Are Cooking Interventions Effective at Improving Dietary Intake and Health Outcomes? A Systematic Review

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Thesis submitted to the faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

Master of Science
In
Human Nutrition, Foods and Exercise

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August 22nd 2022
Blacksburg, Virginia

Keywords: cooking, intervention, cooking efficacy, cooking confidence, processed foods, NOVA, overweight and obesity, BMI, cholesterol

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ABSTRACT

Existing systematic reviews have suggested that cooking interventions can be beneficial for improving dietary intake and health outcomes, with research indicating that the ability to prepare meals at home may prove to be more complex, and involve influencing factors (i.e., cooking self-efficacy, food agency [i.e., one's ability to procure and prepare food with the considerations of their physical, social and economic environment], and nutritional literacy/knowledge) for improving health outcomes. With the average American's diet consisting of about 60% of total energy coming from the consumption of ultra-processed foods, interventions that target increasing cooking skills and the frequency of consuming home-cooked meals may help to reduce reliance on processed foods, improve dietary intake quality, and reduce risk of weight gain, obesity, and related conditions. To date, there are no systematic reviews that have addressed the impact of cooking interventions on processed or ultra-processed food consumption. Therefore, this research systematically reviewed the body of literature focused on cooking interventions and dietary intake including processed food consumption and evaluated intervention's effectiveness at improving dietary intake and physical and mental health outcomes. English and full-text research articles published through January 2021 were obtained through PubMed, CINAHL using EBSCO, Web of Science from Clarivate, Scopus and PsycInfo. Overall, 55 articles were obtained after meeting the inclusion criteria and going through the data extraction process. Outcomes of interests to measure included fruit and vegetable consumption, body mass index (BMI), body weight, waist circumference, blood pressure, physical activity, and if the study measured psychosocial outcomes or processed food consumption. Results indicate that when analyzing the effect sizes for studies that reported mean data for each group (eg, intervention and control/comparison groups), 86% of studies measuring fruit intake found a positive effect size (Average: Cohen's d: 0.65, 95% CI: 0.30, 0.99); 90% of studies measuring vegetable intake found a positive effect size (Average: Cohen's d: 0.80, 95% CI: 0.37, 1.09); 82% of studies measuring BMI found a negative effect size (Average: Cohen's d: -0.20, 95% CI: -0.58, 0.17); 100% of studies measuring body weight had a negative effect size (Average: Cohen's d: -0.27, 95% CI: -0.77, 0.23); and 100% of studies measuring waist circumference had a negative effect size (Cohen's d: -0.16, 95% CI: -0.60,0.24). This systematic review will provide information on recently published studies that were not incorporated in prior reviews that can be utilized in future interventions that aim to improve health outcomes and reduce processed food consumption.

Are Cooking Interventions Effective at Improving Dietary Intake and Health Outcomes? A Systematic Review

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GENERAL AUDIENCE ABSTRACT

Prior systematic reviews have stated that cooking classes and demonstrations may be beneficial for improving an individual's diet and overall health. Research currently suggests that the ability to prepare meals at home may prove to be more difficult to assess, and involve other factors, (i.e., cooking confidence, one's ability to get and prepare food in their physical, social and economic environment, and nutritional knowledge) for improving physical and mental health. With the average American's diet consisting of about 60% of total energy coming from the consumption of ultra-processed foods, interventions that aim to improve cooking skills and how often someone consumes home-cooked meals may help to reduce reliance on processed foods, improve diet quality, and reduce risk of weight gain, obesity, and related conditions. To date, there are no systematic reviews that have explored cooking interventions effects on ultra-processed food consumption. This research systematically reviewed the body of literature focused on cooking interventions and dietary intake including processed food consumption and evaluated their effectiveness at improving dietary intake and physical and mental health outcomes. English and full-text research articles published through January 2021 were obtained through five online databases. Overall, 55 articles were included. Outcomes of interests included fruit and vegetable consumption, body mass index (BMI), body weight, waist circumference, blood pressure, physical activity, psychosocial outcomes, and processed food consumption. Results indicate that 86% of studies measuring fruit intake found their intervention to be effective in increasing fruit intake. A total of 90% of studies measuring vegetable intake found that their interventions were effective at improving vegetable intake. 82% of studies measuring BMI found that their interventions showed effectiveness at decreasing BMI. Both 100% of studies measuring body weight and waist circumference showed effectiveness at decreasing both measures. This systematic review will provide information on recently published studies that were not incorporated in prior reviews that can be utilized in future interventions that aim to improve health outcomes and reduce processed food consumption.

Acknowledgements

I would first like to give things to my advisor, Dr. Brenda Davy, who has diligently guided me through this process, despite the continuous hurdles being thrown into my path. Thank you for taking a chance by accepting me into your lab and providing me with this opportunity to grow and develop as a researcher and professional in the field of nutrition. I would also like to thank my committee members, Dr. Valisa Hedrick, and Dr. Benjamin Katz, for having a shared interest and believing this project would be of great value.

Next, I would like to give thanks to my parents, Tom and Kim. Many of my friends and faculty members have watched me go through the hardest moments of my life- which was to see both my parents have cancer during this experience. At the beginning of graduate school, my father was beginning the recovery process for cancer. In the Fall of 2021, my mother got diagnosed with cancer and went through radiation treatments. Unfortunately, coming off my year-long leave of absence to take a break from these struggles and pursue a dietetic internship, my mother was once again diagnosed with cancer (Summer of 2022). While this has been the most developmental roller coaster of my life, I cannot help but think about their struggles as a catalyst for me pursing and accomplishing my own dreams and demolishing every obstacle. Mom and Dad, despite going through such intense challenges in your life, thank you for always asking, “Is your thesis done yet?”, because when life felt impossible, you always provided me with something to continue to fight for. Needless to say, cancer research will be a topic of interest for me after I obtain my Master’s degree.

To Katelyn, who became my friend through the peer review process at the beginning of this whole adventure. Thank you for the many laughs, struggling alongside me to work EndNote. Thank you for staying adjacent to me in the path moving forward as we both moved, continued to do a dietetic internship, and are now both experiencing/ anticipating our futures as a dietitian.

To all my friends, I say thank you tremendously. Endless zoom sessions halfway across the country trying to figure out how to work SPSS and format excel charts. My graduate school friends, who may have been few due to being launched into a pandemic- some of whom I never met in person, I appreciate your guidance, support, and love through this process. I know I would not have been able to make it this far without any of you.

To Marty, my lovely golden retriever and support buddy who started grad school with me as just a puppy. Thank you for keeping me sane and making sure I took care of both myself and you as we grew together.

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Attribution

Multiple individuals contributed to the creation of this study. Dr. Davy contributed to conceptualization of the thesis design, and finalizing the research questions, design, and assisted in the editing of the document. Dr. Hedrick and Dr. Katz provided insight and corrections for the document. The SAIG team assisted in educating on the statistical analysis, as well as generalized guidance. Katelyn Barker acted as a peer reviewer and conducted an independent search and comparison of studies.

Chapter 1

Introduction

A chronic condition "is a physical or mental health condition that lasts more than one year and causes functional restrictions or requires ongoing monitoring or treatment".[1] In the United States, 6 in 10 adults have a chronic disease, with 4 in 10 adults having two or more chronic diseases and the number of cases identified continues to climb.[1] Seven out of 10 deaths in the U.S are caused by chronic diseases, with the five most common being the following: heart disease, cancer, stroke, chronic obstructive pulmonary disease (COPD), and diabetes.[1] Overall, this would accumulate to around 1.7 million deaths each year. It is anticipated that there will be an increased likelihood of having these comorbidities given the nation's aging population and current medical advances to extend overall longevity.[1] Currently, the CDC identifies tobacco use, poor nutrition, lack of physical activity, and excessive alcohol use as key lifestyle risks for developing a chronic disease. Improving nutrition and the amount and frequency of physical activity have been primary targets in many interventions.[2]

The Dietary Guidelines for Americans have been updated for 2020-2025 and reflect the recent shift regarding the intake of processed foods and improving cooking habits.[3] Some of these include limiting added sugars, saturated fat, and sodium which are often in processed and packaged foods. These new guidelines also include recommendations for healthy dietary patterns for all stages of life, which prior guidelines have not fully encompassed since 1985. The guidelines include recommendations from birth through older adulthood, which also include specific needs for those who are pregnant and breastfeeding. Upcoming interventions may align their objectives to include these topics of interest, where validated tools for assessing processed food consumption and cooking habits are limited. [4] There has been a shift that began around the mid-20th century from home cooking and meal preparation as the

primary dining habit to eating fast food or takeout meals.[5] It is commonly believed that this shift is due to the convenience and ease of purchasing unhealthy food choices. [5] Many Americans experience a busy work-life environment, leading to reduced time and ability to cook meals at home, and increased opportunities for takeout meals. The workplace has recently been utilized as a primary location or funding source for nutrition interventions in the aim to improve this hectic work-life balance.[5]

While many nutrition interventions have been successful in improving health outcomes such as body weight, BMI, blood pressure, cholesterol (etc), [4,6] future cooking interventions that aim to improve health outcomes and cooking skills warrant a longer study duration, a more diverse study population, and the use of validated tools. [4] This systematic review and will serve as an update to existing reviews on the topic of cooking interventions and health outcomes and will summarize findings from previous studies and their effectiveness at improving health outcomes including dietary intake, physical, mental and psychosocial outcomes. This information can be used for the development of future interventions that aim to meet the 2020-2025 Dietary Guidelines for Americans and seek to improve cooking habits, health outcomes, and reduce processed food consumption.

Chapter 2

Systematic Review

INTRODUCTION

Processed food consumption has been linked to an increased risk of cardiovascular disease, type 2 diabetes, cancer, obesity, and all-cause mortality.[7,8,9] According to the results from a controlled feeding trial, 14 days of exposure to a diet high in ultra-processed foods (foods with high proportions of added sugars, fats, and starches) increased daily energy intake by 508 kcal/day and resulted in approximately1 kg weight gain.[10] In 2016, more than 1.9 billion adults 18 years and older were overweight, with 650 million of these adults being obese (body mass index of 30 or more) . [11] In the United States (U.S.), where ultra-processed foods comprise approximately 60% of total energy[12], the age-adjusted prevalence of obesity in adults aged 20 and older was 42.4% in 2017-2018.[13]

Consumers choose processed foods for many reasons. They tend to be ready-to-eat, easy to prepare, tasteful and affordable, but also nutrient-poor and calorie-dense.[14,15] In recent years there has been a shift to eating away-from-home foods, with minimal time being spent preparing foods, as well as number of individuals who cook at home.[14,16] Dietary quality is impacted with this shift. Liu et al., reported that in 2015-2016, the diet quality of restaurant meals and fast food establishments was low, with an American Heart Association (AHA) diet score of 17.3 and 14.7 respectively, out of a potential score of 100.[17] A decrease in total vegetables, whole grains, and fiber, along with an increase in total energy intake and empty calories, as well as body mass index (BMI) was reported to be associated with frequency of fast food consumption in a prospective analysis.[18] Interventions that target improving cooking skills and increasing the frequency of consuming home-cooked meals may help to reduce reliance on processed foods, improve dietary intake quality, and reduce the risk of weight gain, obesity, and related conditions.[19] Research has examined general cooking attitudes or skills, but the ability to

prepare healthy meals at home may be more complex, and involve factors such as one's overall confidence in preparing meals with items at home (i.e., cooking self-efficacy, food agency), assurance of making a meal by memory, or knowledge of how to choose healthier alternatives.[20,21]

In a 2018 systematic review, Reicks et al. reported positive impacts of cooking interventions on fruit, vegetable, and energy intake, cooking confidence, and knowledge outcomes, but findings related to impacts on nutrient intake, body weight, and physical activity were mixed.[4] There is growing evidence for the association of dietary intake with psychosocial and mental health outcomes, which may be enhanced with improved cooking skills and reduced reliance on processed foods and eating out. For example, a recent study found that added sugars intake in college students predicted anxiety in both men and women.[22] While these health outcomes have not been a primary focus in cooking interventions, especially in populations other than older adults, a systematic review conducted by Farmer et al.[23] reported that participation in cooking interventions led to positive effects on self-esteem, social interaction, anxiety, psychological well-being, and quality of life. However, the evidence base was limited by the inclusion of only 11 articles, which suggests the need to include psychosocial outcomes in future interventions on this topic.[23]

Recently, the importance of home cooking in maintaining health, including the ability to better navigate public health and economic crises, has been highlighted in the news media and in the Dietary Guidelines for Americans 2020-2025.[3,24, 25] Previous systematic reviews of cooking interventions and health outcomes in adults have covered a time frame that does not include recent relevant studies (i.e., 1980-2016)[4,20] had only a small pool of studies included which also limited their focus to just psychosocial outcomes, [23] and did not undertake an exhaustive systematic literature search or include interventional studies.[19,26,] Furthermore, although research has identified numerous adverse effects of

ultra-processed food consumption, to date no reviews have addressed the impact of cooking interventions on processed or ultra-processed food consumption.

The purpose of this research is to systematically review all existing literature focused on cooking interventions, with the aim to evaluate their effectiveness at improving dietary intake, including processed food consumption, and physical and mental health outcomes. The secondary purpose will be to determine if interventions were effective at improving the following health outcomes: BMI, body weight, blood pressure, waist circumference, and fruit and vegetable intake. These variables were selected due to their frequency of reporting in this literature in comparison to other outcomes included in this review, as well as the greater likelihood of assessment using validated tools.

MATERIALS AND METHODS

Study inclusion and exclusion criteria

The protocol for this systematic review was registered via PROSPERO[27] (CRD42020178186) on April 3, 2020. Eligibility criteria were developed using the population, intervention, comparison, outcome, and study design (PICOS) model (Table 1).

Table 1. PICOS Objectives[a]

Population	Individuals aged 18 and older, without prior training in culinary arts/nutrition
Intervention	Interventions focused on improving cooking or food preparation skills
Comparison	Control or comparison group
Outcome	Health outcomes including weight status, cardio-metabolic health, dietary intake/diet quality, health behavior constructs, food/cooking-related skills, psychological/mental health outcomes.
Study Design	RCT's [b], non-randomized controlled trials, and pre/post design studies that included comparison/control groups.

[a:] Population, Intervention, Comparison, Outcome, Study design
[b:] Randomized controlled trials

This review included randomized controlled trials (RCT), non-RCT, and pre/post design interventions that included a control or comparison group, that was done in humans and published in the

English language before January 5, 2021. To determine if changes in outcomes could be attributed to the intervention, intervention studies that did not include a control or comparison group were excluded.[28] Meta-analyses, systematic reviews, and narrative reviews were excluded.

Cooking interventions can benefit a wide array of individuals, so there were no exclusion criteria related to health conditions, pregnancy status, or physical abilities of participants when selecting studies. Studies of individuals under the age of 18 were excluded, but studies of parent-children pairs were included if they reported data on participants above the age of 18 separately. Studies of participants who, due to their professional occupation, have substantial pre-existing knowledge about cooking or the culinary arts (e.g., chef, nutritionist, dietitian, food service workers, college students in a nutrition/dietetic major, etc.) were also excluded. Studies in which there was no intervention component addressing cooking skills or food preparation or studies that focused on improving the intake of an individual's minerals/nutrients (e.g., interventions aimed at increasing nutrition knowledge; interventions aimed at reducing sodium intake) were excluded.

Database search strategies

This review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines.[27,29] The searches were performed using four electronic databases: PubMed (with Medline) (1900's-present), Web of Science Core Collection and Clarivate Analytics (1900-present); Scopus (1800's-Present); and Cumulative Index of Nursing and Allied Health Literature (CINAHL) from EbscoHost (1981-Present). In total, there were 35 search terms and Boolean search operators used for each database. The search string that was utilized for PubMed is provided in Table 2 and is identical to the CINAHL and Web of Science search strings. The complete PubMed search string was modified for Scopus due to the defined character limit. This additional search string and others can be found in the Appendix (Appendix A: Database Search Strings). Reference lists of relevant review

articles were also manually reviewed, to identify articles that may have been missed in the electronic search.

The search was carried out independently by two researchers (duplicated) and completed on September 17, 2019. The initial search resulted in 8,568, articles which are summarized in the Appendix (Appendix B: PRISMA Flow Diagram). These articles were imported to EndNote X9 where duplicates were removed, resulting in 4,498 articles (completed December 10, 2019). An updated search was conducted in January 2021 to include any relevant articles that were published after the initial search. An additional electronic database, PsycInfo, was included in this search. The updated search included a total of 1,945 articles. After duplicate removal and exclusion of articles from the prior search, 1,080 articles remained.

Table 2. Search Strategy String

PubMed Search String
((Cooking[MeSH] OR Cooking[TIAB] OR Cook*[TIAB])) AND (Intervention[Title/Abstract] OR Program[Title/Abstract])) AND (Obesity[Title/Abstract] OR "Blood pressure"[Title/Abstract] OR "Diabetes mellitus"[Title/Abstract] OR Diabetes[Title/Abstract] OR Glucose[Title/Abstract] OR Cholesterol[Title/Abstract] OR "Body mass index"[Title/Abstract] OR BMI[Title/Abstract] OR "Body weight"[Title/Abstract] OR "Cardiovascular disease"[Title/Abstract] OR CVD[Title/Abstract] OR Health[Title/Abstract] OR Diet[Title/Abstract] OR "Diet quality" OR "Dietary intake"[Title/Abstract] OR "Nutritional literacy"[Title/Abstract] OR "Processed foods"[Title/Abstract] OR NOVA[Title/Abstract] OR Attitude[Title/Abstract] OR "Self-efficacy"[Title/Abstract] OR "Cooking frequency"[Title/Abstract] OR "Food preference"[Title/Abstract] OR "Meal patterns"[Title/Abstract] OR "Food security"[Title/Abstract] OR "Food literacy"[Title/Abstract] OR "Food selection"[Title/Abstract] OR Depression[Title/Abstract] OR Anxiety[Title/Abstract] OR confidence[Title/Abstract] OR "Mental health" OR Cognitive [Title/Abstract])
Scopus Search String
Cooking OR cook* AND Intervention OR program AND Diabetes OR "body mass index" OR "cardiovascular disease" OR "body weight" OR Health OR Diet OR "dietary intake" OR "processed foods" OR NOVA OR "self-efficacy" OR confidence OR "food security"

Study Selection

The titles and abstracts were assessed independently by two reviewers for inclusion/exclusion criteria. The two reviewers (KW, KB) met to discuss and resolve discrepancies with additional assistance by a third investigator (BD) when needed. Articles that appeared to meet inclusion criteria based upon titles and abstracts (n=133) were retained for full-text review, which was conducted independently by the two reviewers. After the full-text screening, two studies that reported results in individuals below the age of 18 years were included for the following reasons. One family-based intervention study was included, due to the majority of participants being adults, high relevance to this review, and the strong focus on cooking skill development.[30] In the second article, college students in Brazil were recruited, with a minimum age to participate of 16 years old. However, the mean age of participants was 19-20 years.[31] This led to a total of 47 articles that were retained for data extraction and qualitative and quantitative synthesis.

Two additional articles were identified after the manual screening of reference lists in relevant reviews, resulting in a total of 49 articles for inclusion and data extraction. An additional 6 articles were included in the systematic review as a result of the updated search completed in January 2021. This led to a total of 55 articles that were kept for the data extraction phase.

