Public Health England

Protecting and improving the nation's health

NHS Blood and Transplant

Re-calculating viral residual risk - can we improve our previous estimates of safety?

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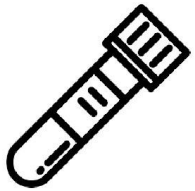
Overview

- Define viral residual risk and explain the scope
- Describe the calculation and refinements over time
- Estimate residual risks for UK 2005-2018
- Compare with previously published estimates
- Consider the estimates alongside observed transmissions

What is residual risk?

Donor selection **excludes** individuals at risk of infection



Testing **excludes** reactive donations

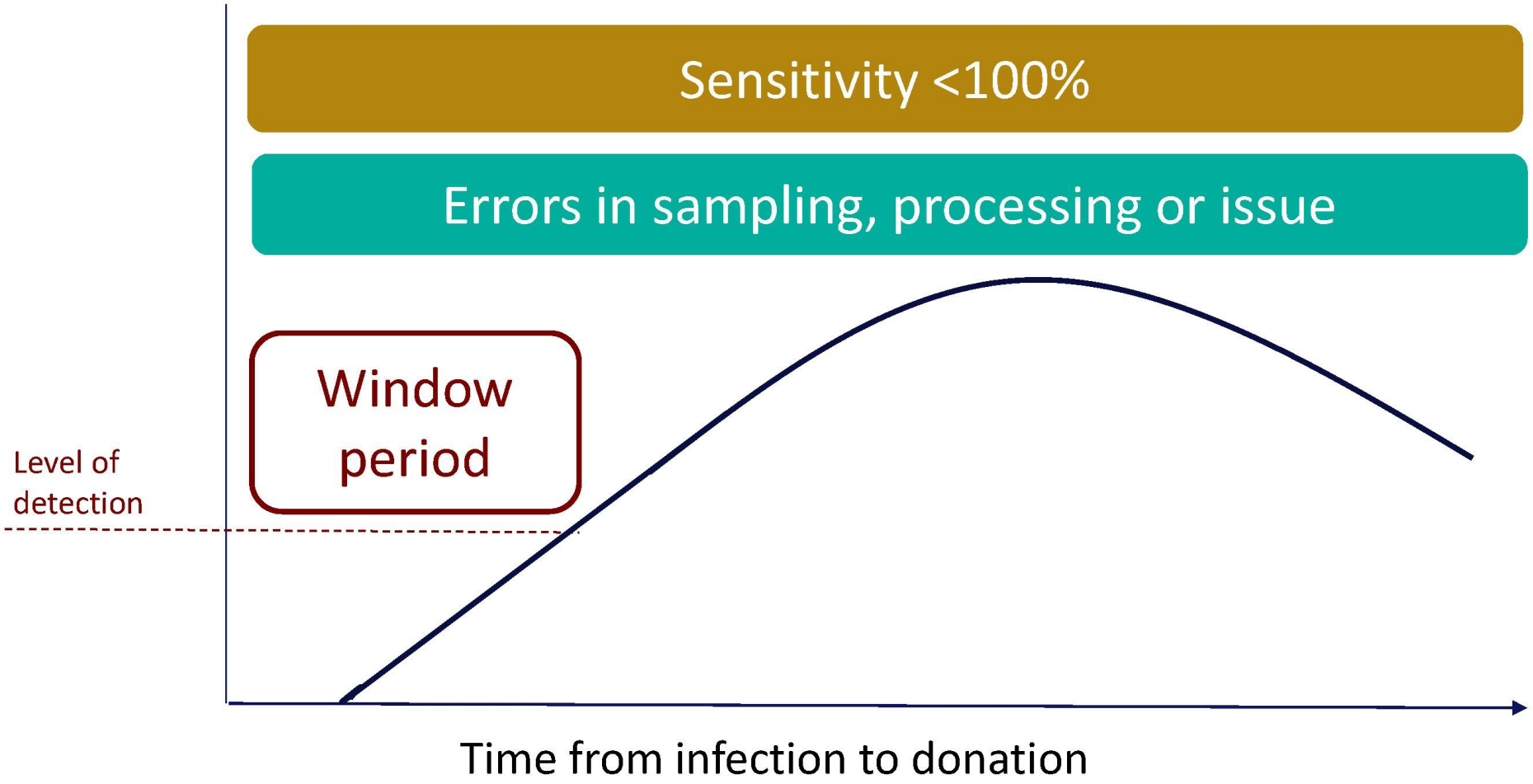
Residual risk
Potentially infectious donation is **NOT** detected and available for transfusion

