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Using Culturally Adapted Theater Outreach to Promote Cancer Screening Among Medically Underserved Minority Communities

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Abstract

Black, Hispanic, and Asian individuals, the three largest US racial/ethnic minorities, continue to suffer disproportionately from breast, cervical, and colon cancers largely because cancer screening continues to be underutilized even after decades of availability. This study examined the utility of theoretically grounded and culturally adapted in-person theater monologues aimed at promoting early detection screening among the three highest population racial/ethnic groups in Harris County, Houston, TX. Nine monologues were created to promote cancer screening and early detection for breast, cervical, and colorectal cancers in three different languages (English, Spanish, Vietnamese) and targeting underserved Black, Hispanic, and Vietnamese adult Harris County residents. From January 2014 to March 2020, 265 live monologue outreach events were held with 110 focused on prevention and screening for breast cancer, 75 for colorectal cancer, and 80 for cervical cancer. A total of 5989 individuals attended these outreach events and 86.3% completed the post-performance evaluation survey. Overall for all monologues, 6.6% of participants reported a positive change in their intent to screen from 75.7 to 82.3% after intervention ($p < 0.001$) and audience member scores on knowledge questions for all three cancers were mostly positive. Importantly, early detection questions for all three cancers were over 90% correct for all respondents, and well over 70% for the various groups. The findings revealed opportunities for improving monologue content to cultivate cancer early detection and screening knowledge. Results suggest that a theater-based approach may be an effective strategy to disseminate cancer screening education, improve knowledge, and increase intent to obtain screening among medically underserved communities.

Keywords Cancer screening · Applied theater · Medically underserved · Cancer education · Knowledge translation

Introduction

Burden of Disease

Despite substantial progress in cancer outcomes in recent decades [1], cancer remains the second leading cause of death overall in the United States (US) [2] and is now the leading cause of death for Asian and Hispanic populations [3]. Though early detection through cancer screening has been the driving force in reducing deaths from breast (by ~ 50%), cervical (by ~ 60%), and colon (by ~ 30%) cancers [4], Black, Hispanic, and Asian individuals, the three largest US racial/ethnic minorities [5], continue to suffer disproportionately from these cancers and their effects [2]. For example, Black individuals have the highest death rate for all three cancers, even as the incidence rates may be lower than for other populations [2], and the breast cancer death rate for Black women is 41% higher than for White

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women [6]. Hispanic women have the highest cervical cancer incidence rate (9.6) and second highest mortality rate (2.5) [2]. Compared to other groups, Asian individuals have the lowest death rates for all three cancers and lowest incident rates for colorectal and cervical cancers [2]. However, these numbers may not account for variations within specific Asian groups [7]. For example, Torre [8] found incidence rates for cervical cancer are higher for Vietnamese women (9.5) and Cambodian women (12.7) compared to Chinese (4.5) and Asian Indian/Pakistani (4.2) women.

Contributing to the high cancer rates in these communities, Black, Hispanic, and Asian communities are more likely to be from medically underserved populations which according to the Health Resources and Services Administration (HRSA) have either high-level poverty, lack of primary care providers, large elder population, or high infant mortality rate [9]. For example, socioeconomic status exacerbates cancer health disparities with an overall cancer death rate approximately 20% higher among residents of the poorest US counties compared with those in affluent US counties [10]. Notably, Black (19.5%) and Hispanic (17.0%) populations continue to have the highest poverty levels, over double that of White (8.2%) and Asian (8.1%) populations [11]. In the US, Asian populations are the only racial/ethnic group for which socioeconomic factors such as educational attainment, employment rates, and household incomes do not contribute to cancer screening disparities [12].

Disparities in Screening Test Utilization

Screen-detectable cancers contribute to disappointing cancer outcomes largely because cancer screening continues to be underutilized even after decades of availability [2]. This is especially true for the three largest underrepresented US racial/ethnic groups [1]. Asian and Hispanic individuals have the lowest screening rates for breast, cervical, and colorectal cancers [1] and screening rates may be even lower for Asian subgroups. For instance, one study found lower rates of colorectal screening for Vietnamese individuals (61%) compared to Japanese individuals (71%)] [8]. One study showed that low cervical cancer screening rates among Vietnamese women were associated with low levels of knowledge about cervical cancer screening and the human papillomavirus, and the community stigma about having a cervical cancer screening prior to marriage [13]. With the exception of cervical cancer screening for Black individuals (87%), all three racial/ethnic groups have lower cancer screening rates than for White individuals. As with morbidity and mortality rates, evidence suggests poverty [10] and lower SES e.g., [14] are associated with lower cancer screening prevalence.

