Widespread PrEP Coverage May Increase The Prevalence Of Hepatitis C Amongst Men Who Have Sex With Men

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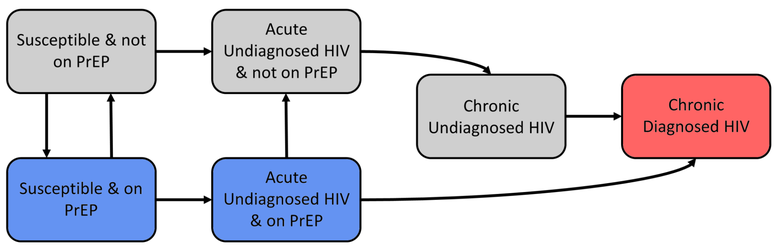
Introduction

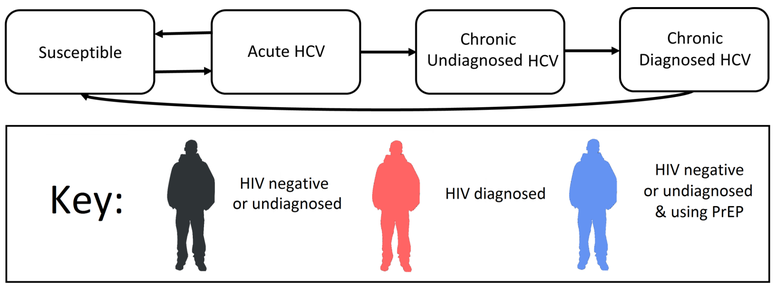
Recent trials have shown that regular use of pre-exposure prophylaxis (PrEP) amongst men who have sex with men (MSM) can reduce the risk of HIV acquisition by around 44-86% [1,2,3]. However, concerns exist around reducing condom usage or changes in MSM mixing; potentially increasing the transmission of STIs such as hepatitis C (HCV) [4].

Methods

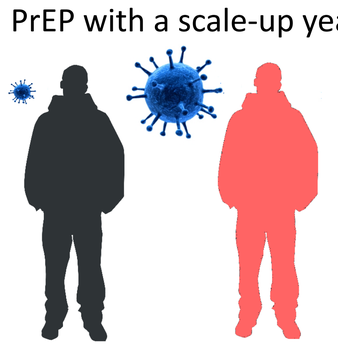
HIV Progression



Hepatitis C Progression



We initiate the model to a stable 5% HIV prevalence, 10% HCV amongst HIV positive MSM and 1% in HIV negative MSM, reflective of the UK (including effects of HIV status and HIV/HCV co-infection). We then introduce PrEP with a scale-up year, reaching desired coverage.



Estimated 2.7 higher hepatitis C viral load in HIV postive men leading to higher infectivity.

HIV positive men are 33% less likely to spontaneously clear hepatitis C.

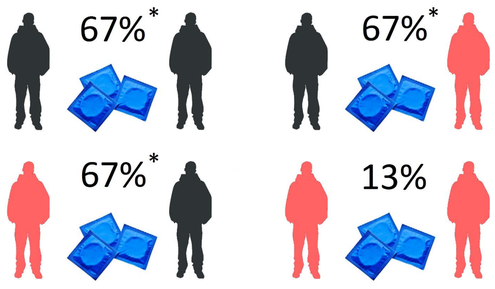
Compared to HCV infection alone, co-infection with HIV results in a 1.7-2.5 higher rate of death from hepatitis C related causes.

MSM mix preferentially by HIV status and a pair of HIV diagnosed MSM use condoms less often.

We then examine two scenarios of behavioural change against a baseline of no behavioural changes and 11-50% PrEP coverage in HIV negative MSM. We also explore the impact of PrEP efficacies of 86% and 43%, as well as screening PrEP users for HCV as well as HIV annually.

Scenario 1: Condom Use

Evidence already shows condom use is lower in partnerships between HIV diagnosed MSM [5]



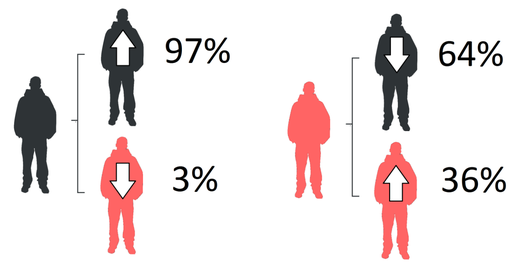
PrEP users may also reduce their condom usage

We explore the worst case scenario to anticipate the maximum potential impact.

