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# Retrospective Evaluation of a Dietitian-led Corporate Wellness Program

Catherine Johnston

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December, 2019

To the Dean of Graduate School:

We are submitting a thesis written by Catherine N. Johnston entitled Retrospective evaluation of a dietitian-led corporate wellness program.

We recommend acceptance in partial fulfillment of the requirements for the degree of Master of Science

[Redacted Signature]

Wanda M. Koszewski, PhD, Thesis Advisor

[Redacted Signature]

Hope Lima, PhD, Committee Member

[Redacted Signature]

John Boyd, PhD, Committee Member

[Redacted Signature]

Adrienne McCormick, Dean, College of Arts and Sciences

[Redacted Signature]

Jack E. DeRochi, Dean, Graduate School

RETROSPECTIVE EVALUATION OF A DIETITIAN-LED CORPORATE  
WELLNESS PROGRAM

A Thesis  
Presented to the Faculty  
Of the  
College of Arts and Sciences  
In Partial Fulfillment  
Of the  
Requirements for the Degree  
Of  
Master of Science  
In Human Nutrition  
Winthrop University

June, 2019

By

Catherine Johnston RD, LD, CPT

## ABSTRACT

**BACKGROUND:** Despite national health and wellness standards, many adults are not compliant with a healthy lifestyle, especially in the southeastern region of the United States. Effective corporate wellness programs are a mutually beneficial method of promoting health among this population.

**OBJECTIVE:** The aim of this study was to evaluate effectiveness of a Registered Dietitian (RD) developed 12-week corporate wellness program for improved health parameters, nutrition knowledge scores and comparable retention rates.

**METHODS:** Outcomes from two consecutive wellness programs offered at a large corporation in the southeast United States were retrospectively analyzed. Program participants were employees or dependents on the corporate insurance plan. Participants met with an RD for a pre-program (n=100), attended nine weeks of wellness classes, and completed a post-program assessment with the RD week 12 (n=80). Biometric, anthropometric and nutrition knowledge data was collected pre- and post-program.

**STATISTICAL ANALYSES:** SPSS version 19.0 was used for data entry and analysis. Individual paired samples *t*-tests were used to assess biometrics, anthropometrics and nutrition knowledge cores, simple linear regression and Pearson's correlation assessed the impact of program intervention on health parameters.

**RESULTS:** There were significant improvements of nutrition knowledge, and in triglycerides (TG), body weight, body mass index (BMI), waist circumference (WC), fat mass (FM), body fat percentage (BFP), and HgA1c ( $p < 0.05$ ). There was an attrition rate of six percent for the class and 20 percent for the 12-week program.

**CONCLUSIONS:** The findings in this study suggest that an RD-led corporate wellness program was well-received, led to biometric improvements and increased nutrition knowledge by employees and dependents, and had a comparable attrition rate at a corporation in the southeastern United States.

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# TABLE OF CONTENTS

<b>LIST OF TABLES.....</b>	<b>vi</b>
<b>LIST OF FIGURES .....</b>	<b>vii</b>
<b>LIST OF APPENDICES .....</b>	<b>viii</b>
<b>INTRODUCTION.....</b>	<b>1</b>
United States Diet and Exercise Standards .....	1
Diet and Exercise in the Southeastern United States .....	3
Lifestyle Impact in the Southeastern United States .....	6
Impact of a Healthy Lifestyle .....	7
Wellness Program Purpose .....	9
Cost Savings in Workplace Wellness .....	11
Dietitian-Led Wellness Initiatives .....	12
Specific Aims.....	13
<b>METHODS .....</b>	<b>14</b>
Participant Recruitment .....	14
Program Overview .....	14
Program Incentives .....	19
Knowledge Assessment .....	20
Post-Program Evaluation .....	20
Statistical Analysis.....	20
<b>RESULTS .....</b>	<b>21</b>
Attrition.....	21
Anthropometric and Biometric Results .....	24

Knowledge Assessment Results .....	27
Subjective Results .....	27
<b>DISCUSSION .....</b>	<b>29</b>
Subjective Outcomes.....	29
Anthropometric Outcomes.....	29
Biometric Outcomes.....	30
Retention.....	31
Nutrition Knowledge Outcomes.....	32
Recommendations for Future Programs.....	32
<b>LIMITATIONS OF RESEARCH.....</b>	<b>35</b>
<b>IMPLICATIONS AND CONCLUSIONS .....</b>	<b>36</b>
<b>REFERENCES.....</b>	<b>39</b>

## LIST OF TABLES

1. Weekly Topics .....	17
2. Anthropometric and Biometric Results at Baseline and Final Assessment.....	26
3. Pre- and Post-Program Knowledge Assessment Results .....	28



## **LIST OF FIGURES**

1. Flowchart of Participants Completing the Program.....	22
2. Weekly Program Absences .....	23
3. Anthropometric/Biometric Results Pre- and Post-Program .....	25

## LIST OF APPENDICES

<b>A</b>	Institutional Review Board Letter of Approval .....	59
<b>B</b>	Biometric and Anthropometric Tools .....	60
<b>C-1</b>	Smoothie Recipe and Materials from Week 8 .....	61
<b>C-2</b>	Yogurt Parfait Recipe and Materials from Week 8 .....	62
<b>D</b>	Validated Nutrition Knowledge Assessment .....	63
<b>E</b>	Anonymous Program Evaluation Survey.....	67
<b>F</b>	Comparison of Pre- and Post- Program Charts .....	68

## **INTRODUCTION**

### **United States Diet and Exercise Standards**

The Dietary Guidelines for Americans (DGA) are published every five years as a reflection of current scientific recommendations and is a collaboration between the U.S. Department of Health and Human Services (HHS) and the U.S. Department of Agriculture (USDA).<sup>1</sup> The 2015-2020 Dietary Guidelines for Americans contain the Dietary Reference Intakes (DRI) for nutrients as well as set key standards for healthy eating patterns: consistently including nutrient-dense foods, limiting added sugar, saturated fat and sodium intake, and supporting healthy eating for every person in all settings. Nutrient-dense foods allow for individuals to better meet DRIs without exceeding calorie intake requirements. Limiting added sugar to less than 10% of calorie intake is recommended to obtain calories from a variety of nutrient-dense sources to meet both macro- and micronutrient needs. Foods high in added sugar tend to be low in other nutrients. Reduction of sodium and saturated has been found to reduce risk of cardiovascular disease (CVD). The American Heart Association (AHA) recommends limiting saturated fat intake to 5-6% of calories to prevent raising low-density lipoprotein cholesterol (LDL) and the DGA recommends saturated fats be limited to <10% of calories,<sup>2-3</sup> although recent research has challenged these recommendations with a suggested emphasis on overall quality of diet, focusing on minimally processed foods, fruits, vegetables, unsaturated fats and whole grains and limiting excess sugar and sodium to reduce CVD risk.<sup>4-5</sup> Focusing on making nutrition available to everyone throughout the lifespan elicits lifelong emphasis on wellness which can bring about long-term disease prevention.<sup>2</sup>

The USDA also provides a visual food guide, MyPlate, that replaced the MyPyramid food guide in 2011.<sup>6</sup> Both the Dietary Guidelines and MyPlate provide consistent, evidence-based recommendations for a healthy eating pattern. These programs recommend a variety of vegetables and fruits, at least half of grains coming from whole grains, fat-free or low-fat dairy, a variety of lean protein and healthy oils and limited saturated fat, *trans* fats, added sugars and sodium, and alcohol intake.<sup>2</sup> Higher consumption of vegetables and fruits are associated with lowered risk of many chronic diseases and cancer incidence, whole grain intake has been related to lower body weight and reduced CVD risk, and dairy has been linked with improved bone health. *Trans* fats and higher saturated fat content of some meats and oil may increase risk for CVD. Healthy fats, defined by the Dietary Guidelines as unsaturated fats, supply essential fatty acids, antioxidants, and help with vitamin absorption<sup>2</sup>

The federal government's plan for promoting a healthier nation is entitled 'Healthy People 2020'. The goals of the initiative are to "attain high-quality, longer lives free of preventable disease, disability, injury, and premature death; achieve health equity, eliminate disparities, and improve the health of all groups; create social and physical environments that promote good health for all; and promote quality of life, healthy development, and healthy behaviors across all life stages."<sup>7</sup> The Centers for Disease Control and Prevention (CDC) and the National Heart, Lung, and Blood Institute (NHLBI) specifically track the 24 objectives related to heart disease and stroke. These are the number one and five leading causes of death in the United States, and the top two causes related to lifestyle.<sup>8</sup> The major controllable risk factors for heart disease and stroke are: high blood pressure, high cholesterol, cigarette smoking, diabetes, unhealthy diet,

physical activity and incidence of overweight/obesity.<sup>9</sup> The Healthy People 2020 initiative cites physical, social and environmental factors as contributors to heart disease and stroke including access to educational opportunities, availability of and access to nutritious foods, community support and resources, and worksite health based on findings from the Community Preventative Services Task Force.<sup>4,10</sup>

The 2008 HHS federal physical activity guidelines recommend that adults perform a minimum of 150-300 minutes weekly of moderate intensity physical activity or 75 minutes per week of vigorous physical activity, with additional muscle-strengthening exercises at least twice weekly for the purpose of chronic disease prevention and health promotion.<sup>11-12</sup> Basic guidelines encourage all Americans to ‘move more and sit less’ to reduce risk of disease.<sup>13</sup> Evidence-based benefits of adequate physical activity include: cancer prevention; reduced dementia, heart disease, stroke, hypertension, and type 2 diabetes risk; improved bone health, physical function and quality of life; and weight management.<sup>14</sup> Regular physical activity may also help manage many pre-existing health conditions and has indirect benefits, such as improved sleep quality and improved nutrition.<sup>14-15</sup>

### **Diet and Exercise in the Southeastern United States**

Origination of food patterns in the southeast are closely linked to the region’s history and has African, European and Native American influences, with a strong influence coming from African slaves.<sup>16</sup> Barbeque, cornbread, collard greens in pork fat, sweet potatoes, and fried okra are a few of the foods that were developed during the time of slavery and continue to have a major influence in southern cuisine today.<sup>16</sup> The Civil

