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Using Implementation Science to Disseminate a Lung Cancer Screening Education Intervention Through Community Health Workers

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Abstract

National lung cancer screening with low dose computed tomography (LDCT) uptake is suboptimal. One factor contributing to slow uptake is lack of awareness. Trained Community Health Workers (CHWs) may be effective in increasing lung cancer screening awareness among disparate populations, however little is known about the processes necessary to scale an intervention for implementation by CHWs in a new area. We examined implementation processes with the RE-AIM framework and pilot tested a CHW-delivered lung cancer education intervention based on the Health Belief Model. We measured pre-post participant knowledge, attitudes and beliefs regarding cancer screening, lung cancer stigma, and intent to obtain LDCT screening. We used community-engaged strategies to collaborate with a local health system, to identify CHWs. CHWs were trained to recruit participants and deliver the one-session lung cancer education intervention. Seven CHWs and eight community sites participated. Participants ($n = 77$) were female (53%) primarily low income (62.9%); tobacco use was high (36.9%). Post intervention changes in lung cancer screening knowledge ($p < .0001$), attitudes regarding lung cancer screening benefit ($p = .034$) and lung cancer stigma. ($p = .024$) We learned important lessons that will be useful in subsequent scaling. Collaborating with a local health system is a promising method to disseminate a lung cancer screening education intervention.

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Keywords

Community health worker; Dissemination and implementation; Lung cancer screening; Education; Lung cancer stigma

According to the most recent United States (U.S.) cancer statistics, in 2018 lung cancer was projected to cause 25% of cancer mortality, making it the deadliest cancer among both men and women [1]. Consistent with other cancers, lung cancer mortality is higher among racial/ethnic minority and medically underserved populations than among Whites [2, 3]. Additionally, regional lung cancer disparities exist in the U.S., with Kentucky (KY) having the highest lung cancer incidence and mortality (92.2 and 66.1 per 100,000 respectively) compared to national rates of 59.2 and 41.9 respectively [4]. Higher incidence and mortality is partly attributed to KY's high adult smoking prevalence, 24.5% [5] compared to the U.S. 16.8% [6]. Targeted efforts to change cancer prevention behaviors and detect lung cancer early are urgently needed in KY.

The National Lung Screening Trial provided strong evidence of decreased lung cancer mortality among high-risk individuals who were screened with low dose computed tomography (LDCT) relative to chest x-ray [7] yet, despite the advances in lung cancer screening that ensued, screening uptake is persistently low, with estimates of only 2–4% of high-risk individuals having undergone the LDCT screening [8-10]. Our research and that of others indicates that one critical barrier to uptake is lack of awareness of and knowledge regarding LDCTs [11-13]. Moreover, despite higher cancer mortality, racial/ethnic minorities and impoverished individuals are slower than other groups to adopt new cancer screening behaviors. Because of the dismally low lung cancer survival rates, a lung cancer diagnosis is often associated with negative psychosocial factors, such as fatalistic attitudes. Additionally, recent literature reviews [14, 15] and research [16-20] indicate that low uptake may in part be due to lung cancer stigma, such that others view the patient as deserving of or having caused a lung cancer diagnosis, due to a personal history of smoking.

To realize the full impact of lung cancer screening on mortality, effort must be directed to implement LDCT screening programs among harder to reach populations, such as racial/ethnic minority and the medically underserved and explore interventions to decrease social stigma as a barrier to screening. Our research and others demonstrate that community outreach in partnership with existing social and health networks is an effective approach to reach communities and engage them to change their cancer prevention and early detection behaviors [12-14]. Moreover, a large body of evidence reports the effectiveness of engaging with lay people as community health workers (CHWs) to reach disparate populations to improve health knowledge and outcomes [21]. CHWs are credible and trusted sources of information; therefore, training them to present lung cancer screening information within the context of other cancer screenings may normalize the information, decrease stigma, raise awareness, and increase consideration of screening initiation. Despite the effectiveness of CHWs, there are notable implementation gaps in some regions of the U.S. that impede dissemination of evidenced-based interventions; more data is warranted on effective methods to establish CHW models in new areas.

The purpose of the program known as the Kentucky-Community Awareness Research and Education (K-CARE) was to disseminate a previously tested lung cancer screening education program through a CHW model [11]. We sought to explore the process necessary to identify and train CHWs to implement K-CARE to racial/ethnic minority and medically underserved adults in western Kentucky. Our secondary aim was to assess the pilot program's post intervention changes in participants' knowledge, attitudes regarding lung cancer stigma, beliefs, self-efficacy and intent to obtain lung cancer screening when compared to baseline. This manuscript reports the methods used to conduct the participant level intervention, the intervention outcomes, lessons learned during implementation, and potential next steps.

