Modelling the impact of HCV prevention amongst injecting drug users in a typical rural U.S. situation: **Preliminary results**

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BACKGROUND

- Needle and syringe provision (NSP) and Opiate substitution therapy (OST) effective in reducing self-reported injecting risk behaviour:
  - Limited evidence for effect on HCV transmission[1,2]
- New studies[3-9] culminating in ongoing systematic review suggests:
  - OST decreases HCV transmission risk by **58% (47-70%)**
  - NSP decreases HCV transmission risk by **61% (21-97%)**
- However, prevalence and incidence trends [10-15] and modelling [16] suggests these interventions are not sufficient for controlling HCV
- Recent modelling suggests HCV treatment could fill this prevention gap [17-19]

1. Palmateer Addiction 2010; 2. Hagan JID 2011; 3 Turner Addiction 2011; 4. Van den Berg Addiction 2007; 5. Tsui JAMA IM 2014; 6. Nolan Addiction 2014; 7. White MJA 2014; 8. Edlin INHSU 2013; 9. Palmateer Plos one 2014; 10. Mehta JID 2011; 11. Grebely Plos one 2014; 12. Van den Berg Eur J Epi 2007; 13. Des Jarlais AIDS 2005; 14. Roy Epid Inf 2007; 15. Sweeting, Am J Epid 2009; 16. Vickerman Addiction 2012; 17. Vickerman DAD 2010; 18. Martin Jhep 2011; 19. Martin Hep2013

