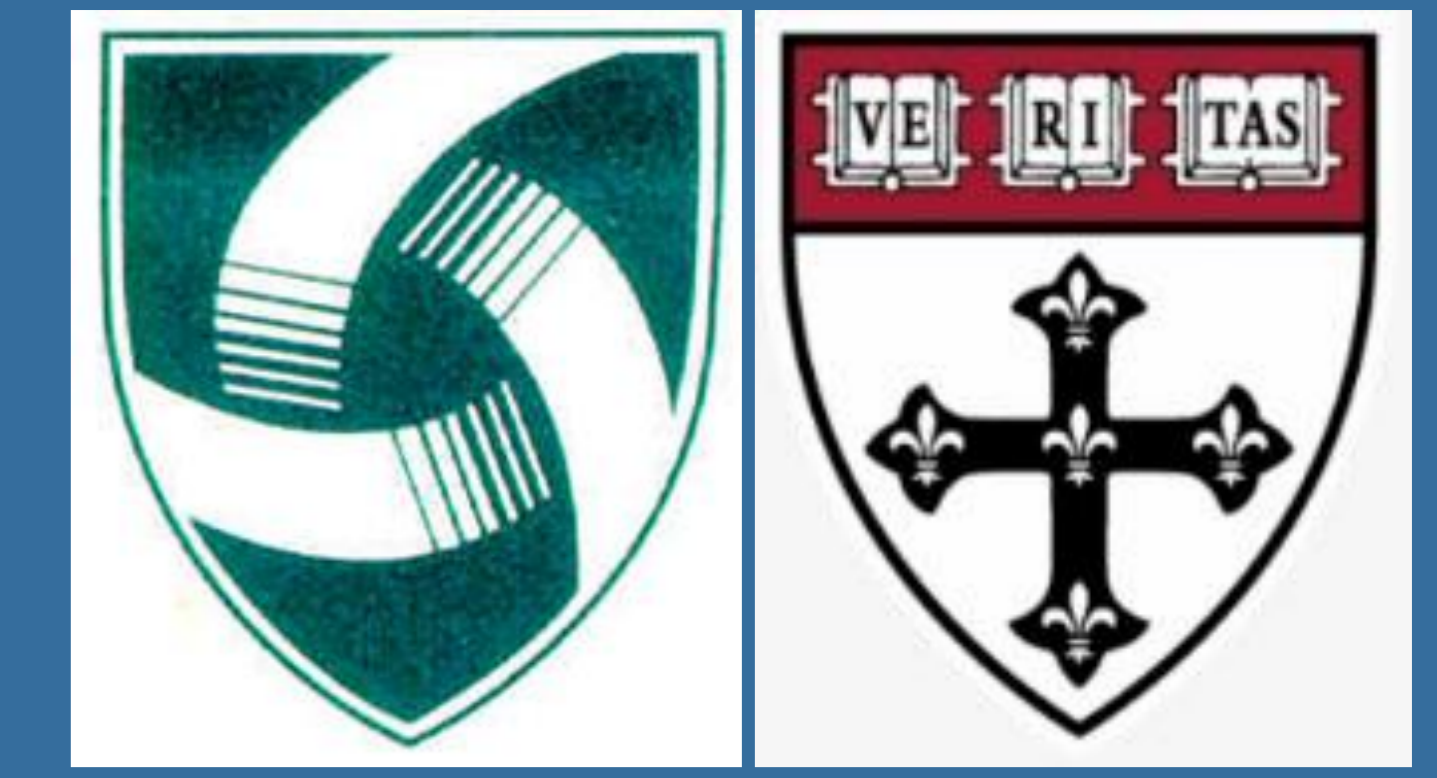




WHOLE GRAINS AND DIETARY FIBER WERE ASSOCIATED WITH REDUCED RISK OF LIVER CANCER AND CHRONIC LIVER DISEASE MORTALITY

Xing LIU^{1,2}, Wanshui YANG^{3,4}, Jessica L. PETRICK⁵, Linda M. LIAO⁶, Weibing WANG², Na HE², Peter T. CAMPBELL⁷, Zuo-Feng ZHANG^{8,9}, Edward GIOVANNUCCI^{1,3}, Katherine A. MCGLYNN⁶, Xuehong ZHANG^{1,3*}

¹T.H. Chan School of Public Health, Harvard University, Boston, MA, USA; ²School of Public Health, Fudan University, Shanghai, P.R. China; ³Channing Division of Network Medicine, Brigham and Women's Hospital and Harvard Medical School, Boston, MA, USA; ⁴School of Public Health, Anhui Medical University, Hefei, Anhui, P.R. China; ⁵Slope Epidemiology Center, Boston University, Boston, MA, USA; ⁶Division of Cancer Epidemiology and Genetics, National Cancer Institute, Bethesda, MD, USA; ⁷Behavioral and Epidemiology Research Group, American Cancer Society, Atlanta, Georgia, USA; ⁸Fielding School of Public Health, University of California, Los Angeles, CA, USA; ⁹Jonsson Comprehensive Cancer Center, UCLA, Los Angeles, CA, USA.



