

Surveying testing preferences in Black, Latin American, and other minorities for the co-design of digital vending machines for HIV self-testing

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Abstract

The use of digital vending machines (VMs) to deliver HIV self-testing (HIVST) could expand HIV testing in priority populations. We surveyed primarily Black African (BA) participants and other minority ethnicities, to identify acceptability, preferences, and concerns of using VMs for HIVST dispensing. A structured survey was developed with Black African and Caribbean, Latin American and other Minorities (BLAM) communities, and distributed between September 2018 and January 2019. Participants were recruited using mobile tablet surveys distributed by outreach volunteers, and online through BLAM communities' websites, workshops, and language-specific messages on social media. Descriptive analyses were undertaken stratified by ethnic groups. One hundred and twenty-eight (67.0%) participants identified as BAs, 31 (16.2%) Black Caribbeans (BCs), 22 (11.5%) Latin Americans (LAs), and 10 (5.2%) other non-white ethnicities (ONWEs). Rates of willingness to use the HIVST were high in all groups except BCs (BAs 77.9%, BCs 53.6%, LAs 81.8%, ONWEs 80.0%). Most participants favoured healthcare-associated venues for VM placement, but there were differences in community venues favoured by different ethnic groups and concerns reported. HIVST is acceptable in many BLAM communities and increases understanding of the concerns and how to address them in the design of VMs for HIVST, to expand HIV testing in these priority communities.

Keywords

HIV, HIV testing, HIV self-testing

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Background

In the UK, the proportion of undiagnosed HIV in Black African and Caribbean, Latin American and other minority (BLAM) ethnicities remains stable despite large decreases in other populations.¹ Estimation of Black Africans (BAs) living with HIV undiagnosed in the UK varies between 12% in men and 4% in women;² however, the rate has been reported as high as 56.3% in women and 40.9% in men in a recent survey of BA participants in the UK.³ Thirty per cent of BA women and 34% of BA men surveyed had never previously been tested for HIV.³ Latin Americans (LAs) are another key minority ethnic group for HIV, with 3.5 times higher

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prevalence of HIV compared to the general UK population, and 33% presenting with a late HIV diagnosis, with the majority living in London (81%) and being men who have sex with men (MSM) (94%).⁴ There are limited data available for the understanding of other minority ethnicities, including Black Caribbeans (BCs) and other groups, in the UK in relation to HIV testing uptake and estimations of undiagnosed HIV. Rates of self-reported sexually transmitted infections (STIs) in heterosexuals have been reported to be nearly twice as high in BCs as those of other ethnic groups in England⁵ and may represent a community which would benefit from expanded HIV testing approaches.

HIV self-testing (HIVST) is recommended by the WHO as an additional HIV-testing approach.⁶ HIVST involves a person collecting their own sample, conducting and interpreting the test results themselves. HIVST was recently legalised in UK in 2014; the first commercial kit (BioSURE) was available for purchase in 2015 and may encourage people to test because of the benefits of convenience, speed, and discretion.⁷ It is a lateral flow device which detects HIV-1 and 2 antibodies, requiring a blood sample from a finger prick and the results available after 15 min.⁸ It has high sensitivity (99.7%) and specificity (99.9%).⁹ HIVST has been shown to increase testing access and enable priority populations to be reached in new settings and contexts. They were found to be more confidential and generated less stigma compared to facility-based testing in a global systematic review of HIVST approaches.¹⁰

The use of technology to delivery HIVST, e.g. digital vending machines (VMs) could expand HIV testing accessibility in a variety of settings, while reducing the need for outreach workers and associated costs.⁶ The use of co-designed VMs for HIVST in MSM in commercial sex venues in the UK¹¹ and US^{12,13} has shown high acceptability and in the UK study 27% of those who accessed it had not previously tested for HIV ever or in past 12 months.¹¹ These VMs were co-designed with participatory design workshops and pre-development surveys involving the LGBT community and sauna users, to develop a bespoke VM design with a user-friendly interface.¹¹ The VM-HIVST approach is a low cost and low maintenance intervention.

