ORIGINAL RESEARCH

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Feasibility Pilot Study of a Teaching Kitchen and Self-Care Curriculum in a Workplace Setting

Abstract: Objective. *To examine the feasibility of a prototype Teaching Kitchen (TK) self-care intervention that offers the combination of culinary, nutrition, exercise, and mindfulness instruction with health coaching; and to describe research methods whereby the impact of TK models can be scientifically assessed.* Design. *Feasibility pilot study. Subjects were recruited, screened, and consented to participate in 14- or 16-week programs. Feasibility was assessed through ease of recruitment and attendance. One-sample* t *tests and generalized estimating equation models were used to compare differences in groups.* Setting. *Workplace.* Subjects. *Two cohorts of 20 employees and their partners.* Results. *All 40 participants completed the program with high attendance (89%) and response rates on repeated assessments. Multiple changes were observed in biomarkers and self-reported behaviors from baseline to postprogram including significant (*P < *.05) decreases from baseline to postprogram in body weight (−2.8 kg), waist circumference (−2.2 in.), systolic and diastolic blood pressure (−7.7 and −6.3 mm Hg, respectively), and total cholesterol (−7.5 mg/dL). While changes in all of the aforementioned biomarkers persisted over the 12-month follow-up (n = 32), only changes in waist circumference and diastolic blood pressure remained statistically different at 12 months.* Conclusions. *These study findings suggest that a TK curriculum is feasible within a workplace setting and that its impact on relevant behavioral and clinical outcomes can be scientifically assessed.*

Keywords: nutrition education; culinary instruction; health coaching; mindfulness; exercise; optimizing behavioral change

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In the setting of dramatic increases in rates of obesity, diabetes, and other lifestyle-related chronic conditions, innovative strategies whereby individuals learn skills to improve the ways they eat, move, and think are in high demand. One such strategy involves the development of Teaching Kitchens (TKs) and TK-related curricula that include nutrition education, culinary instruction, enhanced movement and exercise, mindfulness training, and health coaching. Importantly, TKs and their related strategies and curricula are currently being designed as "learning laboratories" across multiple organizations, including universities (eg, Dartmouth, Princeton, Stanford, University of California, Los Angeles, University of California, San Diego, University of Minnesota, University of Texas Medical Branch, University of Vermont, Vanderbilt, and others), corporate worksites (eg, Google, Compass), organizations in Italy and Japan, and community settings (eg, Sampson Family YMCA in Pittsburgh and L.A. Kitchen). This pilot study was an initial attempt to describe, implement, and test the feasibility of a TK curriculum in a worksite setting.

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With obesity, type 2 diabetes, and heart disease on the rise in the United States and globally,[1-6] there is continued interest in educational programs that can predictably alter the health care trajectories of those who have already developed chronic health challenges or are at elevated risk for developing them.[3] Most diet programs show evidence of helping people reduce their cardiovascular risk through weight loss; however, the effects of various diet programs are typically short lived, and the magnitude of benefit is typically small.[4,5,7] In light of these observations, "diets" may be insufficient to bend the global trajectory with regard to chronic diseases associated with suboptimal lifestyle choices.

Innovative approaches to weight management, cardiovascular risk reduction, and improved health outcomes are emerging in the literature, and include cooking programs,[8-11] mindfulness training,[12,13] exercise[14-16] and digital activity monitoring technology,[17-19] and individualized health coaching.[20,21] Existing studies are still modest in size and have included only one or a subset of all of the above-mentioned self-care strategies. The TK self-care curriculum evaluated in this study is based on the *Healthy Kitchens, Healthy Lives*® medical education conference offered annually at the Culinary Institute of America (CIA) since 2006.[22] In 2013, Eisenberg et al studied changes in self-reported nutrition-related behaviors among health care professionals attending this conference and found statistically significant improvements between baseline and 3 months after the conference in self-reported behaviors such as frequency of cooking their own meals; frequency of vegetable, nut, and whole grain consumption; ability to assess a patient's nutrition status; and ability to advise overweight or obese patients regarding nutritional or lifestyle habits.[23] The present study customized this educational content for use by a general population to determine its potential for changing behaviors known to affect health risks.

In this article, we have 2 objectives. The first objective is to report on a feasibility study to test the hypothesis that an interdisciplinary prototype TK curriculum, which includes nutrition education, hands on cooking instruction, encouragement to enhance movement and regular exercise, mindfulness training, and personalized health coaching, is (*a*) feasible for a worksite population and (*b*) has the potential to favorably affect relevant behaviors, biomarkers, and health outcomes. The second objective is to describe research methods whereby the impact of TK models can be scientifically assessed with regard to changes in (*a*) behavior, (*b*) relevant clinical outcomes, and (*c*) costs.