War also heavily impacted the southern diet, as many crops were destroyed and trades disrupted, leading to dependence on salted pork (“hardtack”), bacon, cornmeal, molasses, peas, eggs, some vegetables, and rice.<sup>17</sup> As the war progressed, the food supply dwindled and forced southerners to learn to make edible dishes of what was available for consumption<sup>17-18</sup>

The Southeast region of the United States consists of Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee.<sup>19</sup> Some studies include Arkansas and Louisiana in regional research. Per Economic Research Services 2013-2017 survey, poverty incidence is concentrated in Southeastern non-metro counties which can be indicative of food insecurity, lower education status and poor overall diet quality.<sup>20</sup> Researchers found the most impoverished areas were the Mississippi Delta, Native American areas, and the Appalachians.<sup>20</sup> The modern-day southern diet has been characterized by inclusion of added saturated fats, fried foods, eggs, organ meats, processed meats and sugar-sweetened beverages by the 2015 Reasons for Geographic and Racial Differences in Stroke longitudinal study (REGARDS).<sup>21</sup> This diet pattern contrasts with the Dietary Guidelines and MyPlate recommendations due to being high in saturated fat, high-fat meats, added sugar and salt, and low in fruits and vegetables. This discrepancy leads to increased rates of chronic disease, such as CVD and cancer, in the southeastern region due to cyclical poverty and resulting poor diet quality.<sup>20-21</sup>

Per the Nutrition Examination Survey III (NHANES-III) self-reported intake data, the southern region had the highest amount of sodium intake, approximately 3.4 grams per day, with inadequate intake of cardioprotective micronutrients, such as potassium, calcium and magnesium which have been correlated with reduced blood pressure.<sup>22-24</sup>

Fiber, vitamin A, C, B<sub>6</sub>, riboflavin, and niacin consumption was also reported to be lowest in the south, which is significant due to the many key roles these nutrients play in overall health and wellbeing.<sup>25</sup> Fiber helps reduce blood cholesterol and may reduce CVD risk; vitamin A is critical for optimal function of eyes and skin; vitamin C is a key factor in immune function as well as iron absorption;<sup>26</sup> vitamin B<sub>6</sub> is hypothesized to play a key role in reduction of CVD risk; riboflavin may play a role in cancer prevention; and niacin has been found to improve blood lipid profiles<sup>27-29</sup>. Saturated, monounsaturated, polyunsaturated fatty acids, and cholesterol intake was reported to be highest in the south, which is likely due to the overall high dietary fat consumption containing a variety of fatty acids.<sup>25</sup> Dietary cholesterol intake has been inconsistently positively correlated with high blood low-density lipoprotein cholesterol (LDL), but this may depend on genetic response.<sup>30</sup>

The CDC reports that only 22.9% of adults ages 18-64 in the United States achieve the recommended guidelines for physical activity. All southeastern states, including Arkansas and Louisiana, fell below the United States average, with a regional average of 18%. Inadequate physical activity incidence was concentrated in the southeast based on the National Health interview Survey 2010-2015 with seven out of 12 states with ‘significantly lower than U.S.’ physical activity average located in the southeast<sup>31</sup> Only one southeastern state, North Carolina was classified as ‘less than but not significantly different from’ the national average of 27.2% with 22.4% of adults meeting both aerobic and muscle-strengthening federal guidelines,<sup>11</sup> while all other states (Mississippi 13.5%, Kentucky 14.6%, South Carolina 14.8%, Tennessee 17.1%, Alabama

19.3%, Georgia 20.2%, and Florida 21.1%) were labeled ‘significantly below national average’.<sup>31</sup>

### **Lifestyle Impact in the Southeastern United States**

Regional health disparities have been blamed for many of the health crises in the Southeastern United States. Predictors for increased CVD risk are high in this region—smoking,<sup>32</sup> obesity, physical inactivity,<sup>31</sup> prevalence of diabetes,<sup>33</sup> poor diet,<sup>21</sup> lack of health insurance and poor access to medical care.<sup>33</sup> Social determinants have also been implicated for the poor health status of the southeast region when compared with the rest of the United States, including low percentage of adults with college degrees, higher rates of unemployment and poverty and a comparatively large amount of racial/ethnic diversity: 58.2% white, 19.3% black, 16.6% Hispanic, 3.2% Asian, 2% mixed, 0.8% other.<sup>34-36</sup>

The Southeastern United States has a significantly increased risk of CVD mortality when compared with other parts of the country, demonstrating a regional disparity in health status.<sup>33</sup> This region has been referred to as the “stroke belt” because rates of stroke incidence have historically been 10% higher than the national average.<sup>37</sup> The highest rate of heart failure is also concentrated in the southeast, leading some researchers to ascribe the additional title “heart failure belt” to the region.<sup>38</sup> Cigarette smoking, an independent risk factor of CVD,<sup>39</sup> is highest in the south (22.7%).<sup>32</sup>

Additionally, sleep duration has been found to be the lowest in the southeast through a nationwide self-reported survey, with a cluster of states in this region only getting 56.1-62.1% of recommended healthy sleep<sup>40</sup> Adequate sleep is defined as more



than or equal to seven hours in a 24-hour period by the American Academy of Sleep Medicine and the Sleep Research Society.<sup>41</sup> A lack of sleep can lead to insulin resistance and weight gain, as well as lead to decreased physical activity.<sup>40</sup>

### **Impact of a Healthy Lifestyle**

According to the World Health Organization (WHO), up to 80% of coronary artery disease (CAD), 90% of type 2 diabetes, and 33% of cancer incidence could be prevented by adopting a more nutritious diet, increasing physical activity, and smoking cessation.<sup>42</sup> Communicating the specific impacts of a healthy lifestyle on overall wellness is key in motivating individuals towards change. A healthy lifestyle is comprised of multiple behaviors which together constitute wellness as explained by the American College of Lifestyle Medicine. Lifestyle Medicine promotes treating/preventing disease through stress management, improved nutrition, implementing exercise, bettering sleep quality, and reducing alcohol and tobacco use.<sup>43</sup> A 2016 study found that only 7.7% of adults reported practicing a healthy lifestyle based on the 2014 Behavioral Risk Factor Surveillance System (N = 412, 942), with 28% of respondents lacking only in fruit/vegetable intake.<sup>44</sup>

Disease prevention is an outcome of healthy lifestyle that contributes to longevity, health-cost savings and overall quality of life.<sup>45-46</sup> The AHA recommends being physically active daily, reducing stress, limiting alcohol, and improved nutrition for CVD prevention, which causes approximately 25% of all deaths in the United States.<sup>47-48</sup> The National Cancer Institute (NCI) cites diet, alcohol intake, and physical activity as lifestyle-related factors that may prevent cancer, which is the second highest cause of

mortality in the United States.<sup>49-50</sup> Alcohol consumption has been associated with increased risk of cancer of the upper gastrointestinal tract,<sup>51-52</sup> liver,<sup>52</sup> pancreatic, colorectal and breast cancers.<sup>53-54</sup> Both the AHA and NCI cite lifestyle-related obesity as a risk factor for cancer and heart disease.<sup>55-56</sup> Physical inactivity has been linked with prevention of breast, colon, prostate, pancreatic, and skin cancer.<sup>57</sup> A prospective study of over 900,000 adults in the United States found that increased body weight was associated with increased death rates for all cancers combined, leading to recommendations to maintain body mass index (BMI) of <25 throughout the lifespan for cancer prevention, though the American Cancer Society indicates more research is needed to specifically identify the correlation and subsequent recommendations.<sup>58-59</sup> A longitudinal study on participants of the Framingham cohort corroborated the AHA's recommendations to maintain a healthy body weight, defined a BMI 18.5-24.9 and/or a waist circumference of <35 inches for women and <40 inches for men.<sup>55,60</sup>

Large-scale United States-based studies relating lifestyle and related chronic disease incidence or mortality further emphasize the need for health promotion in the United States.<sup>46,61-62</sup> A longitudinal study on 713 elderly women showed independent positive correlations between blood carotenoid levels, a biomarker derived from vitamin A in yellow, orange and red-pigmented fruits and vegetables,<sup>63</sup> and physical activity with longevity.<sup>46</sup> Data from nearly 12,000 non-smoking adults in the 1992-1993 Cancer Prevention Study-II Nutrition Cohort who completed questionnaires on diet and lifestyle were assessed for mortality outcomes and found individuals who followed the American Cancer Society cancer-prevention guidelines for BMI, diet, physical activity and alcohol consumption were associated with lower risk of death from CVD, cancer and all causes

during a 14-year follow-up, demonstrating impact of lifestyle on wellness.<sup>61</sup> In a retrospective analysis of 61,414 American adults' survey data from the NHANES, perceived low levels of physical activity was found to strongly correlate with mortality.<sup>62</sup>

In line with the Healthy People 2020 goals<sup>4</sup> of creating healthy environments for everyone, and in light of the impact of lifestyle on United States' mortality rates and chronic disease risk health promotion must be a primary focus.<sup>43,46,61</sup>

### **Wellness Program Purpose**

The average American in the full-time workforce will spend at least one-third of his or her day at work making this a key environment to facilitate lifestyle change.<sup>64-65</sup>

Corporate wellness is an expanding industry in the United States, with 92% of large companies reporting that they have some kind of wellness program.<sup>66</sup> Physicians, nurses, pharmacists, physical therapists, and RDs are among some of the many wellness professionals employed at the corporate level. Many of these practitioners are focused on treating and preventing disease through the promotion of lifestyle medicine.<sup>43</sup>

