Conclusion Statement: The DGAC concurs with the conclusions of the NEL Dietary Patterns Systematic Review Project and AHA/ACC *Guideline on Lifestyle Management to Reduce Cardiovascular Risk* that strong and consistent evidence demonstrates that dietary patterns associated with decreased risk of CVD are characterized by higher consumption of vegetables, fruits, whole grains, low-fat dairy, and seafood, and lower consumption of red and processed meat, and lower intakes of refined grains, and sugar-sweetened foods and beverages relative to less healthy patterns. Regular consumption of nuts and legumes and moderate consumption of alcohol also are shown to be components of a beneficial dietary pattern in most studies. Randomized dietary intervention studies have demonstrated that healthy dietary patterns exert clinically meaningful impact on cardiovascular risk factors, including blood lipids and blood pressure. Additionally, research that includes specific nutrients in their description of dietary patterns indicate that patterns that are lower in saturated fat, cholesterol, and sodium and richer in fiber, potassium, and unsaturated fats are beneficial for reducing cardiovascular disease risk.

DGAC Grade: Strong

Review of Evidence

The DGAC examined research compiled in the NEL Dietary Patterns Systematic Review Project,¹ which included 55 articles summarizing evidence from 52 prospective cohort studies and 7 RCTs, and the 2013 AHA/ACC *Guideline on Lifestyle Management to Reduce Cardiovascular Risk* and associated NHLBI Lifestyle Report,² which included primarily RCTs. The Committee drew additional evidence and effect size estimates from six published systematic reviews/meta-analyses published since 2008 that included one or more studies not covered in the NEL or NHLBI Lifestyle reports.³ In total, 142 articles were considered in these reports, of which 35 were included in two or more reviews. Little evidence on the contribution of dietary patterns to CVD risk factors in the pediatric populations was available, and that which was published was not systematically reviewed.

Most evidence examining hard disease endpoints comes from large, prospective cohort studies in adults using a-priori scores to rank individuals with respect to adherence to dietary patterns of interest. Though the observational design allows the necessary duration of follow-up to observe CVD endpoints, comparison across studies was difficult because of different methods for deriving scores and different versions of scores measuring adherence to the same dietary
In the Mediterranean dietary indices and the AHEI scores, moderate alcohol was included as a “positive” component (associated with potential benefits). Red and processed meats were “negative” (potentially detrimental) components in the Mediterranean scores, AHEI scores, and DASH. Certain scores also included sugars or sugar-sweetened beverages as negative components. Poultry was considered as a positive component in the original AHEI. Total high-fat dairy was a negative component in the Mediterranean diet scores, but dairy was a positive component when meeting recommended intakes for the HEI-2005, and low-fat dairy was positive in the DASH scores. As the NEL systematic review points out, several components of scores associated with decreased CVD risk recurred in multiple dietary patterns and were associated as part of scores and as individual components with reduced CVD risk. These included consumption of vegetables, fruits, whole grains, nuts, legumes, unsaturated fats, and fish.

The NHLBI Lifestyle Report summarized the evidence from two RCTs of the DASH dietary pattern and two trials testing DASH variations with differing levels of sodium or macronutrients. The diet provided to participants in standard DASH intervention trials was high in vegetables, fruits, low-fat dairy products, whole grains, poultry, fish, and nuts. It also was low in sweets, sugar-sweetened beverages, and reduced in (or lower in) red and processed meats. The DASH dietary pattern is high in fiber and potassium and low in sodium, saturated fat, total fat, and cholesterol. It is rich in potassium, magnesium, and calcium, as well as protein and fiber.

In contrast to the patterns described above, vegetarian diets were defined by what they excluded. Variations included: vegan (no meat, fish, eggs, or dairy); lacto-ovo vegetarian (includes eggs and dairy, but no fish or meat), and pesco vegetarian (includes fish, but no meat) diets. The content of these diets varied substantially, though they tended to emphasize plant based foods, especially fruits and vegetables, legumes, nuts, and whole grains.

