
## Disclosures

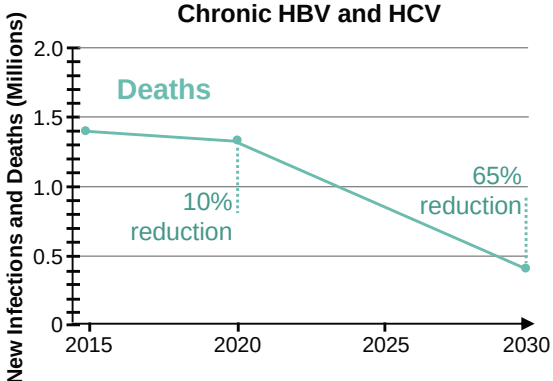
- Research grants, travel support, and honoraria: AbbVie, Gilead, Merck

# HCV Reinfection and Elimination

- Definition of HCV reinfection
- HCV reinfection incidence post-treatment in IFN-based and DAA eras
- HCV elimination modelling, incorporating HCV reinfection
- A public health approach to HCV reinfection

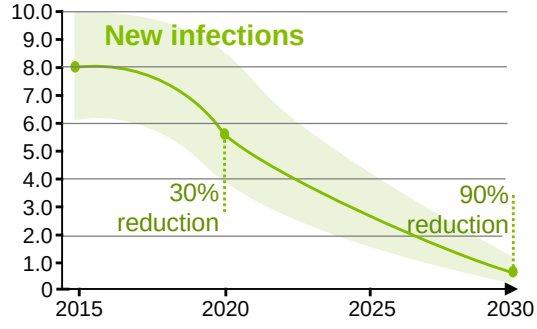
# WHO Viral Hepatitis Elimination Targets: 2016

**65% Reduction in Deaths from Chronic HBV and HCV**




**1.4 million deaths (in 2015) to under 500,000 deaths (by 2030)**

**90% Reduction in New Cases of Chronic HBV and HCV Infection**




**6–10 million (in 2015) to 900,000 infections (by 2030)**
**95% decline in HBV infections**
**80% decline in HCV infections**

**80% of eligible chronic HCV patients treated; 90% of treated patients cured**

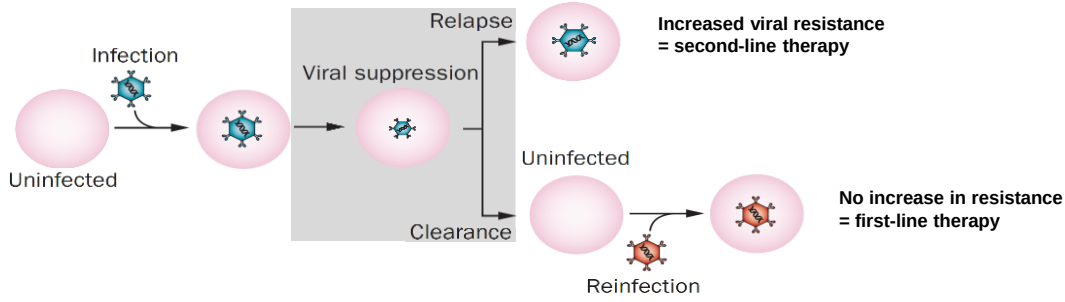
WHO global health sector strategy on viral hepatitis 2016–2021. Available at: http://www.who.int/hepatitis/strategy2016-2021/ghss-hep/en/ (accessed March 2018).

