Factors Associated with Mobile Health Information Seeking Among Singaporean Women

Leanne Chang, PhD
School of International Communications
University of Nottingham Ningbo China
Email: Leanne.l.chang@gmail.com
Phone: +86 8518 0000

Ching Chiuan Yen, PhD
Division of Industrial Design
National University of Singapore
Email: didyc@nus.edu.sg
Phone: +65 6516 3524

Lishan Xue, PhD
Division of Industrial Design
National University of Singapore
Email: didxl@nus.edu.sg
Phone: +65 6516-3524

Bee Choo Tai, PhD
Department of Epidemiology and Public Health
National University of Singapore
Email: ephtbc@nus.edu.sg
Phone: +65 6516 4973

Hock Chuan Chan, PhD
Department of Information Systems
National University of Singapore
Email: chanhc@comp.nus.edu.sg
Phone: +65 6516 3393

Henry Been-Lirn Duh, PhD
School of Computing and Information Systems
University of Tasmania
Email: Henry.Duh@utas.edu.au
Phone: +61 3 6324 3977

Mahesh Choolani, PhD
Department of Obstetrics and Gynaecology
National University of Singapore
Email: obgmac@nus.edu.sg
Phone: +65 6772 4285

Abstract

This study examined effects of age and social psychological factors on women's willingness to be mobile health information seekers. A national survey of 1,878 Singaporean women was conducted to obtain information on women's mobile phone usage, experiences of health information seeking, and appraisals of using mobile phones to seek health information. Results showed that young, middle-aged, and older women exhibited distinct mobile phone usage behaviors, health information-seeking patterns, and assessments of mobile health information seeking. Factors that accounted for their mobile information-seeking intention also varied. Data reported in this study provide insights into mobile health interventions in the future.

Keywords: health, information seeking, mobile phones, Singapore, women

Word count: 6,587

In recent years there is a rapid growth in lay individuals' use of information resources for health care purposes (Rideout et al., 2005). This trend is in line with the public's increased awareness of self-reliance and self-determination in health decision making (Thompson et al., 2011). More individuals nowadays act as health seekers looking for information to better understand a health issue or to supplement suggestions given by physicians (Rainie, 2006). Some studies have reported how information seeking may affect individuals' interactions with health care providers and their selection of health plans (Baker et al., 2003). Others have considered whether health seekers' increased demands and access to medical knowledge can enhance their capacity to maintain health (Dolan et al., 2004).

Mobile phones play an emerging role in fulfilling the public need for health information. As portable computers, mobile phones can process complex health information through voice, text, photo, audio, and video modes. Their mobility also offers convenience for accessing health services wherever mobile networks exist. The immediate communication features of mobile phones and their increased popularity open up possibilities for user-centered health information management. However, despite much evidence on the potential benefits of mobile technology, there is limited research on mobile health information management from the consumer's perspective. To expand the literature on health information management, this study explores factors associated with women's willingness to use mobile phones for health information by using a national sample in Singapore.

Women are the focus of this study for two reasons. First, past studies found differences in men and women's motivation to use computers and the Internet (Venkatesh et al., 2000). This suggests a need to differentiate the two groups when investigating their mobile phone usage and perceptions of being mobile health information seekers. Second, a review of the literature shows

that women have a high tendency to be health seekers in both the pre-Internet era and the Internet era (Rice, 2006; Warner & Procaccino, 2004; Weaver et al., 2009). Antecedents of women's health information-seeking behavior include a longer life expectancy, a higher likelihood of developing chronic illnesses, and a conventional role as caregivers in the family (Atkinson et al., 2009; Hesse et al., 2006). The substantial role that women have played in health information seeking indicates a need to investigate their reaction to the trend of mobile health.

