Is HCV Re-infection after DAA treatment an issue

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Background

- Oral DAAs cure >95% of those treated
  - WHO call for HCV elimination by 2030
- Treatment does not confer protective immunity
  - Reinfection possible after spontaneous or treatment induced clearance
- Highest risk groups for reinfection
  - People who inject drugs (PWID)
  - HIV infected men who have sex with men
- Reinfection a major challenge to HCV elimination
  - Major driver of provider and system level barriers to HCV treatment of high risk groups
  - Elimination dependent on reducing pool of individuals able to sustain epidemic through treatment and cure

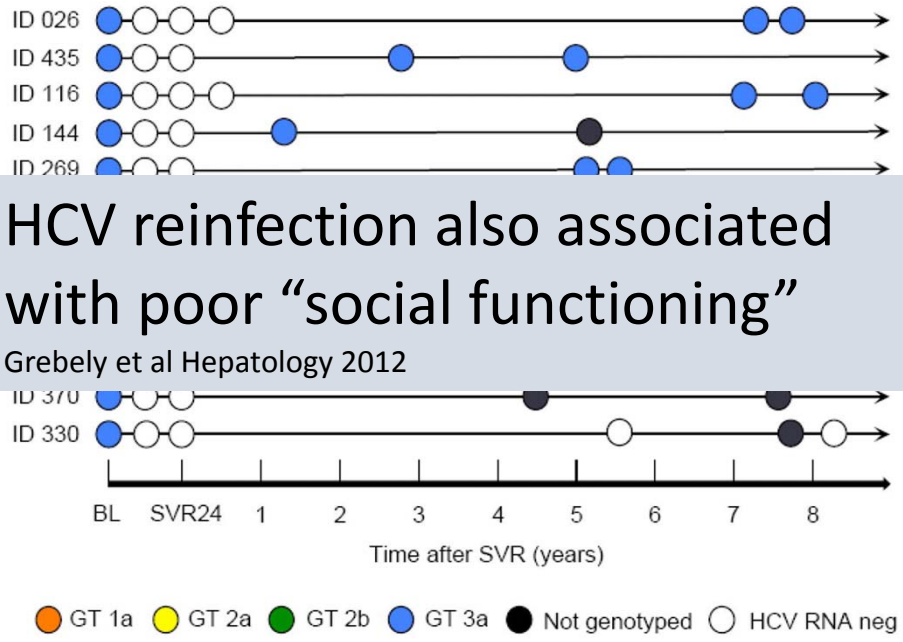
High rates of HCV reinfection in high risk PWID

- 94 PWID enrolled from NSP, Dundee, UK
- Peg/IFN + RBV +/- Simepravir/Telaprevir

Characteristic	n (%)
Age, mean (range)	34 (21-49)y
Male	67 (71)
Homeless	20 (21)
Current Opiate use	93 (99)
Inject daily or more	51 (54)
Harm reduction	
100% needle and syringe	75 (82)
OST	55 (63)

- Among 77 cured; 15/77 reinfected at 18mths
- Reinfection rate of 21.5/100PYs
- Age <30 associated with reinfection

7 year follow up of HCV cured PWID



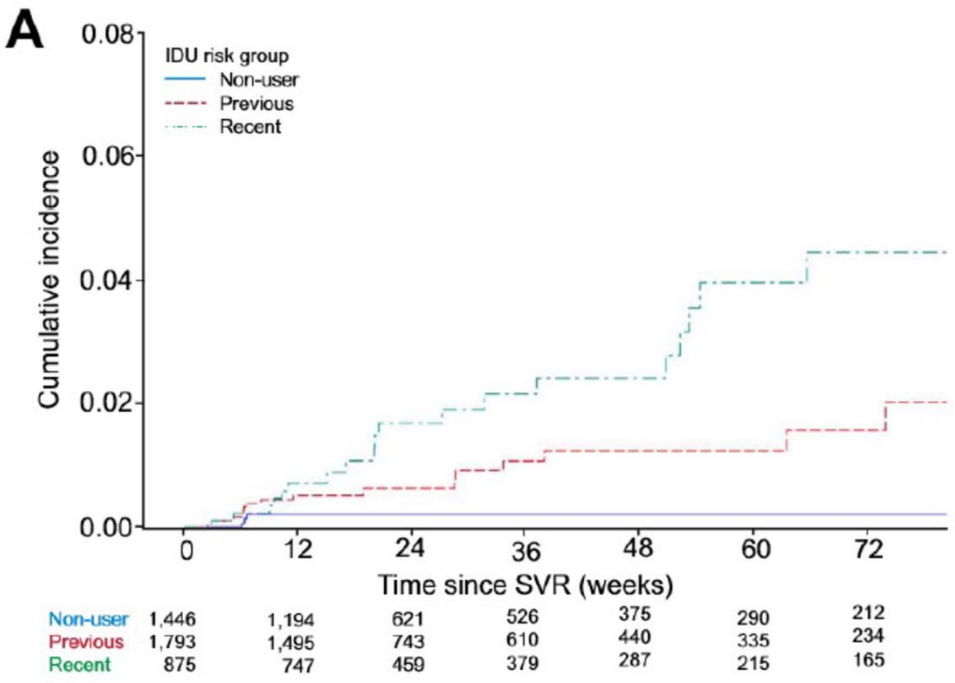
HCV reinfection also associated with poor "social functioning"

