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Research Note

Information Communication Technology (ICT) use among PLHIV in China: A promising but underutilized venue for HIV prevention and care

Yao Zhang[a,*], Xiaoming Li[a], Shan Qiao[a], Yuejiao Zhou[b], Zhiyong Shen[b]

[a] Department of Health Promotion, Education, and Behavior, South Carolina SmartState Center for Healthcare Quality (CHQ), Arnold School of Public Health, University of South Carolina, Columbia, SC 29208, USA
[b] Guangxi Center for Disease Control and Prevention, Nanning, People's Republic of China

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ABSTRACT

In this paper, we report the use of information and communication technology (ICT) among people living with HIV (PLHIV) in Guangxi, China. A total 2987 participants were recruited from 12 sites with the highest number of cumulative HIV incidence, including 2 cities and 10 counties. A questionnaire survey was conducted to collect data on the participants' social demographic characteristics, clinical outcomes, infections and coinfections, pattern of ICT use, and use and intention of using ICT in HIV and AIDS management. The data was analyzed using SPSS, version 24. The results showed 78.7% (n = 2347) never used a computer, 86.9% (n = 2587) had a cellphone, 32.7% (n = 207) owned an email account, and 85.4% (n = 544) owned a social media account. Less than half of the participants reported ever using ICTs for HIV management. Only 26.2% (n = 266) were willing to join a web-based HIV prevention program. Findings of this study suggest that there was an imbalance in the participants' ICT device ownership and choices of media platform. Social media appeared to be a potential platform for health intervention among this group. There was a low penetration of computer use among rural participants and a large disparity between the urban and rural participants, which indicated a need to expand the current infrastructure related to ICTs and increase people's health literacy. Future research also needs to pay attention to security and trustworthiness of the intervention program to better promote ICTs as an efficient and reliable platform for HIV prevention and care.

1. Introduction

The application of Information and Communication technology (ICT) in HIV prevention and treatment has been increasingly examined. ICTs provide people living with HIV (PLHIV) with the possibility of remote access as well as low cost of delivery in reducing the virus transmission and in improving the quality of care (Catalani, Philbrick, Fraser, Mechael, & Israelski, 2013; Muessig, Pike, LeGrand, & Hightow-Weidman, 2013; Zhang & Li, 2017). A substantial body of literature focusing on assessments of efficacy and feasibility of ICT use also indicates that the ICT facilitated intervention has become a promising strategy for a population, which is hard to reach and at high risk of HIV infection (Holloway et al., 2014; Lelutiu-Weinberger et al., 2015; Muessig et al., 2015; Mustanski, Garofalo, Monahan, Gratzer, & Andrews, 2013; Noar, Black, & Pierce, 2009; Roth et al., 2014; Velthoven, Brusamento, Majeed, & Car, 2013; Ybarra & Bull, 2007). Computer-based intervention was widely applied in every key component of HIV prevention and treatment, including diagnosis, medical adherence, risk behavior reduction and sigma elimination (Aronson et al., 2016; Bonar et al., 2014; Festinger, Dugosh, Kurth, & Metzger, 2016; Kurth et al., 2016; Roberto et al., 2007). The use of a computer also plays an indispensable role in improving the access to information and in increasing the patients' level of health literacy in terms of HIV (Jacobs, Caballero, Ownby, & Kane, 2014; Ownby, Waldrop-Valverde, Jacobs, Acevedo, & Caballero, 2013).

There were approximately 501,000 PLHIV in China by the end of 2014 (UNAIDS, 2015) and the disease has been most prevalent among men have sex with men (MSM), injecting drug users (IDU), and female sex workers (FSW) (Hu et al., 2017; Zhang et al., 2013). Research has demonstrated that ICT plays an innovative role in effectively delivering HIV and AIDS prevention campaigns or information targeting on these key populations (Avery, Gang, & Mills, 2014; Cheng et al., 2016; Hu et al., 2017; Huang et al., 2013; Muessig et al., 2015; Shi & Chen, 2014; Zou et al., 2013). In addition to the fact that 92% of the Chinese population own a cellphone and 51.7% having access to the Internet (ITU, 2017a, 2017b), ICT has the penetration to function as a powerful and indispensable venue in promoting HIV prevention and treatment in China. However, although research focusing on HIV prevention

* Corresponding author.
E-mail address: Zhang82@mailbox.sc.edu (Y. Zhang).