Importantly, none of these three racial/ethnic groups has achieved Healthy People 2030 objectives for breast and colon cancer screening and only Black groups have reached the screening objective for cervical cancer [15]. Indeed, the recently released President's Cancer Panel report [4] stresses that "equitable cancer screening must be a public health priority" (p. 7) and innovative educational strategies are needed to improve screening rates in underserved racial/ethnic groups.

Theater-Based Health Interventions

Although the arts have been valued societal expressions for centuries, there is a growing body of work drawing attention to the potential of literary, visual, and performance arts for health education and health care [16–19]. In particular, research-based or applied theater is increasingly recognized as an effective entertainment-education strategy for knowledge translation (KT) [18], a field that emphasizes the use of scientific research to inform practice, policy, and decision-making for the benefit of healthcare practices, patients, and the public [20]. As an arts-based KT strategy [18], applied theater is a theoretically informed and research-driven initiative that uses dramatic performances in a wide variety of nontraditional contexts and venues [20, 21] to translate medical and social scientific knowledge for lay audiences.

With regard to cancer education and prevention, the theater approach has been shown to be effective in educating underrepresented racial/ethnic groups about cancer prevention. For example, theater has been used to educate Alaskan natives about cancer-related issues [22] and colorectal cancer screening [23], African American individuals about breast cancer [24, 25], prostate cancer [26], and colorectal cancer [27], and medically underserved women and men (i.e., African American, Hispanic, Vietnamese) about colorectal and cervical cancer [28].

Persuasive Mechanisms—Narrative

Applied theater may be particularly effective at motivating behavior change because like other forms of entertainment-education (E-E), it capitalizes on narrative logic to influence health-related attitudes, beliefs, and behaviors [19]. As Shen et al. [29] explain, "rather than constructing arguments for readers to judge, narratives often invite readers into story actions and immerse them in the real or plausible life experiences of others" (p. 105). Notably, research indicates that narrative messages are not only an effective means of persuasion when it comes to health-related attitudes, beliefs, and behaviors [29, 30], they may be more persuasive than non-narrative messages immediately after exposure, over time, and, importantly, with regard to actual behaviors [31, 32].

One reason narrative formats such as theater are persuasive is because they increase cognitive and emotional involvement [20] with situations and characters which, in

turn, may reduce various forms of resistance (e.g., disbelief, counterarguing) to the imbedded persuasive message [33, 34]. That is, as viewers become immersed in the world of the story being told in the narrative (i.e., transported) and involved or connected with the characters, they are less inclined to actively consider reasons to reject the claims and evidence regarding behavioral recommendations. Importantly, the characters also serve as role models who successfully overcome barriers to the (implicit) recommended behavior thereby increasing the viewer's perceived self-efficacy to enact behavioral change. According to cognitive-behavioral theories such as Bandura's Social Cognitive Theory (SCT), a theoretical mainstay of E-E from its introduction in the late 1980s [35], and the Health Belief Model [36], one's confidence in her/his ability to engage in a particular behavior or perceived self-efficacy is a pivotal psychological mechanism in the health behavior decision-making process. Thus, if we see a person with whom we identify (including fictional characters) overcome barriers to and engage in a recommended health behavior, it will improve our confidence in our own ability to follow suit.

Given its narrative format, theater-based KT accommodates cultural tailoring [37], arguably the lynchpin of successful message interventions for underrepresented racial/ethnic groups [38]. As Resnicow [39] elaborates, cultural sensitivity in health promotion is "the extent to which ethnic/cultural characteristics, experiences, norms, values, behavioral patterns, and beliefs of a target population as well as relevant historical, environmental, and social forces are incorporated in the design, delivery, and evaluation of targeted health promotion materials and programs" (p. 272). Studies have shown that culturally targeted/adapted narrative formats can be particularly persuasive for Black [40–43], Hispanic [37, 44–47], and Asian [48, 49] groups. More research is needed to explore how culturally targeted narrative-based theater monologues can be developed for minority groups to address cancer screening disparities.

