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Diet Quality Association with Nonalcoholic Fatty Liver Disease by Cirrhosis Status: The Multiethnic Cohort

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ABSTRACT

Background: Epidemiological data on the role of overall dietary patterns in nonalcoholic fatty liver disease (NAFLD) are limited, especially from population-based prospective studies.

Objectives: We investigated the associations between dietary patterns assessed by predefined diet quality indexes (DQIs) and NAFLD risk by cirrhosis status in African Americans, Japanese Americans, Latinos, Native Hawaiians, and whites from the Multiethnic Cohort (MEC).

Methods: A nested case-control analysis was conducted within the MEC. NAFLD cases were identified by linkage to 1999–2016 Medicare claims. Four DQIs—Healthy Eating Index (HEI)-2015, Alternative Healthy Eating Index-2010, alternate Mediterranean diet score, and Dietary Approaches to Stop Hypertension (DASH) score—were calculated from a validated FFQ administered at baseline. Conditional logistic regression was used to estimate the ORs and 95% CIs with adjustment for multiple covariates.

Results: Analyses included 2959 NAFLD cases (509 with cirrhosis; 2450 without cirrhosis) and 29,292 matched controls. Higher scores for HEI-2015 (i.e., highest compared with lowest quintile OR: 0.83; 95% CI: 0.73, 0.94; P for trend = 0.002) and DASH (OR: 0.78; 95% CI: 0.69, 0.89; P for trend < 0.001), reflecting favorable adherence to a healthful diet, were inversely associated with NAFLD risk. Whereas there were no differences by sex or race/ethnicity, the inverse association was stronger for NAFLD with cirrhosis than for NAFLD without cirrhosis (P for heterogeneity = 0.03 for HEI-2015 and 0.05 for DASH).

Conclusions: Higher HEI-2015 and DASH scores were inversely associated with NAFLD risk in this ethnically diverse population. The findings suggest that having better diet quality may reduce NAFLD risk with more benefit to NAFLD with cirrhosis. *Curr Dev Nutr* 2020;4:nzaa024.

Keywords: steatosis, NAFLD, nutrition, food, cirrhosis

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Abbreviations used: AHEI, Alternative Healthy Eating Index; aMED, alternate Mediterranean diet; DASH, Dietary Approaches to Stop Hypertension; DQI, diet quality index; FFS, fee-for-service; HEI, Healthy Eating Index; ICD, International Classification of Diseases; MDS, Mediterranean Diet Score; MEC, Multiethnic Cohort; NAFLD, nonalcoholic fatty liver disease; QFFQ, quantitative food-frequency questionnaire.

Introduction

Nonalcoholic fatty liver disease (NAFLD) is the most common cause of chronic liver disease in the United States, affecting 80–100 million people, and is increasing nationally and globally (1). Diet may influence NAFLD development by regulating overall adiposity and interacting with genetic predisposition to NAFLD (2). To prevent and manage NAFLD, dietary modification has been suggested in terms of overall dietary patterns as well as single foods or nutrients (3–5). Dietary patterns reflect the complexity of foods consumed and are often assessed by predefined diet quality indexes (DQIs) (6–8). For NAFLD, the Mediterranean diet has been recommended owing to its potential to prevent cardiovascular events or related diseases (4, 9). However, evidence on the efficacy of other theoretical dietary patterns in NAFLD prevention and treatment is still limited. Most previous studies are either cross-sectional or case-control and have generally supported the thesis that recommended dietary patterns are inversely associated with NAFLD (10–14). Prospective studies examining the association between dietary patterns and NAFLD have rarely been conducted, especially in racially/ethnically diverse populations.

In the current study, using data from the Multiethnic Cohort (MEC) study that comprises African-American, Japanese-American, Latino,

TABLE 1 Characteristics of nonalcoholic fatty liver disease cases and controls in the Multiethnic Cohort[1]