Data Extraction

One author (KW) extracted data from 55 articles and entered them into a data extraction table (Appendix C: Data Extraction Table), which included the following information for each study: study design, duration, population, study objective, outcome measures of interest, results, and any additional comments.

Article Quality Assessment

Each of the 55 articles was given a quality rating of positive, negative, or neutral based on the Academy of Nutrition and Dietetics Evidence Analysis Library's (EAL) quality criteria checklist for primary research and can be found in the Appendix (Appendix D: Academy of Nutrition and Dietetics Quality Criteria Checklist for Primary Research).[32] This criteria checklist is used to evaluate the validity of articles by taking into consideration the following: Clarity of the research question, potential bias in regards to the selection of study participants, the comparability between study groups, the methods of how withdrawals in a study were handled, the prevention of bias by including blinding in the intervention design, a description of the intervention that was detailed and including intervening factors, valid and reliable measures and clearly defined outcomes, an appropriate statistical analysis, biases and limitations are taken into consideration with conclusions being supported by results, and the absence of bias in funding sources or potential conflicts of interest. The primary researcher completed an article quality assessment for each article, with a summary of ratings found in the Appendix (Appendix E: Quality Criteria Checklist Results Table).

RESULTS

Study Design

Out of the 55 studies evaluated, 37 studies (67%) were RCT/ randomized with comparison groups, 14 studies were non-randomized trials with a control group, which included a follow-up study to another included study of the same design type, and four studies were non-randomized with a comparison group (Appendix F: Study Characteristics Identifiers Table).

Study Characteristics

Study characteristics are summarized in the Appendix (Appendix F: Study Characteristics Identifiers Table). Briefly, the geographic location of studies included 21 (38%) studies based in the US

with the remaining conducted outside of the US. Study lengths were mostly 4 to 12 weeks (36%) or 3 to 6 months (35%). There were 4 studies that did not state the intervention length (7%), and 3 studies had split-duration interventions in which they collected data in phases (5%). Concerning behavior change theories, a large portion of interventions were either not theory-based or did not state a theory used (49%) but of those that did have a theoretical basis for the intervention (51%), the most commonly used one was Social Cognitive Theory. Cooking components were most often described as active, or hands-on as the method of learning (49%), with additional studies (18%) being predicted as active, or hands-on but were not adequately described within the study.

Reported Outcomes

Of the 55 studies included in the systematic review, the number of studies that included the outcomes of interest measured between groups or in groups over time was as follows: BMI (n=11), body weight (n=6), fruit and vegetable consumption combined (n=15), vegetable/vegetable protein consumption specifically (n=3), fruit consumption specifically (n=1) and waist circumference (n=5). Fourteen studies reported on the intake of fast/take away/convenience foods, and 41 studies that reported psychosocial outcomes such as confidence (in oneself or cooking ability), self-efficacy (in oneself or in cooking ability, food preparation, ability to try new things or foods), social enjoyment/support, self-esteem, and mental health measures (Appendix G: Studies Reporting Group Differences on Main Outcomes).

Article Quality

Out of 55 articles, 31 received a neutral grade, 19 received a positive grade, and 5 received a negative grade. The article quality data are summarized in the appendix (Appendix E: Quality Criteria Checklist Results Table)

Intervention Effectiveness: Dietary intake, Physical and Mental Health Outcomes

Dietary Intake

A summary of intervention effectiveness in presented in the appendix (Appendix H: Data collection for Effect Size Analysis). Of the 34 studies that analyzed dietary intake, fruit and vegetable consumption were measured in a total 27 studies, with 15 using a between-group or group by time analysis for either fruit or vegetable consumption. Out of these 15 studies, seven were compared in an effect size analysis for fruit consumption specifically. Most studies (85.7%) indicated an effect size that was positive, suggesting that there was an improvement in fruit intake among most of the interventions. [33-38] There was one study that had a negative effect size that was slightly less than zero (Cohen's d: -0.02, 95% CI -0.41, 0.38) [39] This is presented below, in Figure 1.

Vegetable intake was more commonly assessed for studies, with several studies (n=10) indicating a between-group or group by time result, and therefore included for comparison of effect size. Almost all of the studies (90%) indicated an effect size that was positive, suggesting that there was an improvement in vegetable intake amongst most of the interventions. [34-41] Only one study had a negative effect size (Cohen's d: -0.04, 95% CI 0.66 to 0.59). [42] Overall, the average effect size among studies was large (Cohen's d: 0.8, 95% CI 0.37 to 1.09). There was one major outlier in which the effect size was distinctly larger (Cohen's d: 4.05, 95% CI 3.31 to 4.80).[37] This is presented below, in Figure 2.

There were a few studies that indicated that a between group or group by time result occurred for either fruit or vegetable consumption, but lacked full data to represent either the intervention or control group, did not separate overall fruit and vegetable intake from one another, or compared fruit and vegetable intake improvement in the form of how frequently they were consumed per week (leading to several means for each group).[43-47]

While reviewing the studies that looked at fruit and vegetable consumption, it was made apparent that several nutritional interventions had the aim to promote or require participants to either exclusively cook or fully incorporate Mediterranean or plant-based foods into their diets. This included studies that were not necessarily looking specifically at fruit and vegetable consumption, but an overall healthful diet that was high in nutrients or anti-inflammatory compounds. The majority of these studies were focused on increasing overall dietary quality, with most of these changes attributed to an increase in fruits and vegetable intake and reduction in dairy, processed meats, and snacks, and sugar intake. [33, 38, 46, 48- 50] While an intervention that required a strict and comprehensive change elicited large and significant effects in the intervention group, it should be noted that participation rates can be ultimately affected in interventions containing a larger population size due to the difficulty of maintaining an elaborate dietary change.[51]

Cooking self-efficacy and outcomes related to attitude and confidence in one's ability to cook, select healthful food choices, and prepare food were measured in most studies (71%).[31, 33, 34, 36, 37, 39 43, 45-75] Fast food or convenience foods were measured in 14 studies (25.5%). [31, 33-35, 37, 42, 45-47, 69, 76-78] There were many studies that found some improvement for cooking self-efficacy and confidence, one study in particular included an intervention consisting of motivational interviewing, a 20-week physical activity program and two cooking classes. Despite a fully comprehensive intervention, it was found that at a 2-year follow-up that any initial improvements in social-cognitive changes were found to be negative in both the intervention and control group at follow up. [52] A study that utilized a 24-week cooking intervention separated by active cooking and watching a cooking demonstration noted an increase in both diet quality, cooking self-efficacy and cooking attitudes in both groups at 6 months. While there was no difference between groups, it can be suggested that both delivery methods can be a successful approach to increasing these outcomes. [58]

Physical Outcomes: Physical Activity, Blood Pressure, Waist Circumference, and Body Mass Index

There were only a few studies (n=8) that assessed physical activity (PA) or strength. Of those that did include this outcome, most (n= 6) did not find evidence that their intervention improved physical activity or strength, [50, 52, 79] had poor compliance with PA reporting, [55] did not analyze a between-group change,[67] or improvements were not sustained at follow-up.[64] The intervention with the most notable improvements in PA included a more intense exercise regime that required participants to exercise for a total of 23 hours over 10 days[50] The intervention group had improvements in back and leg strength, bilateral grip strength, and cardiorespiratory endurance compared to the control group. [50]

Blood pressure (BP) was assessed in seven studies, [44, 48, 65, 71,79-81] and waist circumference was measured in nine studies.[33, 38, 44, 55, 64, 76, 79, 81-83] However, most studies did not perform a between-group or group by time analysis for these measures. There was no obvious characteristic of the studies that reported an improvement in BP, other than this outcome being more commonly measured in interventions including individuals aged 60 or older. Waist circumference was more commonly assessed with between group analysis, in which a handful of studies (n=5) measured this as an oucome.[38, 64, 76, 82,83] but most included either only women or a majority (over 80%) being women.

BMI and body weight were the most reported physical outcomes, and most studies reported favorable effects. Of the 17 studies that included body weight, 6 (35.3%) included a between-group or group by time result.[38, 50 ,52, 76, 82, 83] Of the 19 studies that assessed BMI, 11 (47.4%) included a between-group analysis or group by time measurement [33, 38, 50, 63, 64 70, 71, 76, 77, 83, 85] For both body weight and BMI, two studies were excluded from the effect size analysis for each outcome. One study was excluded from the effect size analysis; the authors were contacted in attempts to clarify inconsistencies with data, but no response was received.[81] Another study indicated there was a between-group analysis conducted but did not provide adequate data for the control group which was needed for calculating effect size.[58]

With the exclusion of these two studies, there were a total of 11 studies that indicated a between group or group by time change that was significant for BMI. Of those that were included in the effect size analysis, 9 (82%) indicated a negative effect size, suggesting there was a decrease in overall BMI amongst most of the interventions. [33, 38, 50, 63, 70, 71, 76, 83, 85] Two studies did indicate a positive effect size, in which they appeared to be small (Cohen's d: ranging between 0.10 and 0.15).[64, 77] Overall, the average effect size across all the studies was the following (Cohen's d: -0.20, 95% CI: -0.58 to 0.17). One study had a large effect size, (Cohen's d: -1.06, 95% CI: -1.26, -0.85).[33] This is presented below, in Figure 3.

With the exclusion of the two studies stated prior, there were a total of six studies that indicated a between group or group by time change for body weight. All studies included in this analysis indicated an effect size that was negative, suggesting that there was a decrease in body weight amongst all the interventions. [38, 50, 52, 76, 82, 83] Overall, the average effect size among studies was Cohen's d: -0.27 (95% CI -0.77 to 0.23). There was one study that had a larger effect size, (Cohen's d: -0.91, (-1.52, -0.30). [52] This is presented in Figure 4.

The studies that measured BMI and body weight ranged anywhere from 10 days to a year in length. Some notable studies include the study done by Lee, et al., which as mentioned, had significant changes in BMI due to the strict exercise regime that lasted for 10 total days.[50] Janssen, et al. utilized a mindfulness practice within one of the study groups in combination with cooking workshops and nutrition education, promoting a significant decrease in BMI in this group versus no decrease within the group that only included mindfulness practice and a group meal. [64] Despite the control group only receiving educational handouts on modifying dietary intake, when combined with the intervention group, the study by McGorrigan, et al. found that approximately 70.5% of all participants decreased their BMI over the course of the study. [77]

Five studies were utilized in the effect size analysis for waist circumference. Of this, all the 5 studies indicated a negative effect size.[38, 64,76, 82, 83] The average effect size across studies was small (Cohen's d: -0.16, 95% CI: -0.60 to 0.24). However, this finding and can provide more insight into the intervention effectiveness when utilized with an outcome like BMI. For example, an increase in BMI may not necessarily indicate an increased fat percentage, but rather increased lean body mass percentage if an outcome like waist circumference has decreased for a participant. This data is presented below, in Figure 5.

Mental Health or Cognitive Outcomes

Only eight studies reported mental health or cognitive outcomes. A variety of measurement tools were utilized or findings were provided in a qualitative report, with studies focusing on depression, anxiety, agitation, and stress. [36, 37, 46, 50, 61, 64, 71, 73, 77] Depression is considered a mental disorder that is characterized by symptoms of persistent sadness, loss of interest in doing activities, difficulty sleeping or over sleeping, feelings of worthlessness (etc.) [86] There were two studies that measured depression in particular, with both either reducing or improving symptoms. [37, 71] Pluss et al. found a reduction in symptom severity for a subtype of a group receiving cardiac intervention, with decreases in overall depressive symptoms, however they were still present, suggesting a need for future interventions to focus on treatment strategies to modify negative psychological and psychosocial factors.[71] Parletta et.al found that both the intervention and control group improved all mental health measures at 3 months, however the intervention had larger improvements. [37] Anxiety is defined as a condition in which a person experiences consistent stress, uneasiness, or nervousness. [87] Pluss et. al also found improvements in symptoms of anxiety, and was the one study to collect data via quantitative reporting rather than through comments from participants. [71] Cognitive outcomes were not a popular outcome to assess, but one study did look to determine if social-cognitive determinants of behavior change were improved by

intervention, which positive changes were found for both the intervention and control groups, but were not sustained, and were actually negative at follow-up. [51] Most studies did not report improvements in these outcomes (n=4), or improvements were not sustained at follow-up (n=2). Pierce et. al concluded there were no between group differences found for social support, quality of life or depression during year one, in which the intervention was the most intense for its participants. [36] Currently, qualitative data from self-reporting serves the most common way to report if participants found the intervention to be beneficial, as most studies did not use a tool to measure these outcomes. There is potential for more quantifiable results in future interventions if more valid and reliable measurement tools are used, shifting the focus to collecting quantitative data with proper baseline and follow-up measures.

Figure 1. Effect Sizes of Studies Evaluating Fruit Intake

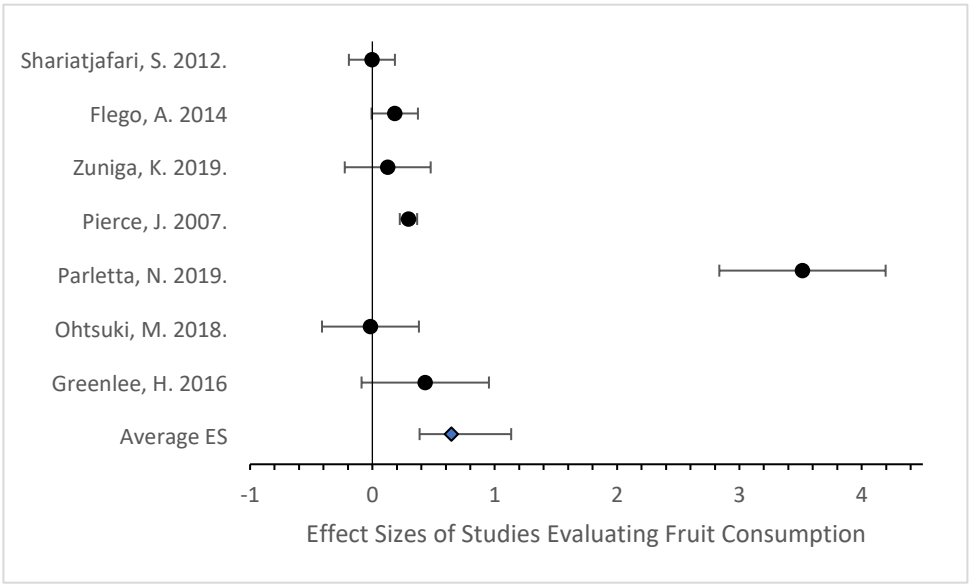
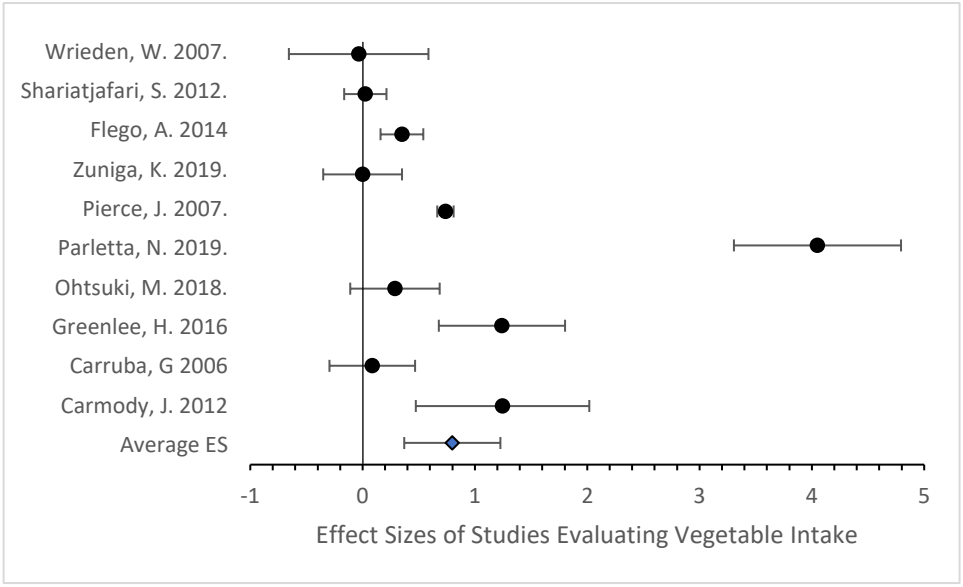


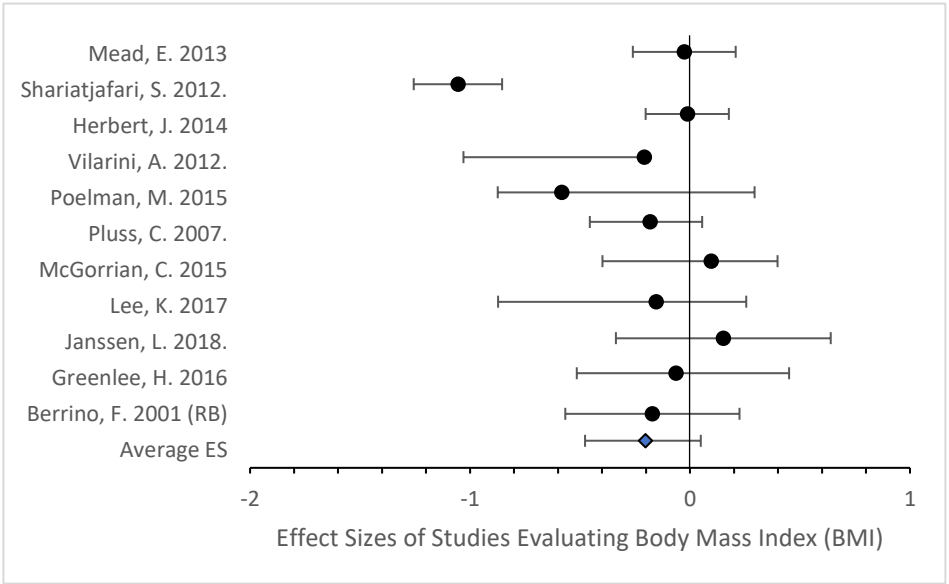
Figure 2. Effect Sizes of Studies Evaluating Vegetable Intake



ES (95% CI)

-0.04 (-0.66, 0.59)
0.02 (-0.16, 0.21)
0.35 (0.16, 0.54)
0.00 (-0.35, 0.35)
0.74 (0.66, 0.81)
4.05 (3.31, 4.79)
0.29 (-0.11, -0.69)
1.24 (0.68, 1.80)
0.09 (-0.30, 0.47)
1.25 (0.47, 2.02)
0.80 (0.37, 1.09)

Figure 3. Effect Sizes of Studies Evaluating BMI



ES (95% CI)

-0.03 (-0.26,0.21)
-1.06 (-1.26,-0.85)
-0.01 (-0.20,0.18)
-0.21 (-0.61,-0.20)
-0.58 (-0.87,0.29)
-0.18 (-0.46,0.09)
0.10 (-0.40,0.59)
-0.15 (-0.87,0.56)
0.15 (-0.34,0.64)
-0.06 (-0.58,0.45)
-0.17 (-0.57,0.23)
-0.20 (-0.58,0.17)