As part of their Theater Outreach Program [50], the Dan L Duncan Comprehensive Cancer Center (DLDCCC) Office of Outreach and Health Disparities (OOHD) at Baylor College of Medicine (BCM) developed theoretically grounded and culturally adapted in-person theater monologues to promote early detection screening for the three highest population racial/ethnic groups in Harris County, Houston, TX. The program was funded by the Cancer Prevention and Research Institute of Texas (CPRIT Awards PP130084, PP140028, and PP170094) and the DLDCCC Office of Outreach and Health Disparities and all procedures were approved by the Institutional Review Board at Baylor College of Medicine. The objectives of this study are to (1) explain the theoretical foundations for culturally adapted theater interventions, (2) describe the process of developing multiple theater interventions for targeted racial/ethnic groups (Black, Hispanic, and Vietnamese), and (3) assess whether these theater monologues increased intent to screen for three screen-detectable cancers (breast, cervical, colorectal).

Methods

Target Population

Our target population included underserved Black, Hispanic, and Vietnamese adult residents who live within Harris County in Houston, TX, the third largest county in the US and one of the most racially and ethnically diverse counties in the US: Hispanic/Latinos are the largest racial/ethnic group (44.4%), followed by non-Hispanic White (27.7%), Black (20.3%), Asian (7.3%), and mixed (2.0%) [51]. Roughly 31% of Harris County's Asian population are of Vietnamese descent [52]. Notably, contributing to health disparities in Houston, Harris County has a disproportionate number of economically distressed neighborhoods largely populated by Black and Hispanic individuals [53]. Compared to the US, Harris County has more adults with no health insurance (24.2% vs. 11.% national median), lower rates of high school graduation (87.6% vs. 89.4%), higher rates of poverty (15.6% vs. 13.6%), a higher unemployment rate (9.0% vs. 6.5%), and a higher poverty rate (15.6% vs. 13.6%) [54].

Monologue Development

From 2012 to 2016, we created nine monologues to promote cancer screening and early detection for breast, cervical, and colorectal cancers in three different languages (English, Spanish, and Vietnamese) and targeting three populations (Black, Hispanic, and Vietnamese) (Table 1). The development of each monologue involved (1) identifying key points to guide local professional playwrights in the creation of scripts, (2) creating the monologue scripts, and (3) rehearsing and pilot testing of live performances. The development of the monologues was guided by Clinical Advisory Boards (CABs) consisting of physicians, other healthcare providers, researchers, and health educators from partner institutions who either treat or serve the target population addressed by the monologues.

Identifying Key Points

Guided by a comprehensive literature review, key points included cancer screening recommendations based on established American Cancer Society (ACS) guidelines, racial/ethnic specific epidemiological information such as cancer morbidity/mortality statistics and risk factors, and general and culture-specific self-efficacy barriers to cancer

Table 1 Monologues by cancer site and target population

	Hispanic (available in Spanish)	Black	Vietnamese (available in Vietnamese)
Breast cancer	No Será Mi Pesadila (It won't be my nightmare)	Up front with the girls	Mức Độ Cảnh Báo Hồng, Mức Độ Ở Những Nước Phiá Đông (Pink meets the wise, wise east)
Cervical cancer	Mi Decisión (My decision)	A well-tuned engine	Sức Khỏe Của Bạn Bè Là Chuyện Việc Của Tôi (My friends' health is my business)
Colorectal cancer	La Vida es un Sueño (Life is a dream)	The bottom line	Cậu Vũ Có Câu Trả Lời (Uncle Vu has the answer)

screening. We used constructs from the Extended Parallel Process Model (EPPM) to guide literature review efforts and then organize results into key points. According to EPPM [55], to be most effective in motivating behavioral change, health promotion messages must include threat messages intended to increase the audience member's sense the health threat is severe (e.g., many people die from colorectal cancer) and they are personally susceptible to the threat (e.g., because I am 57 years old, I'm at-risk for getting colorectal cancer), as well as efficacy messages to assure audience members of the safety and effectiveness of the recommended behavior (e.g., a colonoscopy can save your life by detecting colon cancer at an earlier, treatable stage) and increase perceived self-efficacy to engage in the recommended behavior (e.g., I don't need to be scared or embarrassed to get screened for colon cancer). Organizing the key points based on EPPM constructs ensured we maintained balance between threat and efficacy messages.

Creation of Monologue Script

The development of scripts was an iterative process that involved collaboration of the relevant CAB, a health communication expert, and individual playwrights representing the target populations. Achieving cultural sensitivity was a key concern; thus, the scripts included surface-level adaptations that overtly depicted social and behavioral attributes such as language, visual cues, and racial/ethnic specific epidemiological information, as well as deep-level adaptations that reflected cultural values, beliefs, and practices [39]. Playwrights wrote the scripts using key points for content and were asked to purposefully feature relatable characters who are contextualized in culturally adapted storylines and who serve as role models. The 15–20-min monologues were then pilot tested twice to live audiences comprised of people in the target population (Black, Hispanic, and Vietnamese). Playwrights, in consultation with CABs, used feedback from these performances to make adjustments to the scripts and then prepare the final scripts for the live performances.