Grebely et al Hepatology 2012

- 39% relapsed into IDU within 7 years
- Reinfection in 10 of 37 (27%) who relapsed vs 10 of 94 (11%) who did not
- Only predictor of reinfection was relapse

Schulkind et al JVH 2018, Midgard et al. J Hepatol 2016

HCV reinfection among PWID in the oral DAA era



- British Columbia Hepatitis Testers Cohort
- Recent IDU <3 years (n=875) vs previous IDU > 3 years (n=1793) prior to SVR
- Reinfection rates in PWID
  - Recent 3.1/100 Pys
    - Born after 1975 10.2/100Pys
  - Previous 1.4/100Pys

Rossi et al J hepatology 2018

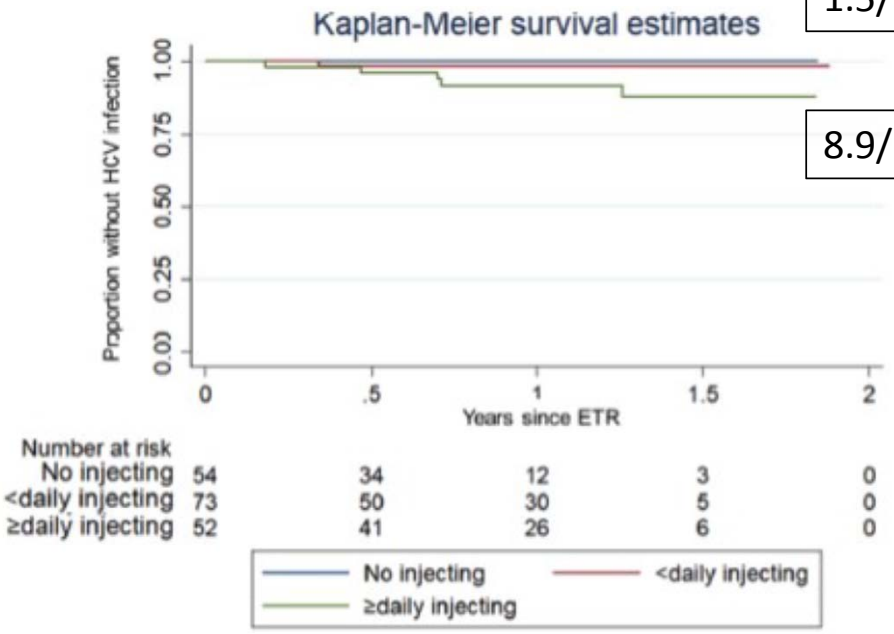
Impact of injection frequency on reinfection after oral DAA therapy

- Phase IV clinical trials (n=179)
  - SIMPLIFY & D3FEAT
  - 25 International sites
  - IDU <6 months or on OST
  - Treated with oral DAA 2016-17
  - Follow up to 2 years
  - No ongoing drug use: no reinfection
  - Ongoing drug use: Reinfection incidence 4.8/100Pys