**Dietary Patterns and Blood Pressure (BP)**

**DASH or DASH-style Dietary Patterns**

The NEL systematic review and AHA/ACC Lifestyle Guideline conclude that strong and consistent evidence from RCTs demonstrates that compared to a dietary pattern that is relatively high in saturated fat and sodium and low in vegetables and fruits, the DASH-style dietary pattern reduced BP by approximately 6/3 mmHg (systolic blood pressure/diastolic blood pressure) across subgroups defined by sex, race, age, and hypertension status. The DASH trial provided all food to participants for 8 weeks. Fat intake was relatively low at 26 percent of energy (7 percent each monounsaturated and saturated, 10 percent polyunsaturated), compared to 36 percent in the control group. Carbohydrates accounted for 57 percent of energy and protein for 18 percent. Sodium was stable at 3,000 mg/day and body weight did not change. Variations of the DASH diet also lowered blood pressure: in the OmniHeart Trial, compared to the standard DASH, replacing 10 percent of calories from carbohydrate with either the same calorie content of protein or with unsaturated fat (8 percent MUFA and 2 percent PUFA) lowered systolic BP by 1 mmHg. Among adults with BP 140–159/90–95 mmHg, these substitutions lowered systolic BP by 3 mmHg relative to standard DASH.\(^1\)^\(^2\)
Appendix E-2.26: Evidence Portfolio

Observational evidence summarized in the NEL report included one cohort showing that increased DASH score was associated with small, but decreased levels of systolic and diastolic BP over time,9 two others cohorts showed no relationship between DASH scores and risk of hypertension.10, 11

**Mediterranean-Style Dietary Patterns**
Several RCTs provide limited to moderate evidence on the benefits of a Mediterranean-style diet for reducing blood pressure. The AHA/ACC Lifestyle Guideline conclude that consuming a Mediterranean dietary pattern instead of a lower-fat dietary pattern had beneficial effects on blood pressure. The NHLBI Lifestyle Report reviewed two RCTs of free-living middle-aged or older adults (with type 2 diabetes or at least three CVD risk factors) in which a Mediterranean diet intervention reduced BP by 6–7/2–3 mmHg.12, 13 The report also reviewed one observational study of healthy younger adults. Higher adherence to a Mediterranean-style diet, as measured through a Mediterranean score, was associated with a decrease in BP of 2–3/1–2 mmHg.14

**Vegetarian Dietary Patterns**
Evidence for the blood pressure benefits of vegetarian dietary patterns is more limited, but moderately consistent trends appear to exist. A recent meta-analysis of seven RCTs found that consumption of vegetarian diets was associated with a reduction in mean systolic blood pressure (-4.8 mm Hg; 95% Cl = -6.6 to -3.1; p<0.01) and diastolic blood pressure (-2.2 mm Hg; 95% Cl = -3.5 to -1.0) compared with the consumption of omnivorous diets.8 The AHA/ACC Lifestyle Guideline did not find sufficient evidence to examine vegetarian dietary patterns, and the NEL systematic review summarized only three studies comparing blood pressure outcomes in lacto-ovo vegetarian diets versus non-vegetarian diets in which meat and fish were consumed. Of the two studies, one was a large prospective cohort that found no association with blood pressure,15 and the other was a RCT among individuals with hypertension that demonstrated a decrease in systolic blood pressure, but not diastolic blood pressure.16 The more recent EPIC-Oxford cohort found lower systolic, but not diastolic blood pressure compared to the findings of Crowe, 2013.17

**Other Dietary Patterns**
As summarized in the NEL systematic review, adherence to the 2005 Dietary Guidelines for Americans was related to lower blood pressure in one study of healthy young adults. Zamora et al reported 20-year findings from the CARDIA study including 4,381 Black and White young adults.18 Participants in the highest (vs. lowest) quartile of adherence to the 2005 Dietary Guidelines had significantly less increase in systolic and diastolic blood pressure over time.