Program Implementation

As part of the OOHD cancer prevention initiative and to cast a wide net for monologue performances in the Houston area, we established the Community Network for Cancer Prevention (CNCP), an academic-community partnership to empower medically underserved Harris County residents to seek and obtain cancer prevention, screening, and follow-up services. The CNCP includes clinical partners (Harris Health System and University of Texas Health Science Center at Houston), Community Clinics (San Jose Clinic and Tomagwa Healthcare Ministries), an academic institution (Baylor College of Medicine), and community partners (American Cancer Society and BakerRipley Community Developers). The CNCP collaborates with community organizations (e.g., faith based, governmental, non-profit, and clinic based) to host monologues and plays for underserved populations in areas where there are high incidences of cancer or low screening rates.

Geographic information systems were used to identify medically underserved areas of Harris County that had a high incidence of breast, colorectal, or cervical cancers. Then, project staff worked with community-based organizations within these areas to select the appropriate monologue cancer performance based on their population and to find community venues (e.g., churches and community centers) that were suitable for the performance. Each community organization assisted with the advertising and recruitment of event attendees. The monologue performance was often integrated into already scheduled health fairs or special cancer events hosted by the community organization.

Structure of Monologue Live Performance Events

Each event consisted of a live monologue performance followed by a Q&A session with a healthcare professional. During the Q&A session, an access navigator from the safety-net health provider, Harris Health System, and other clinical or social services collaborators were present to provide information about their cancer screening services and discuss financial assistance eligibility. After the Q&A

session, we distributed evaluation surveys to audience members to assess their cancer prevention knowledge and intent to obtain screening services. To encourage survey participation, a gift card raffle was done at the end of each performance. Printed materials developed by project staff and pamphlets produced by the American Cancer Society (ACS) about cancer prevention and screening were available at an information table.

Evaluation

The post-performance survey was voluntary, anonymous, and self-administered. The survey included questions related to demographics, past screening (self-reported), assessed cancer screening knowledge (yes/no), intent to screen (pre and post, Likert-type scale), and open-ended questions for comments and suggestions on how to improve future live monologue performances. Both pre- and post-intervention intent to screen were assessed together after post-performance.

Data Analysis

All post-performance evaluation survey data was entered into an Excel spreadsheet and formatted to be analyzed using the statistical software R version 4.1. For event and audience characteristics, we reported descriptive statistics for categorical variables (frequencies and percentages) and continuous variables (means and standard deviations). We compared the percentages of participants who indicated a high intent to screen (answered "likely" or "very likely") pre- and post-performance across all 3 cancer sites, preferred language (English, Spanish, and Vietnamese), and race/ethnicity (Black non-Hispanic, Hispanic, Asian non-Hispanic, White non-Hispanic, and Other) We also compared these percentages pre- and post-performance across record of self-reported past screening for breast and colorectal cancers. In addition, we performed an exploratory analysis comparing the percentages of respondents with correct answers to the knowledge questions for each cancer site across sex and race. We used chi-square tests to perform these comparisons. We considered *p*-values less than 0.05 to be significant.

Results

Live Monologue Outreach Events

In partnership with various community organizations, we held 265 live monologue outreach events from January 2014 to March 2020 (before the COVID-19 pandemic) across Harris County, TX, with 110 focused on prevention and screening for breast cancer, 75 for colorectal cancer, and 80 for cervical cancer (Table 2). A total of 5989 individuals attended these outreach events and 5189 (86.3%) completed the post-performance evaluation survey. The average audience size per event was 22.6.

Participant Demographics

Grouping the audience members by monologue language, 43.9% spoke English, 50.8% spoke Spanish, and 5.4% spoke Vietnamese (Table 3). The majority of English-speaking participants were female (81.1%) and Black (73.6%), and attended a breast cancer monologue (49.6%). Among the Spanish-speaking participants, the majority were female (77.0%) and Hispanic (90.9%), and attended a cervical cancer monologue (36.4%). The majority of Vietnamese-speaking participants were female (67.9%) and Asian (92.2%), and attended a breast cancer monologue (72.9%) (data not shown).