	Cases	Controls
Participants, *n*	2959	29,292
Age at cohort entry, y[2]	57.7 ± 7.8	57.8 ± 7.8
Sex[2]		
Male	1111 (37.5)	11,088 (37.9)
Female	1848 (62.5)	18,204 (62.1)
Race/ethnicity[2]		
African American	202 (6.8)	2013 (6.9)
Native Hawaiian	185 (6.3)	1838 (6.3)
Japanese American	1490 (50.4)	14,685 (50.1)
Latino	611 (20.6)	6053 (20.7)
White	471 (15.9)	4703 (16.1)
BMI, kg/m^2	27.2 ± 4.9	25.7 ± 4.6
Physical activity,[3] h/d	0.31 ± 0.69	0.36 ± 0.78
Daily intake		
Alcohol, g	2.8 ± 6.3	6.8 ± 19.3
Energy, kcal	2117.2 ± 994.2	2126.4 ± 983.2
Coffee, cup	1.0 ± 1.1	1.1 ± 1.1
Coffee, g	242.1 ± 268.7	254.9 ± 272.9
≥1 cup of coffee	1503 (50.8)	15,668 (53.5)
≥2 cups of coffee	736 (24.9)	7630 (26.0)
≥4 cups of coffee	128 (4.3)	1452 (5.0)
Diet quality index		
HEI-2015	66.3 ± 10.5	67.2 ± 10.5
AHEI-2010	64.8 ± 9.4	65.2 ± 9.5
aMED	4.1 ± 1.8	4.2 ± 1.8
DASH	23.4 ± 4.4	23.8 ± 4.4

[1]Values are *n* (%) or mean ± SD unless indicated otherwise. AHEI, Alternative Healthy Eating Index; aMED, alternate Mediterranean diet; DASH, Dietary Approaches to Stop Hypertension; HEI, Healthy Eating Index.
[2]Matching factors.
[3]Hours spent in vigorous works or sports per day.

Native Hawaiian, and white participants, we prospectively investigated the associations of 4 DQIs [Healthy Eating Index (HEI)-2015, Alternative Healthy Eating Index (AHEI)-2010, alternate Mediterranean diet (aMED) score, and Dietary Approaches to Stop Hypertension (DASH) score] with NAFLD risk overall and by sex, race/ethnicity, and cirrhosis status.

Methods

Study population

The MEC was established to investigate the roles of diet and other lifestyle factors in cancer and other chronic diseases, as previously described (15). The cohort was designed to include adults living in Hawaii and California from 5 targeted racial/ethnic groups: African American, Native Hawaiian, Japanese American, Latino, and white. In 1993–1996, >215,000 men and women aged 45–75 y completed a 26-page comprehensive questionnaire on diet, medical history, and lifestyle (available from: https://www.uhcancercenter.org/mec). MEC participants who reached age 65 y were linked to Medicare Services claims (1999–2016) using Social Security numbers, sex, and date of birth; 93% of them were successfully linked (16). For this study, we restricted the analyses to the Medicare fee-for-service (FFS) participants in the MEC (n = 123,196) because the outcome NAFLD was identified using FFS claims (see "Case selection" below). We excluded participants who were not from the 5 major ethnic groups (n = 7511), had invalid dietary data based on implausible macronutrient intakes (n = 4498), and had missing baseline information on the important relevant variables (e.g., BMI, diabetes, vigorous physical activity) (n = 5756). A total of 105,431 eligible participants were available for nested case-control analysis. The excluded and eligible participants had similar duration of Medicare coverage, smoking status, average BMI, and energy intake, but the eligible participants were younger, had a higher education level, and a higher proportion were Japanese Americans.

Selection of cases and controls

For the current nested case-control analysis, NAFLD and cirrhosis cases were identified among eligible participants by using 1 inpatient or ≥2 outpatient/carrier qualifying claims during a 1-y period between 1999 and 2016. NAFLD was identified using International Classification of Diseases, ninth revision (ICD-9) codes (571.8 and 571.9) and tenth revision (ICD-10) codes (K75.81, K760, K7689, K741, and K769) as previously described (17, 18). Using the American Association for the Study of Liver Diseases guidelines (19), NAFLD cases who reported >21 drinks/wk (men) or >14 drinks/wk (women) were reclassified as alcoholic liver disease. The median time between cohort entry (baseline) and the first NAFLD-related claim was 17.4 y. Cirrhosis status among NAFLD patients was identified using the following codes: 571.2, K7030, K7031 (cirrhosis with alcoholism with and without ascites); 571.5, K740, K7460, K7469 (cirrhosis without mention of alcohol); 456.0, 456.1, 456.20, 456.21, I8501, I8500, I8511, I8510 (esophageal varices); 567.23, K652 (spontaneous bacterial peritonitis); 572.2, K7290, K7291 (hepatic encephalopathy); and 572.4, K767 (hepatorenal syndrome). Controls were randomly selected among eligible participants without liver disease and individually matched to cases (with a ratio ≤10:1) by birth year, sex, ethnicity, and length of FFS Medicare enrollment. A total of 2959 cases (509 with cirrhosis and 2450 without cirrhosis) and 29,292 controls were included in analyses. The mean number of controls per case was 9.9.

