

This is a repository copy of *HIV testing amongst older sexual health clinic attendees in England : an epidemiological study*.

White Rose Research Online URL for this paper:
<http://eprints.whiterose.ac.uk/134659/>

Version: Accepted Version

Article:

Bell, Sadie, Adamson, Joy, Martin, Fabiola et al. (1 more author) (2018) HIV testing amongst older sexual health clinic attendees in England : an epidemiological study. International journal of STD & AIDS. ISSN 1758-1052

<https://doi.org/10.1177/0956462418796445>

Reuse

["licenses_typename_unspecified" not defined]

Takedown



If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing eprints@whiterose.ac.uk including the URL of the record and the reason for the withdrawal request.

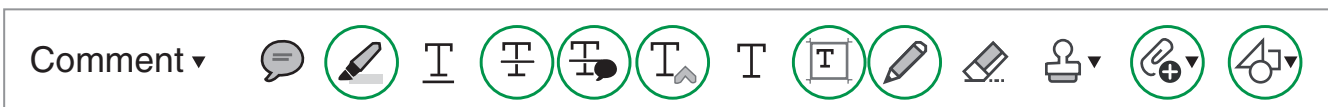
Page Proof Instructions and Queries

Journal Title: International Journal of STD & AIDS (STD)

Article Number: 796445

Thank you for choosing to publish with us. This is your final opportunity to ensure your article will be accurate at publication. Please review your proof carefully and respond to the queries using the circled tools in the image below, which are available by clicking “Comment” from the right-side menu in Adobe Reader DC.*

Please use *only* the tools circled in the image, as edits via other tools/methods can be lost during file conversion. For comments, questions, or formatting requests, please use . Please do *not* use comment bubbles/sticky notes .



*If you do not see these tools, please ensure you have opened this file with Adobe Reader DC, available for free at get.adobe.com/reader or by going to Help > Check for Updates within other versions of Reader. For more detailed instructions, please see us.sagepub.com/ReaderXProofs.

No.	Query
	Please note, only ORCID iDs validated prior to acceptance will be authorized for publication; we are unable to add or amend ORCID iDs at this stage.
	Please confirm that all author information, including names, affiliations, sequence, and contact details, is correct.
	Please review the entire document for typographical errors, mathematical errors, and any other necessary corrections; check headings, tables, and figures.
	Please confirm that the Funding and Conflict of Interest statements are accurate.
	Please ensure that you have obtained and enclosed all necessary permissions for the reproduction of artistic works, (e.g. illustrations, photographs, charts, maps, other visual material, etc.) not owned by yourself. Please refer to your publishing agreement for further information.
	Please note that this proof represents your final opportunity to review your article prior to publication, so please do send all of your changes now.
AQ: 1	Is it “Spearman’s Rho correlation coefficient” or “Spearman’s rank correlation coefficient”? Please check for consistency throughout this article.
AQ: 2	Please provide accessed date for the website in reference 6.
AQ: 3	Please provide publisher and location details in reference 10.
AQ: 4	Please provide publisher and location details in reference 11.
AQ: 5	Please provide publisher and location details in reference 15.
AQ: 6	Please check completeness of the title and provide location details for the publisher in reference 21.
AQ: 7	Please provide publisher and location details in reference 31.
AQ: 8	Please provide publisher and location details in reference 32.
AQ: 9	Please provide significance of * in Table 2.

HIV testing amongst older sexual health clinic attendees in England: an epidemiological study

International Journal of STD & AIDS

0(0) 1–7

© The Author(s) 2018

Article reuse guidelines:

sagepub.com/journals-permissions

DOI: 10.1177/0956462418796445

journals.sagepub.com/home/std



Sadie Bell¹ , Joy Adamson², Fabiola Martin³ and Tim Doran⁴

Abstract

Older adults with HIV are at increased risk of late diagnosis. We aimed to explore the association between age and HIV testing rates in sexual health clinics in England using Public Health England data for 2009–2014. We investigated associations between attendee age and likelihood of HIV test offer, acceptance, and coverage. For each year, increasing age was associated with reduced likelihood of test offer ($R_s -0.797$ to -0.958 , $p < 0.01$). Offer rates were highest for men who have sex with men (MSM), and lowest for heterosexual females (HSFs). HSFs had the greatest decline in offer rates with age (from 86.2% for age 25–29 to 52.1% for age 70+ in 2014). Odds ratios for test offer in 2014 for attendees aged 15–49 compared with attendees aged 50+ were 1.94 (95%CI: 1.88, 2.00) for heterosexual males (HSMs), 1.86 (95% CI: 1.81, 1.91) for HSFs, and 1.54 (95%CI: 1.45, 1.64) for MSM. Overall, there was no significant association between age and test acceptance in any year ($R_s -0.070$ to -0.547 ; $p > 0.05$). The strongest determinant of acceptance was sexual orientation; for attenders aged 50+, compared with HSMs, acceptance was higher for MSM (OR: 1.10; 95%CI: 1.06, 1.13) and lower for HSFs (OR: 0.30; 95%CI: 0.30, 0.31).

Keywords

HIV, diagnosis, epidemiology

Date received: 30 April 2018; accepted: 23 July 2018

Introduction

A major obstacle to tackling HIV is people being unaware of having the infection. In 2016, the United Nations Secretary General reported that only half an estimated 36.7 million people living with HIV worldwide were aware of their infection.^{1,2} Levels of awareness are greater in the UK, but even here it is estimated that over 13,000 people (13% of all cases) are living with undiagnosed HIV.³ Globally, UNAIDS aims to increase the proportion of people aware of their HIV status to 90% by 2020.⁴ To encourage HIV test uptake the World Health Organisation has endorsed the offer of testing in a range of healthcare and community settings.^{5–7} UK National Guidelines for HIV Testing 2008 recommend universal testing in several healthcare facilities including sexual health and antenatal services.^{8–10} Universal testing is recommended for new general practice registrants and hospital admissions in areas of high HIV prevalence (≥ 2 cases per 1000 population aged 15–59 years).^{9,10} These recommendations intend to

increase testing and reduce late HIV diagnoses (defined as CD4 cell count < 350 cells/ μ l within three months of diagnosis).⁹ Late diagnosis is associated with significantly poorer immediate and long-term health outcomes, greater likelihood of HIV transmission, and higher treatment costs.^{11–15}

Older adults, aged 50+ years, are at increased risk of late HIV diagnosis.¹⁶ A comparison of UK reports for

¹Department of Global Health and Development, London School of Hygiene & Tropical Medicine, London, UK

²Institute of Health & Society, Newcastle University, Newcastle upon Tyne, UK

³Department of Biology and Hull York Medical School, University of York, York, UK

⁴Department of Health Sciences, University of York, York, UK

Corresponding author:

Sadie Bell, London School of Hygiene and Tropical Medicine, 15-17 Tavistock Place, London WC1H 9SH, UK.

Email: sadie.bell@lshtm.ac.uk

2000 and 2015 shows the number of new HIV diagnoses per annum in the over 50s more than trebled, from 333 to 1018 cases,¹⁷ and 58% of those diagnosed in 2013 received a late HIV diagnosis compared to 39% of 15- to 49-year-olds.¹⁸ In the over 50s, prompt HIV diagnosis and treatment is particularly crucial as the absolute risk of developing acquired immunodeficiency syndrome (AIDS) increases with advancing age.¹⁹ A key factor associated with increased late diagnoses in older adults is a misjudged risk assessment. HIV has historically been portrayed as a young person's disease¹⁶ and this may prevent older adults from considering themselves at risk of infection.^{20,21} Similarly, clinicians may be unaware of the increasing HIV prevalence in older populations, and HIV infection may not be considered in the differential diagnosis of symptoms associated with HIV/AIDS.²²

Given the higher mortality and morbidity associated with late HIV diagnosis in older adults, compounded by their greater risk of late diagnosis, we explored the potential reasons for lack of HIV testing coverage in older age groups. This is the first study which has aimed to examine the associations between age and sexual orientation and the offer, acceptance, and coverage of HIV testing in England.

Methods

Anonymised attendance and HIV testing data for years 2009–2014 for all sexual health clinics in England were obtained from Public Health England (PHE). It is mandatory for sexual health clinics to collect these data. Attendance data relate to the number of people attending sexual health clinics per annum that are considered eligible for HIV testing (e.g. not already diagnosed with HIV). Testing data relate to the number of eligible attendees that were (i) offered and (ii) accepted the offer of an HIV test.

