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Cell Phone Information Seeking Explains Blood Pressure in African American Women

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Abstract

While cell phone use and Internet access via cell phone is not marked by racial disparities, little is known about how cell phone use relates to blood pressure and health information seeking behaviors. The purposes of this study were to 1) describe Internet activities, cell phone use, and information seeking, 2) determine differences in blood pressure and information seeking between cell phone information seekers and nonseekers, and 3) examine cell phone information seeking as a predictor of blood pressure in African American women. Participants (N= 147) completed a survey and had their blood pressure measured. Independent sample t-tests showed a significant difference in systolic blood pressure in cell phone information seekers and nonseekers. Linear regression revealed cell phone information seeking as an independent predictor of systolic blood pressure, despite confounders. It is possible that cell phone information seekers were using health information to make decisions about self-management of blood pressure.

Keywords

cell phone use; high blood pressure; information seeking behavior; African American women; self-management

Of adult African American women, 47% have hypertension; as a result, they are at an increased risk for stroke, end-stage renal disease, and death (Chobanian et al., 2003; Mozaffarian et al., 2015, 2016). In fact, the prevalence of hypertension in African American women is among the highest of all groups in the world (Mozaffarian et al., 2016). A significant proportion of African American women are living with blood pressure levels consistent with the clinical criteria for prehypertension or hypertension, and many are undiagnosed and untreated (Fryar, Hirsch, Eberhardt, Yoon, & Wright, 2010). When compared to other racial and ethnic groups, African American women are disproportionately affected by prehypertension and hypertension, making this is a serious health disparity that deserves further attention (Mozaffarian et al., 2016; Selassie et al., 2011), particularly in

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terms of understanding how best to educate this population about the disease. The management of prehypertension and hypertension is similar – both require dietary changes, exercise, and possibly medication (Bavikati et al., 2008; Chobanian et al., 2003). Information technology holds potential for helping African American women to self-manage their blood pressure (Smith, 2014).

Self-management describes daily tasks required to promote health or manage a chronic disease, such as hypertension (Lorig & Holman, 2003). According to the Individual and Family Self-Management Theory, the process of self-management applies to both chronic disease management and the management of risk factors that could lead to disease (i.e. elevated blood pressure; Ryan & Sawin, 2009). One self-management process is self-regulation, where people engage in activities of self-monitoring, decision-making, and planning and action in order to achieve a goal (Ryan & Sawin, 2009). Internet information seeking holds potential for providing just-in-time access to information that can facilitate health decision making (self-management) in real time; for example, information can be sought via cell phone when ordering a meal in a restaurant (Riley et al., 2011).

The Internet is a “flexible” medium that can be easily tailored to meet specific needs, and that is available at any time of day or night. Additionally, information seeking, or acquiring information in response to a need or gap in knowledge, (Case, 2012) may be linked to health behaviors (Greyson & Johnson, 2016). For example, some studies have shown that those who seek health information on the Internet are more likely to change their behavior (Ayers & Kronenfeld, 2007). There are a variety of ways for consumers to seek health information on the Internet, including desktops (personal or public) and mobile devices, such as laptops, tablets, or cell phones.

According to Smith (2014), 72% of African Americans have access to the Internet. Although there are racial differences in some modes of Internet access (broadband/home), there is no significant difference in Internet access via smartphones (Smith, 2014). Approximately 90% of African American consumers own a cell phone and 59% own a smartphone, a cell phone that can be used to access the Internet (Smith, 2014). Nevertheless, most of African American women’s Internet activity is categorized as social, rather than informational, in focus (Smith, 2014). Nevertheless, the Internet provides a familiar platform already being used by many African American women, suggesting its potential role in helping this group learn about hypertension and how to manage it.