Figure 4. Effect Sizes of Studies Evaluating Body Weight

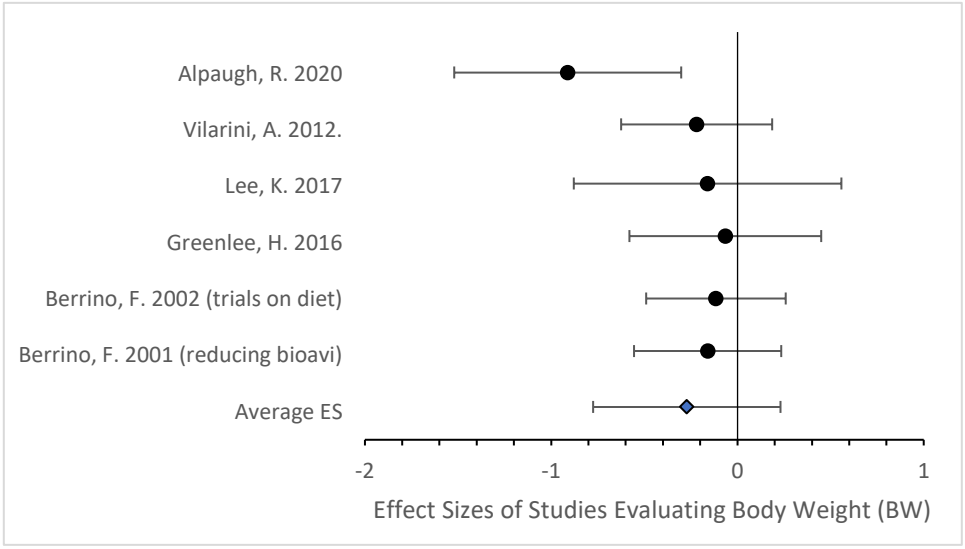
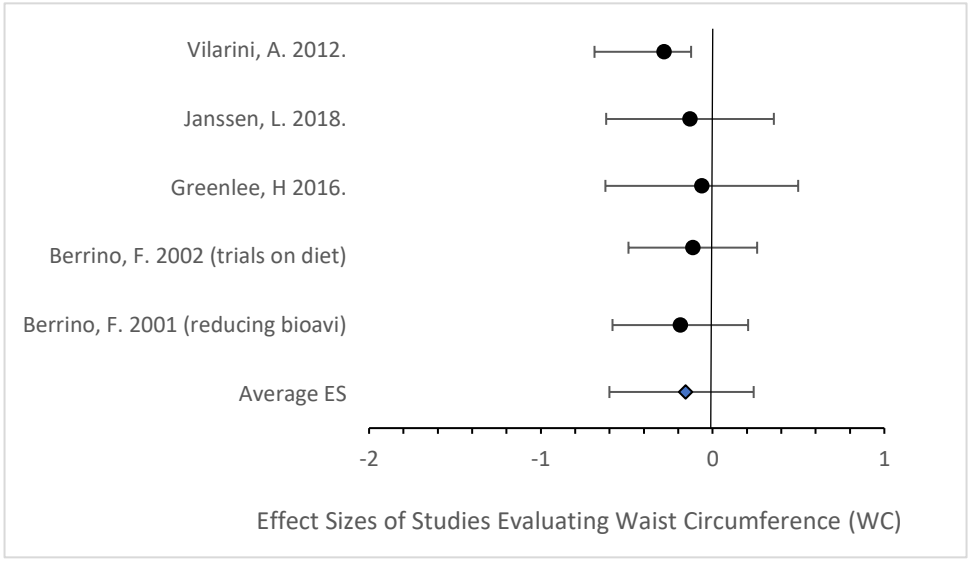


Figure 5. Effect Sizes of Studies Evaluating Waist Circumference



DISCUSSION

This systematic review included all existing literature published prior to January 2021 that focused on cooking interventions and health outcomes, specifically dietary intake, including processed food consumption, and physical and mental health outcomes. This section will summarize findings and address intervention characteristics which were most effective at improving health outcomes, which may be of interest to those planning cooking interventions.

Dietary intake improvements

After the effect analysis was conducted across studies, studies that evaluated BMI, body weight or waist circumference indicated an average effect size that was considered to be small (-0.20, -0.27, and -0.16, respectively). While there were no studies that fell in a medium effect size range, studies that evaluated fruit or vegetable consumption indicated a rather large average effect size across studies (0.65 and 0.80, respectively). Prior reviews have indicated that the results seen from a majority of dietary interventions warrant further consideration.[4] The lack of validated tools, inconsistent measuring methods, and findings based on self-reporting have led to the findings of studies to be non-generalizable to the public, with many of these studies being homogeneous in nature (trends associated with mostly female and middle-aged participants), as well as small study sample sizes. However, over 70% of the studies published in 2019 and later have included some sort of validated measurement tool for dietary intake. This finding suggests that more tools are currently being created and validated, and the results from future studies may have a better chance of being translated into practice for nutritional interventions. While there was a general trend for nutritional interventions to improve dietary intake, a concern shared from other reviews is the inability to determine if improvements were associated with intensity or duration; in which both varied significantly throughout studies.[4, 26] Prior reviews have

indicated the need for more males to be represented in studies, with cooking self-efficacy and cooking attitudes being an important outcome of interest in the male population.[4, 23]

Physical health outcomes

The lack of studies including blood pressure has been addressed in a prior review, with the suggestion that nutritional interventions may be beneficial among participants restricted to therapeutic diets, due to over half of the studies reviewed including a clinical outcome measured.[4] The need for studies with a more balanced gender distribution has been a consistent issue across studies, and changes attributed to the intervention for waist circumference may not occur or be subtle for men. [4,23]

Weight and BMI were two of the most commonly reported physical health outcomes among studies and held more consistency for an analysis. There were several studies that indicated an overall negative effect size in either BMI [33, 38, 50, 63, 70, 71, 76, 83, 85] or body weight. [38, 50, 52, 76, 82, 83] The average effect size (Cohen's D: -0.20, 95% CI: -0.58, 0.17) was small among the studies that measured BMI. For the studies that measured body weight, the average effect size (Cohen's d: -0.27, 95% CI: -0.27, 0.23) was also small, but larger when compared to that of BMI. Weighing participants and calculating BMI appears to be a measure that is both simple and non-invasive. Multiple measurements are also something that is easy to obtain for researchers or participants, which arguably leads to fewer issues with non-compliance reporting, a common issue for nutritional interventions. As compared to something like vegetable intake which can have a variety of ways to measure (ex: cups, servings, or grams of protein), there is less room for interpretation or variance in outcomes which helps to keep study findings consistent.

Mental health outcomes

Only a few studies reported on socialization in either a quantitative or qualitative analysis, which was often correlated with positive health changes in participants. However, there was a lack of validated

tools, inconsistent forms of measurement, or improvements were suggested due to personal statements (qualitative feedback) alone. Therefore, no effect size analysis was done to determine the effectiveness of interventions. Farmer et al. indicated the uncertainty of group-based cooking intervention's positive findings may be due to the act of cooking with others rather than the act of cooking in general. [23] Feuerstein-Simon, et al. noted qualitative psychosocial improvements from a worksite-based intervention in which participants reported attributing their positive feelings about making nutritional changes to workplace conversations related to healthful cooking, which encouraged cooking accountability among coworkers. [61] For general mental health, there were even fewer studies reporting measurements regarding anxiety, depression, agitation or stress, and was often briefly stated in reviews through qualitative reporting or additional statements from participants, rather than measured with validated tools or screening procedures. While measurements occurred more frequently in middle-aged and older adults, it is unclear if these interventions would also benefit a younger population and will need to be explored in future research.

Intervention features associated with effectiveness

Several studies included in this review utilized novel intervention delivery methods, which have shown to be promising for improving health outcomes. A large portion of studies utilized a hands-on instruction, where 49% reported this modality as the main delivery method for the intervention. There were a handful of studies (n=12) that were vague in their description on how the intervention was implemented and fell in the categories of predicted active (n=10), predicted demo (n=1), or was unspecified (n=1). Overall, an active hands-on instruction appeared to be the most popular method of implementing the intervention, which arguably can keep participants engaged, practice and implement new cooking skills with immediate correction or guidance by instructors and encourage the development of muscle-memory for these new skills. Some studies (n=8) combined a hands-on with demonstration

approach, and either assigned one method to the intervention group and one to the control group, or had both approaches used for just one group.

Clifford et al. utilized a 15-minute cooking demonstration delivered four times a week in episode format on televisions, intending to improve purchasing and cooking practices. [56] The intervention was associated with an increase in the ability to make healthful foods and improved cooking motivations and self-efficacy in comparison to the control group. This delivery method may be promising for individuals who lack transportation options, utilize accessibility accommodations, or have busy work schedules. DeRose et al. successfully implemented a church-based intervention that incorporated sermons and a garden to educate and encourage participants to make more plant-based meals, improve dietary quality and reduce body weight gain. [58] Dexter et al. also utilized a telehealth delivery method as a comparison method against the main intervention without significant differences between the two groups for health outcomes. [59] However, findings indicated a positive trend for improvement between both groups, and the authors concluded that both methods may be successful for delivering a cooking intervention, especially to a younger population.

When evaluating psychological factors that may have contributed to intervention success, the feeling of community, learning new habits together, and an increase in socializing may have had an impact, which was noted in qualitative reports for studies evaluating changes in health outcomes. This was also suggested in a past review by Farmer et. al, in which more research was warranted to determine if it could be the feeling of connecting with one another, and to not feel alone when making new changes to dietary habits and cooking practices was the root behind some positive changes. [23]

Processed food consumption was an outcome that was not as commonly assessed in studies, with no studies reporting on ultra-processed food (UPF) consumption. However, there were a small number of studies that did include a focus on processed foods (i.e., take away foods, fast food, sugar-rich foods).

Overall dietary quality was assessed in a variety of ways, either by reducing fast food consumption, increasing fruit and vegetable intake, reducing intake of convenience food items (etc.), but there was a lack of tools used to measure overall dietary quality specifically using tools such as the Healthy Eating Index. In the studies that measured a reduction in processed foods or foods with added sugars, there was a decrease in intake found among studies[30, 34,52, 63,76] but two studies did not do between-group analysis, so no conclusion could be made for those findings[59,78] These trends are favorable, and have the potential to be explored further in future interventions that seek to reduce processed and ultra-processed food consumption.

Learning Theories (LT) were commonly used, with most (51%) utilizing at least one learning theory, or a combination of more than one. [31, 33- 36, 38 ,39, 43, 45-47, 51,52, 54,56, 58, 61- 64, 66, 68-70, 73,74, 77, 85] For the studies that used a learning theory, the majority (93%) indicated at least some positive change for a health outcome of interest, in either a qualitative or quantitative report. [31, 33- 36, 38, 39, 43, 45, 46, 47,52 ,54, 56, 58, 61-64,66, 68-70, 73,74,77 ,85] This is an encouraging finding, and suggests that learning theories can serve as an influential variable for seeing positive changes in health outcomes of interest for cooking interventions.

The most commonly used LT was social cognitive theory (SCT), with a large portion of studies (n=16) using this theory. Overall, this would mean that over half the studies (57%) that did use a LT incorporated SCT as part of their framework. With the considerations that 93% of studies that used a LT found a positive change, it can be argued that SCT can be a favorable LT to use in interventions moving forward, as it made up the majority of studies that incorporated a LT. There is a potential that this theory was used due to its framework's focus on the interactions of people, behavior and environment. Dietary choices are ultimately affected by one's environment, friends and family, culture and knowledge, and therefore these factors are important to consider when developing an intervention. There were a large portion of studies (n=16) that used a new or unique theory that wasn't found more than twice within the

studies included, and therefore was included as “other”. There were a variety of LT’s and techniques that were more unfamiliar or seldomly used, such as “ grounded theory, Kolb’s theory, food agency pedagogy, dual process theory, behavioral change techniques, reward and punishment based reversal learning, transtheoretical model, continuity theory of aging, nudge theory, etc”. Overall, the use of a LT could be assessed in future reviews to determine if a particular type is associated with more improvements for interventions, and therefore would affect overall intervention effectiveness.

Quality assessment

During the quality assessment process, only five articles received a negative ranking. Out of these studies, there were some common trends. Almost all of these studies included received a rating of “unclear”, or “no” for the criteria: study groups are comparable, methods of handling withdrawals are described, and blinding was used to prevent bias. In addition, 80% of these studies also received a rating of “unclear”, or “no” for the criteria: bias due to funding unlikely. This category of the quality criteria checklist can play a significant role in the credibility of results and was one of the strongest trends among studies that ranked as negative. Overall, in studies that ranked positive or neutral, blinding used to prevent bias, study groups being comparable, or methods of handling withdrawals described were also ranked as “unclear”, or “no” suggesting room for improvement the design of future studies. However, it is understandable that “blinding” is often difficult in nutritional intervention studies.

Overall, the results of the review indicate that cooking interventions were the most successful at improving dietary intake, and least successful at improving physical activity. However, physical activity was an outcome that was not explored in most of the studies. Approximately 62% of studies included measurements regarding dietary intake, with negative effect sizes found in several studies that attributed improvements to increasing fruit. [33-38] and vegetable intake. [34-41] Blood pressure was another outcome that was rarely explored, and was only assessed in seven studies, and often measured exclusively in an

older population.[44, 48, 65, 71,79-81] While ultra-processed food (UPF) consumption was not measured in any of the studies, it could be suggested that processed food consumption was still a common outcome of interest for interventions, but with loose definitions on what this may be considered. Several studies (n=14) were interested in if participants decreased or change intake of either fast food or convenience food items (packaged foods, ready-prepared foods that required leaving the home to obtain, made to order foods, etc). [31, 33-35, 37, 42, 45-47, 69, 76-78] It is promising that more studies as of recent are including validated tools and questionnaires that have been extensively tested for reliability. The same can be said for studies utilizing a learning theory, which has helped to build a more a systematic framework for cooking interventions and their intervention implementation that can be assessed in detail upon study completion.

Strengths and Limitations

Previous reviews in this area included a more limited time frame, did not use a systematic search process, or limited the types of study outcomes assessed. Some reviews had an exclusion criterion that included the removal of studies that did not have an outcome related to cooking (e.g., mental health, general self-efficacy or confidence, physical activity). [4] The current review addressed these limitations while also adding a unique focus on psychosocial and mental health outcomes, as well as processed food consumption.

A limitation in this review is that article quality assessments were conducted and assigned a grade by a single reviewer. Articles that included children and a limited focus on reducing sodium intake or other micronutrients were not included, as the review focused on cooking interventions aimed at improving general health outcomes in adults. Articles were also excluded if they were not published in English or were only brief research reports without sufficient statistical and quantitative data. The

exclusion of these articles may have resulted in source selection bias. Several studies were excluded from the effect size analysis due to limited data being provided for either the intervention or control groups, no response was received from authors for clarification, or assessment methods were looking at a range of responses that were unable to be quantified down for the analysis (i.e., responses among participants to select a range of how often they were consuming vegetables: 5-6 times a week, 3-4 times a week, etc.). Overall, this review found that cooking interventions can be impactful in regards to improving a variety of health outcomes. Despite many of the outcomes of interest (body mass index, body weight, and waist circumference) having a small effect size, many studies indicated an improvement in most measures. This is a promising indicator, which may suggestion that cooking interventions can benefit from utilizing new intervention design, tools, and practices. Fruit and vegetable consumption were two outcomes of interest that had larger effect sizes, and therefore the findings of this study may be impactful for intervention design looking to assess and improve dietary intake with fruit and vegetable consumption in mind.

Chapter 3

CONCLUSIONS AND FUTURE DIRECTIONS

Of the 55 articles included in this review, most (96.4%) reported positive findings regarding the impacts of cooking interventions at improving at least one of the following: cooking confidence or knowledge, fruit and/or vegetable intake, energy intake, and body weight, waist circumference, or BMI. This review serves as an update to a previous review (2011-2016) that reported similar findings. This suggests that cooking interventions can be beneficial for reducing the risk of chronic illnesses, improve overall health and cognitive function.

In comparison to prior reviews, this systematic review included 18 studies that were published between 2017-2020 which indicates that cooking interventions are growing in popularity in research to improve health status and cooking knowledge. Learning theories were investigated, with 28 studies reporting the use of a learning theory, with the most common being "social cognitive theory" and 27 studies in which they did not report using a learning theory. However, this does not necessarily indicate that the studies did not use a learning theory at all, but rather it was not reported in general. A majority studies (n=26) using a learning theory also had a positive change found for an outcome of interest to this review, which suggests that incorporating a learning theory into the framework of interventions can lead to greater improvements for health or health behaviors in participants.

There were 48 (87%) studies which included populations targeted at women exclusively or had over 50% of the study being female. The use of either an active hands-on or demonstrated cooking component is something that can affect the potential for a positive outcome, where a hands-on cooking intervention was shown that due to the ability for participants to be actively interacting in the kitchen, that it, in turn, impacted their skills, self-efficacy, and intent to change behavior. There were 27 (49%) studies that included an active or hands-on cooking component, 8 (14.5%) that included cooking

demonstrations only, 8 (14.5%) that had a combination of both or had comparison groups that included one intervention type or the other, and 12 (22%) that were unspecified or were unclear in their language if the cooking component was hands-on or demonstration. While an outcome of interest of this review was ultra-processed foods (UPF), no interventions specifically declared this outcome as an interest, but rather focused on the consumption of take-away/fast-foods, processed meats, and packaged food products.

Implications for Future Research and Practice

Prior research has shown promising benefits from the implementation of cooking interventions on health risk factors. It is recommended that nutrition researchers who implement a cooking intervention utilize a control group. A statistical approach that measures group by time differences or between-group differences will be more accurate at determining if there is an intervention effect, rather than comparing within-group differences for a pre-test and post-test measurement and conclude a change can be attributed to the intervention. The use of alternative intervention techniques such as phone apps or television shows is beginning to be implemented into recent interventions and shows some promise when targeting a younger generation. The use of these newer techniques may appeal more to those who need accessibility accommodations and can prove to be more inclusive to a variety of individuals and therefore able to potentially improve the health status of a more diverse population. The use of learning theories in cooking interventions may be attributable to achieving positive changes in health outcomes of interest and should be used when developing an intervention framework. The lack of validated measurement tools has been noted in prior studies[4, 19, 23] and continues to be a problematic issue in the updated literature and recent interventions.

These findings suggest that future interventions should include a more diverse population that includes the male gender, validated measurement tools, learning theories, and an active cooking

component. Finally, the use of alternative intervention techniques like cell phone apps, television or streaming shows, and social media platforms may be preferable and widely accepted in the upcoming generations. The inclusion of ultra-processed foods as an outcome was not explored in any of the interventions, however, it is presently a critical outcome that should be included in future interventions.