Transmission
to recipients

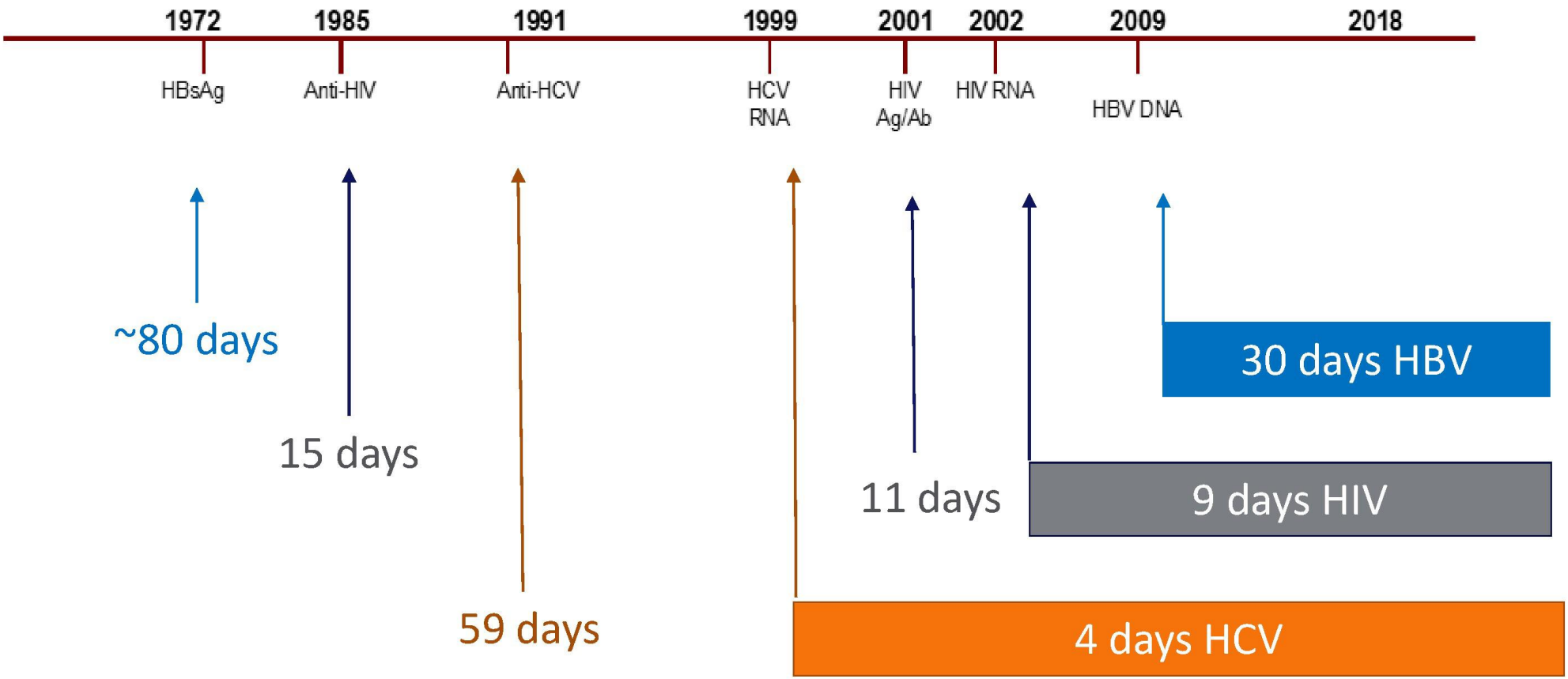
Why do we calculate residual risk?

- Monitor the safety of the supply in terms of the potential risk to recipients of **undetected HBV, HCV and HIV infections**
- Used to evaluate the likely benefits of new strategies to improve safety, e.g. donor selection
- Model is quick, low cost and adaptable - based on routinely available data and evidenced based assumptions
- Avoids need for observational studies – long and costly

When *could* the risk of NOT detecting an infection arise in testing?



