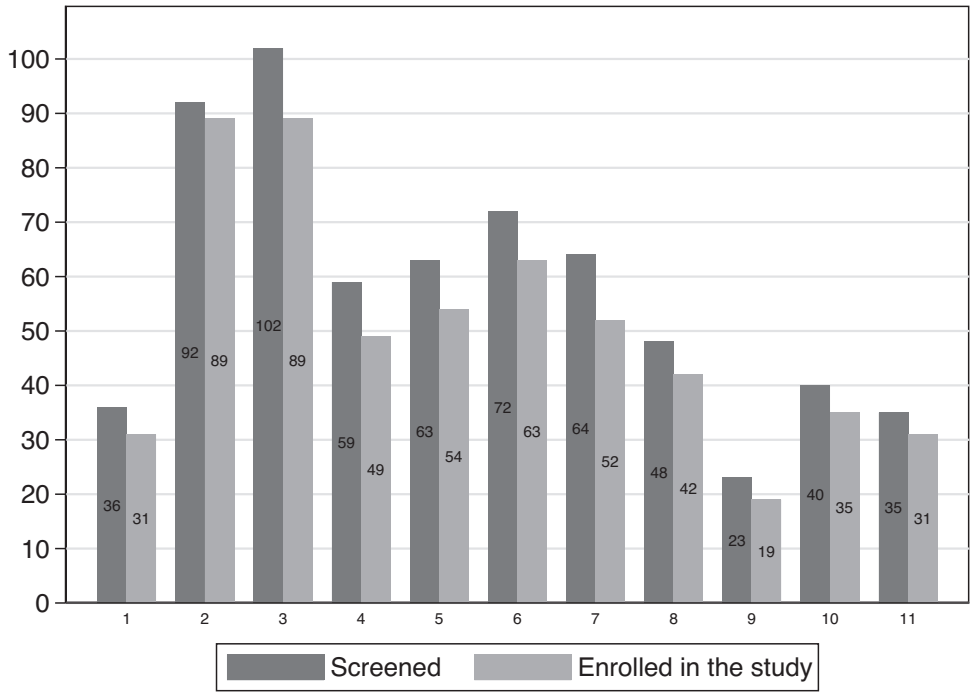

Figure 1. Recruitment rate per week of respondent-driven sampling survey, September 15, 2020 to November 27, 2020.