Previous work introducing VMs for HIVST has been in MSM populations,¹¹⁻¹³ and similar bespoke digital VM technology for BLAM ethnicities may expand HIV testing uptake in these priority communities. We performed an exploratory survey for primarily BA participants, and including other BLAM ethnicities, to describe acceptability, preferences, and concerns of using VMs for HIVST dispensing as part of the

pre-development feedback process to inform the design of digital VMs for HIVST kits for these priority communities.

Methods

A cross-sectional structured survey was developed and piloted with members of the BLAM communities. The survey was available in English, French, and Spanish thus increasing accessibility for the predominantly Spanish- or French-speaking BLAM communities. The primary population surveyed was BA communities, but responses from other ethnicities including BCs, LAs, and other non-white ethnicities (ONWEs) were also collected.

The survey was carried out between September 2018 and January 2019. Participants were included if they were (a) aged 16 and over; (b) able to give informed consent; and (c) self-identified as BAs, BCs, LAs, or any ONWEs. Survey participants who did not provide ethnicity responses were excluded in the analysis. No self-identifiable information was recorded, and verbal informed consent was obtained to participate in the survey.

Recruitment of participants was carried out by outreach volunteers in a range of venues in South East London as part of an outreach programme using mobile tablet surveys. Outreach workers mapped outreach areas and venues in London, and the venues were selected from partner organisation and existing community programmes, for areas popular with BA, BC, and LA communities, included barbershops, salons, restaurants, pubs and bars, churches, community centres, cab offices, car workshops, ethnic minority businesses, shopping malls, supermarkets, bus stops, underground and train stations among others. Outreach workers with pre-loaded iPads directly approached participants to introduce themselves and the survey rationale, confidentiality, and obtained verbal consent for participating. The survey was also available online and promoted through BLAM communities websites, workshops for LA MSM, and language-specific messages on social media for their service users.

The survey comprised of 37 questions, completed over 10–15 min. Questions were structured by sections, covering demographics, any prior HIV testing, acceptability of HIVST via VMs, preferences for VM placement by location and including a free-text entry for respondent suggestions, priorities for placement of VMs within a location, and concerns of using the VMs or HIVST. Information about the proposed VMs and HIVST were presented to participants prior to assessing if they were willing to use the HIVST via

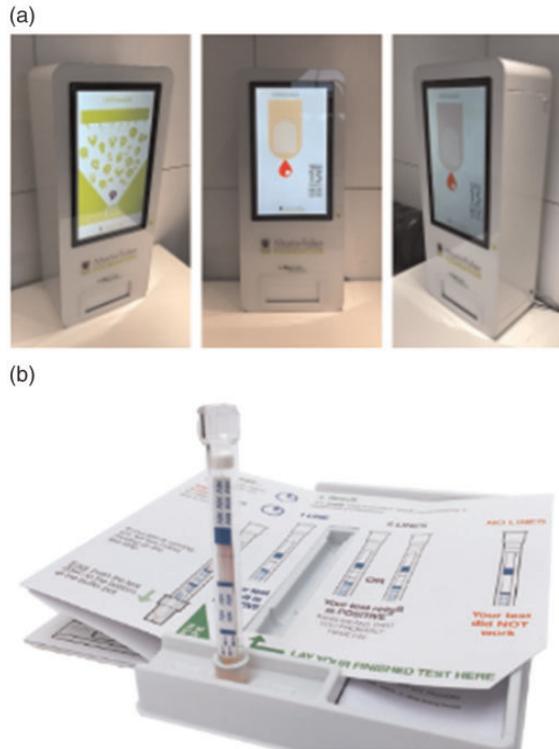


Figure 1. Pictures of vending machines (a) and HIV self-testing kits (b) included in the survey.

VMs, including pictures of the VMs and HIVST (Figure 1).

Results were analysed descriptively in Minitab® v18.1 (Minitab LLC, PA, USA). Post hoc sample size calculation using Cochran's sample size formula¹⁴ required 97 participants to give results with 95% confidence interval and a 10% margin of error, taking the BA population of BAs in England and Wales reported in the last census at 989,628.¹⁵ Other ethnic groups were recruited incidentally, and sample sizes were not formally calculated for statistical significance; responses were reported descriptively. Responses were stratified by ethnic groups: BAs, BCs, LAs, or ONWEs. Participants who identified as mixed White and BAs were included in the BA group, and mixed White and BCs included in the BC group. A venue was assessed as highly favourable if more than 70% of participants agreed or strongly agreed when asked 'Do you think a vending machine with HIVST kits would be suitable at the following venues?'.
Results

