Struijk et al. Diet quality and risk of frailty among older women in the Nurses´ Health Study

Online supplementary material

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Supplemental methods: Components and scoring of the dietary quality scores

The adherence to three diet quality scores were calculated the alternate Mediterranean diet (aMED), the Dietary Approaches to Stop Hypertension (DASH) diet and the alternate Healthy Eating Index-2010 (AHEI-2010) (**Supplemental table 1**). The aMED score measured adherence to a Mediterranean-style diet [1]. This score rewarded 1 point if the intake was above the cohort-specific median for vegetables, fruit, nuts, whole-grains, legumes, fish, and monounsaturated/saturated fat ratio and 1 point for intakes below the cohort-specific median for red and processed meats. Alcohol intake between 5 and 15 g/d received 1 point. Therefore, a higher score corresponds to a higher adherence to the Mediterranean diet, with a final range from 0 to 9 (highest adherence) points. The DASH score was based on food and nutrients emphasized in the DASH diet [2]. In this score, 1 to 5 points were assigned based on quintiles of intake in servings per day of fruits, vegetables, nuts and legumes, low-fat dairy products, and whole grains. Scoring was inverse for sodium, sugar-sweetened beverages and red and processed meat, with more points for lower consumption. The total score ranged from 8 to 40 (highest adherence) points. The AHEI-2010 was based on a comprehensive review of foods and nutrients that had consistently been associated with lower risk of chronic disease in clinical and epidemiologic investigations [3]. The score emphasized higher intake of vegetables, fruit, whole grains, nuts and legumes, long-chain n-3 fats, polyunsaturated fatty acids (PUFAs), and lower intake of sugar-sweetened beverages and fruit juices, red and processed meat, *trans* fat, sodium and alcohol. All components were scored from 0 to 10, and the total score ranged from 0 to 110 points (highest adherence). To best represent long-term diet during follow-up and to account for changes in food consumption, we used the cumulative average of the diet quality scores from all available dietary questionnaires from baseline through frailty onset or the end of follow-up.

References

1. Fung TT, Hu FB, McCulloguh ML, Newby PK, Willett WC, Holmes ME. Diet quality is associated with the risk of estrogen receptor-negative breast cancer in postmenopausal women. J Nutr 2006;136:466-472.
2. Fung TT, Chiuve SE, McCullough ML, Rexrode KM, Logroscino G, Hu FB. Adherence to a dash-style diet and risk of coronary heart disease and stroke in women. Arch Intern Med 2008;168:713-720.
3. Chiuve SE, Fung TT, Rimm EB, et al. Alternative dietary indices both strongly predict risk of chronic disease. J Nutr 2012;142:1009-1018.

Supplemental table 1. Components and scoring of the aMED, DASH, and AHEI-2010 diet quality scores.

Component	Minimum score	Maximum score
aMED	0	1
1. Vegetables	Below the median	Above the median
2. Fruits	Below the median	Above the median
3. Nuts	Below the median	Above the median
4. Whole grains	Below the median	Above the median
5. Legumes	Below the median	Above the median
6. Fish	Below the median	Above the median
7. Monounsaturated/saturated fat ratio	Below the median	Above the median
8. Red and processed meats	Above the median	Below the median
9. Alcohol	5 > alcohol > 15 g/d	5 ≤ alcohol ≤ 15 g/d
Total	0	9
DASH[1]	1	5
1. Fruits	Quintile 1	Quintile 5
2. Vegetables	Quintile 1	Quintile 5
3. Nuts and legumes	Quintile 1	Quintile 5
4. Low-fat dairy	Quintile 1	Quintile 5
5. Whole grains	Quintile 1	Quintile 5
6. Sodium	Quintile 5	Quintile 1
7. Sugar-sweetened beverages	Quintile 5	Quintile 1
8. Red and processed meats	Quintile 5	Quintile 1
Total	8	40
AHEI-2010[1]	0	10
1. Vegetables	0 serving/d	≥5 servings/d
2. Fruit	0 serving/d	≥4 servings/d
3. Whole grains	0 g/d	≥90 g/d (m) ≥75 g/d (w)
4. Nuts and legumes	0 serving/d	≥1 serving/d
5. Long-chain n-3 fats	0 mg/d	≥250 mg/d
6. Polyunsaturated fatty acids	≤2 % energy/d	≥10 % energy/d
7. Sugar-sweetened beverages and fruit juice	≥1 serving/d	0 servings/d
8. Red and processed meats	≥1.5 serving/d	0 servings/d
9. Trans fat	≥4 % energy/d	≤0.5 % energy/d
10. Sodium	Highest decile	Lowest decile
11. Alcohol	≥3.5 drinks/d (men) ≥2.5 drinks/d (women)	0.5-2.0 drinks/d (men) 0.5-1.5 drinks/d (women)
Total	0	110

AHEI-2010, alternate Healthy Eating Index-2010; AMED, alternate Mediterranean diet; DASH, Dietary Approaches to Stop Hypertension

[1]Intakes between the minimum and maximum levels are scored proportionately.