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involving ICT progressed rapidly, little evidence has been documented on the ICT use behavior of PLHIV in China. The absence of a good understanding of the use pattern of ICT could possibly limit the utilization, acceptability, and effectiveness of the programs, and moreover, will hinder the future development and scale-up of the interventions. Thus, to provide a better understanding of the potential for application of cutting-edge products and services, the main purpose of this study is to explore the use of ICT among PLHIV, including computer use, and their intention of using ICT in HIV and AIDS prevention and treatment.

2. Method

2.1. Study design

The study used data from a HIV disclosure research project conducted in Guanxi Autonomous Region from October 2012 to August 2013. Guangxi is one of the regions with the fastest growing HIV epidemic in China (Qiao et al., 2016). Participants were randomly selected from 12 sites with the highest number of cumulative HIV seropositive incidence, including 2 cities and 10 counties. A total 3002 HIV patients agreed to participate, of whom 2987 completed the survey.

Data were collected through a questionnaire survey. To assure confidentiality, participants were asked to complete an anonymous questionnaire in private rooms of local CDC or HIV clinics. Eighty percent of the participants chose to complete the questionnaire through an in-person interview, during which trained interviewers read the questions to them and recorded their responses. The remaining 20% completed the survey independently. The survey took about 75–100 minutes. The study protocol was approved by the Institutional Review Boards at Wayne State University in the U.S. and Guangxi Center for Disease Control and Prevention (CDC) in China.

2.2. Measurement

The variables used in this study were social demographic characteristics, clinical outcomes, infections and coinfections, pattern of information and communication technology (ICT) utility, use and the intention of using ICT in HIV and AIDS management.

- The social demographic characteristics included gender, age, years of education, employment status, occupation, marital status, income, residence, ethnicity, ART status, and duration after diagnosis. The employment status contains three response options, which were "do not work", "part-time", and "full-time." Fifteen response options of occupation were provided for the participants to choose from, which were categorized into three groups, farm worker, non-farm worker, and others. The group "other" contains students and the unemployed. Marital status included six options, which were combined into three groups, unmarried/unmarried cohabitation, married/remarried, and divorced/separated/widowed. Participants who lived in cities and counties were categorized as urban residents, while those who lived in towns and villages were labeled as rural residents.
- The clinical outcomes included the most-recent CD4 counts (≤250 cells/mm^3 vs. > 250 cells/mm^3) and viral load (≤200 copies/ml vs. > 200 copies/ml).
- The infections and coinfections included number of family members infected with HIV and concurrent infections in addition to their HIV infection. The coinfection options reflected the participant's health condition regarding the following diseases: HAV, HBV, HCV, TB, Syphilis, Gonorrhea, and Genital Herpes.
- The pattern of ICT use referred to the ownership of computer, cellphone, email account, and social media account, frequency of using ICT devices and social media, and preferences of social media platforms. The social media options included but were not limited to MSN, QQ, Weibo, and Fetion, which were broadly recognized as communication approaches in China.
- The use of ICT in HIV and AIDS management included use of ICT for information related to the HIV infection, contacting health care work via ICT, and contacting other PLHIV. The intention of using ICT in disease management included willingness to participate in a web-based HIV prevention program and willingness to use a website providing support to PLHIV.

2.3. Statistical analysis

Statistical analyses were conducted using the statistical software SPSS, version 24. Descriptive statistics including mean, standard deviation, frequency, percentage were utilized to describe the demographic background of the participants. The Chi-square test or independent *t*-test was used to analyze the differences in demographic features and the pattern of ICT use between male and female participants. The Chi-square test and one way ANOVA were used to explore the demographic correlates of computer use. Data regarding use behavior and intention of ICT use in disease management was analyzed with the Chi-square test and independent *t*-test.

