


A Statewide Approach to Falls Prevention: Widespread Implementation of A Matter of Balance in North Carolina, 2014–2019

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Abstract

This study showcases the statewide strategies used to implement and sustain an evidence-based fall prevention program, A Matter of Balance (MOB) in North Carolina between 2014 and 2019. Statewide program implementation and data collection support strategies are detailed. The mostly White (not Hispanic/Latino), female participants were 75 years old on average. Pre- and post-self-reported assessments included demographic, health status, quality of life, and falls-related metrics. Survey responses were scaled and analyzed. Statistically significant improvements ($p < .05$) across health status measurements, times fallen, and falls resulting in injury were observed. These results offer a model for effective statewide implementation of the MOB program to reduce falls among older adults in community settings with support from a statewide resource center.

Keywords

A Matter of Balance, evidence-based falls prevention programs, statewide resource center, implementation

Introduction

Falls and fall-related injuries among older adults often result in severe consequences for health, independence, and quality of life (Bergen et al., 2016). Falls among adults ages 65 and older are additionally very costly, and each year, about US\$50 billion is spent on nonfatal fall injuries and US\$754 million is spent on fatal falls (Florence et al., 2018). As the population of older adult Americans continues to expand, the number of fall injuries and the cost to treat them will also increase (Centers for Disease Control and Prevention [CDC], 2014). Coe et al. (2017) state, “with the unprecedented expansion of the U.S. Medicare beneficiary population, and the escalating incidence of falls, widespread adoption of effective prevention strategies will become increasingly important for both public health and for controlling health-care costs.” In 2018, North Carolina (NC) residents ages 60 and above experienced 1,241 fall deaths, 19,296 hospitalizations, and 104,315 emergency department visits (NC Department of Health and Human Services, NC Division of Public Health, Injury and Violence Prevention Branch, 2020). In response to the major public health issue of falls and fall-related injuries, evidence-based falls prevention programs (EBFPPs) have been developed and found effective for mitigating fall risk.

EBFPPs consistently reduce fall risk and rate of falls among older adults in the United States (Beling & Roller, 2009; Sherrington et al., 2019). Dipietro et al. (2019, p. 2) found that “regular physical activity effectively helps older adults improve or delay the loss of physical function and mobility while reducing the risk of fall-related injuries.” Exercise is associated with fewer people experiencing a fall and a reduced number of injurious falls in older adults (Baker et al., 2017; Guirguis-Blake et al., 2018). EBFPPs that include strength and balance exercises are likely to reduce the risk of falls, as both lower body weakness and loss of balance are associated with falls and falls resulting in injury (CDC, 2014). Addressing gait and helping older adults maintain their functional abilities can also be an effective way to reduce falls and promote independence (Ory et al., 2015). Clearly, EBFPPs provide benefit in controlled research settings. It is important

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to understand whether EBFPPs can be effectively implemented across different states and through community-based organizations (CBOs) to prevent the rising incidence of falls, fall-related injuries, and the costs associated with them. This study showcases the statewide implementation of A Matter of Balance (MOB) with technical support and training assistance from a statewide resource center in NC between 2014 and 2019.

MOB is an eight-session program that meets once per week for 8 weeks or twice per week for 4 weeks. Each session is 2 hr in duration and is designed to accommodate between eight and 12 participants. During the first two sessions, participants engage in a facilitated group discussion and gentle exercises accompany the discussion in Sessions 3 through 8. A participant is considered a completer of the program when they attend at least five of the eight sessions. The MOB curriculum was designed to reduce the fear of falling and increase activity levels among older adults by teaching them to view falls and fear of falling as controllable, set realistic goals for increasing activity, change their environment to reduce fall risk factors, and promote exercise to increase strength and balance.

The program aims to benefit community-dwelling older adults who have had a fall in the past year or have a fear of falling, who can walk independently or with a cane or walker, are able to participate in a group discussion, live in their own home or other independent living facility, or have a desire to learn how to reduce their risk of falling and how to improve balance, flexibility, and strength. While falls and fall risk are multifactorial and there are other important, effective strategies to minimize a range of risk factors, this study is focused on the MOB program and its statewide implementation. The findings from multiple studies support the extended use of this program as a way to improve balance and decrease the risk of falling among older adults (Alexander et al., 2015; Chen et al., 2013; Wood, 2013).