Methods

The study was conducted from September 2018 to October 2019. We used a single-group design implemented with community-engaged methods. We used qualitative and quantitative methods as well as four of the five dimensions of the RE-AIM framework (Reach, Efficacy, Adoption, and Implementation) to guide the implementation and evaluation processes [22-24]. The RE-AIM framework was developed to increase the adoption of effective, scalable public health interventions and to provide measures of successful dissemination. The University of Kentucky Office of Research Integrity approved the study. All study participants provided informed consent.

To ensure the availability of an accredited LDCT screening and an evidenced-based tobacco cessation program, we sought to implement the project in an area that had access to these essential resources. Therefore, we conducted the project in Daviess County, KY, a county with high racial/ethnic lung cancer disparity and high poverty. We engaged the Director of Community Engagement at the local health system (Owensboro Health) to facilitate our contact with community gatekeepers who could help identify CHWs. Briefly, we leveraged the existing infrastructure of the University of Kentucky Markey Cancer Center's Affiliate Network (MCCAN) to reach the stakeholders at Owensboro Health, located in western KY. The purpose of MCCAN is to collaborate with smaller community hospitals across KY, such as Owensboro Health, to offer the resources available at the NCI-designated Markey Cancer Center. Our team had previously collaborated with Owensboro Health staff members, thus the relationships were established.

CHW Recruitment

Given the national higher rate of lung cancer incidence and mortality among Black men, [25] we specifically sought to identify CHWs who could reach racial/ethnic minority and/or medically underserved communities. To recruit potential CHWs, we collaborated with the Community Engagement Director at Owensboro Health and other state organizations to disseminate flyers regarding the CHW training.

CHW Training

We used a two-tiered approach to train the CHWs: Tier 1 training was a 6-h face-to-face session held in Daviess County, KY. The overall objective of the Tier 1 training was to

introduce attendees to the CHW role. Twenty-two CHWs registered and 18 attended. From the class of 18 CHWs, based on their ability to reach the priority population, their having previous experience teaching and/or willingness to receive the CHW training, we invited ten to serve as K-CARE CHWs and receive Tier 2 training. Of the ten selected, eight agreed to participate. The eight CHWs received six additional hours of face-to-face training that was specific to delivering the K-CARE lung cancer screening education intervention. After completing Tier 2 training, CHWs were responsible for recruiting and consenting ten participants, collecting data, teaching the one session K-CARE class and attending one community event to disseminate pamphlets about lung cancer screening. The Tier 2 CHWs received \$250 for their role in the project.

Participant Recruitment

The primary target population was adult, English-speaking, racial/ethnic minority and/or medically underserved individuals whose age and tobacco use history made them eligible for LDCT screening. However, given the nationwide low LDCT screening uptake and the generally low level of community awareness regarding lung cancer screening recommendations, we used a public health approach to participant inclusion whereby CHWs included adults age 21–80 years, tobacco users or non-tobacco users who had a family member or loved one who used tobacco. The research team provided the CHWs with investigator-developed flyers to recruit ten participants from their social networks, churches and the community.

K-CARE Curriculum—The K-CARE curriculum was adapted from our previous project [26]. We developed the original curriculum from evidenced-based content from the American Cancer Society and the National Cancer Institute as well as from cancer programs identified on Research-tested Intervention Programs (RTIPs) website [27]. The Health Belief Model [28] (HBM) guided curriculum development. However, because the CHW role was untested in this community, we sought to simplify the intervention by condensing it to include a general overview of cancer screenings and salient content that addressed perceived risk, severity, benefits, and barriers to lung cancer screening and cancer prevention. Additionally, we added content regarding lung cancer stigma.

To adapt the curriculum to local needs, we conducted three focus groups with a diverse population of community members. We then used an iterative process to revise the curriculum. The purpose of the focus groups was to ensure that the curriculum was understandable and culturally relevant. Table 1 provides an outline of the content included in K-CARE. The curriculum was developed to the 6th grade reading level and included a participant handout.