3. Results

3.1. Characteristics of the participants

The characteristics of the 2987 participants are reported in Table 1. In this study, 62.8% (n = 1876) of the participants were male. The average age of the participants was 42.46 ± 12.83, with the average years of education of 6.93 ± 3.00. Three-quarters (74.6%, n = 1939) of the participants were married. The percentages of work status for unemployment, part-time employment, and full-time employment were 26.9% (n = 800), 33.4% (n = 992), and 39.7% (n = 1182), respectively. More than half of the participants (58.8%, n = 1748) were farm workers, and 17% (n = 517) were students or had no occupation. Most of the participants (80.2%, n = 2391) lived in rural areas, and 53.1% (n = 1572) of them with a monthly household income of less than 1000 RMB (~$160). Among the participants, 70.7% were Han (predominant ethnic group in China), and 25.9% (n = 733) were Zhuang (largest ethnic minority group in Guangxi). The average duration since their diagnosis of HIV was 38.72 ± 28.65 months, 72.1% (n = 2146) of them were on ART, 15.7% (n = 469) reported co-infections, and 38.3% (n = 1142) reported other members in their family getting infected with HIV. The most recent medical reports showed that 36.2% (n = 1035) of the participants have a CD4 counts ≤ 250 (cells/mm^3) and 12.2% (n = 200) have a viral load > 200 (copies/ml).

3.2. Gender difference in sample characteristics

Compared to the female group, the male participants were older in age (44.21 ± 12.90 vs. 39.50 ± 12.16, p = 0.004), had longer terms of education (7.08 ± 2.88 vs. 6.80 ± 3.19, p < 0.001), had a higher proportion of rural residence (82.4% vs. 76.4%, p < 0.001), were of Han ethnicity (73.5% vs. 66%, p < 0.001), and were with co-infection (18.3% vs. 11.3%, p < 0.001). A higher proportion of female participants reported being employed (75.9% vs. 71.5%, p = 0.012), being married (83% vs. 70.1%, p < 0.001), on ART (74.9% vs. 70.4%, p = 0.009), with family member infected of HIV (53.6% vs. 29.1%, p < 0.001), and having a longer duration of diagnosis (38.94 ± 27.06 vs. 38.58 ± 29.56, p = 0.003). In addition, a higher proportion of female participants reported CD4 > 250 (cells/mm^3) (72.8% vs. 58.4%, p < 0.001) than the male participants. No gender difference was found in terms of occupation, family income, or viral load (all p > 0.05).

Table 1
Characteristics of the participants.

	Total	Male	Female
N (%)	2987 (100)	1876 (62.8)	1111 (37.2)
Age (mean ± SD)	42.46 ± 12.83	44.21 ± 12.90	39.50 ± 12.16**
Years of education (mean ± SD)	6.97 ± 3.00	7.08 ± 2.88	6.80 ± 3.19***
Employment			
Do not work	800 (26.9)	533 (28.5)	267 (24.1)*
Part-time	992 (33.4)	625 (33.5)	367 (33.2)
Full-time	1182 (39.7)	710 (38)	472 (42.7)
Occupation			
Farm worker	1748 (58.8)	1127 (60.4)	621 (56.1)
Non-farm workers	708 (23.8)	421 (22.5)	287 (25.9)
Others	517 (17.4)	319 (17.1)	198 (17.9)
Marital status			
Unmarried	403 (15.5)	337 (20)	66 (7.2)***
Married	1939 (74.6)	1182 (70.1)	757 (83)
Divorced/separated/widowed	256 (9.9)	167 (9.9)	89 (9.8)
Income/month (RMB)			
0–999	1572 (53.1)	1004 (54.1)	568 (51.5)
1000–1999	870 (29.4)	530 (28.6)	340 (30.9)
2000–2999	334 (11.3)	204 (11)	130 (11.8)
≥3000	182 (6.2)	118 (6.4)	64 (5.8)
Residence location			
Urban	591 (19.8)	329 (17.6)	262 (23.6)***
Rural	2391 (80.2)	1545 (82.4)	846 (76.4)
Ethnicity			
Han	2109 (70.7)	1376 (73.5)	733 (66)***
Zhuang	733 (25.9)	454 (24.3)	319 (28.7)
Others	100 (3.4)	42 (2.2)	58 (5.2)
On ART (Yes)	2146 (72.1)	1316 (70.4)	830 (74.9)**
Time since diagnosis (mean ± SD) (month)	38.72 ± 28.65	38.58 ± 29.56	38.94 ± 27.06**
Any infections in family (Yes)	1142 (38.3)	546 (29.1)	596 (53.6)***
Any co-infection (Yes)	469 (15.7)	344 (18.3)	125 (11.3)***
CD4			
≤250 (cells/mm^3)	1035 (36.2)	741 (41.6)	294 (27.2)***
> 250 (cells/mm^3)	1826 (63.8)	1040 (58.4)	786 (72.8)
Viral load			
≤200 (copies/ml)	1443 (87.8)	847 (86.9)	596 (89.2)
> 200 (copies/ml)	200 (12.2)	128 (13.1)	72 (10.8)

* p < 0.05.
** p < 0.01.
*** p < 0.001.

