Putting Prevention in Their Pockets: Developing Mobile Phone-Based HIV Interventions for Black Men Who Have Sex with Men

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Abstract

Young black men who have sex with men (MSM) bear a disproportionate burden of HIV. Rapid expansion of mobile technologies, including smartphone applications (apps), provides a unique opportunity for outreach and tailored health messaging. We collected electronic daily journals and conducted surveys and focus groups with 22 black MSM (age 18–30) at three sites in North Carolina to inform the development of a mobile phone-based intervention. Qualitative data was analyzed thematically using NVivo. Half of the sample earned under $11,000 annually. All participants owned smartphones and had unlimited texting and many had unlimited data plans. Phones were integral to participants' lives and were a primary means of Internet access. Communication was primarily through text messaging and Internet (on-line chatting, social networking sites) rather than calls. Apps were used daily for entertainment, information, productivity, and social networking. Half of participants used their phones to find sex partners; over half used phones to find health information. For an HIV-related app, participants requested user-friendly content about test site locators, sexually transmitted diseases, symptom evaluation, drug and alcohol risk, safe sex, sexuality and relationships, gay-friendly health providers, and connection to other gay/HIV-positive men. For young black MSM in this qualitative study, mobile technologies were a widely used, acceptable means for HIV intervention. Future research is needed to measure patterns and preferences of mobile technology use among broader samples.

Introduction

In the United States (US), young black men who have sex with men (MSM) continue to experience a disproportionate burden of HIV infection and other sexually transmitted diseases (STD).[1–4] Among black MSM, the prevalence of HIV is estimated at 28%, as compared to 16% among White MSM.[5] From 2006 to 2009, black MSM aged 13–29 were the only risk group with continued significant increases in new HIV infections.[6] Despite this larger disease burden, MSM who are under age 25, black, or have low income are less likely to be aware that they are HIV-infected.[5,7] These disparities persist in care, as black HIV-positive individuals have less linkage to care, retention in care, and use of and adherence to antiretroviral therapy.[3,7] Numerous factors contribute to these disparities for young black MSM, including high rates of unprotected anal intercourse, substance use, multiple partners, exchange sex, high rates of emotional and psychological distress/depression, history of suicide attempts, younger sexual debut, issues of stigma and other challenges associated with being racial, ethnic and sexual minorities, and limited access to care due to lack of insurance, economic instability, and distrust of the health care system.[8–10]

Eliminating these disparities and reversing HIV epidemic trends will require innovative combination prevention approaches to reduce high-risk behaviors, expand HIV testing, and increase linkage and retention in care.[11] Mobile phones have been successfully used within HIV/STD prevention and care initiatives,[12–14] including promoting prevention messages,[15] facilitating test result notification,[16,17] and improving

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HIV medication adherence and attendance at clinic appointments.[18–23] To date, phone-based HIV interventions have primarily utilized voice or text messaging (SMS) functions.[14,20,24,25] Smartphones may further facilitate the delivery of more complex, interactive, and tailored interventions via the mobile web[26] and software applications (apps).[27]

Among US adults, non-Hispanic blacks are more likely than Whites to own a smartphone (47% vs. 42%).[28] Gay and bisexual men have even higher rates of smartphone ownership, with US estimates ranging between 71% and 91%,[29,30] where young gay men (<35 years of age) have higher smartphone ownership than older gay men.[30] While black US residents are less likely to have home Internet access, they are equally active users of the mobile web via phones or other handheld devices.[31] In this way, the digital divide between black and White diminishes when mobile devices are taken into account.[31] The potentially high ownership of mobile phones among black MSM provides a promising platform for delivering engaging HIV/STD prevention messages to this hard-to-reach population, especially those who may not typically access in-person or group interventions.

The nascent field of mobile technology health intervention (m-health) development requires in-depth research among target populations in order to select optimal delivery methods, dose, and content. For example, different types of apps vary in development and operation (Table 1). Native apps are computer programs developed for specific mobile platforms (e.g., iPhone, Android) that capitalize on a phone's existing features and do not require Internet connectivity. Alternatively, mobile web apps provide users a portal to websites and can operate on any phone platform. Hybrid apps operate as native apps but are created using web technologies (e.g., HTML, JavaScript), which allow them to utilize the phone's features and be compatible across multiple phone platforms. Each type of app has strengths and drawbacks (Table 1); as such, the overall goals of an intervention should guide the choice of the most appropriate mode of delivery. Consumer research including patterns of phone ownership and use, desired functionality of the app or website, and unmet needs is a critical component in this development process.

HealthMpowerment.org is a web-based intervention that has been developed in response to the need for comprehensive, innovative HIV/STD prevention and care approaches for young black MSM.[26,32] HealthMpowerment utilizes social marketing theory[33,34] by conducting product utilization and promotion research with a segmented, target audience (young black MSM). In preparation for a full randomized controlled trial, to date, HealthMpowerment has undergone an iterative process of development, testing, evaluation, and revision with young black MSM in North Carolina through six focus groups, 81 in-depth interviews, and one pilot field study. In the pilot study, a number of participants' requested the ability to access the HealthMpowerment website from their mobile device.[26,32] Requests for greater mobile access from the pilot study and widespread ownership of smartphones among youth, black US consumers, and MSM suggest that a well-designed mobile website or app for young black MSM has the potential to reach a marginalized, high-risk segment of the population in a creative and novel way. This study initiated the second round of formative research (focus groups 4 through 6) to understand patterns of mobile phone, mobile web and app use among young black MSM to inform the further tailoring of the HealthMpowerment intervention and the development of a mobile phone component.

