Trisha M. Crutchfield. Where are the Patients? – Missed Medical Appointments and Preferred Reminders among College Students. A Master's Paper for the M.S. in I.S degree. March, 2008. 62 pages. Advisor: Dr. Deborah Barreau

Studies have shown that young adults tend to miss medical appointments. This study seeks to identify ways to reduce the number of missed appointments in this population. This study explores the appointment keeping habits of college students and determines appointment reminder preferences. Five hundred seventy-six students completed an online survey. Students reported that email and phone reminders are most preferred and that text message reminders are the least preferred. Two statistically significant relationships were identified between variables – number of missed appointments and reminder preference for problem-focused, primary care visits, and number of missed appointments and reminder preference for routine dental visits. The relationship between age and number of missed appointments was not found to be significant. The University's Campus Health Service should continue to use email reminders, and should also use a variety of reminder methods to target different groups of individuals for different types of appointments.

Headings**:**

College Students

Medical Appointments

Reminders

Text Messaging

Email

WHERE ARE THE PATIENTS? – MISSED MEDICAL APPOINTMENTS AND PREFERRED REMINDERS AMONG COLLEGE STUDENTS

by
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of the School of Information and Library Science
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Introduction

The quest to reduce healthcare costs is a beguiling challenge for both administrative and clinical healthcare professionals. This study explores one source of "waste" in the United States healthcare system, missed medical appointments, and considers the effectiveness of reminder methods to reduce such waste. The first section of the paper presents the background of the study, identifies the purpose of the study, describes significance of the study, and introduces the methodology used. The section concludes with a discussion of key terminology.

Background

Due to the privatized nature of the United States healthcare system, it is impossible to know exactly how many appointments are missed or to know what the costs associated with missed appointments are, as this information is not tracked, analyzed or reported to a single organization. In 2003, George and Rubin conducted a systematic review of the literature and identified thirty-one articles that addressed no-show rates. They found that in primary care practices in the United States, no-show rates vary greatly from 5 to 55%.

Young adults have been found to miss more appointments than all other age groups (Cashman, Savageau, Lemay, & Ferguson, 2004; Deyo & Inui, 1980; George & Rubin, 2003; Jones & Hedley, 1988; Lacy, Paulman, Reuter, & Lovejoy, 2004; Lehman, Aebi, Lehmann, Balandraux Olivet, & Stalder, 2007; Moore, Wilson-Witherspoon &

Probst, 2001). The reason for this finding is unclear. One can speculate that the reason is that younger individuals do not see their health problems as being as serious as older individuals. Furthermore, the reason may be that younger individuals lead more hectic lives than older individuals and thereby have greater difficulty keeping appointments (Cashman, et al. 2004). Ultimately, much research is necessary to determine why young adults fail to show up at scheduled appointments more often than other age groups.

Studies show that most individuals report missing medical appointments for a variety of factors, but most report forgetfulness (Lacy, et al., 2004; Martin, Perfect, & Mantle, 2005). Another highly cited reason for missing appointments includes confusion over the date, time or location of the appointment (Geraghty, Glynn, Amin, & Kinsella, 2007). Fortunately, the aforementioned reasons have the potential to be reduced by medical appointment reminders.

Problem

When a patient misses a medical appointment, the patient, other patients, the provider and the entire healthcare system feel the effects of the missed appointment. By missing an appointment the patient gives up the opportunity to have his or her medical problems treated by a healthcare provider. A review of the literature revealed that missed appointments among diabetic patients are associated with poor health outcomes (Ciechanowski, Russo, Katon, Simon, Ludman, Von Korff, Young & Lin, 2006). It is not known if poor outcomes result when patients with other conditions miss appointments, but it is reasonable to assume that there may be a relationship.

When patients miss an appointment, they reduce the likelihood that other patients can schedule a timely appointment for medical treatment. Additionally, missed appointments result in reduced productivity for providers. Reduced productivity often directly affects the provider, as many provider compensation models are based on the productivity of the provider (Hekman, 2002; Johnson & Keegan, 2006). Moreover, when patients are not seen, the medical practice loses revenue that is necessary to keep the practice in business. To avoid lost revenue, practices may be forced to increase charges. Ultimately, missed medical appointments indirectly contribute to rising healthcare costs (Koren, Bartel, & Corliss, 1994).

Purpose

Previous studies on medical appointment reminders and habits have not focused college students as a group, but instead have identified frequent offenders of missed appointments as being young adults. However, it is not known if college students are similar or different from the overall young adult population in terms of appointment keeping habits, reminder preferences and reasons given for missing appointments. The primary purposes of this study are to determine the appointment keeping habits of college students and to determine the appointment reminder preference of college students. Additionally, this study will also discover why college students miss medical appointments and will also reveal what type of appointment reminders are currently being used.

Professional Significance

The exact rate of missed medical appointments in the United States is unknown. Additionally, the appointment reminder intervention studies that have taken place in the United States focus on traditional reminder methods such as mail reminders and telephone reminders. The more recent intervention studies have taken place outside of the United States and focus on the use of newer appointment reminder technologies such as text messaging. This study will show the current reminder preference, including the newer reminder methods, among college students in the United States. This knowledge will give providers serving this population insight so that they will be able to best meet the needs of college students. Ultimately, using this information may help providers of college students to reduce the "waste" in their practices and in the end, the entire healthcare system.

Overview of the Methodology

A closed-ended questionnaire was created using the Qualtrics online survey tool. A link to the questionnaire was distributed via email to students at the University of North Carolina at Chapel Hill using a mass email system. Students had the opportunity to self-administer the questionnaire over seven days in November 2007. The student responses were stored and analyzed using the Qualtrics software. For participating in the study, participants were offered the chance to win one of four, $25.00 Amazon.com gift certificates.

Definitions

There are many terms used to describe missed medical appointments. The terms include the following: broken appointments, failed appointments, non-attendance, low appointment compliance and missed appointments. Although the aforementioned terms are often used synonymously, this study will only use the term "missed medical appointments". For the purposes of this study, "missed appointments" are defined as appointments that are scheduled but are not attended by individuals. Furthermore, "medical appointments" are defined as appointments with recognized healthcare professionals that contribute to the well being of a person. These individuals include individuals such as, but not limited to, physicians, nurse practitioners, chiropractors, dentists, physical therapists and nutritionists.

There are also many terms used to describe individuals who miss medical appointments. The terms include the following: dropouts, no-shows, defaulters, non-attenders, and do not attends (DNAs). This study will use the term "no-shows." Individuals who are "no-shows" are patients that are expected for an appointment at a given time but fail to show up for the appointment and have not cancelled prior to the appointment time.

Literature Review

Studies have been conducted in the United States to determine how many appointments are actually missed. The studies vary greatly in terms of the type of medical specialty examined, location, medical facility, population and methodology. Consequently, the studies have yielded differing results. In 2003, George and Rubin conducted a systematic review of the literature and found that in primary care practices in the United States, no-show rates ranged from 5 to 55%. However, certain medical specialties such as psychiatry and pediatrics have been found to have exceptionally high rates of missed appointments, up to 60% (Lefforge, Donohue, & Strada, 2007) and 80% (O'Brein, & Lazebnik, 1998).

Characteristics of No-Shows

In 1980, Deyo and Thomas created a lengthy list of factors that they considered to be potential determinants of missed appointments. These determinants are classified into the following categories: demographic, socio-behavioral, provider features, disease features, treatment features, patient-provider interaction, access factors, facility and administrative features, and the environment. Of these broad categories, demographic characteristics have emerged in the literature as the primary factor of missed appointments. Foremost, studies cite age as being a key determinant of missed appointments. Specifically, younger adults tend to miss more appointments than older adults (Cashman, et al., 2004; Deyo & Inui, 1980; George & Rubin, 2003; Jones &

Hedley, 1988; Lacy, et al., 2004; Lehmann, et al., 2007; Moore, et al., 2001). It is not clear why younger adults miss more appointments. It has been suggested that younger individuals have more hectic lives than older individuals and therefore, tend to forget about appointments. Or, perhaps, younger individuals are less familiar with the healthcare system or have fewer chronic health conditions than their older counterparts and feel that appointments are not that important (Cashman, et al., 2004). Ultimately, we do not know why younger individuals miss medical appointments more than older individuals. Additional research is necessary to discover the cause of this phenomenon.

There are several characteristics of people who miss medical appointments that consistently appear in the literature. Individuals who miss appointments tend to have a lower socio-economic status than individuals who keep appointments (Cashman et al., 2004; George & Rubin, 2003; Jones & Headley, 1988; Lehmann, et al., 2007; Moore, et al., 2002). Additionally, individuals with Medicaid or no insurance miss more appointments than individuals with private health insurance (Cashman, et al., 2004; Lehman, et al., 2007; Moore, et al., 2002).