Behavioral—Intention to Screen

There were significant changes in the intent to screen when comparing high intent (combined "likely" and "very likely") to screen responses before and after the monologue events across all cancer sites, languages, and race/ethnicity with the exception of no change for Vietnamese language or Asian race/ethnicity for cervical cancer screening (Table 4). Overall for all monologues, 6.6% of participants reported a positive change in their intent to screen from 75.7 to 82.3% after intervention ($p < 0.001$), with the greatest change in colorectal cancer screening monologue audiences (9.7%). Performances in Spanish had the greatest change in intent to screen for all three cancers (5.7–14.4% change) compared to English (2.7–5.3% change) and Vietnamese (0.0–5.8%

Table 2 Characteristics of monologue performances from January 2014 to March 2020

	All monologues	Breast	Colorectal	Cervical
Number of events	265	110	75	80
Total audience	5989	2639	1721	1629
Average audience size	22.6	24.0	22.9	20.4
Number of survey responses	5167	2386	1282	1499
Survey response rate	86.3%	90.4%	74.5%	92.0%

Table 3 Demographic information of surveyed participants from January 2014 to March 2020

	All monologues $N=5989$ (%)	Breast $N=2639$ (%)	Colorectal $N=1721$ (%)	Cervical $N=1629$ (%)
Sex				
Male	945 (15.8%)	305 (11.6%)	396 (23.0%)	244 (15.0%)
Female	4689 (78.3%)	2171 (82.3%)	1197 (69.6%)	1321 (81.1%)
Unknown	355 (5.9%)	163 (6.2%)	128 (7.4%)	64 (3.9%)
Average age	50.8	51.7	54.6	45.2
Monologue language				
English	2628 (43.9%)	1303 (49.4%)	839 (48.8%)	(486) 29.8%
Spanish	3040 (50.8%)	1102 (41.8%)	830 (48.2%)	(1108) 68.0%
Vietnamese	321 (5.4%)	234 (8.9%)	52 (3.0%)	(35) 2.1%
Race/ethnicity				
Asian non- Hispanic	352 (5.9%)	239 (9.1%)	69 (4.0%)	44 (2.7%)
Black non-Hispanic	1959 (32.6%)	1025 (38.8%)	581 (33.8%)	346 (21.2%)
White non-Hispanic	256 (4.3%)	86 (3.3%)	106 (6.2%)	64 (3.9%)
Hispanic	3104 (51.8%)	1143 (43.3%)	864 (50.2%)	1097 (67.3%)
Other/Unknown	325 (5.4%)	146 (5.5%)	101 (5.9%)	78 (4.8%)

change) language monologues. Likewise, Hispanic attendees had the highest levels of change (6.5–15.2%) compared to Black non-Hispanic (2.0–4.1%) and Asian non-Hispanic (0.0–5.8%) attendees. Black respondents reported a greater change in intent to screen than Asian respondents for breast (2.0% vs. 1.2%, $p=0.759$) and cervical (3.9% vs. 0.0%, $p=0.609$) cancers, whereas change in intent to screen for colorectal cancer was higher (5.8%) for Asian respondents than for Black respondents (4.1%) ($p=0.526$).

Self-reported Past Screening and Behavioral Intention to Screen

Significant changes in percentage in high intent to screen after intervention were noted in attendees that self-reported no past screening for breast and colorectal cancer ($p<0.001$) compared to those who self-reported past screening for these cancers (see Table 5). For attendees who self-reported no past screening with mammogram for breast cancer, the percentage of high intent to screen increased from 67.7 to 85.2% with an 18.0% change after intervention. For attendees who self-reported no past screening for colorectal cancer, the percentage of high intent to screen also increased from 62.8 to 89.6% with a 26.8% change after intervention.

Cancer Screening Knowledge

Table 6 shows percentages of correct responses to knowledge questions for breast, colorectal, and cervical cancer by sex and race/ethnicity. We separated the questions into five categories depending on their subject matter: early detection, family history, preventable, age, and cancer site specific. The early detection questions for all cancers were answered correctly by a majority of the participants (> 70%), and this held true across all race/ethnicity groups as well as for male and female respondents. Notably, all groups were highly aware that early detection improves treatment efficacy for breast (95.6%), cervical (94.8%), and colorectal (94.4%) cancers.