Methods

Recruitment

From December 2011 to January 2012, we conducted focus groups at three sites in North Carolina (one urban and two suburban) with young black MSM (age 18–30 years) about their use of mobile technologies. The age eligibility criterion for this study was chosen to recruit a specific segment of young black MSM who face the highest burden of continued new HIV infections in the US.[1–4]

We used targeted sampling to recruit participants across a range of locations. Study advertisements were posted in an infectious disease clinic, health departments and other testing facilities, coffee shops, libraries, gyms, college campuses, and on-line through Craigslist and Black Gay Chat (BGC). Interested persons were screened by phone using six inclusion criteria: (1) age 18–30; (2) born biologically male; (3) self-identify as black or African American; (4) currently reside in North Carolina; (5) self-report sex with another man in their lifetime; and (6) currently use any mobile device to text, browse the Internet, *or* use phone apps. Eligible interested participants were then scheduled for a focus group based on their preference and geographic location.

For this formative research we chose not to exclude men based on recent sexual activity (e.g., sex within the past *n* months) or sex with women in order to better understand the range and variety in mobile phone use among young black MSM. All study recruitment materials included a field-tested graphic that features full-body silhouettes of two men holding hands and the questions: "Are you a black man between the ages of 18 and 30? Have you ever had sex with another man?" (Supplementary Document A; Supplementary data are available online at www.liebertpub.com/apc). With these recruitment procedures, we achieved a sample of men who reported a variety of sexual risk behaviors with *men only* and with *both men and women* (see Results section).

Electronic-journal

For 7 days prior to the focus group discussion, participants were asked to complete a brief electronic journal (e-journal) recording their mobile technology use. Each participant chose

Table 1. Types of Mobile Phone Applications

| Characteristic | Type of application | | |
	Native	Mobile web	Hybrid
Uses phone's capabilities	√		√
Compatible across mobile platforms		√	√
Requires internet access		√	√
Available in app stores	√		√
Requires third-party approval	√		*
Development cost	$$$	$	$$

√, includes or requires; *requires third-party approval if sold in app stores; $, low cost; $$, moderate cost; $$$, high cost.

to receive either one daily e-mail or one daily text message with five multiple choice questions regarding the number of texts they sent/received, and the amount of time they spent talking on the phone, browsing the Internet, on social networking sites, and on sexual networking sites. One additional open-ended question asked participants what apps they had used that day. E-journal responses were required to be completed within 24 h of receipt. Five participants were recruited less than 7 days prior to their scheduled focus groups and were given the option to complete the e-journal during the week following their focus group. E-journal response rates were similar between those who completed journal entries before and after their focus group (96% vs. 100%).

Demographic and phone use survey

Participants completed a paper-based survey immediately preceding the focus group. This survey collected basic demographic information, as well as details regarding mobile phone technology (e.g., phone make, model, platform, and data plan) and use (e.g., average number of texts sent per day, hours spent on-line and on the phone per day, length of time with current phone number, number of phone service interruptions). The survey also included questions about using mobile technology to find sex partners and access health information.

Focus groups

Focus groups lasted approximately 90 minutes, consisted of between six and nine participants each, and were held in private spaces in the local community (one library and two community centers). These locations were not explicitly identified as LGBT (lesbian-gay-bisexual-transgender) spaces and participants were given a choice among three cities for the focus groups for convenience and anonymity. After obtaining informed consent from each participant, a trained facilitator led the focus group while a second facilitator took notes and recorded nonverbal cues. Facilitators were white females, trained in the use of qualitative methods for public health research, including conducting consumer research and focus group facilitation. All study team members who interacted with participants (study recruitment, informed consent, focus group facilitators) had extensive experience working with LGBT, youth, HIV-positive persons, and specifically young, black MSM in North Carolina. The team member who conducted study recruitment, screening, and scheduling was present at all focus group sessions to greet participants and continue to build rapport. Principles of mutual respect, privacy, and voluntary sharing of information were emphasized during the one-on-one informed consent process and within the larger group at the start of the discussion.

Prior to the start of the focus group, participants chose a pseudonym to protect their privacy within the group. We use these pseudonyms and participants' ages when presenting quotes from their discussions. The focus groups were conducted with a primary set of discussion questions designed to understand daily use and feature preferences of mobile phones, websites, and apps. Focus groups began with less-sensitive questions about phone features and preferences before opening up the discussion to more sensitive topics about health and the local gay community. These questions were designed based on the primary components of social marketing including audience analysis, channel analysis and product development.[33] Focus groups were digitally recorded and transcribed by members of the research team. Each transcript was checked by two people and discrepancies resolved against the original recording. Study participants received a $50 gift card for attending the focus group and an additional $25 gift card if they completed at least five out of seven e-journal entries.

Data analysis

E-journal and demographic survey data were analyzed using Microsoft Excel. Qualitative data were analyzed using a data reduction process based on directed content analysis[35] whereby we began with the predetermined questions that were used to design the focus group guide. Each transcript was first reviewed by four research team members who created a coding scheme based on predetermined questions and identified emergent themes. Two team members then coded each transcript. Coded quotes were then chosen by group consensus to illustrate the variation and most common responses within each theme. The findings are organized into five sections as follows:

Section 1: "I'm really on my phone for every single thing I do": mobile phones integral to men's lives

Section 2: "I rarely use my laptop": mobile phones are a primary means to access the Internet

Section 3: "Texting is talking": how men use mobile phones to communicate

Section 4: Desired content and features for HIV-related apps

Section 5: Additional logistical considerations for app design
- Requirements and preferences for mobile phone apps
- Confidentiality concerns and requests for monitoring

The number of focus groups needed to reach thematic saturation was estimated based on a high level of homogeneity of technology use previously documented within this target population and the focused nature of our research questions around mobile phone utilization.[32,36] The study protocol remained open to convene additional focus groups if thematic saturation was not reached following preliminary analysis of the first three transcripts. Evidence of sufficient thematic saturation for the purposes of this study was established by the consistency of themes in participants' discussions across the first three focus groups, pre-focus group surveys, and daily journal responses. We also analyzed app-use data and found a core group of 12 apps reported in each focus group. An additional 33 similar apps were reported in two out of three of the focus groups. Twenty-one further apps were found in only one focus group each with the number of apps unique to one focus group declining from the first through third focus group.