Supplemental table 2. Relative risks (95% confidence interval) of frailty according to quartiles of the diet quality scores among women ≥60y who were robust (0 frailty criteria) at baseline in the Nurses' Health Study.

	Q1	Q2	Q3	Q4	P for trend	RR (95%CI) for 1 SD increase in the diet score[4]
aMED						
Participants, n	13,191	16,646	12,887	15,040		57,764
Person-yr	191,177	219,123	209,057	230,554		855,910
Frailty cases	2336	2197	1866	1538		7937
Age-adjusted	Reference	0.86 (0.81, 0.91)	0.73 (0.68, 0.77)	0.57 (0.53, 0.60)	<0.001	0.74 (0.72, 0.76)
Multivariable model[1]	Reference	0.87 (0.82, 0.92)	0.75 (0.70, 0.79)	0.59 (0.55, 0.63)	<0.001	0.76 (0.73, 0.78)
Multivariable model[2]	Reference	0.86 (0.81, 0.91)	0.73 (0.68, 0.77)	0.58 (0.54, 0.62)	<0.001	0.75 (0.72, 0.77)
Multivariable model[3]	Reference	0.96 (0.90, 1.02)	0.89 (0.84, 0.95)	0.81 (0.75, 0.87)	<0.001	0.89 (0.86, 0.92)
DASH						
Participants, n	15,461	16,238	13,480	12,585		57,764
Person-yr	199,865	222,959	212,465	220,622		855,910
Frailty cases	2123	2090	1956	1768		7937
Age-adjusted	Reference	0.82 (0.77, 0.87)	0.73 (0.68, 0.77)	0.59 (0.55, 0.62)	<0.001	0.81 (0.79, 0.83)
Multivariable model[1]	Reference	0.84 (0.79, 0.89)	0.75 (0.71, 0.80)	0.63 (0.59, 0.68)	<0.001	0.83 (0.81, 0.85)
Multivariable model[2]	Reference	0.83 (0.78, 0.88)	0.73 (0.69, 0.78)	0.61 (0.57, 0.65)	<0.001	0.82 (0.80, 0.84)
Multivariable model[3]	Reference	0.93 (0.87, 0.99)	0.90 (0.85, 0.96)	0.84 (0.79, 0.90)	<0.001	0.94 (0.91, 0.96)
AHEI-2010						
Participants, n	14,784	14,425	14,389	14,166		57,764
Person-yr	203,241	211,401	217,278	223,990		855,910
Frailty cases	2338	2123	1938	1538		7937
Age-adjusted	Reference	0.84 (0.79, 0.89)	0.74 (0.70, 0.79)	0.56 (0.53, 0.60)	<0.001	0.79 (0.77, 0.81)
Multivariable model[1]	Reference	0.84 (0.79, 0.89)	0.75 (0.71, 0.80)	0.60 (0.56, 0.64)	<0.001	0.81 (0.79, 0.83)
Multivariable model[2]	Reference	0.83 (0.78, 0.88)	0.74 (0.70, 0.79)	0.59 (0.56, 0.63)	<0.001	0.81 (0.79, 0.83)
Multivariable model[3]	Reference	0.92 (0.87, 0.98)	0.89 (0.84, 0.95)	0.80 (0.75, 0.86)	<0.001	0.92 (0.89, 0.94)

AHEI-2010, alternate Healthy Eating Index-2010; AMED, alternate Mediterranean diet; DASH, Dietary Approaches to Stop Hypertension

[1] Adjusted for: age (1 year increment), body mass index (<25.0, 25.0-29.9, ≥30.0 kg/m^2), smoking status (never, past, and current 1-14, 15-24, and ≥25 cigarettes/day), and energy intake (quintiles of kcal/d).The DASH score is additionally adjusted for alcohol intake (0, 1.0-4.9, 5.0-14.9, ≥15.0 g/d).

[2] Additionally adjusted for medication use (aspirin, postmenopausal hormone replacement therapy, diuretics, β-blockers, calcium channel blockers, ACE inhibitors, other blood pressure medication, statins and other cholesterol lowering drugs, insulin, oral hypoglycemic medication).

[3] Additionally adjusted for leisure time physical activity (quintiles of METs h/wk).

[4] Standard deviations (SD) of the diet scores: aMED score SD was 2, DASH score SD was 4, AHEI-2010 score SD was 10.