Although EBFPPs are effective for decreasing falls, there are few models of widespread implementation in community-based settings supported by a statewide resource center. To address this need, our team developed and systemized multiple strategies supporting the implementation of MOB and other EBFPPs in collaboration with Area Agencies on Aging (AAA)s in NC, a state with high rates of fall-related morbidity and mortality. This article details our implementation strategies and outcomes of older adults who participated in the MOB program over a 5-year time frame.

Method

Statewide Resource Center Establishment

To address the implementation of EBFPPs across NC, NC Falls Prevention Coalition partners advocated for a sustainability planning grant for MOB in 2013 to address Master Trainer attrition and support, barriers to coordination, and a

need for statewide connectivity via a centralized website. Many private foundation officers in NC demonstrated a willingness to support EBFPP implementation as part of a comprehensive falls prevention effort. Hence, as a subcontractor to North Carolina Division of Aging and Adult Services (NC DAAS) for the Prevention and Public Health Fund 2014 falls grant, the North Carolina Center for Health and Wellness (NCCHW) at the University of North Carolina in Asheville (UNCA) established Healthy Aging NC (HANC) as the statewide resource center for EBFPPs in 2016.

Since its inception, HANC has centralized statewide coordination for the implementation of EBFPPs; provided technical assistance; monitored fidelity and continuous quality improvement initiatives; streamlined data collection and analysis; supported the expansion of EBFPPs; identified screening tools, including the CDC's Stopping Elderly Accidents, Deaths & Injuries (STEADI); and increased falls prevention visibility in NC. HANC's statewide EBFPP implementation strategies and our applications of them are outlined in Table 1, using language from Powell et al.'s (2015) table of implementation strategies. MOB is offered across 16 AAAs in NC, all of which are connected to the HANC resource center. Despite this coordination and support, the AAAs and other CBOs offering these programs have autonomy relative to delivery of the EBFPPs. They are responsible for independently identifying their host sites, managing their leaders and participants, and otherwise implementing the program in their communities.

Program Fidelity and Support

NCCHW has worked to ensure that EBFPPs are offered with the highest degree of quality and fidelity to the evidence-based program structure and delivery. NCCHW and NC DAAS support continuous quality improvement processes, including support and templates for EBFPP memorandums of understanding, interview forms for interested trainers, quarterly conference calls with the 16 AAA EBFPP coordinators statewide, informational webinars via HANC, quarterly newsletters, linkages to program administrators, quarterly review of program data, and routine fidelity assessments.

In addition, HANC funds Master Trainers within our partner agencies to train other leaders and build capacity. It costs US\$1,550 to become a Master Trainer and this training equips partners with the education they need to recruit and train volunteers to lead MOB classes and coordinate and market the program to older adults in their community. Each CBO is responsible for and has some autonomy over finding their host sites, implementing the MOB program, and managing their participants. By bridging relationships between the AAAs and partners, NCCHW helps to identify program delivery gaps through coordination in high need areas across the state.

Table 1. Statewide EBFPP Implementation Strategies and HANC's Applications.

Strategy	Application
Access new funding	Generates funding from the Centers for Disease Control and Prevention, the National Association of Chronic Disease Directors, and the Administration for Community Living and often applies for additional funding as appropriate to support statewide implementation of evidence-based community health programs
Build a coalition	Maintains ongoing relationships with the 16 Area Agencies on Aging in NC along with other key stakeholders, including state and regional falls prevention coalitions, health care professionals, senior centers Parks and Recreation, the Office of State Human Resources, Health Centers, Faith-Based Communities, Senior Centers, YMCAs, and more to form a coalition with shared goals
Centralize technical assistance	Supports the 16 Area Agencies on Aging in NC and the community-based organizations they work with through technical assistance related to delivering evidence-based community health programs
Conduct educational meetings	Engages health care professionals through Continuing Education Units and coalition presentations designed to provide education on the evidence-based programs we support and how to refer patients to aging specialists in their area who can connect them with a variety of services they may need
Conduct ongoing training	Connects with organizations interested in our services and provides continuing training and education to our program providers and lay leaders on issues related to program fidelity, implementation, and reporting
Develop academic partnerships	Housed within a university and maintains relationships throughout the UNC system, including with the Carolina Geriatric Education Center
Develop and organize quality monitoring systems	Monitors the quality of data received against reports from the Department of Aging and Adult Services and ensures that quality and fidelity of evidence-based program structure and delivery
Develop and distribute educational materials	Maintains a website with a variety of manuals, toolkits, and other supporting materials that make it easier for individuals, families, clinicians, and program providers to learn about the most up to date guidelines relevant to our partners
Promote adaptability	Supports network of partners in addressing challenges as they arise and implementing real-time changes that promote and support adaptability in response to current events and feedback received
Promote network weaving	Sustains a continuum of programs by supporting the braiding of funding and networks to leverage resources across partnerships
Recruit, designate, and train for leadership	Recruits and leverages funding for training both master trainers and lay leaders to implement programs
Use data warehousing techniques	Enters all of the data received from program providers into the National Council of Aging database allowing for shared records nationwide and with state partners
Use train-the-trainer strategies	Utilizes a train-the-trainer approach by rarely offering direct services and instead identifying community trainers and leaders to help support them and their growth as the implementers of the programs we support

