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Knowledge, Activation, and Costs of the Pharmacists' Pneumonia Prevention Program (PPPP): A Novel Senior Center Model to Promote Vaccination

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Abstract

Background: Vaccination is the best way to prevent pneumococcal disease (PD), but 40% of older adults remain unvaccinated nationwide, with even greater nonvaccination rates among African Americans (AAs). Prior studies suggest that insufficient knowledge contributes to low vaccination rates. The Pharmacists' Pneumonia Prevention Program (PPPP) was designed to improve older adults' knowledge about PD and pneumococcal vaccination (PV). **Objective:** To measure PPPP's effect on knowledge and activation in a predominantly AA population and determine program costs. **Methods:** PPPP uses a senior center model with a pharmacist presentation, actors' skit, and small-group action planning. Knowledge about PD risk, transmission, symptoms, and PV side effects was assessed at baseline (BL), postintervention (PT), and 3 months (M3) and analyzed using an intention-to-treat (ITT) approach. Actions taken (got vaccinated, spoke to doctor or pharmacist, discussed with family/friends) were assessed at M3. PPPP costs ($US 2013) included staff time, PV, actor, and site fees. **Results:** Of 276 attending PPPP, 190 consented and were included in the ITT sample, which was largely black (80.5%) and female (76.3%) and had a mean age of 74.4 years. Knowledge improved by 46.8% (BL vs PT), with significant gains in all domains. At M3, knowledge improved by 54.2% vs BL, indicating sustained gains; 37.2% of previously unvaccinated participants reported receiving PV by M3. Program cost was $119 per attendee. **Conclusion:** PPPP significantly improved PD and PV knowledge. It could be delivered more efficiently by holding larger events on fewer dates, staffing with volunteers where appropriate, and utilizing a local pharmacy to manage the vaccine supply.

Keywords
vaccines, pneumonia, infectious disease, geriatrics, cost, aging

Introduction

Streptococcus pneumoniae is a significant cause of invasive disease, including bacteremia, meningitis, and pneumonia, among adults in the United States.[1] Invasive disease disproportionally affects older adults, with an annual incidence of 3.8 episodes per 100 000 persons aged 18 to 34 years and 36.4 episodes per 100 000 persons aged ≥65 years.[1] Nearly 4000 deaths occur annually among adults in the United States as a result of invasive pneumococcal disease (PD).[1]

Vaccination is the single best way to prevent PD. However, according to the Centers for Disease Control and Prevention (CDC), many adults remain unvaccinated, including those at the highest risk of infection. In 2013, the CDC estimated that only 59.7% of adults aged ≥65 years had ever received pneumococcal vaccination (PV).[2] In Pennsylvania, estimates are considerably lower. According to a 2004 Southeastern Pennsylvania Household Health Survey, only 51.9% of adults older than 60 years had ever received PV. Furthermore, only 43.6% of the poor have ever had PV, and only 41.6% of African Americans (AAs) have ever received PV compared with 53.6% of Caucasians.[3] These values demonstrate the overall low rate of PV,

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particularly among older adults and highlight significant disparities in immunization coverage according to race and socioeconomic status.[4]

Because there remains a large burden of PD in the United States, with immunization rates being suboptimal, especially among older adults, new models of care designed to improve vaccine education are needed. The senior center model of care (SCMC) uses a community senior center as the focal point of access to an older adult population and can provide access to some preventive health services through a facility the population already attends. Health care providers can partner with senior centers to complement the SCMC and enhance the delivery of preventive services. SCMC and other community supports are expected to increase significantly over the coming years with the rapid aging of our population.[5] Senior centers represent an opportunity to connect older adults with specific resources that support healthy aging, including educational programs, among others.[5] Additionally, pharmacists have been routinely providing immunizations in the community setting since 1995 and represent a potential partner for senior centers to improve immunization rates within their population.