Eight CHWs completed the Tier 2 training; subsequently one withdrew due to work obligations. Seven of the CHWs delivered the intervention in eight community sites of their choice (two churches, two community centers, two human and social services agencies, two shelters (one for homeless men; one for abused women). CHWs taught the K-CARE session in a group-based interactive manner. The session lasted 90 min, to ensure the CHWs maintained fidelity to the curriculum, each CHW used a scripted leaders' manual while

teaching. CHWs referred LDCT-screening eligible participants to Owensboro Health and tobacco users to the Owensboro Health Tobacco Cessation Program or to 1–800 QUIT-NOW. To monitor CHW participant recruitment accrual and assess progress with community outreach, the Research Associate contacted each CHW weekly by phone and email.

Data Collection

After documenting informed consent, enrolled participants completed two surveys (1-pre intervention and 1 post) to assess the effects of the K-CARE education intervention. CHWs offered participants the option to complete the surveys electronically with REDCap [29] by iPad, computer or smartphone or by paper and pencil. The survey items were developed from the constructs within the HBM [28] and included a mix of 4-point Likert-style items to assess attitudes, perceived risk, barriers and benefits of lung cancer screening, beliefs and intent to obtain LDCT screening, readiness to quit tobacco and/or intent to discuss smoking cessation/screening with others. Five multiple-choice items assessed knowledge of lung cancer screening and cancer risk factors. One scenario-based item assessed the participants' ability to select the individual who met the lung cancer screening criteria. The scenarios varied according to the age of the individual and intensity/duration of smoking or exposure to second-hand smoke. Because of the negative association with lung cancer stigma and lung cancer screening, we used the Cancer Stigma Scale (CASS) to assess for post intervention change in lung cancer stigma. The CASS was specifically developed and validated to evaluate the effects of interventions to reduce cancer stigma in non-patient populations [30]. The instrument includes 25 items that assess six domains: Awkwardness, Severity, Avoidance, Personal Responsibility, Policy Opposition and Financial Discrimination, which are recorded on a 6-point Likert scale ranging from “disagree strongly to “agree strongly” and reversed scored for four items, whereby all scores were from 1 to 6 with higher scores indicating more stigma.

To avoid participant fatigue, we developed the surveys for completion within 20 min. The pre-intervention survey collected sociodemographic data and relevant health information, which we used to determine lung cancer risk factors and eligibility for LDCT screening. To allow for paired data analysis, we coded the pre and post surveys with a participant identification number. To minimize missing data, CHWs allowed time at the end of the K-CARE session to complete post surveys. In addition to survey data, we collected process data (e.g., methods used to identify CHWs, number of sites approached regarding intervention hosting, site selection, etc.).

Statistical Analysis

Analysis for descriptive as well as inferential analyses was completed with SAS 9.4 (SAS Institute, Cary North Carolina, 2019). We present descriptive statistical data as frequencies, percents for categorical variables and means and standard deviations for continuous variables. Statistical tests were conducted using two-sided tests with a Type I error rate of 5%. The primary outcome measure was post-intervention knowledge of lung cancer screening. McNemar's test was used to assess whether the proportion of participants with the 'correct' answer to each of the five multiple-choice items differed between the pre and post surveys. HBM sub-scales were calculated using all available data. CASS sub-scales

were calculated for each participant except for cases in which the sub-scale was set to missing when more than one item comprising the sub-scale was found to be missing. We calculated a total score for CASS by taking the average of all 25 items contained across the six subscales only when six or less items were missing. Changes in HBM sub-scales as well as CASS sub-scales and total scale were assessed using Wilcoxon Signed-Rank test.

Results

Data were available for 77 participants at baseline and 76 participants at post-intervention. Sample sizes varied across the characteristics measured due to missing data. Table 2 provides the baseline description of sociodemographic, behavioral, and health-related characteristics of the sample. The mean participant age was 44.8 years (SD = 14.6). Nearly 46% were White; 35% were Black/African American; 22% were Latino. The sample was majority female (68%). Nearly half (49%) had Medicare/Medicaid insurance, approximately 23% were uninsured; most (62.9%) had an annual household income of \$25,000 or less.

Cancer Risk Factors and History

Twenty-seven (36.9.1%) of the 73 participants responding to the tobacco question used tobacco with (70%) reporting cigarette use. Eleven percent reported using cigarettes in combination with electronic (E)-cigarettes and E-Vapor. Forty-eight percent of current tobacco users indicated plans to quit. Nine of the 77 participants met the lung cancer screening criteria of the United States Preventive Services Task Force [9] or the National Comprehensive Cancer Network [8]. Eight percent reported a personal cancer history, 52% reported a first-degree relative with a history of any cancer; and nearly 24% (23.8) reported a first-degree relative with lung cancer.

