Successes of a National Study of the Chronic Disease Self-Management Program

Meeting the Triple Aim of Health Care Reform

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Background: Emerging health care reform initiatives are of growing importance amidst concerns about providing care to increasing numbers of adults with multiple chronic conditions. Evidence-based self-management strategies are recognized as central to managing a variety of chronic diseases by improving the medical, emotional, and social role management demands of chronic conditions.

Objectives: To examine the effectiveness of the Chronic Disease Self-Management Program (CDSMP) among a national sample of participants organized around the *Triple Aim* goals of better health, better health care, and better value in terms of reduced health care utilization.

Research Design: Utilizing data collected from small-group CDSMP workshops, baseline, 6-month, and 12-month assessments were examined using 3 types of mixed-effects models to provide unbiased estimates of intervention effects.

Subjects: Data were analyzed from 1170 community-dwelling CDSMP participants.

Measures: *Triple Aim*–related outcome measures: better health (eg, self-reported health, pain, fatigue, depression), better health care (eg, patient-physician communication, medication compliance, confidence completing medical forms), and better value [eg, reductions in emergency room (ER) visits and hospitalizations in the past 6 mo].

Results: Significant improvements for all better health and better health care outcome measures were observed from baseline to 12-month follow-up. The odds of ER visits significantly reduced from baseline to 12-month follow-up, whereas significant reductions in hospitalization were only observed from baseline to 6-month follow-up.

Conclusions: This National Study of CDSMP (*National Study*) demonstrates the successful translation of CDSMP into widespread practice and its potential for helping the nation achieve the triple aims of health care reform.

Key Words: chronic disease, self-management, evidence-based programs, *Triple Aim*

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BACKGROUND

The Affordable Care Act[1] places emphasis on achieving the *Triple Aim* of "better health, better health care, and better value."[2] These aims are salient given concern about the provision of adequate and affordable care for older adults with multiple chronic conditions (73% of this population). The chronic care model[3–5] and the Canadian expanded chronic care model[6] emphasize the importance of community care and self-management support and provide a framework for system and organizational change. Self-management strategies that provide medical, emotional, and role management skills are increasingly recognized as central to managing a variety of chronic diseases.[7] Community evidence-based disease self-management programs have proliferated with the Stanford Chronic Disease Self-Management Program (CDSMP) being among those most evaluated.[8] Self-management programs have been shown to

change health behaviors, improve health status, and reduce health care utilization and costs.[9–11] However, it remains to be determined if interventions developed and tested under more controlled conditions can be brought to scale while achieving similar results.

The objectives of the National Study of CDSMP are to: (1) describe participants who enrolled in the *National Study* by completer status; and (2) examine the 12-month outcomes organized around the *Triple Aim* goals. Constancies or changes from 6- to 12-month follow-up will be noted. The outcomes will be discussed in terms of findings from earlier randomized studies.

METHODS

Participants

A pre-post longitudinal design was used to determine intervention effectiveness among middle-aged and older adults in 22 organizations (17 states). Data were collected before the start of the intervention (baseline) and at 6 and 12 months. We adopted an "intent to treat" approach that included all participants who attend at least 1 class as "class participants" in the analyses and documented completion rates (eg, those who completed at least 4 of the 6 classes). Investigators had no role in leader training, workshop recruitment, or implementation. Each CDSMP delivery site recruited people for workshops in their usual manner, which included referrals from organizations serving older adults (eg, senior centers, health care facilities, and social service organizations as well as self-referrals from other recruitment activities including flyers, brochures, and health fairs). Eligibility included: (1) having at least 1 self-reported chronic disease; (2) enrolling in a CDSMP workshop delivered in either English or Spanish; (3) attending at least one of the first 2 class sessions; (4) not having taken CDSMP previously; (5) completing a baseline assessment; and (6) consenting to the study. See Supplemental Digital Content (http://links.lww.com/MLR/A568) for additional information about sampling, recruitment, training, and fidelity assessment. Figure 1 is a CONSORT diagram describing participant inclusion. Institutional Review Board approval was obtained at Stanford and Texas A&M Universities.

Intervention

On the basis of Social Learning Theory,[12] CDSMP is delivered in a small-group workshops (2.5 hours a week for 6 wk) facilitated by 2 trained peer leaders. Content includes the key skills of action planning, problem solving, and decision making as well as (1) techniques to deal with pain, depression, fatigue, and shortness of breath; (2) exercise; (3) appropriate use of medications; (4) effective communication with family, friends, and health professionals; (5) nutrition; and (6) how to evaluate new treatments.