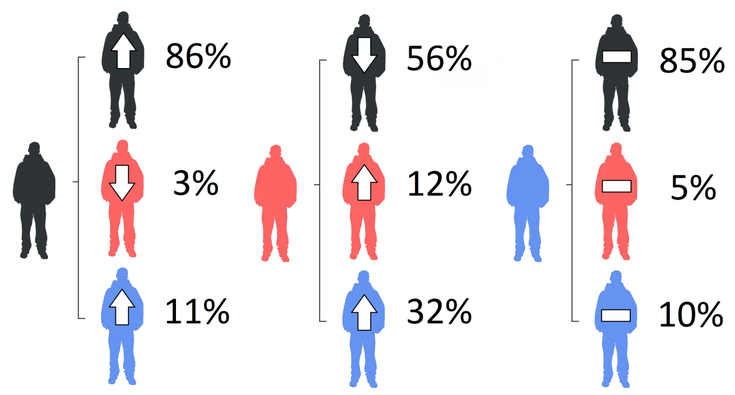
*The average condom use of all partnerships (before PrEP's introduction) except two HIV diagnosed men is 67%. The actual rates for different pairings are in a slightly broader range. Therefore model uses this average value of 67%.

Scenario 2: Partner Selection

Evidence already suggests that MSM mix preferentially based on HIV status [5]



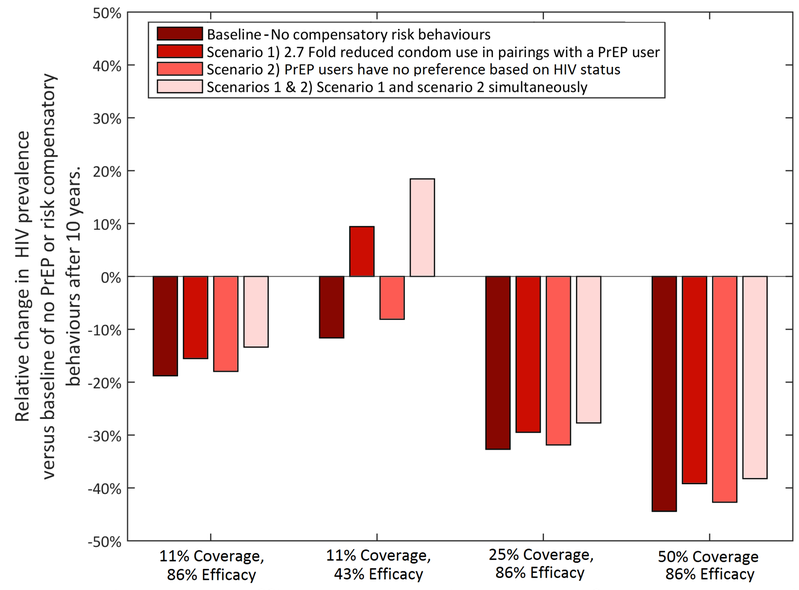
The introduction of PrEP may affect partner selection. We assume HIV diagnosed men and HIV negative/undiagnosed men prefer men of the same status or those on PrEP, and PrEP users have no preference based on partner HIV status.



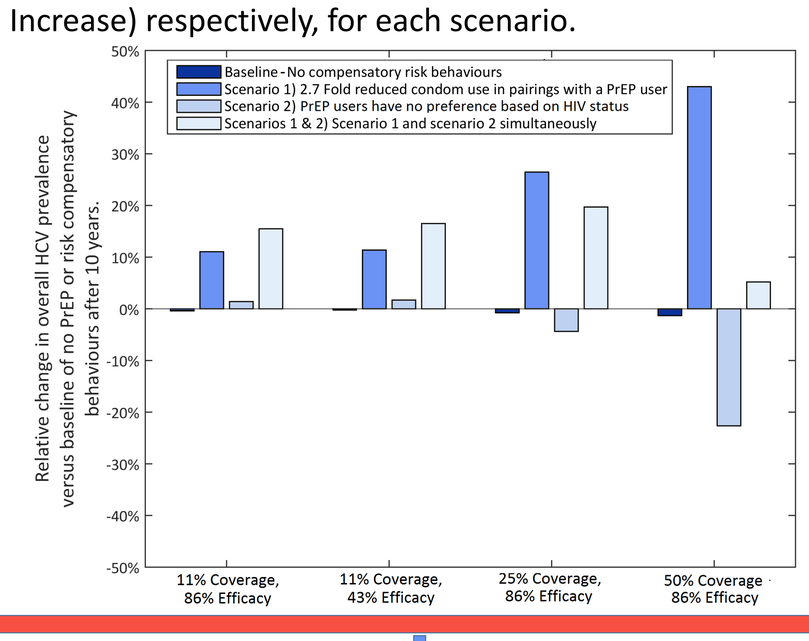
*Based on 11% PrEP uptake within HIV negative men. Mixing pecentages calculated at the initiation of PrEP. These will vary with HIV prevalence. HIV prevalence assumed at 5%, with 80% of those infections diagnosed.

