

BACKGROUND

- Dementia is a leading cause of disability among older adults and a growing public health concern. Treatment options are limited, highlighting the importance of preventive strategies.
- Healthy dietary patterns known to support brain health (e.g., Mediterranean/MIND diets) are primarily plant-based and often rich in dietary fiber. Dietary fiber is very well known for its role in glycemic control, gut-health and other health benefits.
- Dietary fiber consists of two primary subtypes: soluble and insoluble fiber. Additionally, quality of carbohydrate sources assessed by carbohydrate-to-fiber ratio may also define nutritional guidelines. Relation of fiber subtypes with dementia and cognitive decline is limited.

Objective: To examine how dietary fiber intake is associated with the risk of incident dementia and cognitive decline among community-dwelling older adults. Additionally, to evaluate how these associations differ between fiber subtypes (soluble and insoluble) and carbohydrate-to-fiber-ratio.

METHODS

- Study population:** Ongoing prospective cohort study of community-dwelling older adults living in Chicagoland retirement communities: the Rush Memory and Aging Project (MAP).
- Participants:** Individuals were free of dementia at the first food frequency questionnaire (FFQ) assessment and had at least one complete clinical evaluation after dietary data; analytic study group included 1,508 participants.
- Dietary assessment:** Usual dietary intake was assessed using a validated 142-item FFQ.
- Exposure:** Calorie-adjusted total, soluble, and insoluble fiber intake (g/day), and carbohydrate-to-fiber ratio at first FFQ assessment (i.e., analytic baseline), modeled in quintiles.
- Outcome:** All-cause dementia diagnosis determined through annual cognitive testing and clinical evaluation, with consensus diagnosis based on NINCDS/ADRDA criteria. Global cognitive function assessed annually using a composite score derived from 19 cognitive tests.
- Statistical analysis:** To estimate hazard ratios of dementia with increasing fiber intake at baseline, we employed cause-specific Cox models accounting for potential competitive risk by death. To evaluate associations between fiber intake and the annual rate of cognitive change over time, we employed linear mixed models assuming a linear function of time.

RESULTS

Table 1. Baseline characteristics of 1,508 MAP participants as per frequency of total fiber intake. Values are mean (SD) unless specified otherwise.

Variable	Overall (n=1508)	Q1 (n=302)	Q2 (n=303)	Q3 (n=303)	Q4 (n=300)	Q5 (n=302)
Total fiber, g/day, median (IQR)	19.2 (15.7,22.9)	13.1 (11.6,14.1)	16.4 (15.4,17.2)	19.2 (18.3, 19.8)	22.0 (21.2, 22.9)	27.0 (25.3, 29.9)
Carbohydrate-to-fiber ratio	10.14 (3.0)	13.31 (3.4)	11.35 (2.2)	10.32 (1.9)	9.01 (1.6)	7.61 (1.8)
Age, years	80.8 (7.1)	80.0 (7.6)	81.5 (6.9)	81.2 (6.6)	80.7 (7.1)	80.4 (7.3)
Female, %	75%	81%	79%	72%	74%	70%
Education, years	15.4 (3.1)	14.4 (2.8)	15.3 (3.1)	15.5 (3.2)	15.8 (3.0)	16.0 (2.9)
BMI, kg/m²	27.5 (5.0)	28.6 (5.6)	27.5 (5.1)	27.7 (4.7)	26.9 (4.8)	26.7 (4.8)
Physical activity, h/wk	3.6 (3.7)	2.9 (4.0)	3.0 (3.3)	3.2 (2.8)	4.0 (3.8)	4.7 (4.3)
Total calories, kcal/day	1730 (547)	1652 (693)	1758 (564)	1800 (515)	1779 (492)	1666 (420)

Over a mean follow-up of 7.6 ± 4.6 years, 430 (28%) MAP participants developed dementia

Figure 1. Multivariate-adjusted absolute risk of dementia by quintiles of total fiber intake, MAP (N=1,508)

Absolute risk of dementia are derived from cause-specific Cox models censoring at death and controlling for age, sex, education, BMI, physical activity, total energy intake, folate, omega-3 fatty acids, lutein, and vitamins C and E. Curves represent the absolute risk of dementia at each time of follow-up of an average study participant profile.