Patient demographics (Table 1)

Five of the 196 survey participants did not provide ethnicity responses and were not included for analysis. One hundred and twenty-eight (67.0%) identified as

BAs, 31 (16.2%) as BCs, 22 (11.5%) as LAs, and 10 (5.2%) as ONWEs. Overall, 123 (62.8%) of survey participants were male, and one preferred to self-describe their gender (0.51%). Majority of participants were heterosexual (143/186, 76.9%). When asked their country of birth, 139 (71.7%) were from outside the UK. There was variation across different ethnicities with the BC group consisting of more female than male participants, and were mostly born within the UK, unlike the other ethnicities. The ONWE group was of Asian sub-continental, Middle Eastern, or other Mixed ethnicities born in various countries. The majority of participants across BA, BC, and ONWE ethnicities were heterosexual, while the LA group was predominantly non-heterosexual including MSM. One hundred and sixty-one (82%) were recruited via outreach volunteers, with 35 (18%) recruited through the online survey and overall online response rates of 4%.

Responses to survey questions around previous HIV testing (Table 2)

Fifty-eight (30.4%) of all participants had never tested for HIV when asked, with BC participants being the most likely to never have had an HIV test. Approximately six in ten BAs and ONWEs, and over 80% of BC participants who had never tested, felt they were not at risk of HIV. However, there were a third of BAs, two-thirds of LAs, and 40% of ONWEs who had never tested because they did not feel they ever had an opportunity for HIV testing which they were comfortable with, but this proportion was only 11.8% in the BC group.

In the group who reported previous HIV tests, one in two BA participants had tested in the past 12 months, compared to higher proportions reported by the other ethnicities (BCs 61.6%, LAs 57.9%, ONWEs 60%). Settings where HIV testing was undertaken common to all ethnicities were sexual health clinics, other hospital clinics, and GP practices. There were a small group of patients (12/133, 9.0%) who had prior experience with either self-sampling HIV tests or HIVST.

Responses about acceptability and concerns of the VMs for HIVST (Table 3)

When asked to choose what potential barriers or concerns may arise from HIVST via VM use, different ethnic groups had differing rates of participants selecting 'no concern', ranging from 4.5% in LAs, to 25.0% in BAs. The most frequent concern selected by BA participants was 'Not being able to use the self-test correctly', while BC participants selected 'Not being able to use the self-test correctly' and 'Being seen using a machine for HIV self-testing kits', the latter

Table 1. Demographics of survey participants.

	Black African		Black Caribbean		Latin American		Other non-white ethnicities	
	n or Median	% or Interquartile range (IQR)	n or Median	% or IQR	n or Median	% or IQR	n or Median	% or IQR
Age (years)	40	29–52	38	21–50	36	32–42	32	24–38
Gender								
Female	45	35.2	20	64.5	2	91.1	4	40
Male	83	64.8	11	35.5	19	86.4	6	60
Prefer not to say	–	–	–	–	1	4.5	–	–
Sexual orientation								
Heterosexual	102	87.2	27	93.1	2	9.5	8	80
Men who have sex with men (including bisexual men)	10	8.5	0	0.0	19	90.5	1	10
Women who have sex with women	5	4.3	2	6.9	0	0	1	10
Place of birth								
Outside UK	103	81.1	5	16.7	22	100.0	7	70.0
Within UK	24	18.9	25	83.3	0	0.0	3	30.0
Ethnicity								
Black African	119	93.0	–	–	–	–	–	–
Mixed – White and Black African	3	2.3	–	–	–	–	–	–
Other Black background	6	4.7	–	–	–	–	–	–
Black Caribbean	–	–	29	93.6	–	–	–	–
Mixed – White and Black Caribbean	–	–	2	6.4	–	–	–	–
Latin American	–	–	–	–	22	100.0	–	–
Indian	–	–	–	–	–	–	1	10.0
Middle Eastern	–	–	–	–	–	–	1	10.0
Mixed – Other mixed ethnicities	–	–	–	–	–	–	3	30.0
Other Asian background	–	–	–	–	–	–	4	40.0
Pakistani	–	–	–	–	–	–	1	10.0
Mode of recruitment								
Online survey	13	10.2	0	0	22	100	0	0
Outreach with tablet survey	115	89.8	31	100	0	0	10	100

IQR: interquartile range.

also being most frequently selected by ONWEs. In the LA group, the most frequent concern was ‘Not being able to use the vending machine correctly’. Other concerns participants recorded in the free space available included concerns about language, accuracy of the test, and confirmation and counselling available if reactive.

