

Modelling the impact of the HCV care cascade amongst young adult people who inject drugs in San Francisco

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Background and Aims

- The World Health Organisation has set elimination goals to achieve an 80% reduction in Hepatitis C virus (HCV) incidence over 2015-2030¹.
- However, the incidence of acute hepatitis C virus (HCV) in the USA has doubled since 2013, and increased by 15% between 2019-2020².
- Young adult (18-30 years) people who inject drugs (YPWID) experience the highest hepatitis C virus (HCV) burden.
 - In San Francisco, HCV incidence over 2000-2013 is estimated at 23.1 per 100 person years (/100pyrs) among YPWID³.
- PWID suffer inherent barriers to treatment
 - In San Francisco less than 10% of YPWID who have been diagnosed with chronic infection are estimated to have been treated over 2016-2020⁴.

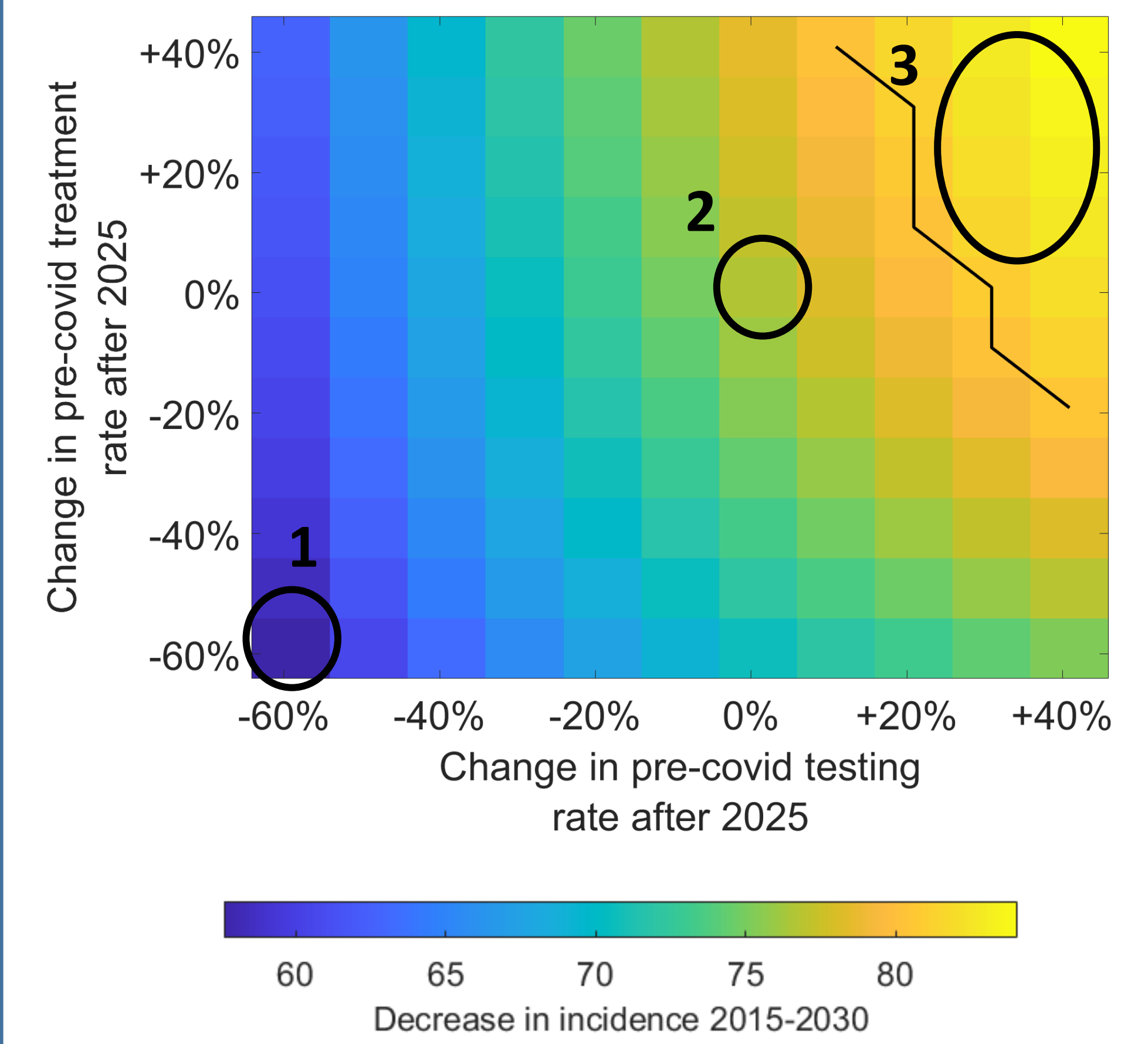
Aim 1: To evaluate progress towards the WHO elimination goals in San Francisco by modelling impact of the current HCV care cascade among PWID.