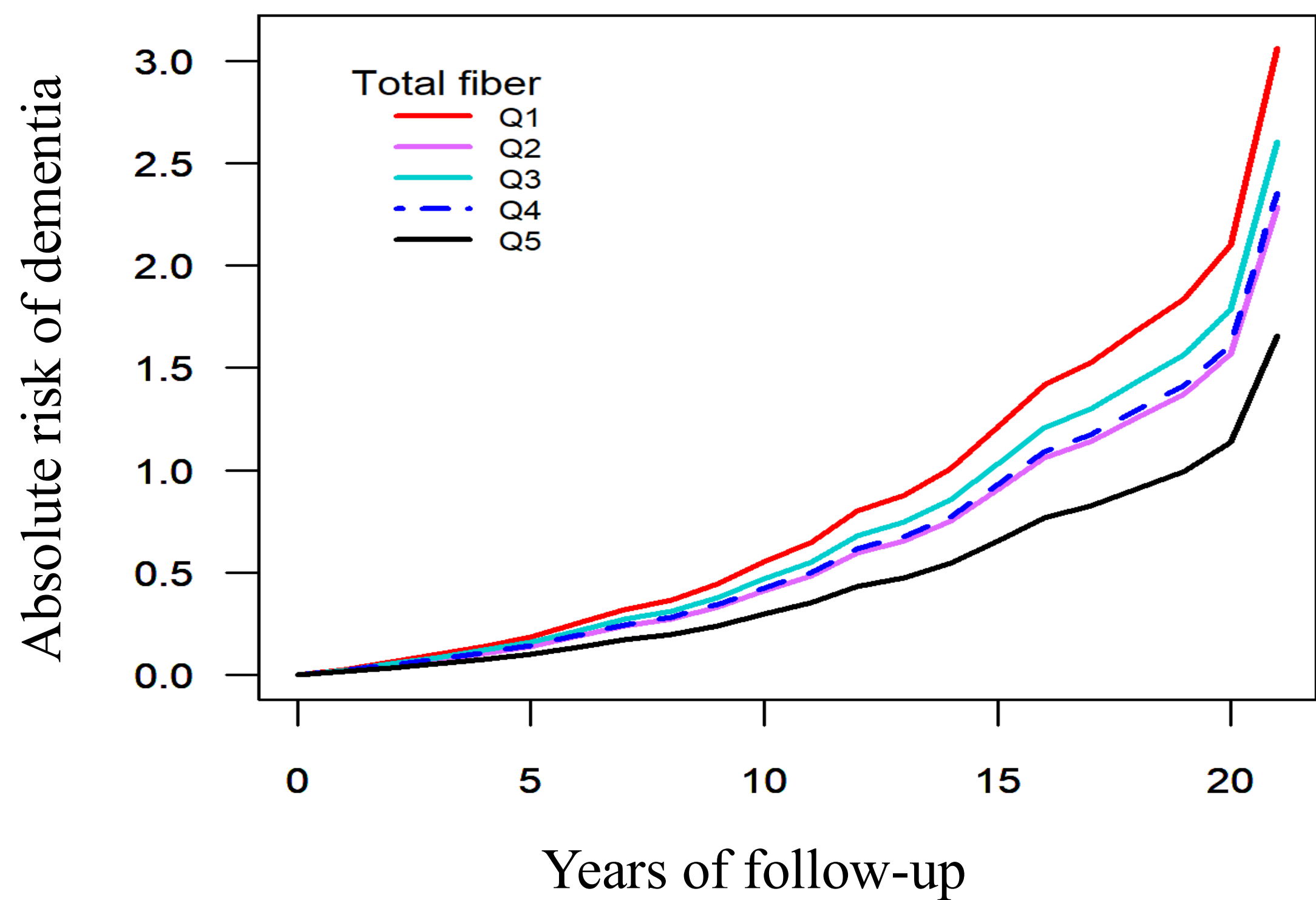


Figure 2. Multivariate-adjusted mean trajectories of change in global cognition by quintiles of total fiber intake, MAP (N=1,508).

Mean trajectories (solid and dashed lines) and 95%CI (indicated with shadings) were estimated using a linear mixed model adjusted for sex, age, education, BMI, physical activity, total energy intake, folate, omega-3 fatty acids, lutein, and vitamins C and E, and lutein, on both the intercept and the slope; the model also included a time-varying term for the mode of cognitive assessment (in-person/phone); within-participant correlation was captured by correlated random intercept and slope.