**Dietary Patterns and Blood Lipids**

**DASH or DASH-style Dietary Patterns**
As reviewed in the NHLBI Lifestyle Report, RCTs of the DASH diet show favorable effects on low-density lipoprotein cholesterol (LDL-C) and total cholesterol: high-density lipoprotein cholesterol (total-C: HDL-C) ratio, and no effect on triglycerides (TG). Benefits were seen with a
variety of different macronutrient compositions, though they were enhanced when some carbohydrates in the standard DASH pattern were replaced with protein or unsaturated fat. In the standard DASH, when food was supplied to adults with a total cholesterol level of less than 260 mg/dL and LDL-C less than 160 mg/dL, and body weight was kept stable, the DASH dietary pattern compared to the control diet decreased LDL-C by 11 mg/dL, decreased HDL-C by 4 mg/dL, and had no effect on TG. The OmniHeart trial tested the DASH dietary pattern with different macronutrient compositions among adults with average baseline LDL-C 130 mg/dL, HDL-C 50 mg/dL, and TG 100 mg/dL. Modifying the DASH diet by replacing 10 percent of calories from carbohydrate with 10 percent of calories from protein decreased LDL-C by 3 mg/dL, decreased HDL-C by 1 mg/dL, and decreased TG by 16 mg/dL compared to the DASH dietary pattern. Replacing 10 percent of calories from carbohydrate with 10 percent of calories from unsaturated fat (8 percent MUFA and 2 percent PUFA) decreased LDL-C similarly, increased HDL-C by 1 mg/dL, and decreased TG by 10 mg/dL compared to the DASH dietary pattern.2

**Mediterranean-style Dietary Patterns**

As with blood pressure, few trials have evaluated the effects of Mediterranean dietary patterns on blood lipids. According to the AHA/ACC Lifestyle Guideline, consuming a Mediterranean-style diet (compared to minimal or no dietary advice) resulted in no consistent effect on plasma LDL-C, HDL-C, and TG. In part, this was due to substantial differences in dietary interventions conducted among free-living middle aged or older adults with or without CVD or at high risk for CVD.2 In the PREDIMED trial (reviewed in both the NHLBI Lifestyle and NEL reports), both treatment groups (Mediterranean diet + olive oil or + nuts) had favorable changes in HDL-C, total-C: HDL-C ratio and TG when compared to the control group, which received minimal advice to follow a lower-fat diet.12 One of the prospective cohort studies reviewed by the NEL showed each one-point increase in alternate Mediterranean diet score assessed in adolescence and early adulthood was associated with a -6.19 (-10.44, -1.55) mg/dL lower total cholesterol in adulthood but no significant effects on HDL-C.19 Of other observational cohorts reviewed, one reported adherence to a Mediterranean diet was associated with favorable changes in HDL-C and TG,20 and another found no associations between adherence to a Mediterranean diet and blood lipids.21

**Vegetarian Dietary Patterns**

The NEL systematic review included three articles on vegetarian patterns that measured blood pressure or blood lipids.15-17 One study reported decreased total-C15 and another reported decreased non-HDL-C in vegetarian versus non-vegetarian participants.17

**Other Dietary Patterns**

Of note, adherence to the 2005 Dietary Guidelines for Americans also was related to higher HDL-C levels in a cohort of Black and White young adults.18
Dietary Patterns and Cardiovascular Disease Outcomes

The NHLBI Lifestyle review did not include any trials examining the evidence of particular dietary patterns with CVD outcomes. Overall, the NEL systematic review found that individuals whose diets mirrored the dietary patterns of interest (typically compared with diets having lower scores) was associated with lower CVD incidence and mortality in 14 out of 17 studies. The studies were predominantly observational, but included some trial evidence, and they typically assessed dietary intakes through self-report. The effect sizes varied substantially, with the decrease in risk of CVD ranging from 22 to 59 percent for increased adherence to various Mediterranean-style dietary patterns and from 20 to 44 percent for increased adherence to a U.S. Dietary Guidelines-related pattern (e.g., HEI or AHEI and updates). The majority of studies that assessed coronary heart disease (CHD) incidence or mortality also reported a favorable association between adherence to a healthy dietary pattern and CHD risk. The lower CHD risk ranged from 29 to 61 percent for greater adherence to Mediterranean-style dietary patterns, from 24 to 31 percent for greater adherence to a U.S. Dietary Guidelines-related pattern, and from 14 to 27 percent for greater adherence to DASH. Similarly, the majority of studies assessing stroke incidence or mortality reported favorable associations, with the lower stroke risk ranging from 13 to 53 percent for greater adherence to a Mediterranean-style dietary pattern and from 14 to 60 percent for greater adherence to a U.S. Dietary Guidelines-related pattern.1

