Mobile Phone Messaging to Promote Uptake of HIV Testing among Migrant African Communities in the UK

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Abstract

Background: In the UK, African communities are a focus of public health efforts to increase uptake of HIV testing. Mobile phone interventions may be an innovative way of reaching migrant groups who are known to face multiple obstacles in accessing mainstream health services. This paper presents findings from a feasibility study that used participatory approaches to investigate the use of a text messaging intervention to encourage HIV testing among migrant African communities.

Methods: Participants were recruited in the city of Nottingham by a team of community researchers. They were sent two text messages per week (one on HIV and one on general health) for 12 weeks. Baseline and follow-up questionnaires were completed to measure HIV testing behaviour, HIV related knowledge and attitudes and general health. Participants' views on the intervention were solicited.

Results: One hundred and sixty-nine participants were enrolled in the study. Follow up data on HIV testing was obtained for 76 participants (45%) and complete follow up measures were available from 60 participants (36%). Eight reported seeking an HIV test during the study period. There were statistically significant positive changes in attitudes about HIV, and a trend towards increased knowledge about HIV. One third of participants reported improvements in physical activity levels, diet, and stress management following the intervention. The intervention messages and structure were positively evaluated.

Conclusions: Well-designed mobile phone messaging proved to be a feasible and acceptable intervention to promote both HIV testing and lifestyle behaviours among African migrant communities in the UK. When co-constructed with communities, they hold considerable promise for overcoming some of the health-related barriers faced by migrant populations in new countries. Future research and service development should focus on exploiting and evaluating this potential in relation to other key health priorities.

Keywords:
African Communities, HIV testing, HIV, text messaging, SMS, Migrant health

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Introduction

An important health issue facing African migrant communities in the UK is HIV (Public Health England, 2016) . Between 30-50% of African migrants who are HIV positive are unaware of their diagnosis; risk perception is low and over 60% of those diagnosed, are identified 'late' with a concomitant poorer prognosis (Public Health England, 2016). Low levels of testing occur in spite of a long history of community-based HIV prevention initiatives in these communities (National AIDS Trust, 2014). It is imperative to identify successful communication strategies to support HIV prevention amongst these groups (NICE, 2011).

Health education for migrant populations in the UK now takes place in a context of 'super-diversity' whereby migrants come from all over the world, are highly mobile, transnationally connected and represent widely varying languages and cultural identities (Vertovec, 2007; Phillimore, 2011). Such populations face many individual, health system and structural barriers to accessing health services (Rechel et al., 2013; Ochieng, 2013). These difficulties are compounded for HIV due to its stigmatised nature and fears of how a positive diagnosis may influence immigration processes (Blondell et al., 2015).

Globally, there is great interest in exploring how mobile phone-based interventions could address health education for migrant populations, with a particular focus on how they might enable access to information, peer support and resources (Morley, 2017; Walker et al., 2015; Liamputtong et al., 2016). With respect to HIV, short messaging service (SMS) interventions have been shown to be effective in supporting aspects of care (e.g. treatment adherence or retention), but there is less evidence on their utility in promoting HIV testing. Some studies have yielded promising results (Odeny et al., 2014; Njuguna et al., 2016), but these have been conducted in Africa. It is not known whether similar approaches would be effective among migrant African groups in high income settings. African migrants in the UK have the highest level of household mobile phone ownership of all other population groups – at 97% (Ofcom, 2013), but there is a lack of research on patterns of use and ownership according to different socio-demographic features (O'Connor and O'Donoghue, 2015).

Study aim

The aim of this study was to test the feasibility of using a mobile phone SMS intervention to increase uptake of HIV testing among African communities in the UK. The intervention design and structure was guided by formative research to identify the challenges faced by communities around HIV testing, using the Health Belief Model (HBM) as a theoretical framework (see Evans et al., 2016, for a full description).

Methods

Research Design

The feasibility study adopted a community based participatory research (CBPR) approach, working in partnership with a pan-African community organisation, the African Institute for Social Development (AISD). CBPR is "collaborative, action orientated research...that involves the development of long term, equitable research partnerships between academic

researchers, community based organisations and community members" (Unertl et al., 2015: 1). This methodology was adopted for three reasons: (i) to address potential power imbalances within the research process, so that all stakeholders had a voice and their contribution was recognised (Minkler and Wallerstein, 2008), (ii) to ensure the intervention would genuinely reflect the needs and experiences of a diverse target group, and, (iii) to build capacity within communities for ongoing advocacy around health (Trostle, 1992).

