



# Text Messaging as a Communication Modality to Promote Screening Mammography in Low-income African American Women

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## Abstract

**Introduction** Though text messages are increasingly used in health promotion, the current understanding of text message-based interventions to increase screening mammography in low-income African American women is limited. This study aimed to assess the feasibility and acceptability of a text message-based intervention to increase screening mammography in low-income African American women.

**Materials and Methods** A 15-item, self-administered, paper-based survey on cell phone ownership, text messaging practices and preferences for future breast health information was administered to 120 female patients at an urban family medicine office. Descriptive analyses and demographic correlates of text messaging practices and preferences were examined.

**Results and Discussion** The majority of respondents (95%) were cell phone owners of whom 81% reported texting. Prior receipt of a text message from a doctor's office was reported by 51% of cell phone owners. Mammography appointment reminders were the most desired content for future breast health text messages. Age ( $\geq 70$  years old) was found to have a significant negative relationship with text messaging practices and perceptions.

**Implications** The use of text messages to promote mammography was found to be acceptable in this patient population. In addition to age, variables such as the frequency, timing and subject content of text messages also influence their acceptability.

**Keywords** Breast cancer screening · Text message · Primary care · African American · Cancer health disparities

## Introduction

Breast cancer is the second leading cause of cancer death in American women. Screening mammography reduces breast cancer mortality through early detection [1]. While screening mammography has contributed to overall declines in breast cancer mortality, significant disparities in mortality persist between African American and White women. Although White women are diagnosed with breast cancer more frequently, breast cancer mortality is over 40% higher

in African American women in comparison to White women. The higher mortality rates in African American women are likely reflective of multiple factors including access and adherence to breast cancer screening, particularly African American women of lower socioeconomic status [1]. Women insured through Medicaid have a mammography completion rate that is nearly 10% lower than completion rates in women with commercial or private insurance [2, 3]. In addition to lower screening completion rates, women of lower socioeconomic status also have lower 5-year breast cancer survival rates [1].

Patient reminders for breast cancer screening increase adherence to recommended screening [4]. Increasingly, the utility and effectiveness of technology-based strategies is demonstrated in health promotion interventions [5]. Widespread cell phone ownership facilitates access to technology-based strategies within populations that may not have access via computer-based platforms [6, 7]. As cell phone usage has increased, health care providers have implemented text messaging to communicate with their patients, particularly in the form of reminders—this form of communication has been demonstrated

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as acceptable in certain patient populations [5, 8]. According to the Pew Research Center, as of 2021, 97% of American adults owned a cell phone including those with a household income level at or below \$30,000 [9]. African American adults are more likely to own a cell phone and to text more frequently than White adults [9, 10]. Text message cancer control interventional strategies targeted at African American adults are effective [11]. Although multiple studies have demonstrated text messaging interventions successfully increase uptake of screening mammography, there is limited data on screening mammogram text message interventions in African American women [12–16].

The COVID-19 pandemic introduced additional barriers to cancer screening and significantly disrupted face-to-face interactions between health care providers and patients. The CDC reported a 154% increase in telehealth visits in March 2020 in comparison to March 2019 [17]. The increase in technology-based contact between patients and providers can improve health behaviors and clinical outcomes for populations like low-income, African American women [18]. This study sought to conduct an initial examination of the feasibility and acceptability of text message-based interventions to increase screening mammography in low-income African American women. Given the recent shift from conventional in-person visits to telehealth due to the COVID-19 pandemic understanding the utility of technology-based communication platforms within specific populations such as low-income African American women is important. The knowledge gained from the study presented here has the potential to advance the knowledge on technology-based strategies to improve breast cancer screening in low-income African American women.