- Capture differences in incidence and care cascade between YPWID and their older counterparts.

Aim 2: Estimate how different testing and treatment strategies would affect the city's ability to achieve elimination among PWID.

- Increases in testing and treatment after reductions seen due to the COVID-19 pandemic

Results II: Testing and treatment needed to achieve elimination by 2030



- This corresponds to the status quo model fits: testing and treatment reduced by ~60% due to the COVID-19 pandemic, resulting in a 57.6% decrease in incidence over 2015 – 2030 (see Results I panel).
- This corresponds to testing and treatment returning to pre-COVID levels by 2025 but the proportion unstably housed remaining at what it is during COVID-19, resulting in an 76.7% decrease in incidence over 2015–2030.
 - Projections suggest returning to pre-COVID testing and treatment rates by 2025 without also addressing unstable housing will not achieve elimination by 2030.
- The area to the top right above the black line shows what testing and treatment rates are needed by 2025 to achieve elimination by 2030. A combination of scale-up of testing and treatment is needed:
 - If testing rates were at pre-COVID levels then treatment rates would need to increase from pre-COVID levels by around 30% to achieve elimination by 2030.
 - If treatment rates were at pre-COVID levels then testing rates would need to increase over 40% to achieve elimination by 2030.

Methods

Dynamic, deterministic, compartmental mathematical model among people who inject drugs (PWID) stratified by age, injecting status, unstable housing status, opioid agonist treatment (OAT) status & HCV disease progression stage (Fig. 1).