Methods

Program Design and Facilities

Research staff worked with subject matter experts in the fields of nutrition, culinary arts, exercise, health coaching, and mindfulness to develop a TK self-care curriculum that combines didactic instruction with experiential learning in each of the above-mentioned areas. The program included one 2.5-hour evening meeting per week and one 5-hour Saturday meeting every other weekend over the course of the 16 weeks (80 hours for the first cohort; scaled back to 70 hours over 14 weeks for the second cohort due to scheduling constraints of the CIA). The classes for this feasibility study took place at the CIA's campus in Hyde Park, New York, for its access to auditorium-style demonstration kitchens for the weekday didactic class and hands-on TKs for the weekend participatory cooking classes.

During the weekday classes, which were facilitated by a research member (either an MD, RD, or MPH), participants watched a chef educator demonstrate cooking techniques necessary to prepare simple, healthy meals at home (eg, whole grain cookery, stock and soup basics, salad composition, and salad dressing techniques). Participants then listened to a lecture by a subject matter expert and/or participated in discussions about one of the other educational topics, including nutrition, movement, and mindfulness.

Individuals had access to all course materials through a secured online course management system and were encouraged to try the various cooking techniques and other life skills at home throughout the week. There were no dietary prescriptions, and the intake during the study was ad libitum. However, the educational components, for example, didactic instruction with regard to why certain foods should be encouraged and others discouraged and the scientific rationale for these recommendations, were conveyed in the hope of altering subjects' dietary choices and behaviors over time. With complementary access to a local gym facility and a personal activity-tracking device provided by the study, individuals were encouraged to increase their physical activity throughout the program. Participants were also matched with a paid certified health coach (through *Wellcoaches*®) who provided regular 30-minute phone calls up to once a week throughout the duration of the 14- to 16-week program in order to help participants leverage their personal motivation to change relevant behaviors. The research team created a general overview of the curriculum but made minor changes to the weekly classes based on weekly feedback from participants.

During the biweekly Saturday classes, study subjects participated in hands-on culinary lessons in a CIA TK, working in assigned teams of 5 to create the recipes demonstrated by chef instructors in the weekday classes of the previous 2 weeks. They shared a "mindful" lunch (practiced techniques to savor and appreciate eating) of the foods they prepared, and listened to a registered dietitian share tips for enjoying nutritionally balanced and properly portioned meals. They then participated in a group discussion about their experiences, challenges, and successes with each element of the program.

The program ended with a banquet event in which teams were tasked with the preparation of a menu of unique dishes (inspired by the basic techniques taught in class) to be shared with their families and "judged" by the instructional team. Participants also had the option of reading aloud excerpts from personal

statements they were asked to write to express what they had learned from the program and what they were committed to continuing.

Participants and Recruitment

Two cohorts of CIA employees, from whom chefs were excluded, were invited to participate in this pilot program, which was approved by Harvard T.H. Chan School of Public Health's Institutional Review Board. Recruitment occurred at 2 intervals, once in October 2013 for enrollment of the first cohort, and once in February 2014 for enrollment of the second cohort. Each cohort was capped at 20 participants due to kitchen constraints at the CIA.

An email was sent to the CIA's employee population with a description of the study and expectations for participation. Interested employees emailed the study coordinator to set up an appointment to be screened, and interested spouses or partners of employees were also invited to participate and be screened. To be eligible for enrollment, potential study participants had to be between the ages of 18 and 70 years, be employees, and commit to attending all of the study-related activities. We gave priority to those with self-reported metabolic risk factors and excluded anyone with a diagnosis of cancer, unstable angina or other significant cardiovascular condition, psychiatric condition requiring psychopharmacologic medications; prior or planned bariatric surgery; pregnant or planning to become pregnant over the next year; or self-reported average consumption of >14 alcoholic drinks per week. The expectations of participants were that they attend all classes, practice cooking at home, use their gym membership, and participate in health coaching sessions. There were no direct incentives beyond the free resources and food provided as part of the program.

Instruments and Outcome Measures

Feasibility was assessed through recruitment and attendance records and adherence to the data collection protocol. Participants also had regular opportunities to provide feedback, including the completion of a short evaluation form after each weekday class along with a midpoint satisfaction survey.