Mediterranean-style Dietary Patterns

To gather additional information on dietary patterns and CVD outcomes, the DGAC consulted two meta-analyses,4, 7 which included many of the same observational prospective cohort studies as one another and as the NEL systematic review. These meta-analyses each reported summary estimates across studies as a 10 percent reduction in risk of CVD (fatal or nonfatal clinical CVD event) per 2-increment increase in adherence to the Mediterranean-style diet. The NEL report also included results from the largest Mediterranean diet trial, PREDIMED, which found that a Mediterranean diet (plus extra virgin olive oil or nuts) had favorable effects in high-risk participants compared to the control group who were advised to reduce dietary fat intake. An approximately 30 percent decrease in risk of major CVD events (a composite endpoint including myocardial infarction, stroke, and deaths) was observed and the trial was stopped early for meeting benefit requirements.1, 22 According to food questionnaires measuring adherence to the assigned diet by the end of follow-up, the intervention groups had significantly increased consumption of fish and legumes and non-significant reductions in refined grains and red meat from baseline, in addition to increased intake of supplemental foods (olive oil or nuts depending on the intervention arm), compared to the control group.

DASH-style Dietary Patterns

A recent meta-analysis6 of six prospective cohort studies with CVD endpoints assessed DASH-style diet through the Fung et al. method,23 which assigns points based on population-specific quintiles of eight DASH dietary pattern components: fruits, vegetables, nuts and legumes, whole grains, low-fat dairy, sodium, red and processed meats, and sweetened beverages. This meta-analysis reported that greater adherence to a DASH-style diet significantly reduced CVD...
(Relative Risk [RR]=0.80; 95% CI = 0.74 to 0.86), CHD (RR=0.79; 95% CI = 0.71 to 0.88), and stroke (RR=0.81; 95% CI = 0.72 to 0.92). All of the studies meta-analyzed also were included the NEL’s evidence base for the DASH-style diet.

Vegetarian Dietary Patterns
The NEL systematic review concluded that evidence for the effects of vegetarian dietary patterns on cardiovascular endpoints is limited. Most of this evidence was from prospective cohort studies; four out of six studies suggested that a vegetarian dietary pattern was associated with reduced incidence of ischemic heart disease (IHD) or CVD mortality. A meta-analysis of seven studies related to CVD mortality and vegetarian diet³ (including two of the studies from the NEL systematic review) found that mortality from IHD was significantly lower in vegetarians than in non-vegetarians (RR=0.71; 95% CI = 0.56 to 0.87). The authors estimated a 16 percent lower mortality from circulatory diseases (RR=0.84; 95% CI = 0.54 to 1.14) and a 12 percent lower mortality from cerebrovascular disease (RR=0.88; 95% CI = 0.70 to 1.06) in vegetarians compared to non-vegetarians.

Table 1. Summary of existing reports, systematic reviews, and meta-analyses examining the relationship between dietary patterns and risk of cardiovascular disease