Closing the window on risk



Nucleic acid testing

Calculating window period risk

$$Window\ period\ (WP)\ risk = Incidence\ x\ infectious\ WP$$

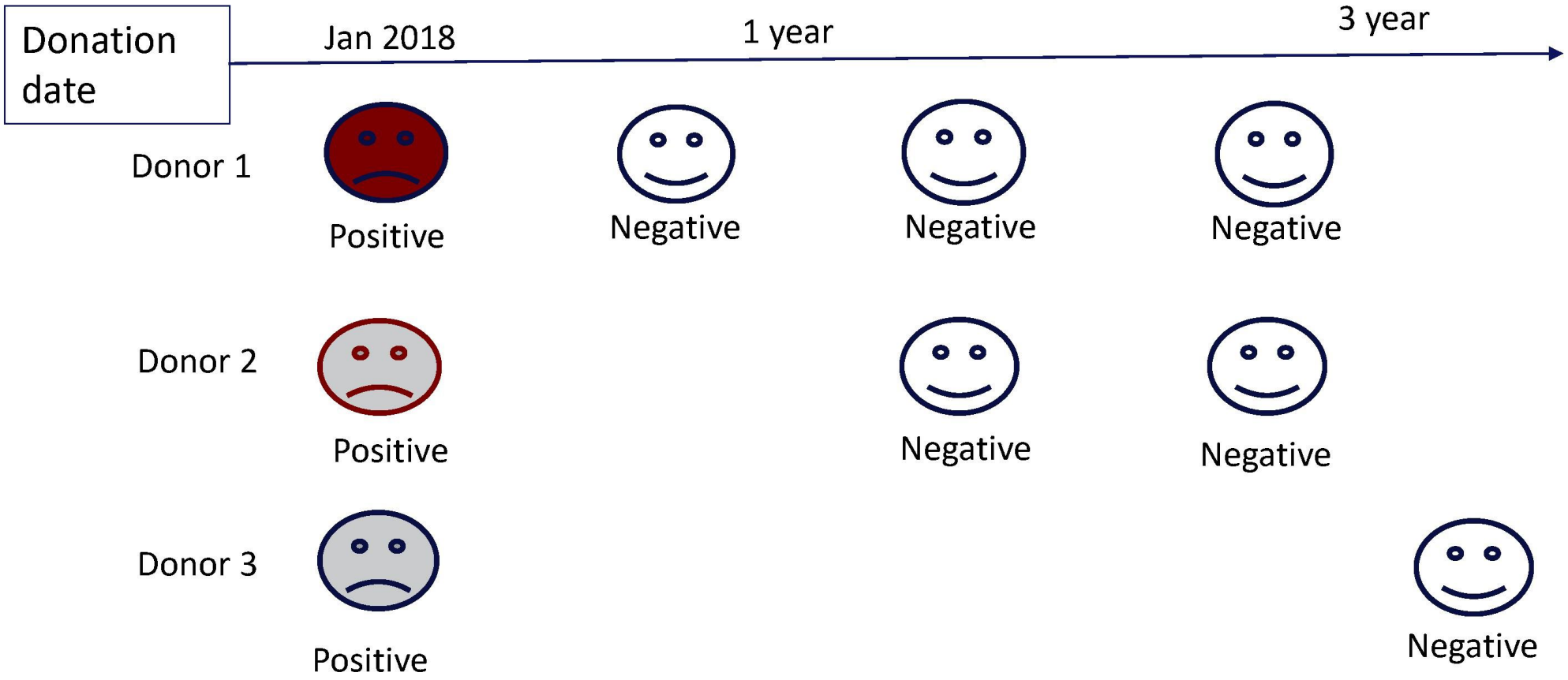
Rate of NOT detecting WP infections in donors

Rate of detecting **new** infections in donors

Time between enough virus to infect but not enough to detect

Identifying new infections in donors

Seoconverter - positive repeat donor with either a previous negative donation within one year, or microbiological and/or clinical evidence of recent infection



Calculating incidence

Repeat donors – observed among donations

$$Incidence\ repeat = \frac{N\ seroconverters}{N\ repeat\ donations\ x\ mean\ IDI}$$