# WHO Viral Hepatitis Strategy: 2016-2021

| Service coverage targets | Baseline 2015 | 2020 Targets | 2030 Targets |
|---|---|---|---|
| Hepatitis B virus vaccination: childhood vaccine coverage (third dose coverage) | 82%[11] in infants | 90% | 90% |
| Prevention of hepatitis B virus mother-to-child transmission: hepatitis B virus birth-dose vaccination coverage or other approach to prevent mother-to-child transmission | 38% | 50% | 90% |
| Blood safety | 39 countries do not routinely test all blood donations for transfusion-transmissible infections<br>89% of donations screened in a quality-assured manner[12] | 95% of donations screened in a quality-assured manner | 100% of donations are screened in a quality-assured manner |
| Safe injections: percentage of injections administered with safety-engineered devices in and out of health facilities | 5% | 50% | 90% |
| Harm reduction: number of sterile needles and syringes provided per person who injects drugs per year | 20 | 200 | 300 |
| Viral hepatitis B and C diagnosis | <5% of chronic hepatitis infections diagnosed | 30% | 90% |
| Viral hepatitis B and C treatment | <1% receiving treatment | 5 million people will be receiving hepatitis B virus treatment<br>3 million people have received hepatitis C virus treatment<br>(Both targets are cumulative by 2020) | 80% of eligible persons with chronic hepatitis B virus infection treated<br>80% of eligible persons with chronic hepatitis C virus infection treated |

**WHO global health sector strategy on viral hepatitis 2016–2021. Available at: http://www.who.int/hepatitis/strategy2016-2021/ghss-hep/en/ (accessed March 2018).**

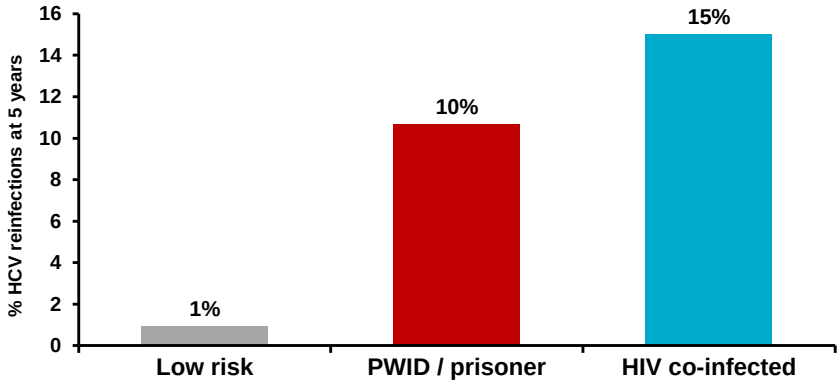
# HCV reinfection in IFN-based era




- **HCV RNA testing**
  - **HCV RNA+ following undetectable HCV RNA at SVR12 = reinfection**
- **HCV genotyping**
  - **Genotype (e.g. 1a to 3a) or subtype (e.g. 1a to 1b) switch = reinfection**
- **HCV sequencing**
  - **Nucleotide divergence/phylogenetic analysis**