INTRODUCTION

Primary liver cancer is the third most common cause of cancer-related mortality worldwide with hepatocellular carcinoma (HCC) and intrahepatic cholangiocarcinoma (ICC) as the two major types.

Chronic liver diseases (CLD) including cirrhosis, fibrosis, alcoholic liver disease and chronic hepatitis are important precursors of HCC.

High fatality suggests that primary prevention for liver cancer is important. The relationship between dietary factors and liver diseases remains to be further explored.

Whole grains contain the endosperm, bran and germ, serve as valuable food sources of dietary fiber, vitamin B, E, selenium, zinc, etc. Whole grains and dietary fiber have long been considered beneficial in lowering the risks of type 2 diabetes mellitus, cardiovascular diseases and some types of human cancers.

RESULTS

Whole grain intake was associated with reduced risk of liver cancer:

HR_{Q5 vs. Q1}=0.78, 95% CI: 0.63-0.96 and CLD mortality:

HR_{Q5 vs. Q1}=0.44, 95% CI: 0.35-0.55 in multivariable adjusted Cox models.

Total dietary fiber intake was associated with reduced risk of liver cancer:

HR_{Q5 vs. Q1}=0.69, 95% CI: 0.53-0.90 and CLD mortality:

HR_{Q5 vs. Q1}=0.37, 95% CI: 0.29-0.48

Fiber from vegetables, beans and grains showed significant inverse associations with both outcomes.

Similar patterns were observed for hepatocellular carcinoma, but not intrahepatic cholangiocarcinoma.

Table 1 Baseline characteristics according to whole grain and total fiber intake among participants of National Institute of Health, American Association of Retired Persons (NIH-AARP) Diet and Health Study

	Categories for whole grain intake			Categories for total dietary fiber intake		
	Quintile 1 (n=96681)	Quintile 3 (n=99242)	Quintile 5 (n=97399)	Quintile 1 (n=97179)	Quintile 3 (n=97095)	Quintile 5 (n=97115)
Age, yr	61.5	61.5	61.5	61.5	61.5	61.5
Female, %	40.2	40	40.3	40.2	40.2	40.2
White, %	91.9	93.4	92.2	92.1	93.8	90.8
College and above, %	33.7	41.4	41.6	34.9	40.8	42.6
BMI, kg/m ²	27.1	27.1	26.9	27.1	27.1	27
Physical activity 5+ times/week, %	15.5	19	24.2	12.5	18.7	28.1
Alcohol, gram/day	14.7	10.7	8.1	12.7	11.4	8.9
Current smoking, %	19.2	10.9	8.7	19.2	11.1	7.5
Self-reported diabetes, %	7.4	8.8	11.1	7.8	9	10.3
Whole grains, oz/d	0.2	0.8	2.2	0.5	1	1.7
Dietary fiber intake, g/d						
Total	13.2	18.2	26.4	9.1	17.5	32.5
Fruits	3	4.1	5.3	1.7	3.7	7.5
Vegetables	5.1	6.2	7.9	3.1	5.8	11
Beans	1.6	2	2.7	0.9	1.8	4.1
Grains	3.3	5.7	10.3	3.2	5.9	9.7

Values are means for continuous variables, percentages for categorical variables, and are standardized to the age distribution of the study population.

Table 2 The associations between whole grains and dietary fiber with risk of liver cancer from the NIH-AARP Diet and Health Study

	HR (95% CI)					P trend
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5	
Whole grains						
Case number	214	194	198	155	179	
Model 1 (ref)		0.91 (0.74, 1.10)	0.91 (0.75, 1.11)	0.73 (0.59, 0.90)	0.78 (0.63, 0.96)	0.90 (0.83, 0.97)
Total dietary fiber						
Case number	193	210	177	187	173	
Model 1 (ref)		1.04 (0.85, 1.27)	0.83 (0.67, 1.04)	0.84 (0.67, 1.05)	0.69 (0.53, 0.90)	0.81 (0.72, 0.90) <0.001
Fiber from fruits						
Case number	185	197	186	185	187	
Model 1 (ref)		1.06 (0.87, 1.30)	1.00 (0.82, 1.24)	0.98 (0.79, 1.20)	0.94 (0.76, 1.17)	0.99 (0.92, 1.07) 0.822
Fiber from vegetables						
Case number	211	186	202	180	161	
Model 1 (ref)		0.89 (0.73, 1.08)	0.94 (0.77, 1.14)	0.80 (0.65, 0.99)	0.65 (0.52, 0.83)	0.82 (0.74, 0.91) <0.001
Fiber from beans						
Case number	198	197	203	153	189	
Model 1 (ref)		1.01 (0.83, 1.23)	1.05 (0.86, 1.28)	0.77 (0.62, 0.96)	0.89 (0.71, 1.10)	0.90 (0.83, 0.99) 0.023
Fiber from grains						
Case number	196	205	169	198	172	
Model 1 (ref)		1.02 (0.83, 1.24)	0.82 (0.67, 1.02)	0.95 (0.77, 1.17)	0.78 (0.62, 0.99)	0.91 (0.84, 0.99) 0.037