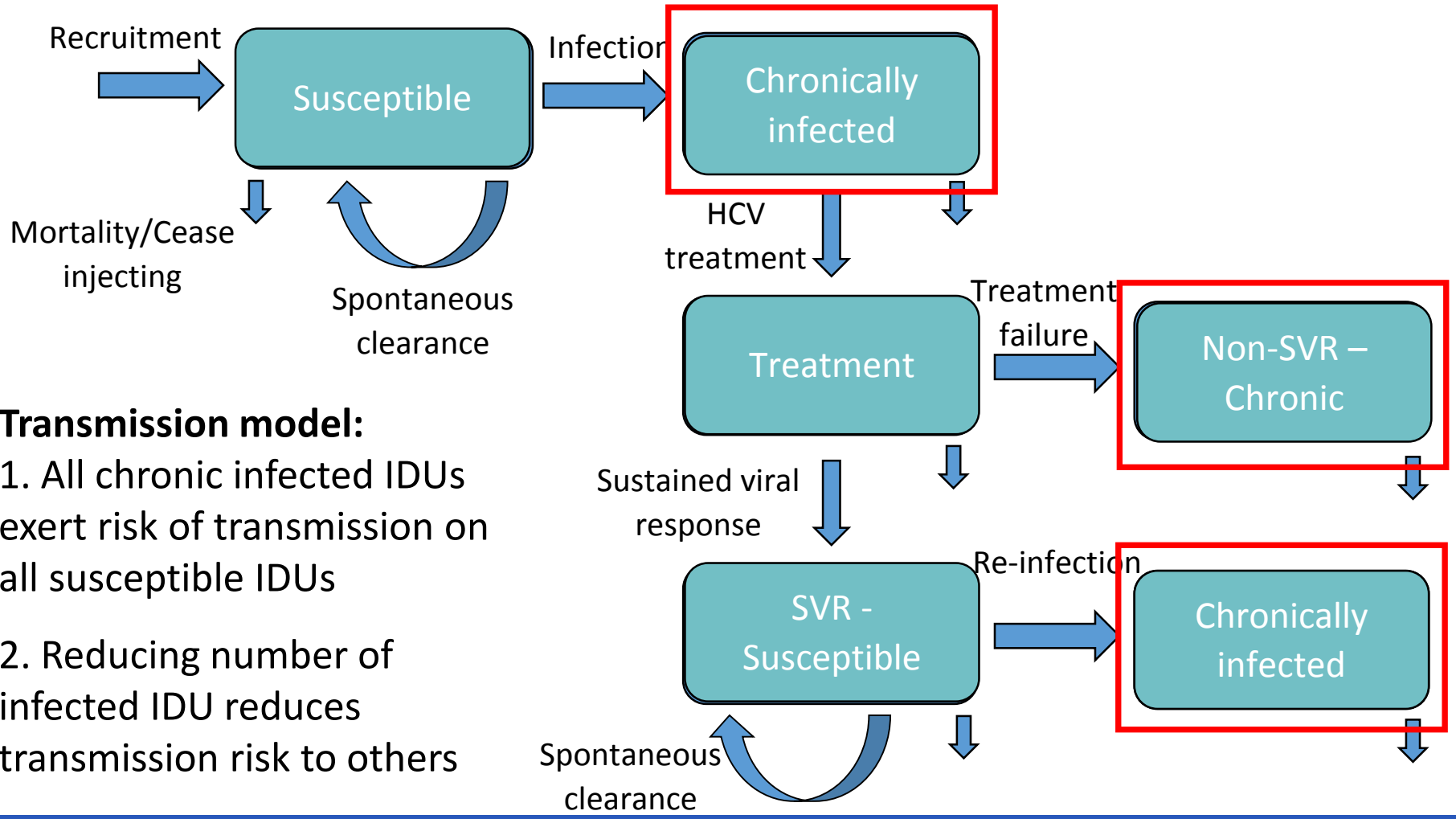
Study setting and analysis aims

- Based on typical rural U.S. setting using data from Scott County, Indiana:
  - High estimated prevalence of injecting (500 or >2.0%)
  - High HCV sero-prevalence of 60%
- Interventions for IDUs were low, but:
  - NSP and OST are being scaled up
  - HCV treatment not started yet, but likely to be scaled up

AIMS:

1. Estimate impact of scaling up NSP, OST and HCV treatment
   - Impact on HCV prevalence and incidence over 5-15 yrs
2. How many IDUs would need to be treated annually to virtually eliminate HCV (chronic prevalence<5 or 1%) in 5-15 years?

Dynamic HCV transmission model among IDU



Transmission model:

1. All chronic infected IDUs exert risk of transmission on all susceptible IDUs

2. Reducing number of infected IDU reduces transmission risk to others

Model assumptions

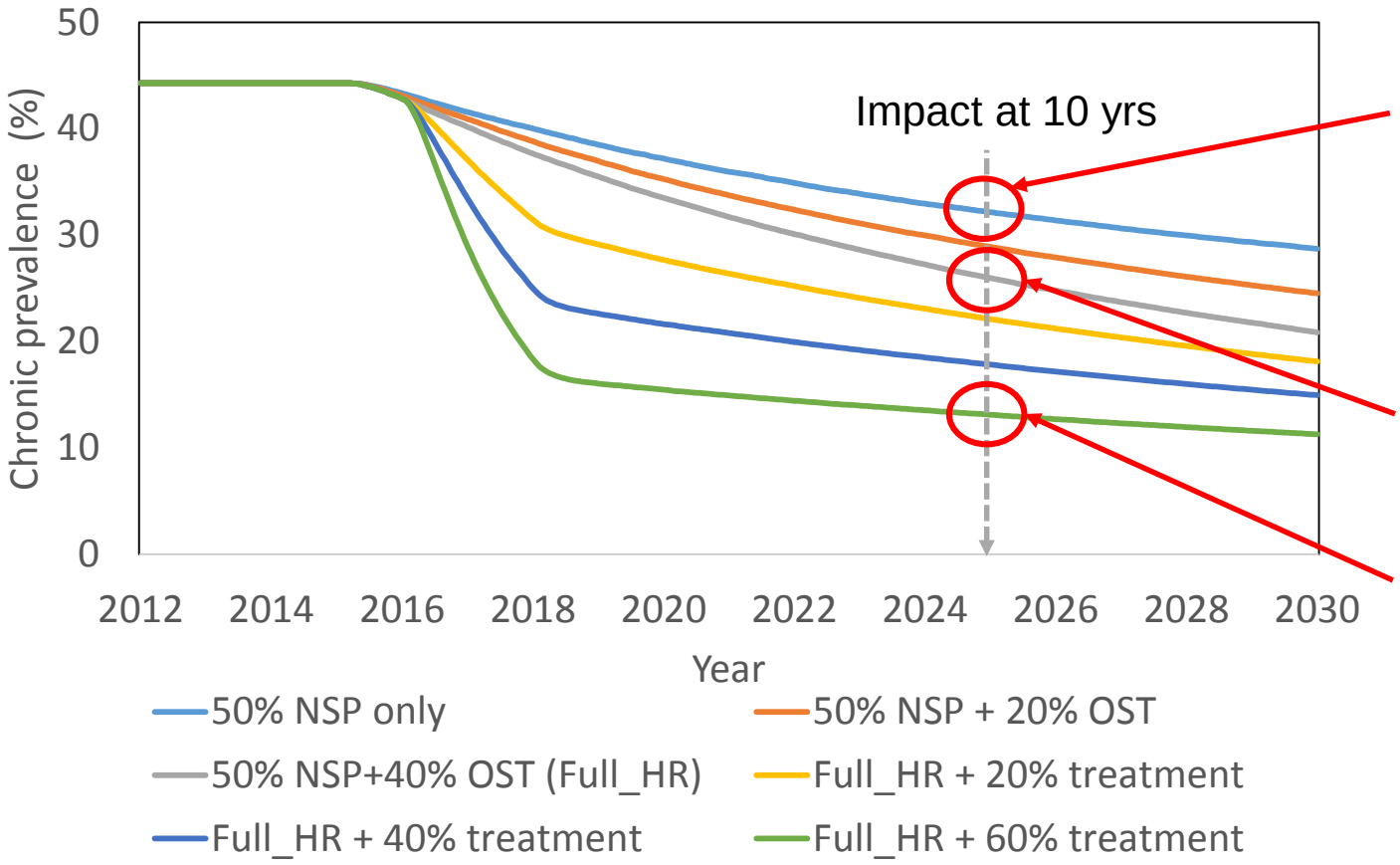
Model calibration

- To incorporate some parameter uncertainty, we obtained 1000 model fits to 45% (41-48%) chronic prevalence (~60% Ab prev)

Intervention scale up scenarios:

- NSP and OST started in March 2015:
  - NSP reaches 50% coverage by start of 2016.
  - OST reaches 20/40% coverage (100 or 200 injectors) by mid-2016.
- HCV treatment starts from beginning 2016:
  - 20, 40 or 60% of those infected at start 2016 are treated in 1 or 2 years.
  - Treatment efficacy 90% (85-95%) over 12 weeks.

Impact on chronic prevalence



When just NSP, chronic prevalence decreases by 27% over 10 years.

This increases to:

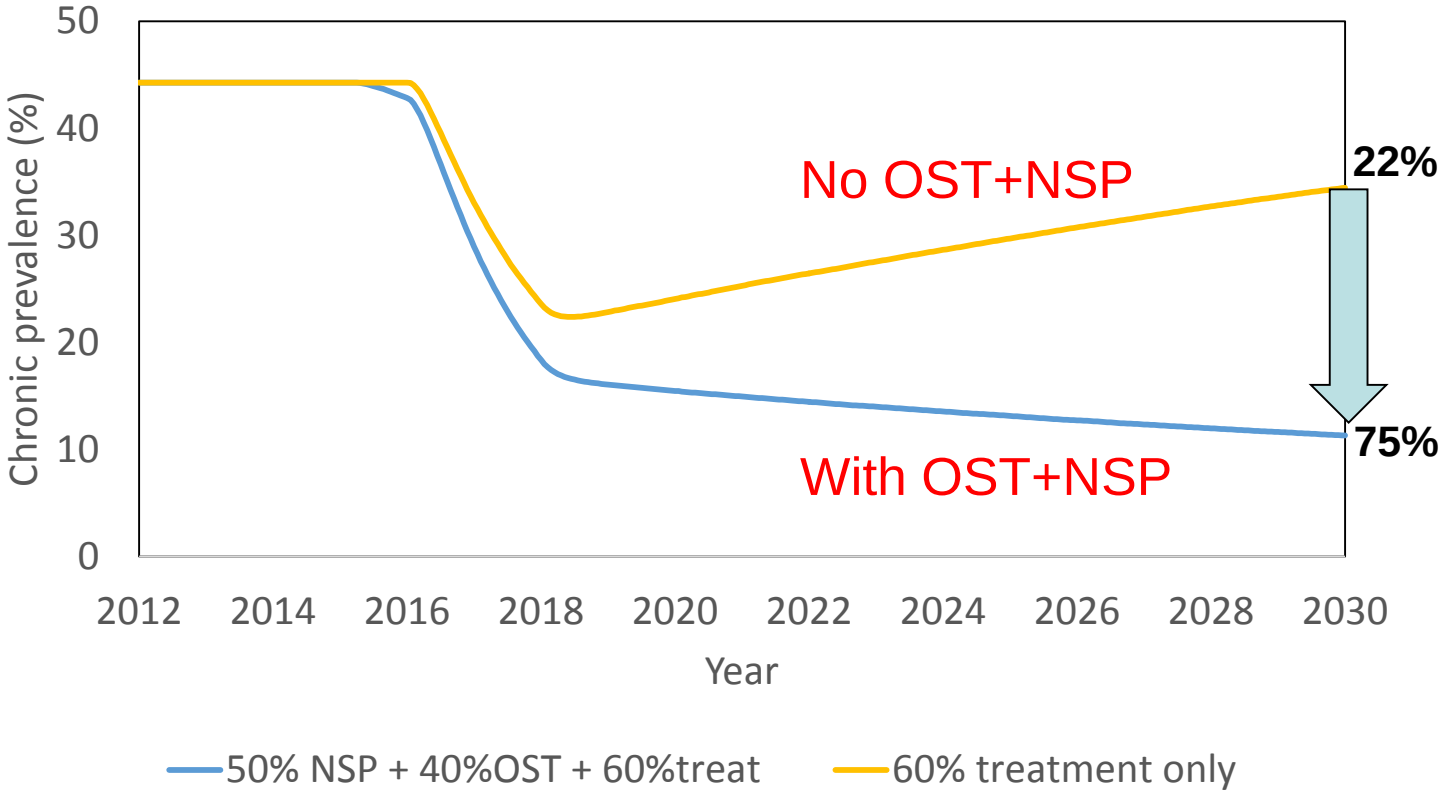
-41% decrease when OST coverage is 40%

-70% decrease when 60% (129) of infected IDUs are treated over 2 yrs.

By 2030 (15 years) the decreases are 35%, 53% and 74% respectively.

Median projections from sample of 1000 parameter sets.

