Keep A Breast: A Qualitative Study of Motivations for Selecting, Downloading and Using a Breast Cancer Self-Exam Mobile App

Emery Rogers

A thesis submitted to the faculty at the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Masters of the Arts in Interdisciplinary Health Communications in the School of Journalism and Mass Communication.

Chapel Hill
2014

Approved By:
Seth M. Noar
JoAnn Sciarrino
Mary Grace Flaherty
ABSTRACT

Emery Rogers: Keep A Breast: A Qualitative Study of Motivations for Selecting, Downloading and Using a Breast Cancer Self-Exam Mobile App (Under the direction of Seth M. Noar)

Despite the rapid spread of mobile health apps, there is little understanding of consumer motivations for selecting, downloading, and using specific health apps. The purpose of this exploratory study was to address this under-researched area, focusing on a particular health app - the Keep-A-Breast self exam app. In-depth interviews were conducted with 14 Keep-A-Breast app downloaders to understand motivations for seeking out and downloading health-related apps, and for downloading and using the Keep-A-Breast app itself. Factors that participants indicated considering when selecting and downloading a general health-related app fell into three categories: Ratings and reviews; Convenience and Improved Efficiency; and Relevance. For the Keep-A-Breast app specifically, three factors emerged regarding why users selected and downloaded the app: Trust in the Organization; Perceived Relevance and Susceptibility; and Convenience. Finally, the study revealed that participants reported using the app to reinforce behavior change because of 4 attributes: Ease of use and simplicity; Reinforcement of intentions; Increased consistency and improved technique of breast self-exams; and Social sharing. Implications of this study for health app design, dissemination, and future research will be discussed.
# TABLE OF CONTENTS

I. Introduction........................................................................................................3

II. Background........................................................................................................6

II. Literature Review...............................................................................................9

IV. Methods and Research Questions....................................................................17

V. Findings..............................................................................................................23

VI. Discussion.........................................................................................................36

VII. Limitations and Suggestions for Future Research............................................38

VIII. References......................................................................................................40

IX. Appendix..........................................................................................................49
INTRODUCTION

The proliferation of smartphone and tablet use has changed the way in which people interact with information and one another and ultimately, live their lives. In 2013, 64% of American adults owned a smartphone, compared to 48% in 2012 (Nielsen, 2013); and 25% of all American adults owned a tablet by mid-2012 (Rainie, 2012). Put simply, Americans are now more digitally connected and engaged than ever before (Agger, 2011).

Much of the rise in smartphone and tablet usage can be attributed to the emergence of applications (apps) (Bhave, 2013). Apps are software programs designed and created for smartphones or tablets by developers, individuals or organizations (van Velsen, 2013). Due to their functionality, apps have become ubiquitous on mobile and tablet operating systems. Users are clearly receptive to the app technology (Appendix I); the average smartphone user downloads about 40 apps to their phone (Gupta, 2013) and app downloads are predicted to reach 185 billion in 2014 (Anthes, 2011).

Apps have become an integral part of the daily lives of consumers, simplifying many everyday tasks including banking transactions, scheduling doctor’s appointments, playing games, receiving news and weather updates, booking travel arrangements, retrieving directions, sending messages internationally, and monitoring fitness levels (comScore, 2011; Purcell, 2012; Nielsen, 2013). On average, users spend 82% of their
mobile minutes interacting with apps (Gupta, 2013), and mobile apps have now surpassed web browsers on number of minutes used on a mobile device.

Mobile devices show promise as tools for disseminating health information as consumers are increasingly using mobile apps for health purposes (Broderick et al, 2014; FDA, 2013; Azar et al, 2013; Ho, 2013). Illustrating this, in 2011, the fastest-growing content category in mobile device use was health information (comScore, 2012). As of 2012, 31% of cell phone owners indicated that they have used their phone to look for health information—up from 17% in 2010 (Fox, 2012). There are over 40,000 health, fitness and medical apps currently available on the market (IMS, 2013). Healthcare topics vary and can include medication reminders, fitness trackers, first aid guides, calorie counters, smoking cessation assistance, and other disease management tools. Over 20% of smartphone owners have downloaded a health-related app on their phone, which is up from 9% in 2010 (Fox, 2012; Purcell 2011). The trend is expected to continue: it is predicted that an estimated 500 million smartphone users worldwide will be using a health app by 2015 (FDA, 2013).

Although the ability to reach audiences anytime, anywhere, inexpensively, and on a large scale is seemingly the most significant capability of mobile technology for the health field (Abroms et al, 2012; Noar and Harrington, 2012; Dennison, 2013; Powell, 2014), the full potential of mobile apps on public health remains unrealized (Goyal, 2013; Bradley, 2013). Mobile health apps show promise as a tool for reaching audiences that are otherwise hard to engage. Furthermore, the app platform allows information to be disseminated to consumers almost instantly and on-demand. Opportunities for data collection and resource sharing with health providers are being further explored (Besara,
The app platform could allow users to communicate with health information providers quickly, and facilitates a two-way conversation between people and providers in a way not previously possible.

Despite the rapid spread of mobile apps, there is little understanding of mobile app consumers (Garg, 2013; Abroms et al, 2012). Specifically, there is a scarcity of evidence supporting the efficacy of health apps (Abroms et al, 2012, Dennison, 2013), and few studies have been conducted to understand downloaders’ behaviors, motivations or attitudes (Yang, 2013). “At this juncture, as well as initial pilot studies of specific individual apps, there is a need for formative research that helps us to better appreciate the interest various groups of people have in using [health-related] apps and factors that may influence acceptability and engagement” (Dennison, 2013.) The proposed exploratory study seeks to address this under-researched, yet important, area. This study focuses on one particular health app, the Keep A Breast “Check Yourself!” app, that was designed to provide users with reminders and instruction on conducting a breast self-exam. This research aims to provide inductive insights that will: a) contribute to an understanding of motivations for health app usage, b) offer specific insights into the motivations, behaviors and overall perceptions of users of the Keep A Breast app, designed to promote self-breast exams, and c) evaluate how users perceive the Keep A Breast app influences their health behaviors.
BACKGROUND

Breast Cancer

Because of the overwhelming prevalence of smartphones, and because the mobile platform is perceived by users as both unobtrusive and confidential (Abroms et al, 2012), apps have the potential to affect many health behaviors, including those relevant to breast cancer. The National Cancer Institute estimates that one in eight women will develop breast cancer at some point in their lifetime (Horner et al, 2009). Breast cancer is the second leading cause of cancer death for women in the U.S. (ACS, 2013). Screening for breast cancer is indicated to be important for women (Kratzke, 2013), and the American Cancer Society recommends self-breast awareness and examination for all females (ACS, 2013). The frequency and age at which screening is recommended, however, is controversial (Thackery, 2013), as some believe that screening can lead to over-diagnosis or over-treatment (Brodersen, 2013).

Johns Hopkins Medicine indicates that 40% of all breast cancer cases are detected by self-diagnosis (JHM, 2013), and some studies suggest that 90% of breast cancer cases begin when the patient notices the cancer themselves (Simsek & Tug, 2002). It has been reported, however, that only one third of women regularly perform breast self-exams (Elmore, 2005). Women living in rural areas are less likely than others to conduct breast self-exams (Kratzke, 2013). It is recommended that breast exams occur regularly, but a survey in the United Kingdom revealed that 1 in 4 women simply forget to conduct regular breast self-exams (Practice Nurse, 2010).
Studies have concluded that there is a need for improved early detection of breast cancer (Howell et al, 2012). According to Genomic Health, an increasing number of women are seeking information about breast cancer on their mobile devices (Genomic Health, 2013). Despite this, no study to date has examined the effectiveness of a mobile app on users’ intentions to conduct a breast self-exam, or looked at the mobile app downloader’s motivations, intentions or usage behaviors regarding the app, particularly when breast cancer is concerned.

