Modelling the allocation of Hepatitis C treatment: relationship to methadone maintenance

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Background

- HCV significant cause of morbidity and mortality
- 60% of IDU in Australia HCV
- Treatment is available (with 50% success rate)
- HCV treatment rates in Australia low (1%)
- Interest in improving access to Hep C treatment and availability of Hep C treatment

Motivation

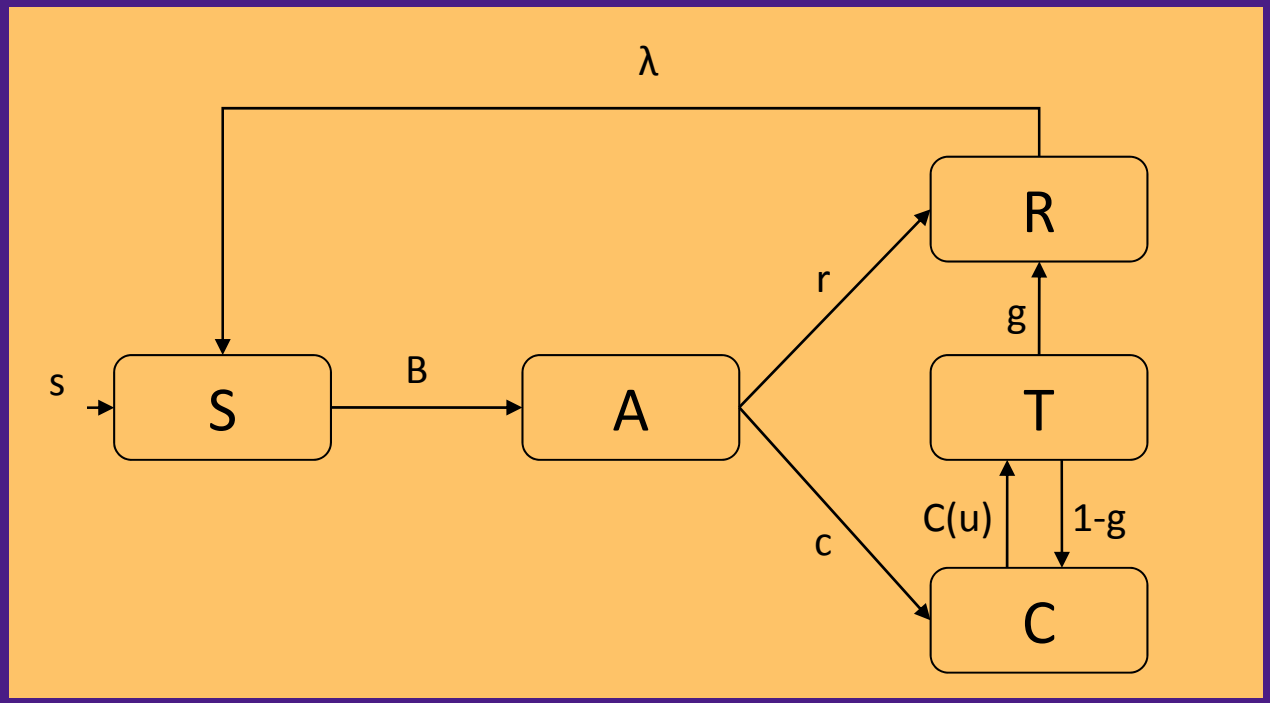
- Allocating HCV treatment?
- Query regarding treatment for current injectors
- Uncertainty regarding reinfection
- Focus on people in opioid pharmacotherapy maintenance:
  - ↑ referrals into HCV treatment
  - Provide ongoing support during treatment
  - Improve compliance
- But: no evidence to date of improved access and outcomes in context of OST

Aim

- In context of:
  - a limited number of treatment spots; and
  - lack of current evidence re role of opioid pharmacotherapy maintenance in improving HCV treatment outcomes
- Explore the optimal allocation of HCV treatment between those people in pharmacotherapy maintenance and those outside pharmacotherapy maintenance treatment
  - How should treatment places be distributed?