Supplemental table 3. Relative risks (95% confidence interval) of frailty according to components of the aMED score among women ≥60y in the Nurses' Health Study (n=71,941).

aMED components	0	1
Vegetables		
Multivariable model[1]	Reference	0.88 (0.84, 0.91)
Multivariable model[2]	Reference	0.97 (0.93, 1.02)
Fruits		
Multivariable model[1]	Reference	0.90 (0.86, 0.93)
Multivariable model[2]	Reference	0.97 (0.94, 1.02)
Nuts		
Multivariable model[1]	Reference	0.92 (0.88, 0.96)
Multivariable model[2]	Reference	0.96 (0.92, 0.99)
Whole grains		
Multivariable model[1]	Reference	0.90 (0.87, 0.94)
Multivariable model[2]	Reference	0.98 (0.94, 1.02)
Legumes		
Multivariable model[1]	Reference	1.03 (0.99, 1.07)
Multivariable model[2]	Reference	1.05 (1.00, 1.09)
Fish		
Multivariable model[1]	Reference	0.92 (0.88, 0.96)
Multivariable model[2]	Reference	0.97 (0.93, 1.01)
Monounsaturated/saturated fat ratio		
Multivariable model[1]	Reference	0.92 (0.88, 0.96)
Multivariable model[2]	Reference	0.95 (0.91, 0.99)
Red and processed meats		
Multivariable model[1]	Reference	0.86 (0.83, 0.89)
Multivariable model[2]	Reference	0.92 (0.88, 0.95)
Alcohol		
Multivariable model[1]	Reference	0.76 (0.72, 0.80)
Multivariable model[2]	Reference	0.80 (0.76, 0.85)

AMED, alternate Mediterranean diet

[1] Adjusted for: age (1year increment), body mass index (<25.0, 25.0-29.9, ≥30.0 kg/m^2), smoking status (never, past, and current 1-14, 15-24, and ≥25 cigarettes/day), energy intake (quintiles of kcal/d), and medication use (aspirin, postmenopausal hormone replacement therapy, diuretics, β-blockers, calcium channel blockers, ACE inhibitors, other blood pressure medication, statins and other cholesterol lowering drugs, insulin, oral hypoglycemic medication). All components are mutually adjusted for each other.

[2] Additionally adjusted for leisure time physical activity (quintiles of METs h/wk).

Supplemental table 4. Relative risks (95% confidence interval) of frailty according to components of the DASH score among women ≥60y in the Nurses' Health Study (n=71,941).

DASH components	Per 1 point increment[3]
Fruits	
Multivariable model[1]	0.94 (0.92, 0.96)
Multivariable model[2]	0.98 (0.96, 1.00)
Vegetables	
Multivariable model[1]	0.92 (0.90, 0.94)
Multivariable model[2]	0.97 (0.95, 0.99)
Nuts and legumes	
Multivariable model[1]	0.97 (0.95, 0.99)
Multivariable model[2]	0.99 (0.97, 1.01)
Low-fat dairy	
Multivariable model[1]	0.99 (0.97, 1.01)
Multivariable model[2]	1.01 (0.99, 1.03)
Whole grains	
Multivariable model[1]	0.92 (0.90, 0.94)
Multivariable model[2]	0.96 (0.94, 0.98)
Sodium	
Multivariable model[1]	0.92 (0.90, 0.95)
Multivariable model[2]	0.95 (0.92, 0.97)
Sugar-sweetened beverages	
Multivariable model[1]	1.02 (1.00, 1.04)
Multivariable model[2]	1.03 (1.01, 1.05)
Red and processed meats	
Multivariable model[1]	0.93 (0.91, 0.95)
Multivariable model[2]	0.96 (0.94, 0.97)

DASH, Dietary Approaches to Stop Hypertension

[1] Adjusted for: age (1 year increment), body mass index (<25.0, 25.0-29.9, ≥30.0 kg/m^2), smoking status (never, past, and current 1-14, 15-24, and ≥25 cigarettes/day), energy intake (quintiles of kcal/d), alcohol intake (0, 1.0-4.9, 5.0-14.9, ≥15.0 g/d) and medication use (aspirin, postmenopausal hormone replacement therapy, diuretics, β-blockers, calcium channel blockers, ACE inhibitors, other blood pressure medication, statins and other cholesterol lowering drugs, insulin, oral hypoglycemic medication). All components are mutually adjusted for each other.

[2] Additionally adjusted for leisure time physical activity (quintiles of METs h/wk).

[3] An increase in points represents a lower intake for the unhealthy components sodium, sugar-sweetened beverages and red and processed meat.

Supplemental table 5. Relative risks (95% confidence interval) of frailty according to components of the alternate AHEI-2010 score among women ≥60y in the Nurses' Health Study (n=71,941).

AHEI-2010 components	Per 2 points increment[3]
Vegetables	
Multivariable model[1]	0.91 (0.89, 0.93)
Multivariable model[2]	0.96 (0.93, 0.98)
Fruits	
Multivariable model[1]	0.96 (0.94, 0.98)
Multivariable model[2]	1.01 (0.98, 1.03)
Whole grains	
Multivariable model[1]	0.93 (0.91, 0.96)
Multivariable model[2]	0.99 (0.96, 1.01)
Nuts and legumes	
Multivariable model[1]	0.95 (0.93, 0.96)
Multivariable model[2]	0.98 (0.96, 1.00)
Long chain n3 fats (EPA+DHA)	
Multivariable model[1]	0.97 (0.95, 0.98)
Multivariable model[2]	0.99 (0.97, 1.01)
Polyunsaturated fat	
Multivariable model[1]	0.97 (0.94, 1.01)
Multivariable model[2]	0.96 (0.93, 0.99)
Sugar-sweetened beverages and fruit juice	
Multivariable model[1]	1.02 (1.01, 1.04)
Multivariable model[2]	1.02 (1.01, 1.03)
Red and processed meats	
Multivariable model[1]	0.98 (0.97, 1.00)
Multivariable model[2]	0.99 (0.98, 1.01)
***Trans* fat**	
Multivariable model[1]	0.96 (0.91, 1.01)
Multivariable model[2]	0.98 (0.93, 1.03)
Sodium	
Multivariable model[1]	0.92 (0.90, 0.94)
Multivariable model[2]	0.93 (0.91, 0.95)
Alcohol	
Multivariable model[1]	0.87 (0.86, 0.89)
Multivariable model[2]	0.90 (0.88, 0.91)