## Materials and Methods

Potential respondents were identified from the waiting rooms of an urban, academic primary care office. One hundred and twenty-four women were invited to participate, and 120 women consented. Study eligibility criteria were: female, patient at the study site,  $\geq 40$  years old, English-speaking, and able to complete a survey written on the 8<sup>th</sup> grade level. The study instrument was a 15-item, self-administered, paper-based survey on cell phone ownership and text messaging preferences and practices. Descriptive analyses were conducted on categorical and numerical data. For categorical variables, chi-square ( $\chi^2$ ) or Fisher exact tests were performed to identify the demographic and texting practices associated with acceptance of future text message-based promotion of screening mammography for respondents. Wilcoxon signed rank test was used to compare related ordinal variables. Data were analyzed using SAS 9.3 software (SAS Institute Inc., Cary, NC) and SPSS 22 software (Chicago, IL) [19, 20]. This study was deemed exempt by the University of Maryland at Baltimore's Institutional Review Board.

## Results

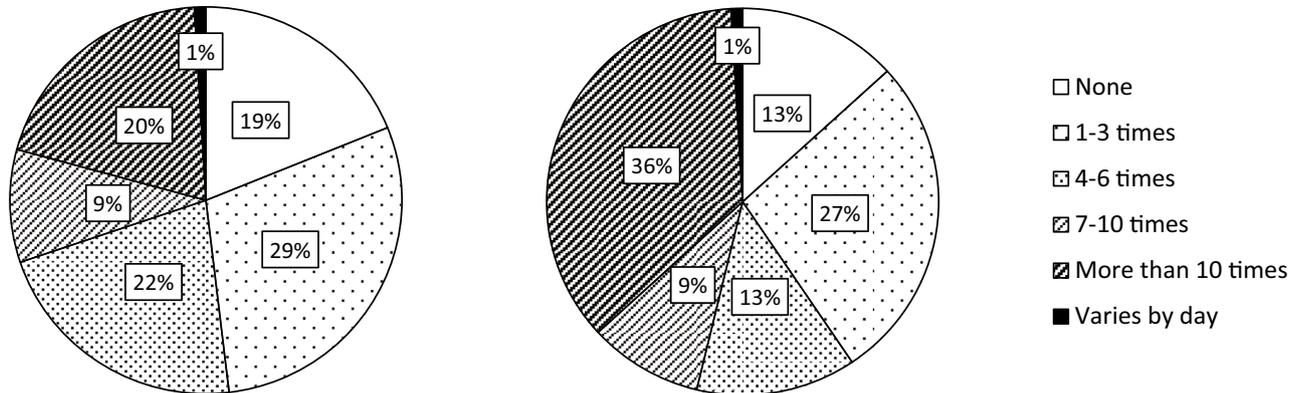
The mean age of respondents was 55 years old with a standard deviation (SD) of 9.2 years. The majority of the study population was African American (88%) and insured, either publicly (66%) or commercially (27%). Most (95%) respondents reported they owned a cell phone (Table 1). Cell phone ownership was significantly associated with age as only 78% of women  $\geq 70$  years old reported cell phone ownership compared to 90–100% of women from younger age groups (Fisher exact test  $p < 0.05$ ). While 81% of all cell phone owners reported using their phones for texting, the use was limited to younger women (40–69 years old). The highest rates of texting were among women 40–49 years old at 91%, followed by 87% of women aged 50–59 years old and 65% of women 60–69 years old; none of the women in 70–79 years old group reported using their phones for texting (Fisher exact test  $p < 0.0001$ ). More than half of cell phone owners reported both sending and receiving  $\geq 4$  text messages per day (Fig. 1). Respondents reported receiving significantly more text messages than they send (Wilcoxon Signed Rank test  $p < 0.0001$ , data not shown). While only 20% of respondents reported sending  $\geq 10$  text messages per day, 36% of respondents reporting receiving  $\geq 10$  text messages per day (Fig. 1). Respondents younger than 50 years old reported sending and receiving significantly more text messages per day than respondents who were 50 years and older. Among women ages 40–49 years old, 86% reported receiving more than 4 texts per day, compared to 58% of women 50–59 years old and 38% women 60–69 years old (Fisher exact test  $p < 0.001$ ). Similarly, 85% of women who

**Table 1** Respondent Demographics

Table 1: Respondent Demographics (N = 120)		
	N	%
<b>Age (years old)</b>		
40–49	36	30
50–59	45	37.5
60–69	30	25
70–79	9	7.5
<b>Race</b>		
African American	106	88
Other	13	11
Missing	1	1
<b>Health Insurance Source</b>		
Public	79	66
Commercial	32	27
No insurance	2	2
Unspecified/Missing	7	5
<b>Cell Phone Ownership</b>		
Yes	114	95
No	6	5

## A. Frequency of sending text messages

## B. Frequency of receiving text messages



**Fig. 1** Daily frequencies of sending/receiving text messages by cell phone owners ( $N=106$ ). Percentages designate the frequency of cell phone owners sending (A) and receiving (B) text messages

were 40–49 years old reported sending more than 4 texts per day compared to 44% women 50–59 years old and 29% of women 60–69 years old (Fisher exact test  $p < 0.0001$ ).