The Keep A Breast Foundation

Dedicated to raising awareness of methods of breast cancer prevention and early detection, The Keep A Breast Foundation was founded in 2000 by Shaney Jo Darden and Mona Mukherjea-Gehrig (Spencers, 2008). The California-based non-profit focuses on using the arts to promote their mission. The stated mission of the organization is “to help eradicate breast cancer by educating young people on methods of prevention, early detection and support. Through art events, educational programs and fundraising efforts [Keep A Breast] seek[s] to increase breast cancer awareness among young people so they are better equipped to make choices and develop habits that will benefit their long-term health and well-being” (Reuters, 2008).

In 2010, the Keep A Breast mobile app was launched. The app is designed to encourage users to schedule monthly breast self-examination reminders on their smartphone, provides a visual guide to administering breast self-examinations, and offers a feature that enables app users to alert their friends that they have completed their self-exam via social media channels. The app is available free for users to download and
it is promoted through the Keep A Breast website, as well as other Keep A Breast social media channels (e.g., Facebook, Twitter, and Instagram). When the term “breast cancer” was typed into the iPhone App Store (on January 13, 2014), the Keep A Breast app was the 10th option to appear.

Due in part to high profile relationships with popular celebrities such as Katy Perry and Dita von Teese, connections with major music groups such as the Foo Fighters, No Doubt, and Taking Back Sunday, and partnerships with national brands such as Emergen-C®, The Warped Tour®, and Fox Racing® (Press Release, 2012; Johnson & Stinchfield, 2012; Reuters, 2008), Keep A Breast has gained national recognition. To raise awareness, the organization released “I Love Boobies” silicone rubber bracelets in 2004. The bracelets, which became a fashion craze among teenagers, were intended to make the conversation about breast cancer less taboo. The risqué slogan, however, caused controversy as many school districts banned the bracelets due to the “sexually suggestive” language (Martin 2010; Toombe 2011). The matter escalated resulting in a court ruling by the U.S. District Court of Appeals for the Third Circuit, which upheld an injunction preventing a school district from enforcing a band on the bracelets in schools citing First Amendment protection (http://keep-a-breast.org/blog/federal-court-rules-favor-students-i-love-boobies/). In March of 2014, The US Supreme Court denied a final appeal from the school district to hear the case of Easton Area School District v. B.H., upholding the rulings of the lower courts in favor of Keep A Breast (Bomboy, 2014).

The popularity of Keep A Breast has continued and is reflected in their strong social media presence. As of December 2013, Keep A Breast has over 380,000 “Likes”
on Facebook, over 36,400 Twitter followers, 28,000 Instagram followers, and over 30,000 mobile app downloaders.

**LITERATURE REVIEW**

The following section briefly summarizes the relevant academic literature regarding the constructs leading to the adoption of mobile technology, the use of mobile technologies for health behavior change, breast cancer information seeking, and relevant theory. According to a 2013 study, “overall, the literature on smartphone app feasibility and acceptability is encouraging. However, in previous research, the exploration of user viewpoints has often been limited and fairly superficial. There is little in depth, qualitative research allowing users to describe their experiences, views, and usage patterns” (Dennison, 2013).

**Mobile Application User Behavior**

The literature identifies a whole host of constructs as potentially influencing adoption of various mobile services including text messaging, multimedia messaging, mobile instant messaging, mobile Internet, mobile entertainment services, mobile games and mobile commerce. These constructs include perceived usefulness, ease of use, relative advantages, perceived ubiquity, expressiveness, enjoyment, behavioral control, social or normative influences, technology self-efficacy, innovativeness, trust, social risk, communication intensity, users experiences, content relevancy, and perceptions of price and cultural values (Deng et al, 2010; Del Rey, 2010;
Yang, 2013; Kim et al, 2011; Malhorta, 2009; Nah et all, 2005; Qi et al, 2009; Vatanparast and Qadim, 2009; Vatanparast, 2010; Hill, 2010; Gummerus and Pihlstrom, 2011). While additional studies have investigated consumer perceptions of mobile technologies as a whole, a clear gap in the literature exists regarding consumer perceptions, usage behaviors and motivation surrounding mobile apps specifically. Only one study (Yang, 2013) examining the motivations and behaviors of mobile app users in the United States can be located, and little evidence exists that indicates that the drivers of adoption of mobile technology also apply to mobile apps.

The single study assessing mobile app perceptions conducted a survey of 555 American college students, and found that consumer attitudes and intentions predicted the use of mobile applications (Yang, 2013). While the study did not focus on health apps (or apps in any specified field) in particular, it found that perceived enjoyment, usefulness, ease of use and subjective norms were significant predictors of mobile apps attitudes. The study also revealed the constructs of perceived behavioral control, usefulness, and mobile Internet use to be predictors of mobile app use (Yang, 2013). Because the mobile app industry has received widespread attention, it is extremely important to understand consumers' perceptions of and motivations for app usage. Understanding of these concepts is crucial not only to researchers (Hsiu-Yu, 2013) but also to app developers and the mobile business community as a whole. As described by Yang (2013), “The limited understanding of young consumers’ acceptance of mobile apps prevents interactive marketers from developing effective strategies to promote mobile apps, engage consumers with apps, and advertise within apps.”
**Mobile Apps for Health Behavior Change**

The app platform may be conducive to health behavior change as it is an interactive medium (Noar & Harrington, 2012). Research indicates that involving consumers in both self-protective behaviors (i.e., a breast self-exam) and self-management of diseases (i.e., as in monitoring a health or disease status) can improve health outcomes (Free, 2013). The literature also indicates that audiences are receptive to mobile interventions for health behavior change (Cornelius, 2012). Health communicators, however, have learned that to encourage participation in programs, the program must be perceived as trustworthy (Evans, Davis et al, 2009), and subsequent studies have supported the construct of organizational trust as invaluable in mobile communication (Okazaki, 2007).

Several studies have indicated that users feel overwhelmed with the sheer number of health apps available in the mobile universe—a term dubbed “health app overload.” This can lead to user difficulty in locating the desired app. Additionally, it can decrease the chances that the app gets downloaded because the fragmentation reduces the perceived added value of a single app (van Velsen et al, 2013).

Research has shown that mobile health has great potential for motivating healthy behaviors (Eng, 2013), and that mobile interventions have been successful in changing health behaviors. A 2013 meta-analysis of mobile health interventions via text messaging cites mobile interventions as successfully increasing medication adherence and smoking cessation (Free, 2013). However, that same study found few indicators of effectiveness in other health fields including weight loss and management, sexual activity, psychological interventions, sun protection, oral health or asthma control. A
second meta-analysis in 2013 also found text-messaging health programs to be efficacious, especially for smoking cessation and physical activity (Head et al, 2013).