AHEI-2010, alternate Healthy Eating Index-2010

[1] Adjusted for: age (1 year increment), body mass index (<25.0, 25.0-29.9, ≥30.0 kg/m^2), smoking status (never, past, and current 1-14, 15-24, and ≥25 cigarettes/day), energy intake (quintiles of kcal/d) and medication use (aspirin, postmenopausal hormone replacement therapy, diuretics, β-blockers, calcium channel blockers, ACE inhibitors, other blood pressure medication, statins and other cholesterol lowering drugs, insulin, oral hypoglycemic medication). All components are mutually adjusted for each other.

[2] Additionally adjusted for leisure time physical activity (quintiles of METs h/wk).

[3] An increase in points represents a lower intake for the unhealthy components red and processed meat, sugar-sweetened beverages and fruit juice, *trans* fat, sodium and alcohol.

Supplemental table 6. Relative risks (95% confidence interval) of frailty according to quartiles of the diet quality scores without the alcohol component among women ≥60y in the Nurses' Health Study.

	Q1	Q2	Q3	Q4	P for trend	RR (95%CI) for 1 SD increase in the diet score[4]
aMED						
Participants, n	18,783	20,624	15,959	16,575		71,941
Person-yr	268,066	257,103	254,836	260,920		1,040,924
Frailty cases	3746	2966	2628	2224		11,564
Age-adjusted	Reference	0.86 (0.82, 0.90)	0.73 (0.70, 0.77)	0.58 (0.55, 0.61)	<0.001	0.75 (0.73, 0.76)
Multivariable model[1]	Reference	0.88 (0.84, 0.92)	0.76 (0.72, 0.80)	0.62 (0.59, 0.66)	<0.001	0.77 (0.75, 0.79)
Multivariable model[2]	Reference	0.86 (0.82, 0.90)	0.73 (0.70, 0.77)	0.60 (0.56, 0.63)	<0.001	0.75 (0.73, 0.77)
Multivariable model[3]	Reference	0.96 (0.91, 1.01)	0.89 (0.85, 0.94)	0.83 (0.78, 0.88)	<0.001	0.90 (0.87, 0.92)
AHEI-2010						
Participants, n	19,579	18,204	17,553	16,605		71,941
Person-yr	258,214	259,878	260,834	262,000		1,040,924
Frailty cases	3455	3047	2750	2312		11,564
Age-adjusted	Reference	0.84 (0.80, 0.88)	0.74 (0.70, 0.77)	0.60 (0.57, 0.63)	<0.001	0.80 (0.78, 0.82)
Multivariable model[1]	Reference	0.86 (0.81, 0.90)	0.77 (0.73, 0.81)	0.65 (0.62, 0.69)	<0.001	0.83 (0.81, 0.85)
Multivariable model[2]	Reference	0.84 (0.80, 0.88)	0.76 (0.72, 0.79)	0.64 (0.61, 0.67)	<0.001	0.82 (0.80, 0.84)
Multivariable model[3]	Reference	0.94 (0.89, 0.98)	0.90 (0.85, 0.95)	0.86 (0.81, 0.91)	<0.001	0.93 (0.91, 0.96)

AHEI-2010, alternate Healthy Eating Index-2010; AMED, alternate Mediterranean diet; DASH, Dietary Approaches to Stop Hypertension

[1] Adjusted for: age (1year increment), body mass index (<25.0, 25.0-29.9, ≥30.0 kg/m^2), smoking status (never, past, and current 1-14, 15-24, and ≥25 cigarettes/day), and energy intake (quintiles of kcal/d). All scores are additionally adjusted for alcohol intake (0, 1.0-4.9, 5.0-14.9, ≥15.0 g/d).

[2]Additionally adjusted for medication use (aspirin, postmenopausal hormone replacement therapy, diuretics, β-blockers, calcium channel blockers, ACE inhibitors, other blood pressure medication, statins and other cholesterol lowering drugs, insulin, oral hypoglycemic medication).

[3] Additionally adjusted for leisure time physical activity (quintiles of METs h/wk).

[4]Standard deviations (SD) of the diet scores: aMED score SD was 2, DASH score SD was 4, AHEI-2010 score SD was 10.

Supplemental table 7. Relative risks (95% confidence interval) of frailty according to quartiles of the aMED score among women ≥60y in the Nurses' Health Study; lagged analysis.