Other factors that reportedly effect appointment attendance by some studies include the following: previous attendance rate – some studies show that missing appointments in the past is an indicator for future behavior, while other studies contradict this finding (George & Rubin, 2003; Lacy, et al., 2004), race/ethnicity – some studies have found that Caucasian and Asian individuals miss fewer appointments than other races (Cashman, et al., 2004), psychological diagnosis – patients with certain psychological diagnoses show a correlation with appointment breaking (Cashman, et al., 2004; Ciechanowski, et al., 2006), and marital status – patients who are divorced or

widowed are more likely to miss appointments than other groups (Moore, et al., 2001) However, it is important to note that the literature does not identify a single characteristic that all no-show patients exhibit.

Reasons for Missing Appointments

No-show patients give many reasons for missing medical appointments. According to studies, forgetfulness is the primary reason why patients miss medical appointments (Cosgrove, 1990; George & Rubin, 2003; Jones & Hedley, 1988; Martin, et al., 2005; Murdock, Rodgers, Lindsay, & Tharn, 2002). Most studies describe forgetfulness as forgetting that the actual appointment exists. However, some studies also include forgetting to cancel the appointment in the forgetfulness category. Another highly cited reason for missing appointments is confusion over time, date or location of the appointment (Deyo & Inui, 1980; George & Rubin, 2003; Jones & Hedley, 1988). Both of the aforementioned reasons for missing appointments have the potential to be remedied with improved communication between patients and medical practice staff.

Logistical issues such as transportation problems, trouble leaving work, and a lack of child care presents problems for some individuals trying to keep appointments (Cosgrove, 1990; Lacy, et al., 2004; Lehmann, et al., 2007). Additionally, some individuals claim that the reason why they do not attend an appointment is that they feel better, while other individuals report not showing up for appointments because they do not feel well enough to attend (Cosgrove, 1990; Jones & Hedley, 1988; Lacy, et al., 2004). Lesser cited reasons for not showing up include inability to contact the clinic to cancel an appointment because the phone line was busy (George & Rubin, 2003; Martin,

et al., 2005), last minute emergencies (Jones & Hedley, 1988), and emotional barriers, such as fear (Lacy, et al., 2004).

Effects on the Healthcare System

Most patients have no idea of the implications of missing a medical appointment. In one study, one patient speculated that when an appointment is missed that, 'maybe they just go to the next patient,' while another said 'I guess they get free time' (both referring to clinicians). Overall, patients assumed that a patient missing an appointment could be positive for providers (Lacy, et al., 2004). Despite patient perceptions, missing a medical appointment is not beneficial for the patient or for the provider.

When a patient misses a medical appointment, he or she may be potentially doing damage to themselves. A missed appointment could potentially lead to exacerbation of symptoms (Lefforge, et al., 2007) and could interrupt treatment schedules (Ciechanowski et al., 2006), both of which could result in unnecessary suffering or damage for the patient. In diabetic patients, missed appointments have shown to be linked to lower medication level adherence, poor glycemic control, and an increase in complications (Ciechanowski et al., 2006). Furthermore, two studies of psychiatric patients have shown that patients that frequently miss appointments are more frequently hospitalized (Jones & Hedley, 1988). Ultimately, a missed appointment is a lost opportunity for "prevention, intervention, and continuity of care" (Cashman et al., 2004).

Healthcare is generally considered a scarce resource. When there is a less than optimal use of healthcare providers or facilities, it is considered a waste. One such waste occurs when patients miss an appointment (Hardy, O'Brien, & Furlong, 2001).

Essentially, a no-show patient wastes an opportunity that could be utilized by another patient (Cashman, et al., 2004; Ciechanowski, et al., 2006; Koren et al., 1994).

The reduced productivity that is caused by missed appointments often results in a loss in salary as many providers are paid based, at least in part, on their productivity (Hekman, 2002; Johnson & Keegan, 2006). Additionally, missed medical appointments result in a loss of anticipated revenue for healthcare organizations (Cashman, et al., 2004; Ciechanowski, et al., 2006; Koren, et al., 1994). For example, if a practice has 10,000 annual visits, a 12% no-show rate, and average revenue per visit of $140, it is estimated the organization is likely to lose $168,000 annually ($10,000 x 0.12 = 1,200 no-show appointments, 1,200 x $140 = $168,000) (Quinn, 2007). Also, if a medical practice plans on having one patient evaluated by several providers in a single day, such as a physician assistant and a physician, the loss of revenue is compounded (Koren, et al., 1994). To cover the reduction in revenue, some medical practices may decide to increase charges for all patients, to cover the costs of no-show patients (Koren, et al., 1994). Some practices instead, decide to charge only the no-show patients for missing appointments. Practices vary on the amount they charge patients and when patients are charged. The Medical Group Management Association surveyed 217 medical practices in 2005 about their policies regarding no-show charges. The study showed that 30.2% of practices charged patients for missing appointments – 8.4% charge a fee for any missed appointment, 6.5% allow for one missed appointment but charge for subsequent appointments, and 9.8% charge only chronic no-show patients. Of the practices that charged for missed appointments, 79% charged a flat fee, 3.1% charge for the full

appointment, and 17% have other means of charging for the appointment (MGMA, 2005).

Interventions

Various interventions have been studied to increase appointment attendance. Commonly used methods include patient orientations, financial incentives, scheduling system improvements, and appointment reminders (Deyo & Inui, 1980; Sawyer, Zalan, & Bond, 2002). The most widely written about interventions are reminder messages, specifically mail and telephone reminders. One study asserts that reminders are the most effective intervention method, citing that 26 of 43 studies that were identified showed patient reminders to be the most effective intervention (Koren, et al., 1994). It is important to note that the majority of reminder studies are aimed at improving missed appointments in pediatric and psychiatric populations where no-show rates are high and are not necessarily generalizable to other populations.

Traditional Reminders

In the United States, mail reminders have been found by several randomized controlled trials to be effective in reducing the overall number of no-show patients (Can, Macfarlane & O'Brein, 2003; Grover, Gagnon, Flegel & Hoey, 1983; Lefforge, et al., 2007; Nazarian, Mechaber, Charney, & Coulter, 1974). Studies were not identified that compare the effectiveness of different types of mailed interventions such as postcards and letters.

Telephone interventions have almost always been shown to reduce the rate of no-show attendance in medical practices (Lee & McCormick, 2003; O'Brien, & Lazebnik,

1998; Sawyer, et al., 2002; Shoffner, Staudt, Marcus, & Kapp, 2007). One recent psychiatric study found that if the provider placed the phone call personally, as compared to another staff member in the clinic, the patient was significantly more likely to attend the appointment (Shoffner, et al., 2007). Additionally, one study found that individuals are not necessarily more likely to attend appointments if they actually receive the telephone call, as compared to another person taking a message or leaving the reminder on an electronic device such as an answering machine (O'Brien, & Lazebnik, 1998). However, the literature does not address whether automated reminders are more or less effective than phone calls made by staff members.

Unfortunately, there are few studies that directly compare mail and telephone reminders. Two studies were identified, and both are over 20 years old. Although it is not clear whether the studies would yield similar results today, the data show that telephone interventions are slightly more effective than mail interventions, but the difference is not considered statistically significant (Grover, et al., 1983; Shepard & Moseley, 1976).

Emerging Reminders

On a typical day, 58 million Americans are estimated to use email (Pew, 2005). Despite this fact, only one study was identified in the literature that examined the use of email appointment reminders. At the time of publication in 2005, it was claimed to be the only study that had examined email as a reminder intervention. The study occurred at a preventative and occupational medicine clinic at a tertiary medical center in the United States. Over the six month study period, the intervention group's overall no-show rate decreased from 9.7% to 6.3%, which was found to be significant. The control group

experienced a slight decline, which was found to be statistically significant (Lim & Varkey, 2005).

Text messaging or short message service (SMS), as it is often known, is used worldwide to communicate brief messages. In some countries, such as England, Malaysia, and Australia, text messaging is being used to remind patients of their appointments. Since 2003, pilot studies of text messaging interventions have been conducted in England, but many are not considered scientifically rigorous (Atun & Sittampalam, 2006). However, there have been several studies of merit that show that texting can improve no-show rates (Downer, Meara, & Da Costa, 2005; Geraghty et al., 2007; Leong, K.C., Chen, Leong, K.W., Mastura, Mimi, Sheikh, Zailinawati, Ng, Phua, & Teng, 2006). In these studies, text-message reminders are described as being cost effective compared with mobile phone calls. Although mobile phone usage is more expensive than text messaging outside of the United States, the opposite may be true in the States. Traditionally, text messaging in the United States has been more expensive than placing phone calls. However, in recent years, the cost of text messaging has dropped.

In 2006, The Pew Internet and American Life Project conducted a study where 1,286 individuals were asked about mobile phone habits. Sixty-five percent of individuals surveyed between the ages 18 and 29 reported using the text messaging, and 14% of individuals in this age group reported that they wanted to use text messaging. A much lower percentage of individuals over 29 reported using text messaging – 37% between ages 30 and 49, 13% between ages 50 and 64, and 8% of individuals over 65 (Rainie & Keeter, 2006). This study suggests that many individuals in the US who are

under 30 are utilizing the text messaging capabilities of mobile phones or are interested in sending and receiving text messages. It is important to note that the use of mobile phones is not as widespread in the United States as it is in many parts of the world. As a result, text message appointment reminders may not be feasible for individuals who do not have mobile phones, who do not want to pay for text messaging services or who have no interest in using text messaging technology.