Internet Information to Support Self-Management of Blood Pressure

In order to maintain their blood pressure within a safe range, women need information about hypertension and how to manage it (Chobanian et al., 2003; Kaziunas, Ackerman, & Veinot, 2013). A vast amount of health information is available on the Internet, including high-quality information on blood pressure (Diaz et al., 2002; Kreps & Neuhauser, 2010). Thus, the Internet can provide and reinforce knowledge about hypertension, including the disease progression, the safe range of blood pressure, and lifestyle modifications to self-manage blood pressure. Studies have shown that text reminders sent to cell phones and other Internet delivered interventions improved medication adherence and self-efficacy, two important

components of self-management (Krishna, Boren, & Balas, 2009; Webb, Joseph, Yardley, & Michie, 2010). However, the evidence is lacking for specific Internet information-seeking behaviors for self-management of blood pressure. The potential value of information technology for health education is widely acknowledged. Indeed, one of the Healthy People 2020 goals is to use health information technology to improve health outcomes for health disparity populations (Office of Disease Prevention and Health Promotion, 2011). Yet, little is known about African American women's cell phone use and health information seeking, and how these concepts relate to blood pressure control.

Purpose

Given the lack of evidence on African American women's cell phone information seeking and the evidence that shows there is equal racial Internet access via cell phones, the purposes of this secondary data analysis were to 1) explore the Internet activities, cell phone use, and information seeking behaviors reported; 2) determine if there were differences in blood pressure and information seeking (purposive vs. incidental) between African American women who used their cell phones to find information about blood pressure and those who did not; and 3) examine cell phone information seeking as a predictor of systolic blood pressure in a sample of African American women.

Methods

A descriptive, correlational design was used for this cross-sectional study. The University of Michigan Institutional Review Board (IRB) granted an exempt status. The parent study was conducted at an African American women's regional church conference in the Midwest in 2013 with permission from the conference administrators. A convenience sample of women attending the conference were invited (announcements, flyers, and verbal invitations) to participate. The purpose of the parent study was to examine predictors of information use to self-manage blood pressure among African American women. In this exploratory study, we focused only on women who owned cell phones.

Participants

Although 151 women were approached and agreed to participate in the parent study, the 147 women who owned cell phone were included in this study. All of the women in the study self-identified as Black or African American. The mean age was 55.0 years (standard deviation = 13.7), ranging from 19 to 82. Over 60% of the sample had earned at least a 4-year college degree. (See Table 1 for additional characteristics of the sample.) The average blood pressure was 136/81 mmHg (standard deviation = 20.0/12.8). Ninety-one of the women (62%) had been told by a health professional that they had hypertension and 51% were taking medications for high blood pressure. Yet, many of the women in the sample had blood pressure levels that were elevated. In fact, 42% of the women had systolic blood pressure readings between 120–140 mmHg and 37% percent of the sample had readings greater than 140 mmHg. (See Table 2 for additional blood pressure frequency data.) Almost half (46%) of the women had their blood pressure measured within the past month. Some of the women (38%) had seen a health care professional within the past month, with most having seen a health care professional in the past six months (50%).

Data Collection

The women who participated in the study completed a 72-question survey and had their blood pressure measured. Participants were seated in a private, quiet area. The first page of the survey provided written information about the study, and the principal investigator was available to speak with any participant who had questions regarding the study. Completion of the survey signified consent to participate in the study. Measures of Internet activities, information seeking, and cell phone use were obtained. On average, the survey took approximately 20 minutes to complete. After the surveys were completed, blood pressure measurements were obtained. Each participant received a $10 gift card for participating in the study.

Measures

Cell Phone Ownership and Use—Cell phone use and related activities were measured with questions adapted from the Pew Internet and American Life Project (Madden, Lenhart, Cortesi, & Gasser, 2010). First the women were asked if they owned a cell phone. Women who owned cell phones were also asked about their use of it: “Do you access the Internet via cell phone?”, “Do you use your cell phone to search for health information online?”, and “Did you happen to talk with a medical professional about what you found online?” Participants could respond “yes,” “no,” or “don’t know.” In this sample, the Kuder-Richardson score was 0.86.

Internet Activities—Participants were queried about frequency of accessing the Internet and devices they used to access it. These questions were adapted from the Pew Internet and American Life Project (Madden et al., 2010). Examples of questions asked were: “Do you access the Internet, at least occasionally?”, “If yes, how frequently do you access the Internet?”, and “What devices do you use to access the Internet?”. The women could select multiple options, as they were directed to “check all that apply.” In this sample, the Kuder-Richardson score was 0.95.

