How Access to Smartphones Affects HIV Risk among Students in Tanzania

A Case Study of Selected High Schools in the Dar es Salaam Region

Anna Meleiya Mbise, MA, and Gwao Omari Gwao, MSc

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CONTENTS

Tables	vi
Figures	vi
Abbreviations	vii
Executive Summary	1
Background	1
Methods	1
Results	1
Discussion	1
Recommendations	1
Introduction	2
Research Objectives	
Study Setting	5
Selection of Participants	5
Results	7
Students' Access to Smartphones	7
Groups Perceived to Have a High Rate of Smartphone Adoption	
Smartphone Use	
Uses of Smartphones for Noneducational Purposes	
Awareness of Online Pornography	11
Use of Phones to Receive Pornographic Photos and Videos	13
Smartphone Use and the Spread of HIV	
Smartphones and School Performance	14
Recommendations of Respondents	14
Discussion	
Limitations	
Recommendations	17
References	

TABLES

Table 1. Secondary schools involved in data collection	5
Table 2. Sample distribution	5
Table 3. Respondents' demographic characteristics	7
Table 4. Students' awareness of health and educational websites, by type of school attended	9

FIGURES

Figure 1. How students use smartphones	9
Figure 2. Students' use of smartphones for health and education, by sex	10
Figure 3. Social media accounts owned by students, by sex	11
Figure 4. Students' access to pornographic websites, by type of school attended	12
Figure 5. Students' reasons for visiting pornographic websites, by sex	13
Figure 6. Students' assessment of the impact of smartphones on their school performance, by type of school attended	14

ABBREVIATIONS

FGD	focus group discussion
ICT	information and communication technology
NGO	nongovernmental organization
PEPFAR	United States President's Emergency Plan for AIDS Relief
STI	sexually transmitted infection
TCRA	Tanzania Communications Regulatory Authority
UNICEF	United Nations Children's Fund
URT	United Republic of Tanzania
USAID	United States Agency for International Development

EXECUTIVE SUMMARY

Background

Studies show that smartphone adoption by teenagers in Tanzania has increased substantially, and mobile access to the Internet for information, communication, education, and entertainment is pervasive. This study investigated whether the use of smartphones by high-school students in Tanzania raises their awareness of HIV or makes them more vulnerable to its acquisition.

MEASURE Evaluation, funded by the United States President's Emergency Plan for AIDS Relief (PEPFAR) through the United States Agency for International Development (USAID), provided a grant for this study, whose topic aligns with USAID's policy on youth in development (USAID, 2012). Guided by that policy, USAID invests in health and HIV prevention among young people in low- and middle-income countries, because of young people's vulnerability to HIV and their role "as influencers in families and communities, promoting positive behaviour across generations" (USAID, 2012).

Methods

Twelve private and government high schools in Ilala and Kinondoni Municipalities, both day and boarding schools, participated in this study. Data collection entailed qualitative and quantitative methods. Questionnaires were administered to 240 students, ages 17–22 years, and two focus group discussions were facilitated with 28 students. In-depth interviews were conducted with 40 stakeholders, including district education officials, teachers, and education and health officials from non-governmental organizations (NGOs) and parents of high schoolers. In addition, secondary data were collected through a document review.

Results

Eighty-two percent of the high school students we interviewed (more day students than boarders) owned or had access to a smartphone. Older boys and girls (those 18–24 years old) and young girls (those 14–17 years old) who lived in urban centres had a higher rate of smartphone adoption than those who lived in semiurban and rural areas. Although respondents mentioned that a smartphone could be used to improve academic performance and health, many students in fact used their smartphones for purposes other than education or health. Interview responses from teachers and officials in education and other NGOs suggested that even most teachers were not aware of specific education and health websites. Connecting through social media was one of the most common uses of smartphones among the students surveyed, as was viewing pornography. Two-thirds of the students (70%) stated that they had accessed pornographic videos and photos on their phones.

Discussion

Eighty-eight percent of students both in day and boarding schools, boys and girls, believed that smartphone use can help increase awareness about HIV and improve academic performance. However, 43 percent of the students used smartphones to search for materials that are not related to either health or education, which renders their smartphone use less beneficial to them and puts them at greater risk of contracting HIV.