While studies have investigated the use of the platforms of text messages (Bock, 2013; Cole-Lewis, 2013; Levine, 2008; Franklin et al, 2006; Lim et al, 2008), the Internet (Morahan-Martin, 2004; Ammann, 2013; del Pozo-Cruz et al, 2013; Van De Belt, 2013; Hong, 2006; Sillence 2007; Huh 2013), social media (Korda & Itani, 2013; Lefebvre, 2013), blogs (Lin & Vaska, 2013) and video games (Hall, 2012; Peng et al 2013), as tools for health behavior change, no studies have evaluated the effectiveness of mobile apps on influencing individual health behaviors. Moreover, the literature reveals perplexingly few studies seeking to gain an understanding of mobile app user's intentions, perceptions, usage behaviors, or motivations.

There is a paucity of published studies to date on the efficacy of smartphone apps for health promotion. More research and evaluation is necessary, particularly those that use designs that emphasize both internal and external validity, to draw conclusions on the potential effectiveness of mobile apps for measured and sustained health behavior change (Bernhardt, 2013).

Although the phone as a platform has been shown effective in promoting healthy behavior through the use of text-messaging programs, the way to most effectively use mobile phone apps for health behavior change is currently unknown. (Abroms et al, 2012).

Breast Cancer Information Seeking

Knowledge of why individuals seek out information, particularly cancer-related information, is limited (Nan, 2012). Despite the fact that information seeking is
considered a preventative action in itself (Rimal, 2003), many are not motivated to seek out information about health (Graham, 2002; Turner, L., 2004; Turner, M., 2006).

Strong trends in the literature, however, reveal perceived risk and perceived efficacy to be motivators to seek out health information (Janz, 1984; Rimal, 2003; Rogers, 1975, Nan, 2012). Perceived risk of breast cancer is determined by cognitive accessibility, personal relevance and perceived similarity to people who suffer from a disease (Puntoni et al, 2007). Perceived efficacy refers to the personal belief in one's ability to carry out the behavior required to successfully deal with difficult tasks and to cope with adversity to reach a desired goal (Bandura, 1977, 1997).

A 2012 study found that demographic traits associated with increased instances of breast cancer information searching included being female and having a higher level of education (Nan, 2012). That same study revealed higher levels of perceived risk and perceived efficacy to increase the likelihood of breast cancer information seeking behavior, but findings were not statistically significant (Nan, 2012).

Although the literature acknowledges that apps designed to assist with breast cancer detection, information seeking and care exist (Genomic Health, 2010; Wallace, 2013; Androich, 2012), little research has been done on breast cancer information seeking behaviors and mobile technology (Kratzke, 2013). The literature suggests that there is an interest in mobile breast cancer communication. For example, a study of rural women found that respondents had a high interest in receiving breast cancer prevention information via a mobile phone, and no significant differences by age were found (Kratzke, 2013). Moreover, that same study found that 37% of respondents indicated an interest in receiving breast exam reminders via cell phone platform (Kratzke, 2013).
Theoretical Perspectives

Although there are many relevant theories that could be addressed in this study, the Theory of Planned Behavior (TPB) and the Health Belief Model (HBM) were selected as the most applicable to this research. TPB and HBM were chosen due to their focus on behavior change and implications for breast cancer prevention. The Theory of Planned Behavior and the Health Belief Model are often applied together in the literature as they both provide a grounded explanation for much of human health behavior and motivation studies.

Theory of Planned Behavior. Azjen’s Theory of Planned Behavior (TPB) posits that the constructs of attitudes about a behavior (informed by attitudinal beliefs), subjective norms (informed by normative beliefs), and perceived behavioral control (informed by control beliefs) all lead to one’s intentions to perform a behavior, which ultimately leads to committing a behavior. In this model, the construct of intentions is the strongest behavioral determinant (Azjen, 1991). When health applications (apps) are concerned, the TPB is applied in the following way: attitudes represent people’s beliefs about the utility and value of the app, subjective norms represent how people feel important others will perceive their use of the app, and perceived behavioral control refers to their perceived ability to use the app based on knowledge, access to technology and availability of the app. The construct of intention refers to one’s resolve to use the particular app, and the actual behavior is the act of successfully implementing the app.
TPB has been applied to mobile usage and adoption (Hsu, 2011; Jiang, 2009; Lin, 2009; Nysveen 2005) as well as mobile app usage (Yang, 2013) in previous studies. When applied to apps, research indicated that the TPB explains the finding that American consumers download and use more mobile apps if they hold favorable attitudes toward mobile apps. In addition, their intention to use mobile apps translated into the actual use of mobile apps (Yang, 2013).

*Health Belief Model.* Rosenstock’s Health Belief Model (HBM) posits that one’s perceived susceptibility, perceived severity, perceived benefits and barriers, cues to action and self-efficacy affect engagement in a health-promoting behavior (Rosenstock, 1988). In this study, perceived severity refers to the degree to which a person believes breast cancer could be severe for them. Perceived susceptibility refers to how vulnerable an individual believes himself or herself to breast cancer diagnosis (this could be based on knowledge, family history or social network). Perceived barriers represent the things that people feel get in their way of administering a breast self-exam (e.g. time, knowledge), and perceived benefits refers to the repayments that an individual feels come from a breast self-exam (e.g. early detection means less chance of chemo therapy, less chance of a mastectomy, greater chance for longer life). The cues to action, when applied to this particular study, are the things that remind a person to administer a breast self-exam (e.g. the app, a note on a calendar, a doctor, a family member), and self-efficacy is how a effective an individual feels they will be at conducting a breast self-exam.

HBM has been frequently applied in breast cancer prevention studies (Kratzke,
Perceived severity can be based on both medical information and knowledge as well as beliefs a person has about how a disease or ailment will affect their life in general (McCormick-Brown, 1999). Higher knowledge of perceived breast cancer severity has been shown to be correlated with higher instances of breast cancer screening (Shieh et al, 2012). Perceived susceptibility indicates that the greater the perceived risk, the greater the chances of participating in behaviors to minimize the risk (Turner, 2004). On perceived benefits (Turner, 2004), studies have found that those who perceive a benefit to come from a screening (Frank & Swedmark, 2004), or breast self-exam (Graham, 2002) are more likely to undergo the process. The most significant construct in determining behavior change, however, is perceived barriers (Janz & Becker, 2004), which are an individual’s own evaluation of obstacles preventing the adoption of the behavior (Turner, 2004). The literature indicates that barriers to performing a breast self-exam have proven to be a stronger indicator of behavioral performance than the perceived threat of breast cancer itself (Champion, 1993; Champion & Menon, 1997; Ellingson & Yarber, 1997; Umeh & Rogan-Gibson, 2001).

Theory of Planned Behavior and Health Belief Model were deemed the most applicable theoretical perspectives to provide framework for this particular study as they most thoroughly capture the nuance and complication of health behavior, user motivations, and technology use. While they were not explicitly tested in this study, they provided some theoretical guidance to the overall study.
METHODS AND RESEARCH QUESTIONS

The goal of this research is to contribute to the wider goal of understanding motivations for seeking out and downloading health apps, as well as to understand specific motivations for use of an app designed for breast self-exam. The Keep a Breast app instructs users on how to properly administer a breast self-exam, enables users to schedule a smartphone alert reminder through the app to administer the exam, and allows users to elect to “share” that they have conducted their self-exam with friends and followers via social media channels. As little research exists in the area of mobile health app use, a qualitative, exploratory research approach was chosen to probe users’ perceptions, motivations and preferences. When searching for the “why” instead of the “how many,” and when there is no clear hypothesis, qualitative research methods often prove most useful (Milena, 2008). Two previous studies aimed at understanding perceptions and motivations of mobile health apps were located, and the methods in this study aimed to improve on those models: A 2009 study that used both focus groups and subsequent in-depth interviews to probe for thoughts about the usability and utility of health apps (Loo, 2009), and a 2013 study that used 19 subjects in a focus group setting to inquire about health apps in general (Dennison, 2013). Previous studies have been limited to university audiences, do not focus on a particular health app, and asked the participants to respond to hypothetical situations. For example, participants in these studies may not have been health app downloaders, but were asked to comment on their perception of the potential value of health apps. The current study asked actual
downloaders of a particular health app to comment on their past experiences with the particular app in an effort to contribute to this under-researched area in new ways.

