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Unifying Multi-State Efforts Through a Nationally Coordinated Extension Diabetes Program

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The Cooperative Extension System translates research to practice and "brings the University to the people" throughout the U.S. However, the system suffers from program duplication and is challenged to scale-out effective programs. One program, Dining with Diabetes (DWD), stands out for its dissemination to multiple states. DWD is a community-based program aimed at improving diabetes management, nutrition, and physical activity behaviors. DWD was coordinated through a national working group and implemented by state Extension systems. A pragmatic, quasi-experimental study was conducted to determine the effectiveness of the national coordination model and the overall impact of DWD. Four states reported data representing 355 DWD participants. Significant differences were found in diabetes management behaviors and knowledge from pre to post-program. However, there were challenges with data analysis due to state

differences in data management. We detail the transition from one state to a national workgroup, strengths and challenges of the national model, and implications for other Extension programs.

Keywords: diabetes, evaluation, implementation, effectiveness, Extension

Introduction

With the release of Cooperative Extension's National Framework for Health and Wellness in 2014, the Extension system has now formalized chronic disease prevention and management as a priority (Braun et al., 2014; Remley et al., 2018). Extension's community ties and broad reach are positioned to significantly impact nutrition and physical activity behaviors impacting chronic disease prevention and management. However, the Extension system has been challenged with program duplication and failing to scale-out (i.e., deliver in new settings to new populations; Aarons et al., 2017) effective programs between states (Balis & Harden, 2019; Balis, Strayer, et al., 2019; Harden et al., 2019). Rather than adapt existing evidence-based programs (i.e., results published in a peer-reviewed journal; National Cancer Institute, 2020) to fit local contexts while maintaining core components (Carvalho et al., 2013; Chambers & Norton, 2016), new state-specific programs are often created. For example, there are over 17 unique older adult physical activity programs delivered in 15 states (Balis, Strayer, et al., 2019) and 14 different versions of Extension walking programs (Harden et al., 2019). This duplication results in inefficient use of Extension resources and low uptake of evidence-based programs – a priority area for the Extension system (Dunifon et al., 2004; Fetsch et al., 2012).

To overcome these challenges, Extension scholars have called for better coordination of programs across states to enhance the adoption, adaptation, delivery, and evaluation of evidence-based programs (Balis et al., 2018; Balis & Harden, 2019; Balis, Kennedy, et al., 2021; Balis, Strayer, et al., 2019; Balis, Strayer, & Harden, 2021; Harden et al., 2021; Harden, Balis, et al., 2020). Solutions include creating a national repository of evidence-based programs to facilitate adoption (Harden, Steketee, et al., 2020), building capacity in program adaptation to retain core components while changing adaptable components to enhance fit in new settings (Balis & Harden, 2021.; Balis, Kennedy, et al., 2021), and comprehensive multi-state planning and evaluation to determine impact beyond the original state (Balis, John, & Harden, 2019; Balis & Strayer, 2019; Downey et al., 2017).

However, this multi-state evaluation is challenging, as programs undergo many practice-based adaptations – making comparisons difficult – and state Extension services tend to use their own evaluation measures rather than adopt common indicators across the country (Balis & Harden, 2019; Balis, Strayer, et al., 2019; Harden et al., 2019). For example, efforts have been underway to establish a common evaluation across Extension walking programs and re-align state programs with the core components of the original evidence-based program, Walk Kansas (Balis & Harden, n.d.) As of yet, a national program has not been established (Harden et al., 2019).

One Extension program that has been scaled-out with a common evaluation is Dining with Diabetes (DWD), a program designed to improve diabetes management, nutrition, and physical activity behaviors based on the Social Cognitive Theory (Bandura, 1986). As of 2020, 36 states (72%) have purchased the DWD curriculum, indicating high penetration throughout Extension. DWD is delivered with high fidelity and is evaluated through standard measures across states. Thus, this presented an opportunity to understand 1) the transition of DWD from development and dissemination through one state Extension service to the national working group and 2) the effectiveness of DWD delivered through this nationally coordinated model, with an overall goal of sharing lessons learned and implications for other Extension programs to be effectively scaled-out.