Measures

The 12-month analyses focused on the *Triple Aim* of better health, better health care, and better value.[2] All measures have been previously tested for reliability and validity.

Better health was measured using a variety of health indicators. Self-reported health was measured using a single item.[13] A visual numeric scale was used to measure fatigue and pain.[13–15] The Centers for Disease Control and Prevention healthy days measures were used to assess the number of days in the past month participants reported their physical health or mental health as not good. Depression was measured using the patient health questionnaire-8.[16]

Better health care was measured using the: (1) communication with physician scale[13]; (2) Morisky medication compliance scale[17]; and (3) Chew health-literacy item.[18]

Better value was measured with self-reported health care utilization as a proxy to actual health care costs. Participants reported their emergency department visits and nights in hospital in the previous 6 months. These items have been found to be reliable and valid when compared with chart audits.[14]

Covariates included age, sex, race/ethnicity, years of education, and number of chronic conditions.

The psychometric properties of most if the items are found on the Stanford Patient Education Research Center Web site (http://patienteducation.stanford.edu) or the Centers for Disease Control and Prevention Web site (http://www.cdc.gov/hrqol/hrqol14_measure.htm).

Statistical Analysis

We used χ^2 tests for categorical variables and 2-sample *t* tests for continuous variables. Baseline characteristics were compared between those with data at 6 and 12 months and those with missing data at 6 and 12 months. Various analyses were used to examine changes from baseline to 6 and 12 months. Linear mixed models (using Stata xtmixed procedure) with participant-level random intercepts were fitted for continuous outcome variables controlling for age, sex, race/ethnicity, education, and number of chronic conditions. Generalized linear mixed models with Poisson distribution and participant-level random intercepts (using Stata xtpoisson procedure), controlling for the same covariates, were used to assess changes in count outcome measures (eg, number of unhealthy physical days and hospitalizations). These 2 mixed-effects models are likelihood-based approaches that use all available data in model estimation and provide unbiased estimates of the intervention effects under the assumption of missing at random.

An effect size (ES) (d = [posttest mean − pretest mean]/pretest SD) using estimates of changes from the mixed-effects models was computed for each outcome except the zero-inflated variables.[19]

RESULTS

Sample Characteristics

Table 1 shows that 1170 participants completed the baseline assessment with an average age of 65, 13 years of education, and 3.0 self-reported chronic conditions (79.4% reported 2 or more conditions). Nearly 83% were female and 55.2% were non-Hispanic white. Seventy-nine percent attended 4 or more workshop sessions. Seventy-seven percent completed the 6-month assessment and 71% completed the 12-month assessment. At both follow-up time points,