In-depth interviews were conducted with Keep A Breast app users; that is, those who have ever downloaded the Keep A Breast app. In-depth interviews are useful when researchers seek “detailed information about a person’s thoughts and behaviors, or want to explore new issues in depth” (Boyle & Neale, 2006). In-depth interviews were also selected because the audience for this study had the potential to be located all over the globe, so employing another sort of qualitative method that could not be conducted over the telephone (i.e. focus group or ethnography) was not logistically feasible. Finally, in-depth interviews proved to be the desired method for this study as the breast cancer subject matter could be personal in nature to many people, and a group setting may have caused participants to be less forthcoming. The Keep A Breast app was chosen for this study due to the prevalence of breast cancer in the United States, the organization’s large social media following, and the willingness of the app developer to participate in this research.

Because no qualitative study targeting the audience of a specific app has been conducted, the methods established in this study may help other researchers to reach the app audience. App user information, and specifically user contact information, can be difficult to obtain, which could explain the lack of research targeting app users. Other barriers include major companies not providing sales data on mobile apps, privacy issues and competitive reasons (Garg, 2013). Additionally, many app companies do not have the ability to communicate with their users directly through the app (e.g. a push notification), and do not require email addresses to download the app.
Recruitment. Respondents were recruited through Keep A Breast social media channels: Facebook, Instagram and Twitter. Social media was the chosen method for contacting the app downloaders as Keep A Breast indicated that social media was the best method available for the company to communicate with their audience (Keep a Breast could not communicate directly with those who have downloaded the app as they did not have in-app notification abilities at the time of the study). As of December 2013, Keep A Breast had over 380,000 Facebook “fans,” over 28,000 Instagram “followers,” and over 36,000 Twitter “followers.” Also, Keep A Breast indicated that they have over 30,000 app downloaders. Because there is no way to determine which of the social media fans or followers are also app downloaders, the recruitment message was distributed to all social media followers. The Social Media Director at Keep A Breast disseminated recruitment messages on three separate occasions via Instagram, Facebook and Twitter (Appendix II). The message featured a link to a Qualtrics site which, when clicked on, gathered basic screening information from interested prospective participants: confirmation that they were 18 years of age or older, that they spoke English, that they had ever downloaded the Keep A Breast app, their time zone, preferred interview day of the week and time of day, email address, and confirmation of their willingness to participate in a telephone interview. While the recruitment link was distributed to all social media fans or followers, only those that met the screening criteria (18 years of age, downloaders of the Keep A Breast app, willingness to participate) were invited to participate in the in-depth interviews. Respondents who met the criteria were emailed to coordinate a
specific interview time based on the day of week and time of day that they indicated (Appendix III).

Although the Keep A Breast organization distributed the recruitment message via Facebook, Instagram and Twitter, it should be noted that, when asked how they heard about the interview, none of the participants indicated Instagram as the source. All respondents (n = 14) indicated that social media was the way that they found out about the opportunity to participate, with 64% (n = 9) citing Facebook as the source of the information, 28% (n = 4) crediting Twitter with the information, and 7% (n = 1) not recalling the specific social media source (but indicating that they do not have an Instagram account).

Participants. A total of 190 respondents began the recruitment survey, and 45.2% (n = 86) completed the survey. Of the completed recruitment surveys, 44.2% (n = 36) of respondents were deemed eligible to participate based on willingness to participate and the predetermined criteria for inclusion (18 or over, spoke English, had downloaded the Keep A Breast app, and was willing to participate in an interview). Once eligibility was determined, the respondents were emailed to coordinate an interview time. There was a 38.9% (14/36) response rate for recruitment emails, resulting in a total of 14 interviewees who agreed to a determined interview time, and completed an interview. All fourteen of the participating interviewees were female. Participants ranged in age from 19 – 51 (Median = 30.33). 64% of participants self-identified as Caucasian, 14% identified as Black, 7% Asian, 7% Mexican American, and 7% Indian. Participants indicated that they currently resided in 10 different US states: Florida, California,

*Interview Protocol.* All selected respondents participated in semi-structured interviews regarding their experience with the Keep A Breast app. The interviews were conducted over the telephone by the researcher, and recorded using the *TapeACall* application for iPhone. An interview guide was developed specifically for this study [Appendix IV], and questions were mapped to both existing literature and theory, as well as study research questions [Appendix V]. Interviews lasted about 30 minutes, though this varied by participant. Participants were assured of confidentiality prior to the interview, and asked to verbally declare their willingness to participate. The Institutional Review Board at the University of North Carolina at Chapel Hill approved all procedures used in this research.

The information garnered through the interviews was used to address the following three key research questions:

**RQ1.** What factors do smartphone users take into consideration when selecting and downloading a health app?

**RQ2.** What factors did smartphone users take into consideration when they selected and downloaded the Keep A Breast app?

**RQ3.** How do smartphone users perceive and use the Keep A Breast app, and how has it affected their health behavior?

*Interview Guide.* The Interview Guide was created to address these key research questions. Questions were created using constructs from existing interview guides
and with guidance from Dr. Seth M. Noar and Dr. Daniel Kreiss from The School of Journalism and Mass Communication at The University of North Carolina at Chapel Hill.

**Incentive.** A monetary incentive was offered to all in-depth interview participants. The incentive of $25 per participant was distributed in the form of an Amazon gift card, which was emailed to interviewees upon completion of the telephone interview. Amazon gift cards were selected because no identifying information beyond a participants’ email address had to be obtained to distribute the gift card. Funds for compensation were secured through the Roy H. Park Fellows Program at the School of Journalism and Mass Communication at the University of North Carolina at Chapel Hill.

**Data Analysis.** Interviews were recorded with respondent permission, and then transcribed. Once the interviews were transcribed and the recordings were no longer needed, they were destroyed. A content analysis of the transcripts was performed, and they were culled for themes, patterns and underlying processes (Palan, Gentina & Muratore, 2010; Rashid, 2011).

Interviews were analyzed using the Grounded Theory Methodology (GTM). GTM is a "general method of comparative analysis" to generate concepts that are “grounded in data systematically gathered and analyzed” (Glaser & Strauss, 1967). The concepts evolve “during actual research through continuous interplay between analysis and data collection” also known as “constant comparison” (Strauss, 1967). This method was chosen because "the strongest case for the use of grounded theory is in
investigations of relatively uncharted water, or to gain a fresh perspective in a familiar situation" (Stern, 1995). Further, GTM will answer the question of "what was going on in an area" by generating either a substantive or formal theory (Samik-Ibrahim, 2000). After nine interviews were analyzed, no new themes were added or revealed, indicating that a point of saturation was reached. Five more interviews were still conducted, however, to ensure that no new knowledge would be gained.

