

Association Between Diet Quality and Cardiovascular Disease Mortality in Cancer Survivors in the United States



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BACKGROUND

- Cardiovascular disease (CVD) is a leading non-cancer cause of death among U.S. cancer survivors, potentially driven by cardiotoxic cancer therapies and shared risk factors.
- Diet quality is increasingly recognized as a modifiable factor in survivorship care.
- Evidence linking overall diet quality to CVD mortality in cancer survivors remains limited.

OBJECTIVES

To evaluate the association between diet quality and 10-year CVD-related mortality risk among U.S. cancer survivors.

METHODS

Data Source

The Continuous National Health and Nutrition Examination Survey (NHANES) from 2005-2018 linked to 2019 Public-Use Linked Mortality (PLM) Files.

Study Population (Fig 1)

Inclusion criteria:

- Aged ≥ 18 years
- Response with cancer diagnosis
- Completed two 24-hour recall dietary interviews.

Exclusion criteria:

- Any self-reported history of coronary heart disease, angina, heart attack, and stroke.

Key Variables

Outcomes:

Population average treatment effects (PATEs) for the 10-year cumulative incidence function (CIF) of CVD-related mortality.

Exposure:

- Diet quality assessed via the Health Eating Index (HEI) 2020: the total score and component scores qualified vs unqualified (total HEI >59 ; component score $>59\%$ of the maximum).
- The component scores: adequacy components (total fruit, whole fruit, total vegetables, greens and beans, whole grains, total dairy, total protein foods, seafood and plant proteins, fatty acids) and moderation components (saturated fats, refined grains, sodium, added sugar).

Covariates

- Sociodemographic: age, race/ethnicity, sex, education, ratio of family income to poverty, BMI category, comorbidities (hypertension, hyperlipidemia, diabetes).
- Life-style factor: MET score (hr/wk), smoking status.

Statistical Analysis

- Fine-Gray competing-risk models with G-computation estimated PATEs, incorporating survey sampling.
- 95% CI obtained by 1,000 bootstrap iterations.
- Missing values: single imputation due to low percentage of missingness ($<1\%$).