Despite the above concerns, participants responded they were still willing to use the HIVST from VMs in all ethnic groups (BAs 77.9%, LAs 81.8%, ONWEs 80%) apart from BC participants (53.6%). Twenty-two (68.8%) of BA, five (33.3%) BC, one (33.3%) LA, and five (100%) ONWE participants, who never tested for HIV previously, agreed or strongly agreed they were willing to use the HIVST from VMs.

Responses to location preferences for placement of VMs for HIVST (Table 4)

There was a trend of participants preferring healthcare-associated venues, e.g. sexual health clinics, general

practice, high street pharmacies, and maternity and children’s services, as compared to community settings. However, there were differences in preferences between ethnic groups in community settings, with BAs and ONWEs frequently selecting community centres, and LA participants preferring saunas and entertainment venues for VM placement. Other venues suggested in the free-text space available include schools, universities, train stations, and airports.

When determining the factors most important for the position of VMs within a venue, BA and BC participants most frequently chose non-crowded areas, LA participants chose ‘trained staff nearby’, and ONWE participants were split between ‘Easy access’ and ‘High visibility’.

Discussion

This survey aimed to describe preferences of primarily BAs as well as other minority ethnicities to inform the

Table 2. Responses to survey questions around previous HIV testing.

	Black African		Black Caribbean		Latin American		Other non-white ethnicities	
	n	%	n	%	n	%	n	%
Have you ever had an HIV test? (n=191)								
No	33	25.8	17	54.8	3	13.6	5	50.0
Yes	95	74.2	14	45.2	19	86.4	5	50.0
If no, why have you never tested? (n=58)								
Don't know where to go	0	0.0	1	5.9	0	0.0	0	0.0
I am not at risk of HIV	19	57.6	14	82.4	0	0.0	3	60.0
I do not want to know my HIV status	3	9.1	0	0.0	1	33.3	2	40.0
I have never had an opportunity	11	33.3	2	11.8	2	66.7	2	40.0
I was comfortable with								
If yes, when was the last time you tested? (n=132)								
Within the last three months	20	21.1	2	15.4	7	36.8	1	20.0
Three months to one year ago	27	28.4	6	46.2	4	21.1	2	40.0
Between one and five years ago	26	27.4	3	23.1	5	26.3	1	20.0
More than five years ago	22	23.2	2	15.4	3	15.8	1	20.0
If yes, which of the following services have you ever used for a HIV test? (You may choose more than one option) (n=133)								
Sexual health clinic	52	54.7	11	78.6	13	68.4	1	20.0
Other hospital clinic	18	18.9	2	14.3	2	10.5	2	40.0
Test done as inpatient	3	3.2	0	0.0	1	5.3	1	20.0
GP (family doctor)	18	18.9	5	35.7	1	5.3	1	20.0
Maternity or children's services	6	6.3	0	0.0	1	5.3	0	0.0
Community outreach organisation	8	8.4	0	0.0	1	5.3	0	0.0
Social venue, e.g. bars, clubs, restaurants	1	1.1	0	0.0	4	21.1	0	0.0
I tested myself using a kit I sent away in the post	5	5.3	1	7.1	2	10.5	0	0.0
I tested myself using a self-testing kit that gave me a result straight away	4	4.2	0	0.0	1	5.3	0	0.0
Other venues	3	3.2	0	0.0	0	0.0	0	0.0

Table 3. Responses about acceptability and concerns of the VMs for HIVST.

