

Implications for Extension

The U.S. Cooperative Extension System: Reaching Priority Populations and Achieving Effectiveness Outcomes in the National Diabetes Prevention Program

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Abstract

The Diabetes Prevention Program (DPP) reduces type 2 diabetes risk by 58% for participants achieving 5% weight loss and 150 minutes of weekly physical activity. The CDC National DPP expands access through clinical and community partners, with Extension well positioned to deliver the program nationally. We report outcomes from eleven Extension organizations following 2021 CDC DPRP Standards. Between 2012-2022, 5,739 participants enrolled; average weight loss was 5.9%, 52.7% met the 5% goal; average weekly activity was 207 minutes, and retention was 43%. The Extension DPP reach, effectiveness, and retention meet or exceed national estimates, demonstrating strong community impact and sustainability.

Introduction

The United States (U.S.) Congress authorized the Centers for Disease Control and Prevention (CDC) National Diabetes Prevention Program in 2010 to address the growing diabetes epidemic (Albright, 2018). The CDC National Diabetes Prevention Program is a partnership of public and private organizations working to increase access to diabetes screening and risk reduction programs (Albright, 2018). The CDC-recognized diabetes prevention lifestyle change program (here forth, DPP) is a key feature. Research shows that adults who complete a structured lifestyle change program and meet the program's 5% weight loss goal can reduce the risk of developing type 2 diabetes by 58% (Knowler et al., 2002). Newer evidence by Kuo et al. (2024) suggests preventing one case of diabetes saves \$160,000 and that simply enrolling in the program can save participants \$2,276 per year in medical costs. Despite the CDC's efforts to

increase access to the program, the number, reach, and accessibility of DPP providers remain insufficient to meet the needs of one in three U.S. adults with prediabetes who may benefit from participation in the DPP (Ariel-Donges et al., 2020).

As of March 2026, the CDC's Diabetes Prevention Recognition Program (DPRP) registry (<https://dprp.cdc.gov/Registry>) lists 1,554 organizations that deliver the DPP in clinical and community settings. Registered organizations are diverse, including hospital systems, pharmacies, YMCAs, and faith-based organizations. There is growing awareness that the Cooperative Extension System (Extension), with its presence in local communities across the U.S. and territories, reach to underserved and marginalized populations, and its mission to promote health equity and well-being could be a national leader in DPP implementation (Burton et al., 2021; Buys & Rennekamp, 2020; Wilson et al., 2023b; Myers & Little, 2024). The Cooperative Extension-National Diabetes Prevention Program working group (CE-NDPP) was established in 2017 to support dissemination, adoption, implementation, and evaluation of DPPs in Extension (Cooperative Extension National Diabetes Prevention Program Working Group [CE-NDPP], 2024; Rafie et al., 2021). Twenty-four states and territories are currently CE-NDPP members; of whom 13 states were represented in the DPRP registry at the time of this study. Some Extension organizations register as a state and some as individual counties (CE-NDPP, 2024).

The CE-NDPP's goals are to strengthen the capacity of Cooperative Extension to impact the prevalence of diabetes nationwide, and to increase the number of state Cooperative Extension Services that

are CDC recognized DPP providers. To accomplish these goals, the working group provides information and support in program evaluation, quality control, marketing, and third-party reimbursement systems (CE-NDPP, 2024; Rafie et al., 2021). The CE-NDPP toolkit and website (<https://preventdiabetes.extension.org/>) is published with resources and information to support extension-specific implementation (Cooperative Extension National Diabetes Prevention Program Working Group, 2024).