Biometric and self-reported behavioral outcomes were assessed 4 times: at baseline, after the 14- or 16-week educational intervention, 6 months, and 12 months. Participants had biometric screenings at each interval through a local HealthQuest facility to measure height, weight, waist circumference, blood pressure, as well as fasting glucose, total cholesterol, high-density lipoprotein (HDL), low-density lipoprotein (LDL), and triglycerides. Participants also completed, at the same 4 intervals, a packet of 6 validated instruments to assess behavioral changes in each of the domains addressed in the curriculum, including cooking frequency and confidence,[24] dietary intake,[25] exercise frequency and intensity,[26] mindful eating practices[27] and other measures of stress,[28] and perceived well-being.[29]

Because few published studies have examined changes in food purchasing from this type of nutrition education intervention, we attempted to assess the feasibility of receipt collection for tracking potential changes in food purchases over time. Participants were instructed to collect all food-related receipts for a 1-week interval at baseline, midpoint, and postprogram.

Data Analysis

Biometric and behavioral data were combined for both cohorts and analyzed using SAS version 9 (SAS Institute, Inc, Cary, NC). For continuous outcome measures, 1-sample paired Student's *t* tests were used to test for statistically significant differences between baseline and postprogram, 6 months, and 12 months. For categorical outcome measures, the differences between baseline and postprogram, 6 months, and 12 months were tested through generalized estimating equations models for repeated measures. Questionnaires were also evaluated for their usefulness in assessing the desired outcomes for inclusion in future studies.

Qualitative feedback data from baseline questions involving motivations and aspirations, the midpoint surveys, weekly feedback surveys, and personal statements were also collected. During this pilot phase, we informally used these data to help refine classes; however, we did not include formal methods for qualitative assessment.

Receipts for food purchases from stores and restaurants over a 1-week period at baseline, midpoint, and postprogram periods were collected and manually entered into a database. We created categories of food purchases into "healthier" versus "less healthy" items by modifying food lists created by French et al[30] in a similar receipt collection investigation. We adapted these food categories with the most up to date dietary data used to create the Alternative Healthy Eating Index[31] to create our own food categories (see the appendix for food category lists created for this pilot study).

Results

Feasibility Assessments

CIA employees (excluding culinary staff; n = 482) were sent 2 emails per cohort for recruitment into the study. Within 14 days of this notice, approximately 13% (n = 63) of eligible employees expressed interest in participating, and 15 indicated interest in having their spouse or partner be considered for enrollment in the study. Sixty-five people were screened, and ultimately, 40 people, or 8.3% of all eligible and 52.4% of employees expressing interest (33 employees, 7 non–employee spouses), were enrolled. The 40 study participants ranged in age from 23 to 67 years (mean = 47.5), were predominately female (70%), overweight or obese (93%), and represented a wide range of work departments (including facilities/housekeeping, financial aid, residence life, human resources, admissions, career services, and others) and individual cooking abilities and self-care aspirations. At baseline, most

Table 1.

Baseline Characteristics of Study Participants.

	Cohort 1	Cohort 2
N	20	20
Mean age (range)	47 (23-67)	48 (31-66)
% Female	75%	65%
Number of singles	14	10
Number of couples	3	5
Children at home	40%	25%
Obese (BMI > 30)	11 (55%)	14 (70%)
Overweight or obese (BMI > 25)	18 (90%)	19 (95%)
Elevated waist circumference (>35 in. women, >40 in. men)	15 (75%)	14 (70%)
High blood pressure (≥130/85 mg/dL)	12 (60%)	5 (25%)
High total cholesterol (≥200 mg/dL)	7[a] (37%)	7 (35%)
High triglycerides (≥150 mg/dL)	7[a] (37%)	5 (25%)
High fasting blood sugar (≥100 mg/dL)	4[a] (21%)	5 (25%)
Metabolic syndrome[b]	8[a] (42%)	3 (15%)
No known metabolic risk factors	4 (20%)	5 (25%)

Abbreviations: BMI, body mass index; HDL, high-density lipoprotein.
[a]N = 19, as the local laboratory was unable to process the baseline blood work of one study subject.
[b]Metabolic syndrome Is clinically classified as having at least 3 of the 5 metabolic risk factors: elevated waist circumference (>35 in. women, >40 in. men), high triglycerides (≥150), low HDL (≤40 men, ≤50 women), high blood pressure (≥130/85), high fasting blood sugar (≥100).

participants (80%) had at least one elevated cardiovascular risk factor and 11 (27.5%) had metabolic syndrome, while 22.5% had no known risk factors. There were 8 couples that jointly participated in all classes, and about one third of participants had children living at home (Table 1).