Recommendations

Although no one recommended doing away with smartphone technology—given its growth and potential benefits—respondents recommended that the Tanzania Communications Regulatory Authority (TCRA) and other arms of the Government of Tanzania educate the public on the proper use of smartphones. Those surveyed thought that parents and guardians should monitor their children's smartphone use; parents, teachers, and community members should restrict the use of smartphones among students under 18 years of age; and youth should be taught the proper use of technologies, including smartphones.

INTRODUCTION

Smartphones are becoming indispensable in everyday life and offer a substantial variety of mobile applications for information, communication, education, and entertainment. These include mobile Internet access, media players, digital cameras, and global positioning system-based navigation (Haug, et al., 2015).

Studies show that smartphone adoption among teenagers has increased substantially, and mobile access to the Internet is pervasive. For example, 95 percent of 12- to 17-year-old American teenagers go online, and 75 percent have a mobile phone, a percentage that has been consistent since 2006 (Lenhart, et al., 2010). Like those in many other Western countries, nearly all 12- to 19-year-old adolescents (98%) in Switzerland own a mobile phone, most of which (97%) are smartphones (Haug, et al., 2015). The nature of teenagers' Internet use has transformed dramatically during the past decade, from stationary desktop connections in the home to constant mobile connections. In many ways, teenagers represent the leading edge of mobile connectivity, and the patterns of their technology use often signal future changes in the adult population (Mary, 2013).

There are around 1.8 billion young people, ages 10–24, representing over a quarter (27%) of the world's population, and studies have noted that these young people are vulnerable, when it comes to sexual risk. Sexually transmitted infections (STIs), including HIV and other reproductive health problems, are one of the threats to the well-being of adolescents and youth around the world (Haug, et al., 2015). Globally, one-third of the 340 million new cases of STIs that are diagnosed annually occur in people younger than 25. Each year, more than one in every 20 adolescents contracts a curable STI, and studies report that more than half of all new HIV infections occur in people between the ages of 15 and 24 (Mulu, Yimer, & Abera, 2014).

Studies by Rosen indicate that school grades suffer when too much time is spent on social media, because valuable study time is lost (Victor, 2013). Rosen's 15-minute observation of middle-school, high school, and college students during study time revealed that students who checked Facebook once during the 15-minute study time had lower test grades (Victor, 2013). Negative psychological effects could result from spending too much time on social media sites. Constantly being connected to technology can also seriously impact a teenager's and young adult's education.

Empirical studies also suggest that Internet addiction, like other addictive behaviours, has a negative effect on many aspects of a person's life: academics, sexual behaviour and relationships, and physical and mental health. Increased smartphone and Internet use among students, especially viewing or sharing pornographic content via social media platforms, may negatively change sexual behaviour, thereby increasing students' risk of acquiring HIV (Young, 1998).

Smartphones have the potential to facilitate both constructive and destructive behaviours, related to adolescents' sexual and reproductive health. According to research by Fox and Druggan (2012), 9 percent of mobile phone owners (15% of 18- to 29-year-olds) have downloaded applications to help them manage their health, for uses such as counting calories, logging fitness workouts, providing health tips, and keeping personal health records. Those with a wireless device or mobile Internet phone are more likely to use the Internet to gather and share information and engage in health-related social media, such as posting health-related comments and reviews online (Fox, 2010).

Young people in low- and middle-income countries are especially vulnerable to HIV, as well as to other health risks such as early pregnancy and poor nutrition. They also play an important role in families and communities, as influencers who can promote positive behaviour across generations (USAID, 2012). For these reasons, understanding what facilitates good and bad health decisions by young people is an important step in designing effective interventions to improve the health of people at all ages.

In Tanzania, as elsewhere, many young people—especially young women—are vulnerable to HIV (Tanzania Commission for AIDS, Zanzibar AIDS Commission, National Bureau of Statistics, Office of the Chief Government Statistician, & ICF International, 2013). Nearly three percent (2.7%) of 15- to 24-year-old females are HIV-positive, compared with 1.2 percent of males of the same age.

Smartphone technology has been used to address HIV and AIDS-related problems and promote healthful behaviour through educational games, motivational materials, and videos.

Mobile phones are a particularly attractive platform to encourage behaviour change, because of their wide adoption, portability, and technical capabilities. Mobile phones can be used to deliver motivational messages, support, and information, and they can record information related to diet or physical activity, in real time. Many mobile health interventions sought to improve health outcomes, ranging from relatively simple, short message service appointment and medication reminders to more complex interventions, incorporating body sensor networks (King & Mobasheri, 2014). Digital technologies allow young people to engage in typical activities—such as chatting, flirting, and dating—in new ways (Kachur, et al., 2015). These technologies also give young people anonymous avenues to seeking health information and, particularly, sexual health information (Lenhart, et al., 2010).