This study was approved by the Institutional Review Board of the University of North Carolina at Chapel Hill.

Results

Focus group demographics

Thirty men were initially screened, resulting in 26 young, black MSM who were eligible to participate in the study. Four

out of 26 men did not attend their scheduled focus group, resulting in three focus groups conducted with a total of 22 men. Sixteen out of 22 of participants completed all seven daily e-journal responses and all men completed the pre-focus group survey. Sociodemographic findings from the e-journals and pre-survey are presented in Table 2 and used throughout the article to frame the qualitative findings in the context of the overall sample characteristics.

Twelve out of 26 screened men reported sex with men only, 14 reported sex with both men and women. Among these 14 screened men who reported sex with both men and women, 11 attended the focus group, 5 of whom reported using mobile MSM Internet sites to find male sex partners (Adam4Adam, Black Gay Chat, Grindr, Jack'd). The mean age among participants was 24 years, and half earned less than $11,000 per year (Table 2). Although smartphone ownership was *not* an inclusion criterion, all participants had smart-

TABLE 2. DEMOGRAPHIC AND MOBILE PHONE USE
CHARACTERISTICS OF BLACK MSM IN THREE CITIES
IN NORTH CAROLINA

	No (%) N = 22	
Mean age (SD)	24 (3.0)	
Income		
<10,999	11	(50.0)
11,000–20,999	6	(27.3)
21,000–30,999	2	(9.1)
31,000–40,999	0	(0.0)
41,000–50,999	1	(4.5)
≥51,000	0	(0.0)
Prefer not to answer	2	(9.1)
Phone platform		
Android	15	(68.2)
Windows Mobile	3	(13.6)
Apple	2	(9.1)
Blackberry	2	(9.1)
Means typically access the Internet		
Mobile phone	6	(27.3)
Laptop	8	(36.4)
Mobile phone and laptop equally	8	(36.4)
Use apps on phone on daily basis		
Yes	18	(81.8)
No	1	(4.5)
Did not respond	3	(13.6)
Average number of texts sent on a daily basis		
0–9	1	(4.5)
10–49	7	(31.8)
50–99	5	(22.7)
≥100	8	(36.4)
Did not respond	1	(4.5)
Use phone to find sex partners	11	(50.0)
Use phone to search for health information	14	(63.6)
Use health/fitness related "app" on phone	2	(9.1)
Mean time owned current phone	2.7 years	
In last 6 months had phone disconnected		
Yes	3	(13.6)
No	16	(72.7)
Did not respond	3	(13.6)
Mean number of phone numbers in past 6 months (SD)	1.2 (0.4)	

phones, with 15 out of 22 using Android platforms. Participants had maintained their current phone numbers for an average of 2.7 years with a range from 4 months to 10.5 years. Only three out of 22 participants reported an interruption in phone service in the past 6 months. All men had phone plans with unlimited text messaging, and many also had unlimited data use. Thirteen out of 20 men sent more than 50 text messages a day and 18 out of 19 used at least one mobile phone app daily.

Section 1: "I'm really on my phone for every single thing I do": mobile phones integral to men's lives

Mobile phones were used as primary means of socializing, finding information, and completing activities of daily life. Participants described using mobile phone apps and the mobile web for a range of purposes (Table 3):

I use my phone pretty much for everything—social networking…Yes, I check my banking, YouTube….To talk, text, and surf the Internet. (Shay, age 26)

I use my phone for everything…I used googlemaps to get here… ⋆ *Everything! Apps, mobile web, anything it can do, I'm using it…I'm really on my phone for every single thing I do…I'm ALWAYS on my phone. Anytime somebody contact me—if it's on Facebook, Twitter—I'M ON MY PHONE.* (Shawn, age 23)

Well, some of the apps I got a journal 'cause I like to write and I do Facebook and Fandango for movies, and, Facebook chat, and then I got a flashlight. I got games. I got my horoscope. I got my e-mail. I got this picture vault where I can lock my pictures in and stuff like that. I got YouTube. (Oobi, age 21)

As mentioned above, many participants used gaming apps, navigational apps, and music related apps:

I do know that usually like a GPS thing comes with the phone now, they already automatically come with them. But gotta have games, like especially if I'm at work and I'm bored, I'll play games, gotta have games. Of course I have Twitter, Facebook, I have a Bible app (group murmurs approval), *music app…*(Wendell, age 23)

I have Pandora [music app]*, Gasbuddy, that really comes in handy—like if you're just somewhere and you need some gas it tells you where the cheap gas is—and I use that all the time—and I have a lot of games, googlemaps.* (Edward, age 21)

Men's mobile phones were an integral part of their social lives. Whether to find a date, meet friends, or keep up with the news, all men used their mobile phones on a daily basis to access and contribute to social and/or sexual networking apps and web sites. As one participant exclaimed, "I couldn't DARE check my Facebook once a month! They'd think I was dead or something! (laughter) I'm constantly posting status updates" (Shawn, age 23). Half of participants had used their phones to find sex partners (as self-reported on the pre-focus group survey, as well as discussed during the focus groups). These included regular use of sexual networking apps and websites such as Adam for Adam (A4A), Black Gay Chat (BGC), Grindr, and Jack'd. Through these sites and apps men could create a user profile, chat, share media files (pictures, videos) and use navigational features to locate other men nearby who are seeking similar social and sexual partnerships. The following quotes are typical of men's responses:

Um, I do (pause) *use my phone also to find a date. Um, I ain't ashamed about it* (everyone laughs)—*basically to be social with other people.* (Star, age 25)

Table 3. Mobile Phone Applications Used by Black MSM in North Carolina

APP store category	APPs used by participants
Social networking	Facebook, Facebook chat, GoChat for Facebook, Twitter, Video chat (Tango, Oovoo, Skype), Voxer (Walkie-talkie), Yahoo/Yahoo messenger, Blackberry messenger
Sexual networking	Adam for Adam (A4A), Black Gay Chat (BGC), Grindr, Jack'd, Facebook
Games	Memory games, brain games, Scatterbrain, Spades, Scrabble, Cross Court Tennis, Solitaire, Bejeweled, Angry Birds, chess
Productivity	E-mail, mobile banking, note taking, journaling
Utilities	Flashlight, alarms, anti-virus, bar code scanner, calendar, security/password managers (Pinnacle Locker, The Locker)
Entertainment	Music (Shazam, Pandora, Music Paradise, MP3 download app, Opera), video (Netflix, YouTube, Xtube, Xvideo), Picture Vault
Navigation	Google, Googlemap, GPS
Shopping	Paypal, E-bay, Craigslist mobile
Miscellaneous	Bible, Sleep-as-an-Droid, Gas buddy, weather apps, daily horoscope, mood scanner, TV remote

I use my phone for going on a lot of social sites: Facebook, A4A, BGC and, uh, yeah, I use it to talk and text, everything! (laughs). (B, age 24)

In regards to what websites I have accessed, I've done Yahoo. I've done YouTube. I've done Facebook, Twitter, I do porno sites on my phone, and I've also done BGC, A4A, and I used to have an app called Jack'd as well. (Brad, age 22)

One man described how he also used the social networking site Facebook to monitor and screen friends and potential partners:

Facebook has turned into a virtual screening process. If you just, you look, oh, well you want to be my friend, ok, let me look at your page. Ok, who do you know? Who do we both know? Ok, oh no, see—un-uh—I can't even add you because I know this person and the only reason they still on my list is so that I can watch what they're doing! (Poet, age 24)

This man went on to describe how he actively watches his friends' and friends-of-friends' Facebook pages so that he can remove them from his contacts when he finds examples of sexually explicit text or images that they have publicly posted.

Section 2: "I rarely use my laptop": mobile phones are a primary means to access the Internet

All men used their mobile phones to access the Internet and more than half of the sample used their phones as their primary means for going on-line or used a phone as often as a laptop to go on-line (pre-focus group survey). Even men who owned laptop computers also regularly accessed the Internet through their mobile phones:

Shay: *I don't use my laptop hardly at all. Hardly ever.*
Facilitator: *So your phone is your main way of being on the Internet?*
Shay: *Pretty much.* (Shay, age 26)
Star: *I rarely use my laptop. The only thing I use my laptop for is to basically back-up information for my phone!* (Star, age 25)

In addition to the convenience of using a phone's GPS features (described in Section 1), a number of men noted a preference for the simplicity or convenience of going on-line via mobile phones regardless of where they were:

Oobi: *Most of the time I use my phone* [to go on-line]*'cause I'm lazy.* (group laughter) *To get in a laptop you've gotta, like, log in and all this extra stuff and the phone is right there.* (Oobi, age 21)

Facilitator: *Is* [the phone] *your main way of being on-line?*
Shawn: *Yeah, most of the time, cause I don't like carrying my laptop everywhere, so most of the time, I'm on my phone…I could be sitting right beside my laptop and I'm on my phone.* (laughter) *I just don't like to do all-this, all-this* (mimics typing on a keyboard with two hands). *I hate doing all that.* (Shawn, age 23)

In explaining the popularity of using mobile phones to access the Internet, one man summarized the advanced capabilities of phones as follows:

A lot of phones nowadays operate like a laptop…you can't really distinguish what would look better or work better because phones are on 4G service now. So it's like that! (finger snap) *downloading like that…Especially if you do have an EVo-or Galaxy S2 or something like that—you have those big screens…That's why I got to say most of the time, I'm on my phone. Everything I can do on my phone, I can do on my laptop. Everything on my laptop, I can do on my phone. It's literally the same thing.* (Shawn, age 23)

This explanation was demonstrated through the extensive functions men used on their phones as described in Section 1 where these devices were used for everything from banking to sexual networking.

In contrast, a few men preferred to use laptops for school or work, and to process larger amounts of information:

Typically I'm on my laptop because I need it as a student at [—-] so I'll just get on my laptop cause I'll have it for classes and everything…most of the time I'm on my laptop as a main source of Internet, but like backup is my phone in case I get an emergency e-mail and it's for a quick response. (CJ, age 21)

The sort of usability of my phone—like it's great if I need to find something out really quickly. But in terms of like if I need to sit down and do some work or if I really need to research something about whatever topic it could be, then I'm gonna use my laptop. (Andre, age 28)

The only time I use my laptop is if I'm really researching something or really want to see something really bad. (Oobi, age 21)

Importantly, men who reported preferring laptops for these activities did not necessarily use their phones less than other participants as they all still reported daily texting, app use, and mobile phone Internet use (pre-focus group survey).