Program completion was 100% for both cohorts with no dropouts and high attendance rates (86% in Cohort 1, 92% in Cohort 2). Response rates for completing pre-post questionnaires and obtaining blood tests were ~100% for all measures (Note: HDL was only collected for Cohort 2), and dropped to 90% at 6 months and 80% at 12 months, owing in part to 4 subjects changing employment during the follow-up period.

Biometric Assessments

Pilot biometric data from baseline to 14 to 16 weeks (Table 2) suggested statistically significant ($P < .05$) decreases in body weight, BMI, waist circumference, systolic and diastolic blood pressure, and total cholesterol in our sample of 40. Changes in triglycerides, HDL, and LDL trended down, while fasting glucose increased slightly, but none of these measures was statistically significantly different at the end of the educational intervention.

Biometric data at 6 months (n = 37) suggested a persistence of significant ($P < .05$) changes from baseline for weight (−4.2 kg [SD 6.5]), systolic blood pressure (−10.08 mm Hg [SD 119.07]), diastolic blood pressure (−8.24 mm Hg [SD 11.72]), and waist circumference (−3.24 in. [SD 3.09]); but were no longer statistically significant for changes in total cholesterol (−5.22 mg/dL [SD 20.45]; $P = .13$). Changes in triglycerides ($P = .22$), HDL ($P = .78$), LDL ($P = .40$), and blood glucose ($P = .73$) remained nonsignificant.

At 12 months (n = 32), only changes from baseline in diastolic blood pressure (−4.25 [SD 9.37]) and waist circumference (−3.21 in. [SD 3.22]) remained statistically significant ($P < .05$). Changes continued to trend downward as compared with baseline, but were no longer statistically significant for decreases in weight (−1.3 kg [SD 6.33]; $P = .26$), and systolic blood pressure (−4.63 mm Hg [SD 17.21]; $P = 0.14$) at 12 months; and changes in other biometric measures remained nonsignificant.

Behavioral Change Assessments

Overall, we observed self-reported changes in a range of behaviors toward more desirable health habits taught in our program as assessed by the outcome instruments used (Table 3). Table 4 summarizes responses from the questionnaire regarding cooking patterns. These show improvements from baseline to end of program in the following measures: cooking meals from scratch at home more often, cooking convenience and ready-made meals less often, reading nutrition labels on purchased foods more often, and feeling more confident cooking, following a recipe, tasting new foods, and cooking new foods and recipes. All of these improvements persisted but appeared to have diminished slightly at 6 and 12 months.

We collected approximately 400 food purchase receipts in total from all of the participants. Ninety-seven percent of the households submitted at least one food receipt; however, the complete receipt

Table 2.

Changes in Biometrics at Baseline and Immediate Postintervention (16 or 14 Weeks) for Both Cohorts (n = 39[a]).

Outcome	Baseline Mean (SD)	Postintervention Mean (SD)	Mean Change	% Change	*P* Value[b]
Weight (kg)	92.7 (25.7)	89.9 (24.6)	−2.8 (4.0)	−1.2%	<0.05
BMI (kg/m^2)	33.3 (8.4)	32.3 (8.1)	−1.0 (1.5)	−2.7%	<0.05
Waist circumference (in.)	41.3 (8.0)	39.5 (7.9)	−2.2 (2.8)	−4.6%	<0.05
SBP (mm Hg)	134.3 (20.0)	126.5 (17.5)	−7.7 (15.5)	−5.6%	<0.05
DBP (mm Hg)	82.0 (10.2)	75.7 (11.9)	−6.3 (9.1)	−7.9%	<0.05
Total cholesterol (mg/dL)	187.1 (41.7)	179.5 (41.9)	−7.5 (23.1)	−4.4%	<0.05
Triglycerides (mg/dL)	124.5 (93.8)	112.3 (53.5)	−12.2 (70.1)	−9.8%	0.28
HDL (mg/dL)	52.4 (17.5)	50.5 (14.3)	−1.9 (4.9)	−3.6%	0.10
LDL (mg/dL)[c]	105.0 (34.5)	102.4 (33.6)	−2.6 (14.7)	−2.5%	0.44
Fasting glucose (mg/dL)	110.0 (53.3)	112.3 (53.7)	2.4 (13.5)	+2.1%	0.28

Abbreviations: BMI, body mass index; SBP, systolic blood pressure; DBP, diastolic blood pressure; HDL, high-density lipoprotein; LDL, HDL, low-density lipoprotein.