Tanzania, like many other developing countries, enthusiastically welcomes mobile technology, and the Ministry of Education and Vocational Training has developed an information and communication technology (ICT) policy to guide the integration of ICT in basic education. The policy covers preprimary, primary, secondary, and teacher education, as well as informal and adult education. It is guided by the objectives of general education policies and relevant national development policies, including the Tanzania National ICT Policy of 2007. However, information about how this policy has been implemented in Tanzanian educational institutions, especially secondary schools, is insufficient.

African adolescents have not been left out of this trend toward smartphone adoption. In South Africa, adolescents and young people are the first adopters of mobile technology, and nearly three-quarters (72%) of 15- to 24-year-olds have a cell phone (United Nations Children's Fund [UNICEF], 2012). A study by Neumann shows that, in Tanzania, smartphone penetration has rapidly increased in the last few years, particularly in cities and among youth who currently attend, or have recently completed, a program of higher education (2015). According to an article in the *All Africa* Tanzania Daily News, the smartphone market in Africa has been growing 19 percent annually, and an increase in the availability of cheap smartphones is expected to continue this growth (Tambwe, December 21, 2014). Although digital technology is the source of many innovations in health, including health education, smartphone and Internet use remain relatively new fields of study in developing countries. Despite many benefits that have been associated with smartphone use and digital technology, in general, improper use of these technologies may contribute to the spread of HIV.

Little research has been done to explore how smartphone use among 15- to 24-year-old secondary school students affects their health and academic performance, even though most smartphone users in Tanzania are in this age group. Owing to increased use of smartphone among youth in Tanzania, Jerusha (T) Limited, funded by USAID, conducted a study to fill the knowledge gap on access to smartphones and the technology's influence on the spread of HIV among youth that was conducted between February 2016 and February 2017. This study aimed to fill the knowledge gap on access to smartphones and the technology's influence on the spread of HIV among youth. Although the youth population in this study involved only students enrolled in secondary schools, we believe the findings may be transferable to the overall youth population.

Research Objectives

This study had the following objectives:

- Investigate whether there is a difference in the rate of smartphone adoption between male and female students, younger and older students, and day and boarding students.
- Investigate whether students' use of smartphones raises their awareness of HIV or makes them more likely to contract HIV.
- Provide recommendations on youth smartphone use in the context of the spread of HIV.

This study investigated the following research hypotheses:

- Hypothesis 1: There are differences in the rates of smartphone adoption between male and female, younger and older, and day and boarding students.
- Hypothesis 2: Smartphone use among students makes them more likely to acquire HIV. This effect outweighs any protective influence this technology may have based on its ability to disseminate health information.
- 3 Student Smartphone Access and HIV in Tanzania

- Hypothesis 3: Students access online pornography more frequently than they do educational and health-related sites.
- Hypothesis 4: Smartphone use among students improves health knowledge, particularly related to HIV prevention, which reduces students' risk of contracting HIV.

METHODS

Study Setting

This study was conducted in Kinondoni and Ilala districts of Dar es Salaam Region, from February 2016 to February 2017. These districts were purposefully chosen based on the presence of relevant institutions and organizations—i.e., both private and government schools, health and education NGOs, and phone companies. Because Kinondoni District has only private high schools, and because we wanted to capture information from both types of schools, we considered it important to include Ilala District, which has both private and public schools. Between the two districts a total of 12 private and government high schools were randomly selected for data collection.

School	District	Funding	Type of school
Feza Girls High School	Kinondoni	Private	Boarding only
Makongo High School	Kinondoni	Private	Day and boarding
Loyola High School	Kinondoni	Private	Day and boarding
Alfa High School	Kinondoni	Private	Day and boarding
Mbezi Beach High School	Kinondoni	Private	Day and boarding
Tegeta High School	Kinondoni	Private	Day and boarding
Jangwani High School	llala	Public	Day and boarding
Benjamini Mkapa High School	llala	Public	Day and boarding
Azania High School	llala	Public	Day and boarding
Pugu High School	llala	Public	Day and boarding
Zanaki High School	llala	Public	Day and boarding
Tambaza High School	llala	Public	Day and boarding

Source: Field data, April 2016

Selection of Participants

Three hundred and eight people participated in the study. We randomly selected 268 students from the 12 schools for data collection. All students consented to participate in the study and thought that the research was relevant to them. We selected schools and officials that had relevant characteristics, suited to the key information required for this study.