**Cunningham EB, et al. *Nature Reviews Gastro Hepatol* 2015**

# HCV reinfection in IFN-based era



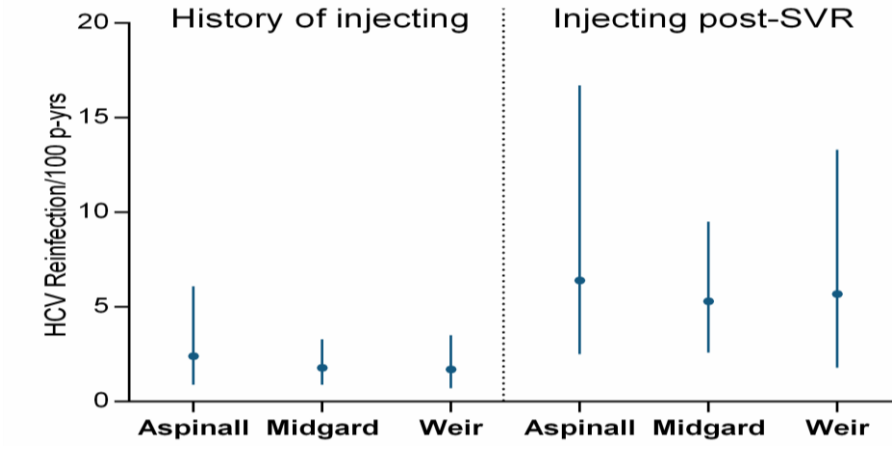

43 studies
n=7,969
Avg. FU=3.9 years

14 studies
n=771
Avg. FU=2.8 years

4 studies
n=309
Avg. FU=3.3 years

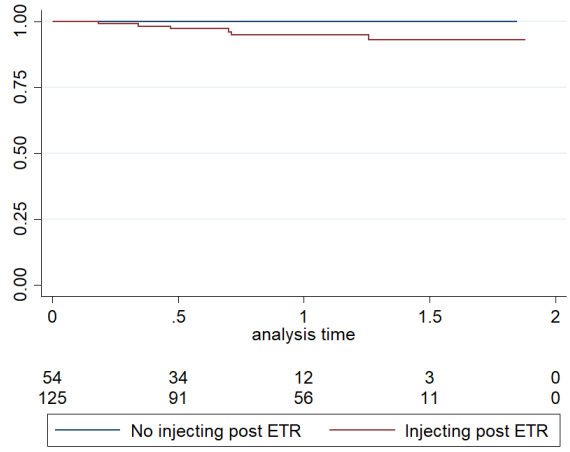
**Simmons B, et al. *Clin Infect Dis* 2016**

# HCV reinfection in IFN-based era




**Aspinall, et al. *Clin Infect Dis* 2013. Midgard et al. *J Hepatology* 2016. Weir et al. *DAD* 2016**

# HCV reinfection in DAA era: SIMPLIFY/D3FEAT




**N = 179 with ETR + follow-up (69% injecting)**

**N = 9 viral recurrence (3 relapse; 6 reinfection)**

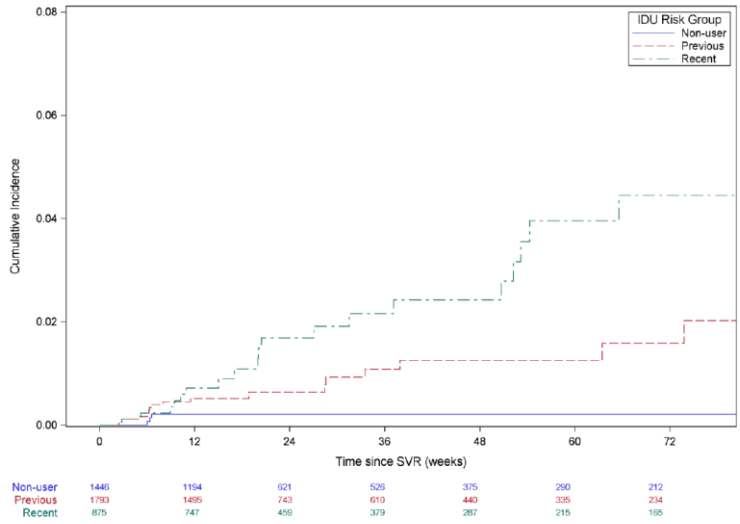
***3.6 (1.6-8.0)/100 py reinfection incidence:***

**- 0.0/100 py in people without injecting**

**- 4.8 (2.2-10.7)/100 py in people with injecting**

**Cunningham E et al. INHSU 2018**

# HCV reinfection in DAA era: BC, Canada (n=4,114)



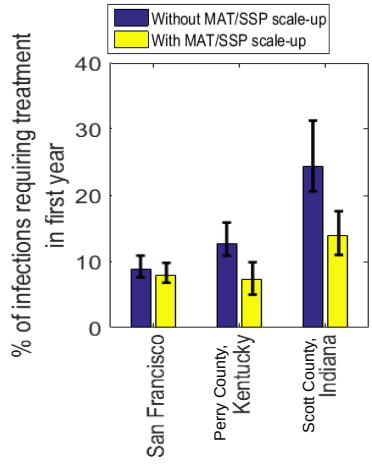

**40 HCV reinfections:**

- **Recent PWID = 3.1/100 py (1.9-23.5)**
- **Former PWID = 1.4/100 py (1.1-12.9)**
- **Non PWID = 0.3/100 py**