PHE HIV testing data are routinely presented in broad age bands.^{18,23} For the purpose of this study, we requested data in five-year age brackets from age 15 years to 70 years. To protect anonymity attendees over 70 years were categorised by PHE into one age bracket.

For each year, we measured associations between age and the likelihood of (i) test offer, (ii) test offer acceptance, and (iii) coverage, i.e. the proportion of eligible sexual health clinic attendees that are actually tested for HIV. We then measured these associations by self-reported sexual orientation as categorised by PHE: heterosexual males (HSMs), heterosexual females (HSFs) and men who have sex with men (MSM). PHE categorises attendees into sexual orientation groups based on the greatest HIV risk group attendees report sexual contact with; for example,

bisexual males are reported as MSM and bisexual females as heterosexual. The number of women who have sex with women was too low for a meaningful analysis (0.2% of total attenders in 2014) and was not separately assessed.

[AQ1] Associations were measured using Spearman's Rho correlation coefficients. Binary comparisons of the odds of offer and acceptance of testing by gender and sexual risk group were assessed using logistic regression modelling. We hypothesised that with advancing age the likelihood of attendees being offered and accepting an HIV test would decline, irrespective of sexual risk group or year. The null hypothesis was that there would be no variation by age in test offer or acceptance. Data management and analysis were performed using Excel and SPSS Version 23.0.

Results

In order to be tested for HIV infection, service users must attend a sexual health clinic, be offered testing, and accept testing. We present results for each of these stages by age and risk group, so that the cause of different levels of test coverage between groups can be determined. We conclude by reporting overall rates of test coverage (the proportion of attendees who are tested).

Attendance

Between 2009 and 2014 the overall number of sexual health clinic attendees that were eligible for HIV testing increased by 33.7% (from 1,076,466 to 1,439,212). The number of attendees aged 15–49 years increased by 32.3% during this time period (1,020,968–1,350,563) whilst attendees aged 50+ years increased by 59.3% (50,917–81,136). The number of attenders in each year is given in Table A1 (online Appendix).

For each year, higher numbers of men than women in the 50+ age group accessed sexual health clinics: for example, in 2014, there were approximately 56.9% more male attendees aged 50+ years than females ($n = 49,553$ males; $n = 31,589$ females) (Table 1). The reverse was found for younger adults: for example, in 2014, there were approximately 35.5% more female attendees aged 15–49 years than males ($n = 573,451$ males; $n = 776,858$ females). For each year, the majority of sexual health clinic attendees aged 15–49 years were HSFs (2014: 54.0%; $n = 729,261/1,350,563$); however, in attendees aged 50+ years the largest group was HSMs (2014: 44.5%; $n = 36,115/81,136$) (Table 1; Table A1).

Table 1. HIV testing uptake rates by sexual orientation.

	Males				Females				
	HSM		MSM		HSM		MSM		
	15-49 years	50+ years	15-49 years	50+ years	15-49 years	50+ years	15-49 years	50+ years	
Attendance	No. of attendees eligible for testing	573,451	49,533	460,604	36,115	92,528	11,408	776,858	31,589
	No. of eligible attendees offered an HIV test	521,949	41,862	422,188	30,707	84,782	10,002	645,693	23,957
Tests offered	Per cent offered	91.0%	84.5%	91.7%	85.0%	91.6%	87.7%	83.1%	75.8%
	Odds ratio (95%CI) ^a	1.84 (1.79-1.89)	-	1.94 (1.88-2.00)	-	1.54 (1.45-1.64)	-	1.86 (1.81-1.91)	-
Tests accepted	No. of eligible attendees accepting a test offer	450,680	35,918	356,834	25,569	81,253	9,394	483,997	18,331
	Per cent accepted	86.3%	85.8%	84.5%	83.3%	95.8%	93.9%	75.0%	76.5%
Test coverage	Odds ratio (95%CI) ^a	1.05 (1.02-1.08)	-	1.10 (1.06-1.13)	-	1.49 (1.36-1.63)	-	0.92 (0.89-0.95)	-
	No. of eligible attendees tested	450,680	35,918	356,834	25,569	81,253	9,394	483,997	18,331
Tests offered	Per cent tested	78.6%	72.5%	77.5%	70.8%	87.8%	82.3%	62.3%	58.0%
	Odds ratio (95%CI) ^a	1.37 (1.34-1.40)	-	1.42 (1.39-1.45)	-	1.55 (1.47-1.63)	-	1.20 (1.18-1.23)	-
Tests offered	Per cent tested	64.1%	58.0%	64.1%	58.0%	62.3%	58.0%	64.1%	58.0%
	Odds ratio (95%CI) ^a	1.20 (1.17-1.23)	-	1.20 (1.18-1.23)	-	1.20 (1.18-1.23)	-	1.20 (1.17-1.23)	-