The questions related to family history had considerably lower correct percentages for colorectal cancer (30.7% overall) than for breast (79.8%) and cervical cancer (82.5%), a trend that persisted across race/ethnicity and sex. Male respondents scored lower than females on family history questions, and a majority of male respondents (> 70%) did not respond correctly to the breast cancer (69.3%) and colon (20.5%) family history questions. Asian non-Hispanic respondents had much lower correct percentages for breast and cervical family history questions (34.8% breast, 41% cervical) than Black non-Hispanic (82.1% breast, 79.2% cervical) and Hispanic respondents (87% breast, 86.5% cervical). However, for colorectal cancer family history, Asian non-Hispanic respondents had the highest correct percentage (41.4%) compared to Black non-Hispanic (24%) and Hispanic respondents (32.5%).

For breast and cervical cancer screening, surveys included questions about whether these cancers are preventable and at what age cancer screening should begin. With regard to prevention, except for Black participant responses regarding breast cancer (59.1%), the majority of respondents (> 70) answered correctly overall and across groups. The breast and cervical cancer questions relating to the age when screening should begin were answered correctly by a majority of the participants (> 70%), and this held true across all race/ethnicity groups, as well as for male and female respondents.

Table 4 Changes in proportion in "likely" intent to screen pre- and post-intervention across all cancer sites, language, and race/ethnicity

	Intent to screen pre-intervention *N* (%)	Intent to screen post-intervention *N* (%)	Percentage change (%)	X^2 *p*-value
All monologues	3946 (75.7%)	4289 (82.3%)	6.6%	< 0.001
Breast[1]	1826 (84.1%)	1935 (89.1%)	5.0%	
Colorectal[2]	992 (57.6%)	1159 (67.3%)	9.7%	
Cervical[1]	1128 (85.4%)	1195 (90.5%)	5.1%	
Monologue language				
Breast				
English	926 (84.9%)	956 (87.6%)	2.7%	< 0.001
Spanish	761 (83.2%)	838 (91.6%)	8.4%	
Vietnamese	139 (84.2%)	141 (85.5%)	1.3%	
Colorectal				
English	553 (63.5%)	577 (68.8%)	5.3%	< 0.001
Spanish	424 (51.1%)	544 (65.5%)	14.4%	
Vietnamese	35 (67.3%)	38 (73.1%)	5.8%	
Cervical				
English	323 (77.6%)	335 (80.5%)	2.9%	< 0.001
Spanish	783 (88.8%)	837 (94.5%)	5.7%	
Vietnamese	23 (95.7%)	23 (95.7%)	0.0%	
Race/ethnicity				
Breast				< 0.001
Asian non-Hispanic	145 (84.3%)	147 (85.5%)	1.2%	
Black non- Hispanic	755 (86.1%)	773 (88.1%)	2.0%	
White non- Hispanic	53 (75.7%)	61 (87.1%)	11.4%	
Hispanic	798 (83.0%)	880 (91.5%)	8.5%	
Other/Unknown	75 (83.3%)	74 (82.2%)	− 1.1%	
Colorectal				< 0.001
Asian non-Hispanic	48 (69.6%)	52 (75.4%)	5.8%	
Black non-Hispanic	395 (68.0%)	419 (72.1%)	4.1%	
White non- Hispanic	62 (58.5%)	71 (67.0%)	8.5%	
Hispanic	432 (50.0%)	563 (65.2%)	15.2%	
Other/Unknown	55 (54.5%)	54 (53.5%)	− 1.0%	
Cervical				< 0.001
Asian non-Hispanic	26 (96.3%)	26 (96.3%)	0.0%	
Black non- Hispanic	237 (76.2%)	249 (80.1%)	3.9%	
White non- Hispanic	42 (82.4%)	43 (84.3%)	1.9%	
Hispanic	780 (88.3%)	837 (94.8%)	6.5%	
Other/Unknown	43 (87.8%)	40 (84.6%)	− 3.2%	

[1]Onlyfemales considered for this analysis

[2]Both females and males for this analysis

Surveys also included questions that were specific to each cancer site. Whereas almost all common questions regarding cervical cancer had high percentages of correct answers (with the exception Asian participant responses regarding family history, 42%), the question relating to cervical cancer having warning signs/symptoms was answered correctly by only 52% of respondents overall. Notably, Asian non-Hispanic respondents had the lowest percentage of correct responses (26.2%) compared to Hispanic (52%) and Black non-Hispanic (57.8%) respondents. The majority of respondents (> 70) across the groups correctly answered the question of whether the HPV vaccine helps prevent cervical cancer, with the exception of male respondents (66.1%). The question of whether breast self-exam helps women find changes in their breasts was answered correctly by the majority (> 70) of respondents overall and across groups. With regard to colorectal cancer screening, the majority of respondents (> 70) overall and across groups recognized there are several

