

ORIGINAL RESEARCH

Use of cell phones and computers for health promotion and tobacco cessation by American Indian college students in Montana

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ABSTRACT

Introduction: Cell phones and personal computers have become popular mechanisms for delivering and monitoring health information and education, including the delivery of tobacco cessation education and support. Tobacco smoking is prevalent among American Indians (AIs) and Alaska Natives (ANs), with 26% AI/AN adult men smoking compared to 19% of Caucasian adult males and 22% of African American adult males. Smoking is even more prevalent in Northern Plains AI populations, with 42% of men and women reporting current smoking. The literature on the availability and use of cell phones and computers, or the acceptability of use in health promotion among AIs and ANs, is scant. The authors report findings from a survey of AI students regarding their cell phone and computer access and use. The survey was conducted to inform the development and implementation of a text messaging smoking cessation intervention modeled on a program developed and used in Australia.

Methods: A 22-item paper and pencil survey was administered to students at tribal colleges in rural Montana. The survey questions included cell phone ownership and access to service, use of cell phones and computers for health information, demographics, tobacco use habits, and interest in an intervention study. The study was reviewed and determined exempt by the institutional review boards at the tribal colleges and the lead research university. The study was conducted by researchers at the tribal colleges. Survey respondents received \$10 when the survey was completed and returned. Data analysis was performed with the Statistical Package for the Social Sciences.



Results: Among 153 AI respondents, the mean age was 29 years, range was 18–64 years. Overall, 40% reported smoking cigarettes with a mean age of 16 years at initiation. A total of 131 participants (86%) had cell phones and, of those, 122 (93%) had unlimited text messaging. A total of 104 (68%) had smart phones (with internet access), although 40% of those with smart phones reported that internet access on their phone was very slow or location limited. A total of 146 (95%) participants reported having access to a computer, although 32% of those did not have daily access. Students aged less than 23 years were more likely to have cell phones with internet access. Cell phone ownership differed by site (93% vs 77%, $p=0.007$). About 60% of the respondents who smoked indicated interest in participating in the intervention study.

Conclusions: This study revealed that AI tribal college students in the rural communities surveyed had less cell phone, smart phone, and computer and internet access than that reported for undergraduate college students elsewhere in the USA. Research efforts and public health interventions must be culturally appropriate and technologically viable, therefore access to and acceptability of mobile technology must be evaluated when planning and implementing interventions for rural and other marginalized populations. The findings from this study contribute to the literature regarding the access to and acceptability of mobile technology for health promotion among AI/AN college students in rural and remote areas, and helped introduce the proposed study to the community and solicited useful data regarding tobacco prevalence and interest in tobacco research in the target population.

Key words: American Indians, college students, rural, smoking cessation, text messaging, USA.

Introduction

Cell phones and personal computers have become increasingly popular as a medium for health education and promotion and as a mechanism to support healthy lifestyle behaviors¹. Cellphone and smartphone ownership is proliferating worldwide, and while most pervasive in industrialized and higher income countries and populations, ownership in emerging nations and lower income populations is also increasing². In 2015, 92% of the US population had cell phones, 88% had cell phone coverage with unlimited texting, and 68% of adults had smart phones with Internet access^{3,4}. Undergraduate college students are among the most 'connected' demographic groups in the USA, as 98% report internet access of some kind and 92% report internet access through a personal laptop or cell phone⁵. Given the widespread availability of these devices, mobile applications have proliferated, and health promotion efforts increasingly rely on messaging, social media and other internet access to deliver health information and behavioral interventions.

Text messaging has been demonstrated to positively impact tobacco cessation efforts in studies conducted worldwide. A

2016 Cochrane review reported on 12 text-message-based tobacco cessation studies conducted in Australia, New Zealand, Switzerland, the UK and the USA. The meta-analysis of the studies' data revealed that smokers in the intervention groups were approximately 1.7 times more likely to be tobacco abstinent at 6 months after their quit date than those in the control groups⁶. Another recent systematic review of tobacco cessation text messaging programs included four studies implemented with young adults or college students. This review reported that text messaging was effective as either a standalone or adjunct mechanism, and that the intervention was well accepted by participants⁷.