	Black African		Black Caribbean		Latin American		Other non-white ethnicities	
	n	%	n	%*	n	%	n	%
Would you have any of these concerns using a HIV self-testing vending machine? (You may choose more than one option)								
No concerns	32	25.0	5	11.9	1	4.5	2	20.0
Being seen using a machine for HIV self-testing kits	50	39.1	17	40.5	6	27.3	6	60.0
Someone finding out I have used a HIV test	35	27.3	7	16.7	6	27.3	1	10.0
Not being able to use the self-test kits correctly	62	48.4	17	40.4	7	31.8	3	30.0
Not being able to use the vending machine correctly	39	30.5	13	31.0	11	50.0	3	30.0
Cost of HIV self-testing kits	32	29.7	5	11.9	1	4.5	2	20.0
Would you be willing to use this HIV self-testing kit?								
Agree or strongly agree	95	77.9	15	53.6	18	81.8	8	80.0

HIVST: HIV self-test; VM: vending machine.

implementation of HIVST via VMs, and shows high acceptability rates particularly in BA communities, as well as LA and ONWE participants. There were differences between ethnic groups though, with BC participants less willing to use the HIVST via VMs than other ethnic groups.

The rates of HIV testing in BAs in this study were higher than previously reported in another London cross-sectional study of BAs (74.2% versus 51.5%).³ There are limited data on HIV testing uptake in other priority ethnic populations. Although the majority of BA participants in this cohort had tested for HIV

Table 4. Responses to location preferences for placement of vending machines for HIVST.

	Black African		Black Caribbean		Latin American		Other non-white ethnicities	
	n	% ^a	n	% ^a	n	% ^a	n	% ^a
Do you think a vending machine with HIV self-testing kits would be suitable at the following venues? (Participants who agreed or strongly agreed)								
Sexual health clinic waiting rooms	104	89.7	27	87.1	13	76.5	9	90.0
General practice	101	87.1	26	86.7	13	68.4	8	80.0
High street pharmacy	93	80.9	21	72.4	15	83.3	8	80.0
Maternity or children's services	85	75.2	19	67.9	7	50.0	9	90.0
Sports centre	76	66.1	19	65.5	10	62.5	9	90.9
Public toilets	77	62.3	18	62.1	9	56.3	10	100.0
Religious venues	65	56.6	15	50	5	38.5	4	40.0
Movie theatres	59	52.2	12	42.8	7	46.7	6	60.0
Entertainment venues, e.g. clubs, bars	78	66.7	16	55.2	13	72.2	7	70.0
Saunas	66	60.0	18	64.3	14	73.7	7	70.0
Community centres	97	78.9	20	69.0	10	58.8	8	80.0
Local businesses, e.g. barbershops, restaurants	76	64.4	12	41.4	7	46.7	6	60.0
Which factors do you think are important when deciding where a HIV self-testing kit vending machine is located within a venue? (Participants who ranked most important)								
Easy access, e.g. near the venue entrance	22	19.5	2	7.14	3	17.7	3	33.3
High visibility – the machine should be easy to find	31	27.9	10	35.7	5	33.3	3	33.3
Non-crowded areas	35	31.0	13	46.4	5	35.7	1	11.1
Trained staff nearby – to ask for help if unable to use the machine	26	23.0	3	10.7	6	40.0	2	22.2

HIVST: HIV self-test.

^aPercentage of respondents who agree or strongly agree against the total number of responses for the question.

previously, a quarter had never tested before and another 23% had not tested in the last five years before. One-third of these BA participants had never had an opportunity to test which they were comfortable with and a majority would be willing to access an HIVST kit from the VMs. From a public health perspective, increasing the proportion of never-testers and occasional testers to engage with testing could have a significant impact on efforts to eliminate HIV transmission and would be population sub-group this intervention is directed towards.

Prior experience with self-sampling or self-testing for HIV was low (9.0%) in survey participants and represents an opportunity for expansion of HIV self-testing or self-sampling in the context of high rates of willingness to use the HIVST. The challenges of using the HIVST must be addressed, particularly in BA and BC communities where the most frequent concern was being able to use the HIVST correctly. A study of 200 participants demonstrated that while incorrect interpretation of HIV self-test was associated with black ethnicity and being born outside the UK, overall rates of incorrect HIVST interpretations were low and 97% achieved a valid result.⁸ Clear instructions

through pictorial or video format displayed on the VMs may address concerns on use of the HIVST.