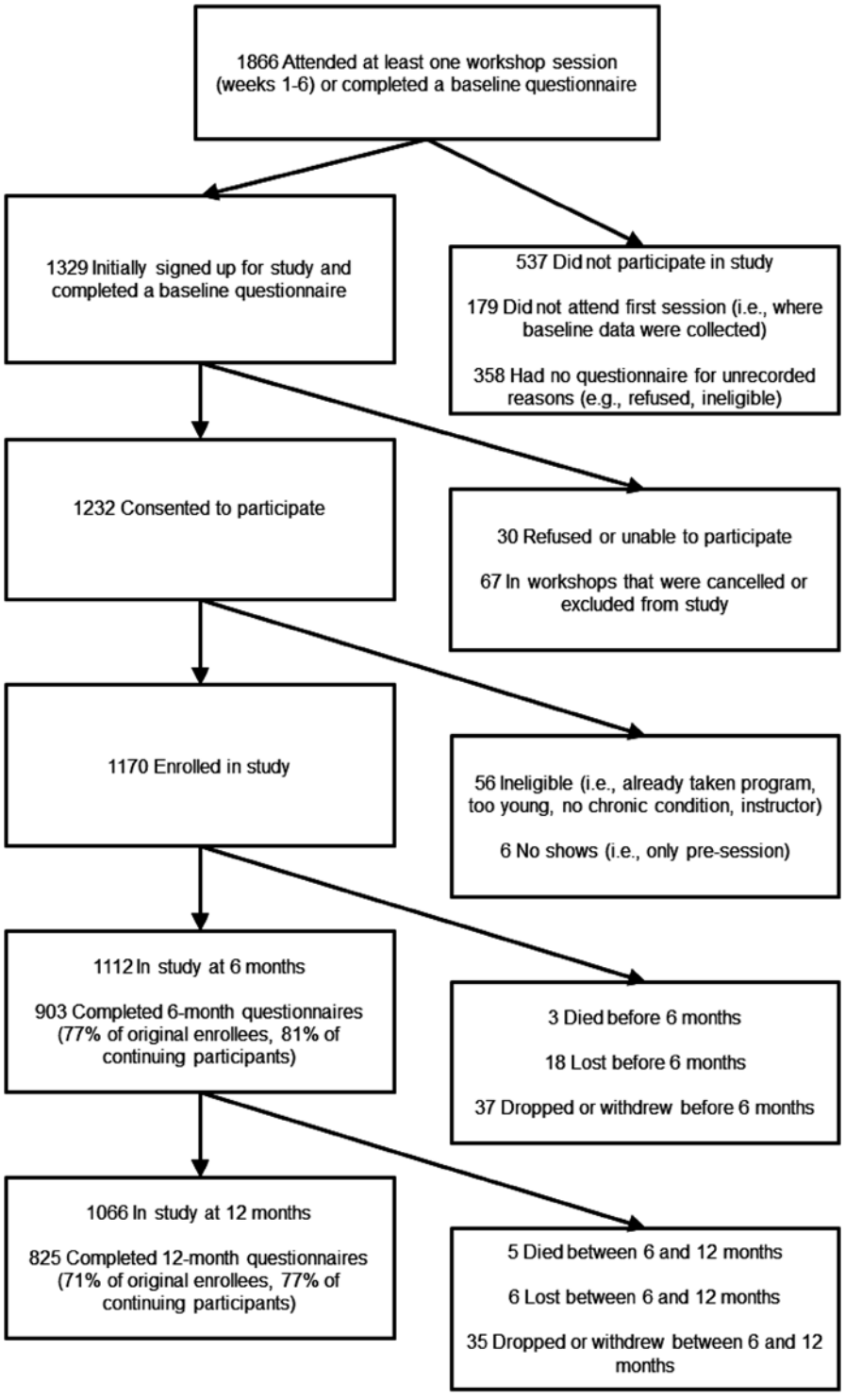

FIGURE 1. Participants in the national study of CDSMP: from baseline to 12 months.

assessment completers were significantly older and had higher workshop completion rates than noncompleters. Completers of the 6-month assessment were significantly more likely to be non-Hispanic white.

Changes in Better Health Outcomes

Table 2 shows that significant improvements were observed for all 6 better health outcome variables from baseline to 6- and 12-month assessments, respectively. The

TABLE 1. Baseline Characteristics of CDSMP Participants by Follow-up Assessment Completion