Methodology

The purpose of this study is to describe the characteristics and preferences of college students for receiving medical reminders. Students were surveyed concerning their preferences. A quantitative, descriptive methodology was selected for this study because little is known about college students' appointment reminder preferences or use. Ultimately, this research may serve as a foundation for more rigorous research in the future.

Research Context

The study was conducted using the online survey software Qualtrics. Qualtrics is a privately held software company in Utah that not only sells software but also assists customers in the survey process. By using Qualtrics, customers are able to conveniently build surveys as well as store and analyze data (Qualtrics, 2007). Using the survey tool, participants are able to take the survey from any location where Internet connection is available. Additionally, participants are able to take the survey on their own time. The survey was distributed on November 5, 2007 and was closed on November 12, 2007.

Research Subjects

To be eligible to participate in the study, subjects are required to be 18 years of age or older and be a currently enrolled student at the University of North Carolina at Chapel Hill. The University has been in existence since 1789 and was the nation's first

State university (University of North Carolina, 2007a). During the spring of 2007 the University had approximately 26,510 students (University of North Carolina, 2007b). Individuals from the student population self-selected to be in the study.

It is not known how many subjects are familiar with using the survey tool Qualtrics. However, it is likely that some students are familiar with the program, as the University allows students, faculty and staff to use the program free of charge.

Survey Design

Much consideration was given to the design and organization of the survey, which can be found in Appendix A. Foremost, the survey was created so that the instructions and content are clear. To assure clarity, one topic is addressed per question, and explanations or examples are provided to reduce the likelihood of misinterpretation. Additionally, questions were constructed to be relevant to the topic and to avoid bias.

Each question is designed to be closed ended. Every attempt has been made to assure multiple choice answers are exhaustively categorized and that the categories are mutually exclusive. In the survey one contingency question was asked. A contingency question is a question that is only asked if a positive answer is given for the preceding question. The purpose of a contingency question is to avoid asking subjects irrelevant questions. The survey also contained several questions in a matrix format. The matrix format is used to ask several different questions with the same set of answer choices. The purpose of this format is to avoid asking similar questions repeatedly with the same answer options.

The order of the questions in the survey is significant. Overall, questions are placed in a progressive, logical order. The first three questions, including the

participation agreement, determine if individuals are eligible for participation in the study. Next, questions 4 and 5 collect subjects' demographic information – student classification and gender, respectively. Questions 6-8 ask students about their technology ownership and use. Questions 9 and 10 get to the heart of the study – appointment keeping habits and reasons for missing appointments. These questions are asked to determine if this sample is similar to prior studies found in the literature. Questions 11, 12 and 13 are specifically asked to gain new information that the literature does not address. Question 11 asks participants about what types of appointment reminders they are currently receiving, while questions 12 and 13 ask about appointment reminder preferences.

In the creation of the survey, an attempt was made to reduce the amount of scrolling and to limit the number of screens in the Qualtrics survey. Each question group described above was placed on the same screen, when possible. However, the Qualtrics software is not flexible in certain situations. For example, in situations where a person's answer to a particular question will dictate the following question, Qualtrics requires the initial question to appear on a screen by itself. In the end, the complete survey had 8 screens. Overall, it was estimated that the survey should take approximately 10 minutes to complete.

Research Procedures

To obtain participants for this study, a recruiting email was sent out to students using the University's mass email system (Appendix B). The email describes the study, lists the two exclusionary criteria, and offers inducements for participation. It is important to note that each student is given an email account by the University upon

enrollment. Students can decline to receive mass emails sent out by the University, if they choose.

Assuming a representative sample, it is possible to estimate the responses of a population with a limited number of study participants. Using a power calculation, it is estimated that a sample size of 96 subjects or greater is appropriate, given the following assumptions: a confidence level of 95%, a confidence interval of +-10, and the student body totaling 26,510. One informational email was sent out and yielded more than the required 96 volunteers in a single day.

Students who received the recruiting email and who were interested in participating in the study were able to click on a hyperlink to self-administer the survey. Although the recruiting email explicitly stated the exclusionary criteria, the survey required participants to verify their eligibility. If eligibility was not verified by the student, he or she was automatically excluded from the study by the survey tool.

To encourage participation, an inducement was offered. Students that completed the survey were eligible to be entered into a contest to win one of four $25.00 gift certificates. Upon completion of the survey, four individuals were selected from a numbered pool of subjects using the random number calculation in Excel. All four subjects were notified of winning via email and were told to expect emailed gift certificates from Amazon.com. Subsequently, four $25.00 gift certificates were purchased and delivered electronically to the winners.

Data Analysis

The Qualtrics software program is capable of storing data and performing some data analysis. For each question, responses were counted and percentages were calculated using the Qualtrics software. The Qualtrics software was also used to generate tables and figures that were used to interpret the data. Tests to determine relationships between data, chi square tests of independence, were also calculated using the Qualtrics software.

Results

Between November 5th and November 12th, 576 individuals responded to one or more questions in the survey. Approximately 25% of the individuals answered every question, and 64% of the individuals answered 90% of the survey. Although the response rate was only 2.2%, the study was able to obtain the 96 participants as required by the power calculation.

Demographics

Participants are mostly female (74.6%) and are mostly undergraduates (57.9%). As the figure shows, the majority of participants are 34 years old or younger, with 64.9% being between 18 and 24 years of age.

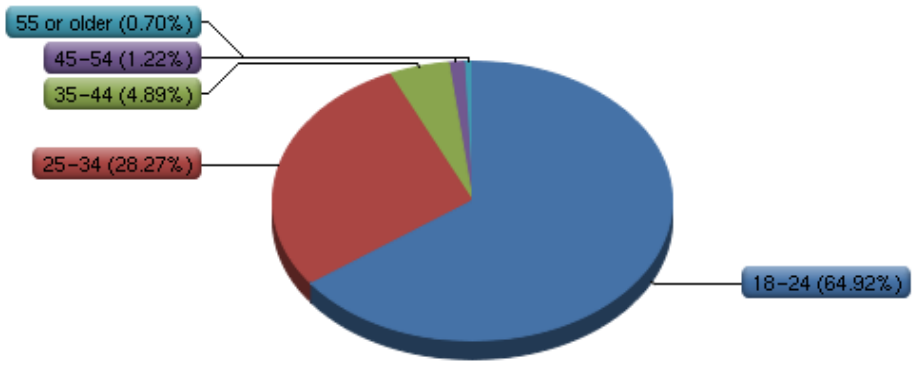

Figure 1: Age of Participants.

Technology Use

Ninety-eight percent of subjects report owning a mobile phone. As Figure 2 shows, the majority of students are sending and receiving text messages using their mobile phone.

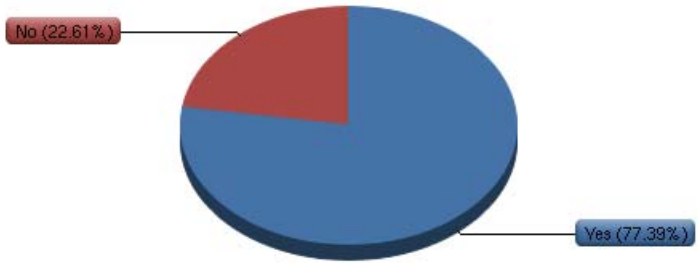

Figure 2: Students Using Text Messaging Features of Mobile Phones.

In contrast, Figure 3 indicates that only a few individuals report sending and receiving email on their mobile phone.

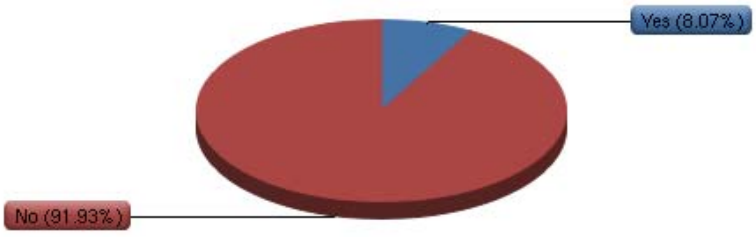

Figure 3: Using Email Features of Mobile Phones.

Medical Appointments

Three hundred and ninety-one individuals surveyed report that they have not missed even one appointment in the past year. Only eight individuals surveyed reported missing five or more appointments in the past year. Of the eight individuals who frequently miss appointments, seven are female, all eight are undergraduate students and all eight are between 18 and 24 years of age. Among the eight individuals, phone calls are the preferred reminder method for all types of appointments, except for allied health appointments.

Table 1: Number of Missed Appointments in 12 months

Answer	Number of Responses	%
None	391	70.32%
1	103	18.53%
2-4	54	9.71%
5 or more	8	1.44%

The top three reasons given for missing appointments include forgetfulness, confusion and problems leaving work or school. Ten percent of individuals cited “other” as being the primary reason for missing appointments. Unfortunately, the survey did not include an area where students could explain “other”.

