Appendix (unedited, as supplied by the authors)

Details of the mathematical model

The model used for the simulations in this manuscript was adapted from a previously described model of HCV transmission among PWID[1], which is described below. Note that in the Victoria simulations we assume no immunity (σ=1 and ξ=0 in the model equations below, such that all those who attain SVR after treatment, or who spontaneously clear the acute stage, become susceptible).

In this system, X denotes susceptible PWID (including those who have cleared the infection and are Ab^+), C_1 denotes both chronically infected and acutely infected PWID which will proceed to chronic infections, C_2 denotes chronically infected PWID who did not achieve sustained viral response (SVR) after treatment, T denotes PWID in treatment, Z denotes immune PWID, τ is time in years, and where $N=X+Z+C_1+C_2+T$. The model equations are as follows:

$$\frac{dX}{d\tau} = \theta - \pi(1-\delta+\delta\xi)\frac{C_1+C_2}{N}X + \omega\alpha\sigma T - \mu X$$

$$\frac{dC_1}{d\tau} = \pi(1-\delta)\frac{C_1+C_2}{N}X - f(C_1) - \mu C_1$$

$$\frac{dT}{d\tau} = f(C_1) - \omega T - \mu T$$

$$\frac{dZ}{d\tau} = \pi\delta\xi\frac{C_1+C_2}{N}X + \omega\alpha(1-\sigma)T - \mu Z$$

$$\frac{dC_2}{d\tau} = \omega(1-\alpha)T - \mu C_2$$

where

$$f(C_1) = \begin{cases} \Phi, & \Phi < C_1 \\ C_1, & 0 \le C_1 < \Phi. \end{cases}$$

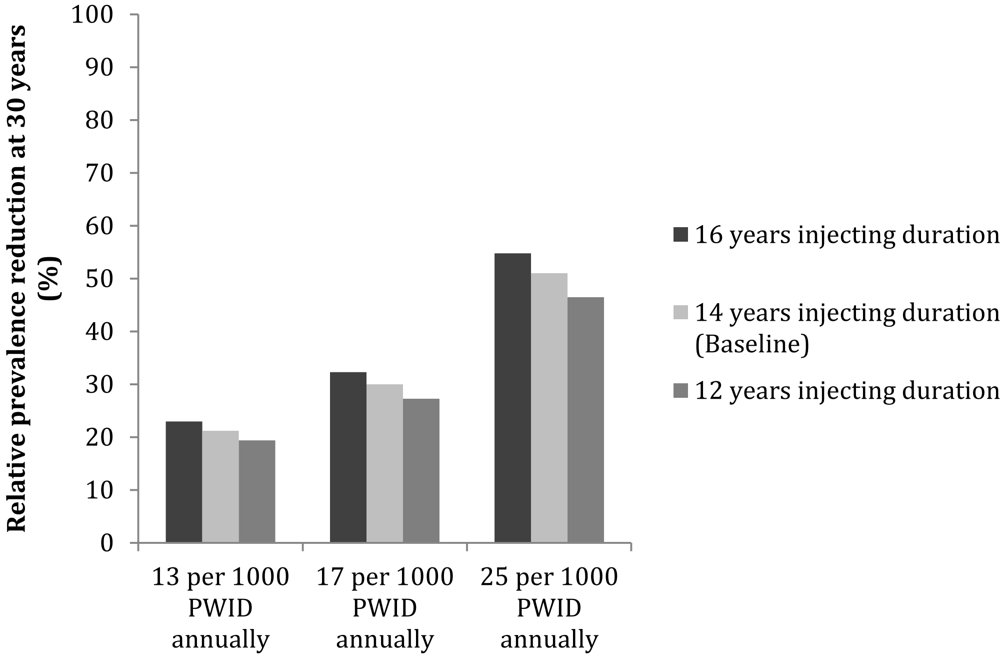
New injectors enter the PWID population at a fixed rate θ, and leave each compartment (due to death or ceasing injection) proportional to the rate μ. Susceptible PWID can become infected at a rate which is proportional to the number of susceptibles, the fraction of the population chronically infected, and the infection rate, π. The acute infection spontaneously clears in the proportion δ, a fraction of which become immune at a proportion ξ. The remaining infected fraction which do not spontaneously clear, $1-\delta$, progress to chronic infection.

Chronically infected PWID can move into treatment at a rate *f(C)*. In the treatment function, infected PWID are recruited onto treatment at a fixed rate, Φ people per 1000 PWID annually. If the infected population is driven below Φ people, all the infected PWID are treated. PWID exit treatment at a rate ω. A proportion of those treated do not respond (proportion '$1-\alpha$') and move from the treatment compartment to the non-responder compartment. The non-responders cannot be retreated, but can leave the PWID population proportional to the same exit rate as the other PWID, μ. In this model, both compartments of chronic infections contribute to the spread of the infection to susceptibles. The remaining proportion respond to treatment and are cured, a fraction of which (σ) become susceptible again with the remainder ($1-\sigma$) becoming immune.

Table 1. **Model parameters and values**. [a]Weighted average of genotype distribution and SVR rates. $\alpha = g_1 * \alpha_1 + g_{2/3} * \alpha_{2/3}$. [b]Weighted average of genotype distribution and treatment durations (assuming 24 weeks genotype 2/3, 48 weeks genotype 1). $1/\omega = (48*g_1+24*g_{2/3})/52$. [c]Sum of the cessation and death rates. $\mu = \mu_1 + \mu_2$. [d]Model solved until steady state with this baseline treatment rate, and equilibrium values used as initial conditions for model projections. [e]Initial conditions calculated from model equilibrium values with current baseline treatment rates in Victoria.

Symbol	Definition	Value	Units
g_1	Proportion population genotype1	0.56	-
$g_{2/3}$	Proportion population genotype 2/3	0.44	-
δ	Proportion who spontaneously clear the acute stage	0.26	-
	Sustained viral response (SVR)		
α	Baseline[a]		-
α_1	Genotype 1	0.45	-
$\alpha_{2/3}$	Genotype 2/3	0.80	-
$1/\omega$	Average duration of treatment	0.72[b]	years
μ	Exit rate from injecting	0.08[c]	Per year
$1/\mu_1$	Average duration of injecting career	14	years
μ_2	Average PWID death rate	0.0083%	Per year
θ	New PWID entry rate	Fit to total population of 1000 injectors	Per year
π	Infection rate	Fit to give 50% chronic prevalence	Per year
Φ	Antiviral treatment rate		
	Baseline in Victoria[d]	1 per 1000 PWID	Per year
	Model projections[e]	5-40 per 1000 PWID	Per year
ξ	Proportion who become immune after spontaneous clearance	0	-
$1-\sigma$	Proportion who become immune after SVR	0	-

Figure 1. Relative reduction in chronic HCV prevalence at 30 years depending on the length of injecting and treatment rate.



* The baseline prevalence is 50%, and baseline treatment rate 1/1000 PWID annually.

1. Martin NK, Vickerman P, Foster GR, Hutchinson SJ, Goldberg DJ, Hickman M. Can antiviral therapy for hepatitis C reduce the prevalence of HCV among injecting drug user populations? A modelling analysis of its prevention utility. *Journal of Hepatology* 2011;54:1137-1144.