This paper seeks to explore how Singaporean women of different ages assess their capacity and intention to be mobile health information seekers. Given that mobile health applications were unpopular in Singapore before our national survey, the focus of this study is on behavioral intention instead of usage behavior. While the gap between intention and action has been recognized, meta-analyses show statistical support for the intention-behavior relationship (Armitage & Conner, 2001; Sheeran, 2002). These findings suggest that studying behavioral intention in the applied setting may contribute to a better understanding of mobile health information seeking. In this perspective, although the present study only examines intention, it nevertheless presents women's concerns about using new information and communication technology (ICT) to fulfill information needs. The data could be helpful in advancing knowledge of mobile health information management.

Theoretical Framework

The theory of planned behavior (TPB) and social cognitive theory (SCT) guide analyses of behavioral motivators in this paper. Both theories emphasize individuals' reasoned decision-making and cognitive evaluation (Bandura, 1986; Fishbien & Ajzen, 2010). As the use of ICT requires health seekers to actively engage in information-management processes, their behavior must be consciously intended. These conditions make both theories suitable for our study.

Debates have been held on the theoretical distinctions between TPB and SCT factors. For example, Bandura (1997) argued that self-efficacy in SCT and perceived behavioral control in TPB are the same construct "bearing different names" and that measures of attitude and perceived norms in TPB only "represent different types of outcome expectations" (pp. 285-286). Contrarily, Fishbein and Ajzen (2010) charged that despite the conceptual overlap, self-efficacy and perceived behavioral control are measured in different ways. Measures of perceived behavioral control usually test respondents' perceived capacity to perform a given behavior, while measures of self-efficacy usually probe respondents' perceived confidence in performing a behavior under a series of conditions. Additionally, Fishbein (2007) argued that anticipated physical and social outcomes should be seen as behavioral beliefs that "serve as the cognitive underpinning of attitude" (p. 286). Researchers from both camps present evidence on their models' greater predictive power. Nevertheless, as Bandura (1997) noted, "the generality of construct redundancy needs to be tested further across different types of health behavior" (p. 286). The above notwithstanding, this study includes both TPB and SCT variables in an attempt to provide more insights into women's perceptions of mobile health information seeking.

Key Factors in the Theory of Planned Behavior

TPB holds that people perform a behavior because they intend to do so (Fishbein & Ajzen, 2010). Being the single most important predictor of behavior, intention is determined by three belief factors: the favorable or unfavorable feeling about a particular behavior (attitude); the perceived capacity to carry out a behavior and have control over it (perceived behavioral control); and the perceived social pressure to engage in the behavior (perceived norms). The more positive perceptions individuals have toward these factors, the more likely they are willing to perform the behavior. Accordingly, the likelihood of actual performance increases.

TPB has been used extensively to study ICT usage behavior. The theory has also been utilized to study different types of health practices and achieved predictive validity to some extent (Chia et al., 2006). However, only a few studies have examined its applications to health information seeking (Yoo & Robbins, 2008). Hence, this study sought to explore the extent to which women's attitude toward mobile health information seeking and their perceptions of behavioral control account for their intention to use mobile phones for health information.

In this study perceived norms is excluded from examination both because of its limited predictive power noted in meta-analyses (Armitage & Conner, 2001; Sheeran, 2002) and because of a measurement concern. Fishbein and Ajzen (2010) identified two types of perceived norms. "Injunctive norms" represent individuals' perceptions regarding whether important others think that they should perform a given behavior (p. 131). Alternatively, "descriptive norms" represent individuals' perceptions concerning whether important others are performing the behavior (p. 143). In the applied setting web-based mobile applications only began to prevail after our national survey was launched (Infocomm Development Authority of Singapore, 2011). As such, it could be difficult for participants to assess beliefs in important others' hypothetical perceptions of the need to use a prospective technology by using standard measures of injunctive norms. On the other hand, if mobile health information seeking was uncommon among participants and their important others, then the measures of descriptive norms might not apply, either. Considering the measurement constraints, the national survey study examined the impact of social normative influences through testing of social and self-evaluative outcomes in SCT.