The study utilised a longitudinal one group comparison design with data collected at two time points; baseline and post-intervention.

Ethics

The University of Nottingham Faculty of Medicine and Health Sciences Ethics Committee provided ethical scrutiny and approval (D09052013 SNMP). All participants gave written informed consent.

Setting

The study setting was Nottingham, a city of approximately 314,000 people in the East Midlands, UK. Its African migrant community is 'super-diverse' with an estimated population of 5,000 representing 31 different countries (African Initiative Support, 2010). Nottingham has a relatively high HIV prevalence of 2.78 per 1,000 population and high levels of late diagnosis (65.8% compared with the England average of 48.3%) (Nottingham City Council, 2015). HIV testing is free to all, regardless of migration status, and is available through public sector health facilities and voluntary agencies.

Sampling and Recruitment

Participants were eligible to participate if they were African, over 18 years, and could complete the surveys in English. A convenience and snowballing sampling strategy was used as is common in research on sensitive topics (Pitts and Smith, 2007). Recruitment took place over a 10-week period between March-May 2014. Individuals were invited to participate by a team of 12 AISD community researchers that represented diverse African communities and genders (Elliott et al., 2002). Recruitment occurred through direct referral within the community researchers' social networks (Penrod et al., 2003) and visits to voluntary sector groups (e.g. refugee charities) and community venues (e.g. library or church). Participants were offered a GBP 5 shopping voucher to thank them for their time.

Text Message Intervention

The intervention was called "Health4U". To avoid participants feeling stigmatised, the intervention embedded HIV text messages alongside general health messages, providing a consistent message that knowing your HIV status was an important part of overall health and wellbeing. It included 24 messages, 12 on HIV, 12 on other health aspects (see Evans, 2016 for a fuller description).

Participants started receiving text messages within seven days of completing the baseline

survey. Two messages per week were delivered for 12 weeks; one HIV message, and one on general health (e.g. diet, physical activity, stress management, seeking appropriate medical help). Messages were limited to 160 characters, were personalised and tailored on religion (Christian, Muslim, neither), language (English, Arabic, French) and gender.

Outcome Measures

Pre-post surveys were used to collect demographic, baseline and follow-up data (see Table 1.) The surveys were piloted with the community research team and 12 community participants. Where necessary, amendments were subsequently made to the items the team had developed (but not to the wording of standardised measures).

Behavioural and attitudinal outcomes were based on HBM constructs and recent research evidence. They included whether participants sought an HIV test during or immediately following the intervention and HIV-testing determinants including: previous testing history, intentions to get tested, changes in confidence to get an HIV test, HIV-related knowledge, and attitudes to HIV testing (Evangeli et al., 2016b; Evangeli et al., 2016a).

Other outcomes included changes in perceived health status, perceived quality of life, diet, physical activity, stress management and confidence to seek appropriate medical help. Participant views on the acceptability of the intervention (content, frequency, duration) were also collected.

Insert Table 1 here

Data Collection

At enrolment, participants were given the option of completing the baseline survey in paper format or online. At the end of the intervention, participants were sent an SMS requesting them to text a reply reporting whether or not they had sought an HIV test during the study period. They were also sent an SMS and email containing a link to the follow-up survey. Participants who did not complete the on-line follow-up survey were contacted via their mobile phone by a researcher who had not previously been involved in the study. If there was no reply after three attempts to contact the participant, they were considered lost to follow-up.

Data Analysis

A researcher who had not previously been involved with the study entered the data and a 10% data check was undertaken. Statistical analyses were performed using IBM SPSS Version 21.0, while exact tests of symmetry were carried out using Stata IC Version 12.0. In order to control for Type I error due to multiple statistical tests being performed, a Bonferroni corrected α of .003 was used to determine statistical significance. Descriptive statistics for ordinal data and continuous data that did not meet the assumptions of normality were reported using the median (Mdn) and range, which represented the lowest and highest scores reported by participants.