HSM: heterosexual female; HSM: heterosexual male; MSM: men who have sex with men.

^aAge 50+ years is the comparator group.

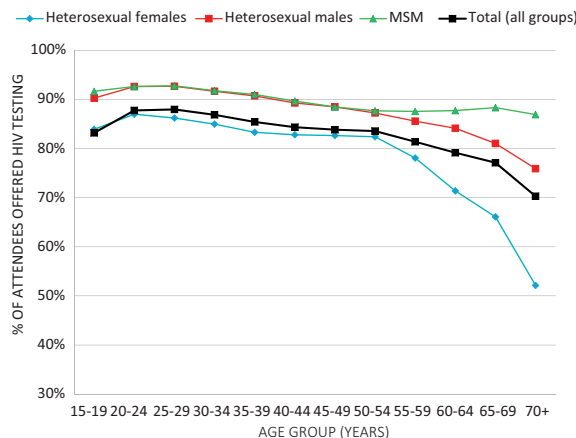


Figure 1. Proportion of sexual health clinic attendees offered an HIV test by sexual orientation and age – 2014, England. MSM: men who have sex with men.

Test offer to attendees

Attendees in the 25–29-year age group had the highest likelihood of receiving an offer of HIV testing (88.0% overall in 2014), with the proportion of attendees receiving an offer declining with age (Figure 1). Only 70.3% of attendees in the over 70 age group were offered testing in 2014, 18 percentage points lower than for 25- to 29-year-olds. The decline in the likelihood of offer was steepest for HSFs after the age of 50, falling to a low of 52.1% in the over 70s. Offer rates for HSMs and MSM in 2014 were very similar up to the age of 50–54, after which rates continued to fall for HSMs but remained stable for MSM. In the over 70 age group, offer rates for MSM were 86.9%, 11 percentage points higher than for HSMs and 34.8% higher than for HSFs.

These gaps were even greater in previous years (Figure A1, online Appendix). Between 2009 and 2014 there were increases in the likelihood of offer for the 65–69 (69.8–77.1%) and 70+ (57.7–70.3%) age groups (Table A1 and Figure A1a, online Appendix). In comparison, for adults aged 15–24 years, the percentage of attendees offered testing declined during this time period (87.7–82.1%). For every year and in every sexual risk group, the association between age and offer of HIV testing was statistically significant ($P < 0.001$ in all cases) with increasing age associated with lower probability of test offer (R_s –0.797 to –0.988) (Table A2, online Appendix).

Following logistic regression modelling, the odds of being offered HIV testing in 2014 were found to be significantly higher for eligible attendees aged 15–49 years compared to eligible attendees aged 50+ years, for both genders and all sexual orientation groups (Table 1). The odds ratios for test offer for attendees aged 15–49 compared with attendees aged 50+ in 2014

Table 2. Odds of HIV test uptake by sexual orientation, ages 50±. [AQ9]

		HSM	MSM	HSF
Attendance	No. of attendees eligible for testing	36,115	11,408	29,623
Tests offered	No. of eligible attendees offered an HIV test	30,707	10,002	23,094
	Per cent offered	85.00%	87.70%	78.00%
	Odds ratio (95%CI) ^a	–	1.25 (1.18–1.33)	0.55 (0.53–0.58)
Tests accepted	No. of eligible attendees accepting a test offer	25,569	9394	17,701
	Per cent accepted	83.30%	93.90%	76.60%
	Odds ratio (95%CI) ^a *	–	1.1 (1.06–1.13)	0.3 (0.30–0.31)
Test coverage	No. of eligible attendees tested	25,569	9394	17,701
	Per cent tested	70.80%	82.30%	59.80%
	Odds ratio (95%CI) ^a	–	1.92 (1.82–2.03)	0.61 (0.59–0.63)

HSF: heterosexual female; HSM: heterosexual male; MSM: men who have sex with men.