Reinfection incidence by frequency of injection

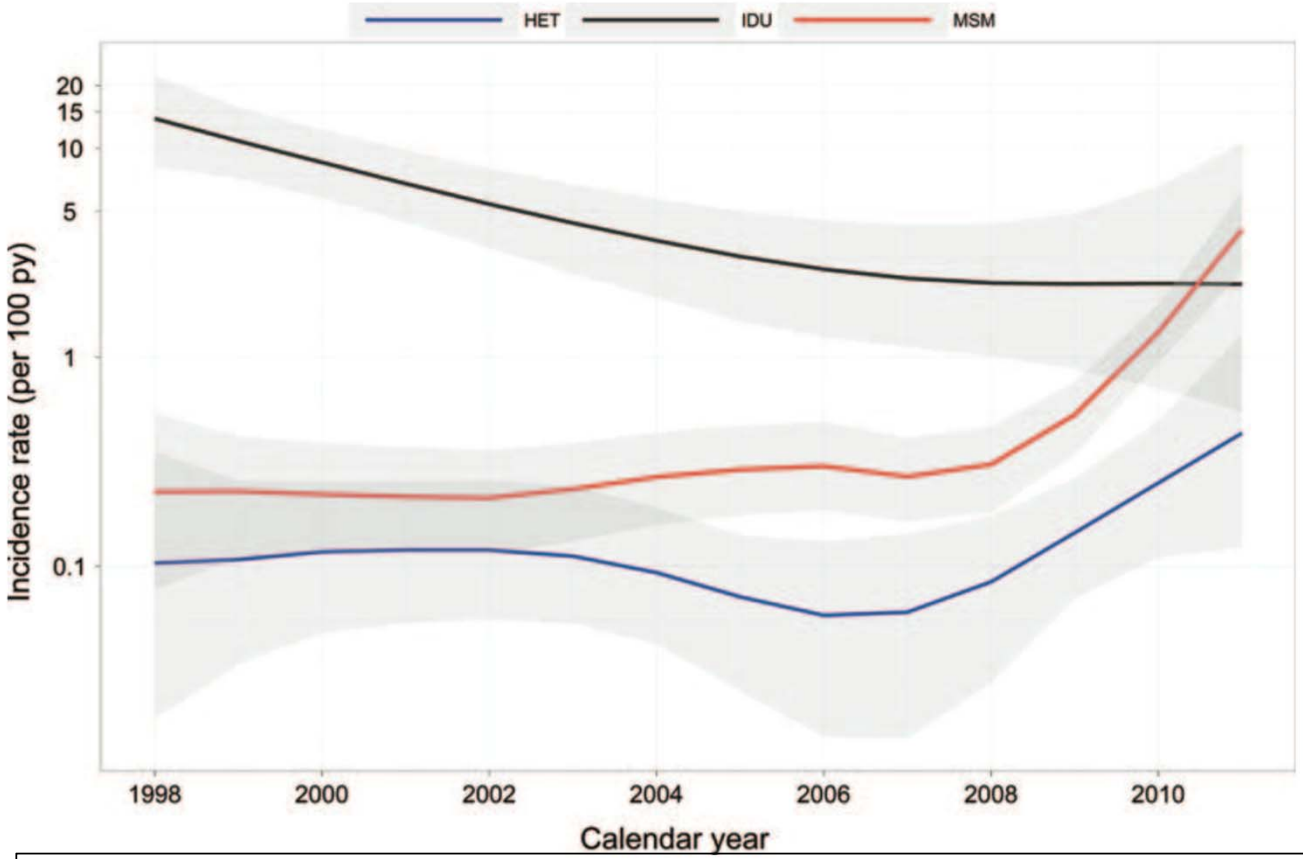
1.5/100Pys <daily

8.9/100PYs ≥ daily



Grebely et al ILC 2019

Increasing incidence of HCV infection among HIV positive MSM in the HAART era



HCV Incidence by risk group in the Swiss HIV Cohort Study

Wandeler et al. CID 2012

High rates of HCV reinfection among HIV positive MSM following SVR

Interferon Era

- HCV reinfection 3-10 x primary infection rate
- Reported HCV re-infection rates of 5.3-15.2/100 PYs
  - As many as 25-33% re-infected within 2 years
  - Multiple subsequent reinfections
  - Increasing re-infection rate with each subsequent re-infection
    - Eight centers in Europe
    - Reinfection rate
      - 7.3/100PYs 1st reinfection
      - 18.8/100 PYs 2nd reinfection