Note. EBFPP = evidence-based falls prevention program; HANC = Healthy Aging NC; NC = North Carolina; YMCA = Young Men's Christian Association; UNC = University of North Carolina.

Referral and Recruitment Process

Between 2017 and 2020, NCCHW partnered with a regional Accountable Care Organization (ACO) to incorporate a pilot falls prevention program referral pathway into the ACO workflow and electronic health record system. Five AAAs in Western NC participated in the pilot referral pathway and were responsible for administering an additional written informed consent form, collecting Physical Activity Readiness–Questionnaire (PAR-Q) forms at the start of the program, ensuring that participants had been cleared to engage in physical activity and asking participants to complete pre- and post-session surveys that included identifying information, full name, and date of birth. UNCA's Institutional Review Board (IRB) approval was sought and awarded for all data collection forms, including this small subset of identifiable information

for the pilot pathway with the ACO. Each individual AAA or CBO may collect referral source information, although this information is rarely reported and therefore the specifics of referrers beyond whether or not they are health care providers is unclear. NCCHW promotes EBFPPs on the HANC website and CBOs are responsible for recruitment of participants.

Data Collection

A collaborative project led by NCCHW established a process of centralizing data collection and data entry into a national database for the purpose of measuring the reach and effectiveness of EBFPPs through 16 AAAs across NC's 100 counties. IRB approval was sought and obtained to collect data on MOB participation. Data for most of the MOB programs offered across NC are exempt from IRB because they are

de-identified. But there is an IRB protocol in place for the ACO pathway participants, who are a small sample of all participants who have enrolled in NC MOB programs since 2016. Participants receive brief pre- and postsession surveys as part of their program participation, which includes self-reported demographic information and falls prevention-related questions. Given that HANC is funded by the Administration for Community Living (ACL), NCCHW is required to use the pre- and postsurveys provided for data collection by the National Council on Aging (NCOA). The instruments were approved by the Federal Office of Management and Budget for ACL falls prevention grantees.

AAAs are responsible for maintaining class attendance records and collecting the pre- and postsession surveys. Standardized data collection includes attendance logs, pre- and postsession surveys, which include participant demographics, and workshop information sheets that are mailed or scanned and emailed via encryption to the NCCHW data administrator who cleans and enters the information into the statewide database. NCCHW supports data collection when receiving incomplete or outdated paperwork, works with partners to ensure the most complete and up-to-date data, and provides technical assistance requested by aging or health promotion specialists. HANC has collected MOB data since 2014. Centralized, statewide data collection through NCCHW provides a sharper image of the impact EBFPPs have on older adults in NC.

Data Analysis

All demographics data along with pre- and postsession survey information were collected, encoded, and analyzed using two-tailed paired *t* tests to determine statistically significant differences between pre- and postsurvey responses. All analyses were conducted with SPSS V27 (IBM® SPSS® Statistics 27.0). Data were collected on 7,648 MOB participants. Participants missing either pre- or postsurveys were excluded from the analysis, producing a sample of 4,296 participants. This data set includes participants who qualified as “completers” if they attended the minimum number of five of eight sessions and those who attended fewer sessions but filled out both pre- and postsurvey information. NC completion rates of the MOB program were compared with national completion rates accessed through the NCOA.

Results

Demographic information about the MOB participants is presented in Table 2. Among the 4,296 MOB participants with pre- and postsurveys from 2014 to 2019, statistically significant improvements ($p < .05$) were observed in the survey questions described in Table 3 utilizing a two-tailed paired *t* test.

Table 2. Characteristics of MOB Participants.

