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
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%). 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 England 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. 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. 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. It has high sensitivity (99.7%) and specificity (99.9%). 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.

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. The use of co-designed VMs for HIVST in MSM in commercial sex venues in the UK and US 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. 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. The VM-HIVST approach is a low cost and low maintenance intervention.

Previous work introducing VMs for HIVST has been in MSM populations 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
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 subcontinental, 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...
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
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%). 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...
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. 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.

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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)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Black African</th>
<th>Black Caribbean</th>
<th>Latin American</th>
<th>Other non-white ethnicities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy access, e.g. near the venue entrance</td>
<td>22</td>
<td>19.5</td>
<td>2</td>
<td>7.14</td>
</tr>
<tr>
<td>High visibility – the machine should be easy to find</td>
<td>31</td>
<td>27.9</td>
<td>10</td>
<td>35.7</td>
</tr>
<tr>
<td>Non-crowded areas</td>
<td>35</td>
<td>31.0</td>
<td>13</td>
<td>46.4</td>
</tr>
<tr>
<td>Trained staff nearby – to ask for help if unable to use the machine</td>
<td>26</td>
<td>23.0</td>
<td>3</td>
<td>10.7</td>
</tr>
</tbody>
</table>

HIVST: HIV self-test.
*Percentage of respondents who agree or strongly agree against the total number of responses for the question.

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

Do you think a vending machine with HIV self-testing kits would be suitable at the following venues? (Participants who agreed or strongly agreed)

<table>
<thead>
<tr>
<th>Venue</th>
<th>Black African</th>
<th>Black Caribbean</th>
<th>Latin American</th>
<th>Other non-white ethnicities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sexual health clinic waiting rooms</td>
<td>104</td>
<td>89.7</td>
<td>27</td>
<td>87.1</td>
</tr>
<tr>
<td>General practice</td>
<td>101</td>
<td>87.1</td>
<td>26</td>
<td>86.7</td>
</tr>
<tr>
<td>High street pharmacy</td>
<td>93</td>
<td>80.9</td>
<td>21</td>
<td>72.4</td>
</tr>
<tr>
<td>Maternity or children’s services</td>
<td>85</td>
<td>75.2</td>
<td>19</td>
<td>67.9</td>
</tr>
<tr>
<td>Sports centre</td>
<td>76</td>
<td>66.1</td>
<td>19</td>
<td>65.5</td>
</tr>
<tr>
<td>Public toilets</td>
<td>77</td>
<td>62.3</td>
<td>18</td>
<td>62.1</td>
</tr>
<tr>
<td>Religious venues</td>
<td>65</td>
<td>56.6</td>
<td>15</td>
<td>50</td>
</tr>
<tr>
<td>Movie theatres</td>
<td>59</td>
<td>52.2</td>
<td>12</td>
<td>42.8</td>
</tr>
<tr>
<td>Entertainment venues, e.g. clubs, bars</td>
<td>78</td>
<td>66.7</td>
<td>16</td>
<td>55.2</td>
</tr>
<tr>
<td>Saunas</td>
<td>66</td>
<td>60.0</td>
<td>18</td>
<td>64.3</td>
</tr>
<tr>
<td>Community centres</td>
<td>97</td>
<td>78.9</td>
<td>20</td>
<td>69.0</td>
</tr>
<tr>
<td>Local businesses, e.g. barbershops, restaurants</td>
<td>76</td>
<td>64.4</td>
<td>12</td>
<td>41.4</td>
</tr>
</tbody>
</table>

Which factors do you think are important when deciding where a HIV self-testing kit vending machine is located within a venue? (Participants who agreed or strongly agreed)

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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, 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 America and self-reported HIV test uptake rates are high (90%) in LA MSM communities in the UK.

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, 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.

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. 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, 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. 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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