Oral DAA era

- Madrid co-infection registry (n=177)
  - Re-infection rate: 5.9/100PYs
- HIV infected MSM in NYC (n=305)
- 1st reinfection 38/305 (12%)
  - Rate 4.4/100Pys (95% CI 3.1-6.0)
  - Median 1.9 yrs (IQR 1.3-3.6)
- 2nd reinfection 6/33 (18%)
  - Rate 8.7/100PYs (95% CI 3.5-18.1)
  - Median 1.1 yr (IQR 0.6-2.5)yrs

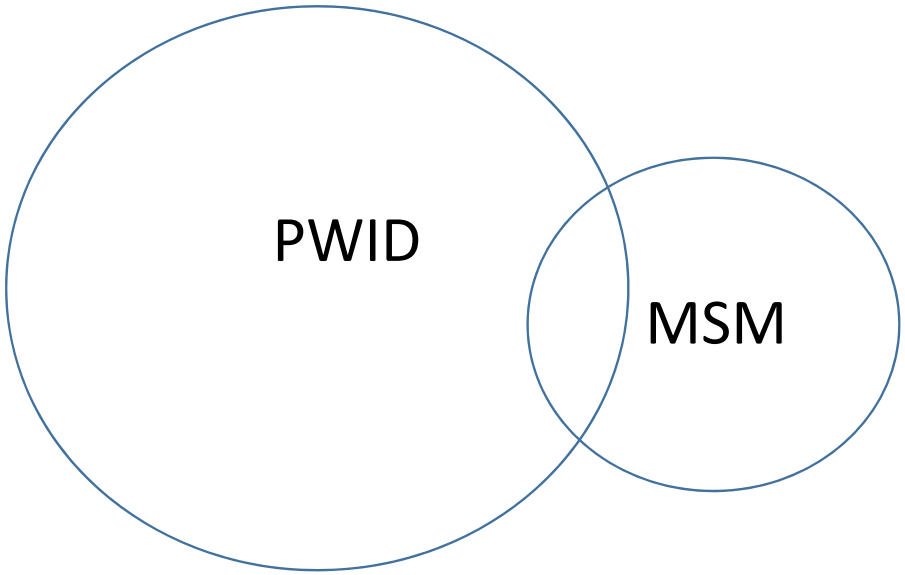
Martin et al, AIDS 2013, Lambers et al AIDS 2011, Ingiliz et al J. hep 2017, Berenguer et al AIDS 2019, Carollo et al ILC 2019

Drivers of HCV reinfection in MSM

Exact mechanism unknown

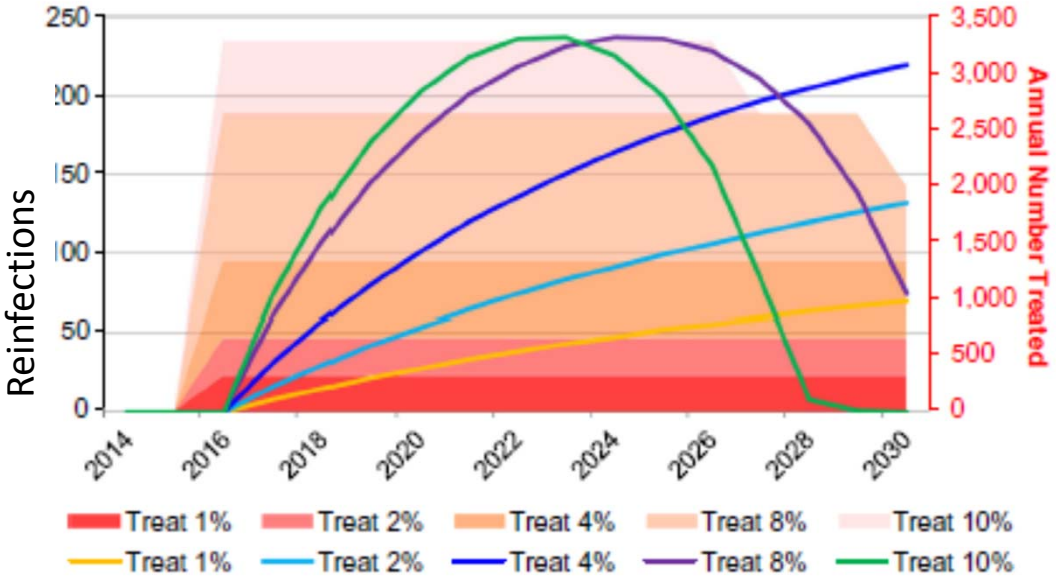
- HCV prevalence and incidence associated with
  - Receptive anal intercourse without a condom
  - Rectal trauma with bleeding
  - Group sex
  - Injection drug use
  - Chemsex-use of drugs to increase sexual disinhibition and arousal
    - Metamphetamine
    - Gamma hydroxybutyrate (GHB)