FINDINGS

RQ1. **What factors do smartphone users take into consideration when selecting and downloading a health app?**

Factors that participants indicated that they considered when selecting and downloading a health-related app fell into three categories: Reviews and Ratings; Convenience and Improved Efficiency; and Personal Relevance. It should be noted that the term “health-related” app was defined broadly and participants were told that it referred to “apps that have anything to do with health, such as weight loss or dieting apps, smoking cessation apps, an app for disease management, or any other health-related apps.”

**Reviews and Ratings.**

Interviewees indicated that the reviews in the app store were an important determinant of whether they elected to download an app. The reviews, which are seen by clicking on the “Reviews” tab in the app store, provide an opportunity for current app downloaders to give feedback about their experiences with the app for others to read, as well as to share with the app developer. For example:
Most of the time, I will check to see the reviews of it, like I will look at the comments, and like I will check to see, like, how many stars and downloads it has, then I will continue with something that has more which means that a lot of people have downloaded most of the time. – Participant 9

I'll look at the reviews to see what other people are saying about it. And reviews are pretty important to me. Usually I read reviews so I know if they have my goals in mind with how they want the app to work. And if they have bad reviews I'll probably skip it. If they have decent reviews I'll probably at least download the app and give it a try. – Participant 1

I read the reviews and see if they have what I’m looking for. It doesn’t matter whether it’s free or not free. I want to read what other people are saying about it. – Participant 7

Although some emphasized reviews more than ratings, others emphasized the importance of ratings as well. The “star” rating system used by the app store to collect consumer assessments of apps proved to be a trusted source when determining whether an app should be downloaded. With the system, current app users can elect to rate their opinion of an app on a scale of 1-5 stars (5 being the highest), and the average rating, as well as the number of people who have provided ratings, appears in the app store on the download page of each app. For instance:

I probably pay attention to the ratings most. I don’t necessarily go in and read individual reviews, but if the app doesn’t get a very good rating, then I am less likely to download it. – Participant 8

Ratings and reviews for an app are gathered through a “Rate This App” pop-up prompt sent to app users (Danova, 2013). Participants seemed to feel as if the ratings and reviews provided a point of differentiation in the otherwise crowded app universe, and that they trusted the ratings and reviews provided.
Convenience and Improved Efficiency.

Many participants indicated that they felt the app platform was perceived as a convenient way to access health information. This was attributed to the ubiquity of smartphones and wireless access in society, the perception that apps have tailored their information for users better than a website, the belief that many apps worked even without Internet access, and the fact that users indicated that they were constantly in possession of their smartphone, even when they are not at home. Convenience was an especially apparent theme, as participants stated the following:

If I’m traveling or if my husband and I are out and we're looking for a place to get vegan food or when we're in other cities I can easily go to my vegan food app. You know, we were in Florida and I was able to say there's a Whole Foods right there in Tampa or, you know, there's a vegan restaurant here. It was already there on my phone and it knew what I wanted, I didn’t even have to open a search engine, the app was ready. - Participant 2

[An app] is more of a convenience, like, when you click an app, you don’t really want to go through the hassle of dealing with popping up of ads or things like that because it gets confusing sometimes. So the fact that using an app you just go straight to it and you don’t have to worry about trying to search it or trying to type it, it is more just the convenience. If I need something, I will scroll to my phone or scroll to whatever the device I am on, and I will just click on the app and open it up and its right there in your face. – Participant 11

It’s just that the app is right there. There’s no searching, there’s no looking, there’s no trying to figure out what I’m thinking about, no searching, it’s just right there. So it’s an easy button push. - Participant 5

With apps, there is not lot of like reviewing or searching for something on your phone or a tablet. When you go onto a website on your phone, it is really confusing on how to
navigate, but on the app you just click it. When you want a program on your phone or your tablet, an app is just pretty much is more designed just so that you don’t have to worry about a desk top and stuff like that so that’s it-- it is quicker to just press an app and you are already into what you want. – Participant 9

My phone is always with me, and it’s very easy to use. Because it’s easier to just click right on the app button than going to a website on my phone. – Participant 6

Adding to the notion of convenience, apps were perceived to be easy to access regardless of Internet access or proximity to a computer or tablet, making them an easier choice for accessing information. As illustrated here:

Mostly I look for ease of access. I don’t always have Wi-Fi, so something I can go to, like the app about yoga, you don’t really need Wi-Fi for it, and you can just watch the video that you saved and go through it without worrying about Wi-Fi or anything. – Participant 10

It is not really like you have to go on the computer, and you have to turn that on and you have to going on to the web-- all that is time consuming, and when you have things you are trying to do and you have a goal, its more simple as just to click something and it opens, and you are right at what you need to get. – Participant 11

I think the reason I like the app it is because before I had a calendar, that I had at home and I would mark on it and end up forgetting some mark and I am stuck trying figure out from months back. With the app on my phone I just know I can go on my phone or wherever like the app is, just put in this information, and it will I notify me, like it is more convenient. – Participant 14

Users perceive apps to be useful in that they are viewed as aggregators for information that users have already indicated that they are seeking. Whereas websites are believed to have more information about a desired subject, apps are believed to have
the desired amount information curated for users to access quickly. Illustrating this, one participant said:

I appreciate that apps are focused on helping people regarding their health in very particular ways. So that provides me with some confidence that this is a place where I can either get more trusted information or that it will do a particularly good job of helping me track my health or that kind of thing versus, you know, something on Google or even just talking people for some time. It feels kind of like I don’t have as much confidence in the information that I am getting another way, because it’s just like basically the other information is not as explicit. The purpose of Google is not to help you find health information, where that is the explicit purpose of the app-to help you find health information. – Participant 8

**Personal Relevance.**

Users indicated that, in order to select and download an app, the subject of the app must be perceived as relevant in their everyday lives. Apps were downloaded when users felt that the content of the app concerned a subject that the user was already consumed with and deemed personally relevant. For instance:

I keep an app on there [my phone] because I am constantly busy doing something and a lot of things that I want to do slip my mind, so I just like how the app is on there and helps to remember when it is something I have needed help on. – Participant 13

If there is something that I really care about, like a topic that I think about a lot, I like to have the app because I know I’m getting the best information and I feel like I am a part of a community of other people who think they way I do and are getting that same information. – Participant 14

This finding was also found salient in that interviewees indicated that they rarely browsed the app store without aim, but rather searched for apps based around subjects
that they had indicated to have some sort of significance in their life. Respondents suggested that they rarely browsed the app store, but rather searched for apps with the intention of discovering information about a desired, specific subject.

**RQ2. What factors did smartphone users take into consideration when they selected and downloaded the Keep A Breast app?**

Three factors emerged as themes regarding why users selected and downloaded the Keep A Breast app: Trust in the Organization; Perceived Relevance and Susceptibility; and Convenience.