Results

Recruitment and Retention

Of the 281 individuals invited to participate in the study, 172 agreed to take part (61.2%). Of those who agreed, three were excluded due to invalid telephone numbers. Hence, the intervention involved 169 individuals, who provided baseline data and were sent SMS. Of the 109 who declined to take part, 46 provided a reason: 19 (41.3%) were not interested, 15 (32.6%) were ineligible due to nationality and 11 (23.9%) did not have time. Twenty-seven participants (15.9%) texted a reply to the final SMS reporting on their HIV testing behaviour. No participants completed the on-line follow up survey. All were then contacted by phone and 60 (35.5%) completed it verbally. Combining the text replies and the survey, data on HIV testing uptake were obtained for 76 participants (45%).

Socio-Demographic Characteristics

Of the 169 participants, 85 were men (50.3%), 67 were women (39.6%), and 17 did not report their gender (10.1%). Ages ranged from 18 to 55 years, the majority were under 45 years (86.9%, n=147). The majority of participants were Christian (60.4%, n=102) or Muslim (26.6%, n=45). Over three-quarters (78.7%, n=133) were university educated. The majority of participants were either working (39.1%, n=66) or studying (33.1%, n=56). The participants represented all regions of Africa, yet the majority (89.3%, n=151) selected English as their preferred language for the intervention.

Demographic characteristics of responders to the follow-up surveys were compared with non-responders. A 2 x 2 x^2 test of independence showed that fewer men (z= -2.1) than women (z=2.1) completed the follow-up questionnaire, x^2 (1, n=152) = 4.38, p=0.036. Fisher's exact test showed that higher educational level (minimum of secondary school education compared with lower educational level) was associated with completion of follow-up measures (z=2.4; p=0.027). No other associations were found.

Insert Table 2 here

HIV Testing

At baseline, almost two-thirds of participants (62.1%, n=105) reported having 'ever had' a HIV test. There were no statistically significant differences in reports of ever having had a HIV test prior to the intervention between follow-up responders (64.8%, n=35) and non-responders (68%, n=70 (x^2 (1, n=157) =0.158, p=0.691). Within the sample, 24.2% (n=41) had tested more than one year ago and 30.8% (n=52) had never tested. A relatively large proportion of the sample had tested less than a year ago (28.4%, n=48).

Eight participants (10.5%) responded that they had sought an HIV test after receiving Health4U messages.

Confidence to Seek a HIV Test

Both before and after the intervention, participants were 'very confident' that they would be able to take a HIV test in the next three months (Md=9 (1–10), *n*=44, *Z*= -0.527, *p=0*.299). There was no statistically significant change in self-efficacy post intervention.

HIV-Related Knowledge

Changes in HIV-related knowledge were analysed using Exact test of symmetry for 3 x 3 contingency tables. Response categories for one item *("If I have HIV, early testing will improve my chances of living a healthy life")* were collapsed into a 2 x 2 contingency table (correct vs incorrect response) in order to run McNemar's Test. Univariate analysis showed that after receiving the intervention, significantly more participants identified that early testing would improve their chances of living a healthy life (*p*=0.006); that HIV testing is free to anyone in the UK (*p=0*.007); and that they would know where to get a test (*p=0*.006), compared with baseline. However, after statistical correction for multiple testing (Bonferroni corrected alpha of 0.003) these relationships became non-significant. See Table three.

Insert Table 3 here

HIV-Related Attitudes

Some changes in HIV-related attitudes were observed. Participants were significantly more likely to strongly agree with the statement, "*If I had HIV, I know I would get the support I need*" at follow-up compared with baseline (Median score (range): Before = 6(1–7); after = 7(1–7)). Participants were significantly more likely to agree with the statement, "*Early testing will help me protect others from infection*" at follow-up compared with baseline (Median score (range): Before = 7(1–7); after = 7(5–7)). Both significant changes had medium sized effects (*r*= -0.44). See table four.

Insert Table 4 here

Intentions to get an HIV test

Using an Exact test of symmetry, a significant difference was found in participants' intentions to get tested before and after the intervention (*p*=0.0015). More than half of the participants who responded to the post-test question reported a change in their intentions to test following the intervention (31/55; 56.4%). Post-hoc analysis showed that this significant difference applied to participants who said that they had been tested for HIV at baseline (n=35); after the intervention, a significant proportion of this previously testing subgroup indicated that they "*have actively looked into getting tested*" (22.9%, n=8), "*have thought about it*" (20%, n=7) or "*don't have any plans to get tested*" (20%, n=7).