[a]N = 39 instead of 40 because measurements were not available for one participant due to a logistical lab error.

[b]The baseline to postintervention difference for continuous variables were tested using 1-sample paired Student's *t* tests. $P < .05$ indicates statistically significant differences.

[c]LDL measures were only taken in Cohort 2, N = 20.

Table 3.

Questionnaires Used to Assess Behavioral Change.

Domain Assessed	Reason(s) for Choosing This Instrument	Suggestive Observations From Pilot Study Data[a]	Questionnaire Recommended for Use in Future Studies and Rationale
I. Dietary Intake/Eating Profile[25]	Short, simple 21-item validated tool with aggregate score that distinguishes characteristics of a healthy versus less healthy diet.	Increased consumption of dark leafy greens, fish/seafood, and whole grains, and less beef/pork/lamb, processed meat, refined grains, and baked goods.	Questions did not capture as extensive dietary changes as encouraged in our program (eg, eating freshly prepared whole foods vs processed food). We will consider a modification of the assessment tool we used, possibly the "blinded" Food Frequency Questionnaire[38] along with a 3-day food diary.

(continued)

Table 3. (continued)

Domain Assessed	Reason(s) for Choosing This Instrument	Suggestive Observations From Pilot Study Data[a]	Questionnaire Recommended for Use in Future Studies and Rationale
II. Cooking Frequency and Confidence[24]	Limited number of validated cooking assessments available. This 17-item tool captures changes in cooking frequency and confidence in 7 questions.	Cooked convenience/ready-made meals less often. Read food labels more often. More confident about: ability to cook from basic ingredients, following a simple recipe, tasting new foods, and preparing and cooking new foods and recipes.	Questions clear and easy to understand; however, some questions in this instrument were not specific to skills taught in the program. Consider changing to assess self-efficacy and attitudes toward cooking.[39]
III. Exercise Frequency & Intensity[26]	Validated, simple and widely used assessment tool to measure MET-hours/week.	Suggestive increases in: METs-hour week, walking pace, number of days per week of exercise, number of flights of stairs climbed daily.	Consider changing to International Physical Activity Questionnaire for Adults[40] to assess more specific exercise and movement habits; however, more complete assessments and data tracking using wearable devices to be considered.
IV. Perceived Stress[28]	Validated, widely used, 10-item tool to assess changes in the levels of experienced stress.	Suggestive decrease from higher stress at baseline to average stress levels at the end of the 14- to 16-week program.	Questions easy and interpretable from study participant and analysis perspective. Continue to use this instrument.
V. Well-being[29]	Validated 26-item tool used in similar health intervention studies to capture 6 categories of physical and emotional well-being.	Suggestive improvements in: perceived sense of disease risk, physical response to diet, meal preparation and time costs, inconvenience for family and outside of home, and food deprivation and dissatisfaction.	Questions not directly relatable to lessons taught in our program. Data collected were not clearly interpretable. Consider changing to RAND 36-Item Short Form Health Survey[41] using subscales for general health, energy/fatigue, and emotional well-being.
VI. Mindful Eating[27]	Validated 28-item tool with one aggregate score that focuses specifically on mindful eating practices.	No average changes in mindful eating as assessed by total score using this instrument. This lack of change in scores was inconsistent with subjective descriptions by participants.	Continue to use this instrument for now as it is the only validated mindful eating tool currently available; however, a more global assessment of mindfulness may be preferable.

[a]Pilot study was not powered to provide stable estimates from statistical analyses. These results are only suggestive of trends seen in this sample of 40 from baseline to end of the intervention at 16 or 14 weeks. Many of these suggestive trends were no longer observed or lessened throughout the 12-month follow-up period. Identical questionnaires were used at all 4 time points and responses may not reflect self-perceived changes from baseline, but rather from the last time subjects were asked the same question. In future studies, we may develop our own additional questionnaires, such as surveys to assess perceived creativity and work-life balance; and wording of all instruments may explicitly ask respondents to compare their current behaviors or perceptions to those assessed previously (ie, at baseline or as compared with specific prior interval assessment).

Table 4.

Self-Reported Cooking Frequency and Confidence in the Kitchen.