Lack of knowledge about vaccinations and negative framing of information contribute to suboptimal vaccination rates.[6] Several studies have attempted to deliver culturally relevant vaccination education using messages and delivery methods that were tailored to particular populations. Kepka et al[6] utilized a radionovelas, or radio drama broadcasting, to promote HPV vaccine knowledge among Hispanic parents. Radionovelas can reach those with lower levels of literacy and English language abilities, and characters in novelas are generally relatable to Latino communities.[6] Dunn et al[7] compared the effect of a vaccine information statement to a 15-minute videotape about the polio vaccination and discovered that the videotape significantly increased short-term knowledge regardless of race/ethnicity and educational level.[7] To our knowledge, no prior studies have evaluated a community-based, pharmacist-delivered educational intervention to improve vaccination knowledge in an older, predominantly minority population of adults in the United States, nor has any study attempted to measure the costs of such a program.

Evaluation of the literature revealed patterns that were considered when designing a PD and PV education program. For example, multiple studies evaluating PV in older adults and minority populations have consistently found that participants who did not receive PV were unaware of their risk for PD, felt that they were not susceptible to the disease, and were unaware of their eligibility to receive the vaccine or felt that the vaccine would not reliably prevent illness.[8-15] In contrast, those who were vaccinated in these analyses understood their susceptibility, were aware of their eligibility for PV, and felt that PV was the best way to prevent disease. In addition, specific knowledge of PD, including the ability to accurately describe one or more symptoms of pneumonia, has also been significantly associated with receiving PV.[8] The literature also suggested that activation, a key element of self-management in which participants share in the responsibility of setting goals for their health, would be an important factor to address in a PD and PV education program.[16,17] The development of health-related action plans has been successful in previous pharmacy community programs; this approach is currently considered a key component of pharmacy practice and is supported by current national pharmacy practice guidelines.[18,19] These literature review findings demonstrated the need for the program to be delivered in a culturally competent manner and designed to both improve knowledge of PD and PV among participants and increase activation toward vaccination.

The goal of this study was to design and measure the effects of a Pharmacists' Pneumonia Prevention Program (PPPP) using the SCMC and to evaluate the costs of the program. The primary objective was to evaluate the effect of PPPP on knowledge and awareness in a target population of older minorities in the senior-center setting. Secondary aims were to evaluate participants' actions planned and taken regarding PV and to determine program costs. Further aims, not reported herein, included improving older minorities' trust in pharmacists as vaccine providers and assessing participants' satisfaction with the program.

Methods

Overall Study Design

The design was an observational 3-month study comparing outcomes of participants before and after receiving the PPPP intervention. To deliver the program, pharmacists collaborated with a nationally accredited senior center in northwest Philadelphia serving a predominantly AA population.

Study Participants and Setting

Study procedures are detailed in Figure S1 (see supplemental material, available at http://journals.sagepub.com/home/aop/supplemental-data). Briefly, recruitment and program delivery occurred from January to November 2014 through partnerships with local senior centers and churches. Participants were recruited through outreach activities such as health fairs, flyers, newsletter articles, telephone calls, and verbal announcements by senior-center staff. Inclusion criteria were (1) age ≥50 years, (2) able to attend a 1.5-hour session, (3) cognitively intact based on an abbreviated mental test score of ≥7, and (4) able to speak and read English at greater than or equal to the fourth-grade level as evidenced by the ability to read a brief passage. Of note, although the guidelines recommend vaccination starting at age 65 years, we elected to include

those who were 50 to 64 years old because the program offers a public health benefit to participation (specifically, education about vaccination and PD).

Interventions: PPPP Educational Program

The PPPP educational program was designed to address knowledge gaps and immunization barriers identified via the literature and consisted of 3 components, each designed to address specific barriers: educational presentation, live actors' skit, and action planning.

In the educational presentation, participants received a 30-minute didactic lecture on PD designed to reduce knowledge-related barriers to vaccination. This presentation was delivered by a licensed pharmacist, was designed to be culturally competent, and aimed to improve understanding of PD through discussion of symptoms; causes, incidence, and prevalence of PD; how it is transmitted; risk factors for infection and potential complications thereof; and prevention and immunization. The presentation also discussed the specific populations who are recommended to receive the vaccination, provided locations at which participants could receive PV using HealthMap Vaccine Finder (http://flushot.healthmap.org), and explained that pharmacists are certified PV providers.