3.3. Pattern of ICT use

Table 2 provides an overview of the ICT utilization of the participants, 78.7% (n = 2347) never used a computer, 86.9% (n = 2587) had a cellphone, 32.7% (n = 207) owned an email account, and 85.4% (n = 544) owned a social media account. The average spent time online was 8.68 ± 13.28 h per week, and 70.5% (n = 449) of the participants, who used a computer, preferred to do online surfing at home. 61% of the participants reported sending short messages (SMS) via a cellphone, 73.8% never accessed the Internet via a cellphone. More than half (56.5%) of the participants reported using social media at least once a week. The most preferred media to receive information was text messaging (46.7%).

3.4. Gender difference in ICT use

Several variables were significantly different between the two gender groups (Table 2). Compared to the male group, female participants reported a higher proportion of using a computer (25.2% vs. 19%, $p < 0.001$), owing a social media account (92.1% vs. 80.2%, $p < 0.001$), using social media at least once a week (89.9% vs. 76%, $p < 0.001$), sending SMS via a cellphone (68.7% vs. 56.5%, $p < 0.001$), accessing the Internet via a cellphone (32.3% vs. 22.7%, $p < 0.001$), and longer average time spent online (9.65 ± 14.65 vs. 7.93 ± 12.08, $p = 0.003$). In terms of locations of accessing the Internet via computer, the female group was more likely to choose home than the male group (77.1% vs. 65.3%, $p = 0.001$), while a higher proportion of male participants chose the Internet Bar (27.7% vs. 12.9%, $p < 0.001$). No significant difference showed between the groups regarding location of Internet access such as workplace, friend's house or elsewhere. There were no significant differences between the two gender groups on online media preferences except that female participants were more likely to use QQ message than male participants (9.1% vs. 5%, $p < 0.001$)

3.5. Demographic correlates of computer use

Table 3 depicts the association between the use of a computer and the participants' sociodemographic characteristics. Significant differences were observed among different social groups. The group who never used a computer was older than the other groups who used a computer (44.86 ± 12.91 vs. 31.97 ± 6.87, $p < 0.001$), had a shorter term of education (6.42 ± 2.82 vs. 9.73 ± 3.08, $p < 0.001$), and had a shorter duration (in terms of months) since HIV diagnosis (37.82 ± 28.08 vs. 43.90 ± 29.78, $p = 0.013$). Participants who worked full-time, worked in non-farming occupations, lived in an urban

Table 2
Pattern of ICT use.

N (%)	Total 2987 (100)	Male 1876 (62.8)	Female 1111 (37.2)
Frequency of using a computer			
Never	2347 (78.7)	1517 (81)	830 (74.8)***
Less than once/month	91 (3.1)	53 (2.8)	38 (3.4)
A few times/month	153 (5.1)	93 (5)	60 (5.4)
A few times/week	171 (5.7)	100 (5.3)	71 (6.4)
Everyday	220 (7.4)	110 (5.9)	110 (9.9)
Time spending online (hours/week) (mean ± SD)	8.68 ± 13.28	7.93 ± 12.08	9.65 ± 14.65**
Location of online surfing			
Home	449 (70.5)	233 (65.3)	216 (77.1)***
Internet bar	135 (21.2)	99 (27.7)	36 (12.9)***
Workplace	54 (8.5)	31 (8.7)	23 (8.2)
Friend's house or elsewhere	52 (8.2)	28 (7.8)	24 (8.6)
Owning an email account (Yes)	207 (32.7)	121 (34.1)	86 (30.9)
Owning a cellphone (Yes)	2587 (86.9)	1642 (87.9)	945 (85.2)
Owning a social media account (Yes)	544 (85.4)	287 (80.2)	257 (92.1)***
Frequency of using social media			
Never	117 (18.3)	86 (24)	31 (11.1)***
Less than once/week	161 (25.2)	98 (27.4)	63 (22.5)
1–2 times/week	127 (19.9)	66 (18.4)	61 (21.8)
3–4 times/week	84 (13.2)	47 (13.1)	37 (13.2)
Everyday	149 (23.4)	61 (17)	88 (31.4)
Sending SMS via a cellphone			
Never	1007 (39)	713 (43.5)	294 (31.3)***
Sometimes	1169 (45.3)	720 (43.9)	449 (47.8)
Often	352 (13.6)	186 (11.3)	166 (17.7)
Almost everyday	52 (2)	21 (1.3)	31 (3.3)
Surfing online via a cellphone			
Never	1899 (73.8)	1265 (77.3)	634 (67.7)***
Sometimes	374 (14.5)	216 (13.2)	158 (16.9)
Often	196 (7.6)	113 (6.9)	83 (8.9)
Almost everyday	103 (4)	42 (2.6)	61 (6.5)
Preferences obtaining information via online media			
Text message	1384 (46.7)	879 (47.1)	505 (45.9)
Email	95 (3.2)	58 (3.1)	37 (3.4)
QQ Message	194 (6.5)	94 (5)	100 (9.1)***
Weibo	22 (0.7)	13 (0.7)	9(0.8)
Others	342 (11.5)	201 (10.8)	141 (12.8)