<table>
<thead>
<tr>
<th>Question/ Purpose</th>
<th>Dietary Patterns and Outcomes</th>
<th>Included Studies** (Number and Study Design)</th>
<th>Evidence/ Conclusion Statement from Existing Report/ SR/ MA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overarching Finding/ Recommendation:</td>
<td></td>
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<tr>
<td>Dietary patterns associated with decreased risk of cardiovascular disease were characterized by regular consumption of fruits, vegetables, whole grains, low-fat dairy and fish, and were low in red and processed meat and sugar-sweetened foods and drinks. Regular consumption of nuts and legumes and moderate consumption of alcohol were also shown to be beneficial in most studies. Additionally, research that included specific nutrients in their description of dietary patterns indicated that patterns that were low in saturated fat, cholesterol, and sodium and rich in fiber and potassium may be beneficial for reducing cardiovascular disease risk.</td>
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<tr>
<td>What is the relationship between adherence to dietary guidelines/ recommendations or specific dietary patterns, assessed using an index or score, and risk of cardiovascular disease?</td>
<td>Dietary pattern assessed using index/score methodology HTN, BP, TG, LDL-C, HDL-C, incidence of CVD, CVD-related death, MI, stroke</td>
<td>55 52 PCS (from 36 cohorts); 3 RCT</td>
<td>There is strong and consistent evidence that in healthy adults increased adherence to dietary patterns scoring high in fruits, vegetables, whole grains, nuts, legumes, unsaturated oils, low-fat dairy, poultry and fish; low in red and processed meat, high-fat dairy, and sugar-sweetened foods and drinks; and moderate in alcohol is associated with decreased risk of fatal and non-fatal cardiovascular diseases, including coronary heart disease and stroke. (Strong)</td>
</tr>
<tr>
<td>Are prevailing patterns of dietary intake in a population, assessed using cluster or factor analyses, related to the risk of cardiovascular disease?</td>
<td>Dietary pattern assessed using factor or cluster analysis HTN, BP, TG, LDL-C, HDL-C, incidence of CVD, CVD-related</td>
<td>22 22 PCS (from 18 cohorts)</td>
<td>Limited evidence from epidemiological studies indicates that dietary patterns, assessed using cluster or factor analysis, characterized by vegetables, fruits, whole grains, fish, and low-fat dairy products are associated with decreased risk of cardiovascular disease in adults. Evidence of a relationship between dietary patterns characterized by red and processed meat, sugar-sweetened foods and drinks, and fried foods and an increased risk of cardiovascular disease is limited and less consistent. (Limited)</td>
</tr>
<tr>
<td>What combinations of food intake, assessed using reduced rank regression, explain the most variation in risk of cardiovascular disease?</td>
<td>Dietary pattern assessed using reduced rank regression</td>
<td>4</td>
<td>Insufficient evidence, due to a small number of studies, was available to examine the relationship between dietary patterns derived using reduced rank regression and risk of cardiovascular disease. The disparate nature of the methods used made it difficult to compare results, and therefore, no conclusions were drawn. (Grade not Assignable)</td>
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<tr>
<td>What is the relationship between adherence to dietary guidelines/recommendations or specific dietary patterns, assessed using methods other than index/score, cluster or factor, or reduced rank regression analyses, and risk of cardiovascular disease?</td>
<td>Dietary pattern assessed using methodologies other than index, factor, cluster, or reduced rank regression analyses</td>
<td>20</td>
<td>There is strong and consistent evidence that consumption of a DASH diet results in reduced blood pressure in adults with above optimal blood pressure, up to and including stage 1 hypertension. A dietary pattern consistent with the DASH diet is rich in fruits, vegetables, low-fat dairy, fish, whole grains, fiber, potassium and other minerals at recommended levels, and low in red and processed meat, sugar-sweetened foods and drinks, saturated fat, cholesterol, and sodium. There is limited evidence that adherence to vegetarian diets is associated with decreased death from ischemic heart disease, with the association being stronger in men than in women. (Strong – DASH and BP; Limited – Vegetarian and IHD)</td>
</tr>
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</table>

**Lifestyle Interventions to Reduce Cardiovascular Risk: Systematic Evidence Review from the Lifestyle Work Group, (National Heart, Lung, and Blood Institute, 2013)**

**ACC/AHA Guideline on Lifestyle Management to Reduce Cardiovascular Risk (Eckel, 2013)**

**Overarching Finding/Recommendation:** Advise adults who would benefit from LDL-C or BP lowering to:
- Consume a dietary pattern that emphasizes intake of vegetables, fruits, and whole grains; includes low-fat dairy products, poultry, fish, legumes, non-tropical vegetable oils and nuts; and limits intake of sweets, sugar-sweetened beverages and red meats.
- Adapt this dietary pattern to appropriate calorie requirements, personal and cultural food preferences, and nutrition therapy for other medical conditions (including diabetes mellitus).
- Achieve this pattern by following plans such as the DASH dietary pattern, the USDA Food Pattern, or the AHA Diet.