**Trust in the Organization.**

Social marketers and health communicators have indicated that organizational trust is a key construct in uptake of a marketing concept (Evans, Davis et al, 2009), and subsequent studies have supported the construct of organizational trust as invaluable in mobile communication (Okazaki, 2007). Supporting existing research, organizational trust also proved to be key in the selection and downloading of the Keep A Breast app. The majority of interviewees indicated that they were not seeking an app for breast self-exam, but that trust in the Keep A Breast organization compelled them to download the app. Moreover, participants appreciated that Keep A Breast as an organization was focused solely on addressing one health issue, which increased its perceived legitimacy. For example:

I definitely feel much more confident doing a self breast exam and with that app from Keep A Breast, which I consider a trusted resource, to guide me in that. I guess I consider them a trusted resource, I think in part because I think they are so focused on this one issue and are not trying to do too much. – Participant 8
I download anything from Keep A Breast because I believe in what they say. It has raised awareness of things. A breast self exam is never something that you really talk about, you know. Your mom told you to or you tell your daughter to. I remember ‘I love boobies’ when it first came out, I mean, it was eye catching. It grabbed males and females. Unfortunately, my daughter goes to a private school, so she can’t wear the bands at school. But we have the app because I just believe in that organization. – Participant 9

**Perceived Relevance and Susceptibility.**

As posited in the HBM, personal experience with breast cancer or perceived risk of developing breast cancer (susceptibility), were found to be strong motivators for downloading the Keep A Breast mobile app. Regarding Keep A Breast, three interviewees indicated (unprompted) that they were breast cancer survivors, one indicated that they were currently undergoing treatment for breast cancer, and four indicated that they knew someone who had breast cancer. These survivors and current patients said the following:

Well, I’m actually a breast cancer survivor. So, even though I’ve already had my double mastectomy and everything, I know it’s so important to check myself. I have updated the app to do it every month just as a reminder. - Participant 4

I’m a breast cancer survivor so, like, I found my own lumps when I had cancer. I'm not great about doing breast exams and I see either my oncologist or my surgeon every six months. But I definitely did think that I probably should be a little bit more vigilant about checking my breasts, so I got this app. – Participant 2

Well, why I downloaded it is because I am a current breast cancer patient and I have three daughters who are under the age of 25. I’m mutated on both genes and I’m scared to death that they’re going to go through what I’m going through. So having three daughters under the age of 25 and knowing that they are more concerned with when the next time their television show is on and when their next friend is coming or
who they’re hanging out with and less concerned with doing a monthly self breast exam, my thought was that since I don’t have to do it anymore because I have no breasts, I will tell them. I downloaded it, I schedule it, and I can then just send a mass text to the three of them to say, try to check your boobs. So that was my motivation to do it. - Participant 5

Well obviously, my diagnosis caused me to get the app because even though there’s a whole process of being in surgery and everything and I just still find I should plan to actually go about checking and making sure. Just because I don’t have actual breasts, doesn’t mean that I can't check anything. So I just wanted to keep on doing it. – Participant 11

Convenience.

The app format made the breast self-exam process seem easier to interviewees. Overwhelmingly, interviewees felt that they were already using their smartphones for the things that were most important to them, and that the app made a self-exam more convenient since the reminder and instructions were coming from a platform that they have already elected to use regularly. For instance:

I use the [Keep A Breast] app because it's the closest to me. People carry their phones with them everywhere and we're constantly connected to what's going on in the world, and the apps lately are really easy to use. They are really pretty to look at and I think that just helps getting people accustomed to keeping up to date with what's going on. So, those are the same reasons why I'm using the Keep A Breast app. - Participant 1

But I like to use the scheduling part of the app because I no longer have a uterus. So when I was younger, I would check my breasts every month on the first day of my period. But now that I don’t have my period, I use the app for the reminders because I am always by my phone. – Participant 6
RQ3. How do smartphone users perceive and use the Keep A Breast app, and how has it affected their health behavior?

Four themes were revealed concerning smartphone users’ perceptions of the Keep A Breast app, and it’s affect on health behavior: Ease of use and simplicity; Reinforcement of intentions; Increased consistency and improved technique of breast self-exams; and Social sharing.

Ease of Use/Simplicity.

Much of the positive sentiment about the Keep A Breast app surrounded the concept of ease of use. Many interview participants expressed that they attributed their regular use of the app to its simplicity. For instance, participants said:

I think it’s just -- it’s right there. There’s no searching, there’s no looking, there’s no trying to figure out what I’m thinking about, no searching, it’s just right there. So it’s an easy button push. – Participant 5

I like the layout of the whole webpage within the app. It’s easy to use, it’s easy to read. The colors are vivid. – Participant 6

I also think like the fact that it is really simple to navigate, and not too many crazy buttons and add-ins and things like that, like you are not constantly try to figure out where you are supposed to click, and it is pretty much straight forward and you can go straight to where you need to go and stuff like that. – Participant 9

I care about the way that the apps look and the ease in the function, and that’s why I like this app. - Participant 1

I actually really like the app because it's simple, and you know exactly how to follow the instructions without being overwhelmed. – Participant 12

I found [the KAB app] refreshing and I really liked the
simplicity of it immediately when I got in the app. This was especially because there wasn’t so much to go through. I didn’t feel like ‘Okay, I need to sit down and dedicate time to go through this, and figure everything out.’ There didn’t seem to be any kind of learning curve, which I appreciated and also just made me more inclined to get into right away. – Participant 8

I really have trouble when people are explaining to me how to do the exam to do it by myself and, so I went through [the app] and I set myself for a reminder for 10th of next month when I downloaded it and then it was pretty simple, like the pictures really helped and I showed my sister and she doesn’t have an iPod, and I showed her how to do it and basically, that was it. I think breast cancer awareness is really important, so we just walked through how easy and simple it was and that was basically how like when I first used the iPod. I liked how easy it was. – Participant 10

Perceived simplicity is important as simplicity creates higher self-efficacy, which supports the postulation of the HBM that self-efficacy affects engagement in a health behavior.

**Reinforcement of Intentions.**

Congruent with the postulations of the TPB, intentions to perform a breast self-exam proved to be a predictor of downloading the Keep A Breast app. The idea that downloading the app onto a smartphone or tablet created a sense of accountability for conducting the breast self-exam, which reinforced their intentions, motivated interviewees to download the app. If smartphone or tablet owners believed that the app would encourage or enforce their desired behavior, they indicated that they were compelled to download and use the app.

I have cancer so my full time job right now is cancer. I have the app on my iPad because my phone is full of reminders of plastic surgeon appointments, oncology appointments, chemo
appointments, lab appointments. You’ve got to go here; you’ve got to go there. I just thought if I downloaded the app on my phone, it would get caught up in there. And it just is a way to remind me separately, you know, it comes up on the iPad and that’s it. - Participant 5

I’m a breast cancer survivor. It's kind of a weird thing it's like I found my own lumps when I had cancer. I'm not great about doing breast exams and I see either my oncologist or my surgeon every six months. But I definitely do think that I probably should be a little bit more vigilant about checking my breasts, so I use [the app]. – Participant 2

Well, I like that the reminder is in an app because just seeing it on my phone is kind of a reminder to use it or to do the self exam because of the actual alerts. And that’s something that I like about apps -- they are better than like bookmarks or something, which you end up with like eight thousand of and just ignore. I don’t ignore my apps. – Participant 14

**Increased Consistency and Improved Technique of Breast Self-Exams.**

Overall, participants indicated that the Keep A Breast Check Yourself app caused them to be more diligent and consistent with regularly administering breast self-exams. For example, two women stated the following:

Because of the app, I’m more consistent with doing it every month. - Participant 6

There is something about the reminder on my phone that makes me always listen. Now, I rarely miss an exam. – Participant 13

Several interviewees reported that the “Learn How” feature of the app that included a visual and instructional step-by-step of how to properly and thoroughly administer a breast self-exam caused them to change their current breast self-exam technique. Participants stated:
I really like the learn-how part. The learn-how -- okay, so there’s a reminder that you have to check your boobs, got it. But what do I do? So the learn-how literally shows how any moron, including my daughters, could do it. And they now do it right. So I think that’s the most important part. - Participant 5