The Institutional Review Boards for the University of Southern California and the University of Hawaii approved this study.

DQIs

Each participant completed a quantitative food-frequency questionnaire (QFFQ) at baseline designed from 3-d measured food records (15). Importantly, a calibration substudy showed satisfactory correlations between energy-adjusted daily nutrient estimates from the QFFQ and three 24-h recalls (19). As part of the Dietary Patterns Methods Project, diet quality of participants was assessed using the following predefined DQIs based on responses to the QFFQ: HEI-2015, AHEI-2010, aMED, and DASH (20–22). The HEI-2015 (0–100 points with 13 components) reflects adherence to the 2015–2020 Dietary Guidelines for Americans (23). The AHEI-2010 (0–110 points with 11 components) was developed to identify dietary patterns consistently associated with lower risk of chronic disease (24). The aMED (0–9 points with 9 components) was an adaptation of the Mediterranean Diet Score (MDS) (25), which was consistently associated with lower risk of chronic disease (26, 27). The DASH index (8–40 points with 8 components) reflects adherence to the DASH diet that was designed to help treat or prevent high blood pressure (28, 29). For all DQIs, higher scores reflect better quality of diets.

TABLE 2 The association between dietary quality indexes and nonalcoholic fatty liver disease in the Multiethnic Cohort[1]

	Cases, *n*	Controls, *n*	OR[2] (95% CI)	OR[3] (95% CI)
HEI-2015				
Q1 (17.9–58.0)	664	5778	1.00 (ref.)	1.00 (ref.)
Q2 (58.1–64.3)	630	5812	0.93 (0.83, 1.05)	0.95 (0.84, 1.07)
Q3 (64.4–69.9)	564	5884	0.82 (0.73, 0.92)	0.85 (0.75, 0.96)
Q4 (70.0–76.4)	577	5878	0.84 (0.74, 0.94)	0.89 (0.79, 1.00)
Q5 (76.5–99.6)	524	5940	0.75 (0.66, 0.85)	0.83 (0.73, 0.94)
P for trend			<0.0001	0.0022
AHEI-2010				
Q1 (25.1–57.1)	623	5814	1.00 (ref.)	1.00 (ref.)
Q2 (57.2–62.8)	588	5857	0.94 (0.83, 1.06)	0.94 (0.84, 1.06)
Q3 (62.9–67.6)	601	5846	0.96 (0.85, 1.08)	0.98 (0.87, 1.10)
Q4 (67.7–73.1)	606	5856	0.96 (0.85, 1.08)	1.01 (0.89, 1.14)
Q5 (73.2–104.5)	541	5919	0.85 (0.75, 0.96)	0.91 (0.80, 1.03)
P for trend			0.024	0.3366
aMED				
Q1 (0–2)	590	5592	1.00 (ref.)	1.00 (ref.)
Q2 (3)	531	5282	0.95 (0.84, 1.08)	0.98 (0.86, 1.11)
Q3 (4)	561	5584	0.95 (0.84, 1.08)	0.99 (0.88, 1.13)
Q4 (5)	565	5355	1.00 (0.88, 1.13)	1.06 (0.93, 1.21)
Q5 (6–9)	712	7479	0.90 (0.80, 1.01)	1.00 (0.88, 1.15)
P for trend			0.1762	0.6136
DASH				
Q1 (9–19)	603	5138	1.00 (ref.)	1.00 (ref.)
Q2 (20–22)	631	6269	0.85 (0.75, 0.96)	0.85 (0.76, 0.96)
Q3 (23–24)	510	4898	0.88 (0.77, 0.99)	0.89 (0.78, 1.01)
Q4 (25–27)	650	6749	0.81 (0.72, 0.91)	0.81 (0.71, 0.91)
Q5 (28–39)	565	6238	0.76 (0.67, 0.86)	0.78 (0.69, 0.89)
P for trend			<0.0001	0.0003

[1]AHEI, Alternative Healthy Eating Index; aMED, alternate Mediterranean diet; DASH, Dietary Approaches to Stop Hypertension; HEI, Healthy Eating Index.
[2]Stratified by matching factors (birth year, sex, race/ethnicity, and length of Medicare enrollment).
[3]Further adjusted for BMI (in kg/m^2), physical activity (h/d), total energy intake (log-transformed kcal/d), and coffee consumption (0, >0−1, 2−3, ≥4 cups/d). For HEI-2015 and DASH, further adjusted for alcohol intake (g/d).