<table>
<thead>
<tr>
<th>Among adults, what is the effect of dietary patterns and/or macronutrient composition on CVD risk factors, when compared to no treatment or to other types of interventions?</th>
<th>Mediterranean BP</th>
<th>4</th>
<th>Counseling to eat a Mediterranean-style dietary pattern compared to minimal advice to consume a low-fat dietary pattern, in free-living middle-aged or older adults (with type 2 DM or at least three CVD risk factors) decreased BP by 6–7/2–3 mmHg. In an observational study of healthy younger adults, adherence to a Mediterranean-style dietary pattern was associated with decreased BP 2–3/1–2 mmHg. (Low)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mediterranean Lipids</td>
<td>1 PCS; 3 RCT</td>
<td>Counseling to eat a Mediterranean-style dietary pattern compared to minimal or no dietary advice, in free-living middle aged or older adults (with or without CVD or at high risk for CVD) resulted in no consistent effect on plasma LDL-C, HDL-C, and TG; in part due to substantial differences and limitations in the studies. (Low)</td>
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<tr>
<td>DASH BP</td>
<td>6 citations</td>
<td>When all food was supplied to adults with blood pressure 120–159/80–95 mmHg and both body weight and sodium intake were kept stable, the DASH dietary pattern, when compared to a typical American diet of the 1990s, decreased BP 5–6/3 mmHg. (High)</td>
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<tr>
<td>DASH</td>
<td>2 RCT</td>
<td>When food was supplied to adults with a total cholesterol level &lt;260 mg/dL, LDL-C &lt;160 mg/dL, and body weight was</td>
<td></td>
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<tr>
<td>Lipids</td>
<td>kept stable, the DASH dietary pattern, when compared to a typical American diet of the 1990s, decreased LDL-C by 11 mg/dL, decreased HDL-C by 4 mg/dL, and no effect on TG. (High)</td>
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<tr>
<td>DASH BP in subpopulations</td>
<td>When food was supplied to adults with BP 120–159/80–95 mmHg and body weight was kept stable, the DASH dietary pattern, when compared with the typical American diet of the 1990s, decreased BP in women and men, African American and non-African Americans, older and younger adults, and hypertensive and non-hypertensive adults. (High)</td>
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<tr>
<td>DASH Lipids in subpopulations</td>
<td>When all food was supplied to adults with a total cholesterol level &lt;260 mg/dL, LDL-C &lt;160 mg/dL, and body weight was kept stable, the DASH dietary pattern, as compared to a typical American diet of the 1990s, decreased LDL-C and decreased HDL-C similarly in subgroups: African American and non-African American, and hypertensive and non-hypertensive. (Low)</td>
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<tr>
<td>DASH variation BP 1</td>
<td>In adults with BP of 120–159/80–95 mmHg, modifying the DASH dietary pattern by replacing 10% of calories from CHO with the same amount of either protein or unsaturated fat (8% MUFA and 2% PUFA) lowered systolic BP by 1 mmHg compared to the DASH dietary pattern. Among adults with BP 140–159/90–95 mmHg, these replacements lowered systolic BP by 3 mmHg relative to DASH. (Moderate)</td>
<td></td>
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<tr>
<td>DASH variation Lipids</td>
<td>In adults with average baseline LDL-C 130 mg/dL, HDL-C 50 mg/dL, and TG 100 mg/dL, modifying the DASH dietary pattern by replacing 10% of calories from CHO with 10% of calories from protein decreased LDL-C by 3 mg/dL, decreased HDL-C by 1 mg/dL, and decreased TG by 16 mg/dL compared to the DASH dietary pattern. Replacing 10% of calories from CHO with 10% of calories from unsaturated fat (8% MUFA and 2% PUFA) decreased LDL-C similarly, increased HDL-C by 1 mg/dL, and decreased TG by 10 mg/dL compared to the DASH dietary pattern. (Moderate)</td>
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</tbody>
</table>