A common theme in the literature review was concern among BA communities and healthcare providers about 'targeting' BA ethnicities for HIV testing.^{16,17} BA-led projects to promote voluntary counselling and testing were deemed more acceptable.¹⁶ With the implementation of VMs dispensing HIVST, avoidance of the perception of 'targeted' HIV testing could be achieved by having VMs offering displays in various language options, to achieve inclusive rather than 'targeted' HIV testing.

Another concern frequently selected was 'being seen using a machine for HIVST'; addressing the barrier of stigma accessing HIV testing remains vital. Qualitative results from Prost et al.¹⁶ show participants' concerns around being stigmatised for being tested for HIV were common, and while a community-based voluntary counselling and testing was acceptable, participants were concerned about the lack of confidentiality within their communities. Taking our survey responses on preferences for factors determining VM position within locations, the most important factor for BA and BC participants was placing the VM in a non-

crowded location, to encourage privacy when picking up HIVST. The HIVST can then be done in a private setting of the user's choosing.

Language problems may be a barrier to HIV testing in migrant populations, particularly in LA migrant communities in UK,¹⁸ and LA participants frequently reported concerns of 'not being able to use the VM correctly'. Having tailored VMs with displays in appropriate language mediums would be beneficial in addressing this concern. Fear of discrimination has been reported to not be a major barrier to HIV testing in MSM from south/central America¹⁹ and self-reported HIV test uptake rates are high (90%) in LA MSM communities in the UK.²⁰

Most participants (>70%) preferred VMs at healthcare-associated venues such as sexual health clinics, general practice, high street pharmacies. These venues may already offer HIV testing and prevention services; however, the choice of accessing HIVST in different settings may encourage increased testing. As increasing demands on sexual health services are coupled with funding cuts, 35% of healthcare professionals surveyed reported reduced access to HIV testing,²¹ patients unable to access sexual health appointments may be able to obtain HIV results, and this also addresses the concerns of 23% of BA, 40% LA, 10% BC, and 22% ONWE participants about the lack of trained staff nearby. There were differences among cohorts in the preferences for community venues, and in LA participants preferring saunas, entertainment venues agree with previous research on MSM engaging with HIVST via VMs in saunas.¹¹

There were several limitations to this study. Firstly the number of non-BA BLAM participants recruited were small, despite recruitment through BLAM communities organisations' social media and workshops; thus it was not powered to determine statistical differences between ethnic groups. Published data on HIV testing in migrants and ethnic minorities in Europe are limited and mostly based on work around African migrants in the UK.^{18,20} In this survey, BC participants were distinctly different from BA participants regarding their demographics, less likely to have tested for HIV, and more likely to perceive themselves at not at risk of HIV. However, STIs are more common in BC heterosexual populations than other heterosexual ethnic groups,⁵ and the risk of undiagnosed HIV may be high in this group, but there are limited data on rates of HIV testing uptake in BC communities. Further qualitative work is required to understand attitudes to HIV testing and strategies to improve HIV testing uptake in this community. Another limitation is this was a convenience sample, with participants recruited by outreach workers from BAs – a community organisation with a focus on sexual health, and other

participants recruited through social media channels and workshops organised by BLAM organisations promoting sexual health, and thus their service users may not fully represent the general BLAM population in the UK.

The strengths of the study are that this is a large BA population including large proportions of heterosexual male and female participants. Many studies on HIV self-testing in BA ethnicities have mostly been in MSM cohorts.^{22,23} In addition, while not powered for statistical significance, this survey provides a snapshot of the differences across BLAM ethnic groups.

Further work is required to improve recruitment of other BLAM ethnicities and understand the differences in attitudes and acceptability to HIV self-testing. Challenges remain, including addressing the importance of linkage to care following reactive HIVST results. However, this survey shows that HIVST is acceptable in many BLAM communities and increases our understanding of the concerns and how to address them in the design and implementation of VMs for HIVST, to expand HIV testing in these priority communities.