Perceived Health Status, Quality of life and other Health Behaviours

Changes in perceived general health and quality of life were analysed using the Wilcoxon signed ranks test. All rated their general health status as *2 = "very good"* (Range = 1 – 5) both before and after the intervention, and hence no statistically significant change was

found (n=60, *Z*= -0.182, *p*=0.434). There was a significant improvement in quality of life at follow-up compared with baseline (p=0.013, n=53), although when a Bonferroni corrected alpha level was applied this change no longer reached statistical significance (Table five).

Insert Table 5 here

With regards to other health behaviours following the intervention, 35.4% of participants self-reported an increase in their physical activity; 29.8% said that they eat healthier and 27.2% said that they were better able to manage their stress. At follow up, respondents generally felt 'very confident' that they would seek out medical help (Md=10 (5–10), n=47.

Evaluation of the Intervention

Fifty-two participants (30.8% of the total sample) provided feedback about the frequency and duration of the intervention. Of these, 59.6% (n=32) were satisfied with the frequency of the messages. Five wanted more messages (9.6%) and 15 said there were too many (28.8%). Regarding intervention duration, 59.6% (n=31) stated it was just about right, with 7.7% (n=4) wanting a longer intervention and 32.7% (n = 17) a shorter one.

On Likert scales of 1- 7, participants tended to agree with positive statements about the intervention and the personal relevance of messages and reported to have discussed the message content with others. See Table six.

Insert Table 6 here

Discussion

Effectiveness of Recruitment Strategies

Recruitment was successful in terms of participant numbers. 172 participants were recruited, which exceeded the original recruitment target of 120. CRs provided a feasible and appropriate means of supporting recruitment into HIV-related SMS interventions. Given the low refusal rate, the intervention was acceptable to the target communities, confirming our hypothesis that mobile phones are an appropriate channel for reaching this population with health messaging.

Acceptability of Data Collection Methods

Data collection using online, text and email methods was not feasible in this population group. Face-to-face interactions or telephone follow up were more successful. Recent UK national surveys of HIV in African communities that attempted to use online methods of data collection have reported similar challenges (Public Health England, 2015; Bourne et al., 2014).

Influence on HIV Testing and Response Rate

Follow-up data were obtained for only 76 out of 169 individuals (45%). Of these, eight (10.5%) reported having an HIV test during or after the intervention. This relatively low response rate and the small numbers in the follow up sample makes these findings difficult to interpret. However, mobile phone interventions are low cost. The cost saving for any new HIV case detected in the UK has been estimated at £380,000 (US$ 493,582) (Nakagawa et al., 2015), suggesting that even marginally increasing the potential for identification of new cases through increasing access to testing has potential for significant economic benefit.

There is relatively little outcome data available for SMS based interventions against which to compare our study findings. In South Africa, a multi-arm SMS intervention study recruited from a mobile phone company's database (n=2,533) achieved a 54.1% response rate for the primary outcome. Of these, 30.2% reported having a HIV test and 22.3% reported that they did not (De Tolly et al., 2012). This relatively higher response rate may have been influenced by the fact that participants who responded received a 10 Rand mobile phone top-up.

With respect to other (non-SMS) community-based HIV testing interventions among African migrants in the UK, we are aware of only one initiative (offering outreach 'point of care' tests) that has published process and outcome data (Rayment et al., 2012). In total, 3,789 African individuals were approached, of whom only 459 (12.1%) agreed to be tested – a relatively low proportion, as found in our study.

Intervention Targeting and Reach

With respect to HIV, the proportion of our sample who reported ever having had a test (62%) is comparable with national surveys conducted in 2008 and 2014 in the UK which reported figures of 61.9% and 65% respectively among African communities (Sigma Research, 2009; Bourne et al., 2014). For pragmatic reasons, our survey did not elicit information on risk behaviours, hence it is difficult to assess whether the intervention was able to reach those most at risk, nonetheless over 50% could be potentially deemed to be eligible for testing (24.2% had tested more than a year ago and 30.8% had never tested). A systematic review of 45 community HIV testing interventions in resource-rich countries concluded that "*the large majority of clients (between 62%-100%) had previously had an HIV test*" (Thornton et al., 2012: 421). These findings, as well as ours, suggest that more work needs to be done in order to understand who interventions are targeting and whether or not the most vulnerable are being reached.