Table 2: Main Reasons Given for Missing Appointments

Answer	Number of Responses	%
I forgot	71	44.38%
I was confused over time, date or location	29	18.13%
I had transportation problems	12	7.50%
I had problems leaving work/school	27	16.88%
I felt better	5	3.13%
Other	16	10.00%

Appointment Reminders

Participants report that their healthcare providers currently use appointment reminders, with phone reminders being used the most, and text messaging being used the least.

Table 3: Reported Reminder Use among College Students' Providers

Reminder Type	Reported Usage
Phone Call	83.80%
Postal Mail	60.27%
Email	52.01%
Text Messaging	0.81%

Participants report that they prefer phone reminders for initial visits, problem-focused visits with primary providers, problem-focused visits with specialists, problem-focused dental visits and for procedural visits. Email is preferred for all routine visits – primary care, specialty care and dental care. Additionally, email is reported as being the preferred reminder for allied health visits and all visits made in advance – six or more months in advance and between one and six months. Also, email was reported as being

the preferred reminder for appointments scheduled within the same month as the visit. For details refer to Appendix C.

Overall, mailed and text message reminders were not reported as being preferred interventions. However, mailed reminders were most preferred for appointments made more than six months in advance, while text messaging was most preferred for routine visits with primary care providers. Lastly, as Table 4 shows, the majority of individuals report that they prefer to receive reminders several days before scheduled appointments.

Table 4: Preferred Time to Receive Reminders

Answer	Number of Responses	%
As far in advance as possible	53	9.80%
Several days in advance	405	74.86%
1 day in advance	302	55.82%
The day of the appointment	43	7.95%
Never	2	0.37%

Relationships between Variables

It is important to know if there are relationships between the variables of the survey. Chi square is one test that can determine if variables are independent. The test shows the chi square value, which indicates the strength of the relationship between the two variables. The probability value that appears with a chi square value indicates the likelihood that the chi square value occurred by chance. If the probability of the chi squared value is less than the p-value, the test is considered statistically significant. For this study a p-value of 0.05 was used.

Chi square tests of independence were conducted to determine if there is a relationship between the following variables: age and number of missed appointments; reason for missing appointments and number of missed appointments; number of missed appointments and type of reminders being used by providers; as well as number of missed appointments and type of reminder, given the type of appointment. The tests revealed two statistically significant relationships. There is strong evidence that the number of missed appointments is strongly related to appointment reminder preferences for problem-focused, primary care visits. Additionally, there is moderate evidence that the number of missed appointments and preference for appointment reminders for routine dental visits are related. Statistically significant relationships were not identified among the other variables that were studied. A table summarizing the chi square tests of independence can be found in Appendix D.

The two statistically significant relationships were examined in detail. The chi square test on preference for reminders on problem-focused, primary care visits and number of visits missed, revealed the following associations are the strongest: preference for text messaging and missing two to four appointments; no preference and missing five or more appointments; no reminder desired and missing five or more appointments; and preference for email and missing five or more appointments. These associations indicate that individuals who report missing two to four appointments show a preference for text messaging, while individuals who miss five or more appointments prefer not to have a reminder or have no preference for reminder type. The data does not indicate that an individual's preference for reminder causes a person to miss a certain number appointments. Details of the strength of associations can be found in Table 5.

Table 5: Chi Square Test – Number of Missed Appointments and Preference for Problem-focused Primary Care Visit

		Number of Missed Appointments			
		None	1	2-4	5 or more
Preference PCP - Problem	Phone Call	0	0.03	0.11	1.7
	Postal Mail	0.04	0.1	0.01	0.39
	Email	0.37	0.03	0.58	3.27
	Text Message	1.94	0.34	11.06	0.05
	No Preference	0.62	2.48	0.91	6.08
	No Reminder	0.01	0.07	0.03	4.28
	Total Chi Square	34.953			

The chi square test on preference for reminders for routine dental visits and number of appointments missed revealed the following associations are the strongest: preference for text messaging and missing two to four appointments; preference for postal mail and missing two to four appointments; and preference for text messaging and missing no appointments. These associations indicate that individuals who miss two to four appointments prefer text messaging and that individuals who report missing no appointments also prefer text messaging. Again, the relationships do not indicate that preference for reminders causes a person to miss a certain number of appointments. Details of the associations can be found in Table 6.

Table 6: Chi Squared Test - Number of Missed Appointments and Preference for Reminders for Routine Dental Visits

		Number of Missed Appointments			
		None	1	2-4	5 or more
Preference Dental - Routine	Phone Call	0.2	0	1.11	0.47
	Postal Mail	1.31	1.49	2.8	0.25
	Email	0.06	0.13	1.04	0.19
	Text Message	2.76	1.18	11.79	0.63
	No Preference	0.01	0.09	0.36	0.05
	No Reminder	0.34	0.56	0.27	0.04
	Total Chi Square	27.094			

Summary and Discussion

To assist the reader, this final section restates the purpose of the research and the methods used in the study. Additionally, the findings of the study and their implications are discussed.

Review of Purpose

Prior research focused on determining the characteristics of people who fail to keep medical appointments. Additionally, the literature also pays much attention to general reasons why individuals fail to keep appointments, but does not investigate why young adults seem to miss more appointments than other age groups. The literature also contains many studies that illustrate the effectiveness of one or more reminders in individual medical practices.

As previously explained, the primary purposes of this study is to determine the appointment keeping habits of college students and to reveal college students' preferred appointment reminder type. The secondary purposes of the study include finding out what types of appointment reminders are currently being used and discovering the reasons why college students miss medical appointments.

This study is unique in that it focuses on four different reminder types rather than focusing on the two most commonly used reminder types – mail and phone reminders. In addition, this study is concerned with a specific group of people – college students, rather

than a specific medical practice. Lastly, to date, no other study has considered people's reminder type preference.

Review of Methodology

A quantitative, descriptive study was designed to determine the preferences and habits of college students. A recruiting email was sent out to college students at the University of North Carolina at Chapel Hill asking students to complete an online survey. Students were offered an inducement to encourage participation. The carefully designed survey consisted of 13 closed-ended questions and asked questions about demographics, technology use, appointment habits and appointment reminder use as well as preferences. Upon completion of the study, the data were analyzed using the online survey tool Qualtrics.

Study Limitations

On the basis of this study alone, it is impossible to generalize the results to all college students. Foremost, this study was conducted at only one university, and it is possible that students at other universities may not be similar to the subjects in this study. Representative sampling methods were used to obtain the opinions of college students. However, the sample may not be perfectly representative of the population of students at the University of North Carolina at Chapel Hill, as the sample size was small. Furthermore, this study asked students to be self selecting and to self administer the survey. It is not known if individuals that elected to be in the study are different in some way from students that did not complete the survey.

Despite the fact that the survey was carefully constructed, it is not known if the question order, wording, or questions themselves had an impact on results. One question in particular may have been confusing to individuals taking the survey. Students were asked how many appointments they had missed within the past year. The question did not specifically state that cancelled appointments, even if cancelled right before appointment times, were not to be considered "missed appointments". For this reason, the reported number of appointments missed may not be accurate. Additionally, the survey was not pre-tested before it was administered to see if any other questions were confusing to students.

The survey did not ask several questions that would have helped to explain the results gleaned from the study. Students were asked to provide a main reason for missing appointments. Ten percent of students did not select one of the five reasons provided, but instead selected "other" as the primary reason for missing appointments. The survey did not allow students to explain what they meant by "other". Had the survey included an area to describe the meaning of "other", the survey may have identified an important reason why students miss appointments. Similarly, the questions regarding appointment reminder preference did not allow students to state why they preferred one type of reminder over other reminder methods for each of the appointment types. Additionally, the survey did not ask students why they are not using the email capabilities of their mobile phones.

Summary of Results

Of the 576 study participants 74.6% are female and 57.9% are classified as undergraduates. Additionally, 64.9% of participants are between 18 and 24 years of age. Ninety-eight percent of the participants stated they owned a mobile phone and of those individuals, 77.4% reported using text messaging. However, only 8.1% of participants report using their mobile phone to send email.

Thirty percent of participants surveyed report having missed one or more medical appointments in the past year. The most cited reasons for missing appointments include forgetfulness (44.4%), confusion over details (18.1%), and problems leaving work or school (16.9%). Eight individuals reported missing five or more appointments within a calendar year. The eight individuals are undergraduate students between the ages of 18 and 24. Seven of the eight individuals are female, all eight are undergraduate students and all eight are between 18 and 24 years of age. Among the eight individuals, phone calls are the preferred reminder method for all types of appointments, except for allied health appointments. Participants report that healthcare providers are using appointment reminders. Reportedly, phone reminders are currently being used the most (88.3%), while text messaging is currently being used the least (less than 1%).