As Extension grows as a provider across the nation, evidence is emerging for the effectiveness of Extension DPP implementation and outcomes (Collins et al., 2023; Dewitt et al., 2023; Gorczyca et al., 2022; Rafie et al., 2021; Wilson et al., 2022; Wilson et al., 2023a; Wilson et al., 2023b). Several factors identified in these studies and others of more diverse organizations suggest Extension may be a highly effective delivery system due to supportive structural characteristics such as state-level nutrition and physical activity (PA) specialists with content expertise, compatible goals and mission, and leadership engagement (Collins et al., 2023; Dewitt et al., 2023; Madrigal et al., 2022; Hannah K. Wilson et al., 2023b). While Extension-specific DPP literature is expanding, (Collins et al., 2023; Dewitt et al., 2023; Gorczyca et al., 2022; Wilson et al., 2022; Wilson et al., 2023a, 2023b) there has yet to be a national-level evaluation of participant data from Extension DPPs.

Purpose

This brief report describes evaluation outcomes of CDC-recognized DPPs offered by a sample of U.S. Extension organizations. The primary objectives are to: 1) describe the reach, effectiveness, and retention of CE-NDPP programs

according to the 2021 CDC Diabetes Prevention Recognition Program (DPRP) Standards informed by the Reach, Effectiveness, Adoption, Implementation and Maintenance (RE-AIM) Framework (Glasgow et al., 2019), and 2) provide a comparison to national participant-level data (Ely et al., 2017).

Background

The CDC's yearlong DPP includes group-based educational sessions encouraging moderate weight loss (4-7% of initial body weight) and 150 minutes of PA per week. A trained lifestyle coach leads 60-minute lessons on a specific topic (e.g., tracking food, peer support, getting active to prevent type 2 diabetes) and facilitates discussion and group problem-solving (Centers for Disease Control and Prevention [CDC], 2024a). The CDC DPRP promotes DPP implementation quality, fidelity, and effectiveness through standards and organizational recognition. The 2021 DPRP standards specify several program fidelity requirements, including DPP intervention duration (12 months), intensity (a minimum of 22 sessions delivered in 12 months; at least 16 sessions in months 1 through 6, and at least six sessions delivered in months 7 through 12), delivery modes (in-person, distance, in-person and distance combined, asynchronous online), approved curricula, and participant eligibility (CDC, 2021). Organizations register with the CDC DPRP to achieve one of four levels of recognition based on implementation and outcomes: Pending (entry-level), Preliminary, Full, and Full Plus (CDC, 2021). Deidentified program data is submitted to the CDC every six months for evaluation and recognition assessment.

Each recognition level requires meeting specific, increasing standards that are

updated every four years. The following are requirements as listed in the 2021 Standards which were in place at the time of the study. Organizations achieve pending recognition upon enrollment and agreement to the standards. Preliminary recognition is required to become a Medicare Diabetes Prevention Program supplier (MDPP) and requires at least five eligible program completers according to attendance standards. Full recognition requires meeting preliminary recognition standards and that at least 35% of completers are eligible based on self-reported prediabetes blood test results or a history of gestational diabetes mellitus (GDM), and at least 60% of completers achieve the CDC DPP risk reduction goals: 1.) lost at least 5% of their initial body weight, 2.) lost at least 4% of their initial body weight, and met 150 minutes (about 5 hours) of moderate to vigorous PA per week, or 3.) reduced their Hemoglobin A1C (HbA1C) by 0.2%. Fully recognized organizations can achieve Full Plus recognition by retaining 50%, 40%, and 30% of participants in months four, seven, and ten, respectively.

Methods

In Spring 2022, the CDC DPP evaluation team agreed to support aggregated, deidentified data evaluation for the CE-NDPP among organizations willing to participate in a one time-study. The CE-NDPP evaluation committee invited CE-NDPP members to participate in the study. Inclusion criteria were CE-NDPP membership, implementing the DPP through Extension in their state (independently or in collaboration with another organization), registration with the CDC DPP, at least one year of program data submitted to the CDC, and willingness to provide an organizational code(s) for inclusion in the evaluation

report. There were no additional exclusion criteria. The committee then supplied the organizational codes to CDC to conduct the analysis and provide the summary data report. The report summary statistics were based on the 2021 DPP standards and included descriptive statistics on participant demographics, attendance, weight loss, PA outcomes, percentage of participants meeting the CDC risk reduction goals, and retention.