	n (%)				n (%)		
	Total (n = 1170)	**Completed 6-mo Assessment (n = 903)**	**Not Completed 6-mo Assessment (n = 267)**	***P****	**Completed 12-mo Assessment (n = 825)**	**Not Completed 12-mo Assessment (n = 345)**	***P**†*
Female	967 (82.7)	748 (82.8)	219 (82.0)	0.76	678 (82.2)	289 (83.8)	0.51
Race/ethnicity				0.01			0.14
Non-Hispanic white	645 (55.2)	520 (57.7)	125 (46.8)		475 (57.7)	170 (49.3)	
African American	187 (16.0)	128 (14.2)	59 (22.1)		125 (15.2)	62 (18.0)	
Latino/Hispanic	260 (22.3)	196 (21.8)	64 (24.0)		175 (21.3)	85 (24.6)	
Asian/Pacific Islander	34 (2.9)	27 (3.0)	7 (2.6)		22 (2.7)	12 (3.5)	
American Indian/Alaska Native	8 (0.7)	5 (0.6)	3 (1.1)		4 (0.5)	4 (1.2)	
Other	34 (2.9)	25 (2.8)	9 (3.4)		22 (2.7)	12 (3.5)	
Education (y)				0.16			0.21
≤11	215 (18.4)	52 (19.6)	163 (18.1)		73 (21.3)	142 (17.3)	
12	384 (32.9)	88 (33.1)	296 (32.9)		117 (34.1)	267 (32.4)	
13–16	435 (37.3)	106 (39.9)	329 (36.6)		121 (35.3)	314 (38.2)	
≥17	132 (11.3)	20 (7.5)	112 (12.4)		21 (9.3)	100 (12.2)	
No. chronic conditions				0.002			0.15
1	241 (20.6)	166 (18.4)	75 (28.1)		159 (19.3)	82 (23.8)	
2	307 (26.2)	237 (26.3)	70 (26.2)		210 (25.5)	97 (28.1)	
3	256 (21.9)	199 (22.0)	57 (21.4)		187 (22.7)	69 (20.0)	
4+	366 (31.3)	301 (33.3)	65 (24.3)		269 (32.6)	97 (28.1)	
Diabetes	300 (25.6)	225 (24.9)	75 (28.1)	0.30	206 (25.0)	94 (27.3)	0.42
Asthma	154 (13.1)	115 (12.7)	39 (14.6)	0.43	116 (14.1)	38 (11.0)	0.16
Chronic Obstructive Pulmonary Disorder	144 (12.3)	113 (12.5)	31 (11.6)	0.69	103 (12.5)	41 (11.9)	0.78
Arthritis	624 (53.4)	509 (56.4)	115 (43.2)	0.0002	462 (56.1)	162 (47.0)	0.004
Cancer	116 (9.9)	105 (11.6)	11 (4.1)	0.0003	85 (10.3)	31 (9.0)	0.49
Workshop completion rate (attend 4+ sessions)	925 (79.1)	761 (84.3)	164 (61.4)	<0.001	695 (84.2)	230 (66.7)	<0.0001
		Mean (±SD)		***P**‡*	Mean (±SD)		***P**§*
Age (19–80) (y)	65.4 (±14.3)	67.0 (±16.1)	59.8 (±13.2)	<0.001	66.7 (±13.0)	62.2 (±16.6)	<0.001
Years of education (1–23)	12.9 (±3.8)	13.0 (±3.9)	12.6 (±3.7)	0.20	13.0 (±3.9)	12.6 (±3.7)	0.15
No. chronic conditions (1–12)	3.0 (±1.7)	3.0 (±1.7)	2.7 (±1.7)	0.004	3.0 (±1.7)	2.8 (±1.7)	0.05

*P-value for χ^2 test comparing the participants who completed the 6-month assessment with those who did not complete the 6-month assessment.
†P-value for χ^2 test comparing the participants who completed the 12-month assessment with those who did not complete the 12-month assessment.
‡P-value for 2-sample t test comparing the participants who completed the 6-month assessment with those who did not complete the 6-month assessment.
§P-value for 2-sample t test comparing the participants who completed the 12-month assessment with those who did not complete the 12-month assessment.
CDSMP indicates Chronic Disease Self-Management Program; COPD, Chronic Obstructive Pulmonary Disorder.

TABLE 2. Adjusted* Changes or Ratios Between Baseline and Follow-up Means and Effect Sizes for Better Health Outcomes

	Mean (± SD)			Adjusted Change From Baseline to 6-mo			Adjusted Change From Baseline to 12-mo		
Better Health Outcomes	Baseline† (n = 1170)	6-mo† (n = 903)	12-mo† (n = 825)	Adjusted Change or Ratio Change ‡	*P*	Effect Size *d*	Adjusted Change or Ratio Change §	*P*	Effect Size *d*
Average Self-Assessed Health status (1–5): ↓	3.2 (±0.9)	3.1 (±0.9)	3.0 (±0.9)	−0.14	<0.001	0.16	−0.17	<0.001	0.19
Average fatigue (0–10): ↓	4.9 (±2.9)	4.5 (±2.9)	4.4 (±2.8)	−0.39	<0.001	0.13	−0.49	<0.001	0.17
Average pain (0–10): ↓	4.6 (±3.1)	4.1 (±3.0)	4.1 (±3.1)	−0.46	<0.001	0.15	−0.50	<0.001	0.16
Average Depression Mean Score (0–24): ↓	6.6 (±5.5)	5.4 (±5.0)	5.1 (±5.1)	−1.07	<0.001	0.19	−1.38	<0.001	0.25
				MR‖			MR¶		
Average unhealthy physical days (0–30): ↓	8.7 (±10.0)	7.6 (±9.5)	7.2 (±9.6)	0.90	<0.001	0.09	0.85	<0.001	0.13
Average unhealthy mental days (0–30): ↓	6.7 (±9.1)	6.0 (±8.4)	5.6 (±8.4)	0.94	0.001	0.04	0.88	<0.001	0.09

The range and direction are given with each variable, where applicable. An upward arrow indicates a higher value is desirable, a downward arrow that a lower value is desirable.
*All changes, ratios, and *P*-values are adjusted for sex, age, race/ethnicity, education, and number of chronic conditions.
†Raw means and SDs at each of the assessments.
‡Adjusted changes between baseline and 6 months from linear mixed regression models.
§Adjusted changes between baseline and 12 months from linear mixed regression models.
‖Adjusted ratio of baseline and 6-month mean from random intercept Poisson regression models.
¶Adjusted ratio of baseline and 12-month mean from random intercept Poisson regression models.