Social Cognitive Factors

From a social cognitive perspective, individuals' health behavior is influenced by two belief factors, self-efficacy and outcome expectations. Self-efficacy involves a person's

perceptions of his or her capacity to "organize and execute courses of action required to attain designated types of performances" (Bandura, 1986, p. 391). Such perceptions are critical to a person's thought process, levels of motivation, and proneness to take action. Researchers like Torkzadeh et al. (2006) found that efficacy contributes positively to individuals' use of computers and Internet technology. The positive association between efficacy and information seeking has also been identified in studies about sexual health (Chang, 2014), HIV treatment and care (Kalichman et al., 2003), cancer information management (Johnson, 1997), tobacco control (Hong, 2006), and wellness-related topics (Rains, 2008). These data provide empirical evidence that self-efficacy should account for women's behavioral intention in the applied context.

Additionally, individuals may motivate themselves when the perceived outcomes are highly valued. Outcome expectations refer to a person's perceptions of possible consequences of an action. Such assessment is threefold. Physical outcomes refer to physical pleasure or displeasure accompanying a given behavior. Social outcomes refer to the anticipated social recognition or disappointment held by others. Self-regulative outcomes refer to positive or negative self-evaluation resulted from performing the behavior. Differing from Fishbein and Ajzen's (2010) treatment of normative beliefs, Bandura (1997) argued that the influence of social norms is conveyed through both "social sanctions and self-sanctions" (p. 284). People not only act based on their anticipation of social consequences but internalize socially approved normative standards when evaluating their behavior. As such, both anticipated social outcomes and self-regulative outcomes represent the normative dimension of behavioral beliefs.

Data from large-scale surveys suggested that outcome expectations may have an effect on health information seeking (Baker et al., 2003). Being able to fulfill personal information needs, reducing dependence on others, and helping family members stay healthy have been frequently

cited as reasons for information seeking. However, such descriptive data do not specify the unique predictive power of outcome expectations. Thus, this study sought to test the relationship between women's anticipated outcomes and their intention to be mobile health seekers.

Being an auxiliary construct in SCT, anxiety is examined in the present study because of its significant role in ICT usage (Broos, 2005). Anxiety refers to a person's negative emotional states derived from recognition of aversive stimuli based on personal or vicarious experiences (Bandura, 1986). Unlike attitude, which entails beliefs and overall evaluation of a given behavior, anxiety represents a person's emotional arousals. SCT posits that the effect of anxiety on behavior should be mediated by efficacy. However, empirical data indicated that the mediating effect could be partial (Torkzadeh et al., 2006). Thus, this study tested the direct effect of anxiety on intention by proposing that women's anxiety about using mobile phones for health information should be negatively associated with their behavioral intention.

The Role of Age

A literature has addressed age differences in individuals' use of traditional and new media for health information. Researchers like Asla, Williamson, and Mills (2006) noted that older people prefer to acquire health information from personal networks rather than from print or electronic media. Among all sources, the Internet is their least favorite (Chang et al., 2014). Although the claim of an age divide is supported by surveys conducted in the United States (e.g., Rideout et al., 2005), such findings cannot infer whether other factors condition individuals' health information-seeking behavior. Alternatively, a few aging studies have investigated personal and environmental factors critical to older adults' ICT usage and information-seeking behavior. Examples include analyses of age-related decline, socioeconomic inequalities, community and family support, and the role of technology in older adults' everyday lives (Blit-

Cohen & Litwin, 2004; Selwyn, 2004). Social psychological factors such as fear of learning, lack of motivation, low perceived benefits, low efficacy, negative appraisals of impersonal mechanisms, and a feeling of being alienated have also been studied (Adams et al., 2005; Turner et al., 2007). Although these analyses capture important characteristics of older adults, they do not explicate the extent to which the aforementioned factors can apply to different age groups.