	Q1	Q2	Q3	Q4	P for trend	RR (95%CI) for 1 SD increase in the diet score[4]
Lagged 6 years						
Person-yr	262,995	256,622	255,236	266,071		1,040,924
Frailty cases	3283	3086	2777	2418		11,564
Age-adjusted	Reference	0.87 (0.83, 0.91)	0.75 (0.72, 0.79)	0.61 (0.58, 0.64)	<0.001	0.75 (0.73, 0.77)
Multivariable model[1]	Reference	0.87 (0.83, 0.92)	0.77 (0.73, 0.81)	0.64 (0.60, 0.67)	<0.001	0.77 (0.75, 0.79)
Multivariable model[2]	Reference	0.86 (0.82, 0.91)	0.75 (0.72, 0.79)	0.63 (0.59, 0.66)	<0.001	0.76 (0.74, 0.78)
Multivariable model[3]	Reference	0.96 (0.91, 1.01)	0.91 (0.86, 0.96)	0.86 (0.81, 0.90)	<0.001	0.91 (0.88, 0.94)
Lagged 10 years						
Person-yr	270,186	253,426	261,011	256,301		1,040,924
Frailty cases	3131	3041	2936	2456		11,564
Age-adjusted	Reference	0.89 (0.85, 0.93)	0.78 (0.74, 0.82)	0.64 (0.61, 0.68)	<0.001	0.78 (0.76, 0.80)
Multivariable model[1]	Reference	0.89 (0.85, 0.94)	0.79 (0.75, 0.83)	0.67 (0.63, 0.71)	<0.001	0.79 (0.77, 0.82)
Multivariable model[2]	Reference	0.89 (0.85, 0.94)	0.78 (0.74, 0.82)	0.66 (0.62, 0.70)	<0.001	0.79 (0.76, 0.81)
Multivariable model[3]	Reference	0.98 (0.93, 1.03)	0.93 (0.88, 0.98)	0.88 (0.83, 0.93)	<0.001	0.92 (0.90, 0.95)
Lagged 14 years						
Person-yr	244,677	305,565	241,318	249,364		1,040,924
Frailty cases	2969	3217	2814	2564		11,564
Age-adjusted	Reference	0.90 (0.86, 0.95)	0.79 (0.75, 0.83)	0.67 (0.64, 0.71)	<0.001	0.80 (0.78, 0.82)
Multivariable model[1]	Reference	0.91 (0.86, 0.96)	0.80 (0.76, 0.84)	0.70 (0.66, 0.74)	<0.001	0.82 (0.80, 0.84)
Multivariable model[2]	Reference	0.90 (0.86, 0.95)	0.79 (0.75, 0.84)	0.69 (0.65, 0.73)	<0.001	0.81 (0.79, 0.83)
Multivariable model[3]	Reference	0.99 (0.94, 1.04)	0.93 (0.88, 0.98)	0.90 (0.85, 0.95)	<0.001	0.94 (0.91, 0.96)

AHEI-2010, alternate Healthy Eating Index-2010; AMED, alternate Mediterranean diet; DASH, Dietary Approaches to Stop Hypertension

[1] Adjusted for: age (1 year increment), body mass index (<25.0, 25.0-29.9, ≥30.0 kg/m^2), smoking status (never, past, and current 1-14, 15-24, and ≥25 cigarettes/day), and energy intake (quintiles of kcal/d).The DASH score is additionally adjusted for alcohol intake (0, 1.0-4.9, 5.0-14.9, ≥15.0 g/d).

[2]Additionally adjusted for medication use (aspirin, postmenopausal hormone replacement therapy, diuretics, β-blockers, calcium channel blockers, ACE inhibitors, other blood pressure medication, statins and other cholesterol lowering drugs, insulin, oral hypoglycemic medication).

[3] Additionally adjusted for leisure time physical activity (quintiles of METs h/wk).

[4]Standard deviations (SD) of the diet scores: aMED score SD was 2, DASH score SD was 4, AHEI-2010 score SD was 10.

Supplemental table 8. Relative risks (95% confidence interval) of frailty according to quartiles of the DASH score among women ≥60y in the Nurses' Health Study; lagged analysis.