In terms of socio-demographic characteristics, the composition of the study sample (including HIV testing history) was strongly comparable to participants in the aforementioned UK national surveys among African communities (Sigma Research, 2009; Bourne et al., 2014).

No-one declined research participation on the grounds of not having a phone, confirming that mobile phone use is high among African community members (Ofcom, 2013). Slightly more men (n=85) than women (n=67) participated in the study and the majority of participants were university educated (79%), however, we were unable to examine the reasons for potential differences in uptake. Although the intervention was available in three languages, the majority (89.3%) chose English. This is perhaps because proficiency in English

was required to consent and take the baseline survey. Overall, our results suggest that mobile phone based health education approaches have good potential to reach widely into African migrant communities across different demographics, but future research should examine variations in uptake and use in more depth, particularly in relation to gender, education and language.

Influence on HIV-Testing Determinants

The intervention had a positive influence on some aspects of HIV-related knowledge and awareness, including a small but significant improvement in participants' knowledge about where to get help and support around HIV and testing, and perceptions of the ease and accessibility of HIV testing. This suggests that some of the messages may have helped to clarify issues that may motivate or prevent individuals from accessing testing. It is unclear why no significant changes to perceived susceptibility (risk) was found but may be related to the fact that HIV remains a stigmatised condition in which a risk discourse is often externalised (i.e. considered a disease of 'others') and where fear of social consequences acts as a barrier to testing (Blondell et al., 2015).

Influence on General Health Status, Quality of Life and other Health Behaviours

High levels of general health and quality of life were reported both before and after the intervention. Still, one quarter to one third of participants reported a positive trend in a range of health domains. Health behaviours often cluster together and it may be that consideration of one area of health led to increased attention being paid to several aspects of health (Buck and Frosini, 2012). Hence, these findings indicate the potential to use SMS messaging to promote other aspects of health in UK African communities.

Study Limitations

Formative research had highlighted the importance of providing the intervention in three languages: English, French, and Arabic (Evans et al. 2016). Yet, the majority of participants (89.3%) requested to receive the messages in English. This may be due to the eligibility requirement of English proficiency for consent and baseline survey completion. Hence, to reach non-English speaking African migrants in the UK, Arabic and French may need to be used in all study components.

There was a poor response rate to online or text-based method at follow up which hampered the measurement of intervention effects. Follow up data were collected within a relatively short time after intervention end. Furthermore, in an effort to keep the survey short, a limited number of items and several single item measures were used.

While the feasibility objectives were met by this study design, the effectiveness of the intervention in changing testing behaviour, health and quality of life outcomes needs to be tested in a well-designed randomised controlled trial with longer follow-up periods.

Conclusions

This study demonstrates potential health benefits of mobile phone-based interventions for African migrant communities in two respects. First, it showed that an SMS intervention designed to prompt HIV testing behaviour is feasible and well-accepted by the target communities. While demonstrating impact on HIV testing with a single group study is not possible, clear improvements in HIV testing determinants, attitudes towards HIV and testing, and indication of potential for improvement in other health behaviours were shown. Findings lend support to the study's strategy of incorporating HIV testing messages among other general health messages. Second, the study indicates that mobile phone based interventions may be an acceptable and wide-reaching mechanism for health promotion more generally among African migrant communities. When co-constructed with communities, SMS initiatives may thus help to overcome some of the health-related barriers faced by migrant populations in new countries. Future research and service development should focus on evaluating this potential in relation to other key health priorities.

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Table 1 Behavioural and Attitudinal Measures