Fifty-five cell phone owners (51%) had previously received a text message from a doctor's office. For those who received such messages, the most common types of prior text message from a doctor's office were: appointment reminders (95%), prescription refill notification (27%) and personalized health messages (9%). Age was not significantly associated with prior receipt of a health care-related text message, or the type of message received (data not shown). More than half of respondents (54%) indicated future willingness to receive a health care related text message from the study site, however 29% of respondents were opposed to receiving a future text message and 17% were neutral. Future willingness to receive a text message and the message type that respondents were willing to receive from the doctor office were not significantly associated with age (data not shown).

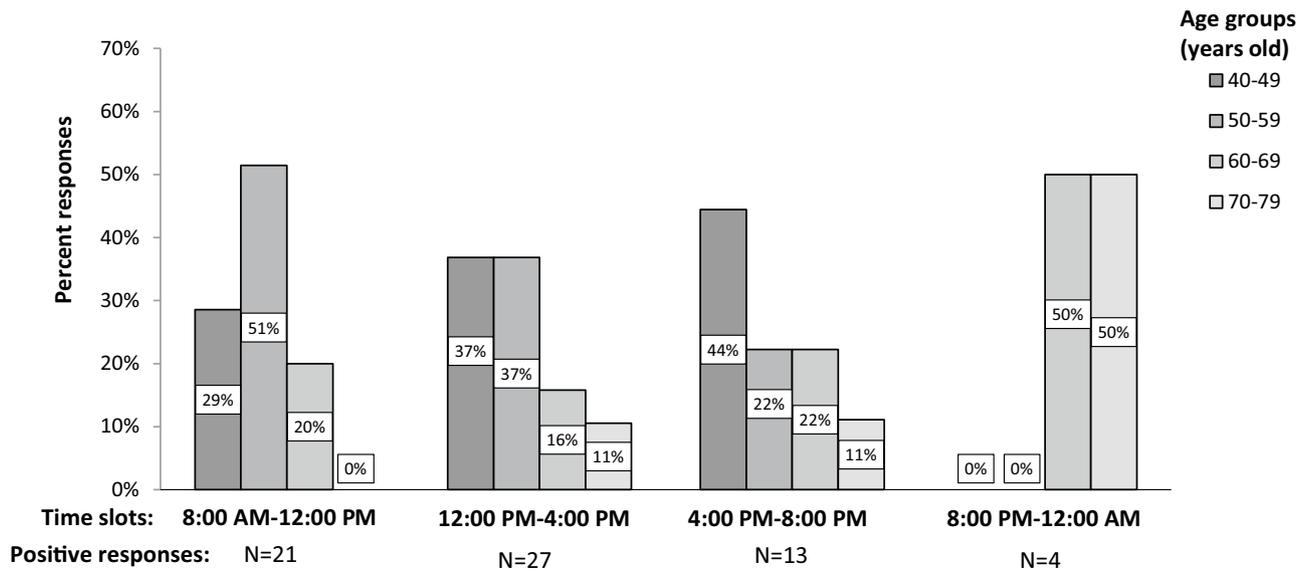
Prior receipt of a text message from a doctor's office was positively associated with future willingness to receive a health-related text message (Wilcoxon Signed Rank test  $p < 0.0001$ , data not shown). Preferences for content of future health related text message varied by prior history of text message receipt from a doctor's office. Among respondents willing to receive a personalized health-related message, 73% had previously received a text message from a doctor's office compared to 27% of those who had not previously received such messages, and 63% of those not willing to receive such a message had never received a prior text message from a doctor's office (Fisher exact test  $p < 0.001$ ). Among respondents willing to receive general health-related information, 65% had previously received a text message from a doctor compared to 35% of those who had not (Fisher exact test  $p < 0.05$ ). In contrast, among respondents who were not willing to receive prescription refill notifications

text, 65% had not previously received a text message from a doctor's office compared to 35% of those who had received such messages in the past (Fisher exact test  $p < 0.05$ ). Among respondents who were not willing to receive appointment reminders, 82% had not previously received a text message from a doctor's office compared to 18% of those who had received such messages in the past (Fisher exact test  $p < 0.01$ ).