Long-term lifestyle modification has become of bigger concern than accelerated weight loss as evidence indicates that even small changes in body weight of only three to five percent can lead to improvements in health parameters.<sup>67-70</sup> Commercial programs (such as the former Weight Watchers, now Wellness that Works) are rebranding their messages to promote wellness and lifestyle change and distance themselves from the “crash diet” culture.<sup>71</sup> Chronic dieting to lose weight has been found to elicit negative psychological and physiological effects, especially in those with lower self-esteem, and some researchers propose that the risks of these effects may outweigh health benefits

from weight loss.<sup>72-73</sup> Polivy et al. demonstrated deprivation leads to cravings and subsequent higher indulgence using chocolate with undergraduate students.<sup>74</sup> A non-diet lifestyle approach to weight management was found to improve psychological well-being in obese women.<sup>75</sup> Provencher et al. had similar findings that indicated potential long-term eating behavior improvements through implementing a Health At Every Size (HAES) program, which promotes health in a weight-neutral setting.<sup>76-77</sup> The position of the Academy of Nutrition and Dietetics (AND) is that maintained lifestyle modification is key in managing overweight and obesity.<sup>68</sup>

Though there is need for behavior-focused modification, knowledge of nutrition is associated with better diet quality, which subsequently improves overall health in a working population.<sup>78</sup> Providing individuals with the education to make informed decisions along with specific goals for health improvement can promote self-efficacy.<sup>79</sup>

Analysis of other wellness programs can aid program developers in formation of program goals. When compared with self-help or education-only programs, structured weekly weight loss programs focused on behavior modification were shown to provide greater weight loss and maintenance.<sup>80-81</sup> As noted by Lutes et al (2008), weight regain is common after intensive behavior change and dropout rates are high in most weight loss or wellness programs.<sup>82</sup> When evaluating commercial weight loss programs, researchers found that retention was directly associated with weight loss.<sup>83</sup> Other factors proposed to improve a commercial weight loss program include treatment personalization, motivational interviewing, and progressive goal setting.<sup>84</sup> Based on these findings, program goals may include attaining a high rate of participant retention, encouraging gradual, sustainable behavior modification and providing a structured setting for an

effective wellness program. However, there is no standard definition of workplace wellness programming leading to high variability and outcomes among programs.<sup>85-86</sup>

### **Cost Savings in Workplace Wellness**

The AHA's *Position Statement on Effective Worksite Wellness Programs* concludes that workplace wellness initiatives are not only essential for health and wellness promotion, but vital for reducing national healthcare costs and reducing chronic disease risk.<sup>87</sup> As American healthcare costs increase, businesses seek to lower related expenses including absences and turnovers through the most cost-effective means. Improving the health of employees is a feasible way to save both on healthcare costs and reduce attrition rates.<sup>85</sup>

Based on a meta-analysis of thirty-two studies, research suggests a substantial return on dollars invested into corporate wellness program. Annual healthcare costs were determined to decrease by \$3.27 for every dollar invested into wellness programs. Costs of absenteeism were found to benefit as well with savings of \$2.73 per dollar invested.<sup>64</sup> In a comparative study identifying effects of wellness program participation on employees, programs were found to not only impact the individual employee's stress, days absent, and job satisfaction but also the organization's overall wellbeing. Abdullah et al. related these outcomes partially to the employee feeling valued by the company,<sup>88</sup> which in turn led to higher morale and decreased turnover. A meta-analysis' findings suggested that corporate wellness programs reduce absences and improve job satisfaction.<sup>89</sup>

## **Dietitian-Led Wellness Initiatives**

Registered Dietitians (RDs) can be effective wellness program facilitators due to training in behavior change, motivational interviewing experience and in-depth education on human health.<sup>38</sup> Obesity and chronic disease treatment can be influenced by emotional, psychological, genetic and physiological factors.<sup>90</sup> Certification of an RD requires a bachelor's degree, course work and a six to twelve-month supervised internship accredited by the Accreditation Council for Education in Nutrition, and passing a national Commission on Dietetic Registration (CDR) exam along with required continuing education credits and maintaining a state authorized licensure. RDs' coursework includes human anatomy, physiology, chemistry, psychology and microbiology which promotes appropriate treatment recommendations for optimal wellness outcomes.<sup>91</sup> Although there are many self-help programs that have modest evidence-based success rates,<sup>92</sup> RD's unique training and continuing education can include treatment of binge and disordered eating patterns, medication or disease-related weight gain and appropriate family history collection to identify health risk factors allowing for an individualized approach.

A systematic review of 47 group diet and/or physical activity programs found that group settings can provide clinically significant weight loss at 12 months.<sup>86</sup> Many RD-led programs have been shown to influence lifestyle change in group settings. A 12-week group educational program led by RDs was found to produce long-term lifestyle changes including consumption of low-energy density foods, intake of lower fat foods and reduced portions of higher-energy density foods.<sup>93</sup> A study that qualitatively assessed participants' experiences in a workplace lifestyle intervention program emphasized the

importance of RD guidance for autonomous behavior change in participants.<sup>94</sup> Results from another 12-week program led by an RD specializing in weight management and exercise physiology in a corporate setting of 135 participants found that a short-term weight management program can be successfully implemented in the workplace.<sup>65</sup> A year-long study on a lifestyle intervention found that a program comprised of 32 total visits with an RD including both group and individual meetings plus exercise interventions produced the greatest improvement in body weight and body composition.<sup>95</sup> An eight-week church-based group wellness program employed two RDs to give nutrition instruction and review food records and had outcomes of improved blood pressure and weight loss.<sup>96</sup> RD-led education has been shown to produce meaningful diet-related outcomes which can be maximized when applied to a group.<sup>98-99</sup> Nutrition as a major component of recommendations for improving lifestyles to better align with national health goals makes RDs, board-certified experts in nutrition and licensed to practice by state, invaluable in wellness initiatives.<sup>1-2,6-7</sup>

### **Specific Aims**

The aim of this study was to retrospectively evaluate outcomes of a RD-led corporate group wellness program in the southeastern United States, specifically attrition rates and health parameter improvements. Statistical analysis of pre- to post-program changes in anthropometric and biometric measurements and validated nutrition knowledge assessments for significance and comparing results with other similar programs allowed for evaluation of this program and recommendations for improvements in future programs at this worksite based on results.

## **METHODS**

This project was approved by Winthrop University Institutional Review Board (IRB) for Human Subjects. The study was approved as an exempt study. The IRB approval letter can be found in Appendix A.

### **Participant Recruitment**

The program was open to all employees subscribed to the company's insurance plan and insured dependents 17 years or older. Participation was limited to 50 employees per class offering. Participants were recruited through flyers displayed in the employee wellness clinic, informational emails sent by human resources, and clinic provider recommendations to patients who expressed interest in weight loss or improving overall wellness. Word of mouth referrals from past participants was notably a large source of recruitment. Interested individuals voluntarily contacted the clinic RD directly via email or telephone to reserve a spot in the program. An overflow list was kept to back-fill any open spots in the weeks leading up to the beginning of the program to maintain an initial group of  $n = 50$  in each program. Data was collected for two consecutive programs for a total initial sample size of  $n = 100$ .

### **Program Overview**

The 12-week corporate wellness programs were provided at a worksite wellness clinic. The focus of the program was to enable participants to manage body weight and improve lifestyle-related health parameters. Weight loss was addressed but not the primary goal of the program. Prior to week one of the program, participants met with the



RD individually for pre-program measurements, to take a validated nutrition knowledge assessment, sign informed consent for measurements and group program consent, and to discuss personal program goals. An optional medication disclosure form was given at this meeting and then communicated to the pharmacist for assessment of medication interactions with patients' health goals. The pharmacist resident contacted patients directly by telephone to discuss medications if applicable. Participants were oriented to the classroom located at the clinic. Pre-program measurements included: body weight, body mass index (BMI), basal metabolic rate (REE, using Mifflin St Jeor), fat free mass (FFM), fat mass (FM), body fat percentage (BFP) using a TANITA calibrated scale with light clothing and bare feet; total cholesterol (TC), low-density lipoproteins (LDL), high-density lipoproteins (HDL), triglycerides (TG) using a control-monitored Cardiochek Cholesterol Analyzer via fingerstick; hemoglobin A1c (HgA1c) using pts Diagnostics A1cNow via fingerstick; blood pressure using an Omron seven series upper arm blood pressure monitor; and waist circumference (WC) at the navel using a tape measure. Height was self-reported. The clinic's RD was trained on proper use of all measurement tools and administered all pre- and post-program evaluations to improve consistency in measurements. Descriptions of the tools used for assessments can be found in Appendix B.

There were nine weeks of nutrition education with weekly hour-long sessions (Table 1), no group classes for weeks 10-11 with RD availability for individual consultations, and final one-on-one meetings in week 12. A free yoga class focused on stress relief was offered at a local yoga studio week 10. Week six was led by a Registered Nurse (RN) employed by the wellness department of the clinic. The final meeting

consisted of repeated anthropometric and biometric measurements, a nutrition knowledge assessment identical to week one, and a “next steps” discussion. Goals, recommendations and appointments with other clinic disciplines (annual physical, cholesterol/blood pressure counseling, diabetes counseling, emotional counseling) were initiated during this meeting.

**Table 1.** Weekly Topics

Week 1	Introduction to Weight Management
Week 2	Meal Planning
Week 3	Discovering the Right Exercise for You
Week 4	Label Reading; Eating Out & Eating Right
Week 5	Grocery Shopping Tips & Tricks
Week 6	Mindfulness, Sleep and Stress Management
Week 7	Eating Environment; Diet Trends
Week 8	Portable Food; Recipe Substitutions with Smoothie Demo/Tasting
Week 9	Next Steps; Special Topics as Requested

The sessions were offered two times per week to accommodate varied schedules of the corporate client: lunch hour and evening class. Participants were free to rotate between classes as schedules allowed due to high variability in overtime and scheduling. Attendance was encouraged but not required for program retention. After two consecutive absences without contact, the RD would reach out via e-mail to ensure the patient was still participating. No additional effort was made to ensure participant retention.