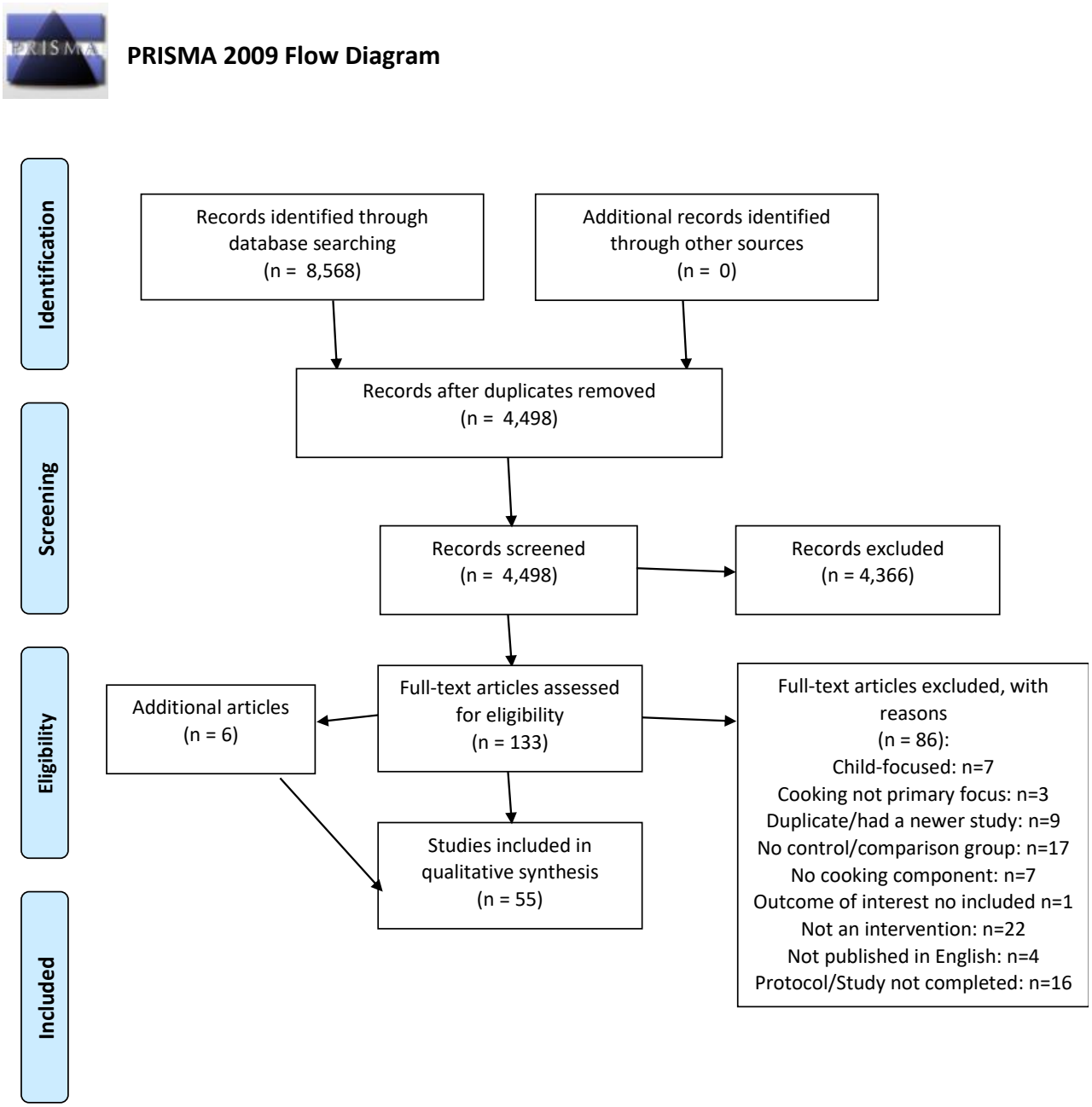
Appendices

Appendix A: Database Search Strings

PubMed	(((Cooking[MeSH] OR Cooking[TIAB] OR Cook*[TIAB])) AND (Intervention[Title/Abstract] OR Program[Title/Abstract])) AND (Obesity[Title/Abstract] OR "Blood pressure"[Title/Abstract] OR "Diabetes mellitus"[Title/Abstract] OR Diabetes[Title/Abstract] OR Glucose[Title/Abstract] OR Cholesterol[Title/Abstract] OR "Body mass index"[Title/Abstract] OR BMI[Title/Abstract] OR "Body weight"[Title/Abstract] OR "Cardiovascular disease"[Title/Abstract] OR CVD[Title/Abstract] OR Health[Title/Abstract] OR Diet[Title/Abstract] OR "Diet quality" OR"Dietary intake"[Title/Abstract] OR "Nutritional literacy"[Title/Abstract] OR "Processed foods"[Title/Abstract] OR NOVA[Title/Abstract] OR Attitude[Title/Abstract] OR "Self-efficacy"[Title/Abstract] OR "Cooking frequency"[Title/Abstract] OR "Food preference"[Title/Abstract] OR "Meal patterns"[Title/Abstract] OR "Food security"[Title/Abstract] OR "Food literacy"[Title/Abstract] OR "Food selection"[Title/Abstract] OR Depression[Title/Abstract] OR Anxiety[Title/Abstract] OR confidence[Title/Abstract] OR "Mental health"[Title/Abstract])
CINAHL using EBSCO	(Cooking OR Cook*) AND (Intervention OR Program) AND (Obesity OR "Blood pressure" OR "Diabetes mellitus" OR Diabetes OR Glucose OR Cholesterol OR "Body mass index" OR BMI OR "Body weight" OR "Cardiovascular disease" OR CVD OR Health OR Diet OR "Diet quality" OR"Dietary intake" OR "Nutritional literacy" OR "Processed foods" OR NOVA OR Attitude OR "Self-efficacy" OR "Cooking frequency" OR "Food preference" OR "Meal patterns" OR "Food security" OR "Food literacy" OR "Food selection" OR Depression OR Anxiety OR confidence OR "Mental health")
Web of Science from Clarivate	TOPIC:(Cooking OR cook*) *AND* TOPIC:(Intervention OR Program) *AND*TOPIC: (Obesity OR "Blood pressure" OR "Diabetes mellitus" OR Diabetes OR Glucose OR Cholesterol OR "Body mass index" OR BMI OR "Body weight" OR "Cardiovascular disease" OR CVD OR Health OR Diet OR "Diet quality" OR"Dietary intake" OR "Nutritional literacy" OR "Processed foods" OR NOVA OR Attitude OR "Self-efficacy" OR "Cooking frequency" OR "Food preference" OR "Meal patterns" OR "Food security" OR "Food literacy" OR "Food selection" OR Depression OR Anxiety OR confidence OR "Mental health")
Scopus	Cooking OR cook* AND Intervention OR program AND Diabetes OR "body mass index" OR "cardiovascular disease" OR "body weight" OR Health OR Diet OR "dietary intake" OR "processed foods" OR NOVA OR "self-efficacy" OR confidence OR "food security"
PsycInfo	(((Cooking[MeSH] OR Cooking[TIAB] OR Cook*[TIAB])) AND (Intervention[Title/Abstract] OR Program[Title/Abstract])) AND (Obesity[Title/Abstract] OR "Blood pressure"[Title/Abstract] OR "Diabetes mellitus"[Title/Abstract] OR Diabetes[Title/Abstract] OR Glucose[Title/Abstract] OR Cholesterol[Title/Abstract] OR "Body mass index"[Title/Abstract] OR

	BMI[Title/Abstract] OR “Body weight”[Title/Abstract] OR “Cardiovascular disease”[Title/Abstract] OR CVD[Title/Abstract] OR Health[Title/Abstract] OR Diet[Title/Abstract] OR “Diet quality” OR“Dietary intake”[Title/Abstract] OR “Nutritional literacy”[Title/Abstract] OR “Processed foods”[Title/Abstract] OR NOVA[Title/Abstract] OR Attitude[Title/Abstract] OR “Self-efficacy”[Title/Abstract] OR “Cooking frequency”[Title/Abstract] OR “Food preference”[Title/Abstract] OR “Meal patterns”[Title/Abstract] OR “Food security”[Title/Abstract] OR “Food literacy”[Title/Abstract] OR “Food selection”[Title/Abstract] OR Depression[Title/Abstract] OR Anxiety[Title/Abstract] OR confidence[Title/Abstract] OR “Mental health”[Title/Abstract] OR Cognition”[Title/Abstract]

Appendix B: PRISMA Flow Diagram



Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
RCT							
Berrino, F. 2001	RCT, 18 wks. Baseline + 4 mo. assessments	n=99 study completers. (I, 50; C, 49) Post-menopausal women Aged 50-65 yrs.	To determine if a diet low in animal fat and refined carbohydrates, and rich in low-glycemic-index foods, MUFA, n-3 PUFA, & phytoestrogens could reduce the risk of breast cancer.	**I:** Cooking classes 2x/wk. for 18 wks. + common meals based upon Mediterranean, vegetarian, and macrobiotic recipes + written materials. **C**: No diet info other than advice to increase f/v + leaflet from Europe Against Cancer program **LT:** not reported **DA:** not reported.	Dietary intake (FV), blood cholesterol, BW, BMI, fasting glucose & insulin, WC, HC	I had a larger decrease in blood cholesterol (-14% vs -4%), BW (avg 4.06 kg vs 0.54 kg), + similar changes in WC (-3.88 vs 0.20) + HC (-2.47 vs 0.20). No group differences in other measures were reported or analyzed	**Location**: Italy **Sample**: Post-menopausal women **Retention:** 104 enrolled, 99 completed = 95%
Berrino, F. 2002	RCT, Baseline, 3 mo. and 12 mo.	n=111 study completers (I, 58; C, 53) Post-menopausal women Mean age of 58 yrs. Aged 44-70 yrs.	To test the same effect on the bioavailability of sex hormones and on other relevant parameters in breast cancer patients as found in the DIANA-1 trial, and to determine the long-term effects over 1 year if the diet, as well as measuring the interaction with tamoxifen treatment.	**I:** 2x/wk. for 3 mo. for common dinner with cooking lesson. Through 7-12 mo., single lesson dinner/mo. **C**: On 4th mo., cooking classes offered 2x a week. Through 7-12 mo., single lesson dinner/mo. **LT:** not reported **DA:** not reported.	BW, WC, HC, TC (blood), TG, dietary intake (F/V)	Both IG and CG decreased BW (-3.51 kg vs -0.77kg, respectively), For 1 year follow up, WC and HC decreased in IG (3.66 and 3.51 cm, respectively) vs C (2.9 and 2.1). TG, and TC decreased in IG (-22 mg/dL and -27 mg/dL) vs C(-4 mg/dL and -21 mg/dL) No group differences in other measures were reported or analyzed	**Location:** Italy **Sample**: Post-menopausal breast cancer patients **Retention:** 114 enrolled, 111 final analysis= 97.37%, 108 for 1 year follow up= 94.74%

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Bernardo, G. 2018	RCT, 6 wks. Assessments at baseline (T1), wk. 6 (T2), and 6 mo. (T3). follow up.	n=76 study completers (I, 38; C, 38) College students Median age I: 19.6 yrs. (19.0-20.4) C: 19.9 yrs. (19.2-20.7)	To determine if the Nutrition and Culinary in the Kitchen (NCK) intervention program improved cooking skills and eating practices in college students.	**I:** 5, 3-hr cooking classes, food selection/purchasing workshop. **C:** no program materials **LT:** SCT **DA:** Nutr student helpers + coordinating teacher with nutr degree	Cooking attitudes (cooking-self efficacy) food literacy	I increased cooking confidence at T2, accessibility + availability of F/V at home at T1-T2 (+0.78) + knowledge of cooking terms + techniques sustained through T3 but not in C. C increased eating away from home T1-T2 but I did not.	**Location**: Brazil **Sample**: I: F=56.4% M= 43.6%; C: F= 64.1% M= 35.9% **Retention:** 82 enrolled, 76 completed. = 93%
Brown, J.L 2012.	RCT, 8 wks. Baseline, wk. 8, + 4 mo. follow up.	n=40 (20 couples), with children living at home. (I, 10; C,10) Aged through mid 40's.	To develop a community-based wellness program to increase the number and types of vegetables offered at evening meals in Appalachian food preparers and their families.	**I**: 8 wkly, 2-hr/wk. sessions. Nutr education + food preparation skill training **C:** Recipes on their own + packets containing handouts, recipes, + meal diary with instructions **LT**: Reciprocal Determinism Model, SCT, Family Systems Theory **DA**: Not reported	Cooking self-efficacy, cooking confidence (vegetable preparation/selection, family preferences)	No statistical data reported. Qualitative reports indicate 7/17 food preparers in I indicated self-efficacy improved; learned new vegetable prep skills, gained confidence about vegetable experimentation, + family preferences.	**Location:** USA, Appalachian region **Sample**: White (98%) Married (88%) Female (94%). **Retention:** 52 couples enrolled, 2 excluded =96% (data only presented from 40 couples) Qualitative data collected via interviews

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Carmody, J. 2012	RCT, 11 wks., with baseline, immediate post + 3-mo post assessments	n=31 study completers with prostate cancer post-treatment. (I, 14; C, 17) Mean age 69.1 ± 9.0 yrs.	To determine whether changes to a vegetarian dietary style were self-sustaining following completion of the intervention.	**I:** 11 wkly 2 ½-hr classes. Learned to shop, + cook a study compliant meal, ate family style, mindfulness sessions. **C:** Usual medical care. **LT**: Not reported **DA:** Instructors, dietitians	Dietary intake/food selection (Animal: Vegetable protein), dietary cholesterol	I had decreases in A: V for protein vs C (I:1.87 to 0.86 vs increase for C: 2.55 to 3.00) at 6 mo. I had Veg protein intake increase, animal protein reduced at 3 mo. post. I had reductions in dietary cholesterol, saturated fats. I had qualitative reports on increases in mindfulness practice.	**Location:** USA, MA **Sample**: All male, Non-Hispanic (91%), Average BMI of 30.1+/- 4.4. **Retention**: 36 enrolled, 31 completed=86.11%
Carruba, G 2006	RCT, 6 mo. Baseline, + 6 mo. assessments	n=106 study completers (I, 51; C, 55) post-menopausal women Mean age 48-69 yrs.	To evaluate the potential impact of a traditional Mediterranean diet on endogenous estrogens in healthy postmenopausal women.	**I:** Wkly "cooking course" + social dinner with chefs addressing the Mediterranean diet. Instructed to follow the learned diet at home. **C**: Advised to increase F/V intake. **LT:** Not reported **DA**: Chef	BW, dietary intake (Animal: Vegetable protein) blood cholesterol,	I reduced the intake of animal protein more vs C with a difference of (-17.5 vs 6.2) indicating a shift to more V. However, C decreased veg intake vs I (-3.1 vs 2.1). I reduced the intake of animal protein (by 30%), fat (by >42% w/ saturated fat being 34%), + carb intake (by 26%), and blood cholesterol at 6 mo. C had a moderate increase in vegetable proteins + carbohydrate intake. No group change for BW.	**Location:** Italy **Sample**: post-menopausal women **Retention**: 115 randomized, 106 completed, = 92.17%

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Cho, S. 2014	RCT, 8 wk. Baseline + end line assessments	n=61 study completers. (I, 30; SC, 31) Mean age. SC: 44.4 ± 7.9 yrs. IG: 47.9 ± 7.1 yrs.	To determine if a nutrition intervention based on dietary counseling can promote f/v consumption, increase serum antioxidant nutrient levels, and improve quality of life in Korean breast cancer patients.	**I:** 2 nutr counseling sessions + 1 cooking class (F/V consumption) **Standard care/C:** Brochures on a phytochemical rich diet. **LT**: Not reported **DA:** Dietitian	BW, BMI, WC, Dietary intake/Food selection (F/V), health(physical), mental outcomes/QOL	No between group differences were either analyzed or reported.	**Location**: Korea **Sample:** Breast cancer patients **Retention:** 86 enrolled, 61 study completed = 71%
Clifford, D. 2009	RCT, 4wk. Pre, post, and 4-mo. follow up assessments.	Off-campus college students. n=101 (I, 50; C, 51) (95% were juniors or seniors)	To determine if a series of SCT driven cooking programs aimed at off-campus college students improved cooking self-efficacy, knowledge, attitudes, and behaviors regarding f/v intake.	**I:** 4 wkly, 15-min episodes of the cooking show, GoodGrubbin'. Demonstration on purchasing, cooking, + strategies to overcome barriers. **C**: Watched 4 weekly episodes on sleep disorders. **LT**: SCT **DA**: Show with registered dietitian.	Cooking self-efficacy, nutritional/food literacy, dietary intake (F/V)	I increased awareness/knowledge of making healthful foods at 4 wks. vs C. I improved in cooking motivators and self-efficacy vs C, but not maintained at follow up. No group differences in other measures.	**Location:** USA, CO **Sample**: 63% female **Retention**: 114 enrolled, 101 completed. At follow up, 60 participants remained. =89%/53%

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
DeRose, K. 2019	RCT, 5 mo. Pre/post assessments	n=213 study completers. Baseline (I, 110; C, 103) Mean age 45.0-62.3 yrs.	To implement a multilevel, church-based intervention with diverse disparity populations and evaluate feasibility, acceptability, and preliminary effectiveness in improving obesity-related outcomes.	**I:** Sermons, educational materials, F/V garden, garden-based cooking +nutr classes held each wk. for 5 wks. Fitness classes wkly. **C**: Wait list control **LT:** SEM **DA**: Pastor (others not stated)	BW/BMI, dietary intake, BP, PA	I had less BW gain, BMI + greater BW loss vs C (-0.87 lbs. vs +1.78 lbs.). Increase in overall health diet for I No group differences for other measures.	**Location:** USA, CA **Sample:** Majority female (78.4%), African American (48.4%), English-speaking Latino (20.7%). Spanish-speaking Latino (31.0%). Avg BMI was 32.2 **Retention:** 307 at baseline, 213 completers =69.38%
Feuerstein-Simon, R. 2020	RCT. 16 wks. Pre/post assessments	N= 60 baseline (I, 30; C, 30) Mean age I. 37; C, 34	To increase the consumption of home-cooked meals among employees at a large urban worksite through a fully subsidized Community Supported Agriculture (CSA) program	**I:** Biwkly CSA deliveries for 4 mo. Curated content with recipe suggestions, instructional cooking videos, + food storage tips **C:** Usual care (employee benefits) **LT:** EAST framework. Nudge theory **DA**: Study staff/CSA box	Cooking frequency, dietary intake (F/V). Psychosocial	I had a 29% difference in mean consumption of home-cooked meals per wk. at follow- up vs C. Fruit intake of at least 2x serves/d fruit was 3.8x higher in I vs C. For veg intake of 2x/d, it was 6.2x higher in I vs C. I had a 89% reduction vs C in claiming food insecurity at follow up. Psychosocial qualitative reports of pos. feelings from support/ trying to new things	**Location:** USA, PA. **Sample:** worksite employees, mostly female (81.6%), and white (61.6%) **Retention:** 60 enrolled, 54 completed= 90.0%