The model

- Simple infectious diseases model: SACTR



Features

- Population model – all IDU in Australia
- Single state model = all IDU. Two state model splits the IDU group into two treatment grps
- Methadone maintenance only (MMT)
- Optimisation = minimum steady state HCV population prevalence (outcome = achieving the least no. of infected people within the model)

Parameters

DPMP
Drug Policy Modelling Program

- Population estimates: # IDU, #'s in MMT etc.
- HCV infection rates: based on rate of injecting (in and out of MMT) and probability of becoming infected
- HCV treatment parameters: duration of treatment, success rate
- MMT treatment parameters: duration of treatment
- Reinfection rate

NDARC

Sensitivity analysis

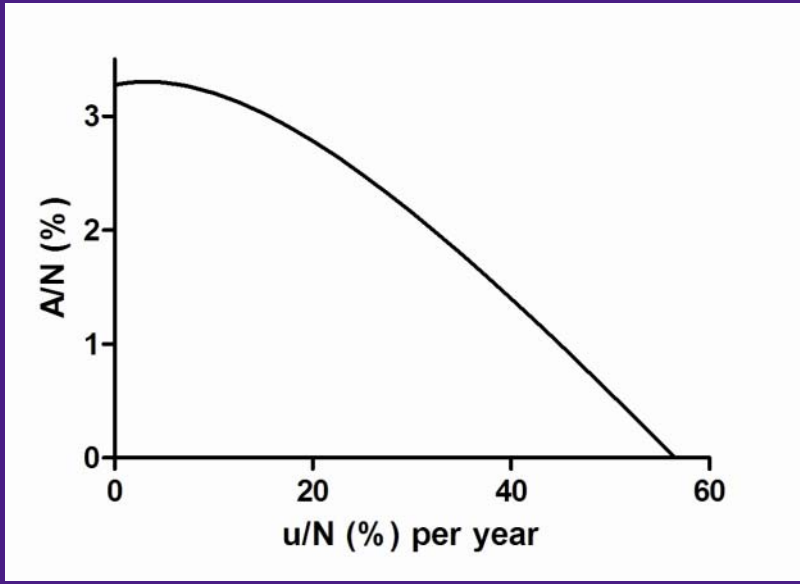
- Model reproduces expected population prevalence of HCV (60%)
- Parameters that had the largest impact on steady state HCV prevalence were:
  - rate of infection and the exit rate
- changing these by +/-10% resulted in a 4-6% change in the predicted prevalence.
- Changing other parameters by +/- 10% resulted in changes in steady state HCV prevalence of less that 1%.

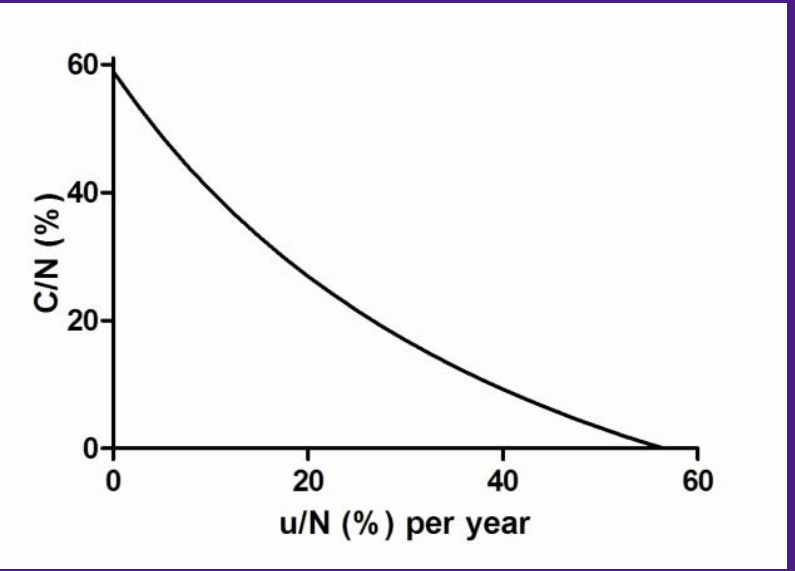
Results

- Single state model without MMT split
- Examines:
  - Impact on HCV prevalence of increasing HCV treatment levels
  - Optimal HCV treatment rate to achieve minimum steady state prevalence

Results

The effect of the treatment rate (percentage of the total population per year), u, on the percentage of acutely infected, A, (left) and chronically infected, C, (right) users in the endemic steady state.