Table 2. Sample distribution

Category	Units	Number per unit	Total participants
Government high school students	6 schools	20 students	134
Private high school students	6 schools	20 students	134
Academic and disciplinary teachers	12 schools	2 teachers	24
Regional and district education officers	2 districts	2 officers	4
NGO representatives	2 districts	1 per district	2
Parents	2 districts	5 parents	10
TOTAL			308

Source: Field data, April 2016

We used multiple data-collection techniques to gather both qualitative and quantitative information. Indepth interviews were conducted with 40 stakeholders, including district education officials, education and health officials from NGOs, high school teachers, and parents of high school students. Interviews also were an opportunity for the data collectors to probe for more information related to the study. In-depth interviews with teachers, parents, and NGO and education officials investigated smartphone use and relevant HIV issues. Using random selection, researchers administered questionnaires to 10 Form-Five and 10 Form-Six students from each of the 12 schools, for a total of 240 students, and provided clarifications to respondents, when necessary. An additional 28 students participated in two focus group discussions (FGDs), comprising 14 students, each, with a mix of males and females, ages, and boarding and day students. The FGDs helped researchers confirm and clarify information obtained through questionnaires. This process built mutual understanding between the researchers and the respondents. Researchers captured responses given during in-depth interviews and FGDs by taking summary notes, which were thematically coded, by hand.

Jerusha (T) Limited secured a research permit from the Tanzania Commission for Science and Technology. All authorities in all the study areas cleared the study and its protocol. Kinondoni and Ilala district authorities issued letters to the schools chosen for study, explaining the aim of the research and asking for cooperation. Informed consent was granted by interviewees prior to data collection. Each participant was given a unique number, to protect his or her identity.

RESULTS

As indicated in Table 3, most respondents (55%) were 17- to 19-year-old students, followed by 20- to 22year-olds (28%), and 17% were ages 23–24. Although students as young as 16 attended the schools in our sample, no one under the age of 17 was included in the random sampling. Almost three-quarters of the parents and officials were 30 to 40 years old. The study sampled females and males in almost equal numbers, but had slightly more female than male respondents because two of the schools randomly sampled were female-only. Most student respondents were from Form 6 (62%), and the remaining students were from Form 5.

Respondent characteristics	Categories	Number of respondents
Students' age (years)	17–19 years of age	169
	20–22 years of age	87
	23–24 years of age	12
Parents' and officials' age (years)	30-40 years of age	29
	41–50 years of age	11
Students' current educational	Form-5 students	102
levels	Form-6 students	166
Students' sex	Male	124
	Female	144
Parents' and officials' sex	Male	24
	Female	16

Source: Field data, April 2016

Students' Access to Smartphones

Most of the students questioned (82%) reported owning or having access to a smartphone. When disaggregated by type of school, 80 percent of the boarding students and 84 percent of day students owned or had access to a smartphone. Day students may have greater access to smartphones compared to boarding students, because, though schools restrict the use of phones on campus, day school students are free to use their phones after school hours. Although all schools reported having strict policies restricting the use of phones in school, students from both boarding and day schools secretly used their phones in school. Sometimes students were caught and suspended or otherwise punished.

Our study found no difference in smartphone access between private and government students, because students in both types of school reported the same high rate of smartphone access. Parents believed that private-school students were more likely to have smartphones, because they thought that the families of these students could more easily afford to buy phones for their children. The teachers claimed that 90 percent of well-off parents buy smartphones for their children, whether the children attend a government or private school. Therefore, teachers thought parents and teachers should work together to help students use their smartphones in a constructive manner.

Sex disaggregation revealed that more boys than girls used smartphones, with 84 percent of the boys and 79 percent of the girls reporting access. Access to smartphones was similar among grades, with 83 percent of Form-5 students and 81 percent of Form-6 students having access to smartphones. When students were asked who bought or gave them the smartphone they use, most (90%) responded that they got their phones from their parents and relatives; some got them from friends (6%); and the rest bought them with their own pocket money (4%).

The largest segments of student smartphone owners were boys, male and female students in Form 5, and male and female day students.