** $p < 0.01$.
*** $p < 0.001$.

area, earned an income above 2000 RMB, had no other family members living with HIV, and had co-infection were more likely to use a computer. A lower proportion of married participants used a computer than those who were unmarried or divorced/separated/widowed. Participants with CD4 > 250 (cells/mm3) were more likely to report computer use at least once per month.

3.6. ICT use and intention of ICT use in HIV and AIDS management

The sociodemographic correlates of the participants' use behavior of ICT and intention of ICT use in disease management are displayed in Table 4. Less than half of the participants reported ever using ICT. A few of the sociodemographic variables, such as employment, ethnicity, ART status, CD4 load, and viral load, were not significantly different between those who had ever used ICT and those who had not. The results showed that participants who were female, younger, had longer terms of education, had non-farm occupation, lived in urban area, had a household income above 2000 RMB, had a longer diagnosed history of HIV (45.16 ± 30.76 vs. 35.35 ± 28.28, $p < 0.001$), and had co-infections were more likely to use an ICT. Participants who were married, and had other family members infected with HIV were less likely to use an ICT.

Only 26.2% (n = 266) of the participants were willing to join a web-based HIV prevention program. The intention of joining this program was not significantly different in terms of most of the sociodemographic variables except ethnicity and time since diagnosis. A lower proportion of participants in the Han ethnicity group were willing to participate in a web-based HIV prevention program ($p = 0.025$). Participants with a longer diagnosed history were more inclined to participate in the program (46.06 ± 30.90 vs. 37.15 ± 27.89, $p < 0.001$). Only 17.8% (n = 532) of the participants expressed their willingness to use a supporting website for PLHIV. The intention of using a supporting website was positively associated with years of education and time since diagnosis, but negatively associated with age. Participants who were employed, had a non-farm occupation, lived in urban areas, were in the Zhuang ethnicity group, and had co-infections were more likely to use a supporting website. In addition, a smaller proportion of participants reported the intention to use an ICT among those who were married and had a household income lower than 1000 RMB.

4. Discussion

The purpose of this study was to examine the current use of ICT and the potential of embedding ICT in health management among PLHIV in China. We found significant gender differences in patterns of ICT use. Female participants were more likely and frequently to use an ICT than male participants. Further analysis showed that gender, age, education, employment, occupation, marital status, income, residence, duration of diagnosis of HIV, infections, coinfections and CD4 were closely

Table 3
Sociodemographic correlates of computer use.