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Fitzsimmons, S. 2003.	RCT, 2wks. Pre/post assessments	n=12 study completers (I, 4 patients at a time, 12 total; C, 12) Mean age 85.54 yrs.	To determine if dementia patients who were enrolled in a cooking program had changes in agitated behavior, passive behavior, or physiological processes.	**I:** Therapeutic recreation cooking + social component, 5d/wk., lasting 1-hr for 2 wks. **C:** Wait list control **LT:** Need-Driven Dementia compromised Behavior (NDB) model, Continuity Theory of Aging **DA:** Geriatric nurse practitioner, staff	Mental health, psychosocial(attitude), blood pressure variability.	I: decreased in agitation vs slight increase in C. Similar trend for passive behaviors in the groups. Active engagement increased as BPV increased, + agitation decreased as BPV decreased. C increased in agitation (+0.03) vs I (-0.84). Both C + I increased in passive behaviors (+0.04), (+1.28), respectively.	**Location:** USA, FL **Sample:** Female dementia patients **Retention:** 12 enrolled, 12 completed= 100%
Flesher, M. 2011	RCT, 12 wk. Baseline, 6 mo.12 mo. assessments	n= 40 study completers (C: 17; I, 23) Mean age: I: 63.4 ± 12.1 yrs. C: 63.4 ± 11.8 yrs.	To determine whether a comprehensive nutrition program would reduce cardiovascular risk factors and slow the progression of certain CKD parameters.	I: Individual nutr counselling, group CKD nutr class with education (4 wks., 2 hr.), shopping tour, cookbook, 12 wk. PA program (3x wk., 1 hr.) **C:** Standard care with nutr counselling **LT:** None reported **DA:** Dietitian, cook educator, certified exercise physiologist, nurse	BP, TC (blood),	BP reduced from baseline for I from 138.9/78.3 mm Hg to 126.6/69.4 mm Hg vs increases in C, 139.5/76 mm Hg to 143.7/75.6 mm Hg. TC had no change.	**Location:** Canada **Sample:** Chronic kidney disease patients I: (14M; 9F). About 1/2 being of Asian ethnicity. C: (7M; 10F) **Retention:** 45 enrolled, 40 study completers = 88.88%

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Greenlee, H. 2016	RCT 12 wks. Baseline, 6, 12 mo. Follow up assessments.	n=70 baseline participants (I, 34; C, 36), Baseline age 56.6 ± 9.7 yrs.	To examine the effect of a culturally based dietary intervention on change in f/v and fat intake among Hispanic breast cancer survivors.	**I:** 9 classes (4 nutr roundtables, 2 food shopping trips, + 3 cooking lessons) over 12 wks. **C**: Dietary recommendations for breast cancer survivors **LT:** SCT, transtheoretical model **DA:** Study staff	Dietary intake/ food selection (F/V), BMI, weight, WC, HC, fasting glucose, biomarkers	At 12 mo. I increased mean daily servings of F/V combined (+2 vs -0.4,) vs C. I had a greater decrease in total caloric intake (-388.4 kcals) vs C. No group difference for other measures at 12 mo.	**Location:** USA, NY. **Sample:** Women of Hispanic descent 3 mo. into treatment. GED or less (60%), income, mean BMI (30.9) **Retention:** At 6 mo., 61 (87%) were retained. At mo. 12, 58 (83%) retained
Janssen, L. 2018.	RCT, 8wk Baseline and 1 yr. follow up assessment	n=65 study completers (ME, 35; EC, 30) Mean age 31.9 yrs.	To investigate the effects of a mindful eating intervention on reward and punishment-based reversal learning and assess the effects on physical and self-reported measures of eating behavior and knowledge of a healthy diet.	**ME:** 8 wk., 2.5 hr. group sessions, mindfulness practices (healthy eating). Group meal **(Educational cooking)/C**: Cooking workshops + nutr. education (8 wk., 2.5 hrs.) nutr labels, healthy eating+ restaurant tips. **LT**: Reward + punishment-based reversal learning **DA:**(ME)Psychologists, psychiatrists, (EC) dietitian, chef.	BMI, WC, nutritional/food literacy, mental health, psychosocial	BMI + WC decreased in EC but not MC. EC had an increase in knowledge on healthy eating where EC did not and had a closer compliance to healthy eating guidelines vs ME. No change in other measures.	**Location:** The Netherlands **Sample**:55W, 10M **Retention:** 92 were randomized, and 65 completed the study= 70.65%

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Kwon, J. 2014	RCT, 12 wks. Baseline, post-intervention (3 mo.), 6 mo. post-intervention follow up assessments	n=79 study completers. (EN=30), (E = 28), (C =31) Mean age EN,76.5 ± 3.8; E, 77.0 ±4.2; C, 76.9 ± 3.9	To determine whether a combined physical exercise training and nutritional intervention improves physical performance and enhances health-related quality of life (HRQOL) among prefrail elderly women living in the community.	**(E):** 4 strength training + stretching exercise classes, 35-70 mins **(EN):** Same exercise program + cooking classes (1x wk., 2-3 hr.) w/ nutr education on food prep, nutr guidance, eating together + cleaning **C:** Health education, 1x a mo. for 3 mo. **LT**: Not reported **DA:** (E) fitness trainer, physician, assistants (EN + C)	Mental health, physical health (strength)	Role emotional score increased in EN vs others. E increased handgrip strength vs C post intervention but not maintained at 6 mo. No group differences for other measures.	**Location:** Japan **Sample:** elderly prefrail women **Retention:** 89 enrolled, 79 study completers= 88.76%
Lavelle,F. 2017	RCT, 90-min. Pre, middle and post-intervention assessments	N=141 study completers (NI, 77; ROI, 64) Mean age NI, 29.7 ± 5.36; ROI, 31.5 ±5.96.	To examine the role of enjoyment in cooking, perceived confidence to cook a recipe, and perceived difficulty of meal preparation on the intention to cook from basic ingredients.	Make lasagna from basic ingredients within 90 min. Participants were assigned to 1 of 4 (1) recipe card only [Control]; (2) recipe card plus video modelling; (3) recipe card plus video prompting; (4) recipe card plus video elements. **LT**: SCT, Behavioral change technique **DA**: Video/card	Cooking confidence	No group differences found for measures. However, for each of those scores, a positive effect of time was found.	**Location:** Ireland **Sample:** Young mothers **Retention:** 141 enrolled and completed = 100%

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Lee, K. 2017	RCT, 10-days. Pre/post assessments	n=30 study completers (I=16, C= 14) Mean age 20.0±1.1 yrs.	To determine the impact of an intensive 10-day health promotion program combining healthy diet and PA on body composition, physical fitness, and biochemical parameters of young adults.	**I:** Nutr lectures, cooking practice, + massage practice. Exercise for a total of 23 hours over 10-days. Vegetarian diet buffet. **C**: Normal diet, refrained from formal exercise researchers **LT**: Not reported **DA**: Nutr/Exercise professors	BMI/BW, dietary cholesterol, health (fitness), biomarkers	BW + BMI decreased. in I vs C (BW -1.1 ± - 0.7 kg vs 0.3 ± 0.5), and BMI -0.4 ± 0.3 vs 0.1 ± 0.2) TG, TC, LDL-C, + glucose levels decreased in I vs C. P,0.05 to p<0.001) Physical fitness + strength increased in I vs C. No other changes for between group measures occurred.	**Location**: South Korea **Sample:** All female undergraduate students **Retention**: 34 participants originally enrolled, 30 study completers= 88.23%
Leone, L. 2018	RCT, 6 mo. Baseline + 6-mo assessments.	n=142 study completers. (I, 74; C, 68) Mean age 46.3 ± 14.0 yrs.	To determine the impact of Veggie Van (VV), a mobile produce market, on F&V intake in lower-income communities using a group RCT.	**I:** Newsletters, nutr + cooking demos, social marketing, tips for cooking seasonal produce + recipes for VV items. **C**: Delayed wait-list control **LT:** SCT. SEM **DA:** VV workers	Dietary intake/food selection, self-efficacy (to prepare, purchase and eat f/v), food security	I increased intake of F/V vs C (+0.31 cups/d vs -0.66 cups/d). No other group differences at 6 mo.	**Location:** USA, NC **Sample:** Female (95.8%), African American (64.8%), Received govt assistance (i.e., SNAP, Medicaid) (62.0%) **Retention:** 201 enrolled, 142 completed= 71%

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
McGorrian, C. 2015	RCT, 5 wks. Baseline,6 mo. 24 mo. follow up assessments.	n=108 study completers. (I, 57; C, 51) mean age I, 63.51 ± SD 8.43; C, 62.23 ±SD 8.35	To provide a high quality and engaging program which might motivate participants to successfully modify their dietary patterns and hence lose weight.	**I:** 5-wk, 2-hr cookery skills program on food prep, cooking, serving + tasting, printed info w/ dietary/PA advice. **C**: Printed info as I **LT**: SCT **DA:** Chef, health promotion officer, dietitian.	BMI, dietary intake(F/V),	No group differences found for all measures besides for BMI, with 2/3 of all participants decreasing in BMI over the study (70.5%)	**Location:** Ireland **Sample:** (M, 87; F, 21). Median BMI of 28.5. Cardiac program patients **Retention:** 116 were randomized, 108 completed= 93.10%
Ohtsuki, M. 2018.	RCT, 25-wk. Pre/post assessments	n=98 study completers, (I, 48; C, 50) Mean age I, 20.5±1.1; C, 20.6±1.1	To determine whether an intervention using educational approaches, could improve the vegetable consumption of university students.	**I:** Vegetable focused nutr lesson, 3-hr tour of a farm + cooking class on simple food prep. **C:** Habitual lifestyle **LT**: SCT **DA**: Farmer, (no other agents stated)	Dietary intake/ food selection (F/V), nutr. literacy/knowle dge	C decreased green/yellow vegetable intake vs no change in I. I increased nutr knowledge on vegetable intake vs no change in C.	**Location:** Japan **Sample:** college students (I: 10M, 38W; C: 14M, 36W) **Retention:** 104 randomized, 98 study completers= 94.23%

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Parletta, N. 2019.	RCT (parallel), 6 mo. Baseline, 3-mo, 6-mo assessments	n=152 study completers (I, 75; C,77) Mean age I, 43.8 ± 12.8; C 44.6 ± 13.3	To investigate whether a Mediterranean-style diet (MedDiet) supplemented with fish oil can improve mental health in adults suffering depression	**I:** 3-mo supply of fish oil capsules (2x day), 450mg DHA + 100mg EPA). Biwkly group sessions (3 mo. w/ nutr. education), cooking workshops focused on MedDiet meals. **C:** "Social group" Attended biwkly social groups (3 mo.) **LT:** Not reported **DA:** Dietitian, support study staff.	Dietary intake, (F/V) psychosocial (happiness, relationships, mental health etc.)	I had a larger increase in MedDiet score from baseline to 3 mo. vs C. I had higher reports versus C in F/V intake score (V: 1.73 to 3.07 vs. 1.74 to 2.27 in C)(F: 1.35 to 2.02 vs 1.38 to 1.42 in C), whole grains (3.81 to 4.49 vs. 4.33 to 4.29), nuts + legumes (4.05 vs 1.82, 2.35 vs 1.25). lower consumption of unhealthy snacks + meat/chicken (3.23 vs 4.46). I+C reduced SSB intake through 6 mo. I+C improved all mental health measures at 3 mo., with I having larger improvements in DASS/AQoL-8D.	**Location:** Australia **Sample:** 105F, 47M, adults with depression **Retention:** 152 eligible participants commenced the study, 95 completed 3-mo (62.5%) + 85 completed 6-mo assessments (55.92%)

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Peters, N. 2014.	RCT, 1-yr. baseline, 6 + 12-mo assessments.	n=71 study completers. WFG, 22; MFG, 49 Aged 50-72 yrs.	To determine the degree of dietary adherence/change in eating patterns, and demographic, psychosocial and study characteristics associated with adherence, in the Comparing Healthy Options in Cooking. and Eating (CHOICE) Study.	**I:** 24 classes(hands-on cooking + behavioral sessions, food tasting + demos) goal setting, + self-regulation. 1 of 3 diets: Whole Foods (WFG), plant-based, macrobiotic-style; + Moderate Fat with 10 g of ground flaxseed added daily + without flax seed (MFG), which were combined **LT:** SCT **DA:** Not reported	BMI, BW Psychosocial (attitudes), dietary intake(F/V)/food selection,	The following had GxT differences: (WFG) increased bean intake (to 2 serv/d), whole grains (to 4 serv/d), & reduced intakes of meat, poultry, dairy + eggs. 24 participants in (MFG) reduced energy intake from fat. No between group differences found for other measures.	**Location:** USA, NY **Sample:** Post-menopausal women, primarily white (>70 %), non-Hispanic (>80 %) **Retention:** 116 randomized, 71 completed assessments= 61%
Pettman, T. 2008.	RCT. 16 wk. Baseline + after 4 +12 mo. assessments	n=153 (I, 103; C, 50) **B**aseline age 44.3-45.9 yrs.	To improve body composition and cardiometabolic risk factors in free-living adults with metabolic syndrome (MetS).	**I:** 16 wk. education program + group exercise (2hr a wk.) Topics on PA, mindfulness, food/shopping. 2 cooking classes, + promotion of attending ≥ 1 PA session (45-60 min) Booklets on healthy eating. **C:** Booklets from I **LT**: Not reported **DA:** Study coordinator, Self-Management Program facilitation leader.	Body composition, WC, TC, BP, dietary intake/ food selection, health (Physical/PA)	No between group differences were either analyzed or reported.	**Location:** Australia **Sample:** Participants with Metabolic Syndrome. 111F, 42M, mean BMI of 36.6 ± 0.7. **Retention**:153 enrolled, 103 study completers= 67.32%

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Pierce, J. 2007.	RCT, assessments at 12 mo., 24 or 36 mo. (split sample — 50% at each time point), 48 mo. + 72 mo.	n=3088 study completers (I, 1537; C, 1551) Mean age. I: 53.3 ± 8.9 yrs. C: 53.0 ±9.0 yrs.	To assess whether a major increase in F/V, fiber intake and a decrease in dietary fat intake reduces the risk of recurrent and new primary breast cancer and all-cause mortality among women with prior treatment.	**I:** Telephone counseling, 12 cooking classes, monthly newsletters. Intensity of program decreased over 3 phases. **C:** Printed materials on healthful diet. **LT**: SCT **DA:** Counselors.	Dietary intake/ food selection (F/V), Cholesterol (blood), food preference, BW, psychosocial (mental health)	Total vegtable intake increased more in I vs C (3.88 to 6.04) vs (3.82 to 3.66 vs). Fruit intake in decreased in C vs I (3.43 to 2.80) vs (3.46 to 3.49) from baseline to 4 years. Dietary fiber intake was unchanged at 1 y in C and declined slightly at 4 y, where I increased dietary fiber resulting in between group differences of 38% at 1 y and 30% at 4 y. No other between group differences	**Location**: USA, CA **Sample**: Women with breast cancer. 14% identified as a minority. **Retention**: 3107 randomized, 3088 study completers= 99.38% (not considering split sample response)

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Pluss, C. 2007.	RCT, 1 yr. Baseline and 1-yr follow up assessments.	n=206 study completers (I, 104; C, 102) Mean age I: 63 ±7.2 yrs. C: 63 ± 7.3 yrs.	To evaluate the effects of an expanded multifactorial cardiac rehabilitation program on psychosocial and medical risk factors	**I:** 20 Stress management class sessions (2 hrs., yr. long). 5-day physical therapist sessions 2x/d, 3-hr weekly cooking class for 3 wks. (focus on low fat foods + increase in fiber) **C:** Received usual care **LT**: Not reported **DA**: Group leader, physical therapist, dietitian, nurse 37 participants took part in a smoking cessation program (2x wks. for 2 wks. and then wkly for 4 wks. taught by a nurse).	BP, TC (blood), BMI, mental health, health, Diabetes, psychosocial	No change in measures for between groups/or were not reported. Patients in I with type D personality (received expanded cardiac rehabilitation) showed a reduced anxiety, depressive symptoms + type D score vs C.	**Location**: Sweden **Sample**: 14% identified as a minority. 173M, 51F **Retention**: 224 randomized, 206 study completers for 1 yr follow up= 91.96% I: 16 smokers reduced to 7, C: 12 smokers reduced to 11 after 1 yr. Cut off for HbA1c was (6.1–7.0 mmol/L). for HbA1c during study. (Study includes a 5 yr. follow up which did not report outcomes of interest to this review and therefore was not included)

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Poelman, M. 2015	RCT (parallel) 3mo. 3, 6 and 12 mo. follow up assessments.	n= 278 baseline. (I: 139, C: 139) T1(n=196) T2(n=223) T3 (n=191) Mean age I: 45.87 ±9.22 yrs. C: 45.42 ±9.21 yrs.	To examine the effect of the multi-component educational intervention "PortionControl@ HOME" on body mass index and portion control behavior.	**I:** PortionSize tool, portion control strategies, cooking class, home-screener, 3 online portion control boosters via e-mail, cooking food + prep demos **C:** Wait list control **LT:** Dual process theory, Health action process approach **DA:** Trainee's	BMI, meal patterns	I had greater BMI loss vs C after completion (T1) with a difference of −0.45, when 3 outliers were removed but not sustained at 6 +12 mo. I had a higher increase self-reported portion control behavior with estimated difference with C of 0.33, 0.30, 0.35 at 3, 6, + 12 mo.	**Location:** The Netherlands **Sample:** the majority were female (84.5 %) + obese (65.1 %). **Retention:** 278 randomized, all included in multilevel analysis- but rates were (I:61.2%/ 75.5% 64.0%; C:79.9%/ 84.9%, 73.4%) at 3, 6, + 12 mo. respectively
Scarinci, I. 2020	RCT. 5wks. Baseline, within 2 wks. of last session, and 7 mo. follow up.	n= 299 study completers. (I, 151; C, 148) Mean age I: 35.03 ±5.3 yrs. C: 35.4±5.9	To test the efficacy of a community-based, culturally relevant intervention to promote healthy eating and nutrition label interpretation among Latinx immigrant mothers and their 9- to 12-year-old daughters	**I:** Lunchbox w/ portion sections matching MyPlate guidelines. Cooking demo Monthly meetings for first 3 mo., biwkly for 5 and 7 mo. about topics of interest for Latinx **C**: HPV vaccination **LT:** SCT **DA**: Native Spanish speaking Lay Health Educators	Dietary intake (F/V) nutritional literacy, nutritional knowledge	I had greater odds increasing F/V intake vs C (57.3 vs. 31.2, OR 3.66), decreasing wkly fried food intake (37.1 vs 13.5 OR 4.3), decreasing daily SSB (38.4 vs 23.7, OR 2.07), increasing frequency of reading and correctly interpreting nutr labels (74.3 vs 20.7, OR 12.58), (65.6 vs 31.1 OR 4.45)+ vs C.	**Location**: US, AL **Sample:** Latinx women. Did not complete high school (78.5%) and no health insurance (90%) Retention: 317 enrolled, and 299 study completers. =I, 93.4%; C, 92.6%

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Vilarini, A. 2012.	RCT, assessments at baseline and end of chemotherapy (3mo)	n=94 study completers. Mean age. I: 52.7 ± 10.8 yrs. C: 48.4 ± 9.4 yrs.	To prevent weight gain using an insulin lowering diet (Mediterranean/macrobiotic) in breast cancer patients.	**I:** Cooking classes, common meals at least 2x wk. for the whole duration of chemotherapy, **C:** Advice based on Mediterranean + macrobiotic recipes + on the avoidance of energy dense foods. **LT:** Not reported **DA:** Not reported	BMI, BW, WC, HC, dietary intake (F/V),	From baseline to end of chemotherapy, changes between groups were found for the following; BW (I: 63.8 to 60.9; C: 64.7 to 64.6), BMI (I: 24.7 to 23.6; C: 24.7 to 24.6), WC (I: 81.4 to 78.4; C: 80.5 to 80.4), HC (I: 101.3 to 98.6; C: 102.2 to 102.3), fat mass (I: 20.0 to 17.7; C: 21.0 to 20.3) I consumed less white bread, sugar (0.4 vs 0.9 times/d), refined cereal products (1.1 vs 2.1 times/d) + dairy products (0.5 vs 0.9 times/d) compared to C. No other findings between groups	**Location**: Italy **Sample:** Women undergoing chemotherapy **Retention:** 96 enrolled, 94 study completers=97.9% Between the end of the 1st cycle + the end of chemotherapy treatment

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Vlaar, E. 2017.	RCT, 24 mo. Baseline with 1 + 2 year assessments.	n=314 study completers (I,165: C, 149) Mean age I: 44.9 yrs. C: 44.7yrs.	To determine effectiveness of an intervention among South Asians in the Netherlands aimed at preventing T2D, with regard to changes in dietary habits, physical activity, and the social-cognitive determinants of behavior change.	**I:** Motivational interviewing (for 6-8 individual lifestyle counselling sessions, family visits, 3-4 booster sessions over the following 18 mo. 20-wk PA program, 2 group cooking classes **C:** 2 group sessions (baseline + after 6 mo.). Info about T2D + PA/diet guidelines **LT:** MI, SCT **DA:** Dietitian	MVPA, dietary intake(F/V), confidence, psychosocial	No change in MVPA, or meeting dietary behaviors at 2 yrs. between groups. Positive change for several of the social-cognitive determinants of behavior change in I + C but were negative at follow up. No other between group measures reported	**Location:** The Netherlands **Sample:** Individuals with impaired fasting glucose. (I, 75M, 90F; C, 77M, 72F.) **Retention:** 535 were randomized with 314 study completers= 58.69%
Waswa, L. 2015	RCT, 5 mo. Baseline + 1 yr. follow up assessments.	5 village pairs, End line n=207 (I=110, c=97), Baseline mean age I: 26.56 yrs (SD 7.32) C:25.09 yrs (SD 5.04)	To assess the effect of an education intervention in improving the diversity of children's complementary diets and nutrition knowledge of caregivers.	**I:** 4 nutr education sessions (mean 2.5 hr.) (+ group trainings + cooking demos), brochure. **C**: Brochure **LT**: None reported **DA:** Agricultural scientist, CHW, 2 nutr researchers.	Nutr/food literacy/ knowledge	I mean nutr knowledge score was higher than C at end line (8.21 ± 3.67) vs. (3.66 ± 3.02),	**Location:** Kenya **Sample:** Caregivers of children (192 biological mothers (F), 6M or non-biological mother) **Retention:** 293 interviewed at baseline, 198 completing the baseline survey, and 207 at end line.