The live actors' skit consisted of a 10-minute educational skit and song performed by the Living Well Players (LWP), a health education theater group composed of 9 senior-center members. The LWP have experience developing and performing educational skits to their community on disease states such as diabetes. The skit, collaboratively developed by the LWP and study personnel, provided a novel and engaging method for delivering culturally relevant information and helped foster a personal connection with participants. Objectives of the skit were to reinforce the material presented in the presentation component of the program and address vaccination barriers related to social influences by presenting scenarios related to PV that participants might encounter with family/friends and demonstrating how participants could approach these scenarios. To end the skit, the LWP sang a song that encouraged PV and fostered audience participation.

Action planning consisted of small-group breakout sessions facilitated by pharmacists and designed to enable participant activation. Breakout sessions provided opportunities for facilitators to address remaining vaccination barriers. Small groups consisted of 5 to 10 participants and were facilitated by licensed pharmacists who were certified to provide vaccinations. Participants individually worked with a pharmacist to determine their vaccine eligibility. Pharmacists assisted those participants uninterested in receiving the vaccine in developing individual action plans consisting of a timeline for discussing vaccination with their physician as well as with family/friends, a selection of locations where they could get vaccinated, and options for vaccination taking into account the participant's health insurance.

Optional Administration of Pneumococcal Vaccine

Vaccinations with pneumococcal vaccine polyvalent, PPSV23, were offered either immediately following the program or during a separate "vaccination day" event at the senior center. The pneumococcal 13-valent conjugate vaccine (PCV-13) was not included because it was not recommended for routine use in adults at the time of this study's design and implementation. The vaccination day was scheduled because several PPPP events were held at other senior-center sites where vaccination was not possible. Vaccination eligibility criteria were derived from those established by the Advisory Committee on Immunization Practices.[20-22] PV was administered free of charge to interested participants. All vaccine recipients were informed of the risks and benefits of PV and were required to sign a Vaccine Consent Form prior to receiving the dose. Study pharmacists administered the vaccine. Recipients were given a vaccination card that confirmed vaccination status, to be shared with their primary care provider. Printed on the card was a 24-hour emergency telephone number for participants to call in the event of any adverse reaction following vaccination.

Study Outcomes

Knowledge and awareness of PD were assessed using 5 standardized questions administered at baseline (BL), immediately following the program (posttest, PT), and 3 months after the program (M3; Table S1). These questions assessed participants' knowledge of susceptibility to infection, transmission, symptoms of disease, and safety and side-effects of vaccination. These items were selected following a review of the literature that did not uncover a validated instrument to assess knowledge of PD but did reveal specific knowledge-related barriers to PV.[8-15]

Participant activation was measured as the proportion of participants taking or planning to take any one of the following actions after the program: (1) receiving PV either on the vaccination day or from another health care provider, (2) speaking with a doctor, (3) speaking with a pharmacist, or (4) discussing what they learned during the program with family/friends.

A cost analysis was conducted to examine total PPPP intervention costs as well as cost per attendee and per participant. Costs were evaluated from a health system perspective, and all costs were reported in $US 2013. Intervention costs included the sum of time costs (travel, training, supervision, and planning), supplies, and actor and site fees.[23] Trained staff members kept detailed

personnel time and travel records. Distance traveled was converted to cost using a mileage reimbursement rate of $0.56/mile. Wages were applied to time using US Bureau of Labor Statistics rates[24] plus fringe benefits applicable to each partnering institution. Volunteer pharmacy students were assigned zero time and travel costs. Material costs included the vaccine, medical supplies, office supplies, signage, printing of participant action plan forms, and food/refreshments.

A univariate sensitivity analysis (SA) was conducted to examine how total program costs would change if PPPP were delivered differently. SA categories included wages of community health care workers and pharmacy students; skit-related costs; vaccine-related expenses; travel, including mileage and staff time; and food.