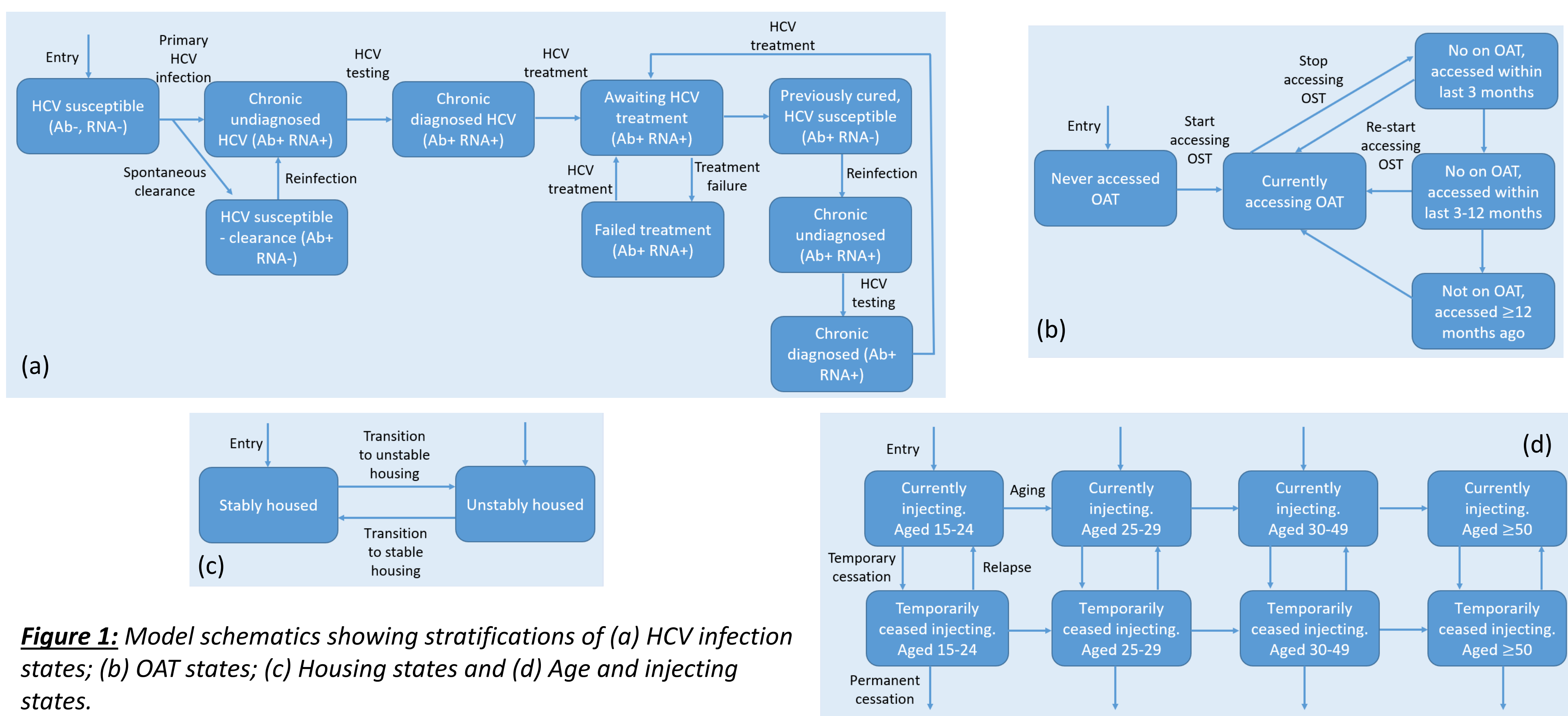


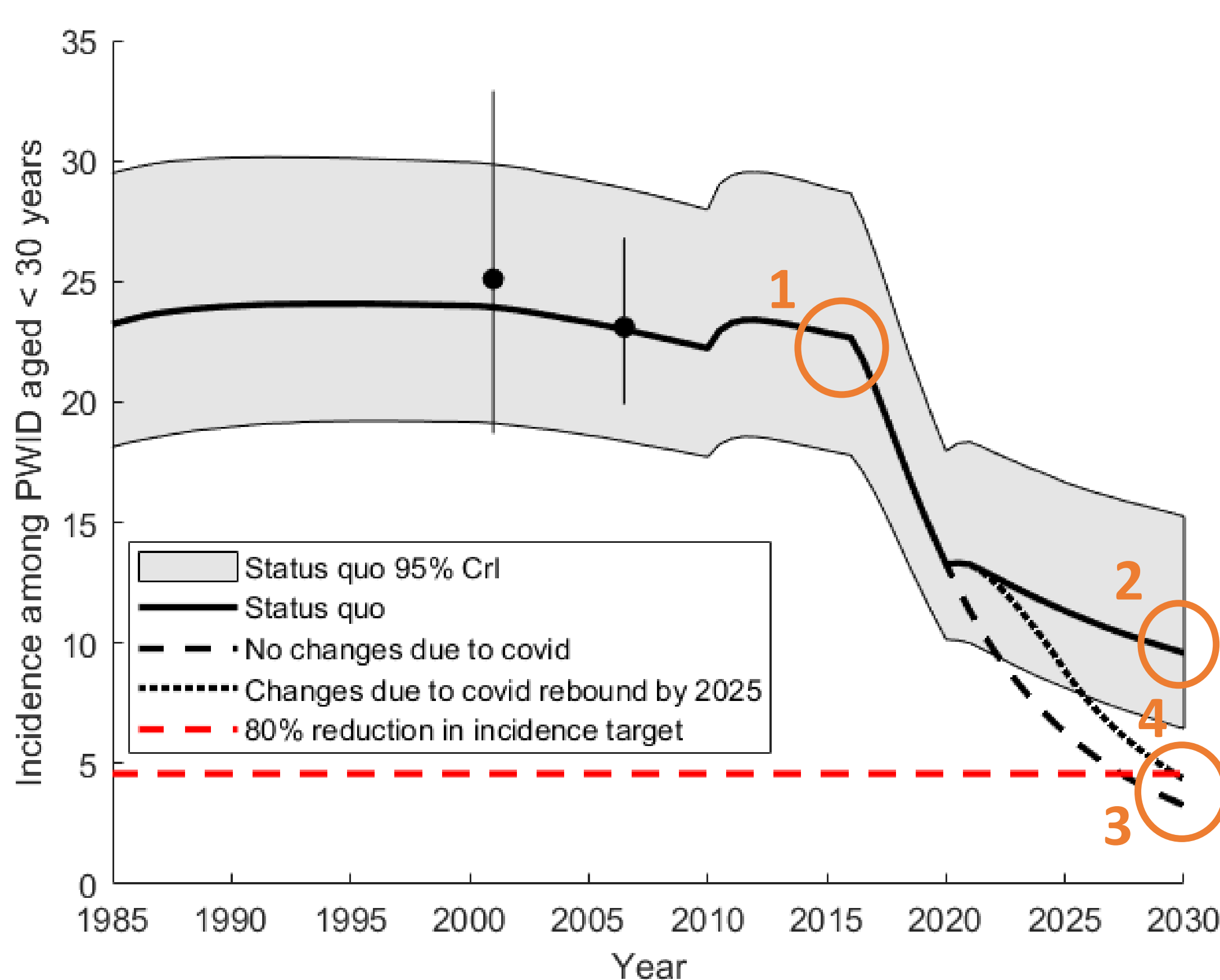
Figure 1: Model schematics showing stratifications of (a) HCV infection states; (b) OAT states; (c) Housing states and (d) Age and injecting states.