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Zuniga, K. 2019.	RCT, 6 mo. Pre/post assessments.	n=125 study completers (I=60; C=65 Mean age. I:55.3± SD 10.3 yrs. C: 58.4 ± SD 8.2 yrs.	To improve adherence to an anti-inflammatory dietary pattern in BCS by promoting consumption of anti-inflammatory foods, herbs, and spices.	**I:** 6 mo. workshops (didactic portion, cooking demos, tasting + interactive discussion) 30 workshops were offered. **C:** Mo. brochure from American Institute for Cancer Research, + telephone calls **LT:** MI **DA**: Chef, study investigators, staff	Dietary intake (F/V)/ food selection, BW	At 6 mo., I increased daily red meat (64.4% to 86.4%), + fish/shellfish, 3+ serves/wk. (13.3 % to 35.6%), spices + herbs vs C (+1.9 vs. +0.4) + reduced commercial sweet + pastries consumption to less than 3x/wk. (69.5% to 86.4%) I had reduced calorie intake vs C (−195.5 vs. +34.8). No changes between groups for other measures	**Location**: USA, TX **Sample:** Overweight and obese breast cancer survivors Latina (51.2%), college degree or higher (54.4%) f **Retention:** 153 randomized, with 125 study completers= 81.7%
Alpaugh, M. 2020.	R w/ Comp. 24 wks. Baseline, 3mo and 6 mo. assessments.	N= 46 study completers (AC, 28; DC, 28) Mean baseline age AC :55 ± SD 11 yrs. DC: 50 ± SD 11 yrs.	To examine cooking as an intervention for weight control in overweight and obese adults, and whether such an intervention increases participants' food agency and diet quality.	Both: 24-wk behavioral WT loss program, with biwkly cooking classes. **AC:** wkly hands-on cooking **DC:** Cooking demo (same foods in AC) **LT**: Food Agency (Trubek) pedagogy **DA:** Dietitian	Dietary intake/diet quality, food agency, cooking self-efficacy, cooking attitudes, cooking frequency	AC lost more BW vs DC (7.34 ± 0.63 vs. 4.49 ± 0.67 kg) at 6mo. Both groups had an increase in diet quality, cooking-self efficacy, cooking attitudes at 6 mo. but no difference between group. DC cooked more lunches at home vs AC at 6 mo.	**Location**: USA, VT **Sample:** Predominantly non-Hispanic white, (89%), with a college or graduate degree (73%). (AC: 25F, 3M; DC: 25F, 3M) **Retention:** 56 randomized, with 46 study completers= 82.1%

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Curtis, P. 2012	R w/ 3 comp. 6 wks. Baseline (T0) post 3 mo. (T1), 6 mo. (T2) + 18 mo.(T3) assessments	(n=169 families; 589 individuals at baseline) No mean age listed	To compare the efficacy of 3 dietary intervention strategies that differed in the amount of education and cooking skill provision and the use of a personalized goal setting framework.	**IA**: a one-off 'education-based' intervention at a community center **IB**: A 'cook and eat' cooking skills-based intervention (4, 2-hr. cooking + education sessions over 6 wks.) **IC:** Education, cook/eat+ personalized goal setting intervention **LT:** Not reported **DA**: Dietitians	Dietary intake, diet quality	T0-T1: IC consumed less fat, carb + starch, + more vitamin C vs IA (not at T2/T3). IC consumed more NSP than IA/IB at T1. IA had lower intakes of total energy than IB/IC (not at T2) T2-T3: IA consumed more starch vs IB at T2, IB had higher intakes of carb vs IA at T3. IC consumed more NSP + Vit C than IA at T3. IB/IC were less energy dense than IA. IB consumed more Ca than IA +IC	**Location:** UK **Sample:** families that did not meet dietary targets of ≥29 %FE starch and ≤35 %FE fat **Retention:** 589 individuals at T0, 444 at T1 (75.38%) 369 at T2(62.64%), 198 at T3 (33.61%)

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Fahmida, U. 2015	Partial R w/ C (+ comp). 6 mo. Baseline and end line assessments	n= 465 study completers (mothers and children combined) (Non-CFR 216; CFR 239) No mean age listed	To assess effectiveness of promoting optimized complementary feeding practices (CFR)s for improving maternal knowledge, and children intakes(calcium, iron, niacin, and zinc)	Groups: 1) CFR, 2) psychosocial stimulation, 3) CFR plus stimulation, + 4) control **I:** The CFRs were promoted during mo. sessions (cooking demos+ practices, a cooking competition +) + wkly home visits. Mothers in CFR groups trained on food prep **LT:** Not reported **DA:** Study member, volunteers, + sub village coordinator	Nutritional knowledge/literacy	At the end of the intervention, mothers in GFR were able to correctly answer questions more frequently about key problem nutrients	**Location**: Indonesia **Sample**: Mothers and children **Retention**: 494 subjects included in the study, 465 completers= 94.12%
Levy, J. 2004	R w/ Comp Baseline, 1, 2, and 3 mo. post-intervention assessments.	n= 65 participants (I, 33; DG, 32) Mean age I:19.6 (SD 0.7 yrs). DG: 19.8 (SD 1.1 yrs).	To determine if cooking classes improve subjects' knowledge, attitudes, and behaviors toward cooking.	**I:** 4, 2-hr basic cooking skills classes + 45-min supermarket tour over 4 wks. **DG:** 1hr class (basic cooking skills + a cooking demo on nutr topics, + 45-min supermarket tour. **LT:** SLT **DA:** Principal investigator	Cooking confidence, cooking literacy, cooking frequency, psychosocial (attitudes towards cooking and their skills),	I had more positive attitudes regarding cooking (D:0.1 vs I: 0.4 gain), confidence in cooking (D: 0.3 vs I: 0.7 gain). I + D had a pos shift in cooking skill knowledge (1.3 gain) + were more likely to cook dinner (61% vs 62%) than eat out/take out dinner (15% vs 20%) No changes between groups for other measures	**Location**: USA, CO **Sample:** I:21F, 12M; D: 28F, 4M **Retention**: 65 enrolled no dropout info.

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Sorensen, L. 2011	R w/ Comp. Phase 1: 3 mo. Phase 2: 5 mo. Baseline, 3,8 mo., assessment with a 2 + 3 yr. follow up assessments.	n=41 study completers NLP: 17; CG: 24 Mean age NLP:42 (± SD 7) yrs. Cooking: 40 (± SD 10) yrs.	To compare the effect on weight, regain of behavior modification consisting of either a gourmet cooking course or neurolinguistic programming (NLP) therapy.	Participants who lost at least 8% of BW in P1 were randomized to NLP/CG. **CG**: Dietary guidance/BW control meetings every 2nd wk. 10 sessions provided training in preparing low-fat meals. **Comp** (NLP): 10 Behavior modification sessions over 5 mo. **LT**: Not reported **DA** (CG)dietitian, (NLP) NLP coach	BW	49 (88%) participants completed P1 with a BW of at least 8% During the 5 mo. of wt. maintenance, NLP lost an additional 1.8 kg on average, + CG lost 0.2 kg. After 3 yrs. 57% of NLP + 50% CG had maintained some of their initial BW loss.	**Location:** Denmark **Sample:** NLP: 11F, 12M; CG: 14F,11M. All were overweight/obese. **Retention**: (based on phase 2) 56 enrolled, 48 completed P1 + enrolled into NLP/CG, 41 study completers= 85.41%, 34 at 3 yrs. 70.83% P1: 12 wks. of calorie restriction + Orlistat 120 mg 3x/d. Education + biwkly meetings

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Vadstrup, E. 2011.	R w/ Comp. 6 mo. Pre/post assessments	Randomization data n=143 (RG,70; IC, 73) RG: 58.5 ± 9.0 yrs. IC: 58.0 ± 10.3 yrs.	To determine whether a group-based rehabilitation program improved glycemic control in patients with type 2 diabetes compared with an individual counselling program.	**Rehabilitation(RG):** 90- min group education sessions (1x wk., 6 wks.), on diabetes BW, PA (etc.) individually tailored PA (90-mins, 2x/wk., 12 wks.), 2, 3-hr group-based cooking classes, + 1, 2-hr supermarket tour. **Individual (IC):** Consultations over 6 mo. w/ 3 meetings with a dietician for goal setting+ advice. **LT:** MI **DA**: Physiotherapist, podiatrist (RG/IC), dietitian(RC/IC), + nurse. diabetes nurse specialist	Health (HRQOL), mental health, psychosocial	Hyperglycaemic + hypoglycaemic distress improved in the IC vs RG (-0.3 points) at 6 mo. No other between-group measures occurred.	**Location:** Denmark **Sample:** RG: 41M, 29F; IG: :44M, 29F **Retention:** 143 randomized. 119 completed baselines assessments =83.21%, 115 completed 6 mo. follow up= 80.41%

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Warmin,A. 2012.	RCT. (No timeline stated). Pre/post assessments	n=94 students. (A, 37; B, 33; C, 24) No mean age listed	To demonstrate that a culinary nutrition program with hands-on and online components, that college aged students will increase their cooking skills and nutrition knowledge.	**Group A:** Instructed by chef (5 hands-cooking sessions) with nutr education. **Group B:** Presented the info with a chef present for each session, the nutr session was online + 5-10 mins. **C:** Students who selected another project. LT: SCT DA: Chef, nutrition team	Cooking self-efficacy (SEC), Self-Efficacy for Using Basic Cooking Techniques (SECT), Self-Efficacy for Using Fruit, Vegetables, and Seasonings (SEFVS)	For the SEC, SECT, SEFVS, + SCORE scales, there was a difference between group B + control with means of (4.19, 4.14, 4.09 and 5.52) vs (3.65, 3.6, 3.58, and 4.46) respectively	**Location:** USA, SC **Sample:** College students, the following were female percentages: Group A (65%), B (73%), C (67%). All were predominantly white. **Retention:** 205 enrolled in the class, with 95 being distributed into groups. No info on dropout rate.
Non-randomized with control							

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Barak-Nahum,A. 2016	NR W/ C, 10 wks. pre and post assessment	n=152 study completers. Data before loss to follow up, (I, 96; C, 88) Mean age. I: 57.58 (SD 8.81) yrs. C: 58.13 (SD 10.64) yrs.	To examine the effectiveness of a culinary group intervention in increasing cancer patients' health related QOL and subjective well-being through changing their eating behaviors.	**I:** Culinary: 10 wks. of psychoeducation. Meetings were 2 hrs., with a hands-on cooking session + group discussion. **WLC**: General wait-list control. **LT**: Not reported **DA:** Mental health professional, nutritionist Participants could do other center activities (I.e. yoga, art, + lectures).	Health related QOL/Psychosocial, Food selection/preference	Health related QOL increased in I vs no change in C over time. Intuitive eating in general increased over time in I vs no change in C besides for a decrease on reliance on hunger cues. Healthy food choices increased in I vs decrease in C.	**Location**: Israel **Sample:** Latina (51.2%), I: 91F, 4M. WLC: 80F,8M Various cancer types with the majority breast + lymphoma. **Retention**: 190 original participants, 152 completed T2= 80.0%
Condrasky, M. 2006	NR W/ C (no timeline stated)	n=29 study completers (I, 15; C, 14)	To promote healthful eating behaviors by teaching parents and caregiver's basic nutrition, food selection, menu planning, and food prep skills.	**I:** 2-hr sessions which emphasized nutr education, culinary skills, taste tests, hands-on learning + lunch. **C**: Lesson materials + recipes. **LT:** Not reported **DA:** Chef, nutrition educator.	Dietary intake (F/V), food/nutritional literacy, psychosocial (confidence in self and trying new things)	I increased awareness of how to prepare simple, healthful meals. No change in F/V intake were noted between groups. Qualitative interviews indicated in increase in confidence to try new foods and not making mistakes.	**Location:** USA, SC **Sample:** Parents and caregivers of children **Retention:** No info stated on dropouts, just completers (no statistics mentioned for outcomes of interest).

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Dannefer, R. 2015	NR W/ C post class survey, workshops ran from July-mid November	n= 2,063 survey completers (C, 671; G1, 656; G2+, 736) Aged 18-60+ yrs.	To inform organizations that may be considering similar initiatives to increase fresh FV purchases among low-income urban populations shopping in farmers' markets.	**I:** Stellar Farmers Market (SFM) workshops (nutr education +demos. F/V to purchase) **C**: Market shoppers who never attended any classes **G1:** Individuals who took 1 SFM class. **G2+:** Had taken 2 or more SFM classes. **LT:** SEM **DA:** Nutritionist/ dietitian, culinary educator, translator.	Dietary intake(F/V), self-efficacy (to prepare + eat produce), attitude (towards FV consumption), food selection/preference	G2+ had higher FV daily intake vs combined C + G1 (4.62 vs 4.17) G2+ had higher self-efficacy to prepare + consume FV than other groups (3.39 vs 3.27) Willingness to try new FV in all groups (71% of G2+ were very willing to try new FV, 58% for G1 + 53% for C). Those in C had the lowest attitude score, which tended to increase with class attendance.	**Location**: USA, NY **Sample:** Female (84%), Hispanic (68%), less than a high school education (45%) **Retention**: surveys were completed directly after workshops, no info on incompletion. Positive family response Some participants noted better management of TC, diabetes, + BW).

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Flego, A. 2014	NR W/ C 10 wks. Pre, immediate post + 6-mo post-intervention assessments	I:T1(694), T2(383) T3, (214) C: T1(237) T2(149) Mean age 46-52 yrs.	To evaluate the immediate and sustained effectiveness of the first Jamie's Ministry of Food Program in Australia on individuals' cooking confidence and positive cooking/eating behaviors.	**I:** 10-wks, (1.5-hr classes wkly). General nutr education, learning recipes, cooking techniques + prep, meal planning, nutrition, discussion. **C:** General wait list **LT:** SCT, Kolbs (experiential learning), Bandura's Social Learning Theory **DA:** Program workers	Cooking confidence (self-efficacy), cooking knowledge, dietary intake (F/V), cooking frequency, processed foods (take away meals/readymade)	I Increased cooking confidence in all generalized cooking skill areas for T1-T3. Increase in I for daily veg. intake for T1-T2 but not sig in C(0.52/serv vs 0.10/serv), continued through to T3 (mean difference of 0.74/serv) Cooking the main meal from basic ingredients increased in T1-T2 (overall GxT) I reduced wkly take-away food intake (-0.21)(GxT) for T1-T2. No other between group measures	**Location**: Australia **Sample:** I: 525F, 153M; C: 198F, 29M demographics provided for T1 **Retention**: 1960 randomized. 931 analyzed at T1, 532 at T2, and 214 (I only) at T3.

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Herbert, J. 2014	NR W/ WLC . (Same study as Flego, but with additional outcomes)	*see Flego study	*see Flego study	*see Flego study	Dietary intake, Food selection/preference, nutritional literacy, attitudes, BMI	Increase in knowledge around cost of f/v for I but not C. GxT interactions found In I for cooking + healthy eating knowledge, attitudes and beliefs for T3. GxT changes for fat, salt + sugar knowledge were found in I + C (besides no change for salt in C) Increase in global self-esteem and general health in I to T3 (GxT). Social eating increased in I (GxT)No change in other measures between groups.	*see Flego study

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Kennedy,L. 1998.	NR W/ C, 10 wks. Pre, post and 3 mo. follow up assessments	n=39 study completers (I, 26; C, 13) Mean age 27.2 yrs.	To determine how and to what extent social and economic constraints were important in determining the response to experiential nutrition education.	**I:** 10 wk., 2-hr sessions with nutr education (reduce total fat, increase consumption of bread, cereals, potatoes + other vegetables), heart tips + nutr facts. Hands-on food prep + cookery. **C**: Non-participant group of 13 women **LT:** Grounded theory **DA:** Project workers with food/nutrition background.	Nutritional/food literacy, dietary intake(V), food preference, cooking/food frequency, psychosocial	Groups 1 + 3 had greater practical knowledge in food purchasing, prep, + cooking methods + distinguishing nutr facts. Qualitative reports from groups for improving cooking confidence, Enhanced self-efficacy (for dietary change), + social occasion + enjoyment	**Location:** UK **Sample:** Low income women with young children at home. (38.46%) 3/4 were dependent on state benefits as the main source of income. **Retention:** 39 participants included in the final analysis, unaware of original numbers 1 (CNEA) was relatively unsuccessful in delivering the program.
Kitaoka, K. 2013	NR W/ C. 5- mo. Pre/post assessment	n=64 study completers (I, 38; C, 26): Mean age. I, 66.2 ± 5.4 yrs. C: 64.1 ± 7.6 yrs.	To decrease sodium level from salted foods and to increase potassium level with an emphasis on an increase in the consumption of F/V through cooking instructions and self-monitoring of the diet.	**I**: 5, 4-hr sessions, 1x mo. (lecture on healthful diet + cooking instruction) Self-prepared lunches 3x + took lunch together with the staff members 5x. **C:** Nutr/lifestyle advice post-intervention. **LT**: Not reported **DA**: Dietitians.	Dietary intake(F/V)/food frequency, BW, BMI, WC, cholesterol (blood), BP	Intake of preserved vegetables decreased in I (P=.039) + was lower vs C (P=.020). Both I + C had a decrease in BW + BMI, but no between group difference. LDL (122.5–120.0,). No change observed in SBP or DBP (mm Hg) for C, but I had a change for DBP. (93.0–87.0) No change in other measures between groups.	**Location:** Japan **Sample:** Men with hypertension. Mean BMI for I was 23.6 +/-2.6 and for C was 23.8 +/-2.4. **Retention**: 71 enrolled and assigned, 64 study completers=90.14%.