Analytical Aims and Definitions

Data Procedures and Analytical Sample. Study data were recorded using paper forms and input into IBM SPSS 23 (IBM, Armonk, NY) for analysis. Electronic data were password protected by the senior center while enrollment, data collection, and data entry were ongoing and were deidentified prior to sharing with investigators for analysis. An intention-to-treat (ITT) population was used in the analysis. The ITT sample included those participants who consented to participate and completed the baseline assessment. If either the PT and/or M3 assessment was missing, the most recent prior responses were carried forward. This study was approved by our institutional review board and was registered on clinicaltrials.gov.

Mean Knowledge Scores. The maximum knowledge score a participant could achieve was 28 points (1 point per correct response, multiple correct responses per question). Knowledge outcomes were measured as (1) mean knowledge scores at each timepoint, (2) difference in knowledge scores for all pairwise timepoints, (3) change in mean knowledge score across timepoints, and (4) percentage of participants answering all knowledge questions correctly at each timepoint.

Activation. For those participants not reporting positive PV history at baseline, planned actions were assessed at each timepoint, and actions taken were assessed at M3.

Cost Analysis. Mean per-session number of personnel required to staff PPPP were calculated by job type (student, pharmacist, and community health worker), and aggregate staff time costs by job category were determined. Total program cost was calculated along with per-attendee and per-participant costs. Costs per participant activated and per participant vaccinated through PPPP were also determined. Total program costs were analyzed to determine which were the most expensive components of PPPP.

Statistical Plan

Change in Mean Knowledge Scores. Using a pre-post design, we sought to detect ≥25% improvement in mean knowledge scores for each knowledge question as well as for the total knowledge score. Because no prior literature exists on which to power the study, we powered our study for this 25% threshold because it was identified as a meaningful improvement by the infectious diseases pharmacist on the project. Changes in mean knowledge and activation responses at each pair of timepoints were investigated for statistical significance using 2-tailed paired-samples *t*-tests. Because 3 serial *t*-tests were used, the Bonferroni correction was applied to the typical significance threshold of $\alpha = 0.05$, yielding the adjusted threshold of $\alpha = 0.0167$. This adjusted threshold was used in all determinations of statistical significance. Two-tailed tests were chosen because, although we expected improvement in mean knowledge, it could have worsened, and it was important to know the direction of difference between timepoints for each knowledge question as well as for the total knowledge score.

Activation. For those participants not reporting positive PV history at baseline, changes in mean activation responses at each of the timepoints were investigated pairwise using 2-tailed paired-samples t-tests and a threshold of $\alpha = 0.0167$.

Cost Analysis. Because the cost analysis represents real program costs, no statistical analysis was performed on the cost data.

Results

Site Activities and Participant Recruitment

PPPP was delivered between March and November 2014 in 8 sessions (5 sessions at our partner senior center and 3 at other Philadelphia locations). More than half of the participants (n = 127) were recruited from the partner senior center.

Demographics

A total of 276 older adults attended the program, 203 consented and met participation eligibility criteria, and 190 were included in the ITT sample (Table 1). The mean age of the ITT sample was 74.3 years (SD = 8.9; range = 54-101). Most participants were female (76.3%), and the majority identified as AA/black (80.5%). In all, 40.5% had completed some college or vocational training or were college graduates. Almost half (48.4%) were married or widowed, and 45.3% lived with at least 1 other individual.

Knowledge

Mean total knowledge score increased above BL levels at both PT and M3 (Figure S2). There was a 54% increase in

Table 1. PPPP ITT Sample Participant Demographics (n = 190).[a]