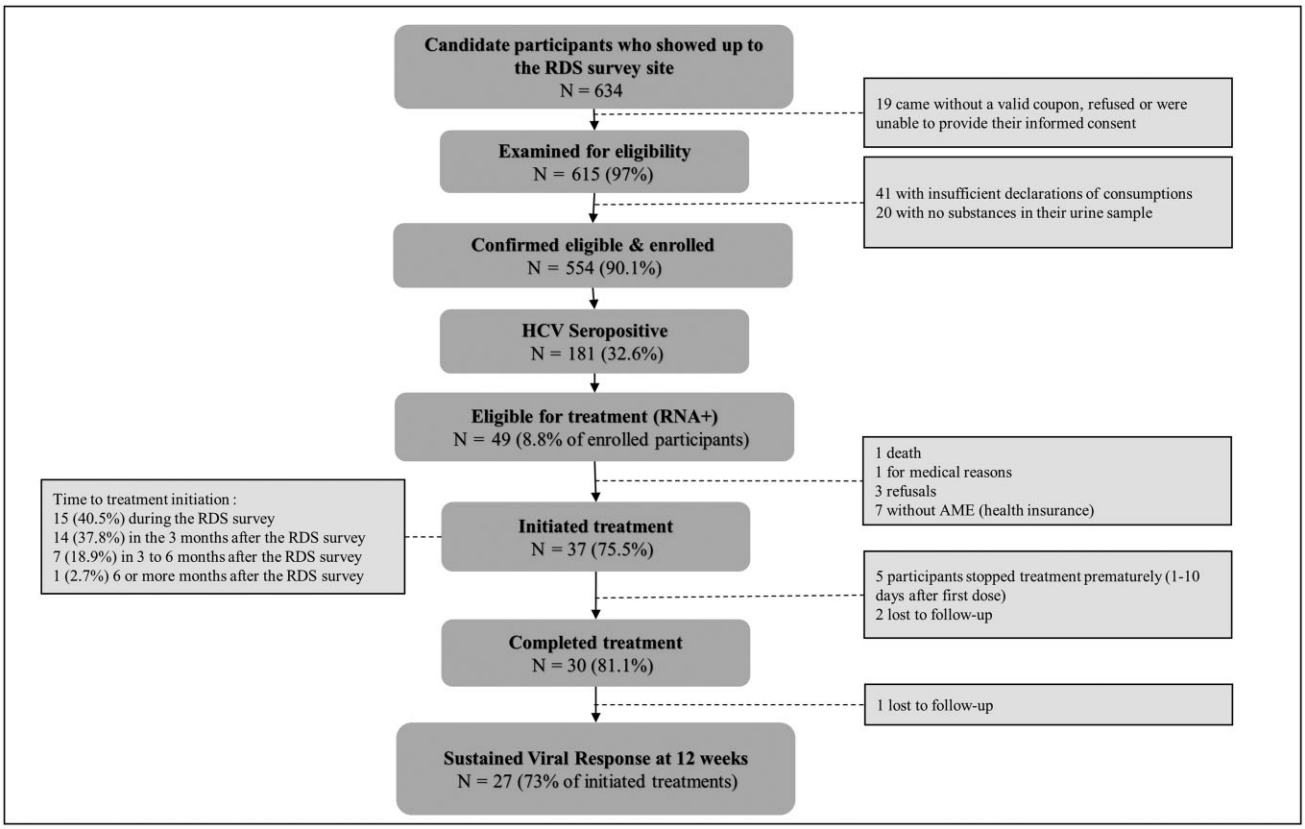

Figure 2. Participants flow chart.
Abbreviations: AME, Aide médicale de l'Etat (Medical financial assistance from the government); HCV, hepatitis C virus; RDS, respondent-driven sampling; RNA, ribonucleic acid.

stood at 32.6% (weighted population estimate, 28.7%; 95% CI, 21.8–35.8). The crude HCV viremia prevalence was 8.8% (95% CI, 28.8–36.8), and the weighted population estimate was 6.7% (95% CI, 3.3–11.1). Only 26.7% of participants reported having attended an addiction care center over the course of the previous year.

Among participants with detectable HCV RNA and available FibroScan data ($N = 43$), 30 (69.8%) had a liver stiffness measurement (LSM) ≤ 7, 3 (6.9%) were between $7 < \text{LSM} \leq 10$, and 10 (23.3%) had severe fibrosis (F3/F4, LSM > 10).

Participant Enrollment and Outcomes

Among the 181 HCV-seropositive PWUD, 49 had detectable HCV RNA and were eligible for treatment (Figure 2). Of the latter, 59.2% were already aware of their HCV status, 36.7% were newly diagnosed, and 37 of 49 (75.5%) initiated treatment, 30 of 37 (81.1%) of which collected their tablets for at least 2 months (under both medication regimens). Finally, 29 of 30 attended the W12 posttreatment visit and 27 achieved SVR12. Assuming those who did not attend the W12 posttreatment visit are not cured (although 2 of them collected all their tablets for the treatment duration), 73.0% (27 of 37) of those who initiated treatment achieved SVR12. Overall, our strategy enabled to cure at least 55% (27 of 49) of all PWUD who were identified with HCV during the RDS survey. It is interesting to note that among the 37 PWUD who started treatment, 20 had not attended any addiction center in the last year.

Cost of the Intervention

Implementing the survey for 554 participants cost 89 004€ (Table 2). The total cost per patient screened was 161€, and the total cost for identifying an HCV-infected patient was 1816€. The costs were mainly driven by the allowances given to the participants for both their initial visit and the returned coupons (almost 45% of the total RDS survey cost) (see Supplementary Table 1). The cost for follow-up visits stood at 825 691€ (Table 2), approximately 90% of which was allocated to the purchase of medication (see Supplementary Table 2). Finally, the cost per patient who completed treatment was 30 490€; the cost was 33 878€ per patient cured.