Tobacco smoking is prevalent among American Indians (AIs) and Alaska Natives (ANs). According to findings from the National Health Interview Survey in 2014, 26% of AI/AN men and 33% of women aged 18 years or more reported current smoking, compared to 19% and 17%, respectively, of their white counterparts and 22% and 14% of black counterparts⁸. Smoking is even more prevalent in Northern Plains AI populations, with 42% of men and women reporting current smoking⁹. Despite the high prevalence of cigarette smoking in the AI population, there is a dearth of published research on smoking cessation interventions



focused on this population. It is notable that only one randomized controlled trial focusing on AI populations was included in a 2012 Cochrane review of smoking cessation interventions for indigenous populations¹⁰. In that study, Johnson and associates examined tobacco abstinence rates among 601 AI clients at four urban clinics, including two sites that offered the 'Giving American Indians No-smoking Strategies' (GAINS) program and two that did not. No significant differences in abstinence rates were detected at 1 year post-intervention¹¹. Another small randomized controlled trial published in 2014 reported the effects of culturally tailored versus generic smoking cessation counseling combined with pharmacotherapy (varenicline) on 103 adult AI participants' smoking abstinence. The authors reported no statistically significant differences between the participants receiving culturally tailored and standard counseling¹². Other non or quasi-experimental studies examined the effects of smoking cessation counseling and pharmacotherapy on AI youth ($n=79$) and adults ($n=317$)^{13,14}. Both studies reported non-significant changes in abstinence rates between intervention and control groups at follow-up, but both also indicated that community and participant interest and need warranted further study. Other studies document the tobacco smoking prevalence¹⁵, the importance of culturally relevant programs^{16,17}, and special challenges in AI populations and their efforts to abstain from tobacco¹⁸. The authors are aware of no published studies that use culturally tailored text messaging to support tobacco cessation in AI populations.

In New Zealand, a randomized controlled trial using text messaging to promote smoking cessation among young adults found that 28% of intervention participants successfully quit smoking, as measured 6 weeks after the designated quit date, compared to 13% of controls¹⁹. A secondary analysis revealed that the intervention was as effective with Maori participants as it was with non-indigenous participants²⁰. Therefore, the authors proposed to adapt this intervention for implementation in AI/AN populations, on the hypothesis that an approach with success in one indigenous group might be suitable for another with a broadly similar history of colonization and marginalization.

For rural AI/ANs, as with other marginalized groups in the U.S. and other countries, , limited data are available on ownership or access to cell phones and other technologies, or on the populations' preferences regarding the use of electronic media for health promotion. The aim of this study was to address this gap in the literature by surveying tribal college students in rural settings regarding their access to and use of electronic technologies and their preferences regarding the use of these technologies for health promotion purposes. The study also assessed participants' smoking prevalence and interest in participating in tobacco research studies.

Methods

Setting

Tribal colleges and universities are institutions of higher education that preserve and support Native ways and are located on or near AI reservations²¹. Sites for the present study were two tribal colleges in Montana, a Northern Plains state. Fort Peck Community College, on the Fort Peck Reservation in north-eastern Montana, home to the Assiniboine and Sioux tribes, has an enrollment of about 450 students, of whom 82% are AI/AN. Little Big Horn College, on the Crow Reservation in south-eastern Montana, has an enrollment of about 400 students, of whom 95% are AI/AN²². The rurality of each community was measured by using Rural-Urban Commuting Area designations, which apply US Census Bureau definitions and data on commuting to characterize rurality and urbanicity of geographic locations in the USA²³. According to these designations, Fort Peck Community College is located in a 'small rural town' and Little Big Horn College is located in an 'isolated small rural town'. These designations are based on zip codes rather than county-level data, making them appropriate for Montana, which has counties the size of Rhode Island, and includes both urban and very rural areas.