Demographic Characteristics	n (%)
Gender	
Male	22 (11.6)
Female	145 (76.3)
Race	
Black[b]	153 (80.5)
Caucasian	2 (1.1)
Other	3 (1.6)
Marital status	
Never married	27 (14.2)
Married or living as married	32 (16.8)
Widowed, not currently married	60 (31.6)
Divorced, not currently married	32 (16.8)
Separated	8 (4.2)
Number of people living in home	
Lives alone	68 (35.8)
Lives with 1 other individual	55 (28.9)
Lives with 2 or more individuals	31 (16.2)
Highest level of education completed	
High school graduate or GED	63 (33.2)
Some college or vocational school	37 (19.5)
College graduate	40 (21.1)
Religious preference	
Christian	106 (55.8)
Jewish	2 (1.1)
Islamic	13 (6.8)
Other[c]	22 (11.6)

Abbreviations: ITT, intention to treat; PPPP, Pharmacists' Pneumonia Prevention Program.
[a]The frequencies and percentages do not sum to 100% because some participants preferred not to answer.
[b]Black represents the sum of participants that identify as African American, black-Caribbean, and black-African.
[c]Other represents all participants who are religious but are not Christian, Jewish, or Muslim or who do not identify with a religion.

mean total knowledge score from BL to M3. For 4 of the 5 knowledge questions, mean score increased at each observation. The percentage of participants who answered all knowledge questions correctly at the BL, PT, and M3 assessments were 0%, 0.5%, and 10.0%, respectively. At PT, a 47% increase in total knowledge score above BL value was achieved, exceeding the goal of 25%. At M3, total knowledge score had increased to 54% above BL (Table S2). Mean item scores improved more than 25% in all but 1 item at PT versus BL, and in all items at M3 versus BL. Change in mean knowledge score was statistically significant for all 5 questions at PT and M3 (Table 2), and total mean knowledge score at PT and M3 were statistically different from BL values.

Activation

A total of 113 participants indicated at BL that they were not vaccinated or that their vaccination status was unknown; 17 of these reported planning to take action regarding PV at BL. Of these unvaccinated participants, 20 reported interest in vaccination on the day of the program, and 18 participants received PV through PPPP. No adverse events were reported from the program or the vaccine.

At M3, 135 (71.1%) participants were activated to complete at least one or more actions. Of those participants unvaccinated at BL, 42 (37.2%) reported having received vaccination by M3 because of what they learned during the program; this includes the 18 participants who received onsite vaccination (Figure S3).

For those participants who were unvaccinated at BL, the percentage planning to take action at each timepoint is presented in Figure 1. In each domain assessed, the percentage of participants planning to take action increased at PT as compared with BL; however, these percentages fell to below baseline in all 4 domains by M3. Paired samples *t*-test results for planned actions among those participants unvaccinated at BL are presented in Table S4. Improvements were seen in mean response across all 4 domains from BL to M3; however, only one of these (plan to speak to doctor) was statistically significant.

Cost

Mean per-session staffing requirements were 5.5 students, 3.6 pharmacists, and 2.0 community health workers. Total program cost was $32 974 (Table 3); total per-attendee cost was $119 (n = 276), and total per-participant cost was $162 (n = 203). Cost per participant vaccinated through PPPP was $442, and cost per participant activated was $244. Aggregate staff time costs by job category are presented in Table S3. Vaccine-related expenses and staff time represented 23.8% ($7861) and 69.7% ($22 972) of total program cost, respectively.

SA results are presented in Figure S4. If pharmacy student volunteers were replaced by community health workers ($18.10 per hour wage), the total program cost would increase to $45 200. In contrast, removing the option for vaccination during the program, decreasing staff travel, and decreasing actors' fees all would reduce total program cost.

Discussion

PPPP was highly successful at improving knowledge about both PD and immunization in an older minority population. Furthermore, it led to an increased number of community members activated to receive vaccinations. These knowledge improvement findings are important because demonstrating an understanding of PD and the importance of immunization has been consistently linked to successful receipt of the vaccine.[16-22] In this program, more than one-third of participants unvaccinated at BL indicated that they received the vaccination as a result of their participation.

Table 2. Change in Mean Score for Knowledge Items: Paired Samples *t*-Tests (n = 190).

