The fall in HIV infections in MSM in England during 2012 through 2016: When did it begin and what caused it?

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Background

1. An earlier analysis[1] of surveillance data for England & Wales from 2001 through 2010 concluded that expanding testing and high (and rising) treatment coverage did not correspond to a decline in HIV transmission in MSM.
2. Since 2010, scale-up of combination HIV prevention (testing and early treatment (TasP)) has continued and PrEP has been added, while bacterial STIs in MSM have continued to increase.
3. Another analysis[2] of the fall in new HIV infection diagnoses in MSM that began in England in 2015, and was well established in 2016, concluded that the fall was best explained by accelerated treatment at diagnosis and a substantial testing increase. The size of the PrEP contribution to the fall has been debated.[3]
4. Important implementation lessons may be learnt through extending the analyses of surveillance and monitoring data to better understand the relative contribution of each component of combination prevention.

Methods

5. Descriptive analyses were conducted of surveillance and monitoring information on MSM through 2016, including new gonorrhoea, syphilis and HIV diagnoses, STI clinic attendances, HIV test frequency, and time to treatment initiation of those newly diagnosed with HIV. Numbers taking PrEP were estimated.
6. The back-calculation method[4] was extended[5]and analyses of underlying HIV incidence were updated with data through 2016 and after exclusion of HIV diagnoses made abroad.
7. One back-calculation analysis focussed on identifying when the downturn in HIV infection began, i.e. when was the tipping-point?

Results

8. After beginning earlier than 2008, the steady increase in new gonorrhoea and syphilis diagnoses continued through 2015-16 with a suggestion that the rate of transmission also increased in the middle of the period – Fig 1, Panel A.
9. Annual numbers of MSM clinic attendees more than doubled from around 50,000 in 2008 to 120,000 in 2015-16, and there was a similar remarkable increase in HIV testing both in those testing frequently (two or more tests within a year) and occasionally (less than two tests within a year) – Fig 1, Panel B.
10. While annual numbers of new HIV diagnoses increased from 2,500 in 2008 to 3,000 in 2015, the proportion beginning ART within 180 days of diagnosis rose from 33% of those diagnosed in 2008 to 74% of those diagnosed in 2015, with a clear acceleration from 2012 onwards – Fig 1, Panel C.
11. MSM began taking PrEP when the PROUD trial began recruiting in late 2012[6]. A half of participants were assigned to the deferred arm for 12 months, and all were offered PrEP in the last quarter of 2014. Therefore, an estimated 25 were taking PrEP at end 2012, 250 at end 2013,and 500 at end 2014. In late 2015, international self-purchase of PrEP via internet sites began, so about 750 are thought to have been on PrEP by year end. A recent online survey[7] of MSM, suggests PrEP usage quadrupled in 2016, so that as many as 3,000 could have been taking PrEP by end 2016 – Fig 1, Panel D.
12. The average time between when a person newly diagnosed with HIV infection in a particular quarter and when they began ART, stayed at 40 months or thereabouts until end 2010. From early 2011, this average interval declined steadily to reach around 30 months for infections diagnosed in 2015 – Fig 2.
13. After peaking at 2,985 in 2014, new HIV infection diagnoses fell to 2,274 in 2016 – Fig 3.
14. Underlying new HIV infections peaked two years earlier at an estimated 2,730 infections in 2012 and fell thereafter beginning at 2,640 in 2013, accelerating down to 2,370 in 2014, 2,020 in 2015, and 1,780 in 2016 – Fig 3.
15. Statistical exploration within the back-calculation model showed that over 90% of the estimates of the peak year in which new HIV infections occurred were in 2012 or earlier (65% of peaks were in 2012 and 25% in 2011 – less than 10% in 2013 and none later). Therefore there is a high probability that the tipping point at which HIV incidence began to fall was before 2013.

