Supplemental Online Content

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This supplemental material has been provided by the authors to give readers additional information about their work.

eMethods. Supplementary Methods

Dietary assessment

Diet was assessed in 1991, 1995, 1999, 2003, 2007, 2011 and 2015 in Nurses' Health Study II (NHSII) using a semi-quantitative food frequency questionnaire (FFQ, eFigure 1). Participants were asked how frequently they consumed each food item in common portion size during the past year, with nine possible responses ranged from "Never or less than once per month" to "6+ per day".

To estimate servings of food groups consumed per day, we first converted the FFQ responses to servings/day and then summed up all food items in each food group. For example, whole grains included oats, brown rice, dark bread, whole-grain cracker, whole-grain cereal, bran, and wheat germ, while refined grains included white bread, white rice, muffin, pancake, pasta, and tortilla. We used the Harvard T. H. Chan School of Public Health nutrient database updated during each questionnaire cycle to calculate nutrient intakes. Previous validation studies in men and women have demonstrated comparable reproducibility (intraclass correlation coefficients: 0.49-0.71 in women) and modest correlation (Spearman correlation coefficient r: 0.36-0.75 in women) between FFQs and one-week food diaries.^{1, 2}

Specifically, for gluten intake, we first identified food items with gluten-containing ingredients like wheat, wheat bran, wheat germ, rye, barley, cereal, and pasta, according to the ingredient lists on commercial product labels provided by manufacturers and recipes on cookbooks for home-cooked items. Then, we quantified the gluten content of the gluten-containing ingredients in all food item by multiplying the protein content of these ingredients with an approximate proportion of gluten (75%), in line with previous studies,^{3, 4} though the proportion of gluten in protein may be more variable in barley and rye than wheat.⁵ We did not calculate the trace amount of gluten in oats and certain condiments like soy sauce since the quantity of gluten in these foods would be negligible compared to the total gluten intake.⁶ Next, we added up gluten from all foods consumed to estimate total gluten intake.

In a recent validation study using 7-day dietary records, FFQ-derived gluten intake showed moderate to high validity (r: 0.58 for gluten, median r: 0.60 for gluten-rich foods).⁷ Another validation studies also showed reasonable correlation between FFQ-derived and 7-day diet records-derived major sources of gluten (e.g., r: 0.79 for cold cereal).⁸ Zong et al. has reported the trend of gluten intake over the past two decades in NHSII and major sources of gluten consumed in 2011, including whole-grain bread, pasta, cold cereal, pizza, and wheat products like pretzel, bagel, muffin, crackers, white bread, and tortilla.⁴

To account for confounding from total energy intake and potential under- or over-reporting, we adjusted gluten intake for total energy intake using the residual method. As previously described,⁹ absolute nutrient intake was regressed on total energy intake to get the nutrient residual, which was uncorrelated with the total energy intake, allowing direct evaluation of the variation in nutrient composition. To estimate long-term intakes, we averaged across FFQs preceding the cognitive assessment. For participants who completed cognitive assessment before the 2015 questionnaire cycle, we averaged daily gluten intake reported in 1991, 1995, 1999, 2003, 2007, and 2011. For the rest of participants, we averaged daily gluten intake reported in 1991, 1995, 1999, 2003, 2007, 2011, and 2015. We categorized participants into quintiles of energy adjusted gluten intake (0.1-<5.1, 5.1-<5.9, 5.9-<6.6, 6.6-<7.6,7.6-<18.3 g/day) to assess potential non-linear relationships and threshold of effect.