Age	<i>n</i>	%
<i>M</i>	75	
Below 60	190	4.42
60–65	364	8.47
66–70	637	14.83
71–75	911	21.21
76–80	815	18.97
81–85	713	16.60
86–90	435	10.13
91+	140	3.26
Unknown	91	2.12
Sex	<i>n</i>	%
Female	3,412	79.42
Male	831	19.34
Unknown	53	1.23
Race	<i>n</i>	%
American Indian or Alaska Native	47	1.09
Asian	18	0.42
Black or African American	801	18.65
Native Hawaiian/Pacific Islander	2	0.05
White	3,267	76.05
Multiracial	41	0.95
Unknown	120	2.79
Ethnicity	<i>n</i>	%
Hispanic/Latino	82	1.91
Not Hispanic/Latino	3,992	92.92
Unknown	222	5.17
Education	<i>n</i>	%
Less than high school	82	1.91
Some high school	131	3.05
High school graduate or GED	793	18.46
Some college/vocational school	1,126	26.21
College graduate or higher	1,203	28.00
Unknown	961	22.37
Health care referral	<i>n</i>	%
Yes	575	13.38
No	2,677	62.31
Unknown	1,044	24.30
Limited activity (restrictions exist for any type of movement)	<i>n</i>	%
Yes	1,388	32.31
No	1,884	43.85
Unknown	1,024	23.84

(continued)

Table 2. (continued)

Chronic conditions (select all that apply)	<i>n</i>	%
Arthritis, other bone/joint disease	2,009	46.76
Breathing/lung disease	516	12.01
Cancer ^a	71	1.65
Depression	479	11.15
Diabetes	795	18.51
Glaucoma/other vision problems	516	12.01
Heart disease, blood circulation problems	830	19.32
High blood pressure ^a	253	5.89
Osteoporosis ^a	124	2.89
Parkinson's disease ^a	8	0.19
Other	699	16.27
None	359	8.36
<hr/>		
Living arrangement	<i>n</i>	%
Living alone	1,880	43.76
Living with someone	2,276	52.98
Unknown	140	3.26

Note. MOB = A Matter of Balance; GED = general educational development.

^aAdded in 2018.

The percent of participants who answered *very good* or *excellent* to the question, “In general, you would say that your health is?” increased from 26.40% before to 33.85% after the program ($p = .000$, $t = -13.06$). Similarly, the percent of participants who answered *not at all* or *a little* to the question, “How fearful are you of falling?” increased from 37.61% before to 49.30% after the program ($p = .000$, $t = 18.40$). An increase in participants answering *not at all* or *slightly* to the question, “During the last 4 weeks, to what extent has your concern about falling interfered with your normal social activities with family, friends, neighbors or groups?” was noted from 66.92% before to 70.6% after the program ($p = .000$, $t = 10.38$). Despite a large proportion of “unknown” responses as the question was added in 2018, more participants reported being *vigorously* or *moderately active* when asked the question, “What best describes your activity level?” after the program (10.80%) than they did at the program outset (8.59%; $p = .019$, $t = -2.41$).

Using this statewide resource center model where the programs are supported by HANC, but are implemented in community-based settings across the state, MOB programs reduced the number and severity of falls. Figure 1 shows the improvement in the number of participants with one or more falls in the past 3 months prior to the program compared with the number of participants with one or more falls following the program ($p = .000$, $t = 17.16$) and falls that resulted in injury 3 months prior to the program compared with times fallen following the program ($p = .000$, $t = 11.30$). Prior to

the start of the program, 1,778 falls were reported on the pre-session survey and 669 falls were reported on the postsession survey, cutting the falls rate by 62%. Of the falls reported, 432 resulted in injury prior to the program and 112 resulted in injury following the start of the program, cutting the injury rate by 74%.

For the following questions, participants were asked to “mark the circle that tells us how sure you are that you can do the following activities” with answer choices such as *not at all sure*, *somewhat sure*, *sure*, or *very sure*. Prior to the program, 55.85% said *sure* or *very sure* to “I can find a way to get up if I fall” and 77.38% said *sure* or *very sure* following the program ($p = .000$, $t = -28.10$). More participants responded *sure* or *very sure* to “I can find a way to reduce falls” after the program 83.48% than before the program (56.08%; $p = .000$, $t = -33.63$). Increases in *sure* or *very sure* responses were seen to statements “I can protect myself if I fall” (36.06% compared with 65.04%; $p = .000$, $t = -32.04$) and “I can increase my physical strength” (65.31% compared with 86.61%; $p = .000$, $t = -27.75$). Prior to the program, 59.57% said *sure* or *very sure* to “I can become more steady on my feet” and 81.56% said *sure* or *very sure* following the program ($p = .000$, $t = -26.19$).