- Overlapping risk factors for HCV infection and reinfection in MSM



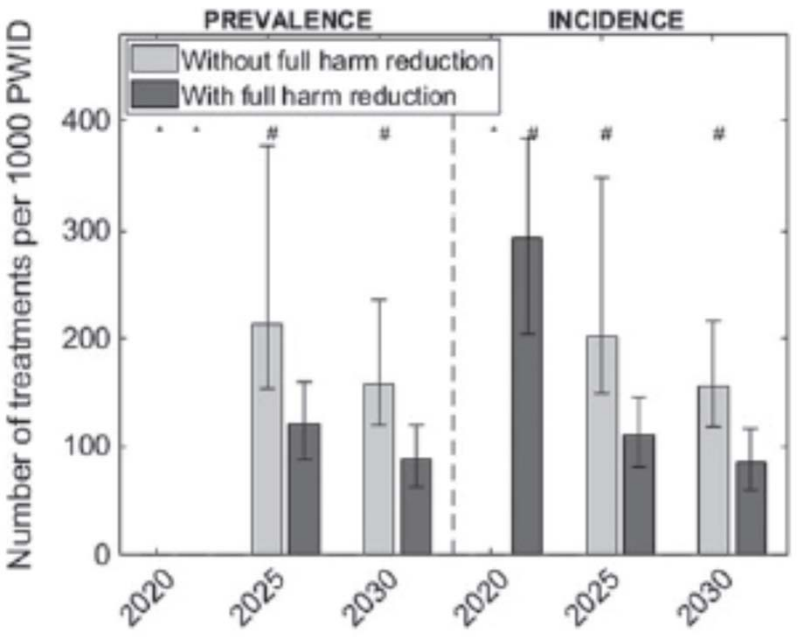
Modeling treatment as prevention and impact of reinfection in PWID

PWID in Australia



Rate of HCV reinfection following HCV treatment scale up assuming varying rates of HCV treatment

HCV Epidemic scenario in rural US

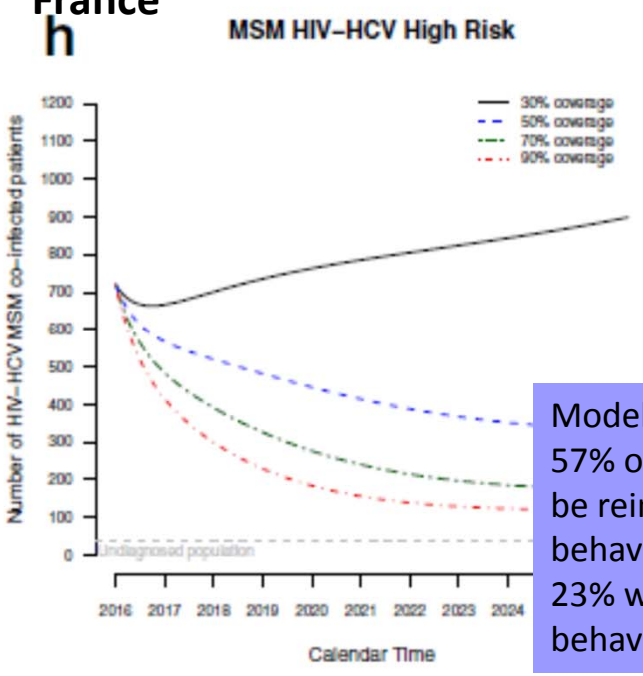


Required intervention to achieve 90% reduction in incidence

Martinello et al 2017 Cur HIV/AIDs report, Razavi INHSU 2015, Fraser et al Addiction 2018