We used the Reach, Effectiveness, Adoption, Implementation, and Maintenance (RE-AIM) framework and RE-AIM definitions used by Nhim et al (2019) in other DPP implementation contexts to evaluate Extension DPP implementation and outcomes and encourage comparability across studies. Similar to Nhim et al, (2019) Reach was assessed as the total number of participants who enrolled in an Extension DPP and their demographic characteristics according to CDC standards (age, gender, race/ethnicity) and eligibility determination (self-reported clinical diagnosis of prediabetes, history of GDM or score of 5 or greater on the prediabetes risk test, (CDC, 2021; Nhim et al., 2019). Effectiveness was assessed by participant attendance in months 1 through 6 (core) and months 7 through 12 (core maintenance), average PA minutes per week compared to the intervention goal (150 min/week), percentage of participants meeting each of the program's risk reduction goals (weight loss, PA and HbA1C changes). Included in effectiveness, retention was assessed as the percentage of participants meeting the CDC completer definition described previously (CDC, 2021). Implementation was assessed by the average number of sessions attended in each phase and total, compared to the required 22 session minimum. Adoption was assessed as the

percentage of states providing each delivery mode (in-person, distance learning, or both in-person and distance learning). Maintenance was assessed as the percentage of participating organization codes that had achieved full recognition by the time of data analysis.

Results

Of the 21 states invited, 13 expressed interest, and 11 were eligible and agreed to participate: Arizona, Georgia, Idaho, Minnesota, New Jersey, North Carolina, North Dakota, South Carolina, Tennessee, Virginia, and Washington. The two states interested, but ineligible, did not have a full year of evaluation data to include. Reasons given for not participating reported were not being registered with CDC, leadership recommendation, and other priorities. CDC provided a summary report of aggregate data from participating states for the period 2012 through 2022. As some Extension organizations register with CDC DPRP as a state and some as individual counties, the eleven states provided 22 organizational codes for analysis.

From 2012 to 2022, assessed Extension organizations reached 5,739 participants who were primarily middle-aged, (45-64 years; 55.6%) and older adults (>65 y; 26.8%), female (85.3%), and non-Hispanic white (Table 1) with similar demographics reported from national participant evaluation reports, (Ely et al., 2017). Various funding sources utilized were reported, with grant funding reported by more than half of the organizations. The majority of participants who completed the program were eligible based on a blood test indicating prediabetes or a history of Gestational Diabetes Mellitus (GDM).

On average, program participants met the CDC effectiveness goals of 5% weight

loss and 150 minutes (about 5 hours) per week of PA (Table 2). Average weight loss (5.9%) and PA (207 min per week) exceed the program goals (5% and 150 min, respectively). A little more than half of participants met at least one risk reduction goal (CDC, 2021). Approximately 43% (2,492) of enrolled participants were retained according to minimum evaluation standards (CDC, 2021). Of the 11 states represented, nine (81%) provided in-person and distance learning modes, one provided in-person programming only, and one provided distance delivery only. Completing participants attended an average of 17 sessions in the first six months of the program (core phase) and six in the second six months of the program (core maintenance) (23 sessions total). Extension organizations implemented an average of 23 total sessions which exceeds the DPRP minimum requirement of 22 sessions over the course of 12 months. Of the 22 organizational codes provided by the 11 participating states, 19 achieved the CDC full or full plus recognition, two received preliminary recognition, and one could not be determined.