RESULTS

Fig 1. Study sample selection

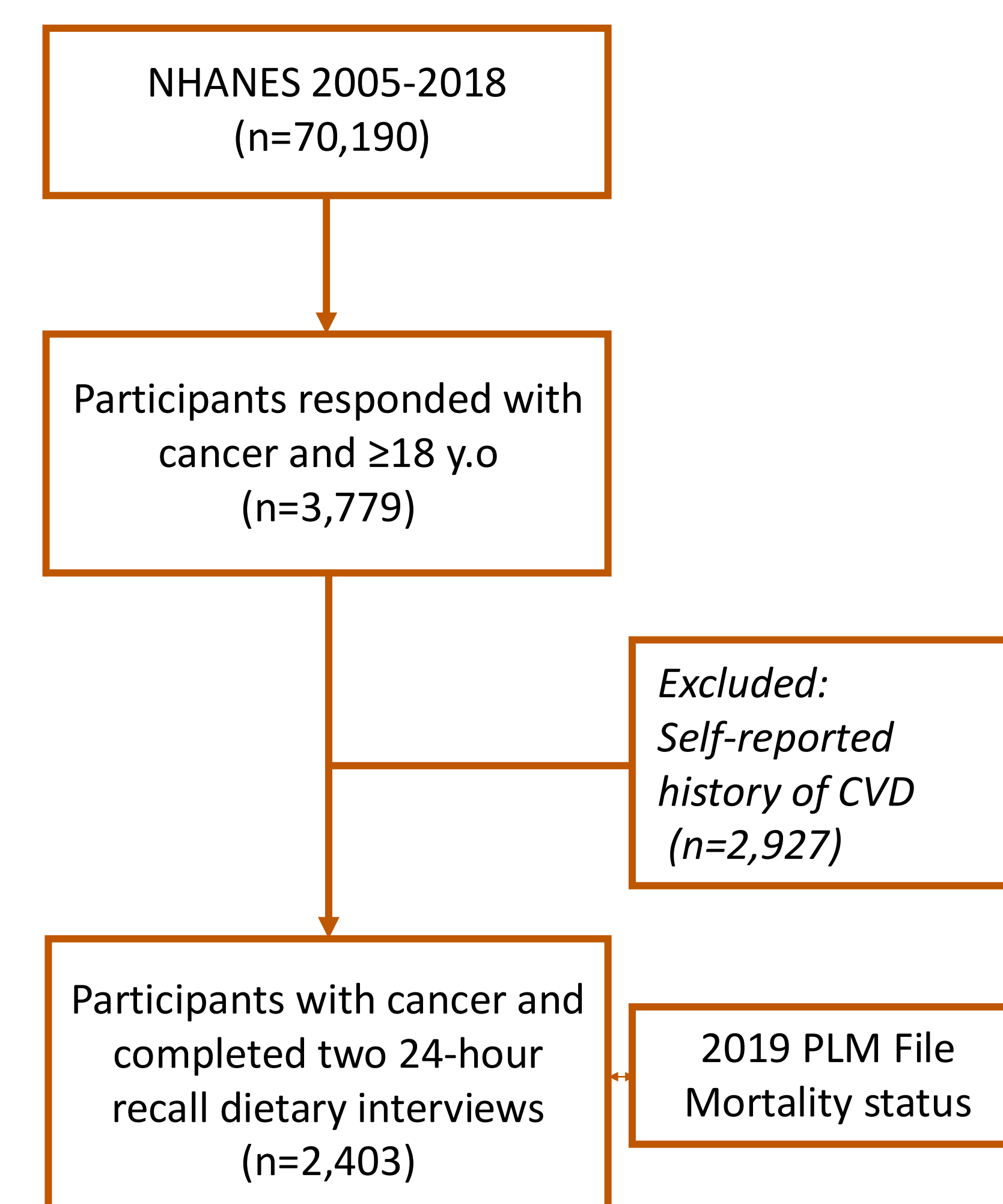
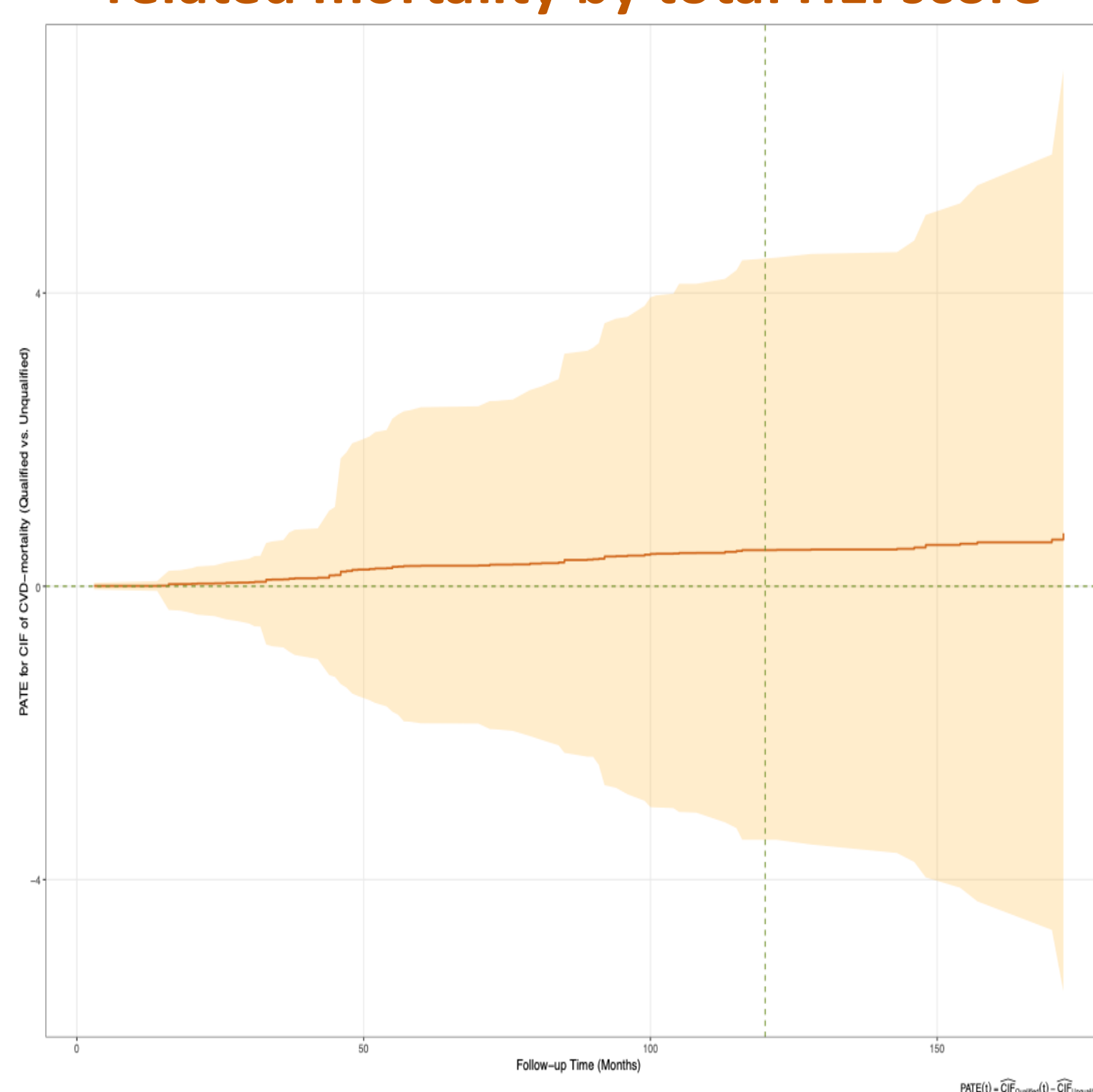


