

Modeling scale-up of harm reduction and treatment interventions to prevent HCV and HIV transmission and mortality among people who inject drugs in San Diego County

The intersecting threats of injection drug use (IDU), HIV, and hepatitis C virus (HCV) transmission have resulted in a public health crisis of unusual magnitude. In addition to the threat of fatal overdose, people who inject drugs (PWID) are at increased risk of transmission of blood borne viruses, such as HCV and HIV. According to the Centers for Disease Control and Prevention (CDC), unsafe IDU the main contributor to the increase in new HCV infections between 2011 and 2015[1] and new HIV diagnoses.[1]

National and local political efforts are focusing on how to eliminate HCV and HIV epidemics. The World Health Organization (WHO) and the U.S. National Academies of Sciences and Engineering (NASEM) set HCV elimination targets of reducing new HCV infections by 80% and HCV-related deaths by 65% by 2030. The U.S. President recently announced a plan to end the HIV epidemic by reducing new HIV infections by 90% in 10 years. Yet, despite the political will to eliminate HCV and HIV among PWID, the most effective and cost-effective strategy to achieve these targets is unknown.

Several U.S. counties, including San Diego County, have announced HCV elimination initiatives, with PWID a priority population. Among PWID in San Diego, 9% and 66% are infected with HIV and HCV, respectively.[7] To address the complexity of the HCV elimination challenge, countries such as the UK have developed micro-elimination goals, including targeting efforts at people living with HIV (PLWH). PLWH are an important target for microelimination efforts because: 1) HIV infection accelerates HCV-related disease progression,[2] 2) viral hepatitis is a leading non-AIDS cause of death[2], and 3) many PLWH access health services regularly.

Recent global systematic reviews found strong evidence that harm reduction interventions, such as opioid substitution therapy and needle/syringe programs, are effective at preventing acquisition of HCV[3] and HIV.[4] Harm reduction interventions, in particular, if combined with HCV or HIV treatment, could have substantial population effects on disease epidemics among PWID. Indeed, theoretical epidemic modeling has indicated that a combination harm reduction and treatment strategies could control or eliminate HCV or HIV epidemics among PWID in the U.S.[5, 6] yet the optimal harm reduction and treatment portfolio for PWID in San Diego County is unknown.

To inform harm reduction and prevention policymaking, we will develop a flexible coinfection epidemic modeling framework to identify what combination of interventions is most effective and cost-effective to reduce incidence of HCV and HCV-related mortality among PWID in San Diego County, with an emphasis on those infected with HIV. While this model can be applied to other settings and programmatic goals (such as HIV elimination initiatives), this proposal will focus on informing HCV elimination efforts among PWID and HIV+ PWID in San Diego.

Training Aims

TA1. Develop knowledge of the epidemiology of IDU and related HIV and HCV epidemics in the United States.

TA2. Gain skills in epidemic modeling of HCV, HIV, and HIV/HCV coinfections among PWID.

TA3: Acquire expertise in cost-effectiveness analyses of harm reduction and treatment interventions among PWID incorporating transmission modeling to capture prevention benefits.

TA4: Obtain expertise in the ethical conduct of research pertaining to PWID.

TA5: Expand professional development skills in preparation for a successful academic career by further developing skills in grantsmanship, publication, and scientific collaborations.

Research Aims

RA1: Quantify the number of PWID with HCV, HIV, and HIV/HCV coinfection in San Diego County (maps on to TA1)

RA2: Determine the level of harm reduction and treatment scale-up that is most effective at reaching HCV elimination goals (reducing HCV incidence by 80% and HCV-related mortality by 65% by 2030) among PWID and HIV-infected PWID in San Diego county by 2030. (maps onto TA2).

RA3: Assess the most cost-effective mix of harm reduction and treatment interventions to reach HCV elimination targets among PWID and HIV-infected PWID, incorporating long term transmission prevention benefits (maps on to TA3).

Our work will directly inform harm reduction and prevention efforts targeted at PWID in San Diego County, to reduce HCV incidence and HCV-related mortality among all PWID and HIV+ PWID. We will be the first to develop a joint HIV and HCV transmission model to assess the most effective and cost-effective harm reduction-based strategies to prevent HCV acquisition and HCV-related mortality among all and HIV-infected PWID in the US. It is in line with the NIH Office of AIDS Research priorities by addressing HIV-associated coinfections as a primary outcome and reducing the incidence of HIV as a secondary outcome of the simulated harm reduction strategies.

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