Cognitive assessment

We used the CogState Brief Battery to assess cognitive function of participants.¹⁰ The CogState Brief Battery was self-administered at home via a web-based interface and took about 15-20 minutes to complete.¹⁰ As the battery were loaded from Internet and ran locally on participants' computers, the cognitive performance would not be affected by Internet connection and speed. Hardware differences would cause minimal time variation as well (on the order of milliseconds).¹¹ The validity of this unsupervised online battery has been well-demonstrated,¹²⁻¹⁴ and its utility has been evaluated in large population-based epidemiological studies.^{10, 11} Moreover, the CogsState battery was sensitive in detecting mild cognitive impairment^{12, 15} and had comparable performance in supervised and unsupervised settings.¹⁴

The CogState Brief Battery contained four tasks in the following order, all involved images of playing cards: Detection, Identification, One Card Learning, and One Back.¹⁰ Participants had to view instructions and complete a practice trial before each task started. During each task, participants responded to playing cards by pressing the "K" and "D" computer keys, which meant "Yes" and "No", respectively. As previously described, 10-14 in Detection, which assessed psychomotor function and information processing speed, participants pressed the "K" key as quickly as possible when a joker card turned face-up. In Identification, which assessed visual attention and vigilance, participants pressed the "K" or "D" key as quickly as possible to indicate whether the faced-up joker card was red or not. In One Card Learning, which assessed visual recognition memory and attention, participants responded "K" or "D" if the faced-up card (normal playing card without joker) had appeared in the task before or not. In One Back, which assessed working memory and attention, participants responded "K" or "D" if the faced-up normal playing card was the same as the immediately previous card or not. The speed (mean reaction time in milliseconds) and accuracy (proportion correct) were recorded for each task. The performance on Detection, Identification, and One Back was measured based on the \log_{10} transformed reaction time for correct responses. These scores were then standardized by z-normalization and reversed so that a higher score indicated better performance. The performance on One Card Learning was measured based on arcsine square-root transformed proportion of correct responses. This score was also standardized using z-normalization. A validation study by Lim et al. found that patients with mild cognitive impairment and Alzheimer's disease had greatest impairment in memory (One Card Learning and One Back) and apolipoprotein E4 genotype had negative influence on performance in One Card Learning.¹⁵

Consistent with previous studies,¹¹⁻¹⁴ we computed composite scores on these tasks as these scores may be more sensitive to detect cognitive variations than individual task scores. We averaged the z-scores on Detection and Identification to calculate psychomotor speed/attention score, averaged the z-scores on One Card Learning and One Back to calculate learning/working memory score, and averaged the z-scores on all four tasks to calculate the global cognition score. These composite scores were then re-standardized using z-normalization so that one unit increase in score indicated 1 SD higher than the sample mean. The composite score was not computed if any of the contributing task scores was missing. We excluded implausibly low score based on cutoffs of percent correctness for each task recommended by CogState (Detection: <0.8; Identification: <0.8; One Card Learning: <0.5; One Back: <0.7), because they were likely due to technical errors. These composite scores have been shown to have high test-retest reliability (r=0.95) in identifying adults with cognitive impairment.¹² Sumner et al. has shown that the standardized loadings for responses times on Detection (0.68) and Identification (0.69) and One Back (0.85) for the learning/working memory factor were high in a confirmatory factor analysis of NHSII cohort,¹¹ indicating that these composite scores were applicable in our cohort.

Covariates

Participants self-reported date of birth, race (White/non-White), husband's education (high school or below, college, graduate, unmarried or missing), family income (dollar), personal history of diseases (hypertension, diabetes, hypercholesterolemia, myocardial infarction, depression, cancer, and dementia), body mass index (BMI, kg/m²), smoking status (never, past, current, and missing n=12), regular use of medications (antidepressant, aspirin, non-steroidal anti-inflammatory drugs, postmenopausal hormone), use of multivitamin, and alcohol intake (g/day) in questionnaires. We averaged BMI, physical activity, total energy intake, and alcohol intake across questionnaire cycles from 1991 to the most recent questionnaire (2011, 2013, or 2015) prior to cognitive assessment, and acquired other covariates from the most recent questionnaire prior to cognitive assessment. Husband's education was measured in 1999 (missing n=391). We used husband's education as an indicator for socioeconomic status because participants in NHSII were nurses with similar education background. We included family income as a covariate to additional capture another domain of socioeconomic status of participants, since it has been found to be associated with diet quality and cognitive function.^{16, 17}