**Sofi, 2013**

<table>
<thead>
<tr>
<th>To investigate the association between the Mediterranean diet and risk and incidence of CVD Meta-analysis</th>
<th>Mediterranean Mortality from and/or incidence of cardio- and cerebrovascular diseases</th>
<th>14</th>
<th>A 2-point increase of adherence to the Mediterranean diet was associated with a reduced risk of mortality and incidence of CVD (RR=0.90; 95% CI: 0.87 to 0.92; P&lt;0.0001).</th>
</tr>
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<tbody>
<tr>
<td><strong>Martinez-Gonzalez, 2014</strong></td>
<td></td>
<td>14 PCS</td>
<td>Each 2-point increment in a 0–9 Mediterranean diet score was associated with a 10% relative reduction in the risk of CVD (RR=0.90; 95% CI: 0.86 to 0.94).</td>
</tr>
<tr>
<td>Study</td>
<td>Objective</td>
<td>Intervention</td>
<td>Study Design</td>
</tr>
<tr>
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<tr>
<td><strong>Rees, 2013</strong></td>
<td>To determine the effectiveness of dietary advice to follow a Mediterranean-style dietary pattern or the provision of foods relevant to the Mediterranean diet for the primary prevention of CVD</td>
<td>Mediterranean Cardiovascular mortality, non-fat endpoints (e.g., MI stroke), change in blood lipids and blood pressure</td>
<td>Systematic review and meta-analysis</td>
</tr>
<tr>
<td><strong>Salehi-Abargouei, 2013</strong></td>
<td>To summarize and if possible quantify the longitudinal effects of a DASH-style diet on the incidence of CVDs</td>
<td>DASH-style Fatal or nonfatal CVDs, including CHD and stroke</td>
<td>Meta-analysis</td>
</tr>
<tr>
<td><strong>Huang, 2012</strong></td>
<td>To investigate cardiovascular disease mortality among vegetarians and non-vegetarians</td>
<td>Vegetarian (lacto-ovo and vegan) Non-vegetarian Mortality from ischemic heart disease, circulatory diseases and cerebrovascular disease</td>
<td>Meta-analysis</td>
</tr>
<tr>
<td><strong>Yokoyama, 2014</strong></td>
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</tbody>
</table>
To conduct a systematic review and meta-analysis of controlled clinical trials and observational studies that have examined the association between vegetarian diets and BP

| Vegetarian Systolic and diastolic BP | 7 RCT | Consumption of vegetarian diets was associated with a reduction in mean systolic blood pressure (-4.8 mm Hg; 95% Cl: -6.6 to -3.1; *P*<0.01) and diastolic blood pressure (-2.2 mm Hg; 95% Cl: -3.5 to -1.0) compared with the consumption of omnivorous diets.

* A measurement tool for the ‘assessment of multiple systematic reviews’ (AMSTAR)

** Reference overlap: Of the 142 articles included in total across the reviews, 35 were included in two or more reviews. The greatest crossover was between Sofi and Martinez-Gonzalez, which included 12 of the same articles in meta-analyses (of 14 and 13 studies, respectively).

### References Included in Review


Additional References


Associated Guideline
Supplementary Information:
(Note: The search and update for the dietary patterns and CVD, body weight, and type 2 diabetes reviews were done simultaneously and are described together below.)

Analytical Framework

Methodology

The questions examining dietary patterns and risk of CVD, obesity, and type 2 diabetes were answered using existing reports, systematic reviews, and meta-analyses. All three of these questions were addressed in the Nutrition Evidence Library (NEL) Dietary Patterns Systematic Review Project. This project was supported by USDA’s Center for Nutrition Policy and Promotion and was informed by a Technical Expert Collaborative of experts in dietary patterns research. Additionally, the DGAC reviewed reports from systematic reviews recently conducted by the National Heart, Lung, and Blood Institute (NHLBI) that included dietary patterns research. For CVD, the DGAC used the NHLBI Lifestyle Interventions to Reduce Cardiovascular Risk: Systematic Evidence Review from the Lifestyle Work Group and the associated American Heart Association (AHA)/American College of Cardiology (ACC) Guideline on Lifestyle Management to Reduce Cardiovascular Risk. For body weight, the DGAC used the NHLBI Managing Overweight and Obesity in Adults: Systematic Evidence Review from the Obesity Expert Panel and the associated AHA/ACC/The Obesity Society (TOS) Guideline for the Management of Overweight and Obesity in Adults. For all three questions, in an attempt to capture new research published since the searches for these systematic reviews were completed, the Committee considered existing systematic reviews and meta-analyses published in peer-reviewed journals since 2008. The existing systematic reviews and meta-analyses considered...
by the DGAC had to meet the general inclusion criteria of the DGAC, and were required to consider dietary patterns and the outcomes of interest.