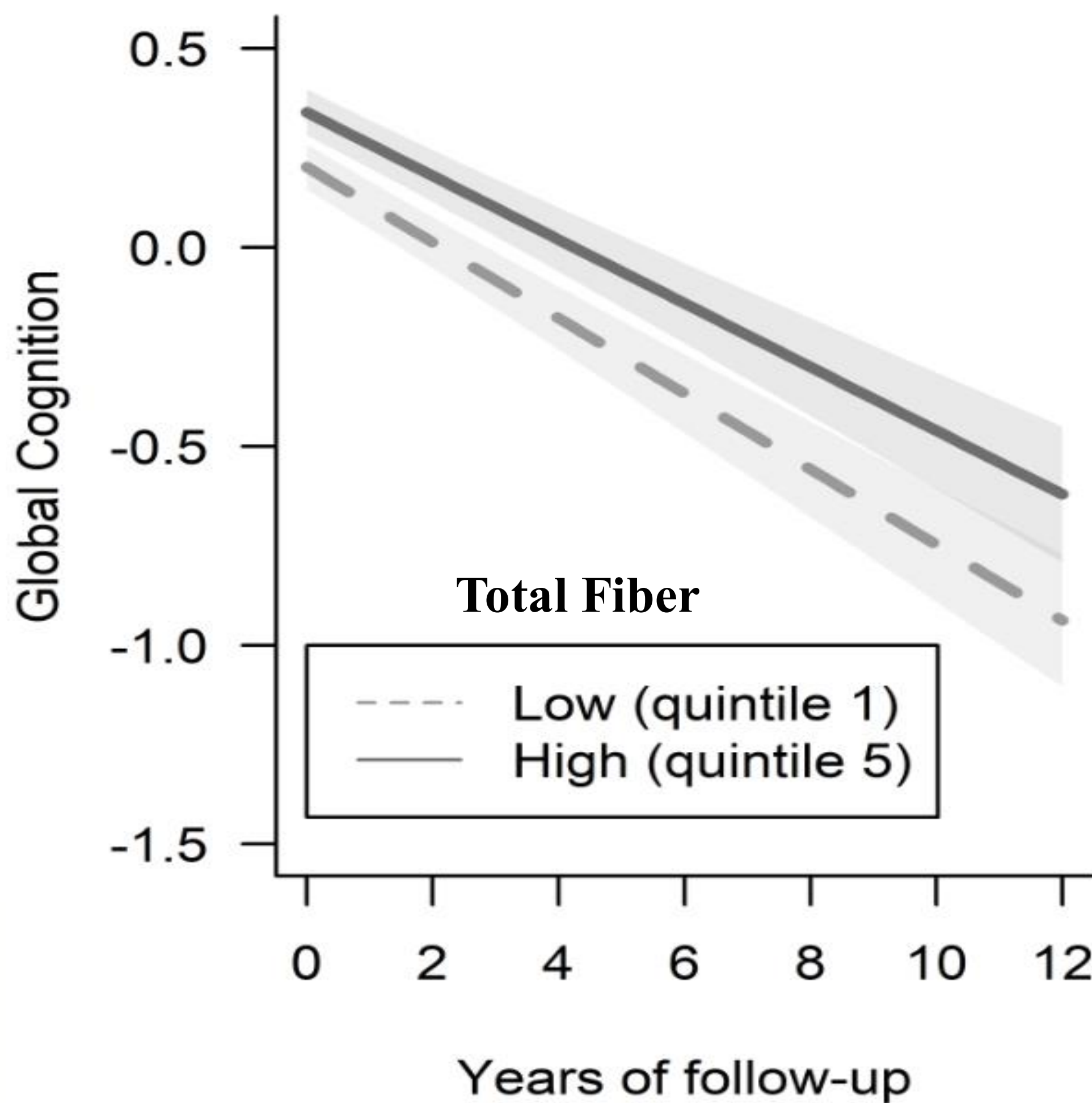


Table 2. Multivariable-adjusted relative risks (HR) of dementia by quintiles of fiber intake, MAP.