Participants attending the weekly class signed in on a roster for attendance, collected a nutritious snack and water bottle provided, and had the option to weigh-in for accountability. Optional weigh-ins were self-administered and written on a slip of paper which could be placed in a locked box. The class was administered by the RD using PowerPoint presentations in the front of the clinic's conference room. All presentations were developed by the RD using current research and professional expertise. Recommendations were based on the MyPlate method,<sup>99</sup> and evidenced-based practices as recommended by the *Dietary Guidelines for Americans 2015-2020*.<sup>1</sup> Estimated energy needs were given to participants in a range using REE as calculated using Mifflin St Jeor<sup>100</sup> multiplied by an activity factor minus 500-1000 calories per day for weight loss.<sup>67</sup> Optional calorie tracking using the MyFitnessPal app was discussed but not required, and participants had the ability to connect with the RD for diet review and feedback.<sup>101-102</sup>

Exercise was encouraged as part of the program through giveaways and instruction, including presenting local gym options and giving internet links to at-home exercise videos during week three. A step competition using Fitbits was incorporated into the last four weeks of the program to encourage increased physical activity.

All presentations and conversations were delivered with enthusiasm by the presenter. Questions and food record analyses, as requested, were addressed by the RD. Of note, all participants' names were learned by week one to assist in putting participants at ease, facilitating community, and promote participation from the individuals in the group.<sup>103</sup> All slideshows from presentations were emailed to participants the week of class for review if needed. Participants were encouraged to share information with coworkers, family and friends if desired.

### **Program Incentives**

The program was incentivized to encourage participation. Program incentives were not earned based on merit but given to be used as tools to supplement the educational components to promote a positive wellness culture.<sup>85,104</sup> Incentives were given as follows: week 1 - infusion water bottles; week 2 - meal-prep containers; week 3 - at-home exercise kits (jump rope, exercise bands and sliding discs); week 4 - FitBit with a heart rate monitor; week 7 - yoga mat, week 8 - personal smoothie blender; week 9 - body-fat percentage scale. Week 8 contained a smoothie demonstration and tasting and a make-your-own yogurt parfait activity to facilitate self-efficacy in meal preparation. Recipes and materials used can be found in Appendix C1-2. The optional yoga class provided by a certified yoga instructor week 10 was a benefit exclusive to class participants. Participants who were employed by the company had the opportunity to complete an additional online survey to receive insurance compensation as part of an annual health screening.

## **Knowledge Assessment**

A 42-question validated survey tool was obtained, modified with permission and used for assessment of participants' knowledge of basic nutrition principles before (week 0) and after (week 12) the program.<sup>105</sup> The survey can be found in Appendix D. The same paper survey was administered during the pre- and post-program meeting with the RD. Participants were encouraged to answer questions they felt sure of and to skip questions they were unable to answer instead of guessing. The questionnaire was originally developed using the *General Nutrition Knowledge Questionnaire*<sup>50</sup> with new questions added based on the *2005 Dietary Guidelines for Americans*<sup>46</sup> and MyPlate.<sup>43</sup> Survey questions were cross-referenced for consistency with the *Dietary Guidelines for Americans 2015-2020*.<sup>44</sup>

## **Post-Program Evaluation**

The nine-question post-program anonymous assessment, found in Appendix E, was administered after week 12 one-on-one meetings through an email link, using a third-party survey site.

## **Statistical Analysis**

Data was de-identified and aggregated for research use. SPSS version 19.0 was used for data entry and analysis for biometric, anthropometric parameters and nutrition knowledge assessments. Individual paired samples *t*-tests were conducted on pre- and post-program health parameter outcomes and to compare mean assessment scores of each survey section ( $p = .05$ ). Simple linear regression was used to determine the relationship

of weight change, blood pressure, total cholesterol, body fat and waist circumference to education intervention. Pearson's correlation was used to identify relationship of body weight reduction to other significant improvements in biometric or anthropometric numbers.

Knowledge assessments were scored with a 1 for questions answered correctly and a 0 for questions answered incorrectly. Pre- and post-program surveys were analyzed using an individual paired samples *t*-test, ( $p = .05$ ).

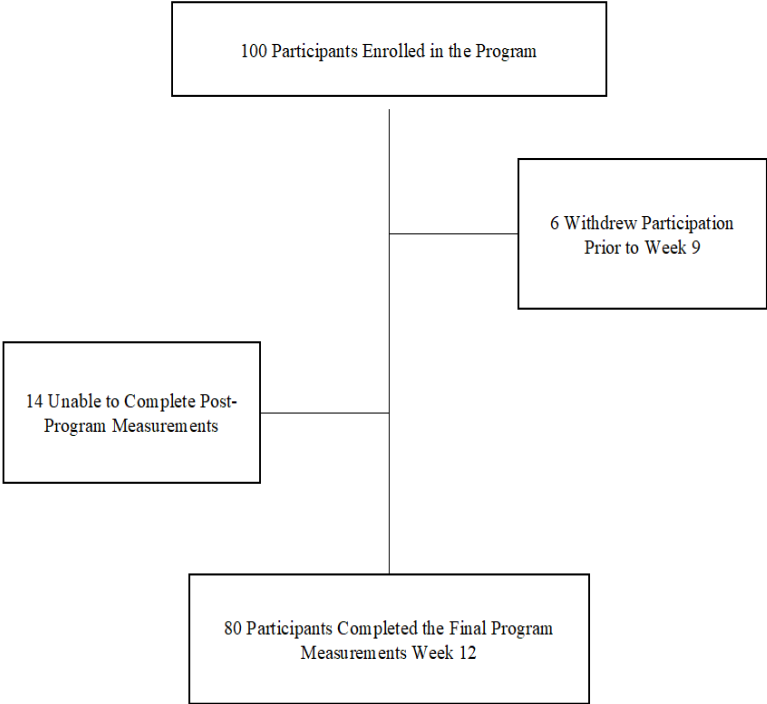
## **RESULTS**

Biometric and anthropometric data was collected from all 80 participants who completed the program. Completion was defined as attending baseline and final individual measurements as well as some group classes. Women made up the majority of the group ( $n= 52, 65\%$ ) with a mean age of 46 years (range, 20-64).

### **Attrition**

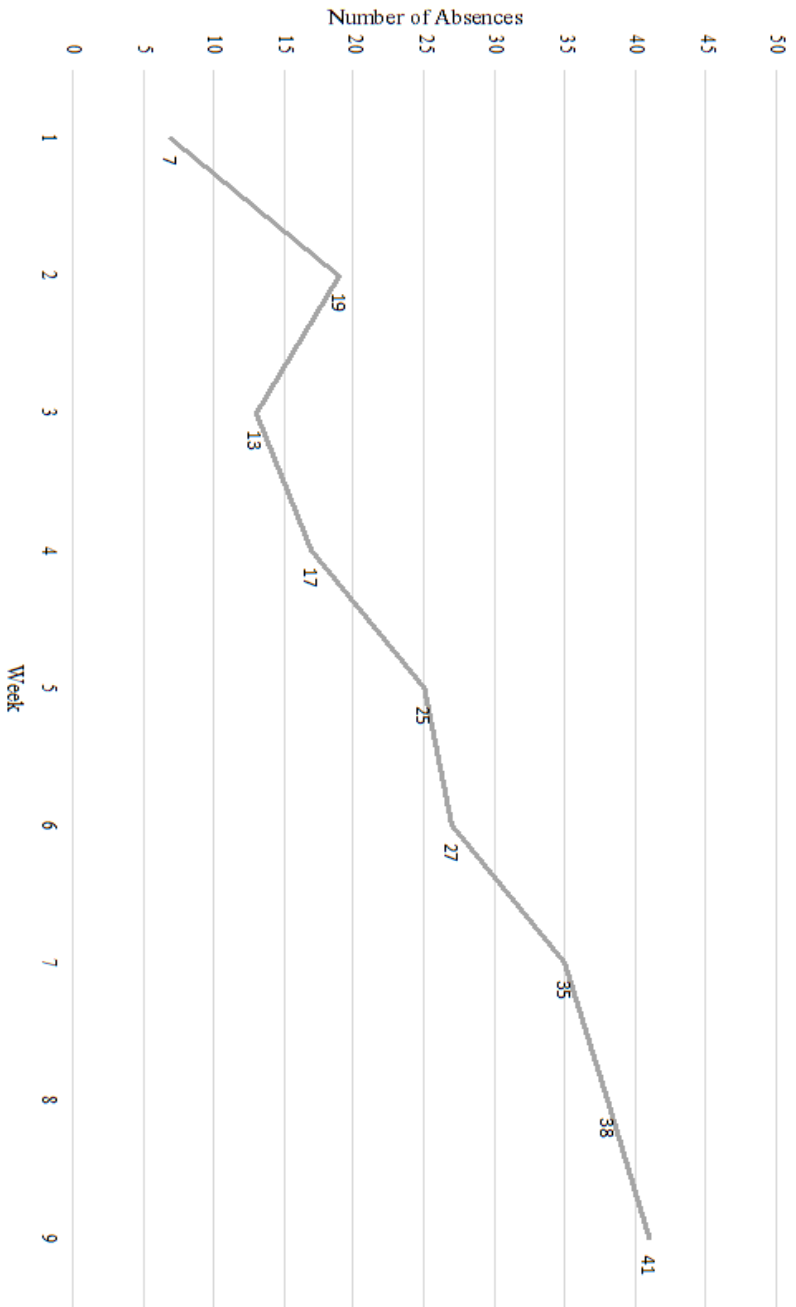
Eighty-percent of participants enrolled in the two programs completed the final check-in at week 12 (Figure 1). The attrition rate of the 9-week class portion of the program was 6%. Weekly attendance for both programs is reflected in Figure 2.