New donors – derived from repeat

$$Incidence\ new = Incidence\ repeat\ x\ Z$$

Z adjustment for the relative difference in acute/recent infections observed between new and repeat donors

Calculating window period risk

For donations from new and repeat donors

$$WP\ risk\ n = (Incidence\ new\ x\ WP)$$

$$WP\ risk\ r = (Incidence\ repeat\ x\ WP)$$

Overall as a weighted risk

$$WP\ risk = (WP\ risk\ n\ x\ \%\ donations\ n) + (WP\ risk\ r\ x\ \%\ donations\ r)$$

Methods

For a 3-year rolling period for HBV, HCV and HIV

- UK blood donation surveillance data between 2005 and 2018
- Estimated incidence
- Derived new donor incidence adjustment Z
- Calculated residual risk with WPs

    HIV NAT 9 days, HCV NAT 4 days

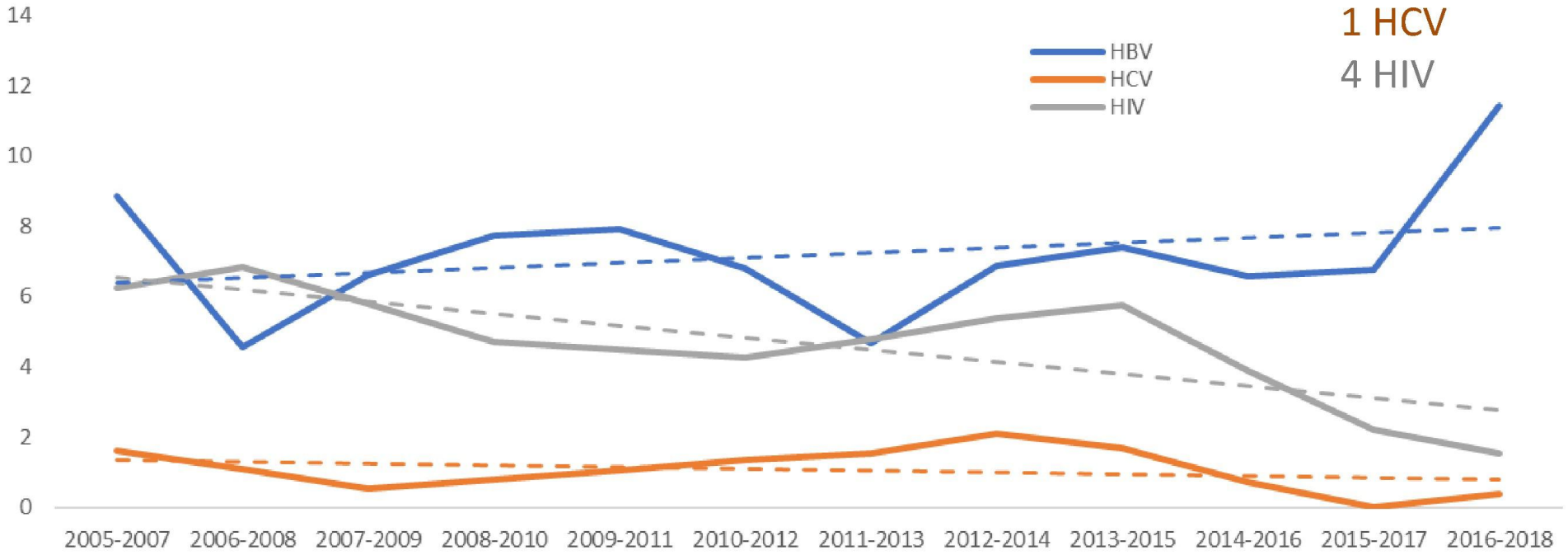
    HBV 66.8 days for HBsAg 2005 to 2008, then 30 days HBV