Modeling impact of oral DAA on HCV Incidence among HIV infected MSM

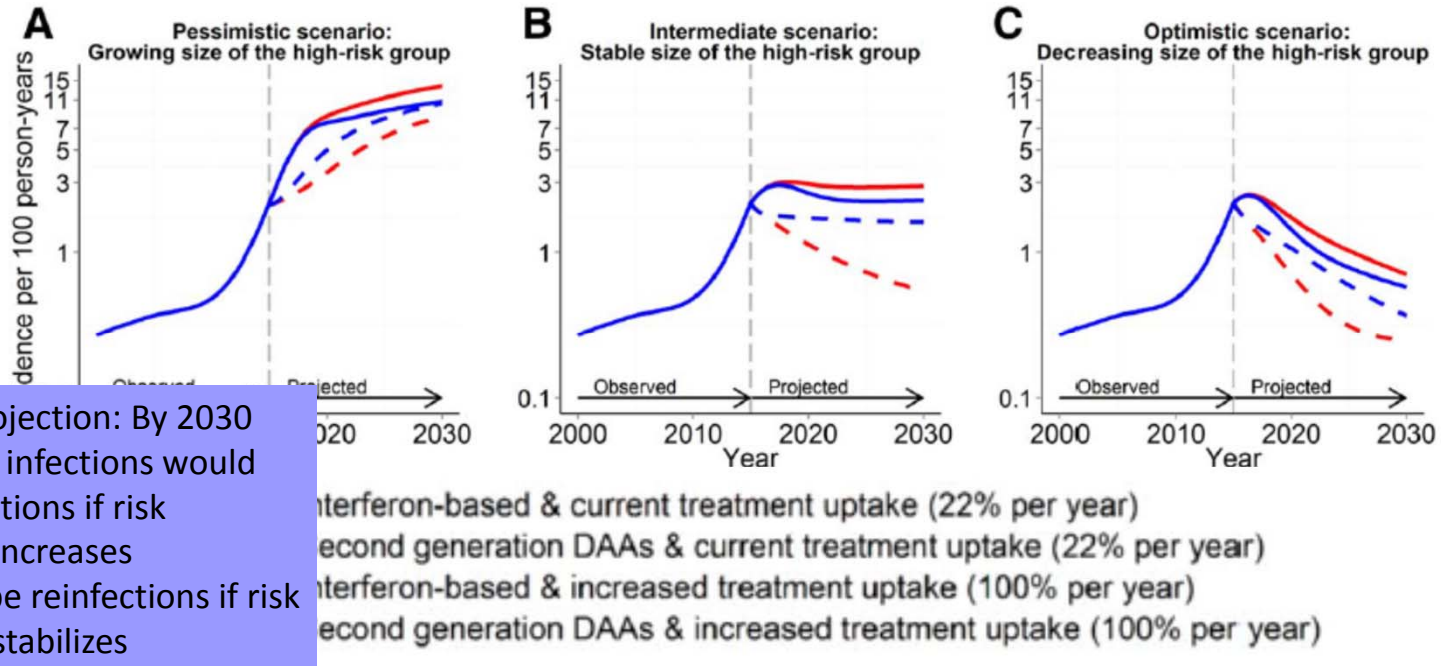
HCV transmission model calibrated to France



Model Projection: By 2030
57% of all infections would be reinfections if risk behavior increases
23% will be reinfections if risk behavior stabilizes