Discussion

16. The underlying fall in new HIV infections preceded the observed fall in new HIV diagnoses by around two and a half years.
17. Given the incidence of bacterial STIs was closely related to observed rises in condomless anal intercourse[8, 9], then risk for HIV transmission among MSM continued to rise steadily from 2008 through 2016.
18. In 2012, the further scale-up of HIV testing that was well underway between 2001and 2008, was only half-way towards the levels reached in 2016.
19. The major high throughput testing innovation at the largest London clinic only began in early 2014[3,10].
20. Similarly, by 2012 the numbers of MSM on ART and the shortening of time to treatment initiation, was only half-way towards the improvement achieved by 2016.
21. The impact of PrEP on HIV incidence in 2012 would have been very little, and not much larger in 2013 and 2014.
22. While both components of TasP probably contributed to the fall in HIV incidence, it is difficult to judge how much of each was necessary to bring about the 2012 incidence tipping point in the face of rising transmission risk. Certainly, there was ample scope for further scale-up of TasP after the tipping point was reached.
23. The additional major scale-up of PrEP use in 2016 and 2017 should accelerate the fall in HIV incidence underway since 2012.

Conclusions

24. The strongest explanation for the fall in HIV incidence is the steady scale-up of HIV testing coupled with a large shortening of the time to treatment initiation. The tipping point when HIV incidence began falling was not associated with any noticeable threshold of combination prevention scale-up.
25. During the initial period the PrEP effect was probably small. The PrEP effect will have increased through 2015 and especially in 2016, though it is too soon to be able to discern the magnitude of this later additional effect.
26. Treatment as prevention can control HIV transmission in communities that are densely networked sexually, provided testing is very frequent and treatment initiation is immediate.

References

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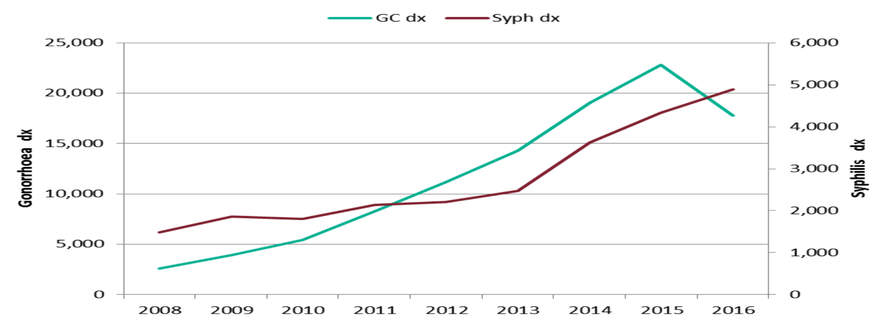
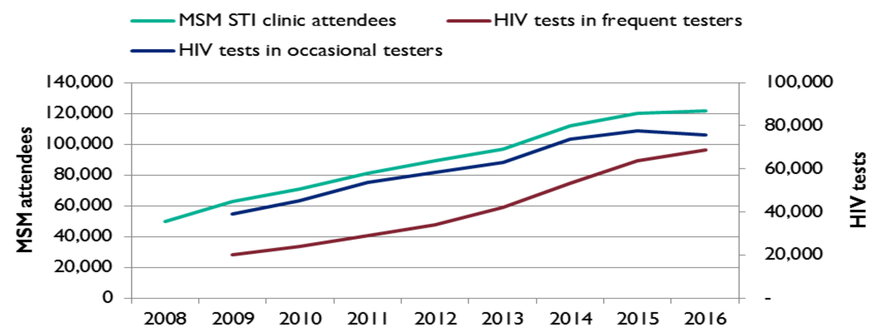
Figure 1: Increasing STI transmission and scale-up of combination prevention