Model calibrated using an approximate Bayesian computation Sequential Monte Carlo (ABC SMC) method to data from the UFO longitudinal cohort study of YPWID⁵⁻⁷, the National HIV Behavioural Surveillance (NHBS) for PWID⁸⁻¹², and the Urban Health Study (UHS) among PWID¹³ on:

- Incidence among YPWID
- Antibody prevalence among PWID aged ≥ 30
- The proportion of PWID who have been diagnosed (by age)
- The proportion of PWID who have been treated (by age)
- PWID population size estimates
- The proportion of PWID accessing OAT (by age and over time)
- The proportion of PWID unstably housed (over time)

Status-quo model fits are calibrated to the above and include the following due to covid from March 2020: (1) an increase in the proportion of PWID unstably housed from around 70%⁸⁻¹¹ to 87.6% after March 2020¹⁴; (2) a reduction in testing and treatment rates among PWID by 59.1% from March 2020¹⁵⁻¹⁶.

Results I: HCV incidence among young adult people who inject drugs



- In 2015, HCV incidence projected to be **22.8 per 100 person years** (/pyrs; 95%CrI: 18.0 – 28.9/100pyrs).
- For status quo, including reductions in testing and treatment due to the COVID-19 pandemic, **incidence is projected to decrease by 57.6% (95%CrI: 43.6 – 68.7%)** to 9.6/100pyrs (95%CrI: 6.4 – 15.3) over 2015–2030.
- If reductions in testing and treatment due to COVID-19 had not occurred, then **incidence projected to decrease by 85.3% (95%CrI: 74.3 – 93.1%)** over 2015–2030.
- However, if effect of pandemic on the proportion unstably housed and levels of testing and treatment rebounds by 2025 the model projects a **decrease in incidence of 80.5% (95%CrI: 69.2 – 89.3%)** over 2015–2030.

Discussion & Conclusions

- The COVID-19 pandemic has affected whether San Francisco will achieve elimination of HCV among young adult PWID by 2030.
 - A greater decrease in incidence is seen among all PWID over 2015–2030 (62.2% decrease), suggesting YPWID have been affected by the pandemic to a greater extent than PWID aged over 30.
- Results indicate that changes in the care cascade are required to achieve elimination by 2030.
- Due to the drop in testing and treatment during COVID-19, an increase in previous testing and treatment rates are now needed to achieve elimination.
- Continued engagement with services is key to targets being met.

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