Overall, email is the most preferred reminder type among college students in this study, especially for routine visits. Phone reminders are participants' overall second choice. Phone reminders are most preferred for initial visits, problem-focused visits, and for procedural visits. On the whole, mail and text message reminders are not preferred in this sample. Furthermore, participants report to want reminders several days prior to scheduled appointments.

Chi square tests were conducted to determine if relationships exist between variables. Only two statistically relationships were identified among the variables examined. There is evidence that the number of missed appointments is strongly related to appointment reminder preferences for problem-focused, primary care visits. Additionally, there is moderate evidence that the number of missed appointments and preference for appointment reminders for routine dental visits are related.

The two statistically significant relationships were examined in detail. The tests for preference for reminders on problem-focused, primary care visits and number of visits missed, revealed the four following strong associations: preference for text messaging and missing two to four appointments; no preference and missing five or more appointments; no reminder desired and missing five or more appointments; and preference for email and missing five or more appointments. These associations indicate that individuals who report missing two to four appointments show a preference for text messaging, while individuals who miss five or more appointments prefer not to have a reminder or have no preference for reminder type. The data does not indicate that an individual's preference for reminder causes a person to miss a certain number appointments. The chi square tests on preference for reminders for routine dental visits and number of appointments missed, revealed the following associations were the strongest: preference for text messaging and missing two to four appointments; preference for postal mail and missing two to four appointments; and preference for text messaging and missing no appointments. These associations indicate that individuals who miss two to four appointments prefer text messaging and that individuals who report missing no appointments also prefer text messaging. Again, the relationships do not

indicate that preference for reminders causes a person to miss a certain number of appointments.

Discussion of Results

Much information can be garnered from the results. The results show that for the most part, healthcare providers of college students are using appointment reminders. In this study email was the most preferred reminder type and text messaging was the least common reminder type. Despite this fact, approximately 30% of college students surveyed, report having missed at least one appointment in the past year. The Medical Group Management Association conducted a study in 2005 of 193 medical practices and found that the average no-show rate was 5%. If one assumes that 5% is an average no-show rate, then 30% would be quite high, suggesting that the reminders being sent to college students may not be effective. Additionally, chi square tests indicate that there is not a relationship between the number of missed appointments and the use of reminders by providers in this sample. This evidence suggests that in this sample the reminders currently being used are generally ineffective at reducing waste in the healthcare system.

Over half of the participants who missed one or more appointments in this study report having done so because of forgetfulness or confusion. This finding is consistent with evidence in the literature. However, ten percent of individuals selected “other” when asked why they missed one or more appointments. The options for the question were selected from the literature. This finding suggests that there are one or more reasons why individuals miss appointments that were not identified in the literature.

Additionally, the chi square test did not reveal a relationship between the reason for missing appointments and the number of missed appointments.

Overall, college students in this study prefer email reminders for appointments that are perceived as “routine,” and phone reminders for appointments that are perceived to be more involved, such as problem-focused or procedural visits. It is not known why this pattern emerged from the data as this question was not included in the survey. It is possible that students simply want a reminder for “routine" appointments, yet they desire human interaction when they perceive appointments to be “important” or for a specific purpose. Additionally, students may have questions or may want to voice concerns before “important” appointments, whereas students may not have such inclinations for “routine” appointments. Furthermore, students may prefer phone reminders for problem-focused or procedural visits as they may be concerned with the confidentiality of their email.

Even though many students send and receive text messages, overall, few find text messaging preferable to other types of appointment reminders. It is unclear why this is the case. It may be that students have concerns regarding the confidentiality of text messaging, and therefore, prefer to rely on other reminder methods. Additionally, students may be concerned that if they receive text message reminders, they will go over their pre-paid text message limits, thus resulting in additional charges.

Chi squared tests revealed two statistically significant relationships between reminder preference, given the type of appointment and the number of missed appointments. A strong relationship was found between the number of missed appointments and reminder preferences for problem-focused, primary care visits. A

closer look at this test revealed that the strongest relationships were between preference for text messaging and missing two to four appointments; no preference and missing five or more appointments; no reminder desired and missing five or more appointments; and preference for email and missing five or more appointments. Two trends can be recognized in the data. First, individuals who have missed five or more appointments have no preference for reminders or do not desire to receive appointment reminders for primary care, problem-focused visits. These individuals may feel that no matter if they receive reminders or not, they will continue to miss appointments. The second group of individuals that are missing appointments feel that either text message or email reminders will be able to help them break their habits. However, it is not clear why individuals missing two to four appointments prefer text messages and why individuals that miss five or more appointments prefer email. This result may indicate that individuals associate reminder type to the "severity" of missing appointments. In this situation, text messaging may be perceived as a weaker reminder type than email.

The second statistically significant relationship is moderate and exists between the number of missed appointments and preference for appointment reminders for routine dental visits. The strongest relationships are between preference for text messaging and missing two to four appointments; preference for postal mail and missing two to four appointments; and preference for text messaging and missing no appointments. This evidence suggests that individuals who miss two to four appointments feel that text message reminders or postal mail will be the most effective at improving their attendance rate. Individuals who do not report missing even one appointment in the past year, report wanting text message reminders. Individuals who keep their appointments may desire

text messaging reminders for a variety of reasons. One reason may be that these individuals want to try out using text message reminders, as they are not as familiar with this reminder type. Additionally, these individuals may also associate reminder type to the "severity" of missing appointments, with text messaging being a weaker reminder type.

Although email is overall the most preferred reminder type among college students in the study, students do not report using mobile phones for emailing. It is not clear why students are not using the email capabilities of their mobile phones. For many students, the cost of email service may be prohibitive. Furthermore, students may not see the need for such a service, as computer ownership and computer access is high at the University of North Carolina at Chapel Hill.

The most surprising finding in this study is that there was not a statistically significant relationship found between age and the number of missed appointments. This information is contrary to the findings in the literature and suggests that college students may be different than the general population in terms of their appointment keeping habits. One other possibility is that respondents were not truthful in their responses or they simply did not know how many appointments they had missed in the previous year. However, it is important to note that of the eight individuals who missed five or more appointments in a single year, all of the individuals were between 18 and 24 years of age, indicating that "frequent offenders" may be younger, but this group overall does not overall miss more appointments than their older counterparts.

Implications for Practice

While this study cannot provide a reason for all healthcare organizations treating college students to modify appointment reminder habits, it can serve as a suggestion for organizations treating college students around Chapel Hill. In particular, the University's Campus Health Service may benefit the most from this study. The Campus Health Service currently uses email reminders for all types of appointments, but should also consider using a variety of reminder methods and combinations of reminders to target different groups of individuals for different types of appointments.

Generally, Campus Health Services may want to continue to use email as a reminder method, as it is the most desired reminder method, but should also consider using phone reminders for problem-focused and procedural visits. Additionally, in this study a statistically significant relationship was identified between individuals who report missing two to four problem-focused appointments with primary care providers and a preference for text messaging reminders. Although we cannot be certain that changing reminder methods will improve attendance rates among individuals who report missing two to four appointments, the data indicates that text message reminders are preferred among this group. Similarly, dentists around Chapel Hill may want to consider using text messages and/or postal messages, as these methods are preferred by individuals who report having missed two to for appointments in the past year. It is important to note that it is entirely possible that the reminder method an individual or group prefers may not result in improved attendance rates. Furthermore, all practices should make an effort to assure that reminders are received a few days prior to the scheduled appointment as this sample desires reminders at that time.

Recommendations for Additional Research

Given that this study is exploratory, much additional research is warranted. Foremost, additional studies focusing on college students are warranted to see how the data in this study compares to other studies. Additionally, this study focused on gathering data and data analysis, but did not question students about why they feel a certain way or why they make certain choices. Future studies would greatly benefit by asking students why they have certain opinions or preferences. Moreover, research is necessary to determine the effectiveness of each type of intervention. Ideally, comparative analysis needs to be conducted between phone, mail, email and text message interventions, not only in practices treating college students but also in practices treating the general population.

Overall, the literature provides little practical information for medical practices about how to select reminder methods and why certain methods should be preferred in certain situations or for certain patients, or medical specialties. Some studies imply that reminder interventions are selected based on cost and/or convenience, but little discussion or evidence, such as cost benefit analyses exists to help medical practices objectively select an intervention type. Research and tools that could be used to help medical practices select reminder type or types would be highly valued. Ultimately, for future research to significantly attendance rates, and thereby reduce the waste in the United State's healthcare system, it must be practical and widely available.

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Appendix A: Qualtrics Online Survey

Screen 1A

Study Information

This study is being conducted by a graduate student, Trisha Crutchfield (828/433-5939; trisha@unc.edu) at UNC's School of Information and Library Science. The study is under the supervision of Dr. Deborah Barreau (919/966-5042; barreau@ils.unc.edu). If you have any questions regarding this research study feel free to contact one of us.

Purpose:
The purpose of the study is to learn more about the medical appointment habits of UNC-CH students and to determine the preferred method of reminding UNC-CH college students of scheduled medical appointments.

What Will Happen During the Study:
This is a study in which you will be asked answer questions online about medical appointment reminders. The study has three parts: introduction, tasks and debriefing, with the entire study taking no more than 10 minutes to complete.