Section 3: "Texting is talking": how men use mobile phones to communicate

In general, participants infrequently used their phones to make traditional calls. Instead, the most common ways of communicating by phone were through text messaging or via the Internet by text and chat apps (e.g., Oovoo, Tango, Skype), or text postings to social networking websites (e.g., Twitter, Facebook):

> *I text a lot. I'd rather text than talk.* (Peanut, age 21)

> *I don't do as much calling as I used to. But texting, Twitter, Facebook, those are the three main things that I use…I use the phone mainly for my family and my job. That's basically it. I mean, for friends too, but, shoot, texting's just, it just seems like the main option!* (Wendell, age 23)

> *I don't call cause I have a 400 a month minute* [phone plan]. *I usually just wait til after 7 if I need to call somebody. But I usually just text people.* (CJ, age 21)

All 22 men in this study had phone plans that included unlimited texting and they confirmed that within their social circles, those without unlimited texting were the exception rather than the rule:

> *Shawn: I think everybody has unlimited texting. EVERYBODY.* (group laughter and agreement)
> *Andre: Actually, I have one friend who doesn't and they complain about it* (group laughter)—*all the time.*
> *Facilitator: It's good to know from this group that that seems to be a real consensus that most people have it.*
> *Shawn: Texting is talking. It's how you talk.* (group head nodding and "yup", "um-hmm")
> (Shawn, age 23; Andre, age 28)

Focus groups did not explore distinctions between choosing phone plans in order to have unlimited texting versus how phone plan limitations shaped texting/calling behaviors. Regardless of this directionality, the end result was constant communication through text messaging and on-line text posts.

Of note, two people disliked text messaging:

> *I might be in the minority—I'm sure I'm in the minority. I hate text messaging. I always have. I do it because everyone else does.* (group laughter) *And it's just the way that people communicate but it's actually to me, it's an annoyance…because what I can say to you in like 10 seconds takes me like 10 messages to go back and forth…but it's just something that I do because everyone else does.* (Andre, age 28)

> *I hate texting!* (Shay, age 26)

Despite this preference, these men still viewed texting as a primary means of communication and both men reported sending text messages daily (pre-focus group survey). Additional details regarding men's preferences for apps with texting components are provided in Results Section 5.

Section 4: Desired content and features for HIV-related apps

Only two participants had used health or fitness related apps, although more than half had used their phones to search for health information online:

> *I do have one* [app], *uh, it's a medical, like a medical terminology type blog or whatever where you can go in and read information and post and stuff, but that's about it.* (Brad, age 22)

> *Facilitator: Let's say you want to find out more* [health] *information…where do you go for that information?*

> *Cortez: Google.*
> *James: Google.* (Apollo, Max, JJ, D nod heads)
> *Poet: WebMD app*
> *James: WebMD*
> *Apollo: Definitely*
> (Cortez, age 28; James, age 28; Max, age 28; JJ, age 26; D, age 22; Poet, age 24; Apollo, age 24)

As described above, and noted in the pre-focus group survey, the most commonly mentioned websites used to search for health information were *Google* and *WebMD*. While many participants had used their phones or computers to search for health information on-line, some men expressed frustration at sifting through large numbers of webpages or amounts of text to find what they were looking for. In the following example, one man described his experience in trying to find an HIV testing site:

> *And just the testing sites, the information about locations and times that they operate and things like that just need to be a little more clear. 'Cause last month, actually, I had a friend who wanted to go get tested…and really it took almost an hour to find a testing site….it really was a challenge. And I was there with them, you know, trying, and I feel like I'm intelligent enough to navigate when you doing online searching….The information just wasn't there…I mean it was crazy…you just thinking in this day and age dealing with this epidemic that the information would be at a finger touch—as soon as you type in "test" it'll just pull up all the testing sites and times.* (James, age 28)

When asked about their preferences for a health related app or mobile website for gay men, men emphasized the importance of information that was simply presented, easy to find, and efficient to use:

> *I like apps that are fast paced. Something that gets you right to what you're trying to look for. And also something that you can see well—like if you want to press a button, it's not too small…Something that's easy to use.* (Wendell, age 23)

> *Like just clicking on certain things of what you want—just like on the WebMD app…like you say exactly this is my symptoms or duh-da-da-da. The same thing with* [this new] *app—not just saying obviously for diseases and stuff, I'm saying like for everything…just put in, you have the different parts that you want and then it automatically uses your location…all you do is just click, "testing center", "Would you like to use your location?" Bam, bam, bam…and it's very user friendly—it gets the job done.* (JJ, age 26)

For some men, simplicity meant minimizing the amount of text presented. Large amounts of text were described as challenging and discouraging:

> *I would just say that the biggest thing is just "keep it simple"…cause especially the sites that are concerning any kind of health care information—sometimes it's just literally like reading an encyclopedia. And you don't want to go through with it. You click on the page and all you see is a whole bunch of words and you're like, "Ok, I don't even want to read that…I don't even want to bother" Because it just already looks too challenging.* (Poet, age 24)

> *I would say just* [not] *too much text in whatever you're sending out because for me it's just really hard to read a whole bunch of words on a really small screen.* (True K, age 30)

Each of these examples describes a different drawback of large amounts of text. In the first, the *amount* of information is overwhelming to the patient, whereas in the second, the participant has physical and logistical difficulties viewing excessive text on his mobile device.