Impact of just treatment on chronic prevalence



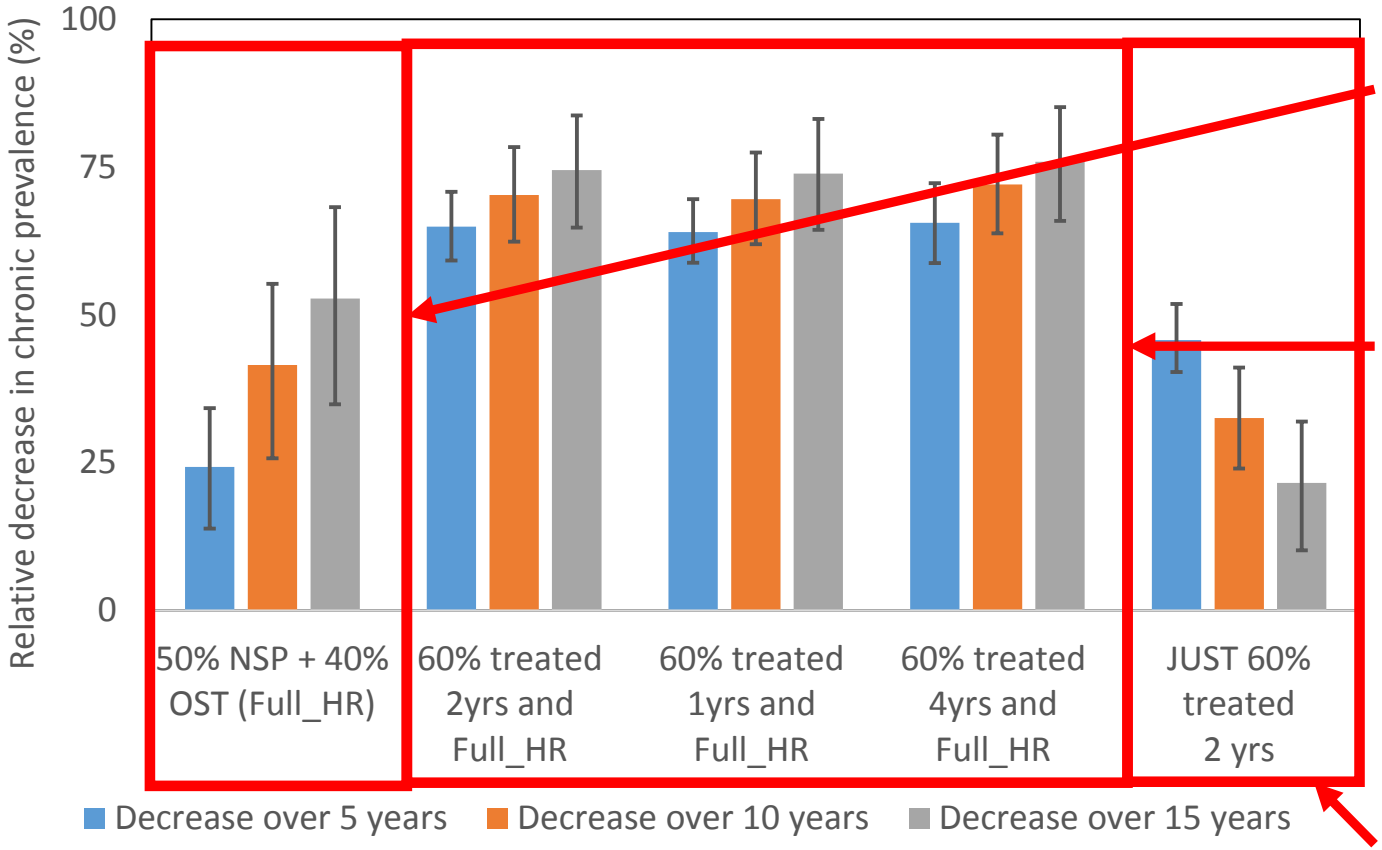
If **only** treatment (for 2 years) and **NO NSP and OST**

Benefits are not maintained with prevalence rebounding when treatment scales down.

60% Treatment with and without NSP+OST - impact increases from 22 to 75% decrease

Median projections from sample of 1000 parameter sets.