**Rossi C et al. *J Hepatology* 2018 (in press)**

***Poor coverage of harm reduction the major threat to HCV elimination***

# Crucial role of harm reduction in HCV elimination

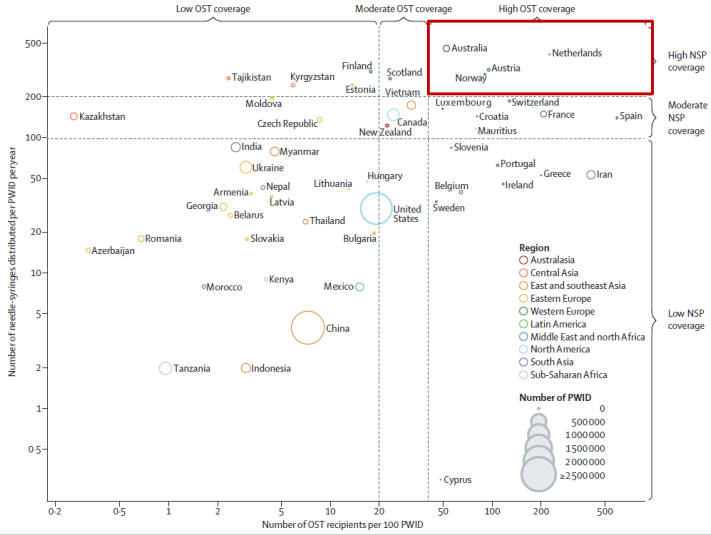



- **Settings:**
  - **San Francisco:** stable, lowest incidence (10/100py)
  - **Perry County, KY:** stable, moderate incidence (20/100py)
  - **Scott County, IN**: increasing, high incidence (>40/100py)
- **Without harm reduction scale-up**
  - <15%/yr treated in SF & KY
  - Double treatment rate in IN as incidence high/increasing
- **With harm reduction scale-up (50% coverage each)**
  - Halves treatment rate in KY and IN
  - Less impact in SF due to higher baseline coverage of syringe exchange

**MAT = medication-assisted treatment; SSP = syringe service programmes**

**Fraser H, et al, *Addiction* 2018**

# Global OST and NSP Coverage among PWID




**Only 1% of PWID live in countries with high coverage of both NSP and OST**

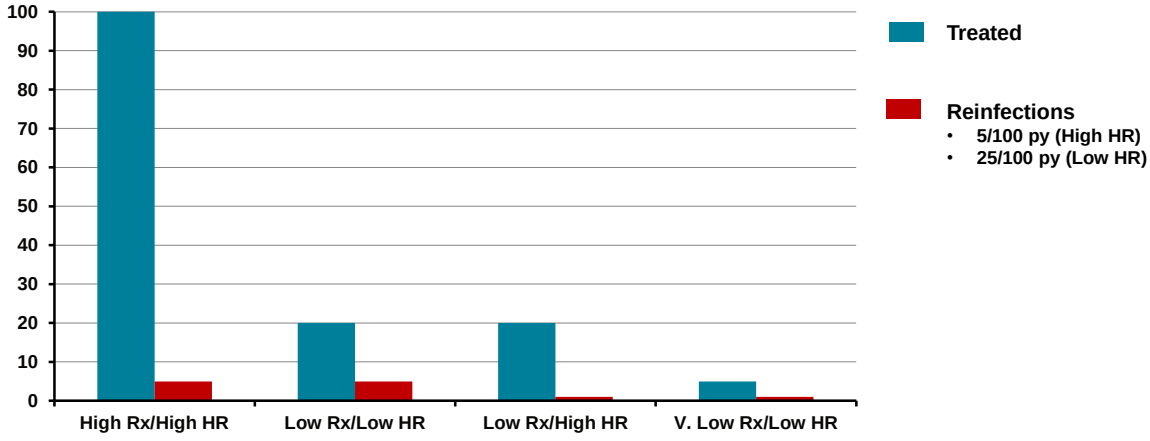
Larney S, et al. *Lancet Global Health* 2017