Fig 2. PATE for the 10-year CIF of CVD-related mortality by total HEI score



Total HEI score (Fig 2)

No significant PATE for 10-year CIF of CVD-related mortality by total HEI score after adjusting for covariates: 0.50% (95% CI: -3.59-4.64%)

Component HEI score (Fig 3)

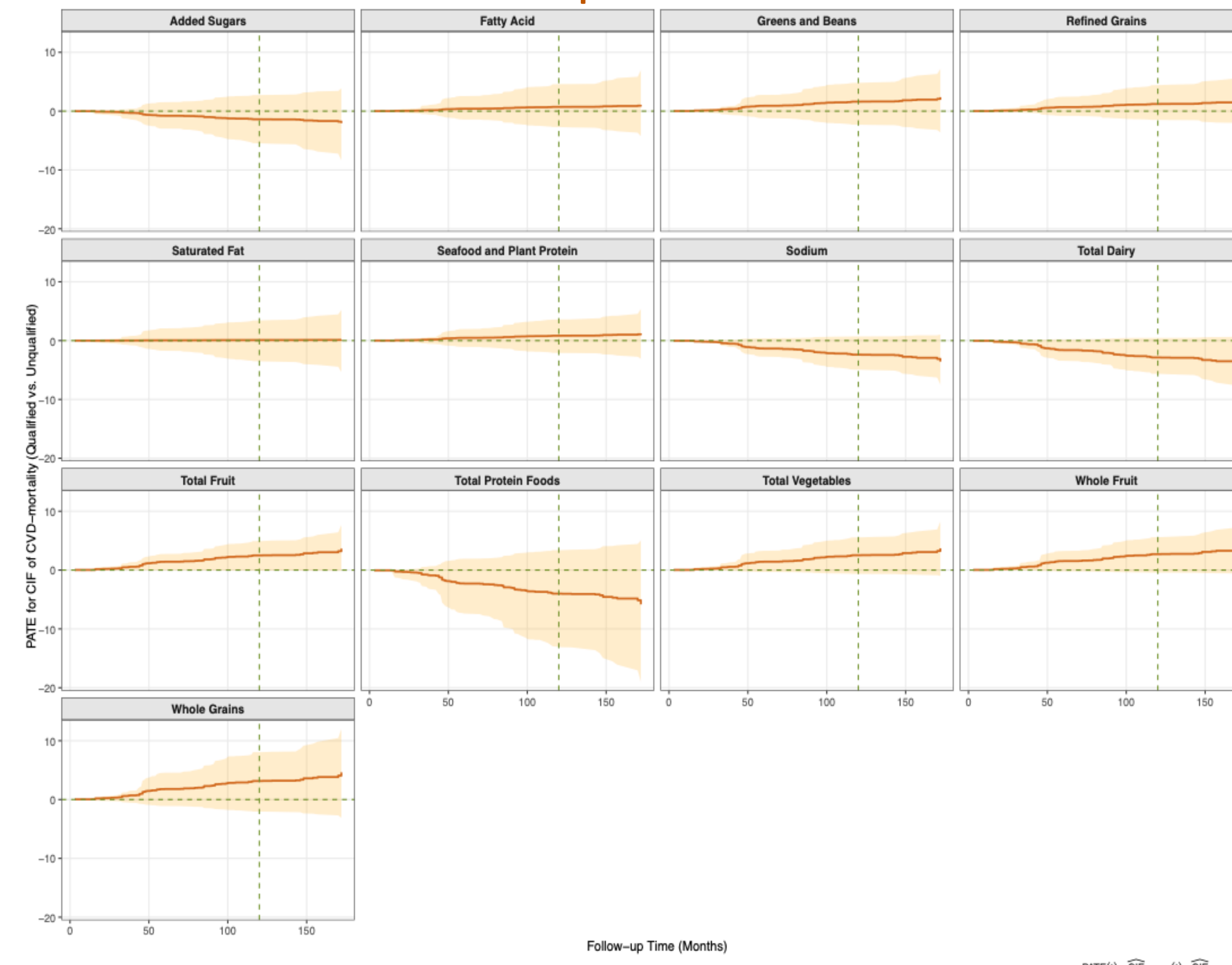
Inverse but non-significant associations were observed between dietary components and 10-year CIF of CVD-related mortality after adjustment for covariates