TABLE 4. REQUESTED HIV/STD CONTENT AREAS FOR A TAILORED MOBILE PHONE INTERVENTION
FOR YOUNG BLACK MEN WHO HAVE SEX WITH MEN IN NORTH CAROLINA

Requested content area	Sample quotations from focus group participants
Information about STDs and HIV testing	(1) *One of the things that I think really needs to be talked about are STDs and really tying STD infection into risk for HIV…Like I watch porn. And some of the porn that I've seen lately -folks got HPV you know, a bunch of different STDs and it's like "nothing is wrong with that"….so really kind of educating people more about STDs and their risk and particularly tying it to HIV as well and what it looks like –you see those pictures on the websites and it's like a really nasty case of herpes, or a really nasty case of genital warts or what-have-you but to really sort of talk to people about what it looks like when it first starts…And so we can really begin to educate people about more things than just HIV - So I would think the STDs and other health topics in general.* (Andre, age 28)
	(2) *Let you know where to go for testing…I feel like would be more helpful to people.* (Apollo, age 24)
	(3) *And just the testing sites, the information about locations and times that they operate and things like that just need to be a little more clear.* (James, age 28)
Drug and alcohol use	(4) *Um, another thing that you could add to the website is—um—let everybody to be knowledgeable about drug use. Because drug use tends to play a major part in STDs and different things like that* (Star, age 25)
	(5) *Most of the time when you're on drugs, or when you're intoxicated–you have no sense of decision—like decision making is just all out-of-whack so it's just like "ok, yeah, this feels good, I'm just gonna keep doing it - but I'm not gonna put a condom on…I'm torn up and it feels good, so I'm gonna keep doing it."* (Shawn, age 23)
	(6) *Not just* [information] *for sexually transmitted diseases, but for people that suffer from drug abuse and people that may have been, you know had issues as a child and different things like that. Cause you really don't have an avenue to look for that type of stuff.* (James, age 28)
Safer sex	(7) *Once you leave school, it's like okay, the whole thing about safe sex, you're supposed to take it with you, you're supposed to know it. But how many of us do actually practice it? (Max and Poet nod their heads in agreement)…And if you don't know what's going on and you may have questions…So that would be something that's good to put on the website.* (Cortez, age 28)
	(8) *…everything like how to use a condom, even when fingering somebody, the whole finger condom, just everything completely.* (Apollo, age 24)
Sexuality and relationships	(9) *Unfortunately with HIV it's like you know—"condom, condom, condom, use a condom, stop sleeping around, condom, condom, condom". But it's not talking about why am I not using a condom? Or why do I feel the need to have these multiple partners because they made me feel good or whatever…or I gotta pay my rent or whatever. Those are the things that I think sometimes are missing from HIV prevention work and health related things in general.* (Andre, age 28)
	(10) *I think really the thing that keeps us separate is the sexual stuff, like most of the time when you want to talk to someone that's gay they only want to do sexual stuff and if it's not about that then they don't want to talk to you (group mumbling and nodding in agreement).* (Lamar, age 20)
	(11) *Coming out stories will probably be a good one.* (B, age 24)
Resources for gay-friendly providers	(12) *I think if there was, like, something on* [the website], *you know, something that says this doctor here is gay-friendly, transgender-friendly, what-have-you.* (James, age 28)
	(13) *Is there ever going to be a time where, such as, like, maybe a small group wants to have a discussion with the physician?* (Brad, age 22, asking about chatting with a gay-friendly physician on-line)
Support groups and groups for positive men	(14) *I think having a section on that site just to find out who has* [HIV] *and who doesn't just so people can actually go there and have somebody to talk to who has issues with the same thing…to have a section for people that whether negative or positive or whatever it is you got—gonorrhea, syphilis, chlamydia, I mean, that's just a discussion that y'all can have…like "hey watch out for this, watch out for that". Cause I noticed that BGC, A4A, Jack'd, they don't have any of that stuff up there.* (Brad, age 22)
	(15) *I think the virtual option* [support groups] *would be awesome because sometimes you have people who, they're not outgoing so they're not "Well, I would love to bounce off of people but I don't really want nobody all up in my business"* (Poet, age 24)
	(16) *It would also help the support groups that are already available to also kind of possibly tap in to becoming associated and affiliated with this one website (Poet: Mm-hm) so it could continue to bring the community together.* (JJ, age 26; Poet, age 24)

When asked about content preferences for an HIV/STD related mobile website or app for black gay men, participants provided a range of requests and suggestions including information about STD symptoms and HIV testing, drug and alcohol use, safe sex, sexuality and relationships, resources for gay-friendly providers, and support groups to connect to other gay/HIV-positive men. Sample quotes illustrating each of these requested content areas are presented in Table 4 and briefly summarized below.

In the focus group discussions, men not only described what intervention features they wanted to see and use, but also explained why they wanted these features as well as where they saw a lack among currently available options for black gay men. For example, Andre notes the need for pictures and information about the early signs of STDs to supplement the currently available images of "really nasty cases" (Table 4, quote 1). Similarly, Brad requested connections to support groups for other HIV/STD positive men, saying, "I noticed that BGC, A4A, Jack'd, they don't have any of that stuff up there" (Table 4, quote 14). Cortez pointed out a lack of reinforcement of messages about safe sex "once you leave school", noting that, "you're supposed to take it with you", but questioning the reality of this in practice (Table 4, quote 7).

The selected quotes in Table 4 also illustrate men's interest in broader areas which they viewed as connected to HIV/STD risk. For example, Star requested information about drug use, explaining that it "plays a major part in STDs" (Table 4, quote 4). A number of men described challenging dynamics around sex and sexuality among black gay men. For some men, the overly focused nature of currently available HIV prevention messages ("condom, condom, condom, use a condom", Table 4, quote 9) masked these dynamics and could even be off-putting. As one participant succinctly stated, "you don't want to have it just focus on, [mimics a monotone voice] 'okay, let's find out the health information, what's the latest HIV information?' Cause no one's gonna use it." (Poet, age 24).