	Change in Mean Scores					
	Baseline Versus Posttest		Baseline Versus 3 Months		Posttest Versus 3 Months	
Questions	Mean (SD)[a]	*P* Value[b]	Mean (SD)[a]	*P* Value[b]	Mean (SD)[a]	*P* Value[b]
Who is at risk of getting pneumonia?	1.336 (2.687)	<0.001	2.288 (2.737)	<0.001	0.830 (2.250)	<0.001
How can you catch pneumonia from an infected person who is near you?	1.879 (1.717)	<0.001	1.411 (1.712)	<0.001	−0.439 (1.675)	<0.001
Which of these are symptoms of pneumococcal disease?	1.676 (1.687)	<0.001	1.738 (1.633)	<0.001	0.090 (1.605)	0.441
I should call my doctor or get emergency help if I get any of the following problems after vaccination:	0.770 (1.511)	<0.001	1.254 (1.639)	<0.001	0.497 (1.485)	<0.001
Which of the following are possible side effects of the pneumonia vaccine?	1.793 (1.932)	<0.001	1.881 (1.829)	<0.001	0.126 (1.659)	0.305
Total knowledge score[c]	7.132 (6.513)	<0.001	7.748 (6.198)	<0.001	1.045 (5.933)	0.020

[a]Positive values indicate improvement in knowledge score; negative values indicate decrease in knowledge score.
[b]Two-tailed significance with α =0.0167 was used for the paired samples *t*-tests.
[c]Total knowledge score represents the mean number of correct responses answered correctly out of 28.

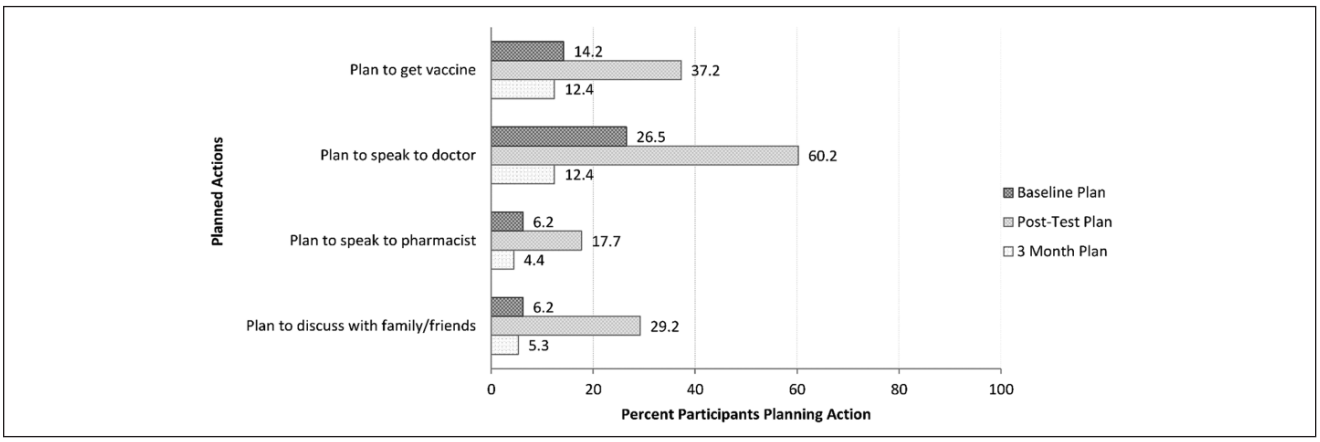

Figure 1. Planned actions among unvaccinated participants (n = 113[a]).
[a]These responses represent those intention-to-treat sample participants who either had not received the vaccination at baseline or had unknown vaccination status at baseline.

These findings agree with other studies demonstrating improvements in vaccination uptake in the elderly as a result of pharmacist-driven vaccination programs.[25,26] However, unlike other vaccination programs, PPPP demonstrated other important vaccine-related activation apart from receiving the immunization. More than 70% of participants, regardless of BL vaccination status, took action steps following the program, such as speaking with physicians, pharmacists, family, and friends about PD and immunization. These action steps have an immeasurable but potentially important impact on PD prevention within this community.