Decrease in chronic prevalence from 2015 after 5, 10 and 15 years



1. NSP+OST gradually increases impact on prevalence:

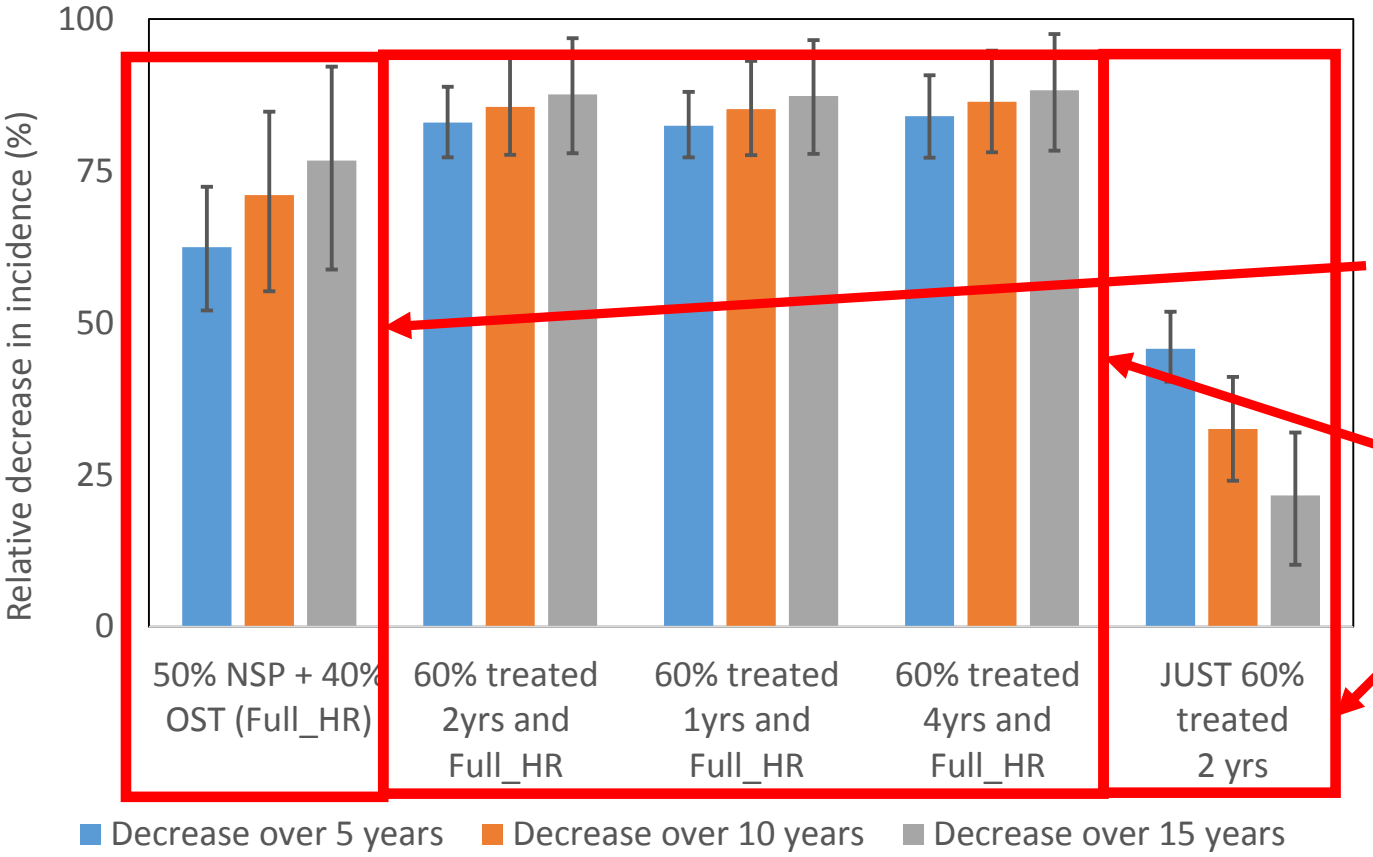
2. Treatment results in **quick hit** that is then maintained by NSP+OST

BUT quickness of treatment does not matter much

BUT if ONLY treatment then impact halves in 10 years and less impact than just NSP+OST

Median projections from a sample of 1000 parameter sets, with whiskers showing 2.5th and 97.5th percentiles.

Decrease in incidence from 2015 after 5, 10 and 15 years



Results converse to prevalence:

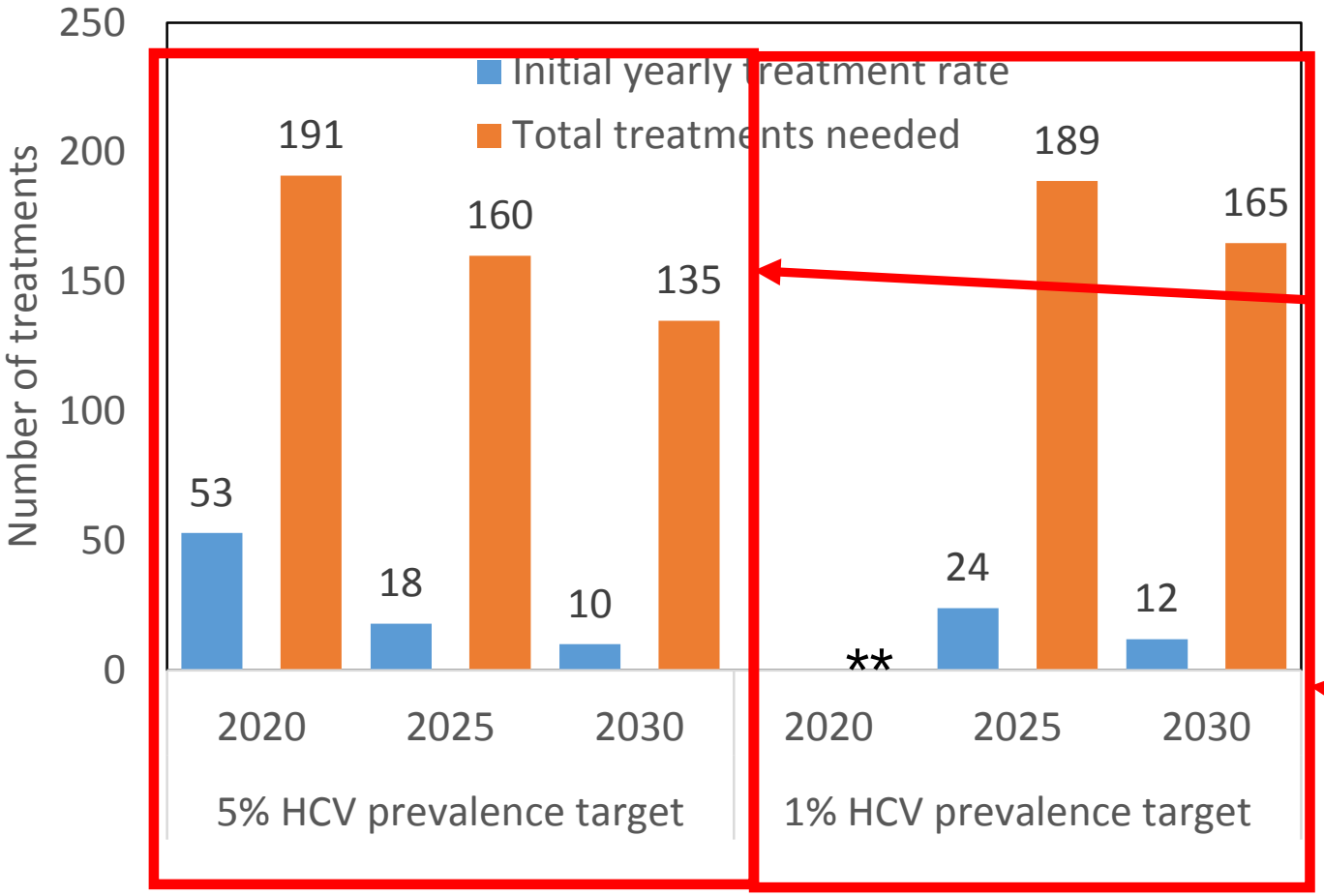
1. **Quick impact** now due to OST and NSP

2. **Treatment has smaller impact** which diminishes if no OST and NSP

Median projections from a sample of 1000 parameter sets, with whiskers showing 2.5th and 97.5th percentiles.

- **What treatment rate is needed to reduce prevalence to elimination levels (< 1 or 5%)?**

How many treatments are needed to reduce chronic prevalence to 5% or 1% in 5/10/15 years?



Note: NSP+OST is included in the mix

Reduce to <5%:
- 90% (191) of infections need to be treated if done in 5 years
- 63% (135) if done in 15 years

Reduce to <1%:
- Not possible in 5 years
- 88% (189) of infections need to be treated if done in 10 years
- 77% (165) if done in 15 years

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** Even if all infected IDUs are treated it is not possible to reduce chronic prevalence to 1% by 2020.