	Never	Less than 1 times/months	A few times/months	A few times/week	Everyday
N (%)	2347 (78.7)	91 (3.1)	153 (5.1)	171 (5.7)	220 (7.4)
Gender					
Male	1517 (81)	53 (2.8)	93 (5)	100 (5.3)	110 (5.9)***
Female	830 (74.8)	38 (3.4)	60 (5.4)	71 (6.4)	110 (9.9)
Age (mean ± SD)	44.86 ± 12.91	33.12 ± 7.09	34.85 ± 8.21	34.73 ± 7.75	31.97 ± 6.87***
Years of education (mean ± SD)	6.42 ± 2.82	7.85 ± 1.79	8.67 ± 2.57	9.02 ± 2.70	9.73 ± 3.08***
Employment					
Do not work	631 (79.1)	24 (3)	37 (4.6)	37 (4.6)	69 (8.6)**
Part-time	811 (82)	28 (2.8)	49 (5)	53 (5.4)	48 (4.9)
Full-time	895 (75.7)	39 (3.3)	67 (5.7)	79 (6.7)	102 (8.6)
Occupation					
Farmer	1550 (88.8)	45 (2.6)	60 (3.4)	49 (2.8)	42 (2.4)***
Non-farming worker	423 (60)	30 (4.3)	61 (8.7)	84 (11.9)	107 (15.2)
Others	364 (70.4)	16 (3.1)	32 (6.2)	35 (6.8)	70 (13.5)
Marital status					
Unmarried	246 (61)	20 (5)	37 (9.2)	36 (8.9)	64 (15.9)***
Married	1571 (81.2)	60 (3.1)	84 (4.3)	102 (5.3)	117 (6)
Divorced/separated/widowed	181 (70.7)	8 (3.1)	26 (10.2)	17 (6.6)	24 (9.4)
Income/month (RMB)					
0–999	1313 (83.6)	44 (2.8)	60 (3.8)	66 (4.2)	87 (5.5)***
1000–1999	668 (77)	23 (2.7)	56 (6.5)	60 (6.9)	60 (6.9)
2000–2999	212 (63.5)	19 (5.7)	28 (8.4)	21 (6.3)	54 (16.2)
≥3000	132 (72.5)	5 (2.7)	8 (4.4)	19 (10.4)	18 (9.9)
Resident location					
Urban	314 (53.3)	27 (4.6)	47 (8)	77 (13.1)	124 (21.1)***
Rural	2028 (84.9)	64 (2.7)	106 (4.4)	94 (3.9)	96 (4)
Ethnicity					
Han	1657 (78.8)	64 (3)	97 (4.6)	132 (6.3)	154 (7.3)
Zhuang	610 (78.9)	23 (3)	50 (6.5)	35 (4.5)	55 (7.1)
Others	75 (75)	4 (4)	6 (6)	4 (4)	11 (11)
On ART (Yes)	1710 (79.8)	59 (2.8)	103 (4.8)	117 (5.5)	153 (7.1)
Time since diagnosis (mean ± SD) (month)	37.82 ± 28.08	40.24 ± 31.58	42.01 ± 30.81	40.81 ± 30.71	43.90 ± 29.78*
Any infections in family (Y)	937 (82.3)	30 (2.6)	48 (4.2)	53 (4.7)	71 (6.2)**
Any infections in family (N)	1408 (76.5)	61 (3.3)	105 (5.7)	118 (6.4)	149 (8.1)
Any co-infections (Y)	340 (72.6)	16 (3.4)	35 (7.5)	38 (8.1)	39 (8.3)**
Any co-infections (N)	2007 (79.8)	75 (3)	118 (4.7)	133 (5.3)	181 (7.2)
CD4					
≤250 (cells/mm^3)	836 (80.9)	35 (3.4)	44 (4.3)	58 (5.6)	61 (5.9)*
> 250 (cells/mm^3)	1403 (77)	53 (2.9)	103 (5.7)	108 (5.9)	155 (8.5)
Viral load					
≤200 (copies/ml)	1155 (80.2)	36 (2.5)	67 (4.7)	76 (5.3)	106 (7.4)
> 200 (copies/ml)	155 (77.9)	7 (3.5)	14 (7)	7 (3.5)	16 (8)

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

associated with the participants' frequency of using a computer. Results also indicated that demographic features together with coinfection endorse a strong influence on participants' intention of using a supporting website, but there was not much of an influence on their willingness to participate in an online HIV prevention program. Education, occupation, residence and duration of diagnosis showed strong correlations with ICT use behavior.

We found that there was an imbalance in the participants' ICT device ownership and choice of media platform. The results showed that 78.7% of the participants never used a computer, while 86.9% owned a cellphone, which indicated that the participants were inclined to choose more affordable and portable devices. The fact that the cellphone was primarily used for sending text messages rather than accessing the internet lead to three speculations: first, the cellphone owned by the participants might only have basic features, including calling and text messaging, but did not support internet access; second, the online surfing function of the cellphone was not sufficiently explored as the participants were not fully aware of online information resources that were currently available; and third, the cost of surfing online via cellphone was beyond their budget (e.g., data plan). The results also revealed the diffusion of social media as an emerging approach of communication among this group. More social media accounts were owned by the participants than email accounts, and more than half of the participants accessed social media at least once a week. However, among the diverse online approaches for obtaining information, the text message was the most preferred, while Weibo, as a media platform requiring login to view personal message, was the least favored by the participants. The results indicated that the participants preferred instant and direct communication. The media choice also reflected that the participants were still heavily rely on the basic functions of a cellphone and had not fully leveraged the convenience and variable resources provided by social media. Future research needs to customize the intervention program by considering the devices and information access available to the target group, and closely observe the diffusion of emerging technologies and social media to modify the intervention strategies.