Frequency/Confidence Performing Task, n = 40	Time of Assessment	% Never/Not at All	% Sometimes/ Somewhat	% Always/Very	# of Responses
1. How often do you cook convenience and ready-made meals	Pre	20.5	66.7	12.8	39
	Post	45.0	55.0	0	40
	6 months	50.0	50.0	0	36
	12 months	37.5	53.1	9.4	32
2. How often do you prepare and cook a main meal from basic ingredients	Pre	18.4	55.3	26.3	38
	Post	0	46.2	53.9	39
	6 months	0	55.9	44.1	34
	12 months	0	56.3	43.75	32
3. How confident do you feel about being able to cook from basic ingredients	Pre	10.3	38.5	51.3	39
	Post	0	17.5	82.5	40
	6 months	0	2.8	97.2	36
	12 months	0	12.5	87.5	32
4. How confident do you feel about following a simple recipe	Pre	0	30.8	69.2	39
	Post	0	5.1	94.9	39
	6 months	0	5.6	94.4	36
	12 months	0	6.3	93.8	32
5. How confident do you feel about tasting new foods	Pre	0	41.0	59.0	39
	Post	0	17.5	82.5	40
	6 months	0	25	75	36
	12 months	0	21.9	78.1	32
6. How confident do you feel about preparing and cooking new foods and recipes	Pre	5.13	46.2	48.7	39
	Post	0	25	75	40
	6 months	0	22.2	77.8	36
	12 months	3.1	21.9	75	32
7. Do you read nutrition labels on purchased foods	Pre	15	57.5	27.5	40
	Post	0	27.5	70	40
	6 months	0	25.7	74.3	35
	12 months	0	34.4	65.6	32

collection protocol requiring a full week of all food and restaurant receipts was only completed by 60% of the participants, making results from any of the analyses highly prone to selection bias and therefore our analyses are not reported. Additionally, we found our receipt collection methodology, with paper copies of receipts from supermarkets, restaurants, and convenience stores, cumbersome. Moreover, the lack of computerized data entry systems made this approach inefficient and of questionable reliability. Regular use of a personal activity monitoring device (pedometer) throughout the duration of the program varied with 65% of Cohort 1 compared to 100% of Cohort 2 wearing the devices. Seven participants lost the device and received a replacement. In addition, 90% (n = 36) of participants accessed the gym facility at least one time, but frequency of use varied with less than half (45%, n = 18) of participants having accessed the gym 10 or more times during the study period. (Note: Some subjects belonged to other gym facilities, precluding their use of the gym facility that was offered as part of this pilot study.) Ten individuals (25%) continued their membership (at their own expense) at the participating gym after the program.

Participants were matched with 1 of 4 health coaches based on logistics of scheduling and were encouraged to talk with their health coach once a week. The majority (73%) of all participants consulted with their health coach more than every other week for 14 to 16 weeks, with few missed appointments or late cancellations (<5%). The feedback with regard to health coaching was positive as multiple participants conveyed the perception that health coaches customized the program for each individual by (*a*) helping them identify personal motivations and (*b*) talking through personalized strategies for implementing new life skills learned during the educational intervention.

Discussion

To our knowledge, this is the first study to investigate the feasibility of an interdisciplinary approach to improved health and wellness that includes hands-on culinary instruction, mindfulness training, and health coaching, in addition to nutrition education and physical activity promotion. We conducted this pilot with the involvement of CIA (nonculinary) employees as proxies for employees at other self-insured organizations across the United States. Our results suggest that this prototype TK self-care curriculum was feasible in this particular workplace setting given the ease of recruitment, 100% program completion, high attendance, and high response rates on repeated assessments. It is important to note that this was the first implementation of this prototype TK program and therefore not necessarily representative of all potential TK models in terms of choice of facilities, core content, feasibility and effectiveness.

It is also worth noting that this model, unlike interventions that are based on restrictive "diets," allowed for an ad libitum food intake on the part of TK trainees, thereby allowing them to establish new dietary habits in the absence of strict prohibitions and the concomitant feelings of perceived deprivation which often accompany many "diets." As such, this prototype model may be of interest to individuals who are not interested in restrictive "diets," or those for whom "diets" have not led to successful and sustained behavioral and clinical change.

This program was well received by the study subjects most likely because of its interdisciplinary approach, incorporating both didactic and experiential learning in a group setting, and access to individualized health coaching. Little is known about the combined effect of multiple components and/or their relative contribution to observed changes in relevant outcomes. A growing body of research is showing the positive effects of health coaching,[32] and we feel that this is a critical component of future models of sustainable, enhanced behavior change. Additionally, the US National Board of Medical Examiners has partnered with the National Consortium for Credentialing Health & Wellness Coaches to create a certification for health coaches,[33] thereby setting core competency standards in an area relevant to the future refinement of TK programs.