^aHeterosexual males are the comparator group.

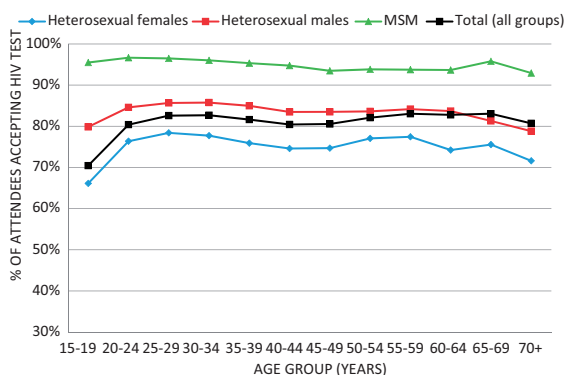


Figure 2. Proportion of sexual health clinic attendees accepting an HIV test by sexual orientation and age – 2014, England. MSM: men who have sex with men.

were 1.84 (95%CI: 1.79–1.89) for males and 1.86 (95%CI: 1.81–1.91) for females. By sexual orientation, the odds ratios for test offer for attendees aged 15–49 compared with attendees aged 50+ in 2014 were 1.94 (95%CI: 1.88–2.00) for HSMs, 1.86 (95%CI: 1.81–1.91) for HSFs and 1.54 (95%CI: 1.45–1.64) for MSM. Comparing sexual orientation groups, the odds of test offer in adults aged 50+ years in 2014 were highest for MSM and HSMs, and lowest for HSFs (Table 2).

Test acceptance after offer

Overall, of attendees offered testing in 2014, those aged 55–59 and 65–69 years were the most likely to accept, and those aged 15–19 were least likely (Figure 2). Whilst rates of acceptance in every age group were highest for MSM and lowest for HSFs, the general patterns of acceptance across all age groups were broadly similar for all sexual orientation groups.

Similar trends were evident in previous years (Figure A2, online Appendix).

Given the patterns described above, the association between age and test acceptance was not as clear as for offer of testing. The association was only statistically significant in every year for MSM ($P < 0.05$ in all cases: Table A2, online Appendix), with increasing age associated with lower probability of test acceptance ($R_s -0.600$ to -0.954). However, for MSM acceptance rates in each year were relatively high for all age groups. For example, in 2014, the difference between the 20–24 and over 70 age groups for MSM was only 3.8 percentage points, and acceptance rates in every age group from MSM were over 90%.

Findings from logistic regression modelling (Table 1) suggest that older MSM and HSMs are less likely to accept an HIV test than their younger comparators. For HSFs, attendees aged 50 years and over are slightly more likely to accept testing than their younger comparators. However, the strongest determinant of test acceptance was sexual orientation. For older attendees, compared with HSMs the odds of test acceptance are highest for MSM (OR = 1.10) and lowest for HSFs (OR = 0.30) (Table 2).

Test coverage

Overall, 85.7% of attendees were offered testing, of whom 81.5% accepted (coverage rate of 69.9%). In 2014, attendees aged 25–29 years had the highest likelihood of HIV test coverage (72.7% overall), with the proportion of attendees being tested declining with age thereafter (Figure 3). The youngest and the oldest age group were least likely to be tested for HIV in 2014 (58.6% in 15–19 years; 56.7% in 70+ years). Between 2009 and 2014, the proportion of tests performed in

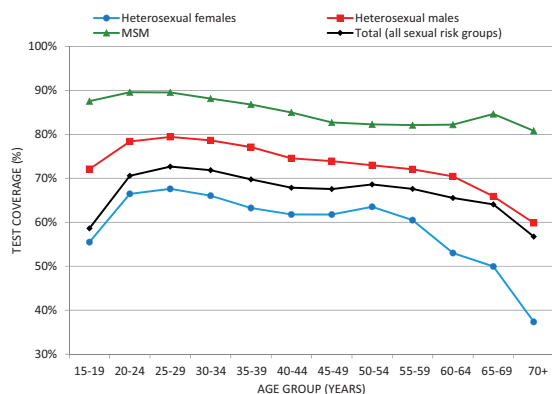


Figure 3. HIV test coverage in sexual health clinics by age and sexual risk group – England, 2014. MSM: men who have sex with men.

each age group increased in the over 50s, particularly in attendees aged 65–69 (54.4–64.1%) and 70+ (44.5–56.7%), and declined in adults aged 15–49 years, particularly those aged 15–19 years (64.6–58.6%) (Figure A3, online Appendix).