**Figure 1:** Flowchart of Participants Completing the Program





**Figure 2: Weekly Program Absences**



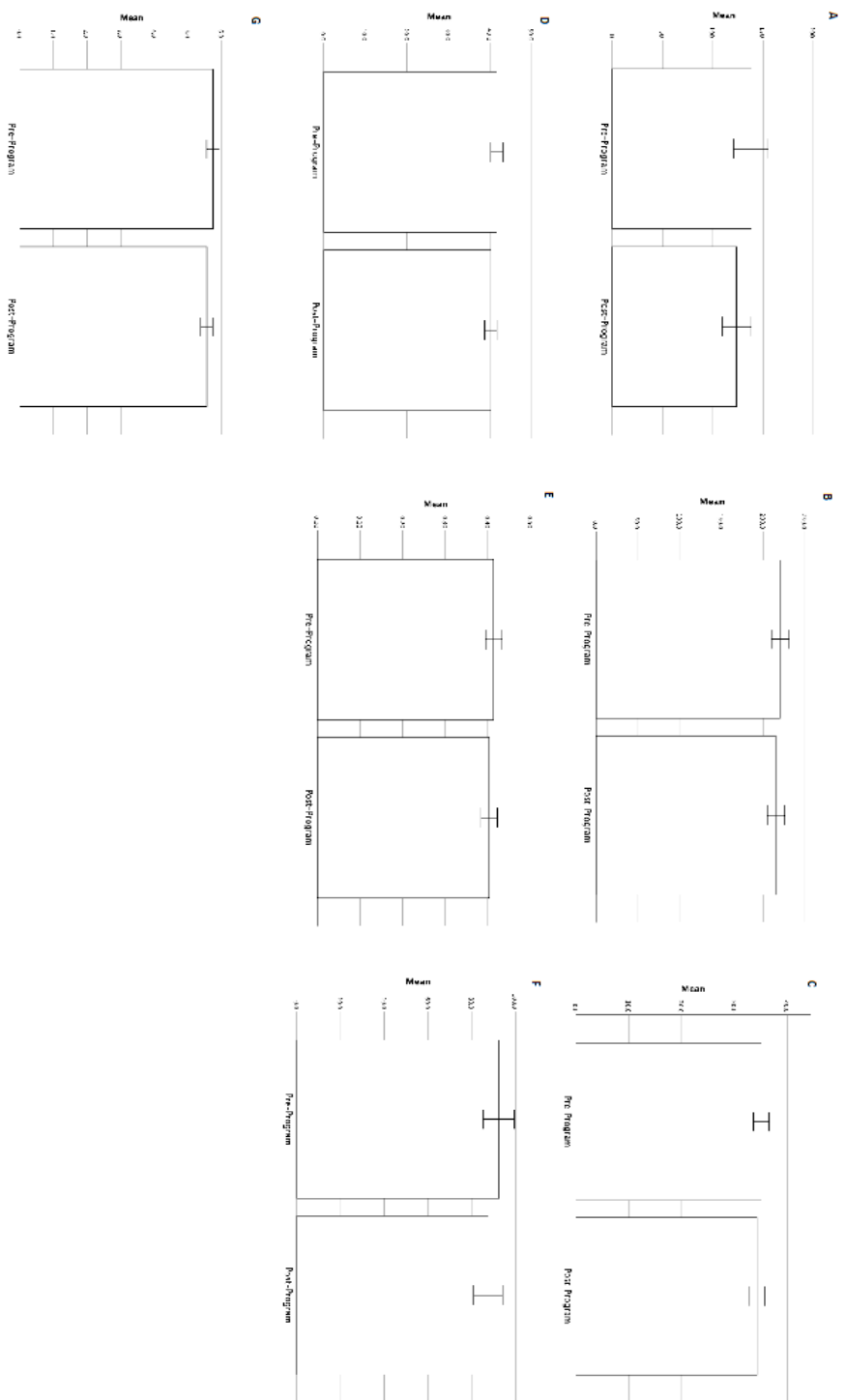
## Anthropometric and Biometric Results

Out of the 80 final weigh-ins, 78% of participants lost weight ( $n = 62$ ), 6% maintained within 1.0 lb of weight gain ( $n = 6$ ) and 16% gained weight  $>1.0$  lb ( $n = 13$ ). Twenty participants (25%) achieved clinically meaningful weight loss of  $>5\%$  with a maximum of 10.5%. Baseline mean BMI was 35.1: 80% obese ( $n = 64$ ), 12.5% overweight ( $n = 10$ ), and 7.5% ( $n = 6$ ) within normal limits. Final mean BMI was 34.3: 70% obese ( $n = 64$ ), 22.5% overweight ( $n = 18$ ), and 7.5% ( $n = 6$ ) within normal limits. Post-intervention, HgA1c decreased from 11 to 6 participants in diabetic range (HgA1c  $>6.5$ mmol/mol), decreased from 27 to 24 participants in the pre-diabetic range (HgA1c 5.7-6.5mmol/mol) and increased from 42 to 50 participants in the normal range (HgA1c  $<5.7$ ). A total of 77.5 inches was lost from the WC of the final participants. All pre- and post-program outcomes are shown in Table 2.

Through paired-sample  $t$ -tests comparing initial and final data assessments ( $p < 0.05$ ) we found significant improvements in TG ( $t = 2.5$ ), body weight ( $t = 5.7$ ), BMI ( $t = 5.7$ ), WC ( $t = 7.6$ ), FM ( $t = 3.6$ ), BFP ( $t = 3.0$ ), and HgA1c ( $t = 3.0$ ). BPS, BPD, HDL, TC, LDL and FFM did not have significant improvements. Comparison of significant pre- and post-program outcomes is demonstrated in Figure 3. See Appendix F for all comparison charts.

Pearson's correlation was used to compare weight change with significantly improved parameters: TG, BMI, WC, FM, BFP, and HgA1c. Change in BMI ( $r = 0.988$ ), WC ( $r = 0.549$ ), BF ( $r = 0.738$ ) were correlated with body weight change at the 0.01 significance level.

**Figure 3: Anthropometric/Biometric Results Pre- and Post-Program**



A. Triglycerides; B. Weight, lbs; C. Body Mass Index (BMI); D. Waist Circumference, inches; E. Fat Mass; F. Body Fat %; G. Hemoglobin A1c

**Table 2:** Anthropometric and Biometric Results at Baseline and Final Assessments

Parameter	N	Baseline (Week 0)			Final (Week 12)			P-value	Mean Difference
		Mean	SD	Range	Mean	SD	Range		
Weight, lb	80	220.2	47.7	142.4-358.6	215.4	47.2	138-359	.000*	4.8937
Body Mass Index	80	35.1	6.4	23.9-51.3	34.3	6.4	22.9-50.5	.000*	.7563
Waist Circumference, inches	80	41.6	6.5	29-58	40.2	6.5	28-56	.000*	1.4312
Body Fat %	80	41.3	8.5	18.6-55.3	40.3	8.6	16.3-54.8	.003*	.01070
Fat Mass, lb	80	92.4	32.0	31-190.6	87.4	29.6	25.4-165.2	.001*	5.0200
Fat Free Mass, lb	80	128.5	27.7	94.4-204.8	127.2	27.7	89.8-209.4	.227	1.2650
Systolic Blood Pressure, mm Hg	80	126.8	16.2	95-169	126.5	14.0	92-159	.814	.337
Diastolic Blood Pressure, mm Hg	80	83.3	11.0	52-119	81.9	8.4	61-103	.214	1.438
Total Cholesterol, mg/dL	80	168.5	31.4	99-237	169.4	34.4	100-252	.740	-.912
LDL Cholesterol, mg/dL	79	93.0	26.9	47-155	96.8	29.2	39-175	.139	-3.759
HDL Cholesterol, mg/dL	80	48.6	12.1	23-85	47.6	12.3	29-98	.174	.938
Triglycerides, mg/dL	80	138.0	75.7	50-500	123.7	63.4	50-340	.014*	14.350
Hemoglobin A1c, mmol/mol	80	5.7	.85	4.5-9.3	5.6	.72	4.6-8	.005*	.1887

Significant p-values (&lt;0.05) indicated by \*

Though not statistically significant, 48% of participants improved LDL with a mean reduction of 14.7mg/dL. Thirty-percent of participants increased HDL numbers with a mean increase of 4.9mg/dL. Subsequently, 40% of participants lowered TC with an average reduction of 17.7mg/dL. BPS and BPD each had 37 participants lower numbers with mean improvements of -10.8mm/Hg and -9.5mm/Hg, respectively.

### **Knowledge Assessment Results**

A total of 53 participants (53%) completed both the pre- and post- knowledge assessment survey. Reasons for not completing both surveys included not attending final appointment, refusal to complete survey, and failure to complete the survey during 30-minute appointment timeslot. Survey questions were divided into three categories: Nutrition Advice, Nutrient Content of Food, and Diet-Disease Relationship. Significant improvement of all categories in post-surveys over pre-surveys was demonstrated by *t*-tests comparing pre- and post-survey averages ( $p < .05$ ). Average improvements in overall scores and scores in each category was observed, as conveyed in Table 3.

### **Subjective Results**

Out of the 46 participants who completed the post-program evaluation, 100% reported enjoying the program.

**Table 3.** Pre- and Post-Program Knowledge Assessment Results (*n*=53)

Questionnaire Section	Pre-Program Scores		Post-Program Scores		Mean Difference	df	t	P
	Total Score	Mean (SD)	Total Score	Mean (SD)				
Nutrition Advice	480	9.1 (3.9)	647	12.2 (3.0)	3.1	97	-4.72	<.0001
Nutrient Content of Food	281	5.3 (2.7)	356	6.7 (2.5)	1.4	104	-2.82	.0057
Diet-Disease Relationship	202	3.8 (2.3)	288	5.4 (2.6)	1.6	102	-3.37	.0011
<b>Overall</b>	963	18.2 (8.9)	1291	24.3 (8.1)	6.1	104	-4.625	<.0001

Paired *t* tests alpha set at *P* =.05

Paired *t* tests alpha set at *P* =.05

## **DISCUSSION**

Results from this study support the multifaceted value of a dietitian-led workplace wellness program by demonstrating significant weight loss, improved participant nutrition knowledge and improved health outcomes with a retention rate comparable to similar programs. A literature review by Benedict and Arterburn,<sup>106</sup> noted that there are very few worksite-based wellness programs that have been studied for outcomes which demonstrates a need for more research in this area. This study is one of the few specifically examining a southeastern corporate wellness program. Understanding factors unique to southeastern corporate wellness, such as attrition rates or average initial health parameters, could lead to enhancement of program effectiveness.<sup>107</sup>

### **Subjective Outcomes**

Subjective outcomes from the study were qualitatively assessed through the post-program survey. The post-program evaluation outcomes demonstrated subjective approval of the wellness program. It is possible that program detractors either did not complete the program or did not attempt the survey, but the anonymous evaluation was distributed via email to all 100 initial participants.

