

Modelling the impact and cost-effectiveness of interventions to eliminate hepatitis C virus among people who inject drugs in Haiphong, Vietnam

755

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BACKGROUND

- In Haiphong, Vietnam, most hepatitis C virus **(HCV)** infections occur among people who inject drugs **(PWID)**.
- As part of multiple respondent-driven sampling **(RDS)** surveys undertaken among PWID in Haiphong, an intervention **(DRIVE-C)** provided HCV testing and treatment in 2019 (table 1).
- Centres providing opiate agonist treatment **(OAT)** or antiretroviral therapy **(ART)** also provided HCV testing and linkage-to-treatment in 2021/22 through a combined intervention by the Vietnam Administration for HIV/AIDS Control and the Global Fund **(VAAC-GF)**.
- We modelled the impact and cost-effectiveness of providing HCV testing and treatment to PWID in Haiphong.

METHODS

- An HCV transmission model among PWID and former injectors was calibrated in a Bayesian framework using data from Haiphong.
- A status quo **(SQ)** scenario modelled historical interventions, with no future HCV treatment.
- Various future intervention scenario modelled the additional impact of providing HCV testing and linkage-to-treatment in OAT and ART centres (among active and former injectors), and annual RDS survey interventions each testing 1400 PWID over 2025-2030 **(table 2)**.
- We modelled historical scenarios (0a) with no historical HCV-related interventions, and (0b) with no historical DRIVE-C intervention
- We compared incidence rates against the WHO HCV elimination target among PWID of <2 infections per 100 person-years
- We estimated the incremental cost-effectiveness ratio **(ICER)** per disability adjusted life-year **(DALY)** averted for the future scenario compared to SQ over 2025-2054 (3% annual discounting)
- For the historical scenarios, the comparator period was 2014-2043
- We compared the ICERs against a willingness-to-pay **(WTP)** threshold of €2,334 (57% of Vietnam's 2023 GDP per capita).

TABLE 1: Historical interventions for HCV among PWID in Haiphong

Historical HCV interventions	Details
DRIVE-IN RDS survey	603 active injectors HCV Ab tested (2014)
RDS1 survey	1,380 active injectors HCV Ab tested (2016)
RDS2 survey	1,451 active injectors HCV Ab tested (2017)
RDS3 survey	1,443 active injectors HCV Ab tested, of which 1039 were HCV positive and 1038 were RNA tested (as part of DRIVE-C)
DRIVE-C	1,425 RNA tested from RDS3 and the DRIVE cohort created from the RDS surveys; 1,201 were HCV RNA-positive, 1,021 were eligible for treatment and 979 initiated it
RDS4 survey	1,267 active injectors HCV Ab tested (2019)
VAAC-GF intervention	In OAT centres, 333 diagnosed with HCV and 191 initiated HCV treatment; in ART centres, 1000 diagnosed and 640 initiated treatment (2021-2022).

RESULTS

- For the SQ scenario, HCV incidence decreased from 8.1 (95% credibility interval 5.1-13.6) per 100 person-years (/100pyrs) in 2015 to 5.3/100pyrs (3.0-9.6) in 2023 and increases to 6.2/100pyrs (3.5-10.7) in 2030.
- Without any historical HCV testing and treatment interventions since 2014 (Scenario 0a), the estimated community HCV incidence rate would be 7.7/100pyrs (4.8-13.3) in 2030.
- Without the historical RDS3 and DRIVE-C survey interventions (0b), 2023's estimated community HCV incidence rate is 6.3/100pyrs (3.7-11.3) and 7.0/100pyrs (4.1-12.0) in 2030.
- In the future intervention scenarios **(table 2)**, incidence decreases, with the biggest impact occurring in scenario 4: 2.7/100pyrs (1.0-6.4) by 2030.
- Scenario 4's mean ICER is €884/DALY averted; cost-effective at the €2,334 threshold.
- The incremental costs related to the RDS, DRIVE-C and VAAC-GF (0a) interventions over 2014-2043 was 2,516,512 euros, and 941,888 euros without the DRIVE-C interventions (0b).
- This produces an ICER of 1,271 Euros/DALY averted for the RDS, DRIVE-C, and VAAC-GF interventions (0a) and 1,063 Euros/DALY averted for just DRIVE-C (0b).
- In the fully incremental cost-effectiveness analysis, scenario 2 would be the most cost-effective scenario, with an ICER of €410/DALY averted compared to scenario 1, whilst the ICER for scenario 4 compared to scenario 2, €2536/DALY, was above the WTP threshold