Knowledge

Table 3 contains data on participants' knowledge of lung cancer screening. Of the five items, three had significant post-intervention increases in the proportion of participants responding correctly ($p < 0.0001$). Specifically, participants held more accurate information regarding cancer risk factors, nicotine effects and lung cancer screening following the intervention.

Health Belief Model Constructs

Table 4 compares the pre to post intervention changes in HBM constructs among the entire sample. The Benefits construct had a significant post intervention change score ($p = 0.034$). Because the sample included both tobacco users and non-users, we conducted an analysis to compare non-tobacco users with tobacco users (not shown in Table). Results indicated a significant post-intervention change score among the non-tobacco users in the Perceived Barriers construct ($p = 0.007$). Among tobacco users ($n = 25$), there was a significant post intervention change ($p = 0.040$) in Intent to obtain LDCT screening.

Lung Cancer Stigma

Table 5 provides the results of the entire sample regarding the CASS instrument. Post-intervention, analyses revealed statistically significant decreases in the following subscales: Severity ($p < 0.0001$), Personal Responsibility ($p = 0.009$), and total lung cancer stigma ($p =$

0.024). To assess differences among the tobacco users and non-tobacco users, we conducted a sub-analysis (not shown in Table 5). Non-tobacco users experienced a significant decrease in Severity from 2.77 to 2.37 ($p = 0.040$). Among non-tobacco users, there were no differences in Awkwardness, Avoidance, or Policy Opposition. Among tobacco users, two subscales experienced a statistically significant decrease: Severity from 3.37 to 2.56 ($p = 0.001$) and Personal Responsibility from 2.98 to 2.25 ($p = 0.007$).

RE-AIM Measures

Reach—We sought to train 25 CHWs in the Tier 1 training and ten in the Tier 2. Twenty-two individuals registered for the Tier 1 training and 18 attended (82%). We sought to select ten CHWs for the Tier 2 training, and we reached 80% of them. We sought to reach 100 participants with the K-CARE education and were successful in reaching 77%. The CHWs reached an additional 1,200 individuals with pamphlets on lung cancer screening by conducting outreach at community events such as health fairs, festivals, recreational and church events and family reunions.

Adoption—Of the eight sites that agreed to host the K-CARE sessions 100% did so. Of the nine individuals who met the lung cancer screening criteria, one underwent lung cancer screening and two indicated intent. Due to telephone number changes; we were unable to reach the remaining six. Post-intervention, seventy-three (96%) of participants stated that they intended to recommend lung cancer screening to a family member or loved one who used tobacco.

Implementation—Seven of the eight (88%) trained CHWs implemented the program. One of the CHWs taught the session at two different sites.

Discussion

Increasing the knowledge of lung cancer screening is critical to improving screening consideration and uptake. Using community-engaged methods and the RE-AIM framework, we evaluated implementation strategies and participant-level results of a lung cancer screening education program (K-CARE). These strategies resulted in our reaching 80% of the CHWs necessary for implementation who subsequently recruited nearly 80% of the desired sample. Results strongly suggests that collaborating with a local health system is an effective strategy to reach and identify CHWs and engage the community in hosting the lung cancer screening education program. To our knowledge, this is the first study to analyze efforts to scale up a community based lung cancer screening education intervention. The RE-AIM framework allowed us to evaluate four components of implementation strategies, thus providing a useful evaluation model for broader implementation. Although the CHW role was largely new to the region, after training, the CHWs were able to recruit and consent a sample of low income, racial/ethnic minority and medically-underserved community members. Moreover, the CHWs were able to deliver the intervention and collect the participant-level data.

Similar to our previous lung cancer screening education project [11], participant results indicated significant post intervention changes in knowledge related to lung cancer

screening. These findings suggest that a brief intervention is effective in improving knowledge regarding lung cancer screening. However, despite the participants' ability to ascertain LDCT as the correct screening test, they were unable to identify the individual who met the screening criteria with a scenario-based question. This finding was surprising and warrants further investigation with a larger sample. Additionally, given the significant post intervention changes in HBM constructs, this suggests that the modified intervention included salient content regarding lung cancer screening education.