Table 5 Changes in proportion in "likely" intent to screen pre- and post-intervention and self-reported past screening

Self-reported past screening	Intent to screen pre-intervention *N* (%)	Intent to screen post-intervention *N* (%)	Percentage change (%)	X^2 *p*-value
Mammogram[1]				
Yes	1232 (93.1%)	1291 (97.6%)	4.5%	< 0.001
No	545 (67.2%)	691 (85.2%)	18.0%	
Colonoscopy[2]				
Yes	484 (87.7%)	510 (92.4%)	4.7%	< 0.001
No	386 (62.8%)	551 (89.6%)	26.8%	

[1]Mammogram is the screening exam for breast cancer

[2]Colonoscopy is the screening exam for colorectal cancer

Table 6 Percentages of corrected responses for cancer screening knowledge questions

Question	All (%)	Male	Female	Asian	Black	Hispanic
Early detection						
Breast cancer						
Improve treatment?	95.6	89.5	96.8	94.3	94.2	97.3
Screening guidelines						
For early detection?	97.6	94.3	98.4	93.6	98.2	98.0
Cervical cancer						
Detected early?	94.3	88.3	95.6	81.4	93.2	95.4
Screening saves lives?	94.8	97.0	94.4	97.7	88.2	97.7
Colon cancer						
Cured if found early?	94.4	92.4	95.3	92.1	96.0	94.3
Need for screening?	91.5	91.5	91.4	92.2	91.5	91.6
Family history						
Breast cancer						
Affect if family history?	79.8	69.3	81.9	34.8	82.1	87.0
Cervical cancer						
Affect if family history?	82.5	76.8	84.5	41.0	79.2	86.5
Colon cancer						
Have another family member?	30.7	20.5	33.3	41.4	24.0	32.5
Prevention						
Breast cancer						
Preventable?	75.4	72.8	76.0	83.3	59.1	88.6
Cervical cancer						
Preventable?	90.2	83.3	91.5	83.3	85.0	92.2
Screening age						
Breast cancer						
Mammogram screening at age 40 every year?	93.7	87.5	94.6	91.1	91.2	97.1
Cervical cancer						
Pap at age 21?	86.2	80.4	87.4	90.5	86.6	85.1
Cancer specific						
Breast cancer						
Breast self-exam helpful?	92.6	79.7	94.2	85.8	95.0	92.3
Cervical cancer						
Have warning signs or symptoms?	52.0	43.7	54.4	26.2	57.8	52.0
Prevented by HPV vaccine?	70.3	66.1	71.1	85.0	72.5	70.5
Colon cancer						
Primarily men?	49.8	39.4	54.5	49.2	62.4	39.8
Several screening tests?	72.9	70.9	73.6	77.8	71.6	73.6

colon cancer screening tests. However, when asked whether colon cancer affects primarily men, only 49.8% of respondents overall gave the correct answer, with male (39.4%) and Hispanic respondents (39.8%) having particularly low correct percentages.

Discussion

Overall, the culturally adapted theater outreach performances were successful in providing cancer early detection education about breast, cervical, and colorectal cancers for medically underserved Hispanic, Black, and Vietnamese communities. The monologues showed promising results in improving intention to screen, a proxy measure for cancer screening behavior. For all monologues, participants reported a positive change in their intent to screen from 75.7 to 82.3% after intervention ($p < 0.001$). Similar intent to screen results have been reported in other studies using a theater-based approach [23, 27]. While we did not obtain information whether the participants actually completed the cancer screening, we assessed intention to screen as a proxy measure for screening behavior. Interventions that have also incorporated storytelling and narratives have resulted in improved cancer prevention promoting behaviors such as cancer screening among African American and Hispanic participants [41, 43, 46, 56].

Moreover, after seeing the monologues, audience members' scores on knowledge questions for all three cancers were mostly positive. Importantly, early detection questions for all three cancers were over 90% correct for all respondents, and well over 70% for the various groups. For breast and cervical cancers, the majority of participants overall (> 70%) gave correct answers for questions about family history, age to begin screening, and whether these cancers are preventable, as well as for breast self-examination efficacy, HPV vaccine efficacy for preventing cervical cancer, and availability of several colon cancer screening tests.