Section 5: Additional logistical considerations for app design

Requirements and preferences for mobile phone apps

We asked men explicitly about the most important features of mobile apps that they liked. As described in many of the passages above, favored apps were described as fast-paced, useful, fun, easy to navigate, user-friendly, having less text, and interactive. Some men received daily messages, or automated alerts or reminders on their phones (e.g., daily horoscope, daily inspirational message, campus alert messages, daily bank account balance reports). Men wanted some control over these and other app features such as the ability to turn off alert signals, set preferences for receiving app-related messages, or edit previous message postings from on-line forums:

If it has an alarm or some sort of reminder set—cause I also use that Sleep As An Droid app…but if you cut the app off, the alarm stays on and so it'll still go off at 9 o'clock every morning…cause it's like set with my phone or something like that. So that if there is some sort of reminder or alarm—make sure that if the app is off that it goes off too. (CJ, age 21)

So we have like some [text] *alert, like when there's any kind of weather emergency on campus. And it actually is quite annoying*

(group laughter)…*one day we literally got seven alerts during the day. And it started at like 5:30 in the morning! So it would be good if you're thinking about those things—to be able to set a certain time when they would come* (group mumbling agreement)…*Or some kind of digest…so they come all in one message* (Andre, age 28).

On mine I actually have an app [that] *associate me with other people or put other people in my contact list and add new people, I guess. I don't know how it does a location thing but it does and I don't have any control over it. Half the time there's people that have been added that I don't know. Other than that, whenever you send messages or post a message to a blog or whatever, sometimes it won't let you go back in and actually edit info, you have to find out how to go back in and I may actually [have to] go to the main website to change the blog.* (Brad, age 22)

Men avoided or deleted apps that did not meet these standards or had other features they found annoying such as charging money after downloading for free, sending frequent updates, crashing/taking too long to load, limiting user control of sounds and features, or using features or buttons that were too small. As Brian, age 21, explained: "The issue is sometimes some of the apps take too long to load. And if it takes too long to load then I don't even want to be bothered with it. Like, I'm not gonna use it, I'm just gonna get rid of it."

Confidentiality concerns and requests for monitoring

Most men were not concerned about the privacy of receiving, accessing, or storing health related information on their phones. Almost all men used locking apps (e.g., pinnacle locker, The Locker):

My phone has like three different codes…you can keep your privacy, and keep all your information hidden. (Star, age 25)

Everything, like I said, I'm linked to everything through my phone. So I have to keep it locked, definitely. Definitely. You'd know all my business! (Shawn, age 23)

While men felt secure in the confidentiality of their phones, most expressed the need for a third party to monitor and guide the content and interaction of a new website geared for gay men:

It [website] *needs to be monitored. It needs to be, I think it definitely needs to be regulated…With a site like this, because you really don't want it to turn into another A4A, BGC, sex thing—it's gonna have to be watched.* (Poet, age 24)

Well you have to monitor that if you do decide to have an event board [on the website]—*because the event board could mean sex parties, drug parties, whatever, you know what I'm saying. So, you gotta be careful.* (Cortez, age 28)

I think that with the website—there's that potential there. But I think there's gonna have to be a sort of a conscientious effort on YOU ALL (focus group facilitators) *to kind of help to facilitate communication between people.* (Andre, age 28)

When asked specifically what kind of monitoring steps should be taken, men suggested establishing ground rules and limiting photo and video content:

I think you should establish a lot of the ground rules and stuff, but I don't think you want to put too many rules and just make the site unpopular. (Lamar, age 20)

Censor pictures that you allow people to put up there! (Shay, age 26)

Cortez: No pictures!
Max: No videos!
(Cortez, age 28; Max, age 28)

As suggested by Poet above, the desire and rationale for monitoring was described in the context of other websites used by gay men—such as BGC and Facebook—that were described as beginning as social networking sites but evolving into more explicitly sexual networking sites:

Because, say for instance, when BGC—I don't know if I was on there when it very first started—but I know I came in some years after—it used to be a very good site. It used to be a site where—the name of it was Black Gay Chat. People chatted! They talked. It was social, it wasn't about sex 24-7 (JJ, age 26)

[On Facebook] *people are becoming a lot more explicit and graphic in their posts, and in their commentary, and in their conversations…it's transitioning into a free-for-all really* (Poet, age 24).

I want Facebook to stop the video stuff- because it's turning into an A4A or BGC. (Max, age 28)

Participants attributed the changes in Facebook to its increased accessibility and a simultaneous reduction in monitoring and regulation.

I remember how Facebook, they used to—if anything explicit came up on there, within 24 hours to 48 hours—it was (snaps fingers) *boom! Your account would be deleted…Now it's just…they're not watching it like they used to.* (JJ, age 26)

I joined Facebook and I think that's the reason why I'm no longer on it the way I used to be, cuz I joined when it was still exclusively for college students… It was "study group, at 10 o'clock in the library." As soon as they opened it up for everybody else, (whispers) *it just went down the drain.* (Poet, age 24)

These concerns that any website designed for gay men would eventually become a sexually focused site prompted men's advice for some sort of external regulation and monitoring.

Discussion

Among this sample of young black MSM, mobile phones were an integral tool in daily life for communicating (talking, texting, on-line chat, video chat, status posts, blogging, etc.), information seeking, entertainment, completing tasks, and social and sexual networking. Many men used their phones to find sex partners as well as health information, making a mobile platform for HIV/STD intervention appropriate and logical. Although owning a smartphone was not a recruitment criterion for this study, all the study participants (who were predominantly low-income) had state of the art smartphones. This finding aligns with recent survey data showing that Americans who earn under $30,000 have a comparable level of smartphone ownership to the national average.[37] Additionally, the high level of ownership of Android platform phones found in our sample mirrors the popularity of Android phones found in national samples where 26% of black cell owners own an Android device compared to 12% of Whites and 16% of Latinos.[37] Men in our sample used a variety of mobile websites and phone apps, presenting a rich environment and opportunity to design mobile interventions. A mobile technology approach could thus capitalize on intervention delivery via a mode and device that is attractive, familiar and regularly used.[38]

This level of familiarity and skill could facilitate intervention adoption and sustainability.