Taken together, prior research suggests that women of different ages may show different levels of intention to be mobile health information seekers. To test age differences in women's social psychological assessments and the impact of such differences on their willingness to use mobile phones for health information, we developed the following two hypotheses:

H1: There will be age differences in women's attitude, perceived behavioral control, efficacy expectations, outcome expectations, anxiety, and intention to use mobile phones for health information.

H2: The unique effect of attitude, perceived behavioral control, efficacy expectations, outcome expectations, and anxiety on intention will vary across age groups.

Method

A random-digit-dial telephone survey of Singaporean women aged 20 years and older was conducted between 25 August and 16 October 2009. The questionnaire was made available in English, Mandarin, and Malay. Telephone numbers were drawn from a dataset provided by the national telecommunications provider. The last four digits of numbers were randomly generated to provide representation of both listed and unlisted numbers. A total of 1,878 women completed the 20-minute survey. Of all eligible respondents reached, the cooperation rate (AAPOR COOP 3) was 66%. The minimum response rate was 33%, using AAPOR formula RR1 (American Association for Public Opinion Research, 2009).

Participants' ages ranged from 20 to 88 ($M = 44.03$, $SD = 13.43$). The distribution by ethnic background was: Chinese (76%), Malay (13%), Indian (10%), and other (1%). Half of the participants had middle school education or less. One-fourth had attended high school or junior college. Another one-fourth had a university degree or higher. The majority of the participants (70%) had an annual personal income of less than SGD$25,000 (~USD$19,000). Participants' ethnicity, education, and income matched the known distribution of the Singapore population.

Measures

This study used five independent variables and one dependent variable. Except for attitude, all theoretical variables were measured on a five-point scale from 1 (strongly disagree) to 5 (strongly agree). To shorten the telephone interviews, the abbreviation *INFOHEALTH* was used to designate the use of mobile phones to access health information in multiple forms.

Independent variables. Attitude referred to the favorable or unfavorable feeling about seeking health information through mobile phones. Four items were used to measure attitude on a five-point semantic differential scale: "Seeking health information through a mobile phone would be very useless/very useful; very unimportant/very important; very inefficient/very efficient; and very inconvenient/very convenient" (Cronbach's α = .86, $M = 3.30$, $SD = .82$).

Perceived behavioral control was defined as participants' perceived capacity to use mobile phones to seek health information. Three items adapted from Fishbein and Ajzen's (2010) research were used: "For you to use INFOHEALTH is possible"; "If you want to, you could adopt INFOHEALTH"; and "It is up to yourself whether you could seek health information through INFOHEALTH" (Cronbach's α = .86, $M = 3.65$, $SD = .70$).

Efficacy expectations were measured by the extent to which participants felt confident in their ability to use mobile phones for health information under different circumstances. Four

items adapted from Torkzadeh and Koufteros's (1994) Computer Self-Efficacy Scale were used to test whether participants could see themselves using INFOHEALTH if they: (1) have used similar applications before; (2) have time to try it out; (3) can afford it financially; and (4) have the software manuals for reference (Cronbach's α = .84, M = 3.52, SD = .73).

Physical outcome expectations were measured by asking participants to rate perceived material benefits of using mobile phones for health information. "INFOHEALTH can be: (1) beneficial to you; (2) valuable to your health care; and (3) advantageous in better managing your health" (Cronbach's α = .87, M = 3.70, SD = .68). Social and self-evaluative outcome expectations were measured by asking participants to rate social normative influences of being mobile health information seekers. "If you adopt INFOHEALTH, then: (1) the people you care about will worry less about your health; (2) you can depend less on others to find health information for you; (3) you can provide better health information to your friends and family; and (4) you can do a better job of guarding the health of people who are important to you" (Cronbach's α = .82, M = 3.46, SD = .72).