### **Anthropometric Outcomes**

Goals for this program were participant retention and improvements in health parameters. Despite emphasis on lifestyle change and mindfulness, weight change was significant. The Task Force on Community Preventative Services recommends an average weight loss of 4lbs six months after initiation of a worksite wellness program to

measure effectiveness.<sup>108</sup> Based on these recommendations, this program met expectations with 5.8 pounds average weight loss after 12 weeks and 50% of participants losing at least 4lbs. The weight change observed in this group was similar to other RD-led programs.<sup>109</sup> A comparable 12-week wellness program led by an RD at a university in New Jersey reported 40% of the participants met the 4lb weight loss goal.<sup>65</sup>

Weight gain was discussed during the program if participants reported weight increase or verbalized discouragement with his or her progress. Participants often attributed weight gain to medication changes, injuries unrelated to the program, binge eating and major life events in discussions with the RD. Some noted a lack of readiness or perceived ability to move to action<sup>110</sup> and were offered additional intervention options, such as a personalized meal plan, physician-referred exercise program, one-on-one nutrition coaching or emotional counseling.

Significant improvement in BMI and WC were related to weight loss. Reduction in BFM and BFP without a significant decrease in LBM demonstrated an improvement in overall body composition. This is important due to resting metabolic rate (RMR) decline with LBM reduction and subsequent impedance of weight loss progression and maintenance.<sup>111</sup>

### **Biometric Outcomes**

TG and HgA1c are both values related to simple carbohydrate intake<sup>112</sup> and had significant improvement after the wellness program intervention. Implementation of MyPlate and the *Dietary Guidelines for Americans* could have facilitated the change through emphasis on reduction of fried food, sugar-sweetened beverages and excess



carbohydrate serving sizes.<sup>1,99</sup> Weight loss and increased aerobic exercise were both recommendations in the program that could reduce HgA1c or TG.<sup>113</sup>

Blood pressure, TC, HDL and LDL outcomes, while not significant statistically, still showed individual improvements. Data may have been affected by some individuals reducing or discontinuing medication during this program, as this data was not recorded. Participants were likely more nervous during the pre-program meeting as this was the first encounter with the RD and “white coat syndrome” may have elevated initial BPS readings.<sup>114</sup> Taking blood pressure consistently throughout the program, either at home or in class, could give a better depiction of trends.

## **Retention**

The retention rate of this program was 80% for 12 weeks and 94% for 9 weeks. Compared to other programs, this is similar to retention rates in the corporate setting.<sup>65,84,115</sup> Average weekly attendance declined throughout the program, partially due to the six drop-outs as the program progressed. Though reasons for attrition were not recorded, unsatisfactory results, length of the program, lack of motivation, and overall levels of stress are among some of the factors found to correlate with weight management program drop-outs.<sup>106,116</sup> Baseline characteristics such as BMI, race, and marital status have been found to not affect attrition in some studies,<sup>107,117</sup> while age (<40 years) was found in one study to be a significant determinant of drop rate.<sup>117</sup> Grave et al. emphasized the importance of facilitators building rapport and collaborating with participants, and also identifying pre-program variables that could affect progress towards personal goals, such as medications, binge-eating disorders or depression.<sup>116</sup> Stress relief was a key

lifestyle medicine element emphasized during this program. Additionally, explaining realistic weight loss expectations, developing patient-facilitator relationships, and emphasizing non-weight related outcomes were components of this class that may have positively contributed to a favorable retention rate.

### **Nutrition Knowledge Outcomes**

The nutrition knowledge assessment tool used was originally developed for use in a general adult population in California.<sup>105</sup> All sections of the assessment showed significant improvements after the intervention, indicating nutrition knowledge developed as a result of the program. In a corporate manufacturing setting, higher nutrition knowledge scores were associated with better diet quality as well as lower blood pressure.<sup>78</sup> In a systematic review of nine randomized controlled trials involving worksite nutrition and physical activity interventions, education combined with behavioral counseling was most effective.<sup>109</sup> ‘Nutrition Advice’ produced the largest difference in average scores from pre- to post-program, which was a major focus of the wellness program. Other sections ‘Nutrient Content of Food’ and ‘Diet-Disease Relationship’ improved significantly despite being topics less thoroughly discussed.

### **Recommendations for Future Programs**

Corporate wellness must continue to grow with evolving research and best practices. An example of this is body positivity, which is growing in popularity and clinician-support and includes the ‘Health at Every Size’ movement.<sup>118</sup> This has come about due to the cultural impact of dieting, such as eating disorders and body

dysmorphia.<sup>119</sup> Wellness providers must implement programs that are not solely focused on weight loss goals. Weight loss, even if achieved by surgical intervention, is unsustainable without significant lifestyle change.<sup>68</sup> Adopting multiple facets of lifestyle medicine into a wellness program can provide long term health improvement and maintainable behavior change.<sup>43</sup>

Group exercise or personal training programs in addition to nutrition education would be beneficial as behavior-focused weight management programs combining both diet and physical activity have been shown to provide the most health outcomes and are both major factors in lifestyle medicine.<sup>43,,68,70,95,109,120-121</sup> However, exercise can be difficult to implement at the corporate level due to liability concerns and logistical barriers. This program promoted increased physical activity by discussing local gym options with personal trainers, fitness-focused giveaways (exercise kit and Fitbit) and a class focused on exercise benefits, guidelines and implementation. Based on the post-program survey, many participants increase physical activity. In agreement with Lutes et al., small, participant-selected changes allow for long-term sustainability of lifestyle change instead of a more intensive and structured approach.<sup>83</sup> Although a 12-week study found variability in exercise-associated weight loss among participants,<sup>122</sup> evidence suggests that exercise has long-term benefits on overall health and wellness.<sup>43,45,68,122</sup> Utilization of an exercise physiologist, physical therapist or personal trainer if available could prevent potential injury, which can discourage weight loss progress.<sup>123</sup>

The flexibility offered by this program with scheduling, lack of attendance guidelines, and absence of a mandatory diet or exercise program are considered strengths. Similar results were observed in a 24-month study on women, showing that weight loss

interventions were more effective when promoting a flexible self-regulating approach to diet and exercise self-efficacy.<sup>124</sup> A program emphasizing self-monitoring can lead to a higher overall weight loss as this practice in diet, exercise and self-weighing has been shown to consistently provide successful weight loss outcomes.<sup>95,101</sup> Submission of activity or food-logs to the program leader is an example of a fitness-related self-monitoring technique with added accountability used in other wellness programs.<sup>65,93</sup> However, sustainability and emotional impact must be considered when recommending self-monitoring as this can lead to over-restriction or disordered eating patterns.

There was a high level of interest surrounding this program. Prospective participants continued to contact the RD throughout the program in anticipation of future class offerings. Participants in the program requested future classes be offered as a follow-up, and also discussed initiation of a virtual support group on a social media platform. Addition of other RDs to the wellness team at this particular company could allow for additional nutrition-focused employee programs. Wellness programs could be directed toward specific disease states, such as heart disease or diabetes, to reach employees who are not interested in weight management.

Structured post-program follow-ups could be emphasized to better track long-term outcomes and prevent relapse.<sup>107</sup> Possible examples of this could include quarterly group meetings, newsletters, and consistent personal outreach to past members. Adequate wellness staffing could be a barrier to this and would have to be a consideration.

Other suggested modifications to this program model could be considering merit-based incentives. This is a popular technique in wellness program, but as Mujtaba et al. discuss, there are legal considerations of this type of program to promote equality.

Alumni-focused classes to reinforce long-term lifestyle interventions in past participants could prove valuable,<sup>43</sup> as this was reported to be well received by a group of adults in a church-based program. This same program employed two registered RDs to assist the classes of greater than twenty-five participants, as well as an additional fitness professional for exercise instruction.<sup>96</sup> Gray et al. identified stages of a lifestyle intervention program to include a maintenance stage, seven group sessions total at six-week intervals.<sup>125</sup> To accommodate these improvements to the present study, staffing the program with additional RDs or other disciplines, such as exercise specialists, could allow for individualized recommendations and sustained follow up for maintenance promotion. To truly elucidate all outcomes of this program longitudinal measurement of health outcomes, nutrition education retention, and post-program food frequency assessments could be informative.

## **LIMITATIONS OF RESEARCH**

Limitations of the study include a small sample size (n=100) and short duration of the program (12 weeks). The outcome of the sample may not be representative of the entire corporation because participants had to be motivated to enter the program initially. Self-selection bias is another factor that may have skewed outcomes, as those who failed to complete the post-program assessment may have been aware of failure to comply with program recommendations. The lack of a control group in this study and potential impact of outside lifestyle modification interventions throughout the 12 weeks is a significant limitation. Variations in timing of the program could also impact outcomes based on

holidays, weather and the corporation's production schedule. Analyzing this program over a several years could give insight into potential variables.

Personal goals of patients could have been more clearly identified at the beginning of the program and flagged in the data set to allow for statistical analysis of weight change to reflect only participants who intended to lose weight. Other useful data for further research on this program or similar studies would be disease incidence among all participants, medication changes during the program, and a personal log of intake and activity.

Other challenges of this study included the lack of consistency in fasting of the participants at pre- and post-program assessments. Due to the nature of the clinic as an on-site corporate wellness resource at a 24-hour company with limited appointment slots, participants were not all able to make fasting appointments, although it was encouraged. Non-fasting blood draws can produce elevated TG, which in turn increases LDL through the Friedewald equation [calculated LDL = total cholesterol – HDL – (triglycerides/5)].<sup>126-127</sup> Designating more clinic staff for pre/post-program assessment appointments or increasing the number of RDs employed at the clinic for program expansion could allow for additional time slots to be opened for fasting measurements to be obtained.