	Q1	Q2	Q3	Q4	P for trend	RR (95%CI) for 1 SD increase in the diet score[4]
Lagged 6 years						
Person-yr	258,603	259,696	263,417	259,209		1,040,924
Frailty cases	3029	2970	2893	2672		11,564
Age-adjusted	Reference	0.86 (0.81, 0.90)	0.75 (0.71, 0.79)	0.62 (0.59, 0.66)	<0.001	0.82 (0.80, 0.84)
Multivariable model[1]	Reference	0.88 (0.84, 0.93)	0.78 (0.74, 0.83)	0.67 (0.64, 0.71)	<0.001	0.85 (0.83, 0.86)
Multivariable model[2]	Reference	0.87 (0.83, 0.91)	0.77 (0.73, 0.81)	0.66 (0.62, 0.70)	<0.001	0.84 (0.82, 0.86)
Multivariable model[3]	Reference	0.96 (0.91, 1.01)	0.93 (0.88, 0.98)	0.90 (0.85, 0.95)	<0.001	0.95 (0.93, 0.97)
Lagged 10 years						
Person-yr	259,004	262,840	259,802	259,278		1,040,924
Frailty cases	2912	3028	2857	2767		11,564
Age-adjusted	Reference	0.89 (0.85, 0.94)	0.77 (0.73, 0.81)	0.66 (0.62, 0.69)	<0.001	0.84 (0.82, 0.85)
Multivariable model[1]	Reference	0.92 (0.87, 0.97)	0.80 (0.76, 0.84)	0.71 (0.67, 0.75)	<0.001	0.86 (0.84, 0.88)
Multivariable model[2]	Reference	0.91 (0.86, 0.96)	0.79 (0.75, 0.83)	0.70 (0.66, 0.74)	<0.001	0.86 (0.84, 0.87)
Multivariable model[3]	Reference	1.00 (0.95, 1.05)	0.94 (0.89, 0.99)	0.93 (0.88, 0.98)	0.002	0.96 (0.94, 0.98)
Lagged 14 years						
Person-yr	256,167	270,820	257,919	256,018		1,040,924
Frailty cases	2838	3025	2871	2830		11,564
Age-adjusted	Reference	0.89 (0.85, 0.94)	0.78 (0.74, 0.82)	0.67 (0.64, 0.71)	<0.001	0.85 (0.83, 0.86)
Multivariable model[1]	Reference	0.92 (0.88, 0.97)	0.81 (0.77, 0.85)	0.72 (0.68, 0.76)	<0.001	0.87 (0.86, 0.89)
Multivariable model[2]	Reference	0.92 (0.87, 0.96)	0.80 (0.76, 0.84)	0.71 (0.68, 0.75)	<0.001	0.87 (0.85, 0.89)
Multivariable model[3]	Reference	1.01 (0.96, 1.06)	0.95 (0.90, 1.00)	0.94 (0.89, 0.99)	0.005	0.97 (0.95, 0.99)

AHEI-2010, alternate Healthy Eating Index-2010; AMED, alternate Mediterranean diet; DASH, Dietary Approaches to Stop Hypertension

[1] Adjusted for: age (1 year increment), body mass index (<25.0, 25.0-29.9, ≥30.0 kg/m^2), smoking status (never, past, and current 1-14, 15-24, and ≥25 cigarettes/day), and energy intake (quintiles of kcal/d).The DASH score is additionally adjusted for alcohol intake (0, 1.0-4.9, 5.0-14.9, ≥15.0 g/d).

[2]Additionally adjusted for medication use (aspirin, postmenopausal hormone replacement therapy, diuretics, β-blockers, calcium channel blockers, ACE inhibitors, other blood pressure medication, statins and other cholesterol lowering drugs, insulin, oral hypoglycemic medication).

[3] Additionally adjusted for leisure time physical activity (quintiles of METs h/wk).

[4]Standard deviations (SD) of the diet scores: aMED score SD was 2, DASH score SD was 4, AHEI-2010 score SD was 10.

Supplemental table 9. Relative risks (95% confidence interval) of frailty according to quartiles of the AHEI-2010 score among women ≥60y in the Nurses' Health Study; lagged analysis.

	Q1	Q2	Q3	Q4	P for trend	RR (95%CI) for 1 SD increase in the diet score[4]
Lagged 6 years						
Person-yr	259,005	259,705	260,711	261,504		1,040,924
Frailty cases	3326	3101	2767	2370		11,564
Age-adjusted	Reference	0.86 (0.82, 0.90)	0.74 (0.70, 0.78)	0.60 (0.56, 0.63)	<0.001	0.80 (0.78, 0.82)
Multivariable model[1]	Reference	0.87 (0.83, 0.91)	0.75 (0.71, 0.79)	0.63 (0.60, 0.67)	<0.001	0.82 (0.80, 0.84)
Multivariable model[2]	Reference	0.87 (0.83, 0.91)	0.76 (0.72, 0.79)	0.64 (0.61, 0.68)	<0.001	0.82 (0.81, 0.84)
Multivariable model[3]	Reference	0.96 (0.91, 1.01)	0.89 (0.84, 0.94)	0.85 (0.80, 0.90)	<0.001	0.93 (0.91, 0.95)
Lagged 10 years						
Person-yr	259,334	259,778	260,674	261,138		1,040,924
Frailty cases	3216	3073	2791	2484		11,564
Age-adjusted	Reference	0.87 (0.83, 0.92)	0.75 (0.71, 0.79)	0.62 (0.59, 0.66)	<0.001	0.82 (0.80, 0.84)
Multivariable model[1]	Reference	0.87 (0.83, 0.92)	0.76 (0.72, 0.80)	0.66 (0.62, 0.69)	<0.001	0.84 (0.82, 0.85)
Multivariable model[2]	Reference	0.88 (0.84, 0.92)	0.77 (0.73, 0.81)	0.67 (0.63, 0.70)	<0.001	0.84 (0.83, 0.86)
Multivariable model[3]	Reference	0.97 (0.92, 1.02)	0.89 (0.85, 0.94)	0.86 (0.82, 0.91)	<0.001	0.94 (0.92, 0.96)
Lagged 14 years						
Person-yr	259,741	259,893	260,497	260,794		1,040,924
Frailty cases	3104	3079	2754	2627		11,564
Age-adjusted	Reference	0.90 (0.85, 0.94)	0.75 (0.71, 0.79)	0.66 (0.63, 0.70)	<0.001	0.84 (0.82, 0.86)
Multivariable model[1]	Reference	0.90 (0.85, 0.94)	0.76 (0.72, 0.80)	0.69 (0.66, 0.73)	<0.001	0.86 (0.84, 0.87)
Multivariable model[2]	Reference	0.91 (0.86, 0.96)	0.77 (0.73, 0.81)	0.71 (0.67, 0.75)	<0.001	0.86 (0.85, 0.88)
Multivariable model[3]	Reference	0.99 (0.95, 1.05)	0.89 (0.84, 0.93)	0.90 (0.85, 0.94)	<0.001	0.95 (0.93, 0.97)