Information Seeking—Information seeking related to blood pressure was measured with an eight-item subscale from the Modes of Information Acquisition, Sharing, and Use Scale (Veinot, Meadowbrooke, Loveluck, Hickok, & Bauermeister, 2013). These items were adapted from a previous study conducted with African American participants regarding information behaviors and health-related decision making (Veinot et al., 2013). Four of the eight information-seeking questions asked specifically about intentional (purposive) seeking of information about blood pressure. Four of the eight questions asked about incidental information seeking, or finding blood pressure information without intending to do so, but nevertheless expending effort by recognizing that the information is needed, paying attention to it, and absorbing it. Responses were based on level of agreement with statements such as “I look for information on high blood pressure by myself,” and “I ask someone else to look for high blood pressure information for me.” The responses ranged from “never” to “very often” on a five-point, Likert-type scale. Possible scores ranged from 8 to 40, with higher scores indicating a higher degree of information seeking. In this sample, the Cronbach’s alpha was 0.84.

Blood Pressure—Each participant's blood pressure was measured with the Omron Elite 7300W Women's Advanced Automatic Blood Pressure Monitor after they completed their surveys and had been sitting quietly at rest for 5 minutes. This type of monitor was validated in previous studies (Grim & Grim, 2009). A written protocol following the guidelines outlined in the Seventh report of the Joint National Committee on the Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC-7) was used when obtaining blood pressures (Chobanian et al., 2003). All the participants received their blood pressure results. As explained in the protocol, participants with systolic blood pressure readings greater than 150 mmHg ($n = 31$) or diastolic blood pressure readings greater than 100 mmHg ($n = 9$) were advised to go to the emergency room for immediate medical attention.

Demographic Information—Part of the survey focused on demographic characteristics. The women were asked their age, marital status, income, and education level. They were asked if they had been diagnosed with hypertension by a healthcare professional. They were also asked if they were taking prescribed medications to control their hypertension, when their blood pressure was measured last, and how recently they saw a health care professional.

Analysis

Statistical analyses of the women's responses to the survey were conducted using SPSS version 21. Given the small sample size and the number of women in the sample with elevated blood pressure levels, all women – those with and without a hypertension diagnosis, were included in data analysis. Surveys with missing data were excluded from the analysis. Descriptive statistics were used to summarize the data. Chi-square tests for independence and independent-samples t-tests were conducted to identify significant differences between the groups (cell phone information seekers versus nonseekers). Preliminary analyses were conducted (on age and systolic blood pressure) to assess for violations of the assumptions of normality and multicollinearity for linear regression. There were no violations of for age (skewness = −0.52, kurtosis = −0.20); however systolic blood pressure did violate the assumptions (skewness = 1.23, kurtosis = 4.16). Therefore, the log10 of systolic blood pressure (skewness = 0.50, kurtosis = 1.29) was used in the regression analysis (Cleveland, 1984; Osborne, 2010).

Stepwise linear regression was used to assess the ability of cell phone information seeking status to explain systolic blood pressure, given the influence of possible confounders (age, diagnosis of hypertension, taking medications for high blood pressure, last time a health care provider was seen, last time blood pressure was measured). The variables were entered as follows: (Step 1) cell phone information seeking status, (Step 2) age, (Step 3) hypertension diagnosis status, and (Step 4) medication for hypertension, recent health care provider visit, and recent blood pressure measurement. All tests were two-tailed and significance levels were set at $p < .05$.

Results

Internet Activities, Cell Phone Ownership and Use, and Information Seeking

Most of the women (96%) responded that they access the Internet at least occasionally, with 65% accessing it daily or several times a day. Most of the participants reported using a computer to access the Internet (91%). Sixty-three percent of the sample used their cell phones to access the Internet. About one-third of the women stated they used a tablet to access the Internet. As shown in Table 3, 42% of the sample reported using their cell phones to search for health information online. Of those who did search for health information using their cell phones, most did not post or share the information they found, nor did they talk to a medical professional. See Table 3 for additional information about Internet Activities in the sample. Although the women in the sample were engaged in blood pressure information seeking, the mean score indicated that in general there was moderate participation in this behavior. Comparing the purposive information seeking mean score to the incidental information seeking mean score revealed that the women in the sample were less likely to purposefully seek blood pressure information than to passively obtain it. See Table 4 for the mean scores of all study measures.