The findings also revealed opportunities for improving monologue content to cultivate cancer early detection and screening knowledge. In particular, Asian participants had low scores for breast (34.8%) and cervical (41%) cancer family history, Black participants had low scores for breast cancer preventability (59.1%), and Black men had low scores for HPV vaccine efficacy (66.1%). Scores for cervical cancer signs and symptoms were low overall (52%) and across race/ethnicity and sex (26.2–57.8%). Thus, future interventions should adapt content to highlight these knowledge issues.

Moreover, audiences for the colorectal monologues gave the lowest scores for knowledge questions related to family history (30.7%) and women's risk (49.8%), despite having the greatest positive change in screening intent overall (9.7%) and high scores on early detection screening knowledge questions (> 90% overall and across groups). The results for women's risk were particularly surprising given that all three colorectal cancer monologues note with differing degrees of emphasis that women are at-risk for colorectal cancer. Having a male actor for this monologue may explain these lower scores since, as noted above, narratives are effective because they distract viewers from overt persuasive arguments by inviting the viewer to focus on the character's experience and women may identify less with the male character. Thus, theater monologues intended to promote women's use of colorectal screening might consider employing a female character to make the case for screening and act as a role model.

While knowledge of family cancer history plays an important role in cancer prevention and may contribute to timely early detection screening, some racial/ethnic group families do not communicate about past cancer history. For instance, several studies describe cultural barriers to health history communication in African American families [57–59]. This may help explain the particularly low family history knowledge for Black respondents. More education is needed on the importance of obtaining and sharing family cancer history in order to increase awareness about cancer risk and tailor cancer screening recommendations appropriately.

In addition to study findings, we also received feedback from our community partners indicating that the monologues were well liked due to high-quality acting, brief duration, and ease of implementation. The Theater Outreach Program also addressed several of the cancer health disparities seen in our CA, utilizing at least five out of the six pillars (Fig. 1) that address the Social Determinants of Health (SDOH) as delineated by the CDC [60]. First, we regularly monitor the

Fig. 1 The six pillars of the CDC's work to address social conditions and structural conditions [60]

catchment area for cancer burdens and target the outreach to the geographical areas of most need (Data and surveillance). The multilingual, culturally adapted performances deliver information about cancer screening guidelines, and through patient access navigation, we provide them with resources for obtaining screening. A vital component of the events is linking the audience members to healthcare services where they can obtain cancer screening (Infrastructure and capacity). Our monologues inform, educate, and empower the audience to learn and seek cancer screening (Community engagement). We work closely with our community partners in the planning and hosting of performances in churches, non-profit organizations, and community centers (Partnerships and collaborations). Lastly, we have an ongoing process for evaluating the performances by requesting feedback from the audience via an anonymous survey to assess knowledge and intent to screen, and for quality improvement (Evaluation and evidence building).

Limitations

Our study has several limitations to consider. First, for logistical reasons, we used a single survey after the performance to inquire about pre- and post-performance intentions to cancer screen. While these questions specifically highlighted "before" and "after" performance for intent to screen, it is possible attendees may have answered the same response and this may have contributed to no change in intent to screen in some cases. With a single survey format, we only assessed knowledge of cancer screening after performance. Therefore, we cannot fully conclude that the monologues improved knowledge about cancer screening. Second, the survey results may present a recall bias since we asked the participants to rely on their previous experiences about cancer screening. Third, there is a possibility of social desirability bias since we asked the attendees to recall their future intentions to get cancer screening. To reduce this bias, we provided an anonymous survey and created a comfortable environment, so the attendees did not feel embarrassed or threatened when answering the survey. Fourth, while overall the sample size of attendees was 5989, it was challenging to attract a large audience for performances targeted to the Vietnamese community. This may have impacted the results for intent to screen for these attendees. Finally, this study did not assess actual cancer behavior change. However, several studies suggest that intention is a good proxy for behavior [61–63].

Conclusion

In conclusion, our findings suggest that a theater-based approach may be an effective strategy to disseminate cancer screening education, improve knowledge, and increase intent to obtain screening among medically underserved communities. The culturally adapted monologues were particularly effective at improving knowledge and intention to screen in Black and Hispanic communities especially those Spanish-speaking attendees. Our Theater Outreach Program serves as a platform where attendees can feel comfortable in a familiar environment and provides a forum where they can address their health concerns, regardless of their level of education. More studies are needed to explore how community theater performances can be an effective approach to communicate health messages related to cancer prevention in particular to raise awareness about the importance of cancer screenings in medically underserved minority populations.

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Declarations

Competing Interests The authors declare no competing interests.

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