Test coverage varied considerably by sexual orientation. In 2014, HSFs were least likely to be tested at any age and had the sharpest fall in testing rates with increasing age: the likelihood of being tested dropped to just 37.3% in HSFs aged 70+ years, compared to 59.8% in HSMs and 80.8% in MSM (Figure 3). Similar trends were evident in preceding years (Figure A3, online Appendix). In every year the association between age and test coverage was statistically significant for HSMs and MSM, with increasing age associated with lower probability of being tested (R_s –0.734 to –0.951).

Following logistic regression modelling, the odds of being tested for HIV in 2014 were significantly higher for eligible attendees aged 15–49 years compared to those aged 50+ years by sex and sexual orientation (Table 1). The difference in the odds of being tested between age groups was greater for males than for females, but males, especially MSM, had a higher chance of being tested across all age groups (Table A2, online Appendix).

Discussion

We discovered that advancing age is significantly associated with a decreased likelihood of being tested for HIV in sexual health clinics in England. This was mainly attributable to a decline in the rate of test offer to older people, particularly to HSFs. This inequality in HIV test offer by age exists despite national and international recommendations of universal HIV testing in this setting.⁹ A major barrier reported

to underpin lower test offers and a reluctance to discuss sexually transmitted infections (STIs) with older adults is the assumption that STIs affect the young, and that older adults do not engage in ‘risky’ unprotected sex.^{20,24} This impression arguably stems historically from the STI and HIV prevention campaigns focusing mainly on younger adults.^{20,25–27} This fuels the perception that older people are not at risk of HIV transmission, an impression reinforced by the societal stereotype of the risk averse, asexual older adult.²⁰

There is evidence that these misrepresentations may also influence clinicians. In general practice, stalemates on the issue of sexual health have been reported between patient and healthcare provider.^{28,29} Older adults have been identified as reluctant to discuss their sexual health with a general practitioner,²⁸ and healthcare professionals report being uncomfortable to raise the subject for fear of causing upset or embarrassment.²⁹ However, in sexual health clinics this would be a less obvious explanation for the observed lower test offer rates for older attendees. There is a clear need to explore the factors associated with the test offer gap, and any barriers identified are likely to be even greater in settings with less clinical experience of managing HIV.

Impact of sexual orientation and age on HIV testing

MSM are disproportionately affected by HIV in the UK; 5.0% of MSM aged 15–44 years are living with HIV in contrast to approximately 0.1% of age-comparable HSMs and HSFs.²³ In response, MSM are consistently targeted in national HIV prevention and testing strategies.^{15,30–32} The success of these approaches can be shown by the low proportion of late HIV diagnoses and undiagnosed infections in MSM compared to other risk groups.²³ The effectiveness of HIV strategies targeting MSM is reflected in our study by the high test uptake for MSM attending sexual health clinics; in every year, MSM had the highest rate of HIV testing and advancing age did not substantially reduce the likelihood of either being offered or accepting an HIV test.

By falling outside of the MSM risk group, the probability of eligible HSM and HSF sexual health clinic attendees being offered an HIV test is lowered. This effect becomes more marked in older HSMs and HSFs, who are not only less likely to be offered a test due to their sexual orientation but also their age, despite attending clinics where universal HIV testing is recommended. HSFs are the least likely group to be offered HIV testing and are generally considered to be at lower HIV risk than HSMs, who are much more likely to report paying for sex, having sexual contact with someone from outside the UK, and are less

likely to use condoms than HSFs.³³ Males are also more likely to use intravenous drugs than females.³⁴ This may create the impression that HIV testing is less of a priority for females, and this perception may be reinforced by other aspects of the attendee history that are not captured in the PHE data. Our findings suggest that substantial numbers of older women are being excluded from testing, and this is likely to have serious consequences for the health outcomes of women with HIV infection.