Differences between Cell phone Information Seekers and Nonseekers

As shown in Tables 5 and 6, there were some demographic differences between those who used their cell phones to seek health information (cell phone information seekers) compared to those who did *not* use their cell phones to seek health information (nonseekers). There was a significant difference in systolic blood pressure for those who used cell phones to seek health information and those who did not, with people who sought information having lower mean systolic blood pressure. This difference in blood pressure also represents a clinical distinction. For example, the lower mean might be categorized as having an elevated blood pressure that requires additional monitoring, while the higher mean would be considered “being hypertensive” and might require adjustments to the patient’s treatment plan. There was no significant difference in diastolic blood pressure for those who used cell phones to seek health information and those who did not. There was no significant difference in purposive information seeking scores for those who used cell phones to seek health information and those who did not. There was a significant difference incidental information seeking for those who used cell phones to seek health information. That is, the women who used cell phones to look for information received information passively less often than those who did not. The influence of age on this difference between the groups was further explored in a regression analysis described below.

Predicting Systolic Blood Pressure

Stepwise linear multiple regression was used to assess the ability of cell phone information seeking to predict systolic blood pressure, controlling for the influence of possible confounders (age, diagnosis of hypertension, medications for hypertension, recent visit with a provider, and recent blood pressure measurement). As shown in Table 7, the first variable entered into the model was cell phone information seeking. Alone, it was a significant independent predictor of systolic blood pressure and the model explained 9% of the variance. During the second step age was added to the model, revealing that both variables

were significant independent predictors of systolic blood pressure. This model explained 14% of the variance in systolic blood pressure. In the third step, diagnosis of hypertension was added to the model. This model explained 26% of the variance in systolic blood pressure. In the final model, medications for hypertension, recent visit with a provider, and recent blood pressure measurement were added to the model. This model explained 27% of the variance in systolic blood pressure. In this final model, diagnosis of hypertension had the highest beta value, indicating that women who were diagnosed with hypertension were more likely to have higher blood pressures. Cell phone information seeking had a beta weight of −0.17 ($p = .05$), indicating that women who sought health information via cell phone were more likely to have lower blood pressures.

Discussion

The results of this secondary data analysis showed that the women who were cell phone information seekers had significantly lower blood pressures than those who did not; regardless of age, taking medication for hypertension, a recent visit to a health care provider, or recent blood pressure measurement (awareness). A possible underlying mechanism for this relationship is that women who reported cell phone information seeking were using the information they found to self-manage their blood pressure. Cell phone information seekers were younger than nonseekers and fewer of them were diagnosed with hypertension, however, even when controlling for these factors, cell phone information seeking remained an independent predictor of systolic blood pressure.

The differences in mean systolic blood pressure are both statistically and clinically significant. Even a 2–3 mmHg reduction in systolic blood pressure is associated with reduced mortality (Whelton et al., 2002). Although additional studies are needed to determine why women who sought health information via cell phone had better systolic blood pressure control, there are several possibilities. Previous studies have shown that information seeking may be linked to behavior change (Meadowbrooke, Veinot, Loveluck, Hickok, & Bauermeister, 2014). Further exploration of the mechanisms underlying cell phone health information seeking is needed to better understand this finding.

Another finding was that cell phone information seekers were less likely to find blood pressure information incidentally than nonseekers. This may be due to the fact that they were actively seeking health information, and thus had fewer knowledge deficits that were brought into social or other situations in their lives. Accordingly, content about blood pressure might have been perceived as redundant or non-novel in these situations, and thus not informative. It is important to consider the large number of African American women who are using cellular devices and accessing the Internet, but not participating in health information seeking. Increasing the chance of incidental information finding on self-management of blood pressure on websites, advertisements, and social media may help to increase awareness among women who are nonseekers.