AHEI-2010, alternate Healthy Eating Index-2010; AMED, alternate Mediterranean diet; DASH, Dietary Approaches to Stop Hypertension

[1] Adjusted for: age (1 year increment), body mass index (<25.0, 25.0-29.9, ≥30.0 kg/m^2), smoking status (never, past, and current 1-14, 15-24, and ≥25 cigarettes/day), and energy intake (quintiles of kcal/d).The DASH score is additionally adjusted for alcohol intake (0, 1.0-4.9, 5.0-14.9, ≥15.0 g/d).

[2]Additionally adjusted for medication use (aspirin, postmenopausal hormone replacement therapy, diuretics, β-blockers, calcium channel blockers, ACE inhibitors, other blood pressure medication, statins and other cholesterol lowering drugs, insulin, oral hypoglycemic medication).

[3] Additionally adjusted for leisure time physical activity (quintiles of METs h/wk).

[4]Standard deviations (SD) of the diet scores: aMED score SD was 2, DASH score SD was 4, AHEI-2010 score SD was 10.

Supplemental table 10. Relative risks (95% confidence interval) of frailty according to quartiles of the diet quality scores among a women ≥60y without diabetes, heart disease or cancer in the Nurses' Health Study.

	Q1	Q2	Q3	Q4	P for trend	RR (95%CI) for 1 SD increase in the diet score[4]
aMED						
Participants, n	14,659	17,782	13,492	15,181		61,114
Person-yr	199,510	215,042	200,470	214,892		829,913
Frailty cases	2373	2036	1697	1308		7414
Age-adjusted	Reference	0.82 (0.77, 0.87)	0.68 (0.64, 0.72)	0.51 (0.48, 0.55)	<0.001	0.71 (0.69, 0.73)
Multivariable model[1]	Reference	0.82 (0.78, 0.88)	0.70 (0.65, 0.74)	0.53 (0.49, 0.57)	<0.001	0.72 (0.70, 0.75)
Multivariable model[2]	Reference	0.82 (0.77, 0.87)	0.69 (0.65, 0.74)	0.52 (0.49, 0.56)	<0.001	0.72 (0.69, 0.74)
Multivariable model[3]	Reference	0.92 (0.87, 0.98)	0.85 (0.80, 0.90)	0.75 (0.69, 0.80)	<0.001	0.86 (0.83, 0.89)
DASH						
Participants, n	17,160	16,923	14,289	12,742		61,114
Person-yr	203,964	212,885	208,517	204,547		829,913
Frailty cases	2164	1902	1880	1468		7414
Age-adjusted	Reference	0.79 (0.74, 0.83)	0.71 (0.67, 0.76)	0.53 (0.49, 0.56)	<0.001	0.78 (0.77, 0.80)
Multivariable model[1]	Reference	0.81 (0.76, 0.86)	0.76 (0.71, 0.80)	0.58 (0.54, 0.62)	<0.001	0.81 (0.79, 0.83)
Multivariable model[2]	Reference	0.80 (0.75, 0.85)	0.75 (0.70, 0.80)	0.57 (0.53, 0.61)	<0.001	0.81 (0.79, 0.83)
Multivariable model[3]	Reference	0.90 (0.85, 0.96)	0.92 (0.86, 0.98)	0.79 (0.74, 0.85)	<0.001	0.92 (0.90, 0.95)
AHEI-2010						
Participants, n	16,405	15,448	14,933	14,328		61,114
Person-yr	205,823	207,216	207,853	209,022		829,913
Frailty cases	2352	2002	1765	1295		7414
Age-adjusted	Reference	0.81 (0.76, 0.86)	0.71 (0.66, 0.75)	0.51 (0.47, 0.54)	<0.001	0.76 (0.74, 0.78)
Multivariable model[1]	Reference	0.82 (0.78, 0.87)	0.72 (0.68, 0.77)	0.54 (0.51, 0.58)	<0.001	0.78 (0.76, 0.80)
Multivariable model[2]	Reference	0.82 (0.77, 0.87)	0.72 (0.68, 0.77)	0.54 (0.51, 0.58)	<0.001	0.78 (0.76, 0.80)
Multivariable model[3]	Reference	0.92 (0.86, 0.97)	0.88 (0.82, 0.93)	0.75 (0.70, 0.80)	<0.001	0.89 (0.87, 0.92)