Anxiety was measured with a modified version of Barbeite and Weiss's (2004) scale. Participants were asked whether using INFOHEALTH would make them worried, nervous, feel uncomfortable, and feel uneasy and confused (Cronbach's α = .88, M = 2.37, SD = .67).

Dependent variable. Intention was measured by personal likelihood of using mobile phones to seek health information: "You will try to seek health information by using INFOHEALTH"; "You intend to learn about using INFOHEALTH"; and "You plan to use INFOHEALTH to seek health information" (Cronbach's α = .90, M = 3.42, SD = .81).

Control variables. Control variables included demographics such as age, ethnicity, education, marital status, chronic health conditions, employment, and annual personal income.

Participants were asked to provide information about mobile phone ownership, frequency of phone usage (1 = a few times a month or less; 5 = many times a day), use of short-message service, and prior experiences with mobile applications. Participants' health information-seeking behavior was measured by the frequency of seeking health information from each of the following sources in the past three months: (1) doctors or other health professionals; (2) family or friends; and (3) the Internet (1 = never; 5 = very often).

Results

A confirmatory factor analysis was conducted to validate differences between TPB and SCT variables. Hu and Bentler's (1999) dual criteria of a comparative fit index (CFI) value close to .95 and a cutoff value close to .06 for the root mean square error of approximation (RMSEA) were used to access model fit. Results showed that all variables were well-behaved (CFI = .97, RMSEA = .04). All items loaded on the corresponding factors and tests for factor loadings were significant. These findings align with the earlier argument, which holds that even if TPB and SCT constructs share conceptual similarities, their measures may differ.

The World Health Organization's (2007) definition of aging was used to divide respondents into three groups: young (20-39 years, $N = 703$), middle-aged (40-59 years, $N = 947$), and older (60 years or older, $N = 228$) women. Table 1 summarizes respondents' demographics, mobile phone usage, and information-seeking behavior by age groups. Overall, older women had lower educational attainment, lower personal income, and more self-reported chronic health conditions than young and middle-aged women. Mobile phone ownership rates were highest among young women (96%), followed by middle-aged (89%) and older women (65%). Two-third of older women only used their mobile phones to make or receive phone calls. Their frequency of phone usage was also lower than young and middle-aged women. Across age

groups less than 10% of the respondents had the experience of using mobile applications other than dialing and sending text messages. Additionally, more than 80% of them never heard of accessing health information through mobile phones. These findings supported our decision to focus on intention instead of usage behavior.

[Table 1 about here]

Health information seeking was unpopular among participants. Only about half of them reported that in the past three months they had sought health information at least once from health professionals (50%), family or friends (45%), and the Internet (43%). Older women ($M =$ 2.19, $SD = 1.27$) acquired information more frequently from health professionals than young (M = 1.85, $SD = 1.02$) and middle-aged women ($M = 1.83$, $SD = 1.07$). Young women ($M = 1.96$, $SD = 1.08$) sought information from family members and friends more frequently than middle-aged ($M = 1.79$, $SD = 1.05$) and older women ($M = 1.66$, $SD = 1.04$). Young women ($M = 2.37$, $SD = 1.31$) also reported a higher frequency of online health information seeking than middle-aged ($M = 1.74$, $SD = 1.11$) and older women ($M = 1.24$, $SD = .70$).

To test whether women of different ages held different perceptions of being mobile health information seekers, this study conducted two-way analyses of variance using age groups and phone ownership as grouping variables. Results showed that age had an effect on all theoretical variables except for social and self-regulative outcome expectations. Scheffè post hoc tests showed that mean differences mainly existed between older women and the other two groups, though the magnitude of the differences was small (see Table 2). Alternatively, phone ownership only had an effect on anxiety and perceived behavioral control. There was no interaction effect of age and phone ownership on any test variable.

[Table 2 about here]

Three hierarchical regression models were performed to test associations between intention and social psychological factors within each age group (see Table 3). Control variables that had significant correlations with intention were entered in block one. In all three models control variables accounted for a small amount of variance in intention (3% to 6%) and none of them were significant after inclusion of theoretical variables.