History of the National Extension Dining with Diabetes Working Group

DWD was originally developed by West Virginia University Extension in 1998. The DWD curriculum and resources were disseminated, and other state Extension systems began implementing the program. However, resources (such as the USDA Food Guide Pyramid) quickly became outdated, and the original grant used to develop DWD ended. State Extension services that had adopted DWD began adapting the program. Since there was no national group or administrator providing guidance on program fidelity or delivery, implementation of DWD greatly varied between states, and no national impact was documented.

To address this challenge, in 2012, an educator within Ohio State University Extension facilitated a DWD meeting at the National Extension Association of Family & Consumer Sciences (NEAFCS) annual conference. Extension professionals from 20 states attended the meeting and expressed interest in coordinating DWD nationally. Following the meeting in 2013, strategy experts were hired using a small ($5,000) grant from the North Central Cooperative Extension Association to help develop a structure and mission statement to drive the work. Notably, this is the only grant received by the working group to date. The National Extension Dining with Diabetes Working Group (NDWD) was formed with a mission to provide leadership and coordination for unified program delivery and evaluation. Initial activities included writing operating guidelines, electing officers, and forming subcommittees.

The original DWD curriculum was updated in 2014, released at the NEAFCS annual conference in 2015, and continues to be used today. DWD is led by educators and includes four two-hour classes and one follow-up class three to six months post-program. Instructors use the Idaho Plate Method (Raidl et al., 2007) to demonstrate food preparation strategies and provide participants the opportunity to taste diabetes-appropriate recipes. Weekly SMART (specific, measurable, attainable, relevant, timely) goal setting is used to move attendees towards behavior changes to improve health outcomes (Hood et al., 2018). In alignment with Extension's open-access policy (Balis, Strayer, et al., 2019; United States Department of Agriculture, n.d.), participants are not required to have diabetes or pre-diabetes to participate.

Need for Empirical Program Evaluation

While DWD has been disseminated to multiple states throughout Extension, the program's effectiveness when coordinated through the NDWD is unknown. To date, there are only two published studies demonstrating the DWD program's effectiveness within individual states. In Pennsylvania, participants demonstrated significant improvement in diet and physical activity behaviors and reduced hemoglobin A1C after completing the program (Griffie et al., 2018). In Illinois, DWD participants improved knowledge of diabetes and nutrition and increased confidence to improve their diets and prepare healthful meals (Chapman-Novakofski et al., 2005).

Demonstrating national impact can heighten the public value of Extension (Franz, 2014) and determine whether the program has been effectively translated from academic control at one institution to practitioner control (Harden et al., 2021). During the initial years of the NDWD, multi-state data was compiled into national reports, but program results were not empirically analyzed or published for national impact. Therefore, in efforts to understand the effectiveness of DWD, program evaluation results from participating states were analyzed in 2018 to determine the effectiveness of the nationally coordinated model. These findings will be informative for other Extension programs to be effectively scaled-out.

Methods

The study employed a pragmatic, quasi-experimental, real-world design (Bauer et al., 2015; Dollahite et al., 2016; Glasgow, 2013; Zoellner et al., 2015). That is, we sought to answer the question, "Does this intervention work under usual conditions?" rather than seeking to understand efficacy under ideal control conditions (Thorpe et al., 2009). Thus, in alignment with the pragmatic-explanatory continuum indicator summary (PRECIS) tool (Thorpe et al., 2009), we used existing DWD program delivery and evaluation protocols (including practitioner-designed surveys). State Extension services delivering DWD were encouraged to share annual program evaluation data for compilation at the national level. Data were gathered from 2018 DWD program attendees in participating states through pre, post, and follow-up paper surveys administered at the first, last, and follow-up classes. Four states shared data in 2018; the respective Institutional Review Boards at Ohio State University, Kansas State University, University of Idaho, and Purdue University approved this study as exempt. All DWD participants in each of the four states were invited and eligible to complete the surveys and provided written informed consent. Marketing for DWD participants included fliers, bulletin boards, social media, websites, newspapers, and connections with stakeholders and medical professionals.