Introduction – To begin the study you will be asked to fill out a questionnaire regarding your demographics.

Questions – You will be asked a series of questions regarding medical appointments and medical appointment reminders.

Debriefing - upon completion of the tasks you will be asked to provide your email address so that you can be notified if you win one of the 4, $25.00 gift certificates.

Privacy is Important:

The only identifying information collected in this study is participants' names and email address, if they wish to be considered for a gift certificate. As soon as the study is complete, your email will be removed from all materials associated with this study.

Risks and Discomforts:
There is a slight possibility that your responses, email address or name could be obtained by a third party by participating in this study. We have security measures in place to prevent this from happening – a secure network, password protection and proper data disposal plans.

Your Rights:
You decide on your own whether or not you want to be in this study. If you decide to be in the study, you will have the right to stop being in the study at any time or skip any question. If you complete the survey, you have the option of providing your name and email address to be eligible to win one of four $25.00 gift certificates to Amazon.com.

Institutional Review Board Approval:
All research on human volunteers is reviewed by a committee that works to protect your rights and welfare. If you have questions or concerns about your rights as a research subject you may contact, anonymously if you wish, the Institutional Review Board at 919-966-3113 or by email to IRB_subjects@unc.edu. If you contact the IRB, please refer to study number 07-1649.

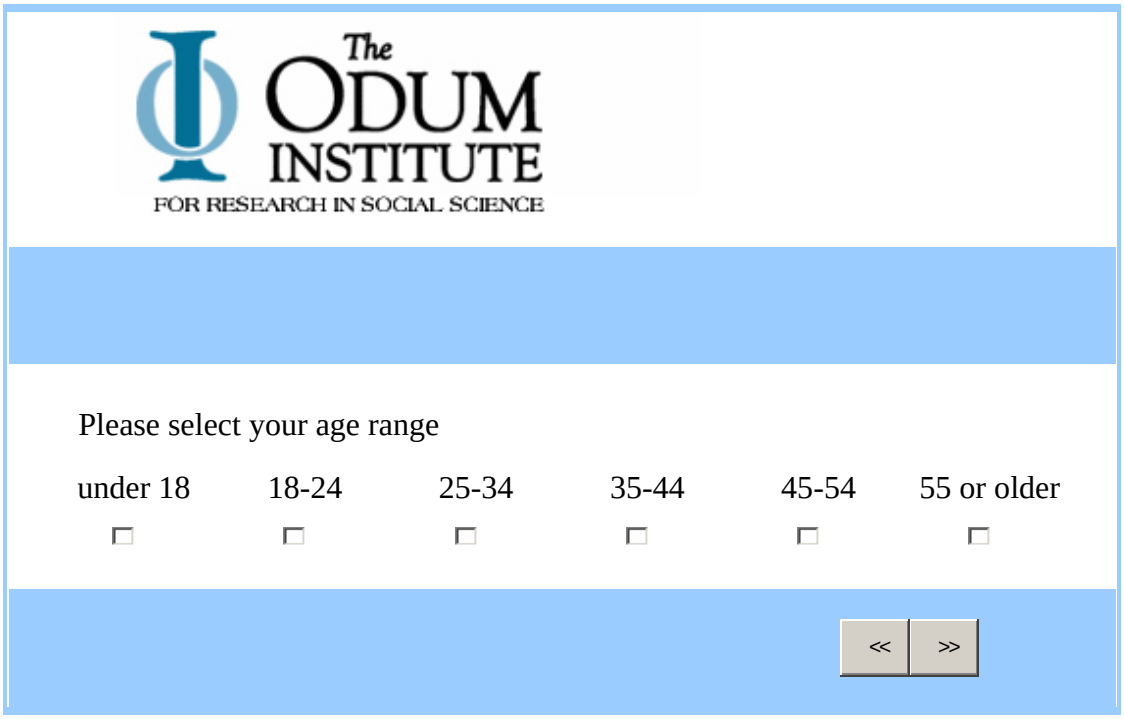
Your Agreement:
I have had the chance to ask any questions I have about this study.

I have read the information in this form, and I agree to be in the study.