**Search Strategy for Existing Systematic Reviews/Meta-Analyses**

(“diet quality” OR dietary pattern* OR diet pattern* OR eating pattern* OR food pattern* OR eating habit* OR dietary habit* OR food habit* OR dietary profile* OR food profile* OR diet profile* OR eating profile* OR dietary guideline* OR dietary recommendation* OR food intake pattern* OR dietary intake pattern* OR diet pattern* OR eating style*) OR

(DASH OR (dietary approaches to stop hypertension) OR "Diet, Mediterranean"[Mesh] OR vegan* OR vegetarian* OR "Diet, Vegetarian"[Mesh] OR “prudent diet” OR “western diet” OR nordiet OR omniheart OR (Optimal Macronutrient Intake Trial to Prevent Heart Disease) OR ((Okinawa* OR "Ethnic Groups"[Mesh] OR “plant based” OR Mediterranean[tiab]OR Nordic) AND (diet[mh] OR diet[tiab] OR food[mh]))) OR

(“Guideline Adherence”[Mesh] AND (diet OR food OR eating OR eat OR dietary OR feeding OR nutrition OR nutrient*)) OR (adherence AND (nutrient* OR nutrition OR diet OR dietary OR food OR eat OR eating) AND (guideline* OR guidance OR recommendation*)) OR

(dietary score* OR adequacy index* OR kidmed OR Diet Quality Index* OR Food Score* OR Diet Score* OR MedDietScore OR Dietary Pattern Score* OR “healthy eating index”) OR


**Body weight:**


**CVD:**


T2D:

AND limit to: systematic[sb] OR systematic review* OR meta-analys* OR meta analy*

**Inclusion Criteria**

**Date Range:**
- Published between January 2008 and April 2014 (in English in a peer-reviewed journal)

**Study Design:**
- Systematic review and/or meta-analysis that included randomized controlled trials and/or prospective cohort studies

**Study Subjects:**
- Reviews that included studies from high or very high human development (2012 Human Development Index)
- Healthy or at elevated chronic disease risk

**Intervention/Exposure:**
- Dietary pattern - The quantities, proportions, variety, or combination of different foods, drinks, and nutrients (when available) in diets, and the frequency with which they are habitually consumed.

**Outcome:**
- CVD: LDL-cholesterol, HDL-cholesterol, triglycerides, blood pressure, incidence of CVD, CVD-related death, myocardial infarction, or stroke
- Body weight: Body mass index, body weight, percent body fat, waist circumference, incidence of overweight or obesity
- Type 2 diabetes: Glucose intolerance, insulin resistance, or incidence of type 2 diabetes

**Quality:**
- Reviews rated 8-11 on AMSTAR (A measurement tool for the 'assessment of multiple systematic reviews')
Search Results

Excluded Articles with Reason for Exclusion


27. Aljadani H., Patterson A., Sibbritt D., Collins C. The association between dietary patterns and weight change in adults over time: A systematic review of studies with follow up. JBI Database of Systematic Reviews and Implementation Reports 2013 11:8 (272-316) EXCLUDE: Did not examine dietary patterns as defined by the Subcommittee

28. Al-Khudairy L, Stranges S, Kumar S, Al-Daghri N, Rees K. Dietary factors and type 2 diabetes in the Middle East: what is the evidence for an association?–a systematic review. Nutrients. 2013 Sep 26;5(10):3871-97. doi: 10.3390/nu5103871. PubMed PMID: 24077241; PubMed Central PMCID: PMC3820049. EXCLUDE: Not all countries in the Middle East are of high or very high development according to the Human Development Index


33. Defagó M., Elorriaga N., Irazola V., Rubinstein A. *Association between food patterns and biomarkers of endothelial function: A systematic review*. Annals of Nutrition and Metabolism 2013 63 SUPPL. 1 (1282) EXCLUDE: Outcomes were biomarkers of endothelial function, which were not included as intermediate outcomes in the Subcommittee’s analytical framework


not included in the Subcommittee’s analytical framework, including incidence of metabolic syndrome, CRP, IL-6, liver transaminases, etc.


review was to describe indices being used with children and adolescents – only brief mention of body weight and no conclusions drawn.


49. McEvoy C., Cardwell C., Woodside J., Young I., Hunter S., McKinley M. A systematic review and meta-analysis examining 'a posteriori' dietary patterns and risk of type 2 diabetes. Annals of Nutrition and Metabolism 2013 63 SUPPL. 1 (864) EXCLUDE: Abstract, not a full article


10.2337/dc11-2216. Review. PubMed PMID: 22275443; PubMed Central PMCID: PMC3263899. EXCLUDE: Only included studies with people with type 2 diabetes