Focus group participants described near constant connection to the Internet throughout the course of their daily activities primarily through their mobile phones. Even among men who had access to laptop computers, phones were often the preferred method for going online. National survey data supports this finding in that Americans who are less likely to have home access to the Internet (lower SES, no college) are more active users of the mobile web.[37] Some men used laptops for processing larger amounts of information, highlighting that intervention-based mobile phone apps may need to be supported by traditional websites depending on an app's content and purpose. Providing both options for mobile HIV/STD interventions could respond to men's requests to have both easily accessible practical tools (e.g., testing site locators and symptom evaluators) and more in-depth information (e.g., dealing with substance use, issues around sexuality and relationships). Utilizing design strategies such as Responsive Web Design[39] could provide one option for addressing this need as this programming approach allows a website to change format to optimize its appearance for whatever device a user is operating. For example, a web-based article viewed on a laptop computer would adjust on a smartphone to present larger sized text in smaller columns with reorganized graphics, rather than simply presenting a proportionally smaller replica of the original article.

The importance of communicating by mobile phone texting emerged as a key finding from this research and supports research conducted among young minority MSM in Los Angeles.[40] The primacy of texting among these young black MSM shows promise for interventions that include an SMS component such as appointment and medication reminders, messages with risk-reduction tips, or ability to interact with a provider. Enhancing a mobile phone app or website with a text messaging component could provide a more interactive and tailored intervention. Critically, men reported wanting to maintain control over the frequency, type, and timing of text messages they received. The regularity of texting among these men also has positive implications for data collection methods. For frequent behaviors, such as the technology use behaviors we assessed, a shorter recall period or ecological momentary assessment (EMA) can provide more accurate data as compared to longer recall periods.[41,42] In this study, we demonstrated the feasibility of collecting near real-time behavioral data from young black MSM through daily pre-focus group electronic journal responses.

Despite the thousands of currently available health apps, only two men were using apps for health-related purposes at the time of the study. A recent systematic review of existing HIV/STD apps (Google Play store and Apple iTunes store) found that these apps were infrequently downloaded and not highly rated. Furthermore, only two out of 55 identified apps were tailored for MSM, suggesting that the few currently available HIV/STD apps have not been optimally designed and promoted for this target audience.[43] While few men had health apps on their phones, the majority had used their phones to find health information online. Men described being overwhelmed by the amount of information and searching required to find what they were looking for and requested easy to understand/find, practical resources around HIV/STDs and testing. Men also expressed interest in a mobile app

that addressed a broader range of content beyond HIV. They asked for information about sexual health risk and substance use, information about safer sex, a forum to discuss sexuality and relationships, resources for gay-friendly service providers, and connection to support groups. Participants' interest in exploring what they viewed as underlying drivers of (risk) behaviors among MSM (e.g., relationship dynamics) suggests that alternative framings of a risk reduction intervention could better facilitate fundamental behavior change, or at least offer a more engaging approach. This broader approach also speaks to the range of health issues facing young MSM including substance use, mental health issues, and economic instability.[8–10]

In many ways, these men are the early adopters and cutting edge users of mobile media. As such, creating attractive programs for them requires attention to what they expect from media, including state of the art technology, speed, engaging content, and apps that meet a need or desire in their lives. Our focus group findings confirm market research that shows apps must be useful and entertaining in order for consumers to keep them on their phones.[44] In general, these men were not concerned about confidentiality issues of having HIV/STD-related content on their phones. Instead, the most consistent request throughout discussions was for external monitoring or facilitation to maintain the focus and appropriate content of an interactive site and prevent devolution of the site into a sexual networking tool. Following participants' requests, for the HealthMpowerment.org intervention we are incorporating interactive app features and components to build social connectedness in a (minimally) moderated on-line environment.

This study has several limitations. The sociodemographic and phone-use numeric descriptors from this sample are not intended to be statistical representations of populations of gay men. While the nature of qualitative data precludes generalizing these findings more broadly to young black MSM, a number of points support the validity of our findings for this particular sample and the plausibility of these findings for other young black MSM. First, we noted both consensus and dissonance within focus group discussions, suggesting that participants felt comfortable enough with each other to voice disagreement. Second, participants voluntarily raised and discussed topics that might be considered sensitive such as sexual behaviors, use of pornography, relationships, drug use, and HIV testing experiences. Third, similar themes emerged across all three focus groups that were held in different locations and drew men from 14 different US postal zip codes. Fourth, our findings follow trends noted in our previous formative work among almost 100 young black MSM in North Carolina[26,32] and among national samples of young black MSM (e.g., use of Internet to find sex partners, SES[45]). Additional focus groups may have yielded previously unmentioned themes, however, we conservatively balance the sustainability of oversampling within this population with the ideal of identifying *all* possible themes. To address this potential limitation, the iterative nature of the HealthMpowerment intervention development allows for continued user feedback and alterations through three more rounds of usability testing and two field trials prior to testing through an RCT.

While this research was conducted among a specific population of young black MSM in North Carolina, many of our findings reflect current trends among the broader population of mobile technology users.[28,37] Mobile phone and mobile web technologies offer promising opportunities for health interventions among young black MSM. The use of these technologies is especially attractive, as it allows targeting services to these men, offering convenient, confidential HIV prevention and care information to a traditionally hard-to-reach population. Programming technology allows for a high level of tailoring and the avoidance of one-size-fits-all health messaging, information, and service provision, which has been a critical component to intervention acceptability in previous technology-based research with MSM[46] and HIV-infected persons.[21] Formative research among the target population from the project's beginning is a critical step in the process of selecting and developing optimal mobile health interventions.

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