Surveys measured participants' knowledge and self-efficacy, behavior change, and self-reported A1C (Griffie et al., 2018). A1C was considered a secondary outcome, as participants may not have been aware of their levels, and clinical testing may not have aligned with program dates

(e.g., participants who were tested once per year). Surveys items included 1) knowledge of core concepts (seven categorical items with four to five responses, e.g., According to the Plate Method, non-starchy vegetables are how much of your plate?), 2) frequency of diabetes management (one item), meal planning (three items), and physical activity (one item) behaviors over the past week (response options of zero to seven days, e.g., On how many of the last seven days did you check your feet?), 3) diabetes management self-efficacy (four items; response options of agree, disagree, and unsure; e.g., Diabetes is not that serious, especially when you feel fine), and 4) frequency of nutrition behaviors (five items, five-point Likert scale from never to always, e.g., How often do you eat… fried foods?).

The pre-program survey contained standard demographic items. The post-program and follow-up surveys also assessed 1) advanced physical activity behaviors on dichotomous scales (e.g., Fit exercise into your daily routine), 2) program-specific nutrition behaviors on a dichotomous scale (e.g., I am using recipes provided by this program), and 3) lessons attended. Finally, the pre-program and follow-up surveys asked participants to report their most recent hemoglobin A1C levels. Please see the Appendix for the pre, post, and follow-up surveys.

Statistical analysis was conducted using SPSS (IBM, Version 25). Means and standard deviations of continuous variables and frequencies and proportions of categorical variables were calculated. Friedman test with Bonferroni post hoc Wilcoxon signed-rank tests was used for the knowledge of core concepts, diabetes management self-efficacy, and frequency of nutrition behaviors items. Repeated measures ANOVA with Bonferroni post hoc was used to test for differences in the frequency of diabetes management, meal planning, and physical activity behaviors item. Pearson Chi-Square test was used to compare proportions for the dichotomous advanced physical activity behaviors and program-specific nutrition behaviors items. Paired sample *t*-test assessed for differences in A1C levels from pre-program to six-month follow-up. Intent-to-treat analysis was used for all variables, as recommended for pragmatic trials (Thorpe et al., 2009). That is, to deal with missing participant data, the last known value (e.g., post-program survey item response for participants who did not complete the follow-up survey) was used in the analysis. P values were set *a priori,* < 0.05.

Results

Demographics

DWD participants ($N = 533$) registered for the program and completed pre-program surveys. These participants were primarily female (72%), non-Hispanic (90%), and white (92%); half (51%) reported having diabetes. See Table 1 for detailed demographic variables. Of these participants, 527 completed post-program surveys and 122 completed follow-up surveys.

Table 1. Demographic Variables of Dining with Diabetes Participants (N = 533)

Demographic Variables	***n* (%)**
Diabetes status	
Diabetes	274 (51)
No diabetes	225 (42)
Not sure	12 (2)
Not reported	11 (2)
Age	
40 or under	26 (5)
41-50	34 (6)
51-60	106 (20)
61-70	192 (36)
Over 70	163 (31)
Not reported	12 (2)
Gender	
Male	138 (26)
Female	382 (72)
Not reported	13 (2)
Ethnicity	
Hispanic or Latino	18 (3)
Non-Hispanic or Latino	481 (90)
Not reported	34 (6)
Race	
White or European American	485 (91)
Black or African American	11 (2)
American Indian or Alaska Native	6 (1)
Asian	3 (1)
Other	4 (1)
Two or more races	7 (1)
Not reported	17 (3)
Education level	
Some high school	14 (3)
High School graduate or GED	112 (21)
Some college	108 (20)
Associate degree	59 (11)
Trade or technical school	39 (7)
Bachelor's degree	79 (15)
Master's degree	63 (12)
Professional degree	36 (7)
Doctorate degree	8 (2)
Not reported	15 (3)
Total household income	
Less than $25,000	85 (16)
$25,001 to $50,000	120 (23)
$50,001 to $75,000	106 (20)
$75,001 to $100,000	88 (17)
$100,001 or more	40 (8)
Not reported	94 (18)