As we observed in our pilot, physiological and behavioral changes that study subjects experienced during the intervention appeared to diminish over the course of 12 months and this, in hindsight, may have been due to the lack of built-in follow-up support after month 4 in the initial prototype protocol. This was due to financial limitations of the pilot. Prior studies have indicated that ongoing reinforcement of learned behavioral change is essential to the formation of sustained change.[32] More built-in follow-up opportunities, along with additional ongoing offerings of a TK program for employees in a worksite setting, may serve to engage additional employees and thereby shift a corporate worksite in the direction of enhanced, and more sustained, self-care and wellness, thereby promoting a "culture of health."

This prototype TK curriculum, which was designed with extensive input from professional chef educators at the CIA, included the conceptual notion of "technique driven, recipe inspired" culinary instruction. This is typical of professional culinary instruction and was viewed as a key asset to this novel curricular model. Instead of teaching trainees how to make an individual "recipe," each week was focused on 1 or 2 essential culinary "techniques" (such as how to make a soup, or a whole grain, or a salad and salad dressing) with the goal of showcasing a core technique instead of an individual recipe using that technique. Once the technique had been applied to any singular recipe, trainees were shown and encouraged to apply this core technique to variations of the initial recipe (ie, a range of soups, salads, and whole grain dishes) but with a customization of essential ingredients, spices, flavorings, and presentations. As such, this "technique driven, recipe inspired" aspect of this TK prototype curriculum was a unique feature of this prototype TK curriculum.

While subjects in this pilot study stated that their culinary skills had improved over the course of 14 to 16 weeks (and investigators and chefs overseeing the pilot observed this to be true), we did not collect objective data (ie, photos, videos, blind tastings) to confirm these self-reported data. There is currently no validated tool whereby culinary skills, competencies, and proficiencies—or their improvement over time—can be objectively measured. Instead, the current state of the science relies entirely on self-report, which may be highly unreliable.

Importantly, this is a limitation of this study and all current studies involving culinary instruction. Moreover, this highlights the need for the development of such evaluative tools, ideally with the combined input of researchers, trained chefs, and relevant experts in emerging technologies, for example, computerized visual recognition platforms.

Regarding the tracking of physical activity, the personal activity monitors we used were in their early phases of development and, as such, were sometimes cumbersome for the participants to wear. It was not uncommon for a participant to lose them. Additionally, the format by which the data were collected was difficult to manipulate and incomplete (because of lost monitors). We therefore chose not to analyze these data, but rather to work on further refinements of this aspect for future TK trials. Specifically, future studies will benefit from emerging IT platforms that allow for data capture from all commercially available energy tracking devices, regardless of manufacturer, and these will be routinely employed in clinical trials involving counseling in the areas of movement and exercise.

An additional limitation of this study was the setting of the CIA, where employees were recruited as proxies for employees at other corporate organizations and worked in proximity to kitchen facilities that are not generally representative of facilities currently available at worksites, schools, universities, and community-based venues. Use of the CIA's demonstration and TKs raises the question as to whether this model is feasible and replicable elsewhere and, therefore, generalizable. As dozens of US health care facilities and corporate worksites have already built demonstration and/or TK facilities, we see this as a trend that may allow for an expansion of this line of inquiry for use by employees, K-12 and university students, patients, and community-based populations nationwide.[3,34,35]

While this pilot made use of a built-in kitchen, another approach would be to refine the curriculum to be delivered using portable, or "pop-up," kitchen facilities consisting of inexpensive cook tops, portable ovens, and access to cafeteria sinks and refrigerators. This "pop-up" approach, ideally suitable for any worksite (or school/community venue) with a cafeteria, could potentially address relevant concerns about the need to minimize start-up costs and increase the program's scalability and generalizability at sites that do not envision the build out of expensive, built in, kitchen facilities.

In our case, the cost of developing and implementing this pilot curriculum, including research personnel time in addition to culinary instruction and food costs, was prohibitively expensive (ie, several hundred thousand dollars over 2 years) and only made possible due to generous donor support and in-kind contributions by the coauthors' partnering institutions. The bulk of these expenses, however, related to the research infrastructure (such as salary support for co-investigators) necessary to recruit and follow study participants over 12 months. By comparison, the food costs per subject were estimated at $400 per person per cohort.