Discussion

Extension organizations participating in the study demonstrated Diabetes Prevention Program (DPP) reach and effectiveness outcomes comparable to or exceeding national benchmarks (Cannon et al., 2020; Ely et al., 2017). They successfully engaged CDC priority populations, including Hispanic/Latino, Black or African American, and older adults, at rates equal to or higher than national estimates. Notably, Extension organizations reached a slightly higher proportion of Hispanic/Latino and non-Hispanic Black or African American individuals than some nationally representative data (Cannon et al., 2020;

Ely et al., 2017). The racial and ethnic makeup of the population in this dataset does not fully represent the diversity or potential reach of all Extension programs, particularly those newly implementing DPP, such as Guam. Moreover, Extension's minority serving institutions (1890 and 1994 Land Grant universities) and the use of community-based peer educators to conduct the DPP in some states (i.e. Arizona) are strengths that could expand Extension's reach among underserved groups.

Our data imply that Extension may be a particularly effective model for delivery, as Extension DPP participants lost more weight and were more active on average than those evaluated by Ely et. al 2017 (5.9% v. 4.2%, 207 v. 152 min/wk, respectively). Extension's structure, including doctoral-level support specialists with nutrition and health expertise who train and support DPP coaches, may provide an advantage to other organizations and enhance effectiveness. Extension DPP retention (43%) exceeds that of literature reported in both clinical and community contexts, (Cannon et al., 2020; CDC, 2021; Ely et al., 2017), and in one study by Lloyd & Ely (2023) Extension organizations had the highest rates of obtaining full plus recognition status. Extension's history in communities and reputation as a trusted resource may contribute to strong reach and retention and has the potential to increase if more Extension organizations adopt the DPP. The CDC recently updated the DPRP standards (CDC, 2024), which include accelerated recognition pathways for organizations reaching priority and underserved populations. This change may allow new Extension organizations adopting the DPP to reach full recognition more quickly.

More than half of Extension DPP participants were enrolled in programs with grant funding support, a sustainability issue illuminated by Ritchie et al (2020) as a significant threat to long-term sustainability of these programs. While the DPP curriculum is available at no cost, funding is required to support startup and ongoing implementation costs, such as CDC required lifestyle coach training (~\$550 per coach; only from approved providers) and continuing education (\$50 - 100 per coach per year), printing of materials, staffing and software for data collection, monitoring, and reporting to CDC every six months as required to maintain recognition, and distance learning infrastructure as applicable. The CE-NDPP is working with national Extension leadership to explore potential funding sources and arrangements, including receiving compensation from health system payors and participation in umbrella organizations for submission of third-party payer claims. Tapping into health insurance funds presents a strong incentive for expanding the DPP in Extension, but setting up the infrastructure to accomplish this represents a radical change in current structure (Myers & Little, 2024). As of 2026, four CE-NDPP member states have registered with an organization (i.e. HabitNu) to process third-party claims, and three have received reimbursement payments. While this may be a viable method, it remains to be seen if the high initial startup costs and ongoing expenditures for billing services are covered by the revenues. It is imperative to determine a sustainable model to expand program adoption and implementation within Extension while maintaining no or low costs for participants to promote health for all people.

Future research should explore specific barriers to adoption among Extension organizations with interest in the DPP, and similarly, barriers to maintenance among those who start the program and discontinue it at a later time, which has been the case for some Extension systems. Even with funding support, not all Extension systems may be able to or choose to deliver the DPP. Extension organizations can work together to promote access to distance learning DPP programs offered by other states, including the 10 of 11 states represented in this data who offer the DPP via distance learning.

The study data does not represent all Extension supported DPPs. Two states opted out of the study due to differing priorities. Some programs included are partnerships with public health departments or medical organizations, or are Extension administered, but coaches are not Extension educators. To our knowledge, only one organizational code represented in this data utilized state staff and does not utilize local Extension faculty or staff as coaches. Future research should assess differences in outcomes across these implementation models. Extension is delivered cooperatively among federal, state, and local resources in all U.S. states and some territories. Extension has diverse delivery models, so some organizations are represented as states and others as counties or regions. While this diversity may be a potential limitation to this analysis, it may be a long-term strength that represents the ability to adapt to local context and resources. Additional study strengths include the various states and U.S. regions represented, data representing ten years, and relative comparison to nationally representative data.