7 Student Smartphone Access and HIV in Tanzania

Researchers were interested in future smartphone access and ownership among those who did not currently have access. Almost half (48%) responded that they planned to own a smartphone, and 52 percent had no plans to own a smartphone. The primary reasons given for not planning to own a smartphone were their cost and perceived lack of importance.

Groups Perceived to Have a High Rate of Smartphone Adoption

The study sought to investigate whether there is a difference in the rate of smartphone adoption between

- Male and female students
- Younger and older students (17- to 19-year-olds and those 20 years old and older)
- Day and boarding students
- Private and government students

Although all schools involved in this study were urban, students were asked about differences they perceived in smartphone adoption between rural and urban students, male and female students, younger and older students, day and boarding students, and private and public students.

Sixty percent (160) of the student respondents reported that they believe older male students from urban areas have the highest rate of smartphone adoption. About three-quarters (77%) of student respondents reported that both younger and older female students from urban areas have a high rate of smartphone adoption. The reason for these assumptions was access to resources. Respondents explained that older boys have their own money to buy smartphones, because in urban centres they have opportunities to work, even as students. Respondents said that although young and old female students from urban areas typically cannot afford to buy a smartphone on their own, some may obtain one from a sugar daddy—an older man who lavishes gifts on a young woman in return for her company or sexual favours.

In-depth interviews with teachers and other officials echoed the belief that older males and females from urban centres are more likely to have access to or own smartphones, as illustrated in the following quotes:

A big number of elder and young female students have smartphones; they get them from boyfriends and parents. Urban male students, as well semi-urban ones, own or have access to smartphones, to some extent, but not as urban female students. Because most boys don't care about having smartphones, any phone is ok for them. The young male and female students from semi-urban and rural areas also have less access to smartphones, because they don't have boyfriends to chat with. (Teacher, Makongo High School)

There is a big difference between the youth from urban areas and the youth from the countryside, male and female youth, and their ages in smartphone adoption. In urban centres, smartphone access and ownership is high, because it is easy for one to get money or use friends' smartphones, as the majority has smartphones, compared to those from the countryside. Females aged 18–24 have more access, as they get smartphones as gifts from their male lovers or boyfriends, compared to their fellow males, who cannot get smartphones from their girlfriends. Those at age of 14 to 17 sometimes have access, but most time uses parents' and friends' phones; while those with the same age in the countryside, sometimes they don't have any access. (Teacher, Loyola High School)

Smartphone Use

Students who own or have access to smartphones were asked what they mostly do, or search, whenever they have access to a smart phone. Figure 1 summarizes their responses.





Source: Field data, February 2016

As this figure shows, most students interviewed (43%) said they primarily use their smartphones to search for reading materials that may or may not be related to coursework. More than a quarter (27%) said they searched for pornography videos and photos, 15 percent chatted with friends on social media, 10 percent played games and searched for news, 5 percent listened to music, one person read religious texts, and one person never used a smartphone. Students did not mention using smartphones for other common purposes: to take photos, call or text friends or family, search for videos (non-pornographic), or look up information unrelated to health and education.

Boarding/day students	Do you know the names of specific websites where students can learn about different educational and health issues?				
	Yes		Yes No		
	Number	Percentage	Number	Percentage	
Boarding students	39	46	46	54	
Day students	67	50	67	50	
Total	106	49	113	52	

Table 4. Students	' awareness of health	n and educational w	vebsites, by type	of school attended
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Source: Field data, April 2016

According to the findings shown in Table 4, more day students (50%) than boarding students (46%) knew about specific education and health websites. Even though about half of all students claimed they knew the names of some of these websites, they could not name any, when asked. Students mentioned Google and YouTube as websites they used to search for health information (such as information about malaria and HIV), without realizing these are instead search engines, not websites. Though students were aware that health and education websites exist, students from Azania High School were the only ones who consistently mentioned specific websites—*Shule Direct* (School Direct) and *Shule Zetu* (Our Schools)—that they used for academic matters.

Students were less aware of health and education websites than of social media and pornography websites. Interviews with teachers and other education and NGO officials indicated that even teachers were unaware of specific education and health websites.