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
McKellar, G. 2007	NR W/ C 6 wks. Baseline, 3-mo, 6-mo assessments	n=130 study completers (I, 75; C, 55) Mean age. I: 55 yrs., C: 54 yrs.	To explore the feasibility of introducing a Mediterranean-type diet to female RA patients living in areas of social deprivation and to assess changes in lifestyle, disease activity and cardiovascular risk.	**I:** Wkly, 2-hr cookery course, for 6 wks(food prep, cooking + tasting, Mediterranean diet emphasis), Written materials for diet, + healthy eating + alternatives. **C**: Written materials on healthy eating. **LT:** Not reported **DA:** Nutritionists, occupational therapy staff, and teaching staff.	Dietary intake(F/V), BP, BMI, dietary cholesterol,	No between group measures	**Location:** UK **Sample:** Females with RA **Retention:** 130 participants recruited, but no info on dropouts/did not meet criteria. Some women also noted an improvement in confidence and self-esteem.
Pakseresht, M. 2015.	NR W/ C , 1 yr. Baseline + post intervention assessments	n=263 Mean age I: 47.14 ± 14.8 yrs. C: 42.77 ± 10.87 yrs. Program was conducted in 6 communities	To improve the diet through increased intake of essential micronutrients and decreased consumption of non- nutrient dense foods that contribute to high energy and fat intake in Inuit and Inuvialuit communities.	**I:** Workshops on, meal planning + healthy cooking, fitness challenges + clubs. Implemented at a variety of public areas **C**: Completed assessments **LT:** Not reported **DA**: Trainees, project coordinators, local store staff	Dietary intake/quality	No between group measures analyzed/reported.	**Location:** Canada **Sample:** 39M, 224W. **Retention:** 494 baseline respondents, 376 completed baseline assessments = 76% with 263 being included in the final analysis due to missing data/extreme energy intakes =53.23%

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Shahar, S. 2013	NR w/ C 6 mo. Baseline, 3-mo + 6-mo assessments	n= 42 study completers (I, 22; C, 20) Mean age. I: 65.3 ±SD 3.5 yrs. C: 67.8 ± SD 4.7 yrs.	To determine the effectiveness of the nutrition education intervention package for improving health parameters, among rural older Malays with MS.	I: 4 sessions over 6 mo. (3 in the first 3 mo., + 1 in last 3 mo.). Group counselling, talks, cooking + exercise demos. Nutr health + PA education **C**: General health education package **LT:** Not reported **DA**: Dietitian or nutritionist	BMI, BW, WC, TG, blood cholesterol, BP, glucose	Men reduced BW in I more than C (-1.9% + -1.0%) at 3 + 6 mo. An intervention effect of stable TC concentration found in I vs C which increased TC at 3 + 6 mo. Women in I had an intervention effect for reducing WC (-4.1%) and BW **(-0.2%)*.** GxT found were LDL-C, TG and DBP in women.	**Location**: Malaysia **Sample:** 16M, 26W. Hypertensive (73.8%) with multiple sclerosis **Retention:** 47 enrolled, with 42 study completers= =89.36% Tables do not reflect the BW change being sig in women. Authors were contacted*
Rhea, K. 2020.	NR w/ C. 4 wks. Pre/post assessments	N=37 study completers I, 23; C, 14 Mean age I: 24.2 ± 2.6 yrs. C: 27.1 ± 2.3 yrs.	To develop and test a multifactorial nutrition education/culinary skill-building program for veterinary medical students that would improve their food literacy as measured by EFLBQ factor scores.	**I:** 4, 30 min sessions. Class topics on nutr education, hands on activities w/ food planning, virtual grocery shopping, basic cooking skills. 10 min group challenge to make a healthy snack. **LT:** Not reported **DA**: Graduate student, assistant **C**: 30 min lessons on money management	Cooking knowledge/ confidence, food literacy	I had a higher mean change vs C for health/nutrition knowledge (0.30) vs (0.02). No other changes measured between groups.	**Location**: USA, LA **Sample:** Veterinary medicine students. Mostly female (83.78%) **Retention:** 37 completed the study, no information on dropouts.

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Shariatjafari, S. 2012.	NR w/ C. 4 wks. Baseline, post-test + 1 mo. follow up assessments	n=435. (I, 221; C, 213) Mean age. I: 38.75 ± 9.35 yrs. C: 41.68 ± 9.79, yrs.	To promote Iran's food-based dietary guidelines, and assess both the feasibility and effectiveness of the program	**I:** 4 educational sessions for 4 wks. Group cooking class where participants observed recipe prep for the 4th session. **C:** No information stated on control. **LT:** HBM **DA**: Trained health workers	Dietary intake(F/V) food selection, nutritional literacy/knowledge. psychosocial (HBM constructs) BMI, PA	Reduction in total energy in I vs C (–232.99 vs 44.16) % of total energy from the total fat in I vs C (–5.19% vs -1.44), daily sodium (-1240.45 vs 346.45). In I + C processed meat intake decreased (–.080, *vs*.070,). + water intake increased. Daily servings of nuts, legumes, + low-fat dairy increased in I (.075), (.298) vs (.025), (-.016) respectively. C decreased daily vegetable intake vs I(–.678 vs .004). Dietary knowledge increased (1.61 ± .149,) + PA (5.36 ± 1.845) increased in I. All constructs measured of HBM improved in I at follow up. BMI changes in I at follow up vs C (–.372 vs .476).	**Location:** Iran **Sample**: Healthy adult women **Retention:** 480 participants, with 435 study completers= 90.62%

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Turner-McGrievy, G. 2019.	NR w/ C (+ comparison) 12 mo. Baseline, 3-mo, 12-mo assessments.	n= 95 Baseline participants I=61, C=34 Baseline mean age I: 51.1 ± 11.0 yrs. C: 39.2 ± 14.0 yrs.	To test the feasibility, acceptability, and impact on systemic inflammation among adults in the IMAGINE program as compared to adults who opted for a remotely delivered, information-only control.	**I:** 21 classes (1x wk. for 12 wks. Followed by mo. booster for 9 mo. Topics on inflammation, PA, + stress. Primarily plant-based diet, 1x1 nutr guidance (2x), hands-on cooking classes(2-3x), + strength training (2-3x wk.). **C**: Emails/ hard copies of cancer prevention materials **LT**: Not reported **DA:** Interventionalist	Blood (TC) psychosocial (stress), PA, BMI,	I reduced their DII score on average (-2.66 ± 2.44 points), vs decreases in C (-0.38 ± 2.56 points) at 3 mo., not at 12. No other between group measures were reported	**Location**: USA, SC **Sample:** Female (81%), White (62%). college-educated (74%), **Retention:** 95 enrolled with 80 at 3 mo. (84.21%), 69 at 12 mo. (72.63%)
Non-randomized with comparison							
Dexter, A. 2019	NR w/ Comp 12 wks. Pre/Post assessments	n=75. Telehealth (10), In-person (65) Aged 31-71	To evaluate a 12-week cooking education class on cooking confidence, dietary habits, weight status, and laboratory data among veterans with prediabetes and diabetes.	**In person**: Cooking classes on carb counting, meal planning, + food safety. **Telehealth**: Same program, delivered online **LT**: Not reported **DA**: Dietitians	Cooking confidence, dietary intake/quality (F/V), cholesterol (blood), BMI, BW	No between group differences were either analyzed or reported.	**Location:** USA, LA + TX **Sample**: Veterans with prediabetes and diabetes (M: 66, F: 9) **Retention:** 75 enrolled, 65completed. =86.66%

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Kakareka, R. 2019.	NR w/ Comp. 4wk (sports g) + 8 wk (Med/Car g) interventions. Weekly assessments.	n= 53 baseline data. (Med I, 19; Med II, 23; Sports G, 11) Average age of 64.47, 62.83 and 22.73 respectively	To assess the feasibility of implementing Fresh and Savory, a hands-on TK modeled as a SMA, at MedStar Health.	**Med/Car G:** 8, 2-h sessions of mind-body exercise, 40 min of didactic presentations for nutritious cooking, sleep, exercise, relaxation. Culinary skills through hands on plant-based cooking + demos **Sports G**: Sports specific didactic presentations, skill building + recipes for easy meals on the go + mind practices **LT**: Not reported **DA:** Clinician	BP, BW, Cooking confidence, dietary intake (F/V)	No group differences for all measures despite qualitative reports on improved sleep, culinary confidence and reduced stress and med dosage.	**Location:** USA, DC **Sample**: (M: 14, F: 39) **Retention:** 98 recruited, 53 with demographic data =54%

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Mead, E. 2013	NR w/ Comp 12 mo. Pre/Post assessments	n=379 (I, 246; C, 144) Mean ages were 42.4 yrs. for women, 42.3 yrs. for men.	To improve food-related psychosocial factors and behaviors among Inuit and Inuvialuit in four intervention communities	**I:** Store component: Interactive taste sessions + cooking demos with nutr education. Community component: cooking classes, taste tests, community feasts walking clubs + challenges. **Comp:** Served as a waitlist and received the intervention post-evaluation. **LT:** SCT, SEM **DA:** Not explicitly stated but community sources were used.	Cooking self-efficacy, BMI, cooking frequency (food preparation) food preference. psychosocial	All psychosocial factors improved from baseline ($p<.001$) I had increased self-efficacy (+0.13 SD) + intentions (+0.16 SD greater) vs C. BMI increased by 0.03 kg in all groups, with the intervention having no sig impact on BMI. No change in healthfulness of food prep. In obese patients in the I group, they had increased healthy eating intentions ($p=0.021$), decreased frequency of unhealthy food acquisition ($p= .008$), + increased self-efficacy.	**Location:** Canada **Sample:** I: 199W, 47M; C:112W, 21 M **Retention:** 494 baseline responders, 379 study completers= 76.72% They say 78.3

Appendix C: Data Extraction Table

Study Design and Reference	Study Design/ Duration	Population	Objective	Intervention (I)/ Comparison Group (C), Delivery Agent (DA)	Outcome Measures	Results	Comments
Wrieden, W. 2007.	NR w/ comp 10 wks with pre, post, and 6-mo. assessments	n=93 were randomized, with 40 + 41 participants included with two separate data points. T1-T2 (I, 29; C, 21) T1-T3 (I, 24; C, 17) n= 24, C= 17. Mean age was similar among groups= 32.3 yrs.	To evaluate the feasibility of undertaking a food skills intervention (CookWell) study aimed at altering cooking confidence, food preparation methods and dietary choices in areas of social deprivation.	**I:** 2-hr food skills program over 7 wks. (informal education on hygiene, nutr, food tasting + cooking component) **Comp:** Same informal education session, w/o cooking **LT**: Not reported **DA:** Local instructor	Cooking confidence, dietary intake(F/V)/ Food selection,	Fruit intake increased for T1-T2 in I (1 portion per wk., p=0.047) but not to T3, with no change in C. Participants from I + C reported doing more cooking from basic ingredients + eating fewer convenience foods (but not avoided all together). No other between group measures found.	**Location:** UK **Sample**: 110F, 13M. Income support (I: 47%, C: 45%) finished full time education at 16 or below (77%) **Retention:** 93 randomized, 40 for T1 –T2 and 41 for the T1–T3 comparison.

Appendix D: EAL Article Quality Rating Worksheet

Quality Criteria Checklist: Primary Research

Symbols Used

+ **Positive:** Indicates that the report has clearly addressed issues of inclusion/exclusion, bias, generalizability, and data collection and analysis.

-- **Negative:** Indicates that these issues have not been adequately addressed.

∅ **Neutral:** Indicates that the report is neither exceptionally strong nor exceptionally weak.

Quality Criteria Checklist: Primary Research

RELEVANCE QUESTIONS		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (NA for some Epi studies)	Yes No Unclear N/A
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes No Unclear N/A
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to dietetics practice?	Yes No Unclear N/A
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes No Unclear N/A
If the answers to all of the above relevance questions are "Yes," the report is eligible for designation with a plus (+) on the Evidence Quality Worksheet, depending on answers to the following validity questions.		
VALIDITY QUESTIONS		
1.	**Was the <u>research question</u> clearly stated?**	Yes No Unclear N/A
	1.1 Was the specific intervention(s) or procedure (independent variable(s)) identified?	
	1.2 Was the outcome(s) (dependent variable(s)) clearly indicated?	
	1.3 Were the target population and setting specified?	
2.	**Was the <u>selection</u> of study subjects/patients free from bias?**	Yes No Unclear N/A
	2.1 Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	
	2.2 Were criteria applied equally to all study groups?	
	2.3 Were health, demographics, and other characteristics of subjects described?	
	2.4 Were the subjects/patients a representative sample of the relevant population?	
3.	**Were <u>study groups comparable</u>?**	Yes No Unclear N/A
	3.1 Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	
	3.2 Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	
	3.3 Were concurrent controls used? (Concurrent preferred over historical controls.)	
	3.4 If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	
	3.5 If case control study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	
	3.6 If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	

Appendix D: EAL Article Quality Rating Worksheet (continued)

4.	**Was method of handling <u>withdrawals</u> described?**	Yes No Unclear N/A	
4.1	Were follow up methods described and the same for all groups?		
4.2	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)		
4.3	Were all enrolled subjects/patients (in the original sample) accounted for?		
4.4	Were reasons for withdrawals similar across groups?		
4.5	If diagnostic test, was decision to perform reference test not dependent on results of test under study?		
5.	**Was <u>blinding</u> used to prevent introduction of bias?**	Yes No Unclear N/A	
5.1	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?		
5.2	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)		
5.3	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?		
5.4	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?		
5.5	In diagnostic study, were test results blinded to patient history and other test results?		
6.	**Were <u>intervention</u>/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were <u>intervening factors</u> described?**	Yes No Unclear N/A	
6.1	In RCT or other intervention trial, were protocols described for all regimens studied?		
6.2	n observational study, were interventions, study settings, and clinicians/provider described?		
6.3	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?		
6.4	Was the amount of exposure and, if relevant, subject/patient compliance measured?		
6.5	Were co-interventions (e.g., ancillary treatments, other therapies) described?		
6.6	Were extra or unplanned treatments described?		
6.7	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?		
6.8	In diagnostic study, were details of test administration and replication sufficient?		
7.	**Were <u>outcomes</u> clearly defined and the <u>measurements valid and reliable</u>?**	Yes No Unclear N/A	
7.1	Were primary and secondary endpoints described and relevant to the question?		
7.2	Were nutrition measures appropriate to question and outcomes of concern?		
7.3	Was the period of follow-up long enough for important outcome(s) to occur?		
7.4	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?		
7.5	Was the measurement of effect at an appropriate level of precision?		
7.6	Were other factors accounted for (measured) that could affect outcomes?		
7.7	Were the measurements conducted consistently across groups?		

Appendix D: EAL Article Quality Rating Worksheet (continued)

8.	**Was the <u>statistical analysis</u> appropriate for the study design and type of outcome indicators?**	Yes No Unclear N/A	
8.1	Were statistical analyses adequately described the results reported appropriately?		
8.2	Were correct statistical tests used and assumptions of test not violated?		
8.3	Were statistics reported with levels of significance and/or confidence intervals?		
8.4	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?		
8.5	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?		
8.6	Was clinical significance as well as statistical significance reported?		
8.7	If negative findings, was a power calculation reported to address type 2 error?		
9.	**Are <u>conclusions supported by results</u> with biases and limitations taken into consideration?**	Yes No Unclear N/A	
9.1	Is there a discussion of findings?		
9.2	Are biases and study limitations identified and discussed?		
10.	**Is bias due to study's <u>funding or sponsorship</u> unlikely?**	Yes No Unclear N/A	
10.1	Were sources of funding and investigators' affiliations described?		
10.2	Was there no apparent conflict of interest?		

MINUS/NEGATIVE (-)

If most (six or more) of the answers to the above validity questions are "No," the report should be designated with a minus (-) symbol on the Evidence Worksheet.

NEUTRAL (∅)

If the answers to validity criteria questions 2, 3, 6, and 7 do not indicate that the study is exceptionally strong, the report should be designated with a neutral (∅) symbol on the Evidence Worksheet.

PLUS/POSITIVE (+)

If most of the answers to the above validity questions are "Yes" (including criteria 2, 3, 6, 7 and at least one additional "Yes"), the report should be designated with a plus symbol (+) on the Evidence Worksheet.