Conclusion

Extension is a successful provider of the DPP with demonstrated outcomes, yet reliance on grant funding may limit long-term sustainability. Several states have successfully partnered with health departments and umbrella hubs, and the CE-NDPP is exploring these innovative solutions with national Extension leadership. The CDC should explore ways of addressing the needs of the almost 98 million Americans who could benefit from the DPP, since funding sustainability is not unique to Extension. With its local presence and reach in underserved areas and priority populations, Extension is a critical player in DPP delivery and the fight against diabetes.

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Author Note

Zena Edwards was affiliated with Washington State University Extension, Clark County at the time this work was conducted. She is no longer with Washington State University Extension.

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Tables

Table 1. Extension Diabetes Prevention Program (DPP) Participant Reach and Enrollment Characteristics (N = 5,739)

Participant characteristic	N(%)
Sex	
Male	840 (14.6%)
Female	4,893 (85.3%)
Not reported	6 (0.1%)
Age	
18 – 44 years	1,009 (17.6%)
45 – 64 years	3,191 (55.6%)
65 years and older	1,539 (26.8%)
Race/ethnicity	
Hispanic or Latino	698 (12.1%)
Non-Hispanic Black or African American	820 (14.3%)
Non-Hispanic White	3,769 (65.7%)
Non-Hispanic or Latino/Asian American	74 (1.5%)
Non-Hispanic or Latino/American Indian Alaska Native	36 (0.74%)
Non-Hispanic or Latino/Native Hawaiian or other Pacific Islander	8 (0.16%)
Non-Hispanic or Latino/Multiracial	170 (16.9%)
Not reported	164 (2.9%)
Payer source	
Medicare	1 (0.02%)
Medicaid	2 (0.03%)
Dual Eligible (Medicare and Medicaid)	418 (7.3%)
Private Insurer	22 (0.38%)
Grant Funding	3,162 (55.1%)
Employer	76 (1.3%)
Free of charge	42 (0.73%)
Other	777 (13.5%)
Not reported	1,239 (21.6%)

Table 2. Participant Effectiveness and Retention Outcomes from Extension and National Published Data^{a,b}

Outcome or implementation variable	CDC standard for full recognition ^a	Extension (n, %, or mean)	National - Ely et al 2017 ^b (n, %, or mean)
Completers	At least 5 per evaluation cycle	2,492	14,747
Eligible based on blood test or history of Gestational Diabetes Mellitus	35%	61.3%	63.7%
Retention	50% at 6 months; 40% at month 7 ^c	43%	37% ^d
Number of core sessions attended	Minimum: 16	Mean: 17	N.R. ^e
Core maintenance sessions attended	Minimum: 3	Mean: 6	N.R. ^e
Average weight loss (% of initial body weight)	Minimum: 5%	5.9%	4.2%
Average weekly physical activity (min/wk)	150	207	152
Met at least one of the risk reduction criteria	60%	57.3%	N.R.
Met 5% weight loss goal (%)		52.7%	35.5%
Met 4% weight loss goal and average 150 min/wk		42.1%	N.R.

a. Effectiveness and retention outcomes according to the 2021 CDC Diabetes Recognition Program Standards: <https://www.cdc.gov/diabetes/prevention/pdf/dprp-standards.pdf>

b. National comparator: Ely, E. K., Gruss, S. M., Luman, E. T., Gregg, E. W., Ali, M. K., Nhim, K., Rolka, D. B., & Albright, A. L. (2017). A National Effort to Prevent Type 2 Diabetes: Participant-Level Evaluation of CDC's National Diabetes Prevention Program. *Diabetes care*, 40(10), 1331–1341. <https://doi.org/10.2337/dc16-2099>

c. Full PLUS recognition is provided to organizations that retain at least 50% of participants who enroll and complete at least one session at five months and 40% at seven months.

d. Estimated retention is based on the percentage of eligible participants who reported attending 9 or more months in Ely et al 2017, as shown by the authors in Figure 2A.

e. N.R.: Not Reported