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References

1. Nash S, Desai S, Croxford S, et al. *Progress towards ending the HIV epidemic in the United Kingdom: 2018 report*. London: Public Health England, 2018.
2. Brown A, Kirwan PD, Chau C, et al. *Towards elimination of HIV transmission, AIDS and HIV-related deaths in the UK*. London: Public Health England, 2017.
3. Fakoya I, Logan L, Ssanyu-Sseruma W, et al. HIV testing and sexual health among black African men and women in London, United Kingdom. *JAMA Netw Open* 2019; 2: e190864.
4. Rawson S, Croxford S, Swift B, et al. Latin Americans in the UK: a key population for HIV. In: *The 25th BHIVA conference*, Bournemouth, UK, 2019.
5. Coyle RM, Miltz AR, Lampe FC, et al. Ethnicity and sexual risk in heterosexual people attending sexual health clinics in England: a cross-sectional, self-administered

- questionnaire study. *Sex Transm Infect* 2018; 94: 384–391.
6. WHO. *Guidelines on HIV self-testing and partner notification: supplement to consolidated guidelines on HIV testing services*. Geneva: World Health Organization, 2016.
 7. Witzel TC, Rodger AJ, Burns FM, et al. HIV self-testing among men who have sex with men (MSM) in the UK: a qualitative study of barriers and facilitators, intervention preferences and perceived impacts. *PLoS One* 2016; 11: e0162713.
 8. Saunders J, Brima N, Orzol M, et al. Prospective observational study to evaluate the performance of the BioSure HIV self-test in the hands of lay users. *Sex Trans Infect* 2018; 94: 169–173.
 9. BioSURE. FAQs (2018) – about your BioSURE HIV self test, <https://hivselftest.co.uk/pages/faq-about-your-test> (accessed 7 November 2019).
 10. Qin Y, Han L, Babbit A, et al. Experiences using and organising HIV self-testing: a global qualitative systematic review. *AIDS* 2018; 32: 371–381.
 11. Vera JH, Soni S, Pollard A, et al. Acceptability and feasibility of using digital vending machines to deliver HIV self-tests to men who have sex with men. *Sex Transm Infect* 2019 May 17. [Epub ahead of print] doi: 0.1136/sextrans-2018-053857
 12. Stafylis C, Natoli LJ, Murkey JA, et al. Vending machines in commercial sex venues to increase HIV self-testing among men who have sex with men. *Mhealth* 2018; 4: 51.
 13. Young SD, Daniels J, Chiu CJ, et al. Acceptability of using electronic vending machines to deliver oral rapid HIV self-testing kits: a qualitative study. *PLoS One* 2014; 9: e103790–14.
 14. Cochran W. *Sampling techniques*. 3rd ed. New York: John Wiley & Sons, 1977.
 15. Office for National Statistics. 2011 Census. 2011. <https://www.ons.gov.uk/census/2011census> (accessed 7 Nov 2019).
 16. Prost A, Sseruma WS, Fakoya I, et al. HIV voluntary counselling and testing for African communities in London: learning from experiences in Kenya. *Sex Transm Infect* 2007; 83: 547–551.
 17. Seguin M, Dodds C, Mugweni E, et al. Self-sampling kits to increase HIV testing among black Africans in the UK: the HAUS mixed-methods study. *Health Technol Assess* 2018; 22: 1–158.
 18. European Centre for Disease Prevention and Control. Migrant health: HIV testing and counselling in migrant populations and ethnic minorities in EU/EEA/EFTA member states. Stockholm: ECDC, 2011.
 19. Hoyos J, Fernandez-Balbuena S, de la Fuente L, et al. Never tested for HIV in Latin-American migrants and Spaniards: prevalence and perceived barriers. *J Int AIDS Soc* 2013; 16: 18560.
 20. Elford J, Doerner R, McKeown E, et al. HIV infection among ethnic minority and migrant men who have sex with men in Britain. *Sex Transm Dis* 2012; 39: 678–686.
 21. BASHH. Government funding cuts leave sexual health and HIV care at ‘breaking point’, <https://www.bashh.org/news/news/government-funding-cuts-leave-sexual-health-and-hiv-care-at-breaking-point/> (2018, accessed 16 July 2019).
 22. Frye V, Wilton L, Hirshfield S, et al. “Just because it’s out there, people aren’t going to use it.” HIV self-testing among young, black MSM, and transgender women. *AIDS Patient Care STDs* 2015; 29: 617–624.
 23. Marlin RW, Young SD, Bristow CC, et al. Piloting an HIV self-test kit voucher program to raise serostatus awareness of high-risk African Americans, Los Angeles. *BMC Public Health* 2014; 14: 1226.