Demographic Variables	*n* (%)
Number living in household	
1	104 (20)
2	316 (59)
3	46 (9)
4	29 (5)
5	10 (2)
6 or more	4 (1)
Not reported	24 (5)

Knowledge of Core Concepts

Due to scoring inconsistencies across states, the five knowledge items with multiple correct answers could not be analyzed. For example, the answer to the question "Which of the following foods contain carbohydrates? (Check all that apply)" lists correct responses as milk, regular soft drink, banana, and potato chips, but not the response hamburger patty. Some states gave partial credit by counting the number of correct responses marked (top score of four), while another state also counted the absence of the incorrect response being checked (top score of five). Two items with only one correct answer were compiled and scored across states. Statistically significant increases were seen in knowledge of which food raises blood sugar levels the most ($x^2(2) = 107.011$, $p = .000$) and what proportion of a plate should be non-starchy vegetables ($x^2(2) = 262.889$, $p = .000$). Post hoc analysis with Wilcoxon signed-rank tests was conducted with a Bonferroni correction applied, resulting in a significance level set at $p < .017$. There was a significant difference in knowledge of which food raises blood sugar the most from pre- to post-program ($z = -7.351$, $p = .000$) and pre-program to follow-up ($z = 7.769$, $p = .000$), and no significant difference from post to follow-up ($z = .221$, $p = .221$). There was a significant increase in knowledge of what proportion of a plate should be non-starchy vegetables from pre to post ($z = -11.862$, $p = .000$) and pre to follow-up ($z = -11.778$, $p = .000$) but no difference from post to follow-up ($z = -.174$, $p = .862$). See Table 2 for all pre, post, and follow-up survey values.

Frequency of Behaviors Over the Past Week

There were statistically significant differences in the number of days participants exercised for 20 minutes or more ($F(2, 980) = 55.64$, $p = .000$), ate a variety of fruits and vegetables ($F(2, 976) = 38.45$, $p = .000$), considered portion sizes when making meal choices ($F(2, 978) = 98.16$, $p = .000$), reviewed the food label before eating ($F(2, 960) = 68.37$, $p = .000$), and checked their feet ($F(2, 974) = 59.95$, $p = .000$). Post hoc analysis with Bonferroni correction revealed that for four of the behaviors, there were significant differences from pre to post-program and pre-program to follow-up, and no significant difference from post-program to follow-up: exercising for 20 minutes or more ($p = .000$, $p = .000$, $p = .226$), eating a variety of fruits and vegetables ($p = .000$, $p = .000$, $p = 1.000$), considering portion sizes ($p = .000$, $p = .000$, $p = 1.000$), and reviewing food labels ($p = .000$, $p = .000$, $p = 1.000$). As for frequency of checking feet, there were significant differences in each of the three comparisons ($p = .000$, $p = .000$, $p = .002$).

Diabetes Management Self-Efficacy

There were statistically significant increases in perceptions of making a positive difference in diabetes and health ($x^2(2) = 6.250$, $p = .044$), confidence in keeping diabetes under control ($x^2(2) = 106.685$, $p = .000$), and belief that diabetes is not that serious ($x^2(2) = 10.146$, $p = .006$). There was a significant decrease in the perception of feeling overwhelmed by the demands of living with diabetes ($x^2(2) = 95.986$, $p = .000$). Post hoc analysis with Wilcoxon signed-rank tests was conducted with a Bonferroni correction applied, resulting in a significance level set at $p < .017$. There was no significant difference in perceptions of making a positive difference in diabetes and health from pre- to post-program, pre to follow-up, or post to follow-up ($z = -1.897$, $p = .058$; $z = -1.897$, $p = .058$; $z = .000$, $p = 1.000$). There was a significant difference in confidence keeping diabetes under control from pre to post ($z = -7.314$, $p = .000$) and pre to follow-up ($z = -7.627$, $p = .000$), and no significant difference from post to follow-up ($z = -1.597$, $p = .074$). There was no significant difference in belief that diabetes is not serious from pre to post or pre to follow-up ($z = -2.039$, $p = .041$; $z = -1.597$, $p = .110$), but a significant increase from post to follow-up ($z = -3.915$, $p = .000$). Finally, there was a significant decrease in the perception of feeling overwhelmed by the demands of living with diabetes from pre to post and pre to follow-up ($z = -7.064$, $p = .000$; $z = -6.463$, $p = .000$) and no difference from post to follow-up ($z = -.931$, $p = .352$).