DISCUSSION

Our community-based strategy proved efficient and cost-effective in rapid recruitment, screening, and treatment of a

Table 1. Characteristics of PWUD Enrolled in the RDS Survey

Category	Subcategory	Total N (%)	Anti-HCV Positive N (%)	Anti-HCV Negative N (%)	*P* Value[a,b]
No. of participants		554 (100.0)	181 (32.7)	373 (67.3)	
Sociodemographic Characteristics					
Gender	Male	437 (78.8)	149 (82.3)	288 (77.2)	.304
	Female	115 (20.8)	31 (17.1)	84 (22.5)	
	Transgender	2 (0.4)	1 (0.6)	1 (0.3)	
Age	<30	97 (17.5)	12 (6.6)	85 (22.8)	.000[c]
	30-39	190 (34.3)	59 (32.6)	131 (35.1)	
	40–49	181 (32.7)	64 (35.4)	117 (31.4)	
	≥50	86 (15.5)	46 (25.4)	40 (10.7)	
Nationality by region	West European	431 (77.8)	126 (69.6)	305 (81.8)	.000[c]
	East European	74 (13.4)	51 (28.2)	23 (6.2)	
	North African	31 (5.6)	4 (2.2)	27 (7.2)	
	Sub-Saharan African	17 (3.1)	–	17 (4.6)	
	Other	1 (0.2)	–	1 (0.3)	
Socioeconomic Characteristics					
Sources of revenue[d]	Professional activities	71 (12.8)	19 (10.5)	52 (13.9)	.255
	Benefits/Social minimums	348 (62.8)	110 (60.8)	238 (63.8)	.488
	Begging	130 (23.5)	61 (33.7)	69 (18.5)	.000[c]
	Family	36 (6.5)	8 (4.4)	28 (7.5)	.167
	Illegal activities	81 (14.6)	31 (17.1)	50 (13.4)	.245
Living situation	Isolated	271 (48.9)	97 (53.6)	174 (46.7)	.129
	Cohabiting	83 (15.0)	19 (10.5)	64 (17.2)	
	With family	61 (11.0)	48 (26.5)	91 (24.4)	
	With friends	139 (25.1)	17 (9.4)	44 (11.8)	
Dwelling	Stable	142 (25.6)	38 (21.0)	104 (27.9)	.005[c]
	Temporary	185 (33.4)	59 (32.6)	126 (33.8)	
	Squat	125 (22.6)	36 (19.9)	89 (23.9)	
	Homeless	102 (18.4)	48 (26.5)	54 (14.5)	
Ever been incarcerated	Yes	289 (52.2)	120 (66.3)	169 (45.3)	.000[c]
Drug Use Behavior					
Self-report of substance consumed in the past 6 months[d,e]	Cocaine	405 (73.1)	134 (74.0)	271 (72.7)	.731
	Heroin	229 (46.8)	76 (42.0)	183 (49.1)	.118
	Analgesic opioid	176 (31.8)	77 (42.5)	99 (26.5)	.006[c]
	Crack	236 (42.6)	62 (34.3)	174 (46.7)	.000[c]
Method of consumption[d,e]	Injected	194 (35.0)	128 (70.7)	66 (17.7)	.000[c]
	Sniffed	389 (70.2)	81 (44.8)	308 (82.6)	.000[c]
	Smoked	288 (52.0)	80 (44.2)	208 (55.8)	.011[c]
	Ingested	435 (78.5)	141 (77.9)	294 (78.8)	.805
Taking ORT (methadone or buprenorphine, regardless whether taken as prescribed or not)	Yes	334 (60.3)	147 (81.2)	187 (50.1)	.000[c]
Sharing injection materials[d]	Yes	64 (11.6)	45 (24.9)	19 (5.1)	.000[c]
	Needles	35 (6.3)	27 (14.9)	8 (2.1)	.000[c]
	Syringes	42 (7.6)	33 (18.2)	9 (2.4)	.000[c]
	Cottons/filters	44 (7.9)	31 (17.1)	13 (3.5)	.000[c]
	Spoons/cups	45 (8.1)	32 (17.7)	13 (3.5)	.000[c]
	Water/vials	42 (7.6)	31 (17.1)	11 (3.0)	.000[c]
	Tourniquet	36 (6.5)	24 (13.3)	13 (3.2)	.000[c]
	Other	19 (3.4)	1 (0.6)	2 (0.5)	.980
Health Status					
Health insurance	Basic coverage plan	188 (33.9)	64 (35.4)	124 (33.2)	.197
	PUMA or AME[f]	286 (51.6)	85 (47.0)	201 (53.9)	
	None	80 (14.4)	32 (17.7)	48 (12.9)	
Ever been hospitalized in a psychiatric hospital	Yes	145 (26.2)	62 (34.3)	83 (22.3)	.003[c]
Positive HIV serology		17 (3.1)	12 (6.6)	5 (1.3)	.001[c]