Construct	Explanation
HIV-Related	
HIV testing	Seeking an HIV test during or immediately after the intervention period
Previous testing history and intentions to get tested	Assessed with the question, *"Have you ever thought about having an HIV test?*" It had four response options, based on the Stages of Change model (Prochaska and Velicer, 1997); *"Yes, I have been tested. It was [time] ago"* (action); *"I have actively looked into getting tested, but haven't taken a test yet"* (preparation); *"I have thought about it, but am not planning to get tested now"* (contemplation); and "*No, I don't have any plans to get tested"* (pre-contemplation).
Confidence to seek an HIV test	Measured through responses to a single item measure *"How confident are you that you will be able to take an HIV test in the next 90 days / 3 months?*" Participants rated their confidence on a 10 point Likert scale for self-efficacy measures, from *1 = "Not at all confident"* to *10 = "Very confident"* (Bandura, 2006).
HIV knowledge	Assessed by calculating the number of correct responses ("*True", "False", "Don't Know*") to seven statements about HIV (e.g. *"With treatment, HIV is a manageable condition"*).
HIV testing -related attitudes	Measured by asking the extent to which participants agreed with a series of eight statements (e.g. *"I am at risk of getting HIV"*) on a 7 point Likert type scale, from *1 = "Strongly Disagree"* to *7 = "Strongly Agree"*.
General Health	
Perceived health status	Measured using the general self-rated health (GSRH) question, asking respondents to rate their health on a 5-category response scale ranging from Excellent – Poor (De Salvo et al., 2006)
Perceived quality of life	Assessed using a 10-point scale, from *1 = "Worst it has ever been"* to *10 = "best it has ever been"* (De Boer et al., 2004; Hauser and Walsh, 2008; Yohannes et al., 2011)
Changes in diet, physical activity and stress management	Measured using one item per behaviour with four response choices per item at post-test, e.g. *1. "No change – I was (physically active enough / a healthy eater / able to manage my stress) before the study, and I am still…"* *2. "No change – I was not (physically active enough / a healthy eater / able to manage my stress) before the study, and I am still not…"* *3.* Small change: *"I am a little more physically active / I eat a little more healthily / I am better able to manage my stress after the study";* 4. *Large change: "I am a lot more physically active / I eat a lot more healthily / I am less able to manage my stress after the study*
Confidence in seeking medical advice when needed	Measured by one item using a 10 point scale ranging from *"Not at all confident"* to *"Very confident" (*Bandura, 2006).
Participant Views on the intervention	
9 items covering intervention content, frequency and duration	Measured using a rating scale of 1 (*strongly disagree*) to 7 (*strongly agree*)

Table 2 Socio-Demographic Profile of Study Participants

	Health 4 U (full sample)	**Did not complete follow-up**	**Completed follow-up**
	n = 169	**n = 109**	**n = 60**
	N (%)	N (%)	N (%)
Gender			
Male	85 (50.3)	62 (56.9)	23 (38.3)
Female	67 (39.6)	38 (34.9)	29 (48.3)
Missing	17 (10.1)	9 (8.3)	8 (13.3)
Religion			
Christian	102 (60.4)	64 (58.7)	38 (63.3)
Muslim	45 (26.6)	31 (28.4)	14 (23.3)
No religion	6 (3.6)	5 (4.6)	1 (1.7)
Other	4 (2.4)	2 (1.8)	2 (3.3)
Prefer not to say	5 (3.0)	2 (1.8)	3 (5.0)
Missing	7 (4.1)	5 (4.6)	2 (3.3)
Age			
18-24	37 (21.9)	18 (16.5)	19 (31.7)
25-34	60 (35.5)	42 (38.5)	18 (30.0)
35-44	50 (29.6)	32 (29.4)	18 (30.0)
45-54	15 (8.9)	12 (11.0)	3 (5.0)
Over 55	2 (1.2)	1 (0.9)	1 (1.7)
Missing	5 (3.0)	4 (3.7)	5 (8.3)
Education			
No education	6 (3.6)	6 (5.5)	0 (0.0)
Primary	4 (2.4)	3 (2.8)	1 (1.7)
Secondary	12 (7.1)	4 (3.7)	8 (13.3)
College / University	133 (78.7)	88 (80.7)	45 (75.0)
Missing	14 (8.3)	8 (7.3)	6 (10.0)
Employment status			
Studying	56 (33.1)	35 (32.1)	21 (35.0)
Working	66 (39.1)	41 (37.6)	25 (41.7)
Not working	16 (9.5)	10 (9.2)	6 (10.0)
In the asylum process	17 (10.1)	14 (12.8)	3 (5.0)
Country of origin (Region)			
Northern Africa	15 (8.9)	10 (9.2)	5 (8.3)