Compared previous published values

Estimated incidence HBV, HCV and HIV

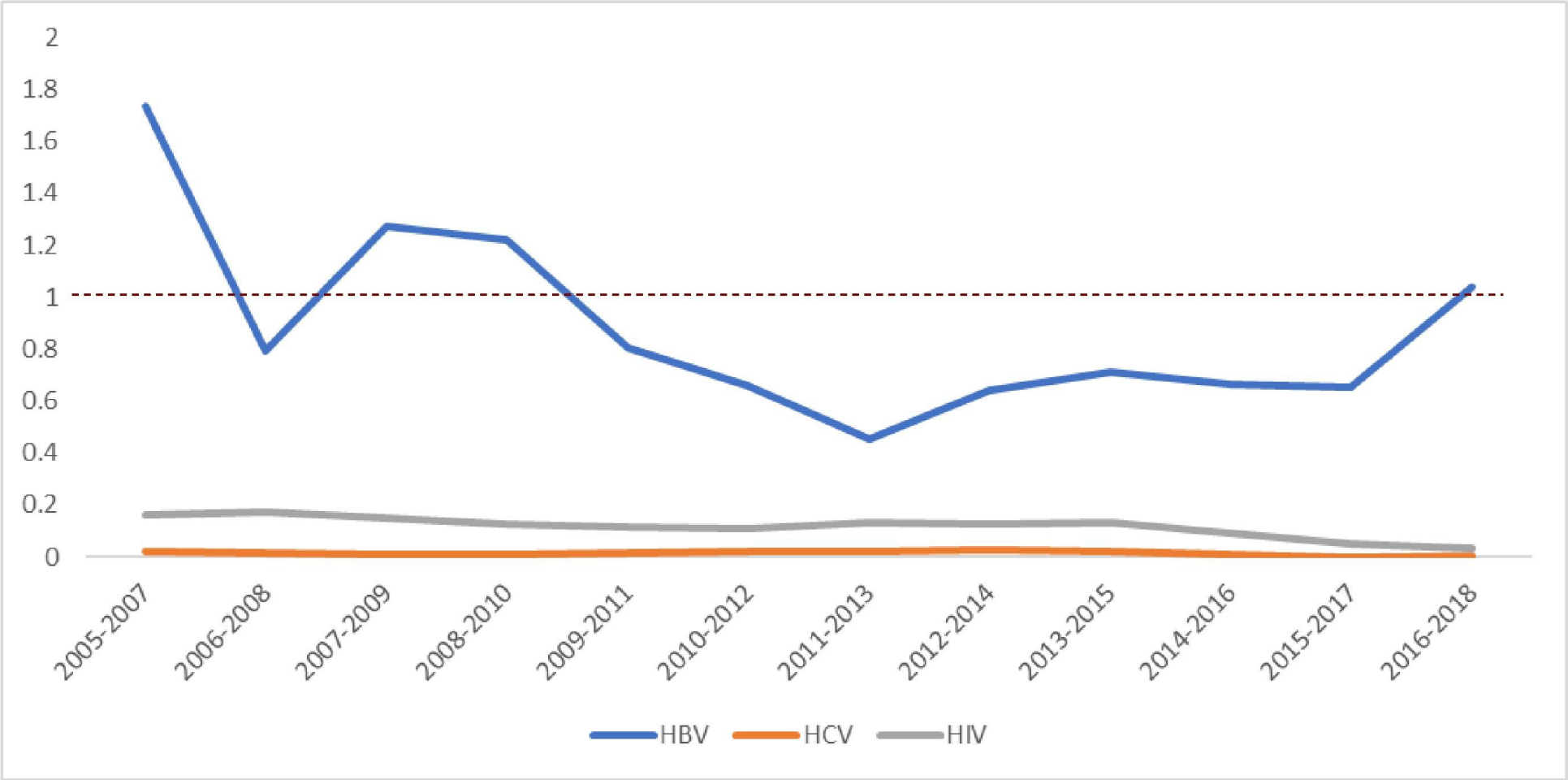
Per million repeat donor years

Seroconverters
2016-2018
12 HBV
1 HCV
4 HIV

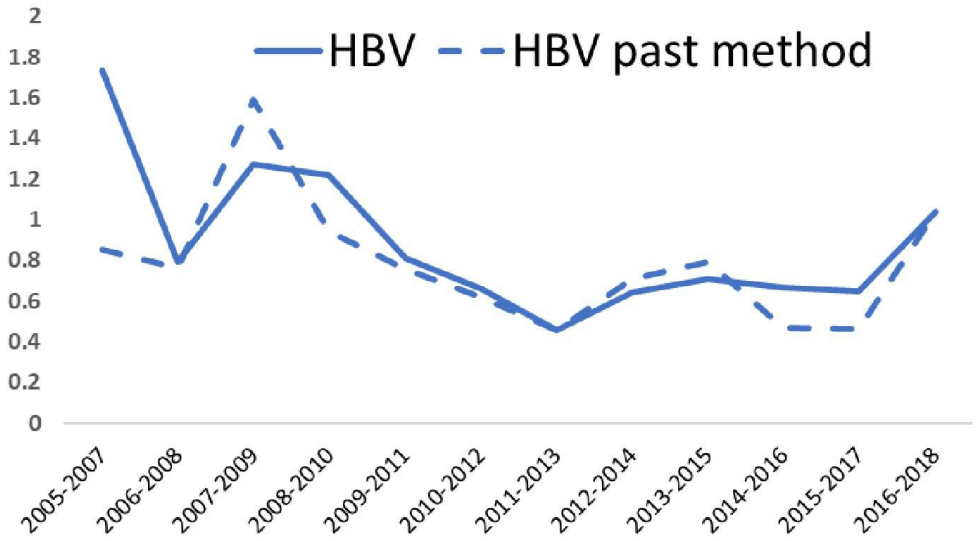


Estimated residual risk HBV, HCV and HIV

Per million donations tested

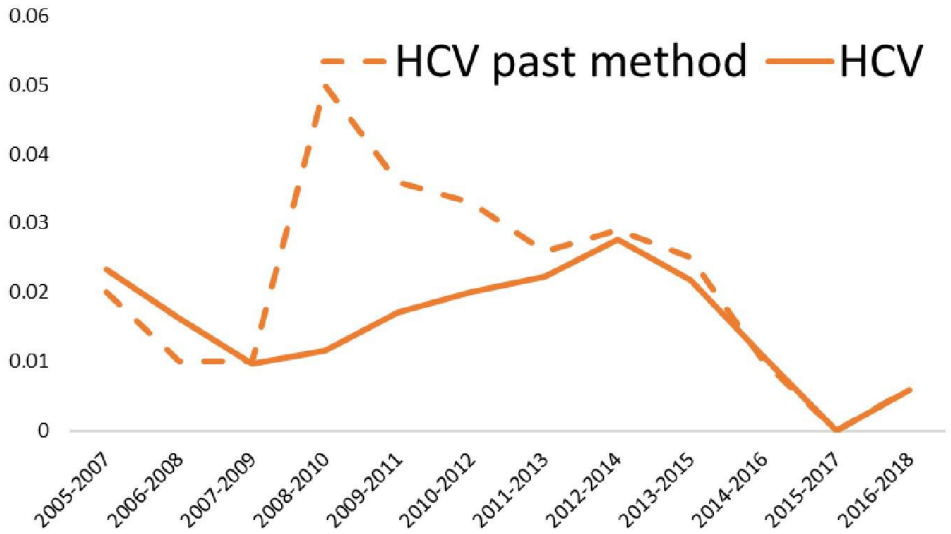


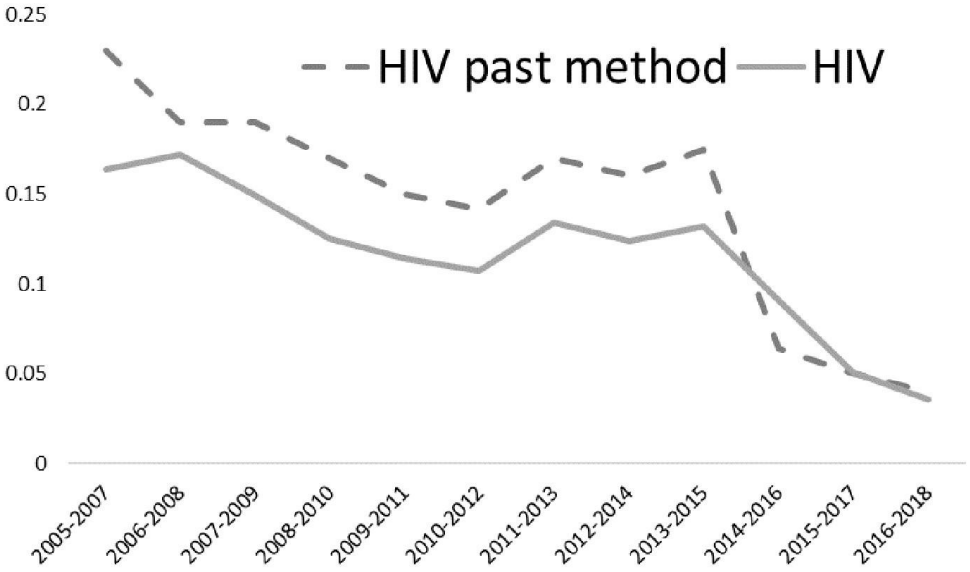
Recalculated v previously published



Incidence and risk calculated using 2016-2018 approach with WPs period specific

- Lower risk HIV and HCV
- HBV generally unchanged





Expected v observed

Do we get it right?

	2005-2007	2008-2010	2011-2013	2014-2016	2016-2018
Million donations tested per year	2.5	2.5	2.4	2.1	1.9