CONCLUSIONS: Using RDS surveys and other care settings (ART and OAT centres) to scale-up HCV-testing and treatment are cost-effective strategies to reduce HCV incidence among PWID in Vietnam.

FIGURE: Estimates of the number of PWID and ex-injectors treated for HCV, community chronic prevalence (RNA positive), and community HCV incidence rate (per 100 person-years).

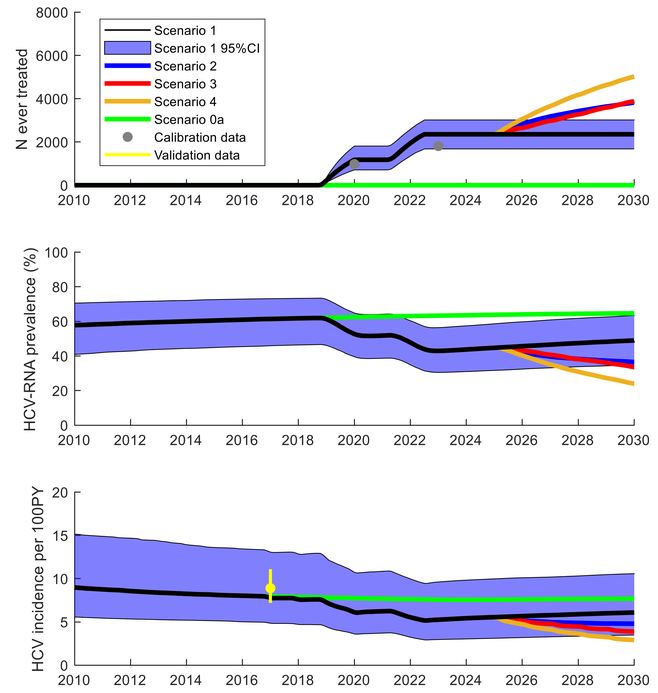


TABLE 2: Modelled overall community HCV incidence among PWID and ex-injectors in 2030 for each scenario, and cost-effectiveness projections of future intervention scenarios versus status quo over 2025-2054.

Scenario	HCV incidence in 2030, per 100 person-years	Percentage change in HCV incidence over 2015 to 2030	Numbers of HCV treatment regimens administered over 2025-2030	% of runs that achieve WHO's HCV elimination target among PWID	Incremental costs compared to scenario 1	Incremental costs compared to previous scenario	DALYs averted compared to scenario 1	DALYs averted compared to previous scenario	ICER compared to Status Quo scenario 1	ICER compared to previous scenario
1: Status quo (SQ) until 2022 and nothing after	6.2 (3.5-10.7)	25% (9-37%)	0 (0-0)	0.1%	0	NA	0	NA	NA	NA
2: SQ plus HCV testing and treatment at ART and OAT centres from 2025-2030	4.8 (2.3-8.9)	43% (26-59%)	1608 (884-2596)	0.7%	€ 897,643	€ 897,643	2,188	2,188	410	410
3: SQ plus annual RDS surveys 2025-2030	3.7 (1.5-8.1)	54% (31-74%)	1858 (814-3209)	8.2%	€ 1,836,619	€ 938,976	1,850	-338	993	Dominated
4: Scenarios 2 and 3 combined	2.7 (1.0-6.4)	67% (46-84%)	2986 (2035-4362)	29.0%	€ 2,488,612	€ 651,993	2,815	964	884	2536 (vs scenario 2)

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