I don't know about any education or health website. This is because students do not use their phones to search for educational and health issues. (Teacher, Tegeta High School)

I don't know. In fact, many students do not use smartphones for educational and health issues. Instead, they use them to chat with their different friends and share love stories. (Teacher, Mbezi Beach High School)

Students normally use Google to search materials; I don't know anything else they use. And this is only for the most serious students; others do not search anything academic. (Teacher, Feza Girls High School)

Many students don't go to sites with educational materials—example, they use Google as a dictionary, searching for meaning of difficult terms, not for getting wider knowledge. Here in school, we have three computer labs with Internet. We realized that 90 percent of students use computers to access noneducation materials, so we decided to disconnect them from the Internet. (Teacher, Alpha High School)

Frankly speaking, I don't know those websites, although I have a smartphone, and I am sure many of us don't know. I normally come across health and education issues on the Internet by chance, since there is no special websites for those information. (Female FGD participant, Mbezi High School)

Figure 2. Students' use of smartphones for health benefits, by sex



Source: Field data, April 2016

Students were asked to give examples of how, if at all, they used their smartphones for health benefits. As Figure 2 shows, nearly a quarter of students said smartphones helped them learn about transmission and prevention of diseases, such as HIV, and more than half said they used the phones for information about "body wellness." Fewer than 10 percent of students thought smartphones offered no benefits for health or education.

Uses of Smartphones for Noneducational Purposes

Students were asked to list all the social media sites where they have an account. As Figure 3 highlights, 88 percent of the students interviewed have several social media accounts—i.e., Facebook, YouTube, Snapchat, Jamii Forum, Instagram, Bible Chat, and Skype. Only 12 percent of the students reported having no social media account. More boys (58%) than girls had WhatsApp and Instagram accounts. However, girls had more social media accounts than boys. Many of the students interviewed (65%) reported spending

a lot of time chatting with friends, reading messages, and reading news feeds on their phones. Slightly more girls (18%) than boys (17%) said they used their smartphones to find lovers, boyfriends, or girlfriends. Finding sexual partners online is not unique to students. The Nelson Mandela Bay study found that 40 percent of students had met someone in person after having chatted online, and 30 percent of students reported meeting a stranger in person who differed significantly from what the student anticipated. According to 2010 news reports in South Africa, a 15-year-old girl was drugged and raped by a 27-year-old man she met on Mxit. In 2011, a similar case involved the rape of a 20-year-old woman by three men.





Source: Field data, April 2016

Awareness of Online Pornography

Seventy-one percent of all students reported being aware of online pornography, and boys (70%) were more than twice as aware as girls (30%). Those who reported being aware said that they knew that pornography is available on Facebook and Instagram and that videos of sexual intercourse can be easily searched via Google. Some respondents said that their friends told them about these photos and videos, but others said they discovered pornographic media on their own.



Figure 4. Students' access to pornographic websites, by type of school attended

Source: Field data, April 2016

When students were asked if they had used their smartphones to access pornographic videos and photos, most students stated that they had done so, as shown in Figure 4. More day students (70%) than boarding students (64%) reported having accessed online pornography, according to the findings. Though most schools restrict the use of smartphones in school, teachers reported that, among the few smartphones that had been taken from students, most were found to contain pornographic content, particularly those belonging to boys.

There have been many cases, what they do with phones depends with a student. Some do normal chatting, others sexual issues and relationship issues, others share and receive pornography pictures. Ninety-nine percent of the phones which have been caught do not show any chatting between relatives, but friends and lovers. Ninety-nine percent of the male phones caught had pornography photos. (Teacher, Alpha High School)

The following responses provide more insight about this phenomenon:

No. But the phones we have caught have porn photos and videos, so obviously they share and receive from friends. (Teacher, Tambaza High School)

Not sharing or watching, but most of their smartphones have porn pictures and videos—i.e., most smartphones that we have confiscated had porn videos and porn photos. We happened to suspend a female student with a smartphone with porn videos, and then her mother (who is a very influential person in the country) come to school and told us the phone was hers; her daughter took it to school without her consent. Then we showed her the videos it contained; habahahaaa, she said, no, this is not my smartphone and she was so much shocked. With my experience as a discipline master in this school, and with the phones I have collected, most female students watch porn videos, and this will stimulate them into doing unsafe sex. (Teacher, Loyola Secondary School)



Figure 5. Students' reasons for visiting pornographic websites, by sex

Source: Field data, April 2016

Students who said they used their smartphones to search for pornographic videos and photos were asked about their intentions. As Figure 5 shows, most (45 %) did so for sexual satisfaction, about a third (35%) to improve sexual skills, and a fifth (20%) out of curiosity to see if pornographic videos and photos are real. More girls (50%) than boys (23%) accessed pornographic content to improve their sex skills. More boys (49%) than girls (41%) visited pornographic videos to get sexual satisfaction, and three times more boys (28%) than girls (9%) searched for pornographic content out of curiosity.