Respondents indicated specific preferences for both the frequency and timing of future text messages. Among cell phone owners, the most desired frequency for delivery of future health related text messages was monthly (40%), followed by weekly (22%) and several times a month (14%). There were no significant differences in preference for frequency of future text message by age or other demographic factors (data not shown). Most respondents preferred their messages delivered between 12:00 PM – 4:00 PM (27%) followed by 8:00 AM – 12:00 PM time slot (21%). There were age-based differences in preferences for the time of day for delivery of future text messages. Respondents  $> 70$  years old indicated that they were not willing to receive messages in the early morning, while respondents younger than 70 years old were not willing to be contacted in the evening (Fig. 2).

### Preferences for Future Breast Cancer Screening Text Messages

The survey also assessed respondents' willingness to receive a future breast cancer screening related text message from the study site. Respondents were asked to indicate preference for the content of future breast cancer screening related text messages. The most desired content was screening mammogram appointment reminders (60%), mammogram results (42%) and general information on breast cancer (38%). Willingness to receive a future breast cancer screening text



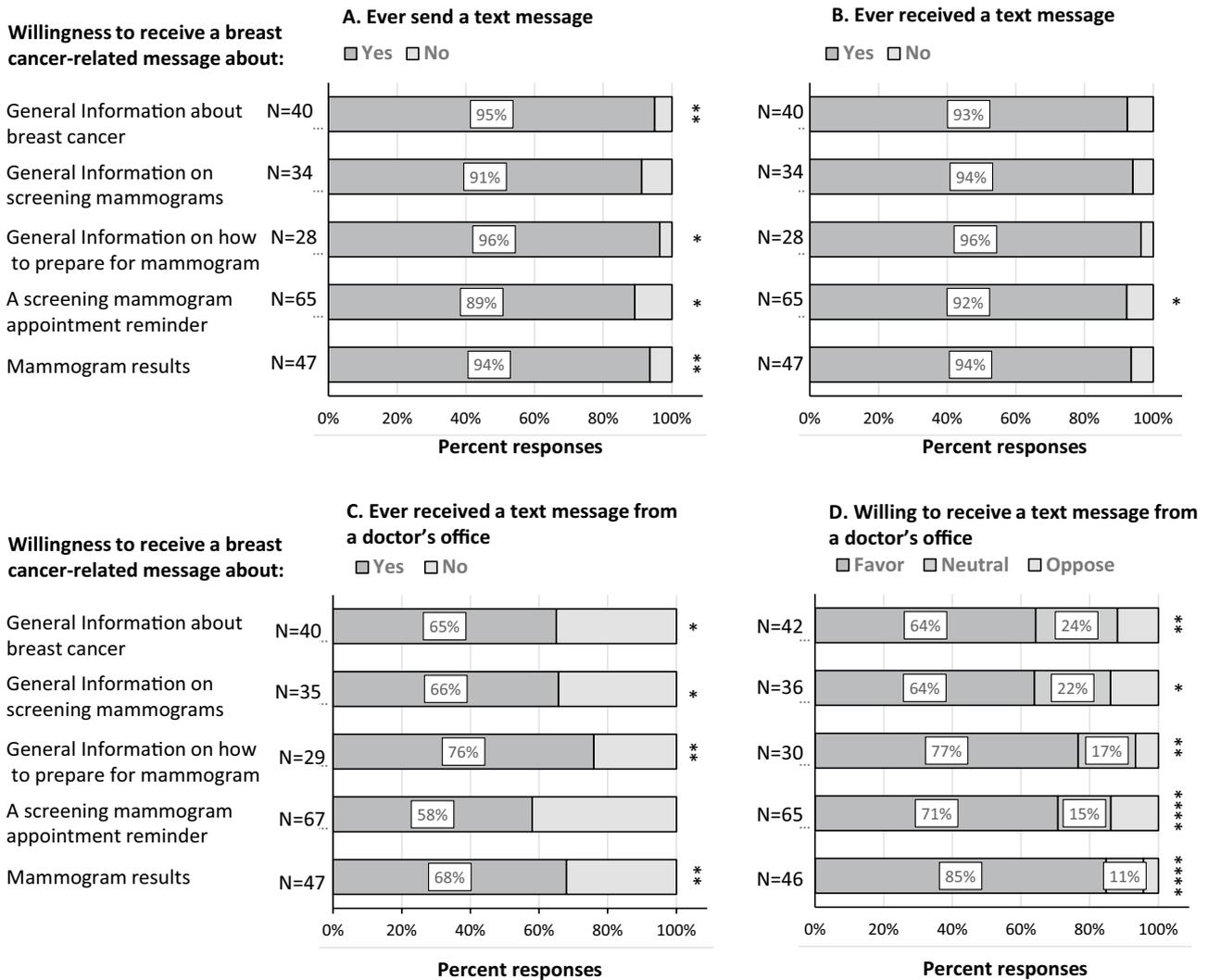
**Fig. 2** Preferences for Text Message Time of Delivery by Age (N = 100). Respondents could opt for more than one (all that applies) response. Percentages indicate positive responses within the subgroups