Frequency of Nutrition Behaviors

There were statistically significant differences in frequencies of each nutrition behavior: consuming fried foods, five or more servings of fruits and vegetables in a day, three servings of dairy products in a day, sugary beverages, and baked fish ($x^2(2) = 16.29$, $p = .000$; $x^2(2) = 65.21$, $p = .000$; $x^2(2) = 8.00$, $p = .018$; $x^2(2) = 25.76$, $p = .000$; $x^2(2) = 16.2805$, $p = .000$). Post hoc analysis with Wilcoxon signed-rank tests was conducted with a Bonferroni correction applied, resulting in a significance level set at $p < .017$. For each of the five nutrition behaviors, there were significant differences from pre- to post-program and pre-program to follow-up, and no significant difference from post to follow up: consuming fried foods ($z = -2.519$, $p = .012$; $z = -3.034$, $p = .002$; $z = -1.543$, $p = .123$), five or more servings of fruits and vegetables in a day ($z = -5.812$, $p = .000$; $z = -6.256$, $p = .000$; $z = -1.573$, $p = .116$), three servings of dairy products in a day ($z = -2.621$, $p = .009$; $z = -3.143$, $p = .002$; $z = -1.347$, $p = .178$), sugary beverages ($z = -3.556$, $p = .000$; $z = -3.408$, $p = .001$, $z = -.292$, $p = .771$), and baked fish ($z = -3.449$, $p = .001$; $z = -3.550$, $p = .000$; $z = -.490$, $p = .642$).

Advanced Physical Activity Behaviors

There were no statistically significant differences in the proportion of participants who fit exercise into daily routines, exercised continuously for at least 30 minutes at least 3 times per week, or participated in physical activity on a daily basis from post-program to follow-up (x^2 (1, $N = 318$) = 1.068, $p = .118$; x^2 (1, $N = 318$) = 1.818, $p = .178$; x^2 (1, $N = 318$) = 1.5354, $p = .215$).

Program-Specific Nutrition Behaviors

There were no statistically significant differences in the proportion of participants who cooked more at home, ate smaller portions, or used recipes provided by the program from post-program to follow-up (x^2 (1, N = 353) = 2.44, p = .301; x^2 (1, N = 369) = .461, p = .497; x^2 (1, N = 358) = .204, p = .651).

Lessons Attended

Of the four DWD lessons, participants had attended lesson one, (n = 478, 91%), two (n = 469, 89%), three (n = 449, 85%), and four (n = 490, 93%).

Hemoglobin A1C Levels

There was a statistically significant decrease (t(278) = 2.203, p = .028) in A1C levels from pre-program to follow-up.

Table 2. Changes in Dining with Diabetes Participants' Knowledge, Self-efficacy, Behaviors, and A1C Levels

	Pre	Post	Follow-up
Knowledge of Core Concepts	**Median (Interquartile Range)**		
Which food raises blood sugar levels the most?	1.00 (.00 to 1.00)	1.00 (.00 to 1.00)*	1.00 (1.00 to 1.00)*
According to the plate method, non-starchy vegetables are how much of your plate?	.00 (.00 to 1.00)	1.00 (1.00 to 1.00)*	1.00 (1.00 to 1.00)*
Frequency of Behaviors Over the Past Week	**Mean (SD)**		
Exercise for 20 minutes or more (n = 491)	2.77 (±2.42)	3.51 (±2.30)*	3.59 (±2.26)*
Eat a variety of fruits and vegetables (n = 489)	4.80 (±2.15)	5.35 (±1.81)*	5.39 (±1.83)*
Consider portion sizes when making meal choices (n = 490)	4.36 (±2.60)	5.48 (±2.00)*	5.51 (±1.98)*
Review the food label before eating (n = 481)	3.66 (±2.78)	4.69 (±2.36)*	4.7 (±2.37)*
Check your feet (n = 488)	3.00 (±2.98)	3.89 (±2.94)*	4.09 (±2.89)*
Diabetes Management Self-Efficacy	**Median (Interquartile Range)**		
When it comes to diabetes and health, what I do can make a positive difference for me or the person I care for with diabetes (n = 529)	3.00 (3.00 to 3.00)	3.00 (3.00 to 3.00)	3.00 (3.00 to 3.00)
I feel confident I can keep my diabetes under control or help the person I care for keep their diabetes under control (n = 529)	3.00 (2.00 to 3.00)	3.00 (3.00 to 3.00)*	3.00 (3.00 to 3.00)*
Diabetes is not that serious, especially when you feel fine (n = 529)	1.00 (1.00 to 1.00)	1.00 (1.00 to 1.00)	1.00 (1.00 to 1.00)
I am feeling overwhelmed by the demands of living with diabetes or caring for someone living with diabetes (n = 529)	2.00 (1.00 to 3.00)	1.00 (1.00 to 1.00)*	1.00 (1.00 to 3.00)*