As a result of the program, participants reported increased comfort in talking with their health care providers about falls risk (76.30% said *strongly agree* or *agree*) and to their family and friends about falling (75.42% said *strongly agree* or *agree*). Furthermore, 77.07% responded *strongly agree* or *agree* to the statement, “As a result of this program, I feel more comfortable increasing my activity”; 67.11% said *strongly agree* or *agree* to the statement, “As a result of this program, I feel more likely to continue exercising”; and 75.02% said *strongly agree* or *agree* to the statement, “As a result of this program, I feel more satisfied with my life.” At least three of four participants (78.38%) would recommend this program to a friend or relative.

In addition, 59.50% of participants indicated that the program reduced their fear of falling. When asked “Since this program began, what have you done to reduce your chance of a fall?” participants made 9,159 selections from the following options: *did exercises at home* (60.85%), *made changes at home* (43.65%), *talked to a family member or friend about how I can reduce my risk of falling* (40.48%), *talked to a health care provider about how I can reduce my risk of falling* (18.06%), *had my vision checked* (21.11%), *had my medications reviewed by a health care provider or pharmacist* (21.07%), *participated in another fall prevention program in my community* (7.98%).

Discussion

The MOB program is being effectively implemented in community settings to reduce falls among older adult residents in NC with the support of HANC. Participants of the program demonstrated improvements in indicators of health status,

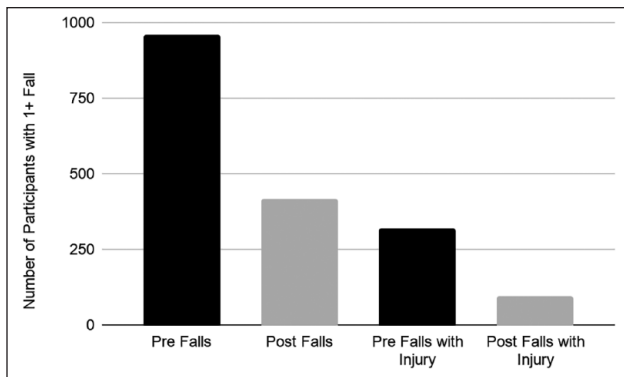
Table 3. Pre-/Postsurvey Results for MOB Participants.

In general, you would say that your health is?***	Pre %	Post %	To what extent has your concern about falling interfered with your social activities?***	Pre %	Post %
<i>Excellent</i>	4.19	5.96	<i>Not at all</i>	37.50	46.65
<i>Very Good</i>	22.21	27.89	<i>Slightly</i>	29.42	23.95
<i>Good</i>	39.39	35.78	<i>Quite a bit</i>	6.73	5.07
<i>Fair</i>	12.31	8.92	<i>Moderately</i>	18.92	12.29
<i>Poor</i>	0.91	0.77	<i>Extremely</i>	1.68	2.07
<i>Unknown</i>	21.00	20.69	<i>Unknown</i>	5.75	9.96

How fearful are you of falling?***	Pre %	Post %	What best describes your activity level?*	Pre %	Post %
<i>Not at all</i>	8.19	11.87	<i>Seldom Active</i>	2.26	0.81
<i>A little</i>	29.42	37.43	<i>Moderately Active</i>	5.94	6.82
<i>Somewhat</i>	27.44	24.07	<i>Vigorously Active</i>	2.65	3.26
<i>A lot</i>	13.45	6.05	<i>Unknown</i>	89.15	89.11
<i>Unknown</i>	21.49	20.58			

Note. MOB = A Matter of Balance.

* $p < .05$. *** $p < .001$.

**Figure 1.** Pre-/postnumber of falls and falls with injury for MOB participants.

Note. MOB = A Matter of Balance.

number of falls, and falls with injury. The completion rate of MOB participants in North Carolina of 97.25% was slightly better than the national completion rate of 97.22% among all participants with pre- and postsurvey information available between 2014 and 2019. This was likely in part due to NCCHW and the statewide network of community partners effectively supporting the delivery of the program. In addition to bridging relationships between AAAs and NC partners and offering centralized, statewide data collection, NCCHW holds a statewide licensure of MOB to maintain program fidelity, shares resources across NC, and offers technical assistance. This coordination allows for CBOs hosting these programs to have access to a statewide network of leaders and master trainers and to fill capacity gaps through centralized support. Using a statewide resource center and deploying multiple systems of support in collaboration with AAAs

provides guidance on how to implement EBFPPs effectively in CBOs.