Projected HCV prevalence over 10 years 2016-2026

HCV transmission model calibrated to Switzerland

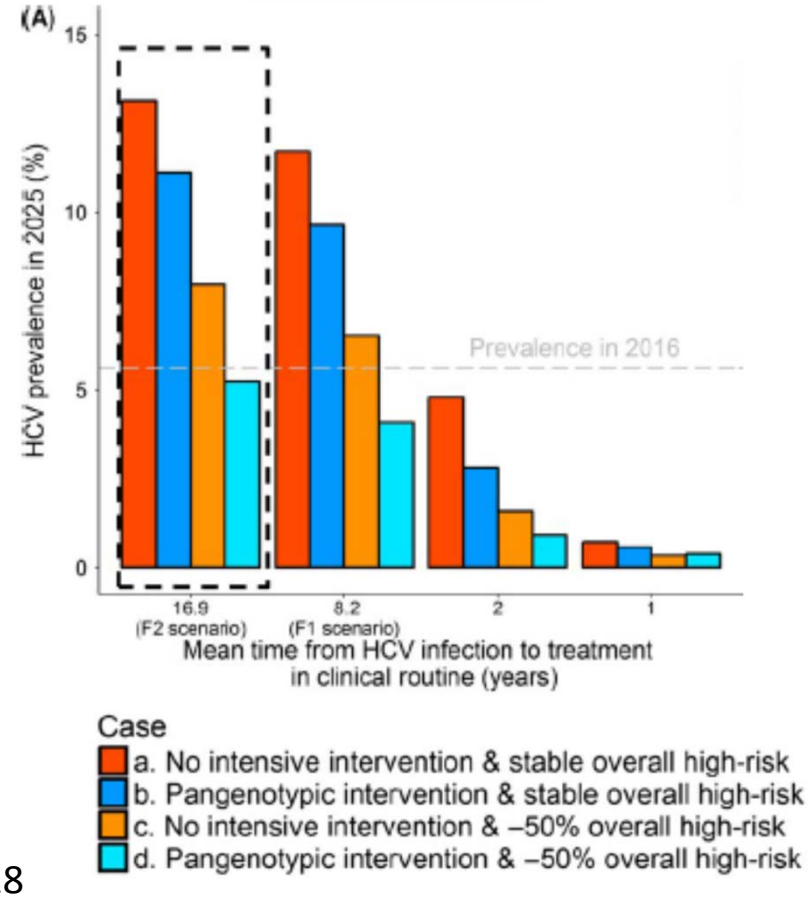


Projected HCV incidence with different HCV treatment uptake and risk behavior scenarios

Virologeux et al BMC Medicine 2017, Salazar Vizcaya Hep 2016

Modeling a short-term intensive intervention to interrupt HCV transmission in MSM with HIV

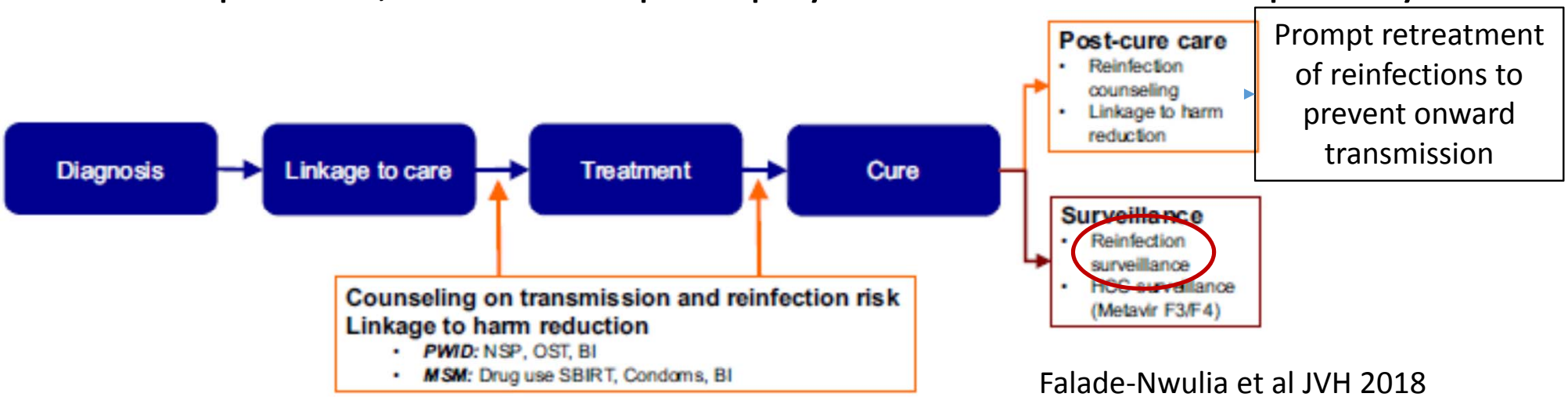
- Data from Swiss HIV Cohort Study
- Swiss HCVree trial
  - Active HCV testing of cohort
  - Patients with HCV genotype 1 and 4 offered treatment & risk counselling
  - Risk counselling behavioral intervention at 4,6,8 and 12 weeks