Appendix E: Quality Criteria Checklist Results Table

Title	1.Research Clearly Stated	2.Participants selected free from bias	3.Study groups comparable	4.Methods of handling withdrawals described	5.Blinding used to prevent bias	6.Interventions or exposures described in detail	7.Outcomes defined, valid and reasonable	8.Statistical analysis appropriate	9.Conclusions supported by results	10. Bias due to funding unlikely	Overall rating
Berrino, F. 2001 (reduce)	*Yes*	*Yes*	Unclear	Yes	No	Yes	Yes	Yes	Yes	No	Neutral
Berrino, F. 2002	Yes	Yes	Yes	Yes	No	Yes	Yes	Unclear	Unclear	No	Neutral
Bernardo, G. 2018	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Unclear	Positive
Brown, J. 2012	Yes	Yes	Unclear	No	Unclear	Yes	Unclear	No	Yes	Unclear	Negative
Carmody, J. 2012	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Positive
Carruba, G. 2006	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Unclear	Positive
Cho, S. 2014	Yes	Yes	No	Unclear	No	Unclear	Yes	Yes	Yes	Unclear	Neutral
Clifford, D. 2009	Yes	Unclear	No	No	No	Yes	Yes	Yes	Yes	Yes	Neutral
DeRose, K. 2019	Yes	Yes	Yes	No	No	Yes	Unclear	Unclear	Yes	Yes	Neutral
Feuerstein-Simon, R. 2020	Yes	Unclear	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Positive
Fitzsimmons, S. 2003	Yes	Yes	Yes	Yes	No	Unclear	Yes	Yes	Yes	Unclear	Neutral
Flesher, M. 2011	Yes	Unclear	Unclear	Unclear	No	Yes	Yes	Unclear	Yes	Yes	Unclear
Greenlee, H. 2016	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Positive
Janssen, L. 2018	**Yes**	**Yes**	**Yes**	**Yes**	**Unclear**	**Yes**	**Yes**	**Yes**	**Yes**	**Unclear**	**Positive**

Appendix E: Quality Criteria Checklist Results Table (continued)

Title	1.Research Clearly Stated	2.Participants selected free from bias	3.Study groups comparable	4.Methods of handling withdrawals described	5.Blinding used to prevent bias	6.Interventions or exposures described in detail	7.Outcomes defined, valid and reasonable	8.Statistical analysis appropriate	9.Conclusions supported by results	10. Bias due to funding unlikely	Overall rating
Kwon, J. 2014	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Positive
Lavelle, F. 2017	Yes	Yes	Yes	Yes	No	Yes	Unclear	Yes	Yes	Yes	Positive
Lee, K. 2017	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Positive
Leone, L. 2018	Yes	Yes	No	Yes	No	Yes	Unclear	Yes	Yes	Unclear	Neutral
McGorrian C. 2015	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Unclear	Positive
Ohtsuki, M. 2018	Yes	Unclear	No	Yes	No	Yes	Yes	Yes	Yes	Unclear	Neutral
Parletta, N. 2019	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Positive
Peters, N. 2014	Yes	Unclear	Unclear	Yes	No	Yes	Unclear	Yes	Yes	Yes	Neutral
Pettman, T. 2008	Yes	Unclear	Unclear	No	No	Yes	No	Unclear	Yes	Yes	Negative
Pierce, J. 2007	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Positive
Pluss, C. 2007	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Positive
Poelman, M. 2015	Yes	Yes	Unclear	Yes	No	Yes	Unclear	Yes	Yes	Yes	Neutral
Scarinci, I. 2020	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Unclear	Positive
Vilarini, A. 2012	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**Yes**	**Yes**	**Yes**	**Yes**	**Unclear**	**Positive**

Appendix E: Quality Criteria Checklist Results Table (continued)

Title	1.Research Clearly Stated	2.Participants selected free from bias	3.Study groups comparable	4.Methods of handling withdrawals described	5.Blinding used to prevent bias	6.Interventions or exposures described in detail	7.Outcomes defined, valid and reasonable	8.Statistical analysis appropriate	9.Conclusions supported by results	10. Bias due to funding unlikely	Overall rating
Vlaar, E. 2017.	Yes	Yes	Yes	Yes	Unclear	Yes	Unclear	Yes	Yes	Yes	Positive
Waswa, L. 2015	Yes	Yes	Yes	Unclear	No	Yes	Yes	Yes	Yes	Yes	Positive
Zuniga, K. 2019	Yes	Yes	Yes	Unclear	No	Yes	No	Yes	Yes	Unclear	Neutral
Alpaugh, R. 2020	Yes	Unclear	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Positive
Curtis, P. 2012	Unclear	Yes	No	Yes	No	Yes	No	Yes	Yes	Unclear	Neutral
Fahmida, U. 2015	Yes	Yes	Yes	No	No	Yes	Unclear	Yes	Yes	Yes	Neutral
Levy, J. 2004	Yes	Unclear	Unclear	No	No	Yes	Yes	Yes	Yes	Unclear	Neutral
Sorensen, L. 2011	Yes	Yes	Unclear	Yes	No	Yes	Yes	Unclear	Yes	Unclear	Neutral
Vadstrup, E. 2011	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Unclear	Neutral
Barak-Nahum, A. 2016	Yes	Unclear	Yes	Yes	No	Yes	Yes	Yes	Yes	Unclear	Neutral
Condrasky, M. 2006.	Unclear	Unclear	Unclear	No	No	Yes	Unclear	Unclear	No	Unclear	Negative
Dannefer, R. 2015	Yes	Yes	No	Unclear	No	Yes	Unclear	Yes	Yes	Unclear	Neutral
Flego, A. 2014	Yes	Yes	No	Yes	No	Yes	Unclear	Yes	Yes	Yes	Neutral
Herbert, J. 2014	**Yes**	**Yes**	**No**	**Yes**	**No**	**Yes**	**Unclear**	**Yes**	**Yes**	**Yes**	**Neutral**

Appendix E: Quality Criteria Checklist Results Table (continued)

Title	1.Research Clearly Stated	2.Participants selected free from bias	3.Study groups comparable	4.Methods of handling withdrawals described	5.Blinding used to prevent bias	6.Interventions or exposures described in detail	7.Outcomes defined, valid and reasonable	8.Statistical analysis appropriate	9.Conclusions supported by results	10. Bias due to funding unlikely	Overall rating
Kennedy, L. 1998	Yes	Unclear	Unclear	No	No	Yes	Unclear	Unclear	Yes	Unclear	Negative
Kitaoka, K. 2013	Yes	Yes	Yes	Yes	No	Yes	Yes	Unclear	Yes	Unclear	Neutral
McKellar, G. 2007	Yes	Yes	Yes	No	No	Yes	Unclear	Yes	Yes	Unclear	Neutral
Pakseresht, M. 2015	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Unclear	Neutral
Shahar, S. 2013	Yes	Yes	No	Yes	No	Yes	Yes	Unclear	Yes	Unclear	Neutral
Rhea, K. 2020	Yes	Unclear	No	No	No	Yes	Yes	Yes	Yes	Yes	Neutral
Shariatijafari, S. 2012	Yes	Yes	Yes	Yes	No	Yes	Unclear	Yes	Yes	Unclear	Positive
Turner-McGrievy, G. 2019	Yes	Unclear	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Neutral
Warmin, A. 2012	Yes	Unclear	Unclear	No	No	Yes	Yes	Yes	No	Unclear	Negative
Dexter, A. 2019	Yes	Yes	Unclear	No	No	No	Yes	Unclear	Yes	Yes	Neutral
Kakareka, R, 2019.	Yes	Yes	No	Unclear	No	Yes	Yes	Yes	Unclear	Unclear	Neutral
Mead, E. 2013	Yes	Unclear	Yes	Unclear	No	Yes	Unclear	Yes	Yes	Unclear	Neutral
Wrieden, W. 2007	Yes	Yes	No	Yes	No	Yes	Unclear	Yes	Yes	Unclear	Neutral

Appendix F: Study Characteristics Identifiers Table

Study location	**(n)**	**%**
USA	21	38
Europe	16	29
Asia	9	16
Australia & New Zealand	4	7
Canada	3	6
South America	1	2
Africa	1	2
Gender	**(n)**	**%**
>50% female	48	87
<50% female	5	9
Unidentified	2	4
Year published	**(n)**	**%**
2017-2020	18	33
2012-2016	21	38
1997-2011	16	29
Design	**(n)**	**%**
Randomized controlled Trial	37	67
Non-Randomized controlled trial	14	26
Non-randomized with comparison	4	7
Outcomes	**(n)**	**%**
Fruit & Vegetable intake	27	49
Body Weight	17	31
Body Mass Index	19	35
Waist Circumference	8	15
Blood Pressure	7	13
Length of intervention	**(n)**	**%**
<10 days	2	4
4-12 weeks	20	36
3-6 months	19	35
1+ years	5	9
2+ years	2	4
Split duration	3	5
Not stated	4	7
Learning Theory	**(n)**	**%**
Social Cognitive Theory	16	29
Social Ecological Model	4	7
Social Learning Theory	3	5
Motivational interviewing	3	5
Not reported	27	49
Other	16	29
Overall studies using a learning theory	28	51
Cooking component	**(n)**	**%**
Active/hands-on	27	49
Demo	8	14.5
Included both	8	14.5
Predicted Active	10	18
Predicted Demo	1	2
Unspecified	1	2

Appendix G: Studies Reporting Group Differences on Main Outcomes

Title	Main Outcome Measured (F/V, BW, BMI, WC, BP)	Fruit or Vegetable	Body Weight	Body Mass Index	Waist Circumference	Blood pressure	Was fast food or Convenience foods measured?	Was Psychosocial outcomes measured?
Berrino, F. 2001 (reduce)	*F/V, BW, BMI, WC*	No	Yes	Yes	Yes			
Berrino, F. 2002	F/V, BW, WC	No	Yes		Yes			
Bernardo, G. 2018	n/a						Yes	Yes
Brown, J. 2012	n/a							Yes
Carmody, J. 2012	F/V (Veg protein)	Yes						
Carruba, G. 2006	BW, F/V (Veg protein)	Yes	No				Yes	
Cho, S. 2014	*BW, BMI, WC*		No	No	No			Yes
Clifford, D. 2009	F/V	No						Yes
DeRose, K. 2019	BW, BMI		Yes	Yes				Yes
Feuerstein-Simon, R. 2020	F/V	No						Yes
Fitzsimmons, S. 2003	n/a							Yes
Flesher, M. 2011	BP					Yes		
Greenlee, H. 2016	F/V, BW, BMI	Yes	Yes	Yes	Yes			
Janssen, L. 2018	BMI, WC			Yes	Yes			Yes
Kwon, J. 2014	n/a							Yes
Lavelle, F. 2017	n/a							Yes
Lee, K. 2017	BW, BMI		Yes	Yes				Yes
Leone, L. 2018	F/V	Yes					Yes	Yes
McGorrian C. 2015	F/V, BMI	No		Yes			Yes	
Parletta, N. 2019	F/V	Yes					Yes	Yes
Peters, N. 2014	F/V, BW, BMI	Yes	No	No			Yes	Yes
Pettman, T. 2008	BP, WC				No	No		
Pierce, J. 2007	F/V, BW	Yes	No					Yes
Pluss, C. 2007	BMI, BP			Yes		No		Yes
Poelman, M. 2015	BMI			Yes				
Scarinci, I. 2020	F/V	No					Yes	Yes
Vilarini, A. 2012	BW, BMI, WC, F/V	No	Yes	Yes	Yes		Yes	
Vlaar, E. 2017.	F/V	No						Yes
Waswa, L. 2015	n/a							Yes
Zuniga, K. 2019	F/V, BW	Yes	No				Yes	
Alpaugh, R. 2020	BW		Yes					Yes
Curtis, P. 2012	n/a							
Fahmida, U. 2015	n/a							Yes
Levy, J. 2004	n/a						Yes	Yes

Appendix G: Studies Reporting Group Differences on Main Outcomes (continued)

Title	Main Outcome Measured (F/V, BW, BMI, WC, BP)	Fruit or Vegetable	Body Weight	Body Mass Index	Waist Circumference	Blood pressure	Was fast food or Convenience foods measured?	Was Psychosocial outcomes measured?
Sorensen, L. 2011	BW		No					
Vadstrup, E. 2011	n/a							Yes
Barak-Nahum, A. 2016	n/a							Yes
Condrasky, M. 2006.	F/V	No						Yes
Dannefer, R. 2015	F/V	Yes						Yes
Flego, A. 2014	F/V	Yes					Yes	Yes
Herbert, J. 2014	BMI			Yes				Yes
Kennedy, L. 1998	F/V (Veg only)	No						Yes
Kitaoka, K. 2013	F/V, BW, BMI, WC, BP	No	No	No	No	Yes		
McKellar, G. 2007	F/V, BMI, BP	No		No		Yes		Yes
Pakseresht, M. 2015	n/a						Yes	
Shahar, S. 2013* author contacted	BW, BMI, WC, BP		Yes*	Yes*	No*	No		
Rhea, K. 2020	n/a							Yes
Shariatijafari, S. 2012	F/V, BMI	Yes		Yes			Yes	Yes
Turner-McGrievy, G. 2019	BMI			No				Yes
Warmin, A. 2012	n/a							Yes
Dexter, A. 2019	F/V, BW, BMI	No	No	No				Yes
Kakareka, R, 2019.	F/V, BW, BP	No	No			No		Yes
Mead, E. 2013	BMI			Yes				Yes
Wrieden, W. 2007	F/V	Yes					Yes	Yes
	Total studies measuring each outcome	26	17	19	9	7	14	39

Appendix H: Data collection for Effect Size Analysis (fruit intake)

Title	Intervention	Control	Control group	Intervention group	SD control baseline	SD int Baseline	SE Control post	SE int post	D	Lower 95% C.I	Upper 95% C.I
Average ES									0.65	0.30	0.99
Greenlee, H. 2016	0.4	-0.2	29	29	SD 2.2	SD 2.0	0.352821	0.278543	0.4319	-0.0888	0.9526
Ohtsuki, M. 2018.	19.8	21.6	50	48	SD 108.8	SD 121.9	13.27947	18.61955	-0.016	-0.4121	0.3801
Parletta, N. 2019.	0.67	0.04	38	47	SD 0.12	SD 0.12	0.030822	0.024797	3.5158	2.836	4.1956
Pierce, J. 2007.	-0.1	-0.8	1551	1537	SE 0.05	SE 0.05	0.05	0.07	0.2948	0.2239	0.3657
Zuniga, K. 2019.	-0.2	-0.3	65	60	SE 0.2	SE 0.2	0.1	0.1	0.125	-0.2262	0.4762
Flego, A. 2014	0.28	0.1	149	383	SE 0.07	SE 0.04	0.08	0.05	0.1826	-0.0069	0.3722
Shariatjafari, S. 2012.	0.059	0.155	213	221	SE 1.58	SE 1.67	1.72	1.36	-0.0042	-0.1924	0.184

Appendix H: Data collection for Effect Size Analysis (Vegetable intake)

Title	Intervention	Control	Duration	Control group	Intervention group	SD control baseline	SD int Baseline	SE Control post	SE int post	D	Lower 95% C.I	Upper 95% C.I
Average ES										0.79877	0.37063	1.08967
Carmody, J. 2012	16	1	182.5	17	14	SD7.7	SD 8.4	2.134314	4.035645	1.246	0.4736	2.0183
Carruba, G 2006	-2.2	-3.1	182.5	55	51	SD 10.2	SD 10.2	1.051752	1.778356	0.0862	-0.295	0.4673
Greenlee, H. 2016	1.6	-0.2	365	29	29	SD 1.8	SD 1.8	0.278543	0.259973	1.2406	0.6786	1.8027
Ohtsuki, M. 2018.	9.4	-23	182	50	48	SD 108.8	SD 121.9	13.27947	18.61955	0.2881	-0.11	-0.6862
Parletta, N. 2019.	1.34	0.53	182.5	38	47	SD 0.13	SD 0.13	0.032444	0.029173	4.05	3.306	4.794
Pierce, J. 2007.	1.9	-0.2	2190	1551	1537	SE 0.05	SE 0.05	0.05	0.09	0.7376	0.6647	0.8105
Zuniga, K. 2019.	-0.1	-0.1	182.5	65	60	SE 0.1	SE 0.1	0.2	0.2	0	-0.3509	0.3509
Flego, A. 2014	0.52	0.1	252	149	383	SE 0.09	SE 0.51	0.1	0.06	0.35	0.1596	0.5404
Shariatjafari, S. 2012.	0.004	-0.678	28	213	221	SE 2.14	SE 1.73	1.99	1.82	0.0243	-0.1639	0.2125
Wrieden, W. 2007.	0.6	1.4	231.6	17	24	SD 3.70	SD 3.31	5.67	4.57	-0.0351	-0.6564	0.5863

Appendix H: Data collection for Effect Size Analysis (BMI)

Title	Intervention	Control	Duration	Control group	Intervention group	SD control baseline	SD int Baseline	SE Control post	SE int post	D	Lower 95% C.I	Upper 95% C.I
Average ES										-0.2011	-0.5832	0.166682
Berrino, F. 2001 (RB)	-1.62	-0.22	126	49	50	avg	avg	1.1	1.2	-0.1722	-0.567	0.225
Greenlee, H. 2016	-1	-0.6	365	29	29	SD 5.6	SD 6.5	1.1	1.2	-0.0644	-0.5792	0.4505
Janssen, L. 2018.	0.2	-0.4	56	35	30	SE 0.7	SE 0.7	0.7	0.7	0.1513	-0.337	0.6397
Lee, K. 2017	-0.4	0.1	10	14	16	4	2.4	1.07	0.6	-0.1542	-0.8725	0.5641
McGorrian, C. 2015	-0.47	-0.92	35	27	38	SD 3.35	SD 2.45	1.01	0.70	0.0956	-0.398	0.5892
Pluss, C. 2007.	0.2	0.2	365	102	104	SD 3.8	SD 3.7	0.39	0.37	-0.1818	-0.4555	0.0919
Poelman, M. 2015	-1.41	0.84	91	102	89	4.57	4.95	0.47	0.53	-0.5838	-0.8741	0.2936
Vilarini, A. 2012.	-1.1	-0.1	169.3	47	47	SE 0.70	SE 0.66	0.73	0.67	-0.2082	-0.6136	-0.1973
Herbert, J. 2014	-0.09	-0.02	252	149	383	SE 0.46	SE 0.27	0.47	0.28	-0.0126	-0.2018	0.1766
Shariatjafari, S. 2012.	-0.372	0.376	28	213	221	SD 4.407	SD 4.418	0.039	0.056	-1.0551	-1.256	-0.8542
Mead, E. 2013	-0.81	-0.44	365	189	112	avg	avg	1.1	1.2	-0.0261	-0.2599	0.2076

Appendix H: Data collection for Effect Size Analysis (Body weight)

Title	Intervention	Control	Duration	Control group	Intervention group	SD control baseline	SD int Baseline	SE Control post	SE int post	Cohen's D	Lower 95% C.I	Upper 95% C.I
Average ES										-0.2718	-0.7749	0.2311
Berrino, F. 2001 (reducing bioavi)	-4.06	-0.54	126	49	50	avg	avg	2.95	3.3	-0.1596	-0.5552	0.235
Berrino, F. 2002 (trials on diet)	-3.5	-0.8	91.25	52	58	avg	avg	2.95	3.3	-0.1155	-0.4901	0.2591
Greenlee, H. 2016	-2.6	-1.5	365	29	29	SD 16.1	SD 17.2	2.95	3.3	-0.0652	-0.58	0.4497
Lee, K. 2017	-1.1	0.3	10	14	16	SD 9.1	SD 8.5	2.43	2.1	-0.1603	-0.8787	0.5581
Vilarini, A. 2012.	-2.9	-0.1	494	47	47	SE 1.91	SE 1.72	1.98	1.73	-0.2191	-0.6246	0.1864
Alpaugh, R. 2020	-7.34	-4.49	182.5	21	25	SD 5.7	SD 5.8	0.67	0.63	-0.9113	-1.5206	-0.302

Appendix H: Data collection for Effect Size Analysis (Waist circumference)

Title	Intervention	Control	Duration	Control group	Intervention group	SD control baseline	SD int Baseline	SE Control post	SE int post	D	Lower 95% C.I	Upper 95% C.I
Average ES										-0.1557	-0.6007	0.2393
Berrino, F. 2001 (reducing bioavi)	-3.88	-0.49	126	49	50	avg	avg	2.55	2.59	-0.1878	-0.5827	0.207
Berrino, F. 2002 (trials on diet)	-2.6	-0.4	91.25	52	58	avg	avg	2.55	2.59	-0.1152	-0.4898	0.2594
Greenlee, H 2016.	-0.5	0.3	365	26	23	SD 13.3	SD 14.2	2.55	2.59	-0.0629	-0.6241	0.4983
Janssen, L. 2018.	-1.9	-0.1	56	35	30	SE 2.3	SE 2.3	2.4	2.4	-0.1313	-0.6195	0.3568
Vilarini, A. 2012.	-3	-0.1	159.5625	47	47	SE 1.56	SE 1.52	1.58	1.43	-0.2812	-0.6875	-0.1251