Another issue worth noting was the low penetration of computer use among rural participants. As shown in Table 3, the use of a computer

Table 4
Sociodemographic correlates of behavior and intention of ICT use in HIV and AIDS management.

Sociodemographic Characteristic	Use of ICT in HIV and AIDS management [N (%)]		Intention of joining a web-based HIV prevention program [N (%)]		Intention of using a supporting website for PLHIV [N (%)]	
	Ever	Never	Yes	No	Yes	No
Gender						
Male	417 (22.3)	1456 (77.7)**	149 (41.9)	207 (58.1)	329 (17.6)	1544 (82.4)
Female	293 (26.5)	813 (73.5)	117 (42.2)	160 (57.8)	203 (18.3)	908 (81.7)
Age (mean ± SD)	36.36 ± 9.58	44.31 ± 13.11***	34.44 ± 7.24	32.98 ± 7.80	36.27 ± 8.35	43.79 ± 13.23***
Years of education (mean ± SD)	8.69 ± 2.84	6.44 ± 2.84*	9.32 ± 2.73	8.79 ± 2.78	8.38 ± 2.76	6.67 ± 2.96***
Employment						
No	194 (24.4)	602 (75.6)	64 (38.1)	104 (61.9)	117 (14.6)	683 (85.4)*
Part-time	212 (21.4)	778 (78.6)	84 (47.2)	94 (52.8)	189 (19.1)	803 (80.9)
Full-time	297 (25.2)	883 (74.8)	117 (41.2)	167 (58.8)	220 (18.7)	959 (81.3)
Occupation						
Farm worker	264 (15.1)	1480 (84.9)***	92 (46.9)	104 (53.1)	247 (14.1)	1499 (85.9)***
Non-farm worker	272 (38.5)	435 (61.5)	110 (39)	172 (61)	176 (24.9)	531 (75.1)
Others	167 (32.5)	347 (67.5)	62 (41.1)	89 (58.9)	104 (20.1)	413 (79.9)
Marital status						
Unmarried	141 (35.1)	261 (64.9)***	63 (40.4)	93 (59.6)	108 (26.9)	294 (73.1)***
Married	440 (22.7)	1495 (77.3)	146 (40.1)	218 (59.9)	314 (16.2)	1624 (83.8)
Divorced/separated/widowed	78 (30.6)	177 (69.4)	41 (54.7)	34 (45.3)	65 (25.4)	191 (74.6)
Income/month (RMB)						
0–999	331 (21.1)	1236 (78.9)***	101 (39.5)	155 (60.5)	248 (15.8)	1321 (84.2)*
1000–1999	207 (23.9)	660 (76.1)	86 (43)	114 (57)	169 (19.4)	701 (80.6)
2000–2999	109 (32.6)	225 (67.4)	57 (47.5)	63 (52.5)	73 (21.9)	261 (78.1)
≥3000	54 (29.7)	128 (70.3)	19 (38)	31 (62)	34 (18.7)	148 (81.3)
Residence						
Urban	272 (46.2)	317 (53.8)***	118 (42.6)	159 (57.4)	170 (28.8)	421 (71.2)***
Rural	437 (18.3)	1948 (81.7)	148 (41.6)	208 (58.4)	367 (15.1)	2027 (84.9)
Ethnicity						
Han	491 (23.3)	1612 (76.7)	172 (38.7)	273 (61.3)*	323 (15.3)	1784 (84.7)***
Zhuang	196 (25.4)	575 (74.6)	80 (49.1)	83 (50.9)	192 (24.9)	580 (75.1)
Others	22 (22)	78 (78)	14 (56)	11 (44)	16 (16)	84 (84)
On ART (Yes)	521 (24.3)	1620 (75.7)	187 (43.3)	245 (56.7)	390 (18.2)	1755 (81.8)
Time since diagnosis (mean ± SD) (month)	43.69 ± 30.45	37.18 ± 27.91**	46.06 ± 30.90	37.15 ± 27.89***	46.06 ± 30.90	37.15 ± 27.89***
Any infections in family (Y)	243 (21.4)	895 (78.6)*	80 (39.2)	124 (60.8)	197 (17.3)	944 (82.7)
Any infections in family (N)	467 (25.4)	1372 (74.6)	186 (43.4)	243 (56.6)	335 (18.2)	1506 (81.8)
Any co-infections (Y)	144 (30.8)	324 (69.2)***	57 (44.9)	70 (55.1)	115 (24.5)	354 (75.5)***
Any co-infections (N)	566 (22.5)	1945 (77.5)	209 (41.3)	297 (58.7)	417 (16.6)	2098 (83.4)
CD4						
≤250 (cells/mm^3)	237 (23)	794 (77)	82 (41.8)	114 (58.2)	168 (16.2)	866 (83.8)
> 250 (cells/mm^3)	456 (25)	1366 (75)	179 (42.7)	240 (57.3)	346 (19)	1478 (81)
Viral load						
≤200 (copies/ml)	340 (23.6)	1099 (76.4)	129 (45.1)	157 (54.9)	271 (18.8)	1171 (81.2)
> 200 (copies/ml)	57 (28.5)	143 (71.5)	18 (40)	27 (60)	33 (16.5)	167 (83.5)