Exposure	Quintile [min-max]	Model 1 ^a HR (95%CI)	Model 2 ^b HR (95%CI)	Model 3 ^c HR (95%CI)
Total fiber (n=1,508)	Q1 [6.59–14.86]	Ref	Ref	Ref
	Q2 [14.87–17.76]	0.82 (0.61,1.09)	0.82 (0.61, 1.10)	0.81 (0.60, 1.09)
	Q3 [17.77–20.46]	0.90 (0.68,1.19)	0.94 (0.71, 1.25)	0.94 (0.70, 1.26)
	Q4 [20.47–24.12]	0.84 (0.63,1.12)	0.83 (0.62, 1.13)	0.83 (0.60, 1.14)
	Q5 [24.13–51.51]	0.58 (0.42, 0.80)	0.61 (0.44, 0.84)	0.61 (0.42, 0.87)
	p-trend	p=0.0024	p=0.0069	p=0.016
Carbohydrate-to-Fiber Ratio (n=986)	Q1 [2.13–7.73]	Ref	Ref	Ref
	Q2 [7.73–9.15]	1.28 (0.82, 2.00)	1.38. (0.87, 2.19)	1.43 (0.90, 2.27)
	Q3 [9.16–10.51]	1.56 (1.00, 2.43)	1.63 (1.03, 2.58)	1.77 (1.10, 2.86)
	Q4 [10.52–12.27]	1.66 (1.06, 2.60)	1.64 (1.02, 2.63)	1.79 (1.08, 2.96)
	Q5 [12.27–23.43]	1.76 (1.13, 2.74)	1.89 (1.19, 2.99)	2.09 (1.28, 3.43)
	p-trend	p=0.0082	p=0.0076	p=0.0049
Insoluble fiber (n=986)	Q1 [2.62–9.77]	Ref	Ref	Ref
	Q2 [9.77–11.99]	0.96 (0.66, 1.40)	0.96 (0.65, 1.42)	0.98 (0.66, 1.45)
	Q3 [12.02–13.88]	0.70 (0.47, 1.04)	0.73 (0.49, 1.10)	0.73 (0.48, 1.10.)
	Q4 [13.90–16.70]	0.77 (0.52, 1.14)	0.76 (0.50, 1.13)	0.77 (0.51, 1.18)
	Q5 [16.70–42.66]	0.73 (0.49, 1.09)	0.72 (0.48, 1.09)	0.70 (0.44, 1.10)
	p-trend	p=0.075	p=0.073	p=0.076
Soluble fiber (n=986)	Q1 [2.23–5.32]	Ref	Ref	Ref
	Q2 [5.33–6.35]	0.62 (0.41, 0.92)	0.59 (0.39, 0.88)	0.61 (0.41, 0.92)
	Q3 [6.36–7.21]	0.79 (0.54, 1.16)	0.79 (0.54, 1.17)	0.80 (0.54, 1.19)
	Q4 [7.21–8.57]	0.65 (0.43, 0.97)	0.64 (0.43, 0.96)	0.67 (0.44, 1.03)
	Q5 [8.58–20.51]	0.60 (0.40, 0.92)	0.58 (0.37, 0.89)	0.56 (0.36, 0.88)
	p-trend	p=0.063	p=0.054	p=0.045

- ^a Cause-specific Cox model adjusted for demographics and total calories
- ^b Further adjusted for BMI and physical activity
- ^c Further adjusted for folate, omega-3, lutein, vitamins C and E

STRENGTHS & LIMITATIONS

Strengths: Prospective community cohort; dementia-free at baseline, long follow-up with annual validated cognitive assessments (~8 years), detailed validated diet data; fiber subtypes examined

Limitations: Observational design, self-reported dietary intake, limited generalizability (older, select cohort)

CONCLUSIONS

- Higher total dietary fiber intake was associated with a lower risk of dementia, independent of demographics, lifestyle, and other key nutrients.
- Similar inverse associations were observed for soluble fiber, whereas the association for insoluble fiber was not statistically significant but suggested a similar inverse trend.
- Higher carbohydrate-to-fiber ratio was also associated with increased dementia risk
- Fiber intake was associated with better baseline global cognitive level but not with rate of cognitive decline over follow-up.

FUNDING

- Rush Medical Student Summer Research Fellowship
- National Institute of Health/ NIA: R01AG085483, R01AG17917, P30AG072975