## **IMPLICATIONS AND CONCLUSIONS**

Employers should seek to create a culture focused on wellness in the workplace.<sup>85,88,109</sup> While some critique corporate wellness for underwhelming outcomes,<sup>128</sup> it is important to note that not all results are numerical. Value on investment

(VOI) has been identified as an important factor to consider when measuring effectiveness and includes health care costs, productivity, retention and stress reduction.<sup>129</sup> Research correlating behavioral impacts to wellness program outcomes can be challenging due to uncontrollable factors that can contribute to overall health, such as genetics and stress levels. Longitudinal studies of large sample sizes are often used to demonstrate impacts of lifestyle.<sup>33,95</sup> In corporate wellness programs, measuring outcomes within the company over time could demonstrate cultural change, for example vending or cafeteria sales, employee anthropometric/biometric trends or job satisfaction. Employees of lower income, who may otherwise be unable or unmotivated to seek out community wellness services, reported health promotion in the workplace is desirable and makes them feel more valued by employers.<sup>106,126</sup> As the U.S Chamber of Commerce's *Winning With Wellness* publication concluded: "effective workplace wellness strategies can be the spark that ignites a culture of health in society."<sup>129</sup>

Improving health in the southeast needs to be a priority for all healthcare providers, employers and policymakers in the region. Accountability for companies by policymakers or increased tax-related benefits for corporations with wellness programs would assist in supporting wellness services. Employers should consider encouraging group wellness classes focused on lifestyle improvement and seek to hire or contract wellness providers, such as RDs, who have formal training on wellness program implementation. Wellness providers should promote Dietary Guidelines and MyPlate<sup>2,6</sup> to assist in improving diet quality in this region with consistent recommendations and, after further comparative research, development of a standard curriculum for wellness programs could be advantageous for promoting consistent delivery, information and

outcomes. Future research should also focus on development of corporate wellness programs and comparison of regional program effectiveness. Longitudinally, regional health disparities, such as CVD mortality rates, should be studied after implementation of programs to measure largescale subsequent health improvement.

This study showed that a 12-week corporate wellness program led by an RD produced biometric improvements, increased participant nutrition knowledge and was well-received by employees. All biometric and anthropometric data changes were dependent on individual readiness to change,<sup>110</sup> and arguably were not the most important results of the program. Education on lifestyle management and promotion of self-efficacy were key outcomes inferred from post-program survey reports and the nutrition knowledge assessment. Providing participants with a comprehensive, flexible and practical wellness program allowed for not only improved physical well-being, but a measured advancement in nutrition knowledge that can be used to positively impact the workplace culture and ideally, will transform a community.



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## APPENDICES

## APPENDIX A: Institutional Review Board Letter of Approval



WINTHROP  
UNIVERSITY

Sponsored Programs and Research

IRB PROTOCOL #: IRB19029R  
TITLE OF PROJECT: Retrospective Evaluation of Dietitian-Led Corporate Wellness Program  
RESEARCHER OF RECORD: Catherine Johnston  
FACULTY ADVISOR: Wanda Koszewski  
EXEMPTION DATE: 11/12/2018  
EXEMPTION CATEGORY: 14(d) Research involving the collection study of existing data, documents, records, pathological specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects. [45CFR46(b)(4)]

The Request for Review of Research Involving Human Subjects identified above has been reviewed by the Winthrop University Institutional Review Board (IRB) and has been determined to be exempt from IRB review. You may begin your research on or after the Exemption date shown above.

**A waiver of obtaining signed informed consent has also been granted.** This waiver means the participant is not required to sign the informed consent document, but you must still advise the participants of the purpose of the research, their rights as a research subject and any risks or benefits associated with participating in the research.

*A Request for Modification of Previously Approved or Exempt Protocol* must be completed by the researcher and submitted to the IRB for review for any proposed changes or modifications to the protocol. IRB approval must be received prior to amended changes or modifications being implemented by the researcher. These changes may include a change in a survey instrument, the addition or deletion of a research site, a change in personnel, a change in methodology or a change in the Researcher of Record.

Use the form *Adverse Event Report* to report any negative consequences that occur as a result of participation in a research project. An “adverse event” or “adverse experience” is an undesirable and unintended, though not necessarily unanticipated, injury or physical or emotional consequence to a human subject. “Unanticipated Problems” may or may not include specific events experienced by individual subjects, but are developments within the research activity that suggest a potential for increased risks to subjects or others.

Maria Aysa-Lastra, Ph.D., Chair  
Winthrop University Institutional Review Board  
803-323-4654  
[aysalastram@winthrop.edu](mailto:aysalastram@winthrop.edu)

Terri Wright, Ph.D., Executive Director  
Grants and Sponsored Research Development  
Winthrop University  
803-323-2460  
[wrightt@winthrop.edu](mailto:wrightt@winthrop.edu)

**APPENDIX B: Biometric/Anthropometric Tools**

<b>Tool Used</b>	<b>Measurement</b>
TANITA BC-418 Segmental Body Composition Analyzer	Body Weight Body Mass Index (BMI) Fat Mass (FM) Body Fat Percentage (BFP) Fat Free Mass (FFM)
Mifflin St Jeor equation: REE (males) = 10 x weight (kg) + 6.25 x height (cm) - 5 x age (y) + 5 REE (females) = 10 x weight (kg) + 6.25 x height (cm) - 5 x age (y) - 161	Basal Metabolic Rate (REE)
Cardiochek ST Analyzer	Total Cholesterol (TC) Low-Density Lipoproteins (LDL) High-Density Lipoproteins (HDL) Triglycerides (TG)
pts Diagnostics A1cNow + System	Hemoglobin A1c (HgA1c)
Omron 7 Series Upper Arm Blood Pressure Monitor	Blood Pressure (BP)
Retractable 6' Tape Measure	Waist Circumference (WC)

## APPENDIX C -1: Week 8 Smoothie Recipe and Materials

Green Smoothie

Servings: 1

### INGREDIENTS

1/2 cup unsweetened almond milk

1/2 cup plain Greek yogurt

1 cup fresh baby spinach

1/4 cup frozen avocado

1/2 cup frozen strawberries

1/2 cup frozen banana/pineapple

1 cup water

1/2 cup of ice, as needed

### MATERIALS

Ninja Professional Blender 1000

Measuring Cups

Disposable Clear Plastic Condiment Storage Cups

Scoops, Tongs and spoons

### INSTRUCTIONS

1. Place all ingredients in the blender.
2. Blend until smooth.
3. Serve immediately.

## APPENDIX C -2: Week 8 Yogurt Parfait Recipe and Materials

Yogurt Parfait

Servings: 1

### INGREDIENTS

1/2 cup plain Greek or Vanilla Greek yogurt

½ cup mixed berries

¼ walnuts or slivered pecans

1 teaspoon flax or chia seeds

### MATERIALS

Mason Jars with Lids, for transport

Plastic Spoons

Bowls for ingredient serving

### INSTRUCTIONS

1. Layer yogurt and toppings of your choice in a jar,
2. Consume or refrigerate for later.



## APPENDIX D: Validated Nutrition Assessment

This questionnaire is so we can get an idea how familiar people are with nutrition. This is a survey, not a test. Your answers will help us identify what nutrition advice people find confusing. For each question, please use a pen or pencil to mark an  or  for the answer that fits you best.

- It is important that you complete it without the help of others.
- If you don't know the answer, please mark "not sure" rather than guess or look up the answer.

These next items are about what advice about nutrition you think experts are giving.  
(Please choose only one answer for each.)

1. Which one of these is the current government food guide?



Not sure

2. How well would you say you know the government's food guide, called MyPlate?

- Never heard of it
- Heard of, but know very little about it
- Know some about it
- Know a lot about it

3. How much would you say you know about whole grains?

- Never heard of them
- Heard of, but know very little about them
- Know some about them
- Know a lot about them

4. As far as you know, what are whole grains?

- Grains that still have the bran and germ
- Milled grains
- Anything with added fiber
- Refined flour
- Not sure

5. Based on what you know, which of these isn't usually a whole grain?

- Popcorn
- Oatmeal
- Flour tortillas
- Brown rice
- Not sure

6. Based on what you know, grains are an important source of...

- Vitamin D
- Vitamin K
- B vitamins
- Vitamin C
- Not sure

7. As far as you know, which of these should you look for on a label to tell if a loaf of bread is whole wheat?

- 100% wheat
- Stone-ground wheat
- Cracked wheat
- Whole wheat is first in the ingredient list
- Not sure

8. As far as you know, what amount of cooked vegetables is generally considered a serving?

- ¼ cup
- ½ cup
- 1 cup
- 2 cups
- Not sure

9. Based on what you know, what is the amount of vegetables MyPlate (the government's food guide) recommends an adult should eat?

- 1 to 2 cups each day
- 2 to 3 cups each day
- 6 to 7 cups each day
- 5 to 6 cups each week
- Not sure

10. Based on what you know, why does MyPlate (the government's food guide) recommend people eat a variety of vegetables?

- To increase protein intake
- Helps you get all your nutrients
- It's better for the environment
- To save money
- Not sure

11. Based on what you know, fruit is an important source of which of these nutrients?

- Protein
- Vitamin C
- Calcium
- Vitamin B12
- Not sure

12. Based on what you know, what type of dairy (milk, cheese, yogurt, etc) does MyPlate recommend?

- None
- Whole milk
- Low fat and fat free
- A mix of low fat and full fat
- Not sure

13. Based on what you know, which of the following are some calcium-rich alternatives to milk?

- Calcium-fortified juice
- Canned fish with bones (such as sardines)
- Kale and collard greens
- All of the above
- Not sure

14. Why do you think MyPlate recommends eating low-fat and lean meat and poultry?

- They have more vitamins
- To keep saturated fat low
- To save money
- They have more fiber
- Not sure

15. Based on what you know, which of these is a safe way to defrost meat?

- On the kitchen counter
- In a bowl of hot water
- In the oven
- In the refrigerator
- Not sure

16. Do you agree that some foods can be high in fat but not cholesterol?

- Agree
- Disagree
- Not sure

17. How would you rate the healthfulness of each of the following types of fat?

	Healthy	Un-healthy	Not sure
a. Polyunsaturated fats	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Monounsaturated fats	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Saturated fats	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Omega-3 fats	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Trans fats	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

18. As far as you know, how are oils like olive and canola oil different from solid fats like butter and shortening?

- Oils are usually lower in saturated fat
- Oils raise LDL (bad) cholesterol
- Oils are usually higher in saturated fat
- Oils are always hydrogenated
- Not sure

19. As far as you know, which fat do experts say is most important for people to eat less of?

- Monounsaturated fat
- Polyunsaturated fat
- Saturated fat
- Trans fat
- Not sure

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These next few items are about the nutrients in foods. (Please choose only one answer for each.)