[My technique] is more thorough. Before it was just kind of whatever I felt like I was comfortable with. But the app definitely made sure that I'm putting attention on all the areas that need it not just what I thought beforehand, so I'm more thorough. - Participant 1

Because the first time my this daughter did [her exam], I handed the app to her. She didn’t live with us. So first time she was here and I happened to hand it to her. And she was like; I don’t really get how to do that. I’m like, well, if you’re not really sure then maybe you should read through the whole thing. So yes, before she was feeling for lumps, but she wasn’t giving herself a self exam. She was just like, nope, everything looks good. Now she does a full exam. – Participant 5

**Social Sharing.**

Key findings of the study were revealed in the potential of the mobile health app for social sharing and promotion of breast self-exam to others. Users indicated that they felt that the app platform was conducive to sharing socially as mobile apps were often already discussed in their social groups, and the app platform also made the breast self-exam issue more palpable and easier to discuss with others. Users indicated that they “like to show other people the apps that I have” (Participant 3). This sentiment, along with the small size of the smartphone and the fact that many people indicated that “everyone they know” has a smartphone, all served as strong segways into discussion about the Keep A Breast app, as in:

I think it’s helped more of the people around me to check themselves because I’ll show them the app and be like, ‘You
know, have you been checking yourselves? Really, you need to really check yourself.’ – Participant 3

When the reminder on the app pops up, what I normally do is I hit the learn how and I put the iPad down on the table in front of whatever kid that is sitting in front of me at the time. And they roll their eyes, but they know – the instructions are sitting right in front of them, it’s time to check themselves. – Participant 5

I like to show other people the apps that I have and so I could spread the app around. – Participant 4

An app, you can bring more around – you’re not lugging a laptop around even if the laptop or a tablet is small, the cell phone is smaller, so you could show it to others easier. – Participant 9

**DISCUSSION**

Understanding of the concepts that motivate app users is crucial not only to researchers (Hsiu-Yu, 2013) but also to app developers and the mobile business community as a whole. App developers and mobile marketing practitioners can use this information to develop appropriate strategies for promoting breast self-exam-related mobile apps. Despite this, few studies have examined the motivations of adopters of a specific health app. The current study examined motivations to adopt and use a breast cancer self-exam app. Results indicated that some of the constructs previously identified as influencing mobile adoption held true. Those concepts that stood out as most motivating use of a breast cancer self-exam app (Keep a Breast) included ease of use, perceived ubiquity, usefulness, behavioral control, trust and content relevancy. It is also worth pointing out the fact that many of the constructs previously identified in the literature as potentially influencing mobile adoption were not supported in this study.
These constructs include expressiveness, enjoyment, normative influences, innovativeness, social risk, communication intensity and cultural values. This finding implies that mobile health app adoption, and specifically a mobile app designed to remind a breast self-exam, may have different adoption influencers than mobile adoption in general, though much more research is needed to provide an answer to this question.

Recruitment for this study used novel social media methods, and revealed Facebook and Twitter to be more effective than Instagram for recruiting participants for a study of this nature. This could be explained by understanding consumer behavior surrounding individual social media. This area should be explored further as findings in this study are not completely congruent with national engagement levels: Facebook generated the most participants for this study, which is consistent with engagement levels, as individuals in the US alone spend 114 billion minutes a month on Facebook on desktop PCs and smartphones, more than any other social media platform. By comparison, Instagram commands 8 billion minutes a month, but generated no participants for this study. Twitter generates 5.3 billion minutes a month, but provided 28% of the participants for this study (Adler, 2014). This finding has implications for businesses as the social media industry is becoming increasingly fragmented, and businesses are actively trying to engage social media followers and determine where to best allocate social media time and resources.

The ratings and reviews in the app store have been considered controversial in the app world as many developers - who strive to provide a clean and seamless user experience for app downloaders - believe the pop-up to garner user feedback to be an intrusion and an annoyance for app users (Danova, 2013). App marketing practitioners,
however, believe the rating and review system to be essential to recruiting more downloaders, and argue that a more effective way to generate user feedback is not available (Danova, 2013). This study supports the notion that high app ratings drive higher download rates.

The concept of organizational trust was an overwhelming theme in this study, and one that should be explored further. The main benefit of trust is customer loyalty, which leads to a longer relationship and higher advocacy or word-of-mouth (Halliburton, 2010), both of which are invaluable to an organization. Engaging customers in a long-lasting, trust-based, journey is key for an organization, and the mobile app can be a valuable tool in the execution of this strategy.

The findings from this study suggest that app developers should create apps that are both simple and explicit. Apps that serve too many purposes were not perceived as valuable or useful as an app with a clear, direct use. Also, users felt that they did not want to spend much time learning how to properly use an app, so an app designed to be used with ease would be considered more desirable as it ultimately improves self-efficacy, which increases engagement in a health-promoting behavior.

LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

There are some limitations to this research. First, data are cross sectional and capture participants’ perceptions at one specific point in time. Generalizability of the results is restricted to the sample (a convenience sample) as the nature of qualitative data precludes generalizing the findings more broadly. Put simply, we cannot assume that in-depth interviews with a convenience sample of users of one particular health app will
generate any sort of findings generalizable to the larger body of health app users overall. Also, because each health issue, and each individual, is unique, making assumptions about global motivations to use health apps based on findings from this qualitative study is not advisable. Rather, this study is intended to contribute to the existing body of literature, and provide a potential hypotheses for future larger-scale studies on motivations for health app adoption and use.

It is important to note that the Keep A Breast self-exam app is preventative in nature, whereas many health apps are for health maintenance or monitoring of an existing condition. Any application of broader generalizability to health apps, especially those that are not preventative in nature, should be avoided. Constructs of health behavior theories, such as the Theory of Planned Behavior, also indicate that each health issue is unique, nuanced, and based on distinctive characteristics of the individual. This serves as further support of the notion that we cannot generalize the findings of this study to other apps and other behaviors.

Those who responded to the recruitment ad are also likely to have been a select population: Because the recruitment was done via social media channels, only app downloaders who are also social media users and followers of Keep A Breast were potentially reached through recruitment efforts. This may have garnered a more “loyal” Keep-a-Breast audience than would have been the case otherwise. In addition, reports about effects on behavior may be influenced by social desirability. Subsequent quantitative studies using larger and more representative samples are needed to replicate and extend these results.
Findings from this study only represent downloaders of the Keep A Breast app, however they are intended to contribute to the larger field of health apps overall. There are significant opportunities to expand the scope of this study by collecting data from more apps across different categories, both within the health field and in other fields as well. Moreover, recent research has highlighted significant racial and cultural disparities in both smartphone use (Fox, 2012) as well as breast cancer diagnosis, treatment and mortality rates (Parker-Pope, 2014), so a similar qualitative study (and ultimately quantitative studies) focusing on minority women could be a very valuable addition to the mHealth field.
APPENDIX

APPENDIX I: APP PROLIFERATION BY INCOME

Source: Pew Internet and American Life Survey 2013
APPENDIX II: SOCIAL MEDIA RECRUITMENT MESSAGES

Facebook:

Want to provide feedback about Keep A Breast AND earn a $25 Amazon gift certificate? We are looking for people who have downloaded the Keep A Breast Check Your Self! mobile app to participate in a 30 minute phone interview. Click here to see if you are eligible: http://bit.ly/1g1XoYo
Twitter:

Keep A Breast
@KeepABreast
Helping eradicate breast cancer by supporting young people & educating them on prevention, early detection, & cancer-causing toxins.
#PreventionIsTheCure
Los Angeles, CA • keep-a-breast.org

Tweets

Keep A Breast @KeepABreast • Mar 13
Have you downloaded the Keep A Breast mobile app? Take a survey & see if you qualify for $25 Amazon Gift Certificate: bit.ly/KABSURVEY
 Expand

Instagram:

keepabreast
2 weeks ago
Want to provide feedback about Keep A Breast AND earn a $25 Amazon gift certificate? We are looking for people who have downloaded the Keep A Breast Check Your Self mobile app to participate in a 30 minute phone interview. Click here to see if you are eligible: http://bit.ly/KABSURVEY

emeryysu, chino_rog, alyssachetovits and 911 others like this.
APPENDIX III: RECRUITMENT EMAIL

Hello [Name],

I am contacting you because you have agreed to participate in an interview regarding Keep A Breast and mobile apps. First of all, thank you! I appreciate your willingness to participate and assure you that your interview will help contribute to a valuable project.