Table 1. Continued

Category	Subcategory	Total N (%)	Anti-HCV Positive N (%)	Anti-HCV Negative N (%)	*P* Value[a,b]
Detectable HBsAg		8 (1.4)	7 (3.9)	1 (0.3)	.001[‡]
Positive HCV serology (crude)		181 (32.6)	181 (32.6)	…	–
Positive HCV serology (weighted)		181 (28.7)	181 (28.7)	…	
Viremia prevalence (crude)		49 (8.8)	49 (8.8)	…	
Viremia prevalence (weighted)		49 (6.7)	49 (6.7)	…	
Liver fibrosis (elastography)	F0/F1 ($2.5 \leq LSM \leq 7$)	30 (69.8)[g]	30 (69.8)[g]	…	
	F2 ($7 < LSM \leq 10$)	3 (6.9)[g]	3 (6.9)[g]	…	
	F3/F4 (LSM >10)	10 (23.3)[g]	10 (23.3)[g]	…	

Abbreviations: AME, aide médicale de l'Etat (medical financial assistance from the government); HBsAg, hepatitis B surface antigen; HCV, hepatitis C virus; HIV, human immunodeficiency virus; LSM, liver stiffness measurement; ORT, opioid replacement therapy; PUMA, Protection Universelle Maladie (universal health insurance); PWUD, people who use drugs; RDS, respondent-driven sampling.

[a] *P* values are calculated for each class individually to account for nonindependent groups.

[b] *P* values were calculated using Pearson's χ^2 test of independence, with the threshold for statistical significance set at $\alpha < 0.05$.

[c] Cramér's V for statistically significant *P* values: age = 0.2547, region = 0.3312, begging as revenue = 0.1683, dwelling = 0.1517, ever been in jail = 0.1993, crack = −0.1176, analgesic opioids = 0.1612, injection = 0.5213, sniff = −0.3879, smoke = −0.1086, sharing injection materials = 0.2900, sharing needles = 0.2462, syringes = 0.2803, cottons = 0.2366, spoons = 0.2437, vials = 0.2512, tourniquet = 0.1911, ever been hospitalized in psych ward = 0.1281, HIV positive = 0.1438, detectable HBsAg = 0.1415.

[d] Participants may be in more than 1 category.

[e] Description of the 4 most common answers.

[f] Universal health coverage scheme for resident in France.

[g] 43 of 49 PWID with RNA HCV$^+$ realized a FibroScan at the 1st follow-up visit.

large number of PWUD with HCV. Approximately 33% of the estimated PWUD population in the city was screened for HCV within 11 weeks. Among those with detectable HCV RNA, most were fully recovered by the end of the study.

In most high-income countries where HCV testing and care are widely accessible and free of charge for patients, many PWUD with HCV have already been cured. This was the case in our study. In HepCare Europe—a large project addressing the various steps of the cascade of care in community addiction, homeless, and penitentiary services (ie, targeting not only PWUD) in 4 European cities—60.5% of 1074 participants (mainly PWUD) with a positive serology were infected with HCV (versus the 27.1% observed in our study) [28]. The ultimate challenge for HCV elimination consists of reaching and treating at least half of the remaining 40% of untreated PWUD (to attain a proportion of 80% of PWUD being treated), who are considered to be the most difficult to reach and engage in care in this especially high-risk community. The findings from our demonstration project suggest that our strategy can rapidly detect and treat a majority of these hard-to-reach PWUD.

Table 2. Costs Associated With the RDS Survey and Follow-up Visits

Category	*N*
Number of patients	554
Number of patients with chronic HCV eligible for treatment	49
Number of patients who completed the treatment	30
Number of cured patients	27
Total cost of RDS survey	89 004 €
Total cost per screened patient (at RDS survey)	161 €
Total cost to identify a patient with chronic HCV	1816 €
Total cost of the follow-up visits	825 691 €
Total cost of the intervention (RDS survey and follow-up visits)	914 695 €
Total cost per patient with chronic HCV	18 667 €
Total cost per patient who completed the treatment	30 490 €
Total cost per cured patient	33 878 €

Abbreviations: HCV, hepatitis C virus; RDS, respondent-driven sampling.