Salazar-Vizcaya JVH 2018

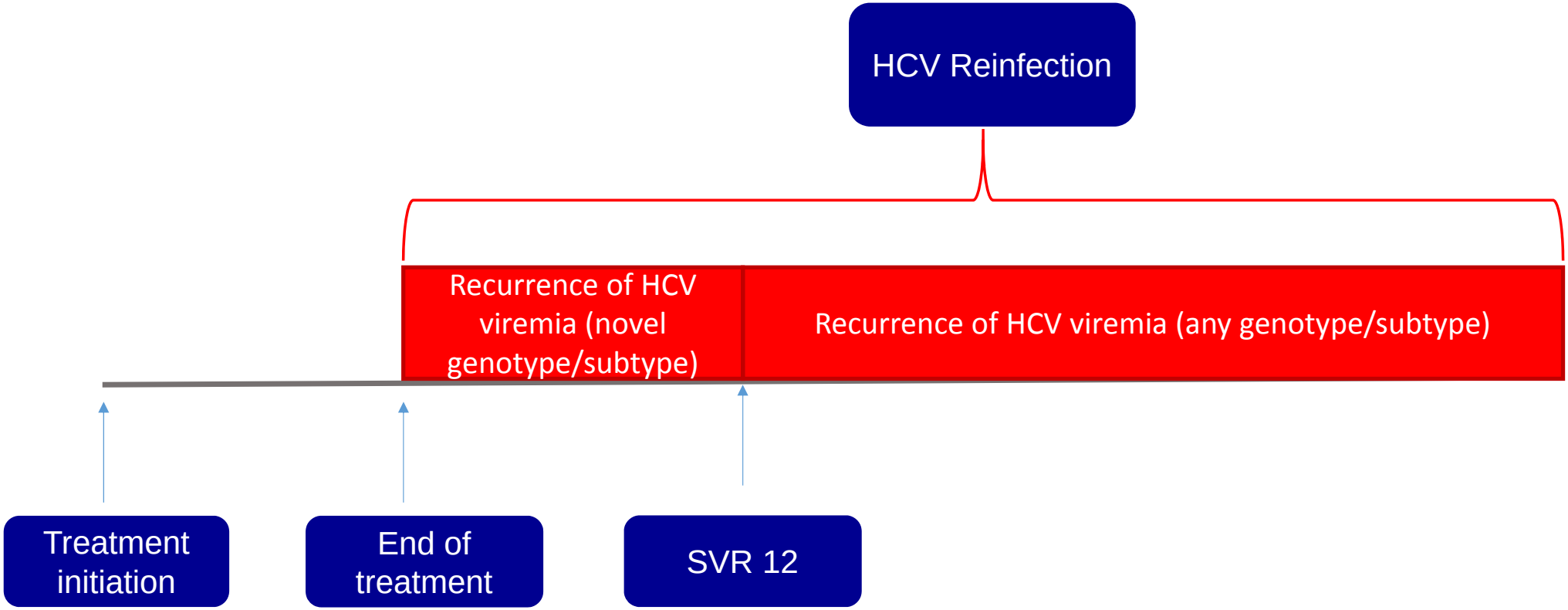
Addressing the challenge

- HCV elimination requires improved engagement with populations at highest risk of sustaining the epidemic
- Reinfection should be viewed as a sign of this engagement
- In the absence of an effective HCV vaccine, the HCV care continuum does not end with cure
- Efforts to prevent, detect and promptly retreat reinfection a priority



Falade-Nwulia et al JVH 2018

Surveillance is key to early detection, retreatment & enhanced behavioral intervention



A proposed clinical definition for HCV reinfection when the gold standard of phylogenetic analysis of pre- and post-treatment HCV sequences are not available

Falade-Nwulia et al JVH 2018

What will be required to limit impact of HCV reinfection

- Combination interventions
- Opioid substitution therapy
- High coverage NSP
- Integrated care
  - Mental health
  - Case management for linkage to housing, job programs etc
  - Peer based programs to support abstinence and safer injection
- Behavioral interventions for safer injection
- Education-Counseling and peer support
- Counselling on safer sex
  - Consistent condom use
  - Avoiding drug use with sex
- Drug use screening, brief intervention and referral for treatment
- Linkage to harm reduction
- Regular post treatment surveillance (HCV RNA) and retreatment

<u>Contextual</u>

- Network based treatment e.g TAP trial
- Destigmatization
- Effective HCV vaccine

Falade-Nwulia et al JVH 2018

Summary

- Treating HCV in groups with the highest burden/risk is critical to HCV control at the population level
- HCV reinfection is a challenge to HCV elimination that can be addressed
- Will require acceptance of reinfection as a marker of treatment of high risk populations
- The HCV care continuum needs to be extended beyond cure; counsel on monitor for and promptly treat reinfection. More data needed..
- Need for development and evaluation of strategies to optimize HCV treatment uptake, integrate harm-reduction strategies and other wrap around services for prevention of HCV reinfection.
- Effective behavioral interventions are needed to further address reinfection risk in the highest risk groups

Thank you

Questions