Statistical analysis

To estimate the associations between the DQIs and NAFLD risk, ORs and 95% CIs were calculated with conditional logistic regression, modeling NAFLD status. The DQIs were divided into quintiles, which were determined by the overall distribution of each DQI in both cases and controls. Trend tests were performed by entering a variable assigned the median of the appropriate quintile group as a continuous variable. *P* values for dose-response were based on the Wald statistics for trend variables.

Matched sets were used as strata in the conditional logistic models, which accounted for the matching criteria: birth year, sex, ethnicity, and length of Medicare FFS enrollment. Multivariate ORs were further adjusted for variables that were related to liver disease in the MEC (17, 30): BMI (in kg/m^2), physical activity (hours spent in vigorous works or sports per day), total energy intake (log-transformed kcal/d), and coffee consumption (0, >0−1, 2−3, ≥4 cups/d). For the HEI-2015 and DASH, alcohol consumption (g/d) was also adjusted for, because these 2 indexes do not include a component for alcohol intake. A sensitivity analysis excluding the alcohol component from the aMED and AHEI-2010 was performed. Because the associations between DQIs and NAFLD risk did not vary by sex, subgroup analyses by race/ethnicity and cirrhosis status were performed in men and women combined. Tests for heterogeneity across racial/ethnic groups were based on the Wald statistics with 4 df for the cross-product terms of trend variables and race/ethnicity. We tested differences in the DQI trend parameters for the outcomes of NAFLD with and without cirrhosis by using case-only unconditional logistic regression with the event being cirrhosis (yes compared with no) and adjusting for the matching variables. All analyses were performed using SAS version 9.4 (SAS Institute, Inc.). Statistical significance was considered at $P < 0.05$ and all tests were 2-sided.

Results

Table 1 presents selected baseline characteristics in cases and controls. Compared with controls, cases were more likely to have higher BMI and less likely to be physically active and drink alcoholic beverages and coffee. Mean scores of the 4 DQIs were slightly lower in NAFLD cases than in controls.

Table 2 presents the ORs and 95% CIs for associations of DQIs with NAFLD risk. HEI-2015, AHEI-2010, and DASH, but not aMED showed an inverse association with NAFLD in the basic model. With multivariate adjustment, the inverse association remained statistically significant for HEI-2015 (for the highest compared with the lowest quintile, OR: 0.83; 95% CI: 0.73, 0.94; *P* for trend = 0.002) and DASH (OR: 0.78; 95% CI: 0.69, 0.89; *P* for trend < 0.001), but not for AHEI-2010 (OR: 0.91;

TABLE 3 Association between dietary quality indexes and nonalcoholic fatty liver disease by cirrhosis status in the Multiethnic Cohort[1]

	Cirrhosis			No cirrhosis			
	Cases	Controls	OR (95% CI)[2]	Cases	Controls	OR (95% CI)[2]	*P*-heterogeneity
HEI-2015							
Q1 (17.9–58.0)	113	986	1.00 (ref.)	551	4792	1.00 (ref.)	
Q2 (58.1–64.3)	134	1017	1.14 (0.87, 1.51)	496	4795	0.91 (0.80, 1.03)	
Q3 (64.4–69.9)	106	1009	0.96 (0.72, 1.28)	458	4875	0.83 (0.73, 0.95)	
Q4 (70.0–76.4)	83	1036	0.75 (0.55, 1.02)	494	4842	0.92 (0.80, 1.05)	
Q5 (76.5–99.6)	73	1018	0.74 (0.54, 1.03)	451	4922	0.84 (0.74, 0.97)	
P for trend			0.0088			0.0315	0.0341
AHEI-2010							
Q1 (25.1–57.1)	120	1032	1.00 (ref.)	503	4782	1.00 (ref.)	
Q2 (57.2–62.8)	105	1052	0.82 (0.61, 1.09)	483	4805	0.97 (0.85, 1.10)	
Q3 (62.9–67.6)	113	1040	0.91 (0.68, 1.20)	488	4806	0.99 (0.86, 1.13)	
Q4 (67.7–73.1)	102	979	0.93 (0.69, 1.24)	504	4877	1.02 (0.89, 1.17)	
Q5 (73.2–104.5)	69	963	0.64 (0.46, 0.89)	472	4956	0.96 (0.84, 1.10)	
P for trend			0.0395			0.8272	0.1450
aMED							
Q1 (0–2)	100	998	1.00 (ref.)	490	4594	1.00 (ref.)	
Q2 (3)	100	929	1.10 (0.81, 1.48)	431	4353	0.95 (0.83, 1.09)	
Q3 (4)	105	1010	1.09 (0.80, 1.49)	456	4574	0.97 (0.85, 1.12)	
Q4 (5)	94	902	1.11 (0.80, 1.55)	471	4453	1.05 (0.91, 1.21)	
Q5 (6–9)	110	1227	1.02 (0.72, 1.42)	602	6252	1.00 (0.86, 1.15)	
P for trend			0.9491			0.6397	0.5319
DASH							
Q1 (9–19)	95	768	1.00 (ref.)	508	4370	1.00 (ref.)	
Q2 (20–22)	117	1025	0.90 (0.67, 1.21)	514	5244	0.84 (0.74, 0.96)	
Q3 (23–24)	88	857	0.78 (0.56, 1.07)	422	4041	0.90 (0.78, 1.03)	
Q4 (25–27)	110	1236	0.69 (0.51, 0.94)	540	5513	0.83 (0.72, 0.95)	
Q5 (28–39)	99	1180	0.68 (0.49, 0.94)	466	5058	0.80 (0.69, 0.92)	
P for trend			0.0058			0.0054	0.0493