Eligibility and enrollment

Study participants were recruited at both campuses in December 2013. Eligibility criteria included age 18 years or greater and enrollment at the local tribal college. Student



assistants were hired, and after completing human subjects training were instructed on recruitment procedures, and helped to administer the project survey to participants. These student assistants visited classrooms and common spaces and, along with researchers, informed potential participants about the intent of the project and encouraged them to participate. Interested students completed a pencil and paper survey; per the exemption granted by ethical review, survey completion was considered implied consent. Respondents were compensated \$10 for their time. Budgetary considerations limited the number of respondents to 200.

Data collection and measures

The study measure was a 22-item survey administered with paper and pencil, requiring about 10 minutes to complete. Some survey items were modified from the Canadian Internet Use Survey for Individuals or the American Indian Adult Tobacco Survey^{24,25} and others were developed specifically for the purposes of this study. Reliability and validity measures are available for those items adopted from previous studies; measures developed for the study were assessed by the research team which included AI researchers familiar with the topic and environment. A copy of the survey is available on request from the corresponding author. Items assessed computer access; computer availability (every day, all day, or only for a few hours); cell phone ownership; type of service plan (pre-paid versus monthly, limited versus unlimited text messaging); ability to access the internet by cell phone; average number of text messages sent daily (10 or more, 1–9, not every day, none); daily time spent on the internet by computer and phone combined (10 or more hours, 5–9 hours, 1–4 hours, less than 1 hour, no internet access); frequency of email use (daily, less than daily, not at all); interest in using the internet to schedule appointments, respond to health questionnaires, and find health information (frequently, sometimes, rarely, or never); and preferred media for reminders of vaccinations, health screening, and medical appointments (US mail, cell phone, email, text messaging, or Facebook).

Items on cigarette smoking and health status included current cigarette use (none or number of cigarettes or packs per day), age at smoking initiation, number of quit attempts (free

response), and self-reported health status (five-point Likert scale with 1='poor' and 5='excellent'). Respondents also reported their age, gender, and race (AI/AN, White, Other) and indicated their interest in participating in the larger intervention study (Yes/No).

Statistical analysis

Frequencies to describe sample demographics, tobacco use, and ownership or access to a cell phone or computer were calculated. *t*-tests were used to examine group differences with regard to tribal college location, age, and gender. Data analysis was performed with the Statistical Package for the Social Sciences v22 (IBM; <http://www.spss.com>). An alpha error rate of 0.05 was considered the threshold for statistical significance in group comparisons.

Ethics approval

The institutional review boards of Washington State University, the University of Washington, Fort Peck Community College, and Little Big Horn College determined that the project was exempt from institutional review board review.

Results

Descriptive findings

Despite verbal screening efforts, 32 out of 200 respondents did not meet inclusion criteria, with 30 reporting that they were not tribal college students, and two ineligible due to age (one aged less than 18 years, and one with no age reported). Compared to eligible respondents, the 32 respondents who were ineligible were older, more likely to be male, and less likely to have access to computers or cell phones. Students were not required to declare their race prior to completing the survey; 12 of the 168 eligible respondents reported their race as white and three reported 'other'. The results reported here are findings from analyses of the data obtained from the remaining 153 students aged 18 years or older who reported they identified as AI/AN.



Participant demographics and smoking behaviors

The mean age of eligible respondents was 29 years (range 18–64 years), and 85 (56%) were female. Eighty four (55%) studied at Little Big Horn College and 45% at Fort Peck Community College. One hundred and thirty four (88%) reported good to excellent health, 12% reported fair health and none reported poor health. The prevalence of self-reported current smoking was 40%. The mean age at smoking initiation was 16 years, with 90% of current smokers reporting initiation by the age of 18 years. Ninety six or 63% of all respondents responded to the 'age of initiation', indicating they had tried cigarettes at some point in their lives. Approximately two-thirds of smokers indicated that they smoked less than half a pack of cigarettes per day. The average number of quit attempts was four (range 0–50 attempts). Participant demographics and tobacco use are summarized in Table 1.

Cell phone use and computer access

Across both sites, 131 respondents (86%) owned a cell phone, 98 (75%) of those had monthly plans, and 33 (25%) had prepaid plans. A total of 104 (80%) of cell phone owners reported having internet access on their phone. However, about 38% of those 104 individuals reported that internet access was either too slow to use easily or available only at certain locations in their community. A total of 122 (93%) of cell phone owners had unlimited text messaging, and the same proportion also reported at least occasional text messaging, with 65% texting 10 or more times per day.