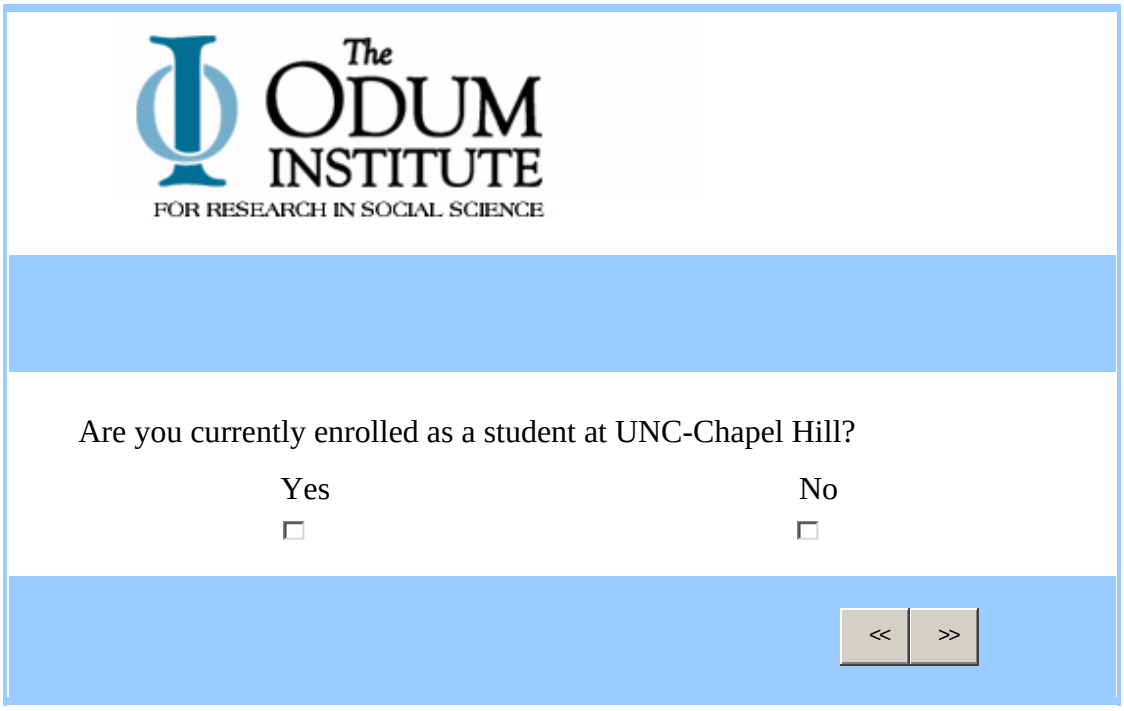
I agree ☐ I disagree ☐

>>

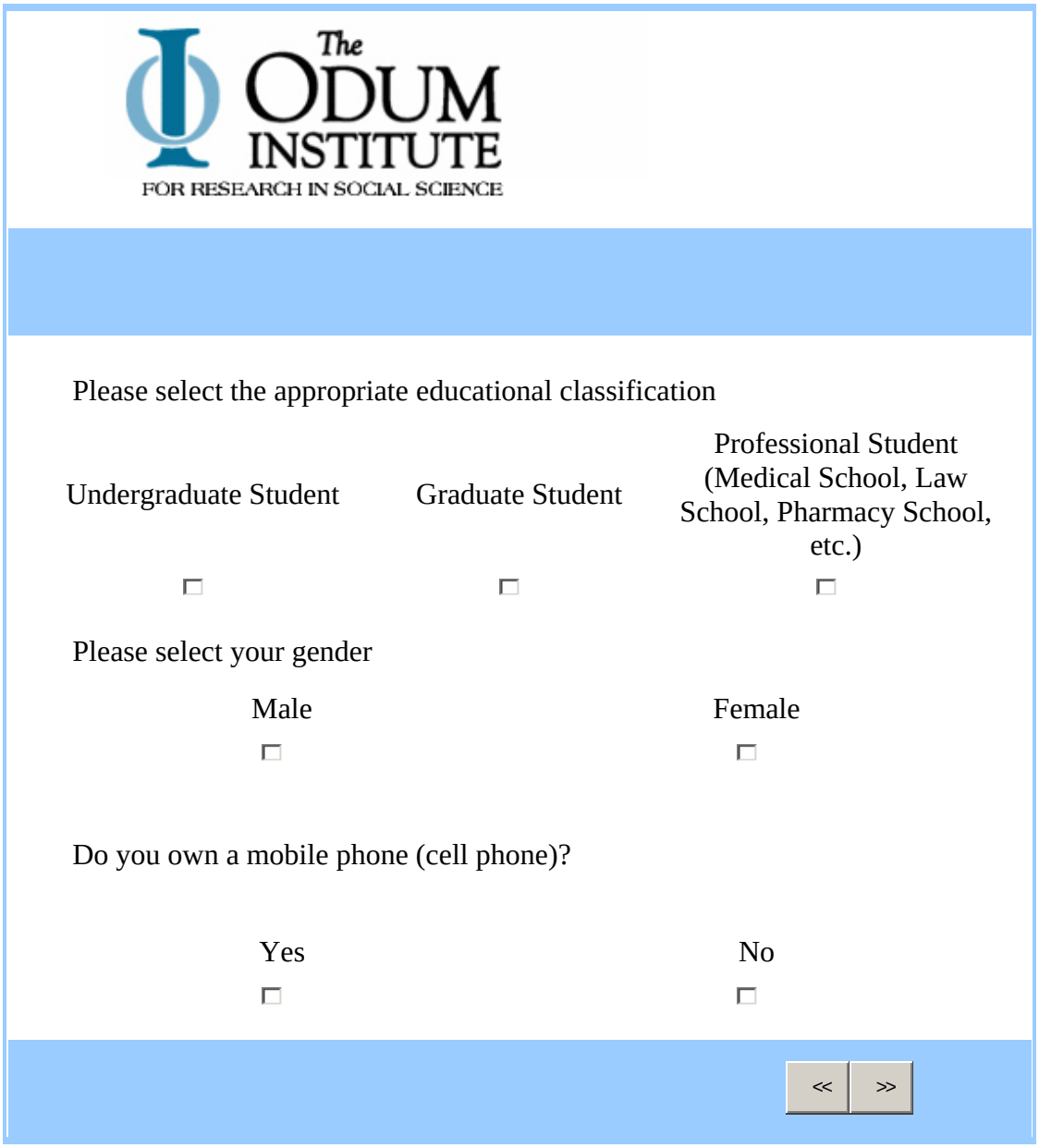
Screen 2A


The ODUM INSTITUTE
FOR RESEARCH IN SOCIAL SCIENCE
Please select your age range
under 18
18-24
25-34
35-44
45-54
55 or older
<<
>>

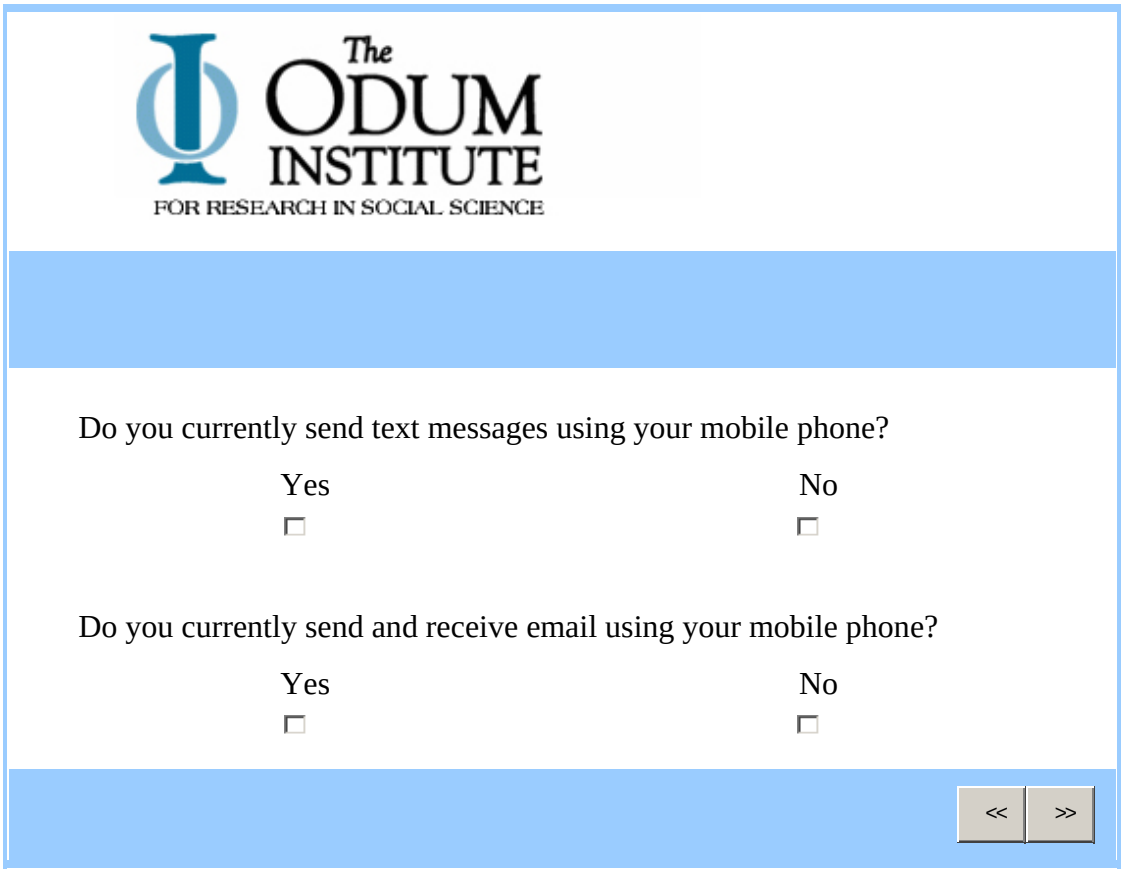
Screen 3A


The ODUM INSTITUTE
FOR RESEARCH IN SOCIAL SCIENCE
Are you currently enrolled as a student at UNC-Chapel Hill?
Yes
No
<<
>>

Screen 4A


The ODUM INSTITUTE
FOR RESEARCH IN SOCIAL SCIENCE
Please select the appropriate educational classification
Undergraduate Student
Graduate Student
Professional Student (Medical School, Law School, Pharmacy School, etc.)
Please select your gender
Male
Female
Do you own a mobile phone (cell phone)?
Yes
No
<<
>>

Screen 5A


The ODUM INSTITUTE
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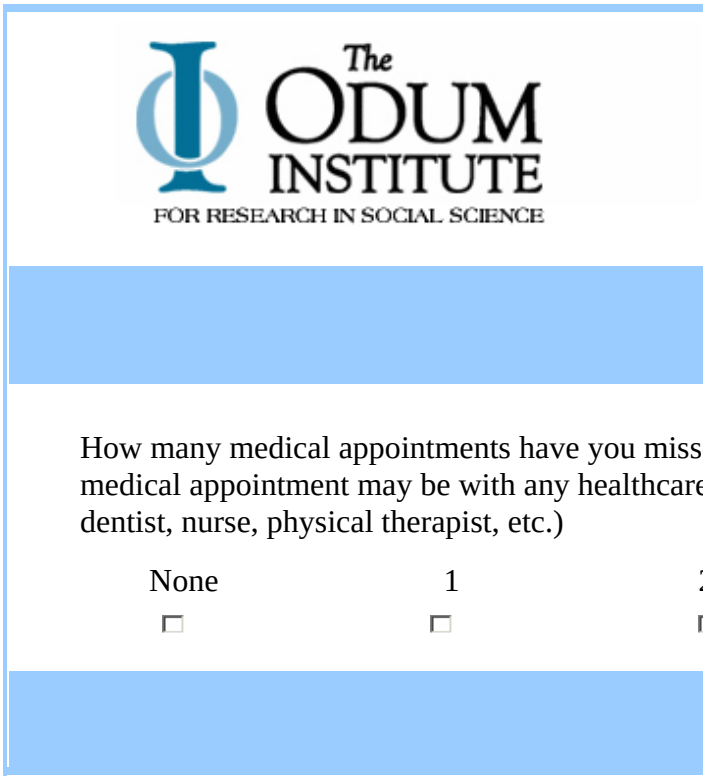
Do you currently send text messages using your mobile phone?
Yes
No
Do you currently send and receive email using your mobile phone?
Yes
No
<<
>>

Screen 6A


The
ODUM
INSTITUTE
FOR RESEARCH IN SOCIAL SCIENCE
How many medical appointments have you missed in the past 12 months? (A medical appointment may be with any healthcare professional - physician, dentist, nurse, physical therapist, etc.)
None
1
2-4
5 or more
<<
>>

Screen 7A

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What is the main reason why you missed one or more appointments in the past year? (select only ONE choice)

I forgot	I was confused over time, date or location	I had transportation problems	I had problems leaving work/school	I felt better	Other
☐	☐	☐	☐	☐	☐

Do any of your healthcare providers currently use the following for appointment reminders?

	Yes	No
Postal Mail	☐	☐
Text Messaging	☐	☐
Email	☐	☐
Phone Call	☐	☐

What type of medical appointment reminder do you prefer the most given the following situation?