[1]AHEI, Alternative Healthy Eating Index; aMED, alternate Mediterranean diet; DASH, Dietary Approaches to Stop Hypertension; HEI, Healthy Eating Index.
[2]Stratified by matching factors and adjusted for BMI (in kg/m^2), physical activity (h/d), total energy (log-transformed kcal/d), and coffee consumption (0, >0–1, 2–3, ≥4 cups/d). For HEI-2015 and DASH, further adjusted for alcohol intake (g/d).

95% CI: 0.80, 1.03; *P* for trend = 0.34). Similar results were obtained when excluding the alcohol component from the aMED and AHEI-2010 analyses (data not shown).

The associations between DQIs and NAFLD risk did not vary by sex (*P*s for heterogeneity > 0.26), although the inverse trends for HEI-2015 and DASH appeared stronger in men than in women (**Supplemental Table 1**). In racial/ethnic-specific analyses, no differences in the associations across the 5 racial/ethnic groups were observed (*P*s for heterogeneity > 0.19) (**Supplemental Table 2**).

In analyses stratified by cirrhosis status (**Table 3**), the inverse association was stronger for NAFLD with cirrhosis than for NAFLD without cirrhosis (*P* for heterogeneity = 0.03 for HEI-2015 and 0.05 for DASH). In addition, higher AHEI-2010 scores were associated with a lower risk of NAFLD with cirrhosis (OR: 0.64; 95% CI: 0.46, 0.89; *P* for trend = 0.04), whereas no significant association was found for NAFLD without cirrhosis (*P* for heterogeneity = 0.15).

Discussion

In the MEC, we found an inverse association between diet quality and NAFLD risk. Higher HEI-2015 and DASH scores were associated with a lower risk of NAFLD. Whereas no difference was found by sex or race/ethnicity, the inverse association was stronger for NAFLD with cirrhosis than for NAFLD without cirrhosis.

Several observational studies have examined overall dietary patterns in relation to NAFLD. Using a factor analysis, which is an a posteriori, data-driven method to define dietary patterns, a cross-sectional study in Korea identified 3 dietary patterns: the traditional, Western and high-carbohydrate, and simple meal patterns (10). The traditional dietary pattern was associated with an increased risk of NAFLD, and the simple meal pattern was associated with a decreased risk, whereas the Western and high-carbohydrate pattern was not significantly associated (10). In a cross-sectional study with 170 NAFLD patients in Iran (11), a healthy dietary pattern identified by factor analysis was associated with a lower risk of fibrosis, whereas a Western pattern was associated with a higher risk of fibrosis. In a Greek case-control study (12), a fast food–type pattern derived by factor analysis was associated with a higher risk of NAFLD. Using predefined dietary indexes, a cross-sectional study in a Chinese population reported that Diet Quality Index-International but not MDS was associated with lower prevalence of NAFLD (13). A case-control study in Iran found an inverse association between the DASH score and NAFLD risk (14). In a recent report from the Framingham Heart Study that prospectively assessed changes in diet and liver fat over 6 y (2), increases in the MDS and AHEI

scores were associated with reduced liver fat accumulation and lower risk and severity of fatty liver among 1521 participants, especially those with high genetic risk scores for NAFLD. These observational, mostly cross-sectional or case-control, studies generally supported preferable dietary patterns and high-quality diets as being inversely associated with NAFLD development or progression.