Most respondents (146 or 95%) reported having access to a computer, although one-third of those did not have daily access. Eighty-five (about 60%) of the 146 with computer access reported the ability to use a computer at any time. About 84% of all respondents reported spending 1 hour or more on the internet per day, and 93% reported using email, although two-thirds of those did not check email daily. Computer and cell phone access is summarized in Table 2.

About half (49%) of respondents with cell phones reported they would either frequently or sometimes use online health

appointment scheduling. Two-thirds would frequently or sometimes respond to online health questionnaires, and one-third would frequently or sometimes use websites to view or update their personal health information. *t*-tests indicated no significant differences in these variables by gender or smoking status (data not shown). Internet access and use patterns are summarized in Table 3.

Interest in participating in tobacco cessation research and frequency of messages

Respondents with cell phones were asked about their interest in a health research project that used text messaging to stop smoking and their preferred frequency for messaging. Among the 131 respondents with cell phones, 70 (53%) indicated they were interested, and 60 (46%) indicated they were not. Responses of the 49 cell phone owners who were also smokers were of particular import; 29 (59%) reported being interested in participating in the research, 19 (39%) were not, and 1 (2%) did not respond. Cell phone owners who were smokers reported their preferred frequencies of messaging for health behavior education as once or twice per week (45%) and once or twice per month (41%). Few respondents (8%) preferred receiving messages once or twice per day.

Inferential statistics

No significant differences were observed in cigarette use whether by tribal college site ($t(151)=1.16$, $p=0.250$), age (<23 years vs ≥ 23 years) ($t(151)=-0.829$, $p=0.408$), or gender ($t(150)=0.959$, $p=0.339$). These results are inconsistent with previous studies reporting a higher prevalence of smoking in males than females²⁶⁻²⁸. In general, nonetheless, self-reported health status in the study sample was consistent with recent research among AI/AN college students²⁹.

There were significant differences in cell phone ownership and internet capability on cell phones by site, with the more remote site reporting lower levels of both ownership and access to internet through their phones ($t(151)=-2.87$, $p=0.005$; and $t(128)=-2.55$, $p=0.012$, respectively) (Table 4).



Table 1: Participant demographics and tobacco use (n=153)

Characteristic	n/ years	%
Age		
Mean	29 years	N/A
Mode	19 years	13
Range	18–64 years	N/A
Sex		
Male	67	44
Female	85	55
Missing	1	1
College location Rural Urban Commuting Area		
Small rural (Fort Peck Community College)	69	45
Isolated rural (Little Big Horn College)	84	55
General health		
Poor	0	0
Fair	19	12
Good	46	30
Very good	54	34
Excellent	34	22
Missing	1	1
Cigarette smoking		
Non-smoker	92	60
More than one pack per day	3	2
Between half and one pack per day	17	11
Less than half pack per day	41	27
Total smokers	61	40
Age at smoking initiation		
Mean	16 years	N/A
Mode	18 years	14
Range	8–30 years	N/A
Number of smoking cessation attempts		
Mean	4	N/A
Mode	1	14
Range	0–50	N/A

N/A, not applicable.

Table 2: Access to computers and cell phones (n=153)

Computer and cell phone use	n	%
Access to computer		
Yes, every day	97	63
Yes, but not every day	49	32
No	6	4
Missing	1	1
Ease of computer access		
Not accessible every day	15	10
Accessible for a few hours every day	44	29
Easily accessible at any time	85	56
Missing	9	5
Have cell phone		
Yes, monthly plan	98	64
Yes, prepaid plan	33	22
No cell phone	22	14



Table 3: Internet access and use (n=131)