Participation in MOB program resulted in statistically significant improvements ($p < .05$) between pre- and post-survey responses on 11 of the 14 questions analyzed, which included improvements in general health, times fallen, falls resulting in injury, fear of falling, and concern about falling interfering with activities. The three questions that did not result in statistically significant differences between pre- and postresponses were the following: (a) “Where did your fall occur?”: *indoors*, *outdoors*, or *both*; (b) “What happened after your injury?”: *did not seek medical care*, *visited primary care physician*, *was admitted to hospital*, or *went to ER*; and (c) “I have made safety modifications in my home, such as installing grab bars or securing loose rugs, to reduce my risk of falling”: *true* or *false*, all of which had over 65% unknown answers on both the pre- and postsurveys. This is because these questions were not added to the survey until 2018 so the number of responses was low among total participants between 2014 and 2019.

While these results are substantial, a few limitations must be acknowledged. Our sample was largely composed of White (76.05%) females (79.42%). Considering NC is 76.5% White and 50.8% female, our sample was proportionally White, but disproportionately female as compared with the state on the whole (U.S. Census Bureau, 2019). We are therefore uncertain about how effective the program might be with other populations and it would be useful for future research to examine the barriers faced by older adult males in participating in community-based programs and to identify strategies that are most successful at recruiting participants who would benefit the most from these interventions. All analyzed data points were self-reported on the

pre- and postsession surveys and this limitation of possible social desirability (tendency of subjects to choose responses they believe are most socially acceptable over those that are most reflective of their true experience) is also worth noting. Only participants who completed both pre- and post-surveys were included in this analysis (56.17% of the total individuals enrolled) so further work is needed to address the fall risk of the remaining participants and the reasons they may not have completed the forms. In addition, an updated version of the pre- and postsurveys was introduced in 2018, limiting the analysis on questions that were removed or added at that time. CBOs also expressed reluctance to collect valuable data on physical assessments such as the Timed Up and Go Assessment either due to lack of time or inability to ask this additional task of their volunteers or staff. While community providers can effectively be trained and coached to conduct functional assessments, such as the Timed Up and Go (TUG) test (Schrodt et al., 2013), many community providers rely on volunteer lay leaders for these programs. Staff and volunteer turnover may impede the ability to have consistent testers and/or regular trainings. Ensuring that volunteers can find safe testing areas where community classes are located and making the functional assessment a priority are additional challenges to widespread TUG assessments in NC community settings. Including functional assessments in future research would add value to the self-reported assessments. Further research is also needed to determine the number and frequency of classes that must be attended to prevent falls, what characteristics are correlated with completers of each program, and what barriers noncompleters may be facing to completing the programs.

In summary, our experience shows that MOB can be feasibly implemented statewide in community settings with a resource center to provide support. As noted by Levy et al. (2018, p. 40), “Building an evidence base for community-delivered programs should provide impetus for increased dissemination through state and national agencies thereby increasing program impact.” Furthermore, our experience and evidence demonstrate the importance of increasing the availability and accessibility of these programs through a centralized statewide support system to reduce the impacts of falls on both older adults and the health care system. The establishment of a statewide resource center such as HANC can offer a sharper image of the impact of EBFPPs through the centralization of statewide data collection and quality assurance, which can help to identify program delivery gaps and partnerships to better serve high need and underserved areas and populations.

Conclusion

Among NC residents who participated in the EBFPP, MOB, with both pre- and postsurvey information available, statistically significant improvements ($p < .05$) were observed in

the number of falls, falls resulting in injury, fear of falling, and general health as a result of the program. Public health professionals can promote these programs in collaboration with medical providers and statewide partners to improve the health and well-being of older adults while minimizing the risk of falling, falls resulting injuries, and the costs associated with them. The establishment of a statewide resource center and connectivity among state partners supports the implementation of and data collection for these programs. Other states can replicate and draw insights from our methods and strategies to effectively implement EBFPPs.

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Ethics Statement

This study was approved by University of North Carolina Asheville’s Institutional Review Board (Approval No. 1237981-3).

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