A recent comprehensive review including dietary patterns in the management of NAFLD concluded that recommending the Mediterranean diet seems prudent, although more studies are required to determine which components of the DASH diet provide the greatest benefits, and other dietary patterns need further investigation (4). The Mediterranean diet may reduce important cardiovascular disease risk factors such as total cholesterol and LDL cholesterol, based on a systematic review of 11 randomized trials (31). However, randomized trials examining the effects of the Mediterranean diet on liver histology are limited (4). Nevertheless, the European Association for the Study of the Liver, European Association for the Study of Diabetes, and European Association for the Study of Obesity recommended the Mediterranean diet for NAFLD management (32). In a randomized clinical trial addressing weight loss and metabolic status among NAFLD patients, the DASH diet, primarily designed for hypertension, was shown to have beneficial effects on body weight and metabolic profiles including liver enzymes, triglycerides, insulin-metabolism markers, inflammatory markers, and oxidative-stress markers (33).

In the current study, the inverse association between diet quality and NAFLD risk was evident for HEI-2015 and DASH but not for AHEI-2010 and aMED overall. The major difference between HEI-2015 and DASH compared with AHEI-2010 and aMED is that the former 2 indexes do not include alcohol consumption as a component, whereas the latter 2 indexes do. However, the associations with these indexes remained similar, whether or not they were also adjusted for alcohol intake. For NAFLD with cirrhosis, a significant inverse association was found for AHEI-2010, in addition to HEI-2015 and DASH, but not for aMED. The aMED may be less sensitive to the variance in diet quality owing to its smaller range of total score (0–9 points) than the other indexes (HEI-2015: 0–100; AHEI-2010: 0–110; and DASH: 8–40). Because aMED scores are based on the median intakes of the populations, the high score in the MEC could be lower in other populations. Also, the Mediterranean diet may not be practical in some non-Mediterranean countries or populations. Nevertheless, in previous studies in the MEC, the aMED was associated with lower risk of liver cancer (34), colorectal cancer (35), colorectal cancer–specific mortality among women diagnosed with colorectal cancer (36), and mortality from all causes, cardiovascular disease, and cancer (21). In a subgroup of the MEC ($n \sim 2000$), high-quality diets at baseline were associated with a lower risk of NAFLD 20 y later, which was defined as an MRI-based measure of >5.5% liver fat (37). The risk reduction in the highest tertile of DQIs was statistically significant for the HEI-2010, AHEI-2010, and DASH, and suggestive for the aMED. The weaker or lack of association between the aMED and NAFLD in the MEC warrants further examination.

The etiology of NAFLD is multifactorial and likely involves interactions between genetic and environmental factors (38). There are several proposed mechanisms linking diet quality to NAFLD risk including anti-inflammatory and antioxidant properties of certain diet components such as fiber, monounsaturated and omega-3 fatty acids, and phytosterols (39, 40). Diet can also influence NAFLD development by its effect on modulating body weight and metabolic syndrome (39). Potential interactions between diet quality and genetic predisposition to NAFLD have also been reported (2).

The strengths in our study include the large sample size with 5 racial/ethnic groups, the populations-based design, and comprehensive information on diet and covariates related to NAFLD. Especially, the prospective design of the study minimizes the likelihood that diet quality at baseline was affected by the disease process. However, we cannot rule out the possibility that NAFLD status was misclassified if it was already present before cohort entry or was present but was never reported on a Medicare claim. Measurement error is inevitable in dietary assessment based on a self-administered QFFQ, but tends to be uncorrelated with disease in a prospective study, resulting in attenuated risk estimates. In the current analysis, we used dietary data measured only once at baseline, although dietary habits might change over time. Indeed, diet quality slightly improved over 10 y among participants in the MEC. Among the controls in the current study, 16,795 completed both baseline and 10-y follow-up QFFQs. The DQIs for these individuals were moderately correlated between the 2 surveys; Spearman rank correlation coefficients were 0.57 for HEI-2015 and DASH, 0.50 for AHEI-2010, and 0.47 for aMED. Because the current study was performed in the FFS participants, the results may not be generalizable to the entire MEC cohort. However, the FFS subcohort was large and still incorporated racial/ethnic and socioeconomic diversity (16).

In conclusion, our findings suggest having better diet quality may reduce NAFLD risk in this ethnically diverse population. The benefit of a high-quality diet to NAFLD prevention may be larger for NAFLD with cirrhosis than for NAFLD without cirrhosis.

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