message was significantly associated with text message practices. Most respondents (89–95%) who were willing to receive a future breast cancer screening text message were those who reported ever sending text messages (Fig. 3A). A similar trend was observed among respondents who reported ever receiving text messages, although the association was not statistically significant in most cases (Fig. 3B). There was a significant association between responses from women who had previously received a text message from a doctor's office and whether they were interested in receiving breast cancer screening related text messages in the future. More woman indicated willingness to receive future breast cancer screening text messages if they had previously received a text message from a doctor's office. Further, preferences for content of future breast cancer screening related text message varied by prior history of text message from a doctor's office (Fig. 3C). In addition, women who were open to receiving a text message from a doctor's office were significantly more interested in receiving breast cancer screening related text messages (Fig. 3D). There was no significant correlation between willingness to receive a future breast cancer screening text message and patient's age (data not shown).

## Discussion

This study assessed the initial feasibility and acceptability of text messages as a modality to promote screening mammography within a primary care patient population of low-income African American women. This study found the use

of text messages as a communication modality to be feasible, but with some limitations. Most respondents reported cell phone ownership, and more than half of cell phone owners reported using their phones for text messaging. While there were significant age-based differences in cell phone ownership and text messaging practices, a significant proportion of women 70 years old or older indicated willingness to receive a future screening mammogram text message appointment reminder. Importantly, even those respondents who did not report sending text messages indicated willingness to receive both general health and breast cancer specific text messages. Prior research has shown that text messages are effective at increasing breast cancer screening rates in women due for screening mammography [12–15]. This study demonstrates that text messages are a communication platform that is readily accessible and agreeable to women of age for screening mammography in this patient population. Notably, women's prior receipt of a health-related text message positively influenced future preferences. Next steps will be identifying the best practice strategies to implement text messaging for the promotion of breast cancer screening in this patient population. Given that several women opposed receiving future health related text messages, an important next step component will be identifying reasons women are opposed to receiving future health related text messages. This information would allow for these concerns to be addressed through the implementation of targeted strategies with the potential to make the communication form more acceptable to this group of women. Such steps will enable the opportunity to assess if the impact of text message-based interventions on the uptake of screening mammography in



**Fig. 3** Content Preference for Future Breast Cancer Screening Related Text Message by Prior Receipt of Text Message. Respondents could choose more than one response. N indicates the total number of positive responses. Percentages within the bars indicate positive responses by subgroups. Fisher exact test: \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.0001$

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low-income African American women is similar to what has been seen in other populations. Lastly, it will be important to determine if there is any impact on breast cancer morbidity and mortality as a result of this intervention strategy for this group of women.