Another factor which may be a barrier to offering an HIV test to younger women (pre-menopausal age) is that their reason for attendance may not be for a STI screen. This group may also use a clinic for family planning services, perhaps to access contraception, and the reason for attendance may therefore detract healthcare providers from offering an HIV test.³⁵ In older HSFs, however, there is no obvious factor that can be attributed to the lower likelihood of being offered HIV testing in a setting where universal HIV testing is recommended, other than being considered to be at lower HIV risk.

Limitations

This study is dependent on the accuracy of reporting of attendance and HIV testing by sexual health services to PHE, and any trend towards more complete reporting in any particular age or risk group will have biased our results. The available data also omit other important variables, such as ethnicity, which are associated with HIV testing. Misclassification is unlikely to have affected reported age or sex groups, but may have affected sexual orientation.³⁶

Analyses, particularly regressions, were limited by the data format. Data received from PHE are presented in cells (e.g. number of MSM aged 50–54 offered HIV testing) rather than at the individual attendee level, and several important attendee characteristics are not reported. It was therefore not possible to adjust for all potential confounders. In addition, Spearman's rank correlation coefficient was considered the most appropriate statistical test given the ordinal nature of the data,³⁷ but this test overlooks the degree of variation within the data and does not provide an estimate of the strength of association between variables.

Conclusions

Despite their mandate to offer universal HIV testing, sexual health clinics in England are less likely to offer testing to attendees with increasing age. Sexual orientation is also strongly associated with the likelihood of being offered an HIV test, and many heterosexual women – particularly those in older age groups – are

currently being overlooked, likely due to a perception of lower risk. This is compounded by the lower rate of test acceptance by this population group; heterosexual women were the least likely to accept an offer of testing and acceptance rates decreased with increasing age (as was the case with HSMs), although this effect was not as marked as for test offer. In contrast, rates of test acceptance by MSM remained consistently high across all age groups, which suggest that attendees' perceptions of their own risk align with the perceptions of healthcare professionals. Effective interventions to increase test offer and uptake of universal HIV testing will therefore need to target both attendees and providers, and such interventions are urgently required.

Ethical approval

This research was granted ethical approval by the Health Sciences Research Governance Committee at the University of York.

Acknowledgements

We thank PHE for providing the data for this project.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study was funded by the Department of Health Sciences at the University of York.

ORCID iD

Sadie Bell  <http://orcid.org/0000-0003-4381-0030>

References

1. United Nations. *On the fast track to ending the AIDS epidemic. Report of the United Nations Secretary-General for the high-level meeting on ending AIDS*. New York, NY: United Nations, <http://sgreport.unaids.org> (2016, accessed 24 November 2017).
2. UNAIDS. *Global AIDS update*. Geneva: Joint United Nations Programme on HIV/AIDS, 2016.
3. Kirwan PD, Chau C, Brown AE, et al. *HIV in the UK – 2016 report*. London: Public Health England, 2016.
4. UNAIDS. *90-90-90: an ambitious treatment target to help end the AIDS epidemic*. Geneva: Joint United Nations Programme on HIV/AIDS (UNAIDS), 2014.
5. World Health Organisation. *Guidance on provider-initiated HIV testing and counselling in health facilities*. Geneva: World Health Organisation, 2007.