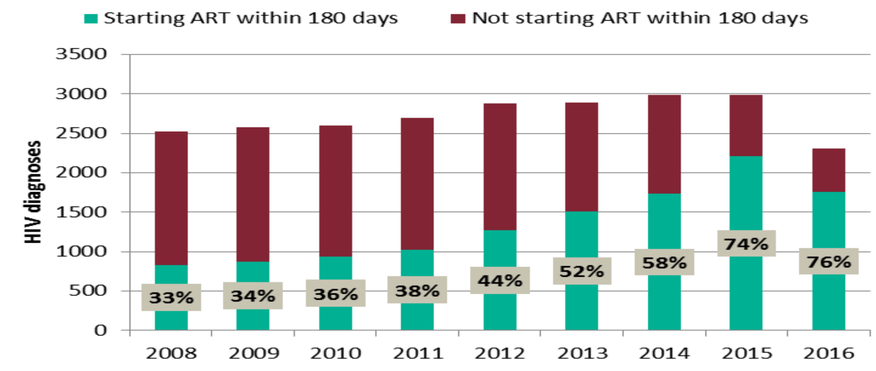
Panel A: Annual Gonorrhoea & Syphilis diagnoses in MSM



Panel B: Annual STI clinic MSM attendees, frequent & occasional HIV testers



Panel C: Time to start ART for new HIV diagnoses in each year



Panel D: Estimated year end prevalence of MSM taking PrEP

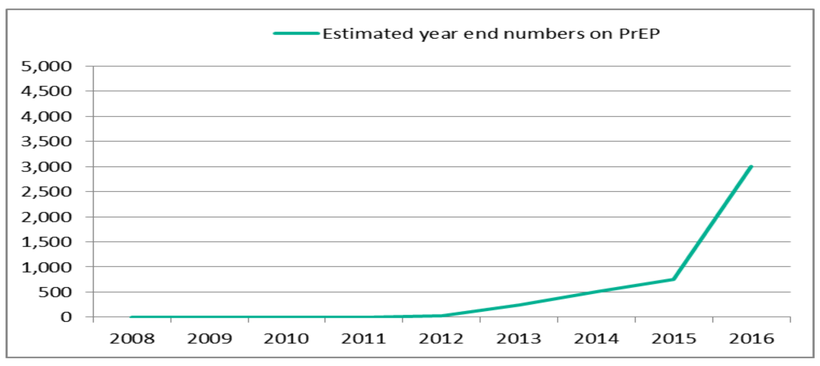


Figure 2: Average time (in months) to diagnosis for new HIV infections that occurred in that quarter - assuming the rates of diagnosis in that quarter

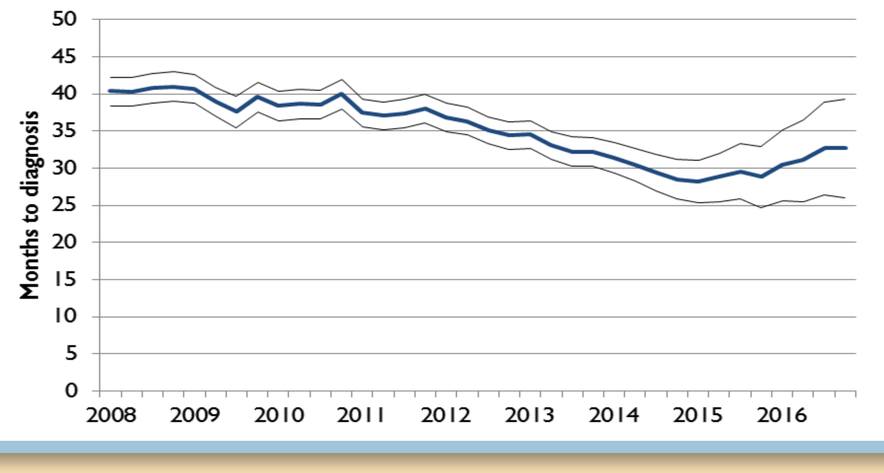


Figure 3: New HIV diagnoses & Back-Calculation estimate of new HIV infections