**Prior Experience with Health Care Related Text Messages**

Prior receipt of health care related text messages was common in this study population. More than half of respondents reported previously receiving a text message from a doctor's office, primarily in the form of an appointment reminder. Previous experience with text message communication from a health care provider was significantly

associated with respondents' future willingness to receive future health related text messages. This finding suggests that respondents' prior exposure to health care text messaging was positive or beneficial and respondents anticipated similar outcomes from future health related text messages. Further investigation should be done to determine if the level of willingness to receive health care related text messages changes in women with no prior exposure to health care text messages after receipt of health care related text messages. It is also important to determine if responsiveness to screening mammography text message reminders varies by history of prior receipt of health care related text messaging. Such knowledge would enable for tailoring of text messages according to their health care text message history.

## Preferences for Future Text Messages

The overwhelming preference for the content of health care related text messages was appointment reminders for both general text messages and breast cancer specific messages. Interestingly, respondents did not indicate a strong preference for personalized health care text messages. This finding may be indicative of a desire for in-person or phone communication for individualized information or situations when there is a greater desire for bi-directional communication. Text messages may provide a succinct way to provide more generic health information such as an appointment reminder. Most respondents (77%) indicated a willingness to receive a future breast cancer related text message. Prior research has shown that patient reminders increase completion rates for screening mammography [4]. This study's finding that of a top preference for mammogram appointment reminders suggests there is a need to for mammography reminders in this population and that text messages are an acceptable strategy to meet that need. It would be informative to assess if women's preference for text messages changes at the different phases of the breast cancer screening continuum e.g., preparation for mammogram, mammogram results and/or need for follow-up. Such information could drive the development of a tailored text message system to communicate with patients at various points during the screening cascade.

The study results did show that women had specific desires for the timing and frequency of text message delivery. Respondents were provided with multiple options to select from for the frequency text messages delivery including on an as needed basis only. Respondents overwhelmingly indicated a preference for receiving text messages at the frequency of once a month or once a week. This finding suggests that respondents have a desire to maintain regular communication from their doctor's office and that text messages would be an acceptable option to maintain this contact. The survey asked about desired time of delivery using broad time categories. For all respondents younger than 70 years old, the most preferred time of day for text message delivery was 8 am to 4 pm. These findings of definitive preferences for text messages frequency and time of delivery suggest that future interventions may want to assess at baseline patient preferences for text delivery options such as frequency, time of day and other delivery modifications that may differ by age and other population specific variables.

## Limitations

The generalizability of our study is limited by our sample size and the sample's slight skew to younger women. It is possible that with a larger sample and an increased proportion of women older than 70 years old there would have been greater

variation in text messaging practices and preferences. Despite this, our sample did include a broad age range of women who are eligible for screening mammography and therefore provides important preliminary information on this topic.

## Implications

This study is an important first step in understanding the role of text message-based interventions to increase screening mammography in low-income African American women in a primary care setting. Text messages provide a communication modality suitable for the primary care setting that this study found to be largely available among a population of low-income African American women of age for screening mammography. There is a need to identify effective strategies that promote breast cancer screening and improve breast cancer outcomes for low-income African American women [12, 16]. The COVID-19 pandemic changed the way health care providers and patients communicate. Text message-based strategies to improve screening such as the one described here build upon the recent increase in technology-based strategies in health care and importantly enable outreach in the absence of conventional face-to-face interactions between patient and provider. This study identified text messages as a potential interventional strategy to improve breast cancer outcomes in low-income African American women. Further, this strategy may also be applicable in cancer control efforts for other screen-detectable cancers such as cervical and colorectal cancers which also care disproportionately high morbidity and mortality burdens in low-income African American patient populations.

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## Declarations

**Ethical Approval** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This study was deemed exempt by the University of Maryland, Baltimore (UMB) Institutional Review Board.

**Conflict of Interest** Shana O. Ntiri, MD, MPH declares that she has no conflict of interest. Malia Swanson, MD declares that she has no conflict of interest. Elena N. Klyushnenkova, PhD, MSPH declares that she has no conflict of interest.

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