	Pre	Post	Follow-up
Frequency of Nutrition Behaviors	**Median (Interquartile Range)**		
Fried foods (*n* = 529)	2.00 (1.00 to 2.00)	2.00 (1.00 to 2.00)*	2.00 (1.00 to 2.00)*
Five or more servings of fruits and vegetables in a day (*n* = 529)	2.00 (1.00 to 3.00)	2.00 (2.00 to 3.00)*	2.00 (2.00 to 3.00)*
Three servings of dairy products in a day (*n* = 529)	2.00 (1.00 to 3.00)	2.00 (1.00 to 3.00)*	2.00 (1.00 to 3.00)*
Sugary beverages (*n* = 528)	2.00 (1.00 to 3.00)	1.00 (.00 to 2.00)*	1.00 (.00 to 2.00)*
Baked fish (*n* = 529)	2.00 (1.00 to 2.00)	2.00 (1.00 to 2.00)*	2.00 (1.00 to 2.00)*
Advanced Physical Activity Behaviors		***n* (%)**	
Fit exercise into your daily routine (*n* = 318)	---	215 (68)	227 (71)
Exercise continuously for at least 30 minutes at least 3 times per week (*n* = 318)	---	148 (47)	165 (52)
Participate in physical activity such as walking on a daily basis (*n* = 318)	---	196 (62)	211 (66)
Program-Specific Nutrition Behaviors		***n* (%)**	
I am cooking more at home (*n* = 353)	---	291 (82)	306 (87)
I am eating small portions (*n* = 369)	---	337 (91)	342 (93)
I am using recipes provided by this program (*n* = 358)	---	277 (77)	281 (78)
A1C Level		**Mean (SD)**	
A1C level (*n* = 288)	7.23 (±1.68)	---	7.14 (±1.62)*

**Significant difference from pre-test, p < .05*

Discussion

Overall, the multi-state, nationally-coordinated DWD program is effective in changing participants' diabetes management behaviors, self-efficacy, and A1C levels – and in maintaining these changes three to six months post-program. These results are similar to single-state studies, which found DWD effective in changing behaviors, A1C levels, knowledge, and confidence (Chapman-Novakofski et al., 2005; Griffie et al., 2018). These results add to the literature in demonstrating that the program maintained effectiveness when being scaled-out to new delivery settings and populations and when moving to a new national (rather than state-specific) coordination model. Multi-state data are important for establishing DWD as an evidence-based program instead of single-state studies that show effectiveness (but typically use different evaluation measures between states; Balis, Strayer, et al., 2019; Harden et al., 2019).

Based on the results presented here, DWD was effective in changing all the diabetes management behaviors assessed, including diabetes management, meal planning, nutritional intake, and physical activity. This is important because Extension has an evidence-based program to fill the gap in communities with limited resources for individuals living with diabetes. DWD provides a concrete example of how Extension can positively impact major

public health challenges that disproportionately impact communities with fewer healthcare and public health resources.