Activity	n	%
Internet access by phone		
Yes, easily accessible	65	50
Yes, but only in some locations	20	15
Yes, but it is too slow to use easily	19	14
No	26	20
Missing	1	1
Unlimited texting on phone		
Yes	122	93
No	9	7
Number of text messages sent per day		
10 or more texts per day	85	65
1–9 texts per day	21	16
Text but not daily	16	12
Never send text messages	7	6
Missing	2	1
Hours spent on internet per day		
≥10 hours	9	7
1–9 hours	101	77
<1 hour	15	11
Don't have internet service	6	5
Use of email		
Yes, every day	43	33
Yes, but not every day	79	60
No	8	6
Missing	1	1
Appointment scheduling		
Frequently/sometimes	64	49
Rarely/never	67	51
Answering online health questionnaires		
Frequently/sometimes	85	65
Rarely/never	43	35
Visit websites to view and update health information		
Frequently/sometimes	41	32
Rarely/never	89	68
Preferred frequency of health information messages		
1–2 per day	11	9
1–2 per week	49	37
1–2 per month	42	32
No messages	29	22

Table 4: t-tests access to computers and cell phones by campus (n=153)

Variable	Little Big Horn	Fort Peck Community College	t	p	95%CI
	mean (SD)	mean (SD)			
Daily access to computer	0.60 (0.492)	0.68 (0.469)	1.00	0.318	−0.076 to 0.234
Have cell phone	0.93 (0.259)	0.77 (0.425)	−2.87	0.005	−0.271 to −0.050
Internet on phone	0.87 (0.336)	0.69 (0.466)	−2.55	0.012	−0.319 to −0.040

CI, confidence interval. SD, standard deviation.



Discussion

Forty percent of study participants reported being current smokers, similar to the 37.0% reported for 18–25-year-old AI/ANs on the 2013 National Survey on Drug Use and Health³⁰. This proportion is consistent with recent research on self-reported health behaviors by AI/AN college students, in which 44% of Northern Plains students reported smoking tobacco 'now'³¹. The mean age at smoking initiation (16 years) was similar to that reported in previous studies among AIs in the Northern Plains³².

About 63% of respondents reported daily computer access, a much smaller proportion than the 92% for non-students and 100% for college students reported for the all-races population in a survey on internet use in 2011⁵. A total of 104 (80%) of those with cell phones reported having access to the internet on their phones, however, only 65 (50%) of those with phones had consistent internet, with the other 39 (30%) reporting inconsistent access due to location or low signal. These proportions are lower than a 2014 Pew Foundation survey which reported that 85% of young adults (aged 20–29 years) had smart phones (with internet access)³³. The authors note that internet access and cell phone use vary widely in rural communities, with limiting factors including location of service towers, efficiency of service providers, and income and resources of users.

Limitations of this study include a small sample size and recruitment of participants at only two sites. This limited size and scope preclude generalization of results to other tribal communities or student populations. Approximately 300 students were enrolled at each of the colleges during the data collection period; therefore, the sample represented approximately one-third of the colleges' populations. Also, it should be noted that because recruitment for survey participation was largely by word of mouth, and was conducted during a limited time frame, in person, on campus, the authors may have obtained a sample that was more able to travel to campus, or be in classes on the given

days, thus potentially excluding otherwise eligible students with less access to transportation or other resources.

Conclusions

These results guided the recruitment plan and research design for the authors' larger intervention study. They can also help to remedy the general lack of information on cell phone access and internet use among AI/ANs, while offering insight into the preferences of AI/AN college students regarding the use of digital media for health information³⁴. Younger participants in the study were especially likely to own cell phones and to use digital media. The well-known 'digital divide' in access to technology disproportionately affects rural and low-income people in the USA, including many AI/ANs^{35,36}. Even though access to the internet and other technologies is now an expected feature of everyday life and important in college settings, such access is often restricted for Native people^{37,38}. Limiting factors include individual and family income, both of which tend to be low in AI/AN communities, as well as available infrastructure, which is generally less than optimal in rural areas, where most AI reservations are located^{39,40}.

Effective smoking cessation programs in tribal communities, especially interventions using text messaging and other technology-dependent delivery systems, must be designed and implemented with a thorough understanding of resources and access. More research is needed to assess the impact of the digital divide on health and health services in rural Native and other marginalized communities, and to identify realistic, responsive interventions in partnership with community leaders.

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