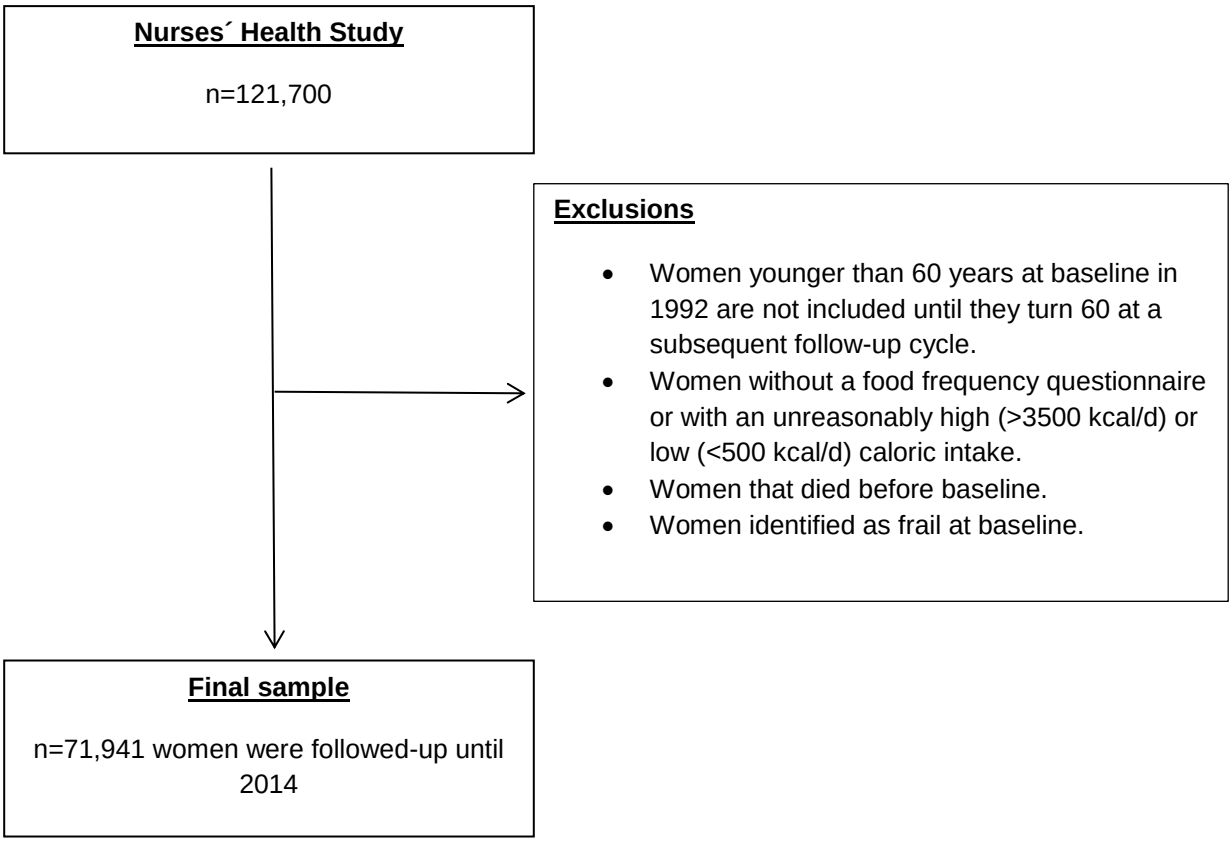
AHEI-2010, alternate Healthy Eating Index-2010; AMED, alternate Mediterranean diet; DASH, Dietary Approaches to Stop Hypertension

[1] Adjusted for: age (1 year increment), body mass index (<25.0, 25.0-29.9, ≥30.0 kg/m^2), smoking status (never, past, and current 1-14, 15-24, and ≥25 cigarettes/day), and energy intake (quintiles of kcal/d).The DASH score is additionally adjusted for alcohol intake (0, 1.0-4.9, 5.0-14.9, ≥15.0 g/d).

[2]Additionally adjusted for medication use (aspirin, postmenopausal hormone replacement therapy, diuretics, β-blockers, calcium channel blockers, ACE inhibitors, other blood pressure medication, statins and other cholesterol lowering drugs, insulin, oral hypoglycemic medication).

[3] Additionally adjusted for leisure time physical activity (quintiles of METs h/wk).

[4] Standard deviations (SD) of the diet scores: aMED score SD was 2, DASH score SD was 4, AHEI-2010 score SD was 10.



Supplemental figure 1. Participant flow chart