I will be calling you for your phone interview. As a reminder, the phone interview can take up to 45 minutes, and you will be emailed a $25 Amazon gift card for your time. You have indicated that [day of week] during the [morning/afternoon/evening] is a good time for your interview, can we schedule a call on this [date] at [time]?

Please respond and let me know if this works, and also please indicate the best phone number for me to contact you. I am flexible with times, so if there is another date or time that works better for you, I can easily adjust.

Looking forward to connecting.

Best,
Emery
APPENDIX IV: INTERVIEW GUIDE

Introduction

Hi, my name is Emery and I am with The University of North Carolina at Chapel Hill. I wanted to thank you for taking the time to talk with me today. I would like to talk with you about your experiences with mobile health apps in general, and specifically the Keep A Breast app.

The interview should take about 30-45 minutes. I will be recording the session because I want to make sure that I don’t miss anything that you say. I want to assure you that all responses will be kept confidential. This means that I will not share your interview with anyone, and anything printed in my final report will not identify you or anyone by name. Once I have everything I need from the recording, it will be destroyed. Please remember that you don’t have to answer any question that you don’t want to, and you may end this interview at any time.

Are there any questions you have about what I have just explained?

Are you willing to participate in this interview?

Thank you.

Before we begin chatting, I’d like to get some basic information about you.

1) What is your age?

2) Are you male or female?

3) What is your race or ethnic identity?

4) What city and state do you live in?

Thank you.

5) Now I’d like to ask you about the platform that you use to access apps. What do you use?

   Probe: iPhone/Android/iPad? What kind of phone? Make and Model?

6) What social networking sites do you use?

   Probe: Facebook, Twitter, Instagram, other?

Thank you.
**Health info:**

7) Typically, when you’re looking for information regarding your health, where do you go?
   
   *Probe: Why?*
   
   (If they say Internet): What type of device do you use to search for health information?
   
   *Probe: Desktop, laptop, iPad, phone*

**Health apps:**

Now I want to ask some questions about apps, which are applications on your smartphone or tablet that you can download in the app store and appear with an icon on your smartphone or tablet screen. I am particularly interested in health apps, which are apps that have anything to do with health, such as weight loss or dieting apps, smoking cessation apps, an app for disease management, or any other health-related apps.

8) About how many health apps would you say you currently have on your phone?
   
   *Probe: So, you would estimate about XX apps?*

9) Where did you find out about these health apps?

10) Why did you download the health apps that you did?

11) With all of the apps available, how did you choose which apps to download?

12) Is there a specific health app on your phone that you use the most?
   
   *Probe: Why?*
   
   *Why did you download it?*

**Keep-a-Breast:**

Thank you. Now let’s talk specifically about the Keep A Breast app.

13) When you answered the screening form online, you indicated that you have downloaded that app on your phone. Walk me through when you first selected and downloaded the Keep A Breast app, how did that process work for you?
   
   *Probe:*
   
   - *Where did you find out about it?*
   - *Why did you download?*
   - *Why did you seek out an app for breast self-exam? (versus Internet, doctor, etc.)*
   - *When was this?*
   - *Did you consider other apps?*
14) Think about the last time you used the Keep A Breast app:
   Probe:
   - Why did you use it?
   - Where were you?
   - Who were you with?
   - Can you tell me a little more about what the circumstances were? Was there something that prompted you to use the app?
   - Did you use your phone? Tablet?
   - For yourself? For another?
   - Did you discuss the app with anyone?
   - What features did you use on the app?
     Did you use the reminder feature?
     Did you use the tool designed to show you how to administer an exam?
     Did you use the social media share feature?

15) How often do you use the Keep-a-Breast app?

16) What features of Keep-a-breast do you use?
    How often do you use the calendar?
    How often do you refer to the breast self-exam instructional?

17) In general, what do you see as the pros and cons to this app?

18) What functionalities of the Keep A Breast app do you really like?
    Probe: Why? Can you tell me more?

19) What functionalities of the Keep A Breast app would you like to change?
    Probe: Why? Can you tell me more?

20) Is there anything that you wish the Keep A Breast app did that it doesn’t currently do?
    Probe: What? Why? Can you tell me more?

21) Since you have downloaded the KAB app, how has your breast self-exam routine changed, if at all?
    Probe: Are you administering self-exams more regularly?
    Has your self-exam technique changed?
22) Since you have downloaded the KAB app, have you noticed any other changes regarding your health in general?
   *Probe: Can you tell me more?*

23) What are your thoughts on the Keep-a-Breast organization as a whole?

24) Do you follow Keep-a-breast on social media?
   *Probe: What channels?*

25) Do you believe Keep-A-Breast is a trustworthy organization?

26) Is there anything more that you would like to add? Something you feel we should have discussed?

27) Finally, how did you find out about this interview?
   *Probe: Social Media? A friend?*

I’ll be analyzing the information that you and others gave me and submitting a final report to my committee at UNC Chapel Hill and also to the Keep A Breast Organization. I also may publish the study in a journal. You’ve been a critical part of this project and I appreciate you taking the time to participate. I will email you a $25 gift certificate to Amazon.com in the next week. To what email address can I send this?

Thank you again for your time.
### APPENDIX V: INTERVIEW MAP

<table>
<thead>
<tr>
<th>Key concepts</th>
<th>Questions in Interview Guide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographic and Technology Characteristics</td>
<td>Q’s 1-6</td>
</tr>
<tr>
<td>Health Information</td>
<td>Q 7</td>
</tr>
<tr>
<td>General health app motivations, behaviors and attitudes</td>
<td>Q’s 8-11</td>
</tr>
<tr>
<td>Keep A Breast app beliefs, motivations, behaviors and attitudes/ Relative advantage of apps over other methods</td>
<td>Q’s 12-20</td>
</tr>
<tr>
<td>Behavior Change due to Keep A Breast app</td>
<td>Q’s 21-22</td>
</tr>
<tr>
<td>Overall perception of Keep A Breast organization</td>
<td>Q’s 23-25</td>
</tr>
<tr>
<td>Conclusion</td>
<td>Q’s 26-27</td>
</tr>
</tbody>
</table>
REFERENCES


iPhone app shows women how to examine their breasts. (2010). *Practice Nurse, 40*(8), 7.


Powell, A; Landman, A, & Bates D. (2014). In search of a few good apps. *Journal of the American Medical Association.* Published online at jama.com E1- E2.


the health belief model. Health Education Quarterly, 15, 175–183.