Previous studies have examined lung cancer stigma and its impact on lung cancer care; however, most of these studies have included samples of lung cancer survivors [31-33]. To our knowledge, our study is the first to specifically examine lung cancer stigma among a community-based sample participating in an intervention. Our results suggest that brief interventions may be effective in changing attitudes regarding lung cancer screening, these findings were consistent with our previous study and those of others [18, 34], that indicate among individuals who smoke, lung cancer screening may be perceived as beneficial. However, barriers such as fear, fatalism and stigma may prevent them from actually undergoing the screening. Future researchers should include lung cancer stigma in their cancer education interventions, offering an additional pathway to reducing stigma as a barrier to lung cancer screening consideration and uptake.

We learned some significant lessons that may assist other dissemination and implementation scientists. An important barrier to dissemination science is the time and travel burden of training the CHWs in a face-to-face manner. According to a study conducted by Holt et al. [35] training CHWs with web-based methods compared to face-to-face resulted in no differences in the participant-level outcomes. Based on this evidence and our future plans to scale the intervention, we provided each CHW with an iPad and planned to conduct the Tier 2 CHW training in a synchronous web-based format (e.g., Zoom teleconference). However, after meeting with the CHWs, they indicated a strong preference for face-to-face training. These findings have important implications and indicate that there may be a need for a combination of face-to-face and web-based CHW training, whereby the researchers interface with the CHWs to build rapport before delivering additional content online. Another consideration may be to deliver some content as web based asynchronous modules and other content, such as that specific to the intervention delivery in a face-to-face manner. Additionally, we found wide variability among the CHWs level of proficiency with technology. In hindsight, we should have assessed for technological competency during the Tier 1 training, having done so would have allowed us to plan to conduct face-to-face training, or we could have provided basic technology preparation during the Tier 1 training. Allocating a small amount of time to teach CHWs how to access the web-based training would have saved a considerable amount of time that we spent coordinating and traveling to conduct face-to-face training. Another alternative that future researchers should consider is training a community member to conduct peer to peer face-to-face training. Other dissemination scientists have used peer to peer training effectively [36, 37]; however, they caution regarding the importance of providing technical assistance and robust, standardized training to achieve outcomes comparable to those achieved during the efficacy trial.

Secondly, based on the success of collecting the survey data electronically in our previous lung cancer education project [11], we anticipated using the same methods with the current dissemination project. However, the majority (90%) of the participants completed the surveys with pencil and paper. The use of pencil and paper required the development of methods to maintain data confidentially in community sites and to obtain paper surveys from CHWs. Moreover, it required manual data entry. To overcome the challenge of obtaining the paper data, we developed a codified method for CHWs to submit the data to the research office by express mail service.

This study had a number of strengths, firstly, our project aligned with the priority of the local hospital to reach harder to reach populations. Aligning the project with the priorities of the local health system allowed us to establish a strong community stakeholder relationship that facilitated identification of CHWs, and provided access to community collaborators willing to host the sites—allowing access to our priority populations of racial/ethnic minority and medically underserved individuals. Leveraging the community relationships of the local hospital also allowed us to match some of the CHWs to community sites, which avoided the CHWs from having to identify their own site. Lastly, although we shortened the original four session intervention to one session, the brief intervention was effective in changing participants' lung cancer screening knowledge and attitudes regarding lung cancer stigma.

There were however some limitations to our study. The one group study design has limitations inherent in single group pre-posttest design. Although a stronger design may have increased the validity of our findings, the main purpose of this pilot study was to explore the processes necessary to disseminate the lung cancer screening education program; therefore, the single group design was appropriate. Second, despite our earnest attempts, due to inoperable phone numbers and changed addresses, we were unable to verify lung cancer screening completion among the majority of screening-eligible participants. Our inability to verify screening completion limited our ability to measure the impact of the intervention beyond intent to obtain screening. To overcome this limitation in the future, we have established a method to identify study participants when they schedule an appointment with the Owensboro Health lung cancer screening program. Previous evidence indicates that integrating the health intervention into existing hospital activities improves scaling, thus this process measure will be impactful during subsequent scaling [35, 38].

In conclusion, this pilot program demonstrated the value of using an existing infrastructure to implement a lung cancer screening program in a new area and reach socioeconomically disadvantaged community and under-represented minority groups. The program also allowed us to explore some of the barriers to broad scaling, such as CHWs training, data collection and verifying LDCT completion among screening-eligible participants. Our future plans include applying the strategies used in this pilot to broadly scale the intervention among the MCCAN network and beyond.