Use of Phones to Receive Pornographic Photos and Videos

When students were asked if they had received pornographic videos and photos on their smartphones from friends and unknown senders, more than half (57%) responded affirmatively. More boarding-school students (60%) than day-school students (55%) said they had received such videos and photos, and more girls (58%) than boys (56%) said they had done so.

Smartphone Use and the Spread of HIV

We asked students if they thought smartphones improved their awareness of how to protect themselves against HIV or if the phones made them more vulnerable to acquiring HIV. Most respondents (88%) believed that smartphones could make them more vulnerable to contracting HIV. Those who linked smartphone use with HIV vulnerability gave several reasons for the increased risk. They stated that watching pornographic videos excited them and increased their interest in sex. These respondents also said that some students engage in sexual activities to obtain a smartphone, because they could not afford one otherwise. Some respondents said they believed that smartphones make it is easier for young people to connect with others in social networks, including sexual partners.

The respondents who said smartphones do not increase their likelihood of acquiring HIV (13%) indicated that smartphones can provide access to educational videos, photos, and other information about disease transmission and prevention, including information about HIV. Teachers, parents, and education and NGO officials added that smartphones can help only if the users are well-educated and willing to practice proper smartphone use.

To be more precise, I can say these smartphones accelerate youth into catching diseases than being aware of protecting themselves. This is because they are connected to big networks than when they have no access to smartphones. In 1990, when I was a secondary school student, no student had access to any phone; we could only write letters. Letters had no big harm, because you could get the feedback after some months, and the teachers could read your letters before they are issued to you; but today, a girl may meet a boy, exchange phone numbers, and next day they have sex, without knowing each other in detail. (Teacher, Alpha High School)

Smartphones are real good, as they have eased communication. For good students, smartphones can contribute more in improving their school performance and getting useful information about their health and about how to plan a good future. The issue is that smartphones are very tempting; one has to be smart enough to manage using smartphone properly. I know most of us students use smartphones to strengthen our relationships or getting more girlfriends and boyfriends. This days, if you want a girl, it may only take a day or two to get her and probably become lovers. (Male FGD participant, Pugu High School)

Smartphones and School Performance

Students were asked if their smartphones had improved their academic performance. Figure 6 shows that most students believed that their smartphone had had a positive impact.





Source: Field data, April 2016

During in-depth interviews, most teachers, parents, and other officials confirmed that smartphone access can improve students' school performance, because students can search for reading materials for their academic courses on their phones. Few thought smartphone access, because of the time spent on noneducational searches and chats, could lead to poor academic performance.

Recommendations of Respondents

Nearly one-third of the students (31%) suggested that parents and guardians should monitor their children's smartphone use. An additional 18 percent believe that the government should provide guidance on appropriate smartphone use, including age recommendations for smartphone access. Smartphone use should be restricted for those younger than 18 (15%). Thirty percent of students believed that the Tanzania

Communications Regulatory Authority (TCRA) should educate smartphone users. Students also thought that parents, teachers, and community members should restrict the use of smartphones among students and young people (5%). Finally, they also thought the price of smartphones should increase, thereby making them too expensive for students to afford (1%).

The majority (70%) of teachers, parents, education officials, and officials with education and health NGOs interviewed said it is impossible to restrict smartphone use among youth. Rather, they expressed the need for youth to be taught the proper use of technologies, including smartphones.

It is difficult to restrict the use of smartphones and technology among youth, but they have to be educated about proper use of technologies, including smartphones. Even adults lack education about proper use of smartphones. Children have to be taught how to make proper use of technology, from their tender age, so that they grow with that knowledge. Teachers, government officials, and parents need to guide youth on how to use phones for benefits. (Teacher, Makongo High School)

Parents should play a big role in educating their children on the proper use of phones, because most of the time they use smartphone, they are at home. (Parent, Kinondoni District)

No way you can restrict youth from using smartphones, because this is a globalized world; if you restrict him or her, they will always have access, because everyone now has these phones, and they are becoming cheap. The best way is to give them education about the effects of improper use of smartphones to their health and life in general. Parents and teachers should seriously give reproductive health education to the youth, as it is lacking. (NGO official)