Our strategy has been designed to improve the proportion of PWUD cured from HCV. To our knowledge, few alternative interventions have been able to address the entirety of the cascade of care (ie, from increased screening to full recovery), and they rarely report encouraging results. A randomized controlled trial in London tested outreach peer support to engage PWUD in care. Although this strategy resulted in modest improvement in engagement in HCV care, no participant achieved SVR12 [29]. In the HepCare project, the acceptance rate for testing was 75% [28]. Only 43.5% of those with detectable HCV RNA were initiated on a treatment regimen. Of note, HCV testing was done (1) in prisons and (2) in addiction and homelessness services. In Montpellier, as is the case in the rest of France, this strategy would be of limited benefit because prisoners and addiction center attendees are widely screened and treated. In Toronto, a randomized trial tested peer-led, point-of-care serological testing to target individuals in the community who had ever injected drugs in their lifetime. The results showed a poor uptake of HCV screening and a dismal engagement rate in care (3%) for those with positive serology, with no difference between study arms [30]. In Belgium, a similar peer outreach screening approach targeting PWUD

resulted in major losses throughout the cascade of care with 63 of 425 (14.8%) testing HCV seropositive, 88.9% of whom were referred, and 66.1% of whom were finally linked to care and tested for HCV RNA. Among the 29 (78.4%) with chronic HCV, DAA treatment was initiated in only 17 (58%) with no report of SVR12 [31].

We believe that the strategy we propose could be much more efficient for several reasons. The RDS survey approach is a powerful tool in reaching hard-to-reach PWUD [32, 33], whereas the peer outreach option tends to limit the testing coverage to more restricted networks. We were able to recruit ±33% of the whole PWUD population, including community members never before seen in addiction care centers. The RDS surveys also allow for an accelerated recruitment. For example, in Antwerp, 36 days of outreach screening in 18 locations recruited 425 PWUD over the course of 1 year, whereas we recruited a similar number in fewer than 3 months from 1 site [31]. Furthermore, the choice of a neutral, temporary site, outside of the usual health services, was likely a motivating factor for those reluctant to attend usual services. Beyond being a friendly environment with presence of peers and empathetic healthcare workers, this site provided the full HCV treatment eligibility check, using Xpert HCV VL and portable FibroScan. This "all-in-one" visit allowed eligible participants to leave the study site within 2 to 3 hours with a DAA prescription and peer-assisted referral to a pharmacy. This same-day assessment is crucial to reduce losses along the cascade of care [34]. Peer involvement, together with the choice of a temporary "test-and-treat" setting implemented within the community, were potentially instrumental in the success of our study.

As a result, the cost per person screened using our strategy (161€) was substantially lower compared to those reported by the HepCare project (from 194€ testing prisoners to 635€ in medication-assisted treatment clinics) [28]. Our findings confirm the high SVR12 success rates among PWUD initiating DAA as reported from other settings [14, 35].

Our approach could also provide, for the first time in France, a precise estimate of HCV serology and chronic HCV in the PWUD population. Although we could not estimate the elimination targets (new infections and HCV-related deaths could not be measured by design), we could assess our progress toward HCV elimination through the proportion of PWUD with detectable HCV RNA among those that are HCV seropositive (27.1%) and through the proportion of eligible PWUD who started treatment among those with detectable HCV RNA (75.5%). Therefore, our findings showed that RDS surveys are very close to achieve the World Health Organization HCV elimination target of 80% of those eligible.

Our study has several limitations. First, it was a demonstration project whose findings must be confirmed in other settings. Second, the intervention effectiveness relies on the assumption that participants identified with detectable HCV RNA would not have been initiated on DAA in the absence of the intervention. This assumption is likely true because few participants had any engagement in addiction or medical care over the past year. Finally, the total costs might be slightly underestimated because drug costs were only taken into account for those who completed their treatment.

A major improvement in this strategy would be the possibility to initiate DAAs directly on site. Although, to our knowledge, few other examples of this have been reported [36], research from the HIV field showed that both antiretroviral therapy initiation within the community [37] and prompt engagement in care proved efficacious in maintaining patients in care [38].

CONCLUSIONS

Our findings suggest that mass community-based HCV screening using an RDS survey coupled with same-day DAA eligibility onsite could be a cost-effective and efficient strategy to rapidly make the final step towards HCV elimination among PWUD in high-income settings.

Supplementary Data

Supplementary materials are available at *Open Forum Infectious Diseases* online. Consisting of data provided by the authors to benefit the reader, the posted materials are not copyedited and are the sole responsibility of the authors, so questions or comments should be addressed to the corresponding author.

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