The program was also effective in changing two of the four self-efficacy constructs assessed. Results for the two other constructs (believing that your actions can make a difference in diabetes management and health and believing that diabetes is not that serious) reveal that participants had high self-efficacy upon beginning the DWD program, and it remained high after completing the program.

While a majority of DWD participants reported achieving advanced physical activity behaviors and program-specific nutrition behaviors, these items were not assessed at pre-program, so it is unknown whether these behaviors were the result of program participation. Also, changes in knowledge of core concepts were unfeasible to determine because of scoring inconsistencies between states. These challenges reveal implications for system-level changes to enhance data collection, analysis, and reporting. This study has unearthed implications for other Extension programs to replicate the NDWD national coordination model, detailed in the implications section.

Finally, based on the results presented here, efforts may be needed to reach a more diverse population to address diabetes-related health disparities (Chin et al., 2014). Iterative use of the RE-AIM framework is suggested to improve program reach and enhance public health impact (Harden et al., 2018). For example, in the program planning phase, Extension practitioners are encouraged to define the priority population for the program and consider how participation obstacles will be removed (e.g., engaging with community partners to recruit underserved populations; Balis et al., 2019). During program implementation and evaluation, suggestions include fully assessing the "reach" dimension: number, proportion, and representativeness of program participants (Glasgow et al., 1999, 2019). This information can be used to refine the program continually (e.g., planning to recruit populations that were less likely to participate; Balis & Harden, n.d.). Additionally, an improvement to the DWD program evaluation would be capturing participant demographics with more granularity. For example, "Over 70" is a broad age group. Asking participants for their year of birth could result in a better understanding of who participates.

Limitations

This work is not without limitations. First, different state approaches to compiling and scoring data were a challenge that resulted in the inability to analyze the majority of knowledge question items. While this is a substantial limitation of the study, the data missingness is important to report and informs next steps. Second, only four states contributed to this initial effort to compile national data; they are likely not representative of all DWD participants nationally. Efforts are underway to understand how many state Extension services deliver DWD each year of the 36 that purchased curriculum and increase national data compilation and analysis. Third, collecting

follow-up data is a challenge and not uncommon with community-based programs (Holden et al., 2015). Ninety-eight percent of program participants completed both the pre-program and post-program surveys, while only 23% (n = 122) completed the follow-up survey. Related, collecting self-reported A1C data was also a challenge; this may be because participants do not know their A1C levels or that program dates may not align with clinical testing (e.g., for participants who are tested annually). For data collection to be successful in community-based programs, measures need to be feasible and pragmatic (Balis et al., 2018; Balis & Harden, 2019, 2021; Balis & Strayer, 2019; Glasgow, 2013). Thus, this program emphasizes nutrition, physical activity, and goal-setting behavior changes as indicators for improved diabetes management and blood glucose control (Hood et al., 2018).

Implications for Research and Practice

The challenges encountered in coordinating data collection and analysis in this multi-state study lead to implications for other Extension programs to be effectively scaled-out across states. One barrier to compiling data across state Extension services is state-level reporting requirements. The NDWD created national Qualtrics surveys for each state to input pre, post-, and follow-up program evaluation results. However, states may be required to use their own Qualtrics or other evaluation systems, requiring duplication of data entry. The NDWD had developed a scoring guide and reporting system to facilitate accurate analysis and reporting. However, based on the results of this study, the guide needs to include more specific protocol for scoring to increase the uniformity and accuracy of national results.

Collecting follow-up data was also difficult. If participants were unable to attend the follow-up class to complete the final survey, some educators mailed the survey to participants to complete and return. Future programming should consider the addition of follow-up phone calls, newsletters, social media contacts, e-mail, and other novel strategies for participants to receive post-program support and remain engaged through the follow-up evaluation (Fincham et al., 2011; White et al., 2018).

In general, collecting national data on Extension programs is a challenge (Kushner et al., 2017). There is no national umbrella organization directing programming and evaluation nor a national-level statistician or evaluator. Protected time for this role could aid national evaluation and research efforts for many Extension programs (e.g., one data collection and scoring system). Offering training and technical assistance to state DWD program leaders could also improve data collection and analysis efforts.