The remaining (30%) of teachers, parents, and education and health officials that we interviewed said that students should be restricted from using smartphones, as indicated in the quotes below:

Secondary school students should be restricted from smartphones, because they are still young, and their level of awareness on what to search and what time is very low. They should only be allowed to use smartphones when they join colleges and universities, because, at that time, they are matured enough. (Parent, Ilala District)

Education policy should not allow smartphone access to secondary students, in order to improve academic performances, because, with their age, they cannot balance studies with the use of smartphones. Also, smartphones are expensive. Buying Internet bundles also increase expenses; therefore, the government should consult with parents to see how better this can be achieved. (Education official, Ilala District)

DISCUSSION

Our first study question was whether there is a difference in the rate of smartphone adoption between male and female students, younger and older students, and day and boarding students. We found no differences in smartphone access between private and government students, and students in both types of school reported the same high rate of smartphone access. However, a higher percentage of day students than boarding-school students own or have access to smartphones. Form-5 students recorded a higher percentage of smartphone access and ownership than did Form-6 students.

When looking at the differences between male and female students, we found that boys have a higher rate of access to smartphones than girls do. However, findings indicated that some girls engaged in sexual relationships with older men to obtain a smartphone. This confirms previous research findings in sub – Saharan countries, where a study by Save the Children (2014) shows that a substantial and growing body of evidence identifies the demand for mobile phones as being among the key drivers for young girls in low-income countries to engage in sex with older men. The same study added that, in many countries in sub-Saharan Africa, elevated HIV rates among young women 15 to 24 years old has been attributed to age disparate sexual relationships between young girls and older men.

Our second question was whether students' use of smartphones helps raise their awareness of HIV or makes them more vulnerable to acquiring the virus. Most respondents believed that smartphones can make students and young people more vulnerable to acquiring HIV. Respondents gave the following reasons for the increased risk: watching pornographic videos is exciting and increases their interest in sex; some students engage in sexual activities to obtain a smartphone, because they cannot afford to buy one on their own; and smartphones facilitate connection with others in a young person's social network, including sexual partners. Those few student respondents who said that smartphones do not increase their vulnerability to HIV said that the phones can help them access educational videos, photos, and other information about disease transmission and prevention. Although 43 percent of students use smartphones to search for reading materials, 70 percent of students reported accessing pornographic videos and photos. A study by Mahapatra & Saggurti demonstrated that exposure to pornographic videos is associated with HIV risk behaviours among migrants; those exposed to pornographic videos were more likely than others to engage in behaviours that may increase their risk of acquiring HIV (2014). Another study, from Tamil Nadu, India, demonstrated that exposure to pornographic materials is a significant predictor of STIs among migrant hotel workers. Therefore, students who are exposed to pornographic videos are more likely to engage in behaviours that may increase their risk of acquiring HIV. The findings of this study are in line with previous global studies that associated the use of smartphones with increased risk of youth acquiring HIV and other STIs. However, other studies show a great potential for smartphones to benefit students, by acting as a resource to improve academic performance and improve their sexual and reproductive health while reducing health risks through education, interventions, and provision of resources.

Our third question was what recommendations students, teachers, parents, researchers, and health and education officials might offer for smartphone use by students in the context of the spread of HIV. Recommendations of students and adults aligned in many ways. Both highly recommended that parents and guardians monitor their children's smartphone use and that more education be given to the youth about the use of technology, including smartphones. Few adults thought that students should be totally restricted from smartphone use, but students thought smartphones should be made too expensive for students to afford.

Limitations

Ideally, our sample would have included high schools outside of Dar es Salaam region, but because of budget constraints, this was not possible. Although we believe the schools that were randomly selected for the study included a representative sample of students, we recommend conducting this study in other regions of Tanzania to see if the findings can be replicated.

Recommendations

Given the increasing use and reach of mobile technologies, government ministries, NGOs, and phone companies should consider if and how smartphones can best be incorporated into sexual health education, HIV prevention, and school academic improvement efforts.

The general population in Tanzania should be educated about the use of new technologies, especially smartphones, because we observed that neither young people nor adults were maximizing the benefits of smartphone use. Finally, more studies are needed related to health and smartphone use, not only among youth, but also among adults, in Tanzania.

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