We assessed current depression status based on self-reported depression diagnosis, treatment, and clinically relevant depressive symptoms (≥ 10) according to the validated 10-item Centre for Epidemiological Studies Depression Scale (CES-D-10), which was assessed in 2013. The CES-D-10 includes 3, 5, and 2 questions on depressed effect, somatic symptoms, and positive affect in the past week, respectively, with options ranging from "rarely or none of the time", which contributes 0 score, to "all of the time", which contributes 3 scores.¹⁸ We included depression status as a covariate because it has been shown that depression was associated with cognitive deficits.¹⁹

We computed the Alternative Health Eating Index 2010 (AHEI-10) as described previously,²⁰ without alcohol and whole grain components. The included AHEI-10 components each assigned a score of 0-10, with higher scores for higher intakes of vegetables, fruits, nuts and legumes, long-chain (n-3) fatty acids, and poly-unsaturated fatty acids, but lower scores for higher intakes of fruit juice and sugar-sweetened beverages, red and processed meats, trans fats, and sodium.²⁰ This score has been widely used in NHSII studies to assess diet quality^{4, 11} and was strongly associated with major chronic diseases like coronary heart disease, diabetes, and cancer.²⁰ Like other dietary variables, we averaged AHEI-10 scores across previous questionnaires.

For 22, 5, and 8 participants with missing information on family income, BMI, and AHEI-10, respectively, we imputed missing values with median values of these variables. For 2 participants with missing information on aspirin or non-steroidal anti-inflammatory drug use, we carried forward the last non-missing response.

Statistical analysis

We included the above covariates in our multivariable-adjusted linear regression model examining mean difference in each standardized cognitive score comparing across quintiles of gluten intake. We used a linear trend analysis to test the overall significance of the gluten variable and whether the cognitive score increased or decreased across gluten quintiles, by assigning the median quintile value to each gluten category (4.45 g/day, 5.48 g/day, 6.23 g/day, 7.03 g/day, 8.34 g/day) and testing this variable as a continuous variable. This trend test has been widely used in prior analyses of data from our cohort.^{3, 4, 20, 21} To test the robustness of this trend test, we modeled the continuous gluten intake variable in g/day to test its linear relationships with cognitive scores.

To assess whether gluten intake during different time periods relative to the cognitive assessment would produce different results, we first calculated gluten intake assessed during each 4-year FFQ cycle (\leq 4 years, 4-8 years, 8-12 years, 12-16 years, 16-20 years, and 20-24 years before cognitive assessment), average gluten intake in distant past (12-24 years), and average gluten intake in recent past (4-12 years), and then used each of these gluten variables in the linear model as the main exposure. To test whether change in gluten intake over time would affect cognitive function, we calculated the change in gluten intake from distant to recent past (mean: -0.87 g/day) and examined the mean difference in each cognitive score associated with per 1 SD (1.98 g/day) increase in gluten intake.

Other statistical analyses have been described in detail in the Methods section of main texts.

eTable 1. Mean Differences in Standardized Cognitive Scores Associated With Continuous Gluten Intake in Grams per Day Among 13 494 Women

Composite cognitive scores ^a	Age-adjust	ed	Multivariable-ac	ljusted ^ь
	Estimate (95% confidence interval)	Р	Estimate (95% confidence interval)	Р
Psychomotor speed/attention	-0.003 (-0.01, 0.01)	0.63	-0.01 (-0.02, 0.004)	0.23
Learning/working memory	0.01 (-0.00001, 0.02)	0.05	0.005 (-0.01, 0.02)	0.39
Global cognition	0.004 (-0.01, 0.01)	0.47	-0.002 (-0.01, 0.01)	0.73

^a Standardized scores for psychomotor speed/attention, learning/working memory, and global cognition were calculated by standardizing as the mean of the standardized scores of the following CogState battery tasks: Detection + Identification, One Card Learning + One-Back, and all four tasks, respectively. Higher scores indicate better performance, with one unit increase represents 1 SD higher than the mean.