Using a comprehensive planning and evaluation framework such as RE-AIM (reach, effectiveness, adoption, implementation, maintenance; Glasgow et al., 1999, 2019) could also strengthen understanding of the overall national impact of DWD. While data were collected on reach, effectiveness, and individual-level maintenance for the four contributing states, developing indicators of adoption and setting-level maintenance (at both state and educator

levels) could present a broader picture of the public health impact of DWD. Related efforts are underway to understand better and capture implementation data, including fidelity, adaptations, and cost (Balis et al., n.d.)

While improvements in empirical program evaluation are necessary, without a shift in focus away from “program development,” program duplication is likely to continue. Engaging Extension Directors and university-level promotion committees in discussions around changing requirements is a suggested starting point. Paired with this, efforts to train Extension professionals on selecting, adapting, delivering, and evaluating evidence-based programs can start the discussion on changed expectations from the bottom up. With this will need to come new metrics of success. For example, perhaps replacing “programs delivered” and “materials created” sections from promotion packets with “evidence-based programs delivered," “culturally appropriate adaptations,” and “multi-state evaluation” would incentivize the necessary work to deliver programs with the strongest impact on improving the health of Americans.

Taken together, the NDWD has been successful in disseminating and managing DWD through Extension. Despite the challenges in data collection and analysis, NDWD successfully addressed an obstacle faced by many community-based programs: what happens when the original grant ends, and there are no specific funds for iterative program refinement, evaluation, or training. Indeed, this barrier is common to community-based programs (Chen et al., 2012). While additional funding could certainly strengthen the NDWD, especially in terms of data analysis and evaluation, this national effort succeeded in program dissemination and management by using several tested implementation strategies encouraging adoption, implementation, and sustainability (Powell et al., 2015). See Table 3 for implementation strategies used by the NDWD based on the Expert Recommendations for Implementing Change (ERIC) project’s compilation of implementation strategies (Powell et al., 2015).

These strategies can serve as examples to Extension practitioners to scale-out programs and determine effectiveness across states. For Extension to be publicly recognized for its health promotion programs, better dissemination, implementation, and evaluation are needed. Collaborative work at the national level is recommended to reduce the duplication of efforts common with health promotion programs in Extension and more effectively use resources. The research reported here indicates that DWD is effective on a multi-state scale and that effective Extension programs delivered across states may benefit from a similar national working group structure. Future efforts include improving program evaluation processes to demonstrate national impact better.

Table 3. Implementation Strategies Used by NDWD

Implementation Strategy	Definition (adapted for community settings)	NDWD Application
Identify and prepare champions	Identify and prepare individuals who dedicate themselves to supporting, marketing, and driving through an implementation, overcoming indifference or resistance that the intervention may provoke in an organization	Program champion planned and facilitated initial meeting
Access new funding	Access new or existing money to facilitate the implementation	Core NDWD team received a small grant to hire strategy experts to develop a structure and mission statement
Use advisory boards and workgroups	Create and engage a formal group of multiple kinds of stakeholders to provide input and advice on implementation efforts and to elicit recommendations for improvements	NDWD meets quarterly via Zoom and annually in-person in conjunction with a professional conference
Develop educational materials	Develop and format manuals, toolkits, and other supporting materials in ways that make it easier for stakeholders to learn about the evidence-based program and for staff (educators, volunteers, paraprofessionals) to learn how to deliver the evidence-based program	Documents are stored on Google Drive
Assess for readiness and identify barriers and facilitators	Assess various aspects of an organization to determine its degree of readiness to implement, barriers that may impede implementation, and strengths that can be used in the implementation effort	State program leaders were polled to develop an evaluation protocol. In the future, other staff with evaluation expertise (e.g., specialists) should also be included
Provide ongoing consultation	Provide ongoing consultation with one or more experts in the strategies used to support implementing the evidence-based program	Consultation is offered to states that purchase curriculum
Conduct ongoing training	Plan for and conduct training in the evidence-based program in an ongoing way	Training is offered to states that purchase curriculum
Promote adaptability	Identify the ways an evidence-based program can be tailored to meet local needs and clarify which elements of the evidence-based program must be maintained to preserve fidelity	Materials have been developed in Spanish

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