PPPP cost $119 per attendee. Resource costs were driven by costs of planning time (36.2%), program delivery (26.3%), and vaccine-related expenses (23.8%). Despite only administering 18 vaccinations through PPPP, vaccine-related costs were high because of institutional prices for the product as well as storage and supply management costs. Although this program is costly, there are several possible approaches for reducing program costs. Cost-saving measures may include having fewer sites involving larger groups of participants, reducing travel costs by limiting the geographic radius of program sites, or outsourcing PV

Table 3. Pharmacists' Pneumonia Prevention Program Costs.

Cost Category	Cost (Percentage Total)[a]
Vaccine-related expenses (ie, acquisition, staff time, materials)[b]	$7861 (23.8%)
Actor fees and video	$2270 (6.9%)
Program delivery (staff time, site fees)[b]	$8659 (26.3%)
Travel (mileage and staff time)	$2257 (6.8%)
Planning time (ie, phone calls, supervision, recruitment)	$11 927 (36.2%)
Total	$32 974 (100.0%)

[a]Sum of percentages may not equal 100% because of rounding.
[b]Staff time associated with vaccine screening and administration included in vaccine-related expenses only.

management to a regular licensed pharmacy. Additionally, the SA was conservative in that it did not test the scenario in which pharmacists donate their time (ie, a zero cost for the pharmacist wage component); program costs would be considerably reduced if the pharmacists volunteered.

Strengths

PPPP represents a novel use of the SCMC. Operationalizing the program through a senior center enabled us to reach our desired audience in an environment already familiar to and trusted by them, which may have increased their receptivity to the intervention.[27,28] The success of PPPP demonstrates that senior centers can be an effective, engaging, and accessible hub for health promotion activities. Because of the community-based approach we used, peers of the target audience were integrally involved in program development and delivery, ensuring that tone and content were culturally relevant, respectful, and engaging. Notably, the skit and song resonated very well with participants; they were able to easily understand the presented information, and it was performed in an engaging manner. An additional strength of PPPP was that, although PV guidelines recommend vaccination at age 65 years, the educational program was open to those as young as 50 years. The PPPP attendees 50 to 64 years of age benefit by improving their knowledge about PD and PV before they become eligible for the vaccination, which may result in increased vaccination rates when these individuals reach 65 years of age.

Limitations

There are limitations to this study. First, we targeted a predominantly older AA population. Although this may limit generalizability of our findings, we expect the community-centered model to be transferrable across settings. Although the program was open to those as young as 50 years, participants on average were older than the recommended age for PV (mean age 74 years as compared with recommended age 65 years). It would be ideal to target predominantly younger participants of senior centers because vaccine at an earlier age may be more effective as a preventive strategy. Second, knowledge was measured using a tool developed for this study, limiting our ability to compare these results with those of other educational intervention studies. Third, PV vaccination status was self-reported; thus, the actual number of participants who received the vaccine may be different from what was reported. Additionally, approximately 30% of attendees did not consent to enroll in this study but may have gotten vaccinated outside of PPPP or taken other activation steps; therefore, our findings may represent a conservative estimate of activation rates. Finally, the PV guidelines were updated following the design and implementation of PPPP. Current immunization guidelines have become more complex and now include recommendations for eligible adults to receive both PPSV23 and PCV13. Therefore, it could be argued that programs like PPPP are now even more important to engage and educate vulnerable populations. PPPP was highly successful at improving PD and immunization knowledge in an older minority population, and the majority of participants took immunization action steps following the program. As a result, although the content and assessments of PPPP would require updates to include PCV13-related information, we are confident that the program design, delivery, and goals of improving knowledge and awareness and reducing vaccination barriers among participants could be achieved.

Conclusion

PPPP significantly improved participants' knowledge about both PD and PV and resulted in increased activation toward vaccination. Though costly, we identified approaches for improving program efficiency. PPPP represents a novel model of care that can be leveraged to continue building trust between pharmacist immunizers and traditionally underserved segments of the older adult community.

Declaration of Conflicting Interests

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Supplementary Material

Supplementary Material for this article is available online.

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