***HCV reinfections as a positive (initial) indicator***

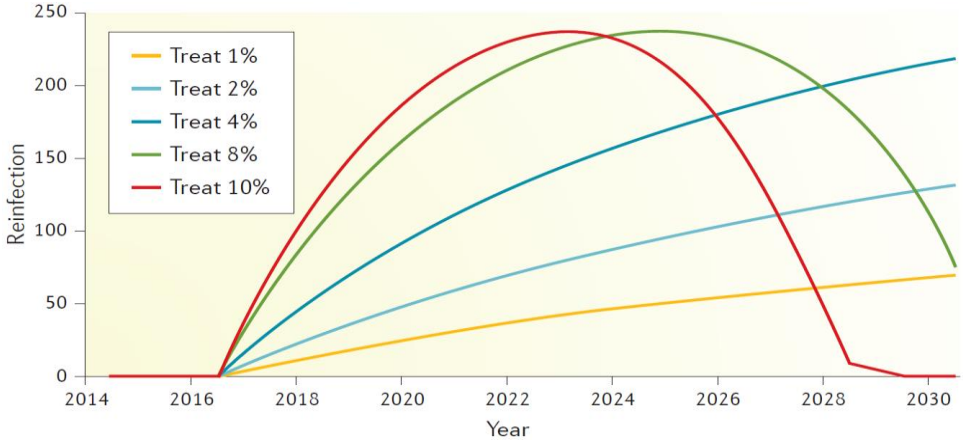
**= High harm reduction coverage + large numbers of high-risk treated**

# Reinfection reflects treatment *and* harm reduction

**Number treated and HCV reinfections per 1,000 PWID per annum**



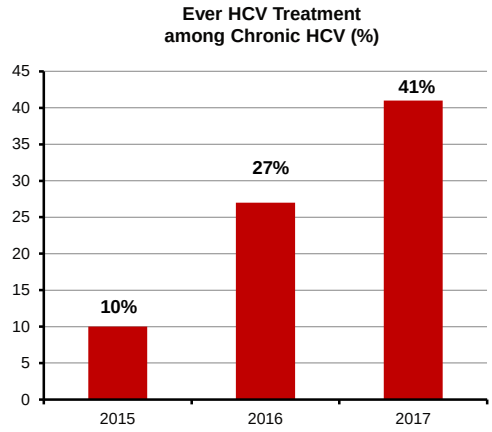

# HCV reinfections indicate treatment of high-risk

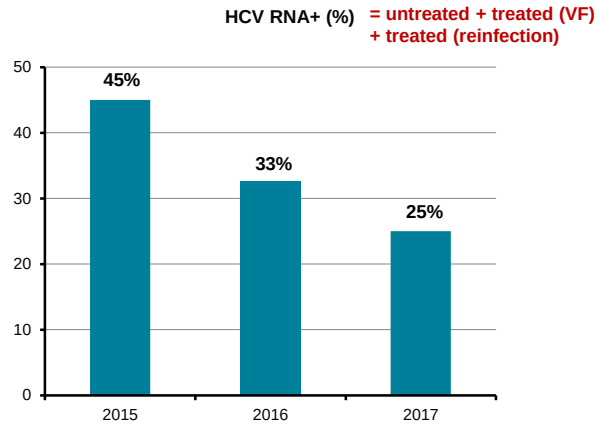



**Grebely J, Hajarizadeh B, Dore GJ. *Nature Reviews Gastro Hepatol* 2017**

# DAA uptake high in current PWID

**Annual Needle Syringe Program Survey (n = 2,000-2,500)**

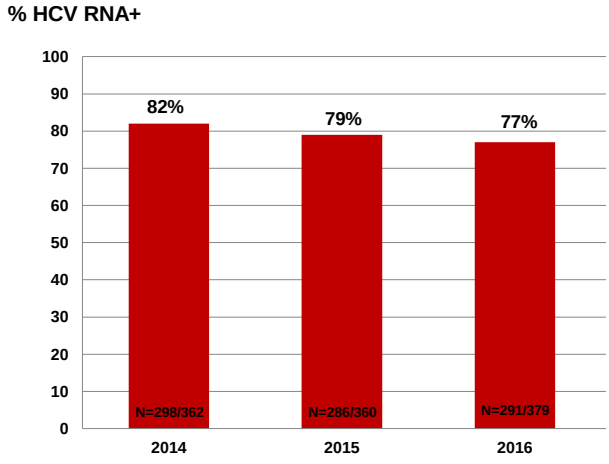



Iversen J, *et al.* AVHC 2018.