^b Energy-adjusted gluten intake was cumulatively averaged from 1991 to the last questionnaire cycle preceding the cognitive assessment. Model was adjusted for age (years), race (white, non-white), body mass index (kg/m²), husband's educational attainment (high school or below, college, graduate school, unmarried/missing), family income (dollar), history of diabetes (yes, no), history of hypertension (yes, no), history of hypercholesterolemia (yes, no), history of myocardial infarction (yes, no), current depression status (yes, no), smoking (never, past, current, missing), aspirin or non-steroid anti-inflammatory drug use (yes, no), multivitamins use (yes, no), physical activity (metabolic equivalents/week), menopausal status and hormone use (pre-menopause, post-menopause and never/past/current user of hormone therapy), total energy intake (kcal/d), alcohol intake (g/d), and Alternative Healthy Eating Index score (excluding alcohol and whole grains).

eTable 2. Mean Differences in Standardized Cognitive Scores Associated With Deciles of Gluten Intake Among 13 494 Women^a

				ſ	Deciles of average	je gluten in	take				P-
Model	Q1 (lowest)	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10 (highest)	trend
Median gluten intake (g/day)	3.97	4.79	5.28	5.68	6.04	6.41	6.82	7.29	7.90	9.04	
Psychomotor	speed/atten	tion ^c									
Age-adjusted	Ref.	0.02 (-0.06, 0.09)	0.005 (-0.07, 0.08)	0.04 (-0.03, 0.12)	0.03 (-0.05, 0.10)	0.03 (-0.04, 0.10)	0.01 (-0.07, 0.08)	-0.02 (-0.09, 0.05)	0.02 (-0.06, 0.09)	-0.01 (-0.08, 0.06)	0.52
Multivariable- adjusted ^d	Ref.	0.09) 0.01 (-0.06, 0.09)	-0.002 (-0.08, 0.07)	0.12) 0.03 (-0.04, 0.11)	0.02 (-0.06, 0.09)	0.02 (-0.06, 0.09)	-0.002 (-0.07, 0.07)	-0.04 (-0.11, 0.04)	0.09) 0.005 (-0.07, 0.08)	-0.03 (-0.11, 0.04)	0.18
Learning/work	king memory	/ ^c									
Age-adjusted	Ref.	0.01 (-0.06, 0.09)	0.01 (-0.06, 0.08)	0.05 (-0.02, 0.13)	0.09 (0.01, 0.16)	0.11 (0.04, 0.18)	0.09 (0.01, 0.16)	0.05 (-0.02, 0.12)	0.06 (-0.01, 0.14)	0.05 (-0.03, 0.12)	0.05
Multivariable- adjusted ^d	Ref.	-0.00 (-0.07, 0.07)	-0.01 (-0.08, 0.06)	0.03 (-0.04, 0.11)	0.06 (-0.01, 0.14)	0.08 (0.01, 0.15)	0.06 (-0.01, 0.13)	0.02 (-0.05, 0.09)	0.03 (-0.04, 0.11)	0.01 (-0.06, 0.08)	0.38
Global cogniti	on ^c	,			1 1						I
Age-adjusted	Ref.	0.02 (-0.05, 0.09)	0.01 (-0.06, 0.08)	0.06 (-0.02, 0.13)	0.06 (-0.01, 0.14)	0.08 (0.01, 0.15)	0.05 (-0.02, 0.13)	0.01 (-0.06, 0.09)	0.05 (-0.03, 0.12)	0.02 (-0.06, 0.09)	0.54
Multivariable- adjusted ^d	Ref.	0.01 (-0.07, 0.08)	-0.01 (-0.08, 0.07)	0.04 (-0.03, 0.11)	0.05 (-0.03, 0.12)	0.06 (-0.02, 0.13)	0.03 (-0.04, 0.11)	-0.01 (-0.09, 0.06)	0.02 (-0.05, 0.09)	-0.02 (-0.09, 0.06)	0.66
	-	•	•	•	estionnaire cycle prec	eding the cogr	nitive assessment	t.			
^b P-trend was calcu	8	3									
CogState battery ta higher than the me	asks: Detection an.	+ Identification,	One Card Learnir	ng + One-Back,	and global cognition w and all four tasks, res	pectively. High	er scores indicate	e better perform	ance, with one	unit increase represe	nts 1 SD
income (dollar), his smoking (never, pa	tory of diabetes ast, current, miss menopause, pos	(yes, no), histo sing), aspirin or st-menopause a	ory of hypertensio non-steroid anti-ir	n (yes, no), histo nflammatory dru	(m2), husband's educa ory of hypercholestero g use (yes, no), multiv mone therapy), total e	lemia (yes, no) ritamins use (ye), history of myoo es, no), physical a	cardial infarction activity (metabo	(yes, no), curre lic equivalents/\	ent depression status week), menopausal s	(yes, no), tatus and