- Added sugars: -1.39% (95% CI: -5.48-2.74%).
- Sodium: -2.41% (95% CI: -4.95-0.71%).
- Total dairy: -2.89% (95% CI: -5.65-0.46%).
- Total protein foods: -4.03% (95% CI: -13.12-3.38%).

Table 1. Survey-weighted participant characteristics at baseline

Characteristics	Overall (N= 18,988,543)	Unqualified total HEI score (N=11,724,521)	Qualified total HEI score (N=7,264,022)	p
Age, Median (IQR)	63 (52, 73)	61 (50, 71)	66 (54, 75)	< 0.001
Met score (hr/wk), Median (IQR)	39.90 (17.50, 81.78)	33.33 (14.00, 82.00)	44.00 (21.17, 80.00)	0.013
Smoking status, n (%)				< 0.001
No	9,188,025 (48.40)	5,070,883 (43.25)	4,117,142 (56.68)	
Past	6,855,429 (36.10)	4,137,760 (35.29)	2,717,668 (37.41)	
Active	2,945,089 (15.50)	2,515,878 (21.46)	429,211 (5.91)	
BMI category, n (%)				< 0.001
Underweight	300,308 (1.58)	175,885 (1.5)	124,423 (1.71)	
Normal	5,310,016 (28.00)	2,788,287 (23.78)	2,521,729 (34.72)	
Overweight	6,622,176 (34.90)	3,968,868 (33.85)	2,653,309 (36.53)	
Obese	6,756,042 (35.60)	4,791,481 (40.87)	1,964,561 (27.05)	
Follow-up (months), Median (IQR)	77 (43, 120)	73 (40, 119)	80 (46, 123)	0.013
Mortality status: Deceased, n (%)	3,075,736 (16.20)	1,896,540 (16.18)	1,179,196 (16.23)	0.979
CVD-related death, n (%)	480,229 (2.53)	287,196 (2.45)	193,033 (2.66)	0.974

Fig 3. PATE for the 10-year CIF of CVD-related mortality by component HEI score



CONCLUSIONS

Limitations

- Some individuals might not have sufficiently long observation period to capture the event.
- The outcomes and covariates were derived from the NHANES self-reported questionnaire, therefore, recall bias was introduced.
- Small number of CVD-mortality events may affect the statistical power.
- A high proportion of NHANES participants were diagnosed with skin cancer, thus leading to generalizability issue to other types of cancer.

Strengths

- The study provides information regarding the use of the HEI-2020 to evaluate diet quality of U.S. cancer survivors in preventing CVD.
- G-computation incorporating survey sampling weights provided marginal CIF of 10-year CVD-related mortality for the U.S. population.

Implications

- Patients with cancer may benefit from high adherence to high protein intake, low sugars and sodium intake to mitigate the risk of CVD events.
- Our findings can assist clinicians and nutritionists to individualized suitable diet plan and evaluate diet quality using specific components of the HEI-2020 for patients with cancer who have high risk of CVD.
- Other diet quality indices can be considered to have more comprehensive evaluation, such as the Dietary Approaches to Stop Hypertension (DASH).

Conclusion

- Dichotomized total HEI was not clearly associated with 10-year CVD mortality in the U.S patients with cancer. However, specific component evaluation via the HEI-2020 can be considered for patients with cancer and high risk of CVD.
- Interdisciplinary approach, integrating nutrition, cardiology, and oncology is warranted to optimize quality of life in cancer survivors.

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