# HCV elimination in HIV population

**HCV RNA prevalence among HIV/HCV cohort (antibody +ve)**




Martinello M, et al. AVHC 2018

# HCV elimination in HIV population

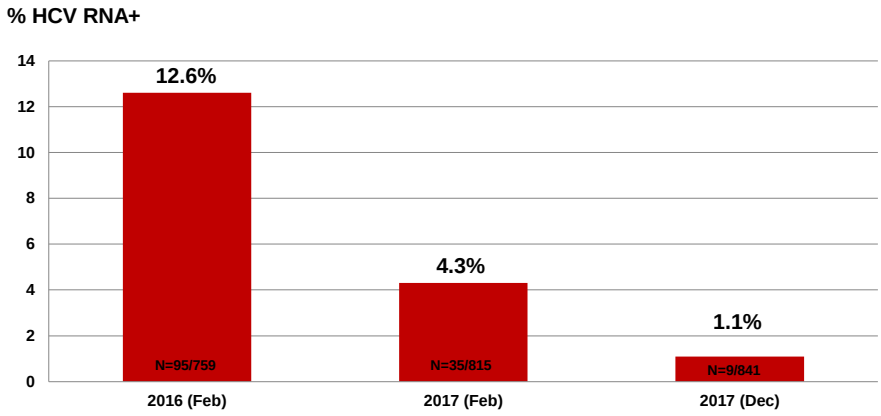
**Modelling HCV incidence in Australian HIV population**


Salazar Viccaya L, et al. IAS 2018

***Will limited harm reduction in the prison setting prevent HCV elimination?***

# HCV elimination (near) in QLD prison: Lotus Glen

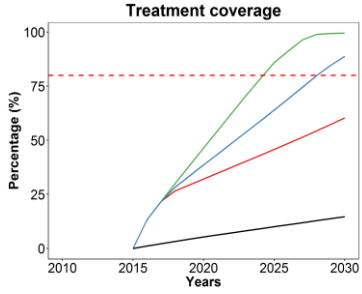
**HCV burden within prison (800-850 inmates)**

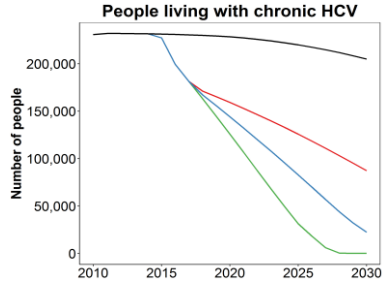



Bartlett S, et al. *CID* 2018

# HCV elimination in Australia: treatment scenarios

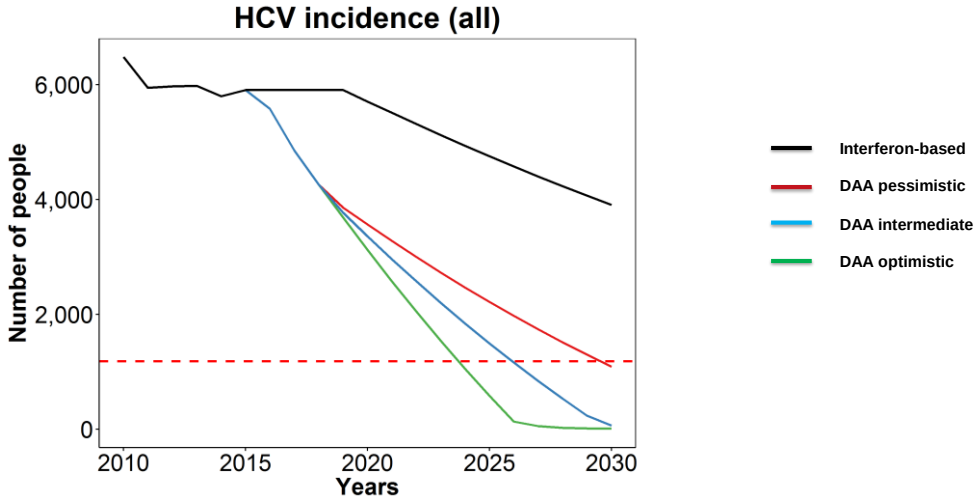
| Treatment roll-out | 2015 (IFN + DAA) | 2016 | 2017 | 2018 | Post- 2019 |
|---|---|---|---|---|---|
| Pessimistic | 7,296 | 32,600 | 21,370 | 12,822 (40%↓) | 7,693 (40%↓) |
| Intermediate | 7,296 | 32,600 | 21,370 | 17,096 (20%↓) | 13,677 (20%↓) |
| Optimistic | 7,296 | 32,600 | 21,370 | 21,370 | 21,370 |