Never fully eliminate HCV (always new infections)

- As increasing numbers are treated, prevalence decreases:
  - But with an initial increase in acute
- Treatment level to minimise HCV is 56.5%
- Rate of infection continues (due to sharing) so never eliminated with treatment alone
- Slow: 3.3 yrs for chronic infections to decrease by half; 11.1 yrs for acute infections to decrease by half

Optimal mix: MMT or non-MMT

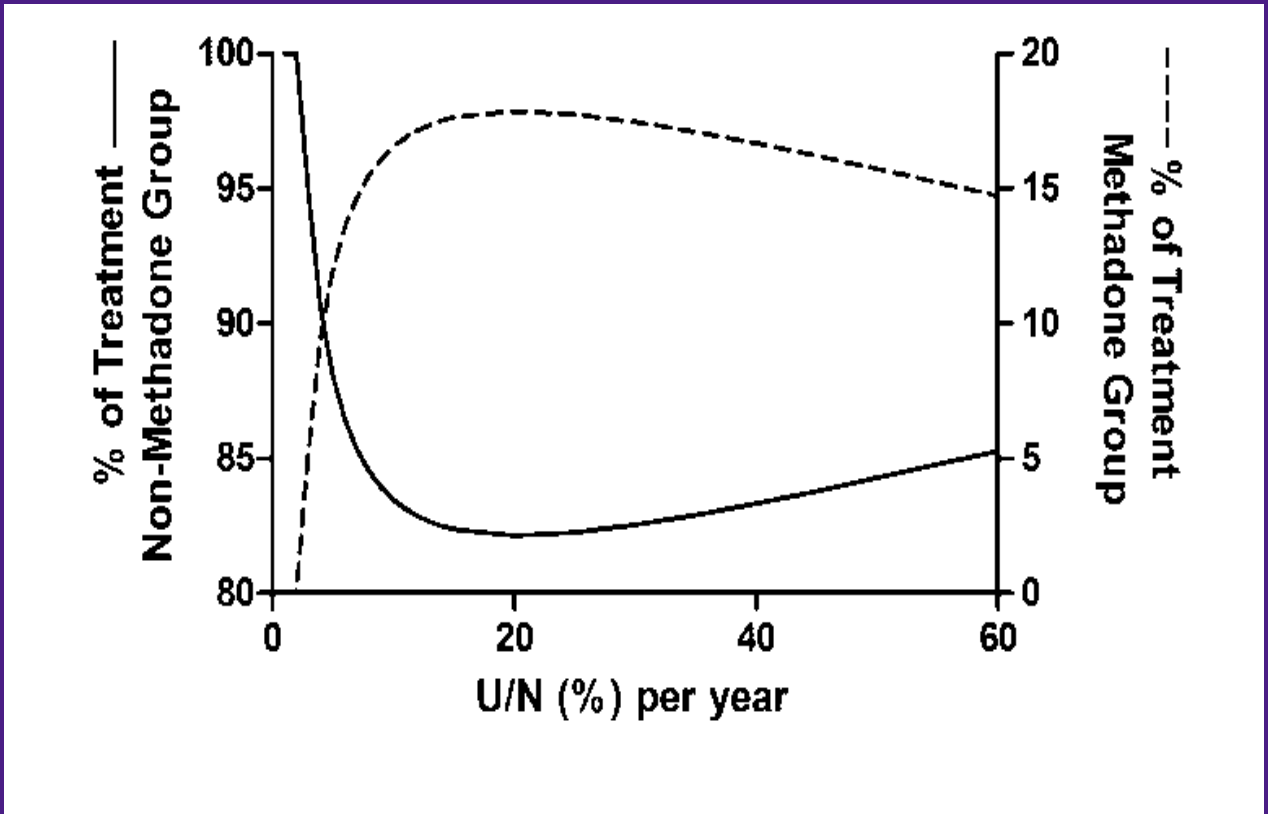
- Assuming treatment rate of 50% (derived from single state model) optimal mix between MMT and non-MMT HCV treatment is:

- 84% of HCV treatment places to non MMT
- 16% of HCV treatment places to MMT

- This mix results in lowest steady state HCV in the population

- Varies as the HCV treatment rate changes (but not by much.....)

Optimal allocation between MMT and non-MMT



The effect of varying the percentage of the total population treated per year on the optimal treatment allocation between non-methadone (solid line) and methadone (dashed line) users.

Limitations

- As with all maths models, parameters are essential:
  - Reinfection rate too low?
  - MMT cycling behaviour too high?
  - Length of HCV treatment averaged across genotypes
- HCV treatment rate of 56% of total population unrealistic
- Does not account for potential advantages of MMT

Conclusions

1. Programs that minimise sharing must continue (cannot eliminate HCV with treatment alone)
2. Optimal allocation is to treat those not in MMT (at significantly wide margins)
   - Focus efforts on treating current injectors
3. More research on whether MMT does improve HCV treatment compliance and outcomes
   - Then can re-run model with those new parameters

Further information

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