eTable 3. Multivariable-Adjusted Differences in Standardized Psychomotor Speed and Attention Score Across Quintiles of Gluten Intake by Smoking Status With Additional Adjustment for Refined Grains Among 13 494 Women^a

Strata	n			Quintiles of gluten	intake		<i>P</i> -	P-
Sirald	n	Q1 (lowest)	Q2	Q3	Q4	Q5 (highest)	trend ^b	interaction ^c
Women who never smoked	8,932	Ref.	0.02 (-0.05, 0.08)	0.02 (-0.04, 0.09)	0.01 (-0.05, 0.08)	0.02 (-0.05, 0.09)	0.69	0.02
Women who ever smoked	4,550	Ref.	0.01 (-0.08, 0.10)	0.02 (-0.07, 0.11)	-0.07 (-0.17, 0.02)	-0.06 (-0.17, 0.04)	0.09	

^a Energy-adjusted gluten intake was cumulatively averaged from 1991 to the last questionnaire cycle preceding the cognitive assessment. Model was adjusted for age (years), race (white, non-white), body mass index (kg/m²), husband's educational attainment (high school or below, college, graduate school, unmarried/missing), family income (dollar), history of diabetes (yes, no), history of hypercholesterolemia (yes, no), history of myocardial infarction (yes, no), current depression status (yes, no), smoking (never, past, current, missing), aspirin or non-steroid anti-inflammatory drug use (yes, no), multivitamins use (yes, no), physical activity (metabolic equivalents/week), menopausal status and hormone use (pre-menopause, post-menopause and never/past/current user of hormone therapy), total energy intake (kcal/d), alcohol intake (g/d), Alternative Healthy Eating Index score (excluding alcohol and whole grains), and refined grain intake. Standardized scores of two CogState battery tasks, Detection and Identification. A higher score indicated better performance, with one unit increase representing 1 SD higher than the mean.

^b *P*-trend was calculated using the median gluten intake for each quintile as a continuous variable.

^c *P*-interaction was estimated using an interaction term of gluten intake and the respective stratifying variable.