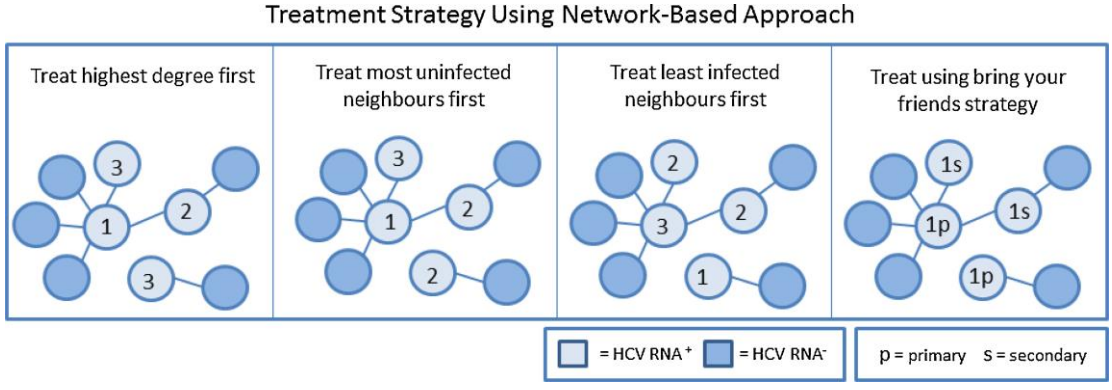

Kwon A, et al. AVHC 2018

# HCV elimination in Australia: treatment scenarios




Kwon A, et al. AVHC 2018

# Network-based HCV treatment to reduce reinfection




- "Bring your friends" strategy performed better than the random strategy

Hellard M, et al. *Hepatology* 2014

# HCV Reinfection and Elimination

- **Acknowledgement:** cases of HCV reinfection inevitable, and can be a positive indicator re elimination
- **Harm reduction coverage:** HCV reinfection incidence will reflect HCV incidence in the setting
- **Rapid scale-up:** slow scale-up creates HCV "susceptible" PWID without reduction in viraemic pool
- **Individual-level strategies:** treatment of injecting partners sensible public health
- **Population-level strategies:** prioritise PWID, diverse models of care, follow-up for reinfection
- **Access to re-treatment:** without stigma and discrimination; outcomes will be favourable
- **Community engagement and partnership:** use of peer workers

# Acknowledgements

**UNSW Sydney**
A/Prof. Jason Grebely
A/Prof. Gail Matthews
Prof. Andrew Lloyd
Prof. Carla Treloar
Prof. Louisa Degenhardt
Prof. Michael Farrell
Dr. Behzad Hajarizadeh
Dr. Maryam Alavi
Dr. Tanya Applegate
Dr. Marianne Martinello
Ms. Pip Marks
Dr. Richard Gray
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**Collaborators**
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Dr. Homie Razavi (USA)
Dr. Philip Bruggmann (Switzerland)
Prof. Olav Dalgard (Norway)
Prof. Julie Bruneau (Canada)
Dr. Jordan Feld (Canada)