ES for these variables ranged from 0.04 to 0.19 at 6 months and 0.09 to 0.25 at 12 months.

Changes in Better Health Care Outcomes

Table 3 shows significant improvements from baseline to 6 months were observed for communication with physician scores and health literacy. Significant improvements for all 3 better health care outcomes, including medication adherence, were observed from baseline to 12-month follow-up. The ES for these variables ranged from 0.03 to 0.16 at 6 months and 0.09 to 0.16 at 12 months.

Changes in Better Value Outcomes

Table 4 shows changes in the cost outcomes from baseline to 6 and 12 months. The average number of ER visits were significantly reduced by 27% from baseline to 6-month (MR = 0.73, $P = 0.002$), and 21% from baseline to 12-month (MR = 0.79, $P = 0.02$). The mean number of hospitalizations in the past 6 months among CDSMP participants were significantly reduced by 22% from baseline to 6 months (MR = 0.78, $P = 0.03$); however, this change was not sustained at 12 months.

DISCUSSION

This is the first study to explicitly document the potential of the CDSMP to facilitate the *Triple Aim* goals. Study participants reported significant improvements for better health, better health care, and better value. Having met the criteria of effectiveness, we will now discuss how this compares to previous studies. Compared with previous randomized trials and other related studies, the *National Study* yielded improvements in health outcomes, similar to findings of earlier studies with English-speaking participants.[9,11] A recent CDSMP meta-analysis found slight outcome differences across studies.[8] These may reflect a variety of methodological and programmatic differences such as: (1) whether or not different study populations were followed for 6 or 12 months; (2)

TABLE 3. Adjusted* Changes Between Baseline and Follow-up means and Effect Sizes for Better Health Care Outcomes

	Mean (± SD)			Adjusted Change From Baseline to 6-mo			Adjusted Change From Baseline to 12-mo		
Better Health Care Outcomes	Baseline† (n = 1170)	6-mo† (n = 903)	12-mo† (n = 825)	Adjusted Change ‡	*P*	Effect Size *d*	Adjusted Change §	*P*	Effect Size *d*
Average Communication with Physician Score (0–5): ↑	2.6 (±1.4)	2.9 (±1.4)	2.9 (±1.4)	0.22	<0.001	0.16	0.23	<0.001	0.16
Average Medication Compliance Score (0–1): ↓	0.25 (±0.3)	0.22 (±0.3)	0.21 (±0.3)	−0.01	0.12	0.03	−0.03	0.001	0.10
Average Confidence Filling Out Medical Forms (0–4): ↑	3.0 (±1.2)	3.1 (±1.2)	3.1 (±1.2)	0.11	0.006	0.10	0.12	0.003	0.09

The range and direction are given with each variable, where applicable. An upward arrow indicates a higher value is desirable, a downward arrow that a lower value is desirable.
*All changes and *P*-values are adjusted for sex, age, race/ethnicity, education, and number of chronic conditions.
†Raw means and SDs at each of the assessments.
‡Adjusted changes between baseline and 6 months from linear mixed regression models.
§Adjusted changes between baseline and 12 months from linear mixed regression models.

TABLE 4. Adjusted* Ratios Between Baseline and Follow-up Means and Effect Sizes for Better Value Outcomes

	Mean (± SD)			Adjusted Change From Baseline to 6-mo			Adjusted Change From Baseline to 12-mo		
Reduced Cost Outcomes	**Baseline (n = 1170)**	**6-mo (n = 903)**	**12-mo (n = 825)**	**Adjusted Ratio†**	***P***	**Effect Size *d***	**Adjusted Ratio‡**	***P***	**Effect Size *d***
No. emergency room Visits in the past 6 mo (0–9): ↓	0.27 (±0.75)	0.18 (±0.54)	0.19 (±0.57)	0.73	0.002	0.10	0.79	0.02	0.08
No. time hospitalized in the past 6 mo (0–10): ↓	0.20 (±0.65)	0.15 (±0.51)	0.20 (±0.66)	0.78	0.03	0.07	1.04	0.72	0.01