	Health 4 U (full sample)	**Did not complete follow-up**	**Completed follow-up**
	n = 169	**n = 109**	**n = 60**
	N (%)	N (%)	N (%)
Eastern Africa	31 (18.3)	18 (16.5)	13 (21.7)
Southern Africa	19 (11.2)	12 (11.0)	7 (11.7)
Western Africa	46 (27.2)	31 (28.4)	15 (25.0)
Central Africa	24 (14.2)	19 (17.4)	5 (8.3)
Other	19 (11.2)	11 (10.1)	8 (13.3)
Missing	15 (8.9)	8 (7.3)	7 (11.7)
Language Preference for text messages			
English	151 (89.3)	95 (87.2)	56 (93.3)
French	11 (6.5)	9 (8.3)	2 (3.3)
Arabic	3 (1.8)	2 (1.8)	1 (1.7)
Missing	4 (2.4)	3 (2.8)	1 (1.7)

Table 3 HIV-Related Knowledge

Item		**Before**			**After**			
		n (%)			**n (%)**			
	N	True	False	D/K	True	False	D/K	*p*
HIV is a manageable condition	56	41 (73.2)	6 (10.7)	9 (16.1)	41 (73.2)	4 (7.1)	11 (19.6)	.852
More than a month to get my result.	55	8 (14.5)	32 (58.2)	15 (27.3)	9 (16.4)	39 (70.9)	7 (12.7)	.086
Chances of living a healthy life.	55	44 (80.0)	3 (5.5)	8 (14.5)	53 (96.4)	0 (0.0)	2 (3.6)	.006*
Services **will not** pass on information.	56	44 (78.6)	6 (10.7)	6 (10.7)	46 (82.1)	3 (5.4)	7 (12.5)	.833
Treatment not free for everyone.	56	8 (14.3)	32 (57.1)	16 (28.6)	7 (12.5)	40 (71.4)	9 (16.1)	.238
HIV **testing** is free to anyone.	56	35 (62.5)	2 (3.6)	19 (33.9)	49 (87.5)	2 (3.6)	5 (8.9)	.007*
Would you know where to get a test?	48	Yes: 34 (70.8)	No: 14 (29.2)	-	Yes: 43 (89.6)	No: 5 (10.4)	-	.006*

** Binomial distribution used; D/K = "Don't Know"*

Table 4 HIV-Related Attitudes

Question		Before		After			
	N	*Mdn*	*Range*	*Mdn*	*Range*	*Z*	*p*
How confident… able to take an HIV test in the next 3 months?	45	9	(1 – 10)	9	(1 – 10)	-.527	.304
I am at risk of getting HIV.	53	1	(1 – 7)	1	(1 – 7)	-1.412	.081
I am at risk of passing on HIV.	52	1	(1 – 7)	1	(1 – 7)	-.677	.256
I am less likely than the average person to get HIV	52	4	(1 – 7)	4	(1 – 7)	-.410	.345
If I had HIV, I know I would get the support I need.	53	6	(1 – 7)	7	(1 – 7)	-3.183	<.001*
Early testing will help me protect others from infection.	52	7	(1 – 7)	7	(5 – 7)	-3.170	<.001*
If I am feeling healthy, I don't need to get an HIV test.	52	2	(1 – 7)	1	(1 – 7)	-1.422	.081
I don't want to get tested… I am worried about the result.	53	1	(1 – 7)	1	(1 – 7)	-.352	.370
Easy to get an HIV test at a time that is convenient...	53	6	(1 – 7)	7	(1 – 7)	-2.172	.014*

** Binomial distribution used; Mdn = median, range = lowest and highest scores provided by the participants.*

Table 5 Pre-Post Comparisons for General Health Status and Quality of Life

Question		Before		After			
	N	*Median*	*Range*	*Median*	*Range*	*Z*	*p*
General Health Status	60	2	(1 – 5)	2	(1 – 5)	-.182	.434
Quality of Life	53	7	(1 – 10)	8	(1 – 10)	-2.220	.013*

** Binomial distribution used; Mdn = median, range = lowest and highest scores provided by the participants.*

Table 6 Participant Evaluation of the Intervention

Item	N	Median (Range)
I was happy to receive HIV information on my mobile phone	52	7 (1 – 7)
I read all of the messages.	53	7 (1 – 7)
I found the messages easy to understand.	53	7 (1 – 7)
I found the messages personally relevant.	52	5.5 (1 – 7)
I found the messages contained the right amount of information	53	7 (1 – 7)
I discussed the information in the messages with others.	53	4 (1 – 7)
Text messages are a useful way of encouraging HIV testing.	53	7 (1 – 7)

Note: Mdn = median, range = lowest and highest scores provided by the participants.