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

was significantly different between urban and rural residence. The results supported previous studies that a large digital divide between urban and rural areas existed in many countries (Gerpott & Ahmadi, 2015; Ghobadi & Ghobadi, 2015; Van Deursen, van Dijk, & Peter, 2015). Besides the inadequate exposure to computers, the restricted resources and insufficient education (6.97 ± 3) posed a challenge for promoting information literacy and digital skills among the rural participants to enhance their ICT adoption (Yu, Lin, & Liao, 2017). Realizing the lower adoption of computer, future study should consider using mobile devices, such as cellphone, which has a higher ownership among the participants as the primary platform to conduct an intervention. At the same time, future intervention programs should be designed to meet the users' literacy level to lower the threshold of accessing the healthcare resources. In addition, in order to reduce the urban-rural disparity, education targeting on the access and use of ICTs needs to be integrated with the construction of infrastructure.

In addition to the limited utility of ICTs, involvement of ICTs in HIV management and future intervention was not well embraced by the participants. Participants using an ICT for disease management were proportionally low regardless of any demographic characteristics, and those who intended to use ICT-based intervention programs were also small in number. Despite inadequate recognition of and lack of access to ICTs, several other issues may contribute to these findings. First, a concern for privacy was frequently mentioned as a barrier to using ICT-based interventions (Cherenack, Wilson, Kreuzman, Price, & Adolescent Medicine Trials Network for HIV/AIDS Interventions, 2016; Horvath et al., 2012; Saberi, Yuan, John, Sheon, & Johnson, 2013). The participants might not feel secure to initiate HIV-related communication or release their health status in a virtual environment. Second, in-person communication is still one of the most common health communication approaches (Vermund, Mallalieu, Van Lith, & Struthers, 2017). There is a high probability that the participants took in-person communication as the prior channel of health information. Third, trust may affect the participants' online searching behavior (Xiao, Sharman, Rao, & Upadhyaya, 2014). Limited exposure to web-based interventions could be a reason that holds people back from joining the program.

Last, but not the least, the questions in the survey did not provide sufficient information on what the intervention program entails or requests. The participants were uncertain if the program would be helpful or affordable. Promotion strategies of future intervention programs must be geared towards increasing the acceptance of ICTs as a secure and efficient health communication approach. Efforts should be made to guard the users against privacy threats, build up the authority and trustworthiness of the intervention program, and use of in-person communication as a supplement to the ICT-based program to make it more approachable for the user.

This study is subject to several limitations. First, the study was conducted in Guangxi, an autonomous region with residence of multiple ethnicities, current findings may not be generalized to other areas of China. Second, the use of ICT was assessed using self-reported data, which might create more bias than log data. Third, the cross-sectional data for this study does not warrant any causal conclusions.

Despite the limitations, this study is one of the first efforts to investigate the information use behavior and the potential application of ICTs among PLHIV in China. The large sample size provided sufficient statistical power in the current study. The high owning rate of cellphone and prevailing trend of social media adoption suggest the feasibility and potential of implementing ICT supported interventions among this highly stigmatized population. With expanding access to information resources and increasing information literacy among the Chinese population, interventions delivered via ICTs are definitely the most promising strategy in China or other less developed and resource-constraint settings.

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