Results

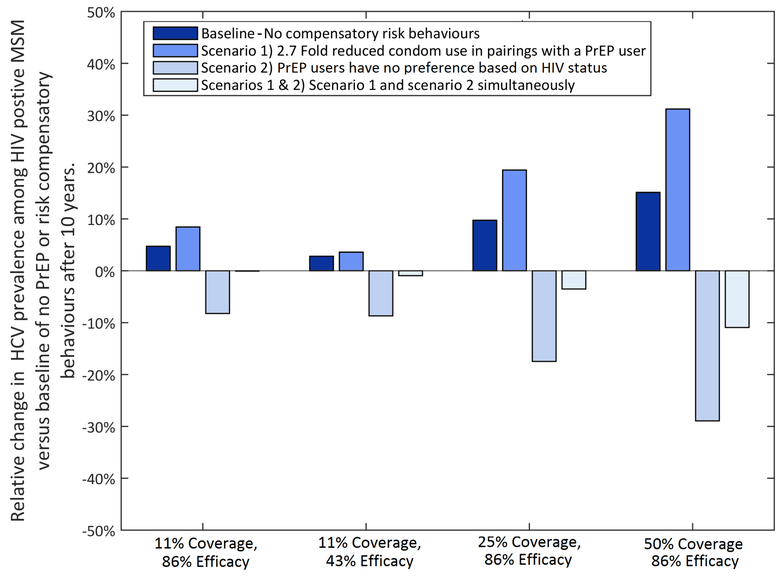
At 86% HIV-efficacy, PrEP decreases HIV prevalence by 18.8% from 5.00% to 4.06% over 10 years at baseline. When we assume PrEP users either reduce condom use or change their mixing behaviours, or both, then the decrease in HIV prevalence due to PrEP is reduced from 18.8% to 15.6%, 18.0% and 13.4%, respectively.



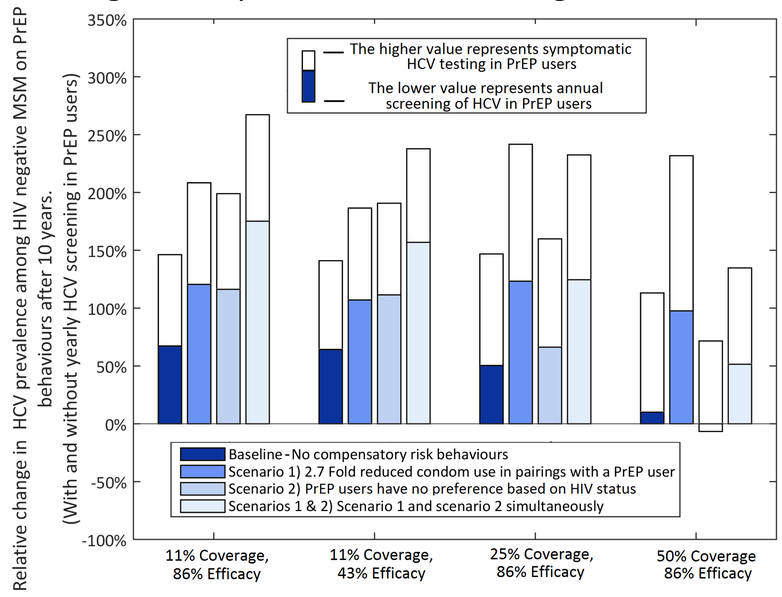
At 43% PrEP efficacy, the impact of PrEP can be completely mitigated; HIV prevalence reaching 5.47% (9.4% increase), 4.59% (8.2% decrease) and 5.92% (18.4% Increase) respectively, for each scenario.



At baseline with 86% PrEP efficacy and 11% coverage, the overall HCV prevalence changes by <1%. However HCV prevalence increases by 4.7% amongst HIV-positive MSM (from 10.0% to 10.5% - due to the reduction in HIV incident infections of individuals without HCV).



HCV decreases by 8.7% amongst HIV-negative MSM who are not using PrEP (from 1.04% to 0.95% overall). The HCV prevalence within MSM using PrEP however, increases 2.5-fold from 1.04% to 2.56%. It is however possible to reduce the overall increases of HCV in PrEP users significantly with annual screening.



In all sub-populations, in all scenarios, reduced condom use increases overall HCV prevalence. Less mixing by HIV status can lower HCV prevalence overall (at 25% and 50% PrEP coverage) and always lowers HCV prevalence in HIV-positive MSM; as it protects HCV vulnerable MSM from self-mixing. PrEP users however suffer from increased HCV prevalence, except for at coverage of 50%, where reduction of HIV/HCV co-infections reaches a point where it protects the entire population from HCV.

Discussion

Without risk compensations, the overall HCV prevalence remains similar, while concentrating within PrEP users and HIV positive MSM. Screening PrEP users annually can largely mitigate their greater HCV burden. Generally with lower HIV prevalence, we expect co-infection prevalence to increase within the remaining HIV positive population. Reduced condom use increases HCV prevalence overall, (especially in PrEP users). PrEP users mixing less by HIV status can lower HCV prevalence with high PrEP coverage.

Take Home Messages

1. HCV is likely to concentrate further within HIV positive MSM and also in HIV negative MSM using PrEP.
2. Annual HCV Screening in PrEP users can help mitigate their large anticipated increases in HCV prevalence.
3. Lower condom use greatly increases HCV prevalence.
4. Mixing changes could lead to reduced HCV prevalence.

References

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