In block two TPB and SCT variables jointly accounted for an extra 49% to 58% of the variance in intention. While the joint effect of social psychological factors was found, their unique predictive power varied. Older women's intention was mostly accounted for by how confident they felt about using mobile phones to seek health information in different circumstances and how strongly they felt about being mobile health information seekers based on social and self-regulative norms. For middle-aged and young women, in addition to efficacy expectations and social and self-regulative outcome expectations, their intention was associated with attitude, physical outcome expectations, and perceived behavioral control. Anxiety only had a significant effect on middle-aged women and its predictive contribution was small.

[Table 3 about here]

Discussion

This study examined Singaporean women's perceptions of using mobile phones to access health information and their intention to be mobile health information seekers. Results showed that age is related to most test variables. Young, middle-aged, and older women exhibit distinct phone usage behaviors, health information-seeking patterns, and assessments of mobile health information seeking. Implications of the findings are presented below.

High Penetration but Limited Use of Mobile Phones

This study found that the prevalence of mobile phones in all age groups is much higher

than the prevalence of computers and the Internet reported by the Infocomm Development

Authority of Singapore (2010). In particular, phone usage rates among older women (65%) are

five times higher than computer (14%) and Internet usage rates (13%) among citizens in the

same age group. The results imply that female mobile phone users, especially those who have no

access to computers or the Internet, may have a potential to benefit from the integration of

mobile technology and health information systems.

However, the obstacles to transforming older women into mobile health information

seekers stay substantial. While both young and middle-aged women are adapted to basic mobile

applications such as text messaging, the older generation tends to use mobile phones mainly for

dialing and receiving phone calls. The discrepancy between high phone ownership and low

usage of mobile applications suggests that mobile-based health interventions, especially those

targeting older women, should go beyond a consideration of mobile phone "haves" and "have-

nots." Attention should be given to women's use of different mobile applications to fulfill

different needs. The design of mobile health interventions should also take into account the

compatibility of mobile technology with women's existing phone usage behaviors.

Overall Positive Perceptions of Mobile Health Information Seeking

Consistent with past studies of ICT usage, our data show that age has an effect on

women's perceptions of mobile health information seeking. Notably, despite the statistically

significant differences among age groups, respondents do not show strongly negative prejudice

against the use of mobile phones for health information. In general women feel positive about

the medical and social benefits of mobile health information seeking. Moreover, they do not

express much fear of using mobile technology for health information and they feel rather positive

about their ability to adopt it. Their openness toward the idea of seeking health information

through mobile phones warrants some expectation of the development of mobile health care systems and mobile-based health interventions in the future.

Strong Associations between Belief Factors and Intention

This study found strong connections between behavioral beliefs and intention across age groups. Women's intention to seek health information through mobile phones is significantly associated with their self-assessments and evaluation of the situation. From a social psychological standpoint, demographics can affect a person's psychological mechanisms but their unique influence on intention should be greatly reduced after belief factors are taken into account. Results of this study support such a proposition. The varying predictability of TPB and SCT variables reveals that women of different ages may attend to different belief factors when evaluating their information-seeking intent. Self-efficacy is the most significant predictor across age groups and it has the greatest effect on older women. Findings from this study reaffirm the theoretical prediction that a person's behavioral intention is associated with his or her perceived competence to perform the behavior.

In the applied context anticipated social recognition and personal sanctions play a more important role than physical outcome expectations in accounting for women's willingness to be mobile health information seekers. Compared to physical benefits, women of all ages care more about whether their behavior can enhance their relationship with others and whether they can attain self-satisfaction by helping people who are important to them. As with past studies, this study found that women do not look for information only based on utilitarian considerations. The notion that health information seeking might be motivated by social normative influences is supported in this study.