The findings of the current study are consistent with those of Smith (2014), who found that less than half of the sample—only 42%—of the women accessed the Internet to seek health information. This finding is important for several reasons. First, using a mode (Internet via

cell phone) that is already being used by this vulnerable group to provide information might prove a feasible and an effective method of reaching African American women at high risk for hypertension and negative outcomes if not managed (Chobanian et al., 2003; Mozaffarian et al., 2016). Given that the women in the sample used the Internet frequently, there is an opportunity to direct African American women to specific, quality, and culturally appropriate sites and mobile phone applications that are useful in meeting their blood pressure information needs and help them to successfully self-manage their blood pressure.

Encouraging African American women to use their cell phones to support education and lifestyle changes may also be useful to assist them to self-manage their blood pressures. Smith (2014) found that most African Americans access the Internet through a cellular device or smartphone. In this study, the majority of the women owned a cell phone, but more of the women accessed the Internet via desktop computers. Perhaps some of the women preferred connecting to the Internet through a desktop computer because of the larger screen size. However, cell phone-based information seeking may better facilitate health behavior change since information can be readily available in the time and place in which decisions are made (Riley et al., 2011). Additional studies are also needed to determine whether certain kinds of information require being stationary versus being mobile, and if successful management of hypertension requires access to relevant health information throughout the day, including when the subject may be away from the computer. Additional studies are needed to determine when African American women need information to self-manage their blood pressure. Interventions that address needs as they arise may be useful to aid women in making decisions about managing blood pressure.

This study focused on use of cell phones to seek health information. In addition to smartphones, there are other devices and technologies that provide information and personalized feedback for monitoring cardiovascular health, such as wearable sensors (Fitbit activity trackers and heart rate monitors), mobile applications that count steps, and home blood pressure monitors. These devices can provide just in time feedback to users, allow them to use the information to make self-management decisions. Due to the swift pace of technology change, it is important that researchers continue to examine the feasibility and effectiveness of these products to support self-management of blood pressure.

These findings should be interpreted within the limitations of this study. One limitation is that a full theoretical model was not used. However, evidence shows that the literature is lacking health behavior models that include information science and the development of mobile technology over time (Greyson & Johnson, 2016; Riley et al., 2011). This study was one of the first to examine relevant variables that have not been considered in traditional health behavior models. Another limitation was that specific cell phone features (e.g., screen size, download speed, Internet accessibility) were not taken into account, and specific features could be related to the women’s decisions to seek or not seek health information from their cellular devices. This is an unresolved issue that deserves further study. A third limitation was that data were collected at a church conference in one region and these findings may not be generalized to the entire African American female population. Therefore, the findings of this study warrant further examination in larger and more diverse settings to validate the findings of this hypothesis-generating study. Although the women

were queried about whether or not they were taking medication for hypertension, medication adherence was not measured and is another limitation of this study. Another limitation was that the type of information sought was not captured. Future studies that hone in specific information needs and actual information sought are needed. Finally, data collection was completed in 2013, prior to the release of mobile applications with blood pressure monitoring that are currently available. They were not assessed in this study, but use of cell phone for information seeking could translate into mobile application use. These findings could be used to guide the development of websites and applications to improve self-management processes (such as self-efficacy and self-regulation). Despite these limitations, this study was an initial step to gain a better understanding of the health information seeking behaviors, use of cell phone to access the Internet, and blood pressure in African American women.

This study is one of the first steps toward understanding Internet cell phone use among African American women in the context of a specific health condition (self-management of blood pressure). It is innovative in that it assesses the potential use of existing tools—the Internet and smartphones—for informing African American women about high blood pressure and its associated risks, as well as ways to manage their blood pressure. Moreover, these tools are already being used by many of the women and deserve further study to determine the mechanisms underlying their usefulness to help lower and maintain blood pressure within a safe range, thereby reducing the disparities in hypertension treatment affecting this group.