6. World Health Organisation. *Statement on HIV testing and counseling: WHO, UNAIDS re-affirm opposition to mandatory HIV testing*. Geneva: World Health Organisation, http://www.who.int/hiv/events/2012/world_aids_day/hiv_testing_counselling/en/ (2012, accessed). [AQ2]
7. World Health Organisation. *Consolidated guidelines on HIV testing services. 5Cs: consent, confidentiality, counseling, correct results and connection*. Geneva: World Health Organisation, 2015.
8. Ogaz DFM, Connor N, Gill ON, et al. *HIV testing in England: 2016 report*. London: Public Health England, 2016.
9. British HIV Association, British Association for Sexual Health and HIV, British Infection Society. *UK national guidelines for HIV testing 2008*. London: British HIV Association, 2008.
10. National Institute for Health and Care Excellence. *HIV testing: increasing uptake among people who may have undiagnosed HIV (NG60)*, 2016. [AQ3]
11. Halve It Coalition. *Early testing saves lives – HIV is a public health priority*, 2011. [AQ4]
12. May MT, Gompels M, Delpech V, et al. Impact on life expectancy of HIV-1 positive individuals of CD4+ cell count and viral load response to antiretroviral therapy. *AIDS* 2014; 28: 1193–1202.
13. Nakagawa F, Lodwick RK, Smith CJ, et al. Projected life expectancy of people with HIV according to timing of diagnosis. *AIDS* 2012; 26: 335–343.
14. Mocroft A, Lundgren JD, Sabin ML, et al. Risk factors and outcomes for late presentation for HIV-positive persons in Europe: results from the Collaboration of Observational HIV Epidemiological Research Europe Study (COHERE). *PLoS Med* 2013; 10: e1001510.
15. NICE. *HIV testing: increasing uptake in men who have sex with men [PH34]*, 2011. [AQ5]
16. UNAIDS. *The gap report*. Geneva: UN Joint Programme on HIV/AIDS (UNAIDS), 2014.
17. Public Health England. *United Kingdom National HIV surveillance data tables*. No. 1: 2016, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/525154/National_Tables23052016.xls (2016, accessed 19 November 2017).
18. Yin ZBA, Hughes G, Nardone A, et al. *HIV in the United Kingdom 2014 report: data to end 2013*. London: Public Health England, 2014.
19. Phillips A, Pezzotti P and Collaboration C. Short-term risk of AIDS according to current CD4 cell count and viral load in antiretroviral drug-naïve individuals and those treated in the monotherapy era. *AIDS* 2004; 18: 51–58.
20. Gott M. *Sexuality, sexual health and ageing*. Maidenhead: Open University Press, 2005.
21. Rosenfeld DAJ, Ridge D, Asboe D, et al. Social support, mental health, and quality of life among older people living with HIV: findings from the HIV and later life. Keele University, 2015. [AQ6]
22. Pratt GGK, Cunningham K and Tunbridge A. Human immunodeficiency virus (HIV) in older people. *Age Ageing* 2010; 39: 289–294.
23. Skingsley AYZ, Kirwan P, Croxford S, et al. *HIV in the UK – situation report 2015: data to end 2014*. London: Public Health England, 2015.
24. Kaufmann T. *A crisis of silence: HIV, AIDS and older people*. London: Age Concern, 1993.
25. Department of Health. *Better prevention, better services, better sexual health – the national strategy for sexual health*. London: Department of Health, 2001.
26. Department of Health. *Choosing health: making healthy choices easier. Executive summary*. London: Department of Health, 2004.
27. Health Protection Agency. *HIV in the United Kingdom. 2008 report*. London: Health Protection Agency, 2008.
28. Gott M and Hinchliff S. Barriers to seeking treatment for sexual problems in primary care: a qualitative study with older people. *Fam Pract* 2003; 20: 690–695.
29. Gott M, Hinchliff S and Galena E. General practitioner attitudes to discussing sexual health issues with older people. *Soc Sci Med* 2004; 58: 2093–2103.
30. Select Committee on HIV and AIDS in the United Kingdom. *No vaccine, no cure: HIV and AIDS in the United Kingdom – Select Committee on HIV and AIDS in the United Kingdom*. London: The Stationery Office Limited, 2011.
31. Public Health England. *National HIV testing week*, n. d. [AQ7]
32. Terrence Higgins Trust. *Making it count – CHAPS national HIV prevention campaign*, n.d. [AQ8]
33. Mercer CH, Tanton C, Prah P, et al. Changes in sexual attitudes and lifestyles in Britain through the life course and over time: findings from the National Surveys of Sexual Attitudes and Lifestyles (Natsal). *Lancet* 2013; 382: 1781–1794.
34. National Treatment Agency for Substance Misuse. *Injecting drug use in England: a declining trend*. London: National Treatment Agency for Substance Misuse, 2013.
35. Jones M. Undiagnosed HIV in women attending a sexual health clinic for non-barrier methods of contraception. Two case studies. *J Fam Plann Reprod Health Care* 2003; 29: 31–32.
36. Schroder KE, Carey MP and Vanable PA. Methodological challenges in research on sexual risk behavior: II. Accuracy of self-reports. *Ann Behav Med* 2003; 26: 104–123.
37. Bland M. *An introduction to medical statistics*. 3rd ed. Oxford: Oxford University Press, 2000.