The range and direction are given with each variable, where applicable. An upward arrow indicates a higher value is desirable, a downward arrow that a lower value is desirable.
*All changes, ratios, and *P*-values are adjusted for sex, age, race/ethnicity, education, and number of chronic conditions.
†Adjusted ratio of baseline and 6-month mean from random intercept Poisson regression models.
‡Adjusted ratio of baseline and 6-month mean from random intercept Poisson regression models.

whether the study designs were randomized or longitudinal; (3) whether or not participants were experiencing certain symptoms like pain at baseline; and (4) differences in specific delivery format. For example, in the *National Study*, small but significant improvements were found for pain and fatigue at 6 and 12 months, whereas results from the meta-analysis reported small but significant improvements for fatigue only at 6 months and pain only at 12 months.

The *National Study* showed significant improvements in the experience of health care as indicated by improved physician communication at 12 months, which is similar to findings of the original Stanford studies.[9,11] This improved doctor-patient communication may contribute to *National Study* improvements in medication adherence.[20] Essential to engaging patients in a patient-centered environment, health literacy is typically viewed as an antecedent to improving self-care behaviors and health outcomes.[21] The *National Study* is among the first to demonstrate that health literacy can be modified by participation in a self-management program.

In terms of better value, the *National Study* observed a decrease in emergency room visits among participants at 6- and 12-month follow-up, which supports findings from previous studies.[11] Similar to previous studies,[9,11] the *National Study* showed a significant decrease in hospitalization from baseline to 6 months; however, these reductions were not sustained at 12 months. Conversely, there was no increase in hospitalizations during this time, which might be expected in an aging population. Given that older adults with chronic condition consume 75% of health care expenditures, these findings are encouraging.[22–24]

The majority of the CDSMP health outcome and health care experience effects were sustained and often strengthened after 12 months. Given most health promotion programs struggle with sustainability,[25,26] the current study suggests that CDSMP provides participants with the skills and motivation to help meet the *Triple Aim* and maintain outcomes for at least 1 year.

The *National Study* also achieved its goal of reaching a more representative population when compared with those in earlier studies. First, the *National Study* of nearly 1000 participants had a broader reach into the middle-aged and older American population than earlier randomized controlled or quasiexperimental studies.[9,11] Second, in contrast to other health promotion/self-management programs that typically reach a more homogeneous white population,[27] the *National Study* reflected minority/ethnic diversity with almost half of the population (45%) being African American, Latino, or from another minority group.

Study limitations should be acknowledged. Responses were self-reported resulting in the possibility of recall and social desirability biases. Selective attribution is another possibility. Our analyses indicate those completing both 6- and 12-month assessments were significantly different in terms of age and workshop completion than those not completing assessments. It is unknown if those experiencing greater intervention effects remained in the program or if remaining in the program helped achieve better outcomes. It is also unknown if there were any confounding impacts of health care systems on the health care outcomes in the current study, as such organizational variables were not included in the current database. As formulated in CDSMP Workshops, social and family supports are critical change agents; however, the current study was not designed to assess the specific impact of such external supports. The lack of a control group may be a threat to internal validity; however, the focus of this study was to answer basic translational research questions about the representativeness of the *National Study* participants and whether a national rollout of CDSMP could duplicate findings found in earlier randomized clinical studies. Similar to other health promotion studies, participants were primarily women, and hence generalizability was limited to the female population.

The modest ES are dependent upon the mean change scores for the study population and do not account for the likelihood that not all participants had the same symptoms or needed to improve the same behaviors. It is likely that ES within individuals were larger than across individuals. Although stronger ES may have been achieved by targeting participants, this study reports on real-world participants living in communities across America who were motivated to enroll in programs widely disseminated through existing delivery channels, independent of their specific conditions or symptoms.

Sustaining and expanding upon recent successes in scaling self-management programs will require a multipronged approach including: (1) coordinated efforts to help persons with multiple chronic conditions become familiar with and have access to these evidence-based programs; (2) improved

health policies that provide sustained financing through Medicare, Medicaid, and other health insurers; and (3) strong collaboration among federal agencies, national and regional aging and public health organizations, and the health care sector to promote a variety of self-management strategies.

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