Further refinement of this prototype curriculum will need to explore how it can be made more cost-effective and readily accessible to larger audiences using videotaped and other web-based components. The curriculum will also need to be customized for different high- and low-risk populations, with or without spousal/partner participation, across different workplaces, kitchen facilities, socioeconomic populations, and community settings. Lastly, future evaluations will benefit from the incorporation of relevant financial data to assess potential cost-saving benefits for employees and their third-party payers, some of which may be enhanced by employee incentive programs as are occurring more frequently across the corporate landscape.[36,37] These future refinements are precisely the goals of the recently launched Teaching Kitchen Collaborative, which involves 32 member organizations with TK programs.[34]

This TK intervention should be viewed as an "initial prototype" with the understanding that there will likely be a range of TK models that, over time, can and should be implemented, evaluated, and refined for their application to different populations, including (*a*) patients with increased cardiovascular risk; (*b*) employees with and without chronic disease at worksites; (*c*) students in K-12, college, and university settings; (*d*) retirees; (*e*) community populations; (*f*) military and VA populations, and others. In addition, TK curricula, if implemented and shown to be replicable and effective, should, ideally, be customized in order to meet the specific needs, aspirations, and financial requirements of each individual population and setting. This portfolio of research is being planned by the recently launched Teaching Kitchen Collaborative.[34]

Our results suggest that a TK and self-care curriculum involving hands-on culinary education, mindfulness training, health coaching, nutrition instruction, and exercise promotion is feasible and that the impact of TK programs on relevant behavioral and clinical outcomes can be measured. Given trends with regard to obesity and diabetes, and in light of societal aspirations to move from a fee for service to a capitated scheme of medical reimbursement, thereby incentivizing patients, providers, and payers to keep people well,[35] additional research involving the models and parallel curricula being devised by additional groups with TKs is recommended.

In terms of future research in this area, it will be important to demonstrate that TK curricula are or are not (*a*) replicable from site to site; (*b*) adaptable to a range of study populations; (*c*) capable of demonstrating predictable changes in behaviors, clinical outcomes, and, ideally, costs; (*d*) superior to existing, popular "diets" in terms of changes over time and sustainability of these changes over time; and (*e*) capable of demonstrating sufficient return on investment to warrant third party payment and/or inclusion in employee benefits.

Appendix

List of Food Categories Created for This Pilot Study.

Meats and Eggs	
Leaner meats: more healthy	Poultry, fish
Eggs and egg substitutes: more healthy	Shell eggs, egg beaters, carton egg whites
Red or processed meats: less healthy	Beef, pork, lamb, lunchmeat, hotdogs
Vegetables (including greens, tomatoes, avocados)	
Whole vegetables: more healthy	Fresh, canned, frozen vegetables
Modified vegetables: less healthy	Vegetables in cream sauce, fried potatoes
Fruits	
Whole fruits: more healthy	Fresh, canned, frozen, dried unsweetened fruits
Modified fruits: less healthy	Canned in syrup, applesauce, sweetened fruits
Grains	
Whole grain products: more healthy	Whole grain bread, cornmeal, plain popcorn
Simple carbohydrate products: less healthy	White bread, sugary cereals, pie crusts
Beans/Legumes/Pulses	
Whole products: more healthy	Dry or canned beans, peas, chickpeas
Modified products: less healthy	Refried beans, baked beans
Nuts/Seeds	
Whole products: more healthy	Walnuts, sunflower seeds, natural peanut butter
Modified products: less healthy	Honey-roasted peanuts, peanut butter with added sugars
Fats	
Plant-based fats: more healthy	Olive oil, canola oil, vegetable shortening
Animal-based fats: less healthy	Butter, lard
Trans fats: less healthy	Margarine
Snacks and Sweets	
Salty snacks: less healthy	Chips, pretzels, flavored popcorn
Sweetened snack foods: less healthy	Cookies, donuts, ice cream, sweetened yogurt

(continued)

Appendix. (continued)

Beverages	
Noncaloric beverages: more healthy	Water, unsweetened tea, coffee
100% fruit/vegetable juices: more healthy	V8, Tropicana orange juice
Sugar-sweetened beverages: less healthy	Sugary sodas, sweetened tea
Premade Foods	
Prepackaged entrees: less healthy	Frozen pizza, canned soup
Deli foods (otherwise unclassifiable): less healthy	Coleslaw, potato salad
Eating Out (for counts and dollar amounts only)	
Leaner meat or vegetarian entrée: more healthy	Grilled chicken salad, veggie burger
Side dish, fried: less healthy	French fries, onion rings
Appetizer: less healthy	Egg roll, mozzarella sticks
Red or processed meat entrée: less healthy	Hamburger, pork chop
Side dish, nonfried: more healthy	Cooked vegetable, side salad
Dessert/sweetened snacks: less healthy	Milkshake, doughnut

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