Both attitude and perceived behavioral control can account for young and middle-aged

women's intention but have no effect on older women. Anxiety is statistically significant only among middle-aged women. Past studies found that older adults usually hold a higher level of technology anxiety, less favorite attitude toward technology, and a lower level of perceived control over technology than young people (Asla et al., 2006). While similar patterns are observed in this study, results of regression analyses also show that these factors do not prevent older women from intending to learn about mobile health technology.

Findings from this study support most theoretical propositions and provide some practical implications. While most demographics cannot be changed, health practitioners can still encourage women to access health information through mobile phones by increasing the strength of their behavioral beliefs. This study illustrates that efficacy and nonphysical outcome expectations are of greater concern to women when evaluating their role as mobile health information seekers. To motivate women, especially those in the older age group, the design and promotion of mobile-based interventions and mobile health care systems must take into account women's social normative concerns and find ways to enhance their efficacy expectations.

Several limitations of the study should be noted. First, limited by the cross-sectional survey design and participants' low awareness of mobile information seeking, the relationship between intention and behavior was not tested. Nonetheless, the national data may remain useful in setting a benchmark for monitoring women's use of mobile phones for health and changes in their health information-seeking patterns. Second, the large sample size of this study may affect statistical significance of many tests. Thus, when interpreting the results, attention should be paid to indicators of practical significance such as the absolute values of beta coefficients and the magnitude of mean differences other than the p values. Third, this study applies social cognitive theory to examine participants' anticipated social outcomes and personal sanctions instead of

testing perceived norms in TPB. To explore the full strength of TPB, future studies should test the effect of important others' mobile health information-seeking behavior and their normative pressure on women's usage behavior. By doing so, a fair comparison of the empirical significance between TPB and SCT could be done. Fourth and finally, our survey design may lead participants to focus on disease-related information only. This narrow view of health information may influence participants' recall of past information-seeking behavior and their perceptions of using mobile phones to fulfill information needs. Future research could examine women's interest in different types of health information and test whether different information needs would affect their beliefs, intention, and actual use of mobile technology for health.

In conclusion, this study examines factors critical to mobile health information seeking in the female population of Singapore. Results of the national survey present disparities among age groups and provide a baseline for the continual exploration of women's health information-seeking behavior. The similarities and differences among young, middle-aged, and older women provide indications of design specifications required in the later development of mobile health information systems. Both descriptive and inferential statistics reported here offer insights into the design and implementation of mobile health interventions. For programs aimed at promoting mobile health information seeking, results of this study are helpful in identifying key determinants of women's learning motivation. For programs focusing on age divide in the utilization of mobile health technology, the descriptive data are useful for presenting disparities between those who intend to be mobile health seekers and those who do not. In an e-health era emphasizing individuals' self-health management, this study extends the understanding of age, cognitive beliefs, and health information-seeking behavior in the female population.

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Table 1

Demographics, Mobile Phone Usage, and Health Information-Seeking Behavior by Age Groups

Variable		20-39 yr (n = 703) %	40-59 yr (n = 947) %	60+ yr (n = 228) %	X^2
Ethnicity	Chinese	68	78	90	52.7***
	Malay	17	12	3	
	Indian	14	9	6	
Chronic health conditions	Yes	4	24	49	272.9***
Marital status	Married	61	89	84	329.5***
Education	Secondary school or below	32	67	87	306.3***
	Pre-university	27	12	5	
	University or above	41	21	8	
Employment	Employed	61	52	17	698.2***
Personal income	Below SGD$20,000	53	66	94	104.4***
	SGD$20,000 – $49,999	36	23	4	
	SGD$50,000 or above	12	12	3	
Owned a mobile phone	Yes	96	89	65	186.9***
Frequency of usage	A few times a month or less	1	3	1	249.4***
	A few times a week	6	24	40	
	Once a day	12	19	19	
	Many times a day	81	54	30	
Text messaging	Yes	74	91	34	355.6***
Ever used mobile applications to access information	Yes	19	5	3	111.1***
Heard of accessing health information through mobile applications	Yes	18	22	17	4.9
Sought information from health professionals	Never	48	53	43	41.7***
	Seldom	28	23	20	
	Sometimes	16	15	18	
	Often	5	7	13	
	Very often	2	2	6	
From family or friends	Never	47	57	65	35.3***
	Seldom	21	16	12	
	Sometimes	22	18	15	
	Often	8	7	5	
	Very often	2	1	2	
From the Internet	Never	38	63	87	240.7***
	Seldom	15	11	6	
	Sometimes	24	16	5	
	Often	16	7	2	
	Very often	7	3	1	