1. Do you agree that sunlight helps the body produce vitamin D naturally?

- Agree
- Disagree
- Not sure

2. As far as you know, which of the following has the most calories?

- 1 gram of sugar
- 1 gram of protein
- 1 gram of fiber
- 1 gram of fat
- Not sure

3. Do you agree that brown sugar is a healthier choice than white sugar?

- Agree
- Disagree
- Not sure

4. Do you think these are high or low in salt when they are cooked without added salt?

	High	Low	Not sure
a. Cheese	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Pasta without sauce	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Red meat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Do you think these are high or low in fiber?

	High	Low	Not sure
a. Fish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Raspberries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Eggs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Red meat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Broccoli	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Baked potato with skin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Do you think these foods are high or low in saturated fat when cooked without adding fat?

	High	Low	Not sure
a. Fish sticks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Whole milk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Olive oil	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Red meat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Chocolate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. A type of oil which contains mostly monounsaturated fat is...

- Coconut oil
- Soybean oil
- Olive oil
- Palm oil
- Not sure

8. Based on what you know, which has more fat per serving?

- Hot dogs
- Ham
- They both have the same
- Not sure

9. Based on what you know, which has more fat per serving?

- Peanuts
- Air-popped popcorn
- They both have the same
- Not sure

10. As far as you know, cholesterol is found in...

- Vegetables and vegetable oils
- Animal products like meat and dairy products
- All foods that have fat or oil
- Not sure

11. As far as you know, if a product is labeled as only containing vegetable oil, it is...

- Low in saturated fat
- High in saturated fat
- Could be either high or low in saturated fat
- Not sure

12. Would you consider 100 milligrams of sodium to be a low or high amount for one serving of food?

- Low
- High
- Not sure

13. Would you consider 20 grams of fat to be a low or high amount for one serving of food?

- Low
- High
- Not sure

14. Would you consider 5 grams of fiber to be a low or high amount for one serving of food?

- Low
- High
- Not sure

15. Would you consider 10 grams of saturated fat to be a low or high amount for one serving of food?

- Low
- High
- Not sure

This next section is about health benefits of foods.  
(Please choose only one answer for each.)

1. Are you aware of any major diseases that eating enough fruit and vegetables might help prevent?

- Yes
- No
- Not sure

If Yes, what major diseases does eating enough fruit and vegetables help prevent?

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2. Are you aware of any major diseases that eating enough fiber might help prevent?

- Yes
- No
- Not sure

If Yes, what major diseases does eating enough fiber help prevent?

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3. Are you aware of any major health problems or diseases that are related to how much salt people eat?

- Yes
- No
- Not sure

If Yes, what diseases or health problems do you think are related to salt?

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4. Do you think these help protect against certain kinds of cancer? (Please choose only one answer for each.)

	Yes	No	Not sure
a. Eating more fiber	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Eating less salt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Eating more red meat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Do you think these help protect against heart disease?

	Yes	No	Not sure
a. Eating more fiber	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Eating more red meat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Neural tube defects are birth defects of the brain and spinal cord. Can eating any of these vitamins in early pregnancy help prevent these kinds of birth defects?

- Vitamin A
- Folic acid or folate
- Vitamin D
- None of these
- Not sure

7. Which of the following statements about exercise and cancer do you agree with?

- Exercise increases chances of some types of cancer
- Exercise decreases chances of some types of cancer
- Exercise makes no difference
- Not sure

8. Which of the following statements about calories and weight gain do you agree with?

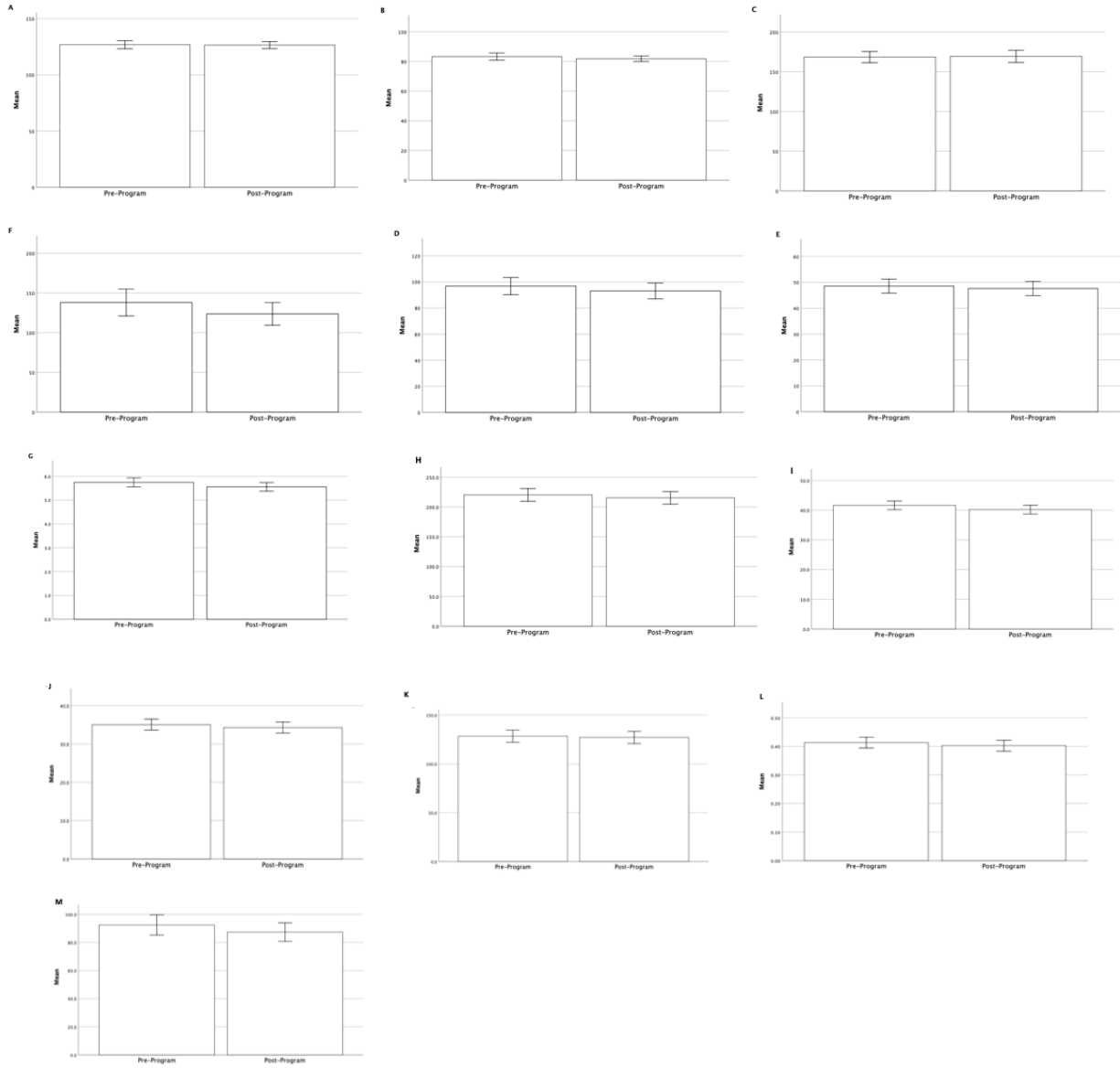
- Calories from fats are most likely to cause weight gain
- All calories cause the same weight gain
- Calories from carbohydrates are most likely to cause weight gain
- None of these
- Not sure

## APPENDIX E: Anonymous Program Evaluation Survey

1. Did you enjoy BMW's Weight Management Program  
Yes  
No
  
2. What were your favorite program incentive(s)?  
Infusion Water Bottle  
Meal Prep Boxes  
Exercise Kit  
Fitbit  
Yoga Mat  
Personal Blender  
Digital Scale
  
3. What were your LEAST favorite program incentive(s)?  
Infusion Water Bottle  
Meal Prep Boxes  
Exercise Kit  
Fitbit  
Yoga Mat  
Personal Blender  
Digital Scale
  
4. Do you have any feedback about the incentives offered in the wellness program?
5. What were your favorite things about the wellness program?
6. What were your LEAST favorite things about the wellness program?
7. Do you have any suggestions for future wellness programs you would like to see offered?
8. What lifestyle changes did you make as a result of this program? (select all that apply)  
Eat more vegetables/fruit  
Eat more whole grains  
Increase in exercise  
Joined a gym  
Bought exercise equipment  
Sleep more hours each night  
Actively reducing stress  
Increased number of steps per day  
Improved labs (cholesterol, A1c, other)  
Decreased weight/waist circumference  
Positively influenced the health of coworkers  
Positively influenced my family's health  
Drink more water  
None of the above  
Other \_\_\_\_\_
9. Please include any additional feedback below:

## APPENDIX F: Comparison of Pre- and Post- Program Charts

**Figure 3: Anthropometric/Biometric Results Pre- and Post-Program**



A. Blood pressure, systolic; B. Blood pressure, diastolic; C. Total Cholesterol; D. Low-Density Lipoprotein; E. High-Density Lipoprotein; F. Triglycerides; G. Hemoglobin A1c; H. Weight; I. Waist Circumference J. Body Mass Index; K. Fat-Free Mass; L. Fat Mass; M. Body Fat %