Models were stratified by sex, adjusted for age at baseline (continuous), level of education ('<=11 yrs', 'High school', 'Vocational technology school', 'Some College', 'College/Post Graduate'), race ('Non-Hispanic White', 'Non-Hispanic Black', 'Hispanic', 'Asian, Pacific Islander, or American Indian/Alaskan Native'), BMI ('<25', '25-30', '30+', kg/m²), alcohol use ('Non-drinker', '0.1-4.9', '5-9.9', '10+', gram/day), tobacco smoking ('Never smoked', 'Former smoker', 'Current smoker'), physical activity ('Never', 'Rarely', '1-3 times per month', '1-2 times per week', '3-4 times per week', '5+ times per week'), history of diabetes ('No', 'Yes') and total energy intake (continuous).

AIM

To examine the association of whole grain and dietary fiber intake with risk of liver cancer and chronic liver disease mortality.

METHOD

Design:

Prospective cohort study
The NIH-AARP Diet and Health Study
Following up 566,398 participants aged 50-71 from six U.S. states 1995-2011

Subjects:

485,717 eligible participants

Outcomes:

940 primary liver cancer identified by registries
993 CLD deaths identified by National Death Index Plus

Data collection:

Epidemiologic information collected by mail
Dietary factors obtained by FFQ at baseline

Exposure:

Whole grain intake
Dietary fiber overall and from different sources:
Total/Fruits/Vegetables/Beans/Grains

Covariate:

Age, race, weight, height, level of education, tobacco, alcohol, physical activity, history of diabetes, and total energy intake.

Statistical analysis:

Cox proportional hazard regression model

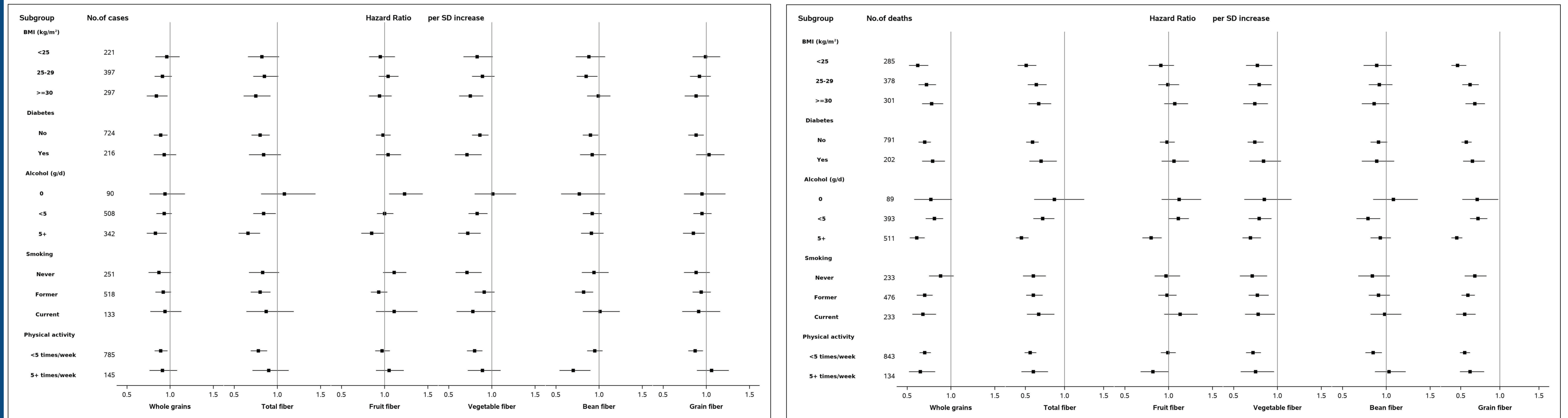


Figure 1 & 2. Stratified analyses for association between whole grain and dietary fiber intake with liver cancer incidence and chronic liver disease mortality among the participants of NIH-AARP Diet and Health Study.

CONCLUSIONS

Those in the highest quintile for intake of whole grains had a 22% lower risk of liver cancer and a 56% lower risk of CLD mortality;
Those in the highest quintile for intake of total dietary fiber had a 31% lower risk of liver cancer and a 63% lower risk of CLD mortality;
Higher intake of fiber from vegetables, grains, beans, but not fruits was associated with the reduced risk.

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CONTACT INFORMATION

Dr. Xuehong Zhang: xuehong.zhang@channing.harvard.edu
Dr. Xing Liu: xing.liu@channing.harvard.edu