Note. *** p < .001. Percentages of "Frequency" were calculated from those who used mobile phones. SGD$20,000 was about USD$15,000. SGD$50,000 was about USD$37,500.

Table 2

Mean Differences in Theoretical Variables by Age Groups

	20-39 yr		40-59 yr		60+ yr		F
	M	*SD*	*M*	*(SD)*	*M*	*(SD)*	
Attitude	3.40	0.75[a, c]	3.27	0.85[b, c]	3.10	0.89[a, b]	13.4***
Perceived behavioral control	3.81	0.56[a, c]	3.62	0.71[b, c]	3.26	0.88[a, b]	58.2***
Efficacy expectations	3.64	0.62[a, c]	3.50	0.74[b, c]	3.20	0.86[a, b]	31.3***
Physical outcome expectations	3.77	0.57[a]	3.68	0.71[b]	3.55	0.82[a, b]	10.0***
Social and self-regulative outcome expectations	3.48	0.65	3.48	0.73	3.34	0.84	3.5
Anxiety	2.25	0.58[a, c]	2.39	0.68[b, c]	2.62	0.81[a, b]	27.9***
Intention	3.53	0.70[a]	3.43	0.82[b]	3.07	0.93[a, b]	29.5***

Note. *** p < .001. A study-wise significance p value threshold of 0.05/7 = 0.007 was used. Means with different superscripts within a row indicate statistical significances in post hoc tests. All variables were measured on a five-point scale ranging from 1 to 5.

Table 3

Demographic and Social-Psychological Factors as Predictors of Intention to Seek Mobile

Health Information

	Model 1 20-39 yr		Model 2 40-59 yr		Model 3 60+ yr	
	β	*(SE)*	β	*(SE)*	β	*(SE)*
Step 1						
Frequency of phone usage	−.06	(.04)	−.08	(.03)*	.02	(.05)
Prior experiences with mobile applications	.12	(.08)*	.06	(.12)	.08	(.39)
Chronic health conditions	.01	(.15)	.01	(.07)	.01	(.13)
Information seeking from family or friends	.03	(.06)	.04	(.06)	.12	(.14)
Information seeking from the Internet	−.04	(.06)	.05	(.06)	.04	(.19)
Ethnicity (Chinese)	−.11	(.06)**	−.09	(.07)**	.06	(.21)
Employed	−.07	(.06)	.09	(.06)**	.16	(.17)*
R^2	.03		.04		.06	
F	2.74**		4.89***		1.61	
Step 2						
Attitude	.17	(.03)***	.14	(.03)***	.08	(.06)
Perceived behavioral control	.14	(.05)***	.08	(.03)**	.12	(.07)
Efficacy expectations	.27	(.04)***	.34	(.04)***	.41	(.08)***
Physical outcome expectations	.16	(.05)***	.13	(.04)***	.03	(.08)
Social and self-evaluative outcome expectations	.22	(.04)***	.24	(.04)***	.28	(.08)***
Anxiety	−.03	(.04)	−.05	(.03)*	−.03	(.06)
ΔR^2	.49		.55		.58	
F change	100.53***		189.93***		49.49***	

Note. *p < .05; ** p < .01; *** p < .001.