	Phone Call	Postal Mail	Email	Text Message	No Preference	No Reminder
First visit to a provider	☐	☐	☐	☐	☐	☐
Routine visit with Primary	☐	☐	☐	☐	☐	☐

Care Provider (check-up)						
Problem-focused visit with Primary Care Provider	☐	☐	☐	☐	☐	☐
Routine visit with Specialist (check-up with OB/GYN, Ophthalmologist, ENT, etc.)	☐	☐	☐	☐	☐	☐
Problem-focused visit with Specialist (OB/GYN, Ophthalmologist, ENT, etc.)	☐	☐	☐	☐	☐	☐
Procedural visit (an in-office procedure will be performed)	☐	☐	☐	☐	☐	☐
Routine Dental visit (check-up)	☐	☐	☐	☐	☐	☐
Problem-focused Dental visit	☐	☐	☐	☐	☐	☐
Allied Health visit (Physical Therapy, Chiropractor, etc.)	☐	☐	☐	☐	☐	☐
Appointment made 6 or more months in advance	☐	☐	☐	☐	☐	☐
Appointment made between 1-6 months in advance	☐	☐	☐	☐	☐	☐

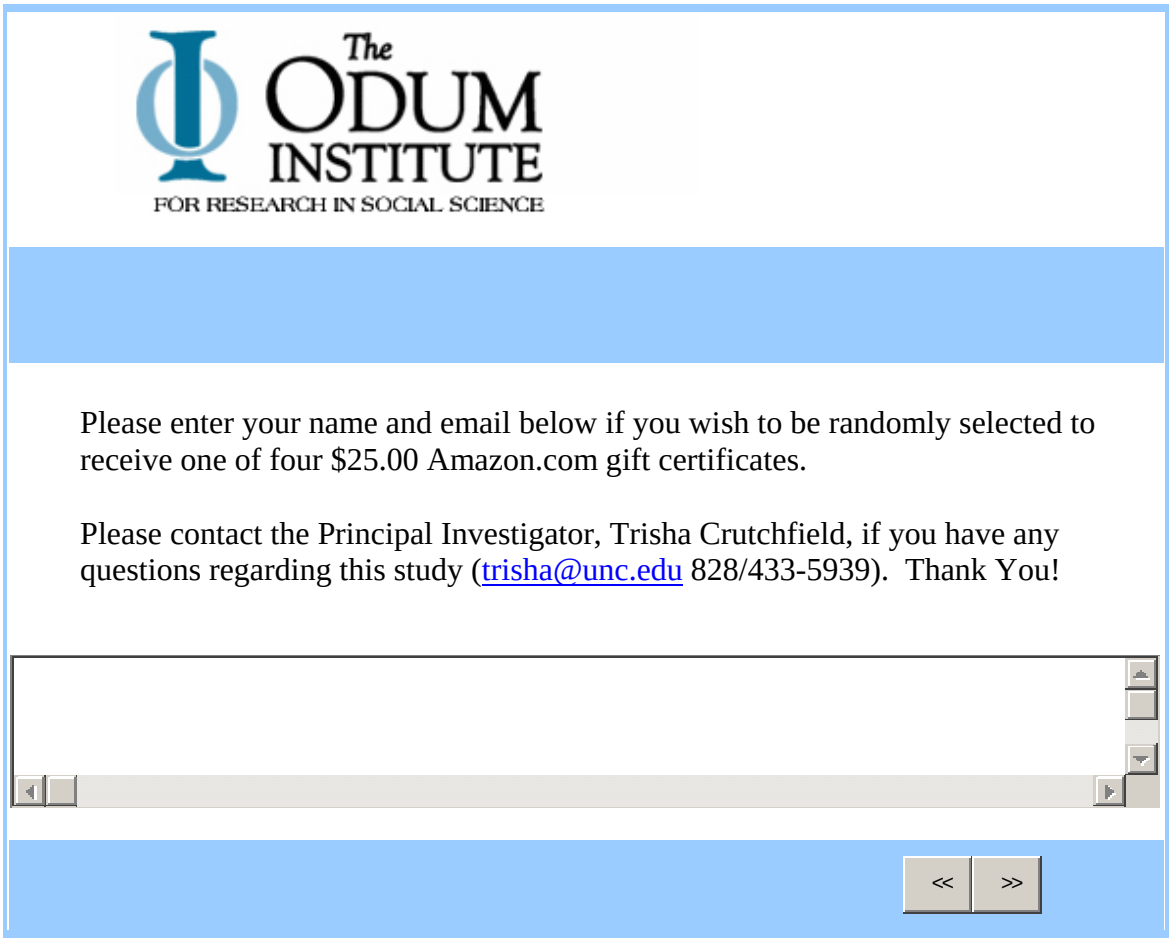
Appointment made within the same month as visit	☐	☐	☐	☐	☐	☐

When do you prefer to receive medical appointment reminders? (select all that apply)

As far in advance as possible	Several days in advance	1 day in advance	The day of the appointment	Never
☐	☐	☐	☐	☐

<< >>

Screen 8A


The ODUM INSTITUTE
FOR RESEARCH IN SOCIAL SCIENCE
Please enter your name and email below if you wish to be randomly selected to receive one of four $25.00 Amazon.com gift certificates.
Please contact the Principal Investigator, Trisha Crutchfield, if you have any questions regarding this study (trisha@unc.edu 828/433-5939). Thank You!
<<
>>

Appendix B: Recruiting Email

To: UNC Community

From: Trisha Crutchfield

Subject: INFORMATIONAL: Medical Appointment Reminder Study

What type of medical appointment reminder do you prefer – phone call, text message, email or mail?

We are currently recruiting individuals interested in helping us best determine what type of medical appointment reminders college students prefer. To participate, you must be over 18 years of age and be a UNC-CH student. Participant's identities will be anonymous.

If you complete the entire survey, you will have a chance to win one of four $25.00 gift certificates for Amazon.com.

If you have questions regarding the study, please contact the principal investigator, Trisha Crutchfield at trisha@unc.edu or 828/433-5939 or her faculty advisor, Dr. Deborah Barreau at barreau@ils.unc.edu or 919/966-5042.

All research on human volunteers is reviewed by a committee that works to protect your rights and welfare. If you have questions or concerns about your rights as a research subject you may contact, anonymously if you wish, the Institutional Review Board at 919-966-3113 or by email to IRB_subjects@unc.edu.

Study title: "Medical Appointment Reminders for College Students"
Study number: 07-1649
Approval date: 11-5-07

This email is sponsored by: School of Information and Library Science

Appendix C: Appointment Reminder Preferences by Visit Type

Question	Phone Call	Postal Mail	Email	Text Message	No Preference	No Reminder	Number of Responses
First visit to a provider	48.43%	12.71%	32.29%	4.33%	1.49%	0.75%	669
Routine visit with Primary Care Provider	25.41%	12.85%	51.85%	8.71%	0.59%	0.59%	677
Problem-focused visit with Primary Care Provider	44.34%	4.87%	40.88%	6.29%	1.57%	2.04%	636
Routine visit with Specialist	27.55%	12.23%	50.93%	7.12%	1.39%	0.77%	646
Problem-focused visit with Specialist	45.48%	5.30%	40.03%	5.76%	1.56%	1.87%	642
Procedural visit	46.14%	6.66%	39.64%	5.75%	0.76%	1.06%	661
Routine Dental visit	25.30%	17.62%	48.19%	7.83%	0.60%	0.45%	664
Problem-focused Dental visit	44.32%	5.12%	41.44%	5.92%	0.96%	2.24%	625
Allied Health visit	27.48%	7.99%	51.60%	6.87%	3.99%	2.08%	626
Appointment made 6 or more months in advance	33.55%	19.61%	39.61%	6.45%	0.52%	0.26%	775
Appointment made between 1-6 months in advance	30.86%	18.01%	43.31%	7.02%	0.53%	0.26%	755
Appointment made within the same month as visit	30.41%	6.05%	50.08%	9.38%	1.06%	3.03%	661

Relationship	Chi Square	DF	Probability	p-value	Evidence
Age & # of missed appointments	15.545	12	0.213	0.05	No
Reason & # missed appointments	12.873	15	0.612	0.05	No
# of missed appointments & provider use - phone call	4.713	3	0.194	0.05	No
# of missed appointments & provider use - postal mail	3.93	3	0.269	0.05	No
# of missed appointments & provider use - email	7.766	3	0.051	0.05	suggestive against
# of missed appointments & provider use - text messaging	0.508	3	0.917	0.05	No
# of missed appointments & preference - first visit	23.792	15	0.069	0.05	No
# of missed appointments & preference - routine, primary care	18.276	15	0.248	0.05	No
# of missed appointments & preference - problem, primary care	34.953	15	0.002	0.05	Strong
# of missed appointments & preference - routine, specialist	19.198	15	0.205	0.05	No
# of missed appointments & preference - problem, specialist	22.579	15	0.093	0.05	No
# of missed appointments & preference - procedural	13.134	15	0.592	0.05	No
# of missed appointments & preference - routine dental	27.094	15	0.028	0.05	Moderate
# of missed appointments & preference - problem, dental	14.368	15	0.498	0.05	No
# of missed appointments & preference - allied health	19.546	15	0.19	0.05	No
# of missed appointments & preference - made 6+ months in advance	17.63	15	0.283	0.05	No
# of missed appointments & preference - made 1-6 months in advance	10.299	15	0.805	0.05	No
# of missed appointments & preference - made same month as visit	19.829	15	0.179	0.05	No

Appendix D: Chi Square Tests