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Table 1

Demographic Characteristics of the Sample Group (n = 147)

Characteristic	*n*	%
Education Level		
Some college	36	24.5
Bachelor's degree	44	29.9
Master's degree	35	23.8
Doctorate or Professional degree	12	8.2
Employment		
Working full-time	63	42.9
Unemployed, retired, or unable to work	57	38.8
Income		
$20,000 – $39,999	28	19.1
$40,000 – $59,999	29	19.7
$60,000 – $79,999	23	15.6
$80,000 or more	25	17.0
Marital status		
Single	24	16.3
Married or Life Partner	67	45.6
Divorced, Widowed, or Separated	49	33.4

Table 2

Systolic Blood Pressure (SBP) Frequencies

	SBP<120		SBP 120–140		SBP>140	
	n	**%**	***n***	**%**	***n***	**%**
Not diagnosed with hypertension (*n* = 55)	23	41.1	21	37.5	11	19.6
Diagnosed with hypertension (*n* = 91)	4	4.4	41	45.1	43	47.3

Table 3

Internet Activities of the Sample

	n	%
Used a cell phone to access the Internet	93	63.3
Frequency of accessing the Internet via cell phone		
Once a week or less	6	6.4
Several times a week	14	15.1
Every day or several times a day	73	78.5
Used cell phone to search for health information online	62	42.2
Posted or shared online	31	21.1
Talked to a medical professional about health information found online	24	16.3

Table 4

Study Measures

Measure	Number of Items	Range	Mean (SD)
Information Seeking	8	8–34	19.15 (5.44)
Purposive	4	4–18	8.68 (3.00)
Incidental	4	4–20	10.47 (3.14)
Systolic Blood Pressure	Not applicable	96–239	136.12 (20.00)
Diastolic Blood Pressure	Not applicable	54–146	81.48 (12.78)

Table 5

Differences in Demographic Characteristics between Groups – Cell phone Information Seekers (CPIS) (n = 62) vs. Nonseekers (NS) (n = 85)

Characteristic	CPIS		NS		χ^2 (df) value	*p*-value
	n	%	*n*	%		
Diagnosed with hypertension					χ^2 (2) = 10.40	.01
No	33	53.2	23	27.7		
Yes	29	46.8	60	72.3		
Education level					χ^2 (12) = 6.42	.89
Income					χ^2 (20) = 16.85	.66
Marital status					χ^2 (12) = 13.01	.36

Table 6

Differences in Age, Blood Pressure, and Information Seeking between Groups – Cell phone Information Seekers (CPIS) (n = 62) vs. Nonseekers (NS) (n = 85)

Characteristic	CPIS Mean (SD)	NS Mean (SD)	t (df) value	*p*-value
Age	47.57 (13.43)	60.33 (11.30)	t (116.45) = −5.98	*p*<.001
Systolic blood pressure	129.79 (17.50)	140.89 (20.52)	t (143) = −3.43	*p*<.001
Diastolic blood pressure	80.37 (11.25)	82.27 (13.73)	t (139) = −0.88	*p* = .38
Information Seeking				
Purposive	8.69 (3.01)	8.67 (2.94)	t (144) = 0.53	*p* = .96
Incidental	9.85 (3.02)	10.95 (3.18)	t (142) = −2.01	*p* = .04

Table 7

Stepwise Linear Regression Explaining Systolic Blood Pressure

Step	Variable	Beta	*P* Value
1	Cell phone information seeker	**−0.30**	**<.001**
2	Cell phone information seeker	**−0.20**	**.02**
	Age	**0.23**	**.01**
3	Cell phone information seeker	**−0.17**	**.04**
	Age	0.10	.26
	Diagnosed with hypertension	**0.38**	**<.001**
4	Cell phone information seeker	**−0.17**	**.05**
	Age	0.13	.14
	Diagnosed with hypertension	**0.45**	**<.001**
	Taking medication for hypertension	−0.08	.59
	Recent health care provider visit	−0.04	.63
	Recent blood pressure measurement	−0.09	.31

Step 1: $F(1, 139) = 13.98$, p <.001, $R^2 = 0.09$

Step 2: $F(2, 138) = 10.83$, p <.001, $R^2 = 0.14$

Step 3: $F(3, 137) = 15.60$, p <.001, $R^2 = 0.26$

Step 4: $F(3, 134) = 8.07$, p <.001, $R^2 = 0.27$