Discussion

- Scaling up HCV treatments with NSP+OST could have large impact over 10 years:
  - ↓ **HCV prev and inc by 70%** if treat 130 over 4 years, or
  - ↓ **HCV prev to less than 1%** if treat 190 over 10 years
- Scale up of NSP and OST is essential:
  - HCV treatment gives quick hit to epidemic,
  - OST and NSP maintains and increases impact
- **However, projections are preliminary**:
  - Need better data on size of injector population and HCV prevalence
  - Factors that relate to increased transmission risk
  - Whether epidemic is stable or increasing

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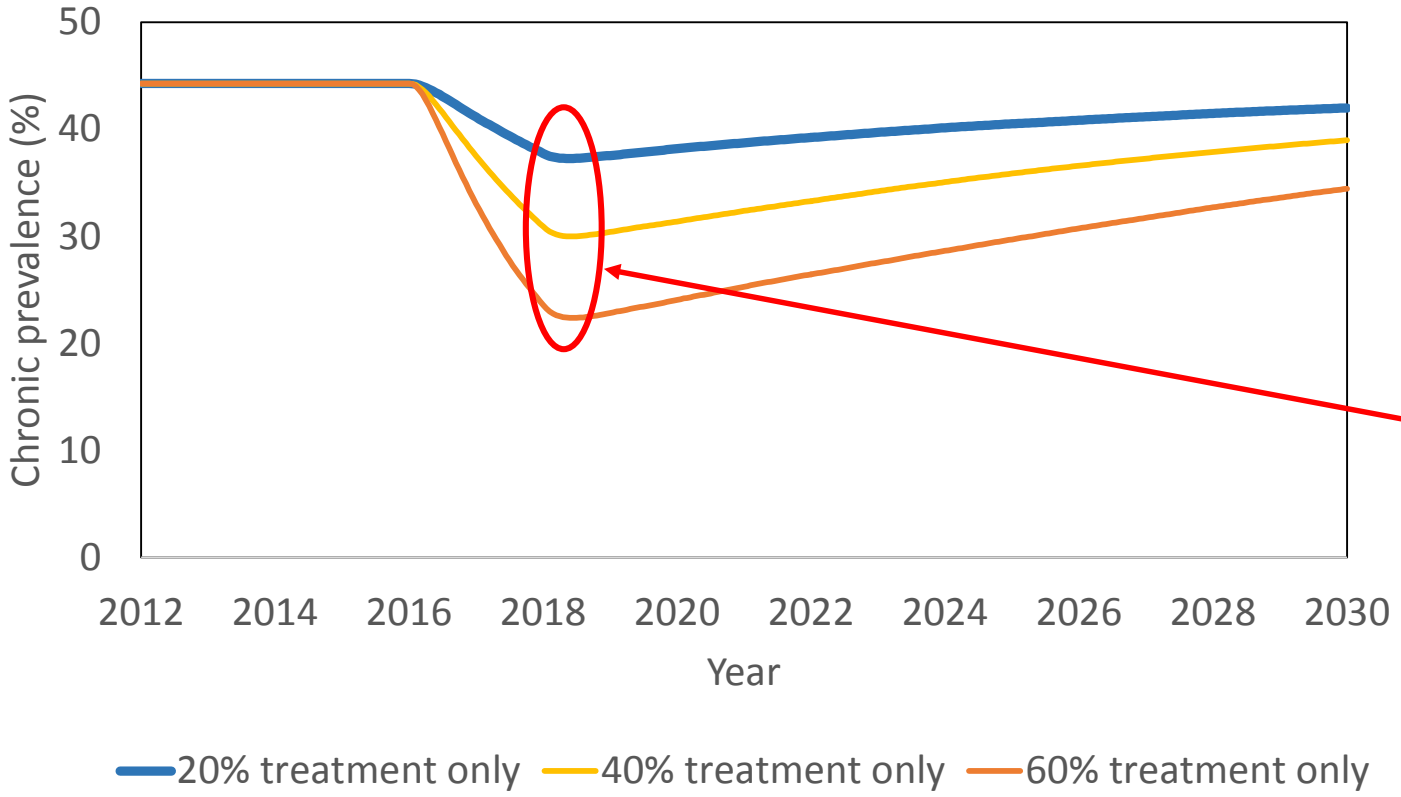
Impact of just treatment on chronic prevalence



If **only** treatment (for 2 years) and **No NSP and OST**

Benefits are not maintained with prevalence rebounding when treatment scales down.

Median projections from a sample of 1000 parameter sets.

But level of harm reduction needs to be tailored to amount of treatment