Number expected NOT detected per year					
HBV	4.3	3.0	1.1	1.4	2.0
HCV	0.1	<0.1	<0.1	<0.1	<0.1
HIV	0.4	0.3	0.3	0.2	0.1
Observed transmissions from SHOT	1 HBV		2 HBV (inc 1 probable)		1 HBV probable

~40 Expected number infections NOT detected

4 TTIs (SHOT)

Conclusions

The residual risk model is a quick and easy measure of safety

NAT is closing the window on risk, and since universal testing estimates have been extremely low at around 1 in 1 million, mostly due to HBV

Current approach confirms previous calculations may have over-estimated risk for HCV and HIV, but not HBV

Likely still too conservative regarding WP, and because the expected number of undetected viral infections blood donations exceeds observed transmissions

Next steps : consider occult HBV, transmission

Annual Review

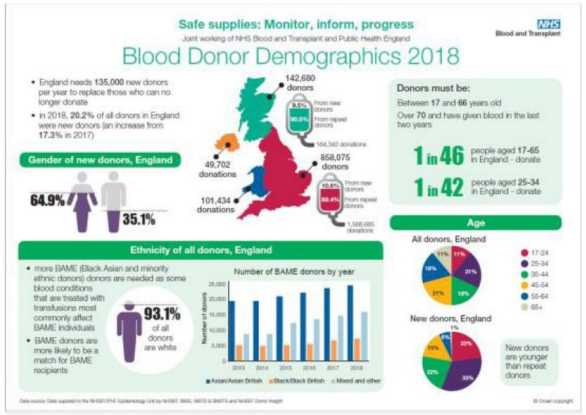
Safe supplies 2018: Monitor, inform, progress

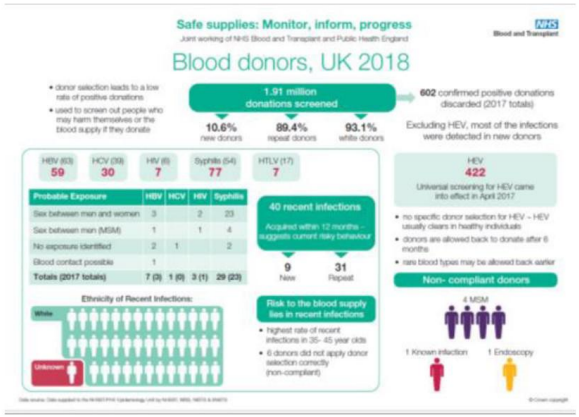
A summary of the report can be found on the PHE website:

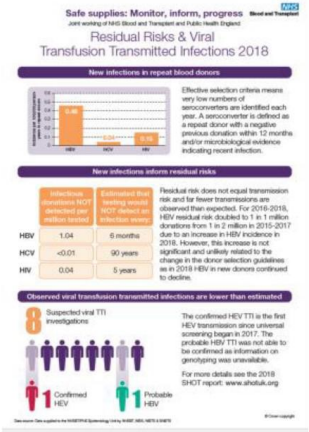
https://www.gov.uk/government/publications/safe-supplies-annual-review/safe-supplies-2018-monitor-inform-progress

The full report is available for download on the NHSBT website:

https://hospital.blood.co.uk/epidemiology-reports/







Thanks to

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Further information please contact the Epidemiology Team

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