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Table 1

Content of K-CARE intervention

Participants learned about cancer and the incidence, risk factors and they examined their personal cancer risk. They learned about the USPSTF cancer screening recommendations for adults and then they were introduced to lung cancer screening. They also learned about the benefits, shared-decision making, risks/harms and financial implications of LDCTs, and how to access local LDCT resources. Information was provided on lung cancer stigma and its negative association with lung cancer diagnosis and screening. The importance of tobacco avoidance and cessation was emphasized. Participants developed a personal cancer prevention action plan

Table 2
Participant sociodemographic characteristics, health behaviors and health history

Characteristic	Frequency	Percent
Gender, n = 77		
Female	52	68.4
Male	24	31.6
Other	1	1.3
Race, n = 67		
White (non-Hispanic)	35	52.4
African American/Black	27	40.3
Ethnicity, n = 74		
Non-Hispanic	58	78.4
Hispanic	16	21.6
Yearly income, n = 70		
< \$25,000	44	62.9
\$25,00–\$49,999	22	31.4
\$50,000	4	5.7
Education, n = 71		
High school graduate	48	67.6
< High School	12	16.9
College Graduate	11	15.5
Insurance, n = 73		
Medicare/medicaid	38	52.1
Private/military	17	23.2
None	18	24.7
Health status, n = 73		
Excellent	6	8.2
Very good	20	27.4
Good	41	56.2
Poor	6	8.2
Health behaviors		

Characteristic	Frequency	Percent
Smoking history, n = 73		
Current smoker	27	36.9
Previous smoker	11	15.1
Exercise (days during the past week with exercise of at least moderate intensity), n = 74		
0–2 days	44	59.5
3+ days	30	40.5
Clinician recommended lung cancer screening, n = 75		
Yes	10	13.3
No	65	86.7
Personal cancer Hx, n = 76		
Yes	6	7.9
No	70	92.1
1st degree relative with lung cancer Hx, n = 63		
Yes	15	23.8
No	48	76.2
1st degree relative with any cancer Hx, n = 72		
Yes	38	52.1
No	28	38.4
Don't know	7	9.6

Table 3

Pre and post intervention survey responses to knowledge

	Pre-intervention correct response (%)	Post intervention correct response (%)	p-value
Knowledge of lung cancer screening test n = 71	20.8	77.6	< .0001*
Nicotine as cause of lung cancer n = 75	18.2	65.8	< .0001*
Lung cancer screen rec. n = 73	31.2	44.7	< 0.068
Cancer risk factors n = 77	29.9	68.4	< .0001*
Who should be screened n = 75	18.2	21.1	0.366

The asterisk indicates a statistically significant p value <.05

Table 4

Comparison of pre and post intervention responses to health belief model constructs

Subscale	Time-point	M (SD)	p-value
Perceived Suscep. n = 72	Pre	2.20 (.76)	.646
	Post	2.14 (.68)	
Perceived severity n = 70	Pre	2.16 (.87)	.093
	Post	1.98 (.75)	
Perceived threat n = 70	Pre	5.11 (3.33)	.059
	Post	4.53 (2.87)	
Perceived benefits n = 73	Pre	3.53 (.52)	.034*
	Post	3.36 (.67)	
Perceived barriers n = 72	Pre	1.85 (.57)	.115
	Post	1.75 (.55)	
Self-efficacy n = 72	Pre	3.44 (.65)	.403
	Post	3.33 (.73)	
Intent n = 72	Pret	2.94 (.82)	.426
	Post	3.03 (.87)	

The asterisk indicates a statistically significant p value <.05

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Table 5

Comparison of pre and post intervention cancer stigma sub-scales

Subscale	Time-point	M (SD)	p-value
Awkwardness n = 65	Pre	1.75 (.91)	.399
	Post	1.69 (.91)	
Severity n = 61	Pre	3.03 (1.30)	< .0001*
	Post	2.45 (1.02)	
Avoidance n = 67	Pre	1.40 (.73)	.292
	Post	1.52 (.89)	
Policy opposition n = 66	Pre	2.09 (1.20)	.452
	Post	2.29 (1.35)	
Personal responsibility n = 62	Pre	2.79 (1.48)	< .009*
	Post	2.33 (1.09)	
Financial discrim. n = 60	Pre	2.08 (1.15)	.478
	Post	1.94 (1.12)	
Total cancer stigma n = 62	Pre	2.16 (.73)	.024*
	Post	1.95 (.65)	

The asterisk indicates a statistically significant p value <.05

Discrim discrimination

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