		Q	uintiles of average gl	uten intake		
Model	Q1 (lowest)	Q2	Q3	Q4	Q5 (Highest)	– <i>P</i> -trend ^t
Psychomotor speed/attentionv°						
Standardized score mean (SD)	-0.02 (1.03)	0.01 (1.00)	0.03 (0.96)	0.01 (0.99)	0.03 (0.99)	
Age-adjusted	Ref.	0.02 (-0.04, 0.07)	0.02 (-0.04, 0.08)	-0.004 (-0.06, 0.05)	0.005 (-0.05, 0.06)	0.86
Multivariable-adjusted ^d	Ref.	0.01 (-0.04, 0.07)	0.01 (-0.04, 0.07)	-0.02 (-0.07, 0.04)	-0.01 (-0.07, 0.05)	0.44
Learning/working memory ^c						
Standardized score mean (SD)	-0.05 (0.98)	0.01 (0.96)	0.08 (0.98)	0.07 (0.98)	0.06 (0.96)	
Age-adjusted	Ref.	0.04 (-0.02, 0.10)	0.10 (0.04, 0.15)	0.08 (0.03, 0.14)	0.06 (0.003, 0.11)	0.02
Multivariable-adjusted ^d	Ref.	0.03 (-0.03, 0.08)	0.08 (0.02, 0.13)	0.06 (0.002, 0.11)	0.03 (-0.03, 0.09)	0.21
Global cognition [°]				L	L	
Standardized score mean (SD)	-0.05 (1.02)	0.01 (0.98)	0.05 (0.98)	0.03 (1.00)	0.04 (0.98)	
Age-adjusted	Ref.	0.03 (-0.02, 0.09)	0.07 (0.01, 0.12)	0.04 (-0.01, 0.10)	0.03 (-0.02, 0.09)	0.27
Multivariable-adjusted ^d	Ref.	0.02 (-0.03, 0.08)	0.05 (-0.005, 0.11)	0.02 (-0.04, 0.08)	0.01 (-0.05, 0.07)	0.88
^a Energy-adjusted gluten intake was cumu	latively averaged from ²	1991 to the last questionnaire	e cycle preceding the cognit	ive assessment.		
^b <i>P</i> -trend was calculated using the median	gluten intake for each	quintile as a continuous varia	able.			
^c Standardized scores for psychomotor sp CogState battery tasks: Detection + Identii higher than the mean.						
^d Model was adjusted for age (years), race income (dollar), history of diabetes (yes, n smoking (never, past, current, missing), as hormone use (pre-menopause, post-meno	o), history of hypertens spirin or non-steroid ant	ion (yes, no), history of hype -inflammatory drug use (yes	ercholesterolemia (yes, no), , no), multivitamins use (yes	history of myocardial infarctio s, no), physical activity (metab	n (yes, no), current depressio olic equivalents/week), meno	n status (yes, r pausal status a

		Qı	intiles of average glu	iten intake		
Model	Q1 (lowest)	Q2	Q3	Q4	Q5 (Highest)	- P-trend ^t
Psychomotor speed/attentionv ^c						
Standardized score mean (SD)	-0.03 (1.03)	0.01 (1.00)	0.02 (0.96)	-0.002 (1.02)	0.02 (0.99)	
Age-adjusted	Ref.	0.02 (04, 0.07)	0.02 (03, 0.07)	-0.01 (-0.07, 0.04)	-0.005 (-0.06, 0.05)	0.53
Multivariable-adjusted ^d	Ref.	0.01 (-0.04, 0.06)	0.01 (-0.04, 0.07)	-0.02 (-0.08, 0.03)	-0.02 (-0.07, 0.03)	0.21
Learning/working memory ^c						
Standardized score mean (SD)	-0.04 (0.98)	0.001 (0.96)	0.07 (0.98)	0.05 (0.98)	0.05 (0.96)	
Age-adjusted	Ref.	0.03 (-0.02, 0.08)	0.09 (0.04, 0.14)	0.06 (0.01, 0.11)	0.05 (-0.003, 0.10)	0.04
Multivariable-adjusted ^d	Ref.	0.01 (-0.04, 0.07)	0.07 (0.02, 0.13)	0.04 (-0.01, 0.09)	0.02 (-0.03, 0.07)	0.30
Global cognition [°]				1		
Standardized score mean (SD)	-0.05 (1.02)	-0.0002 (0.98)	0.05 (0.97)	0.02 (1.02)	0.03 (0.97)	
Age-adjusted	Ref.	0.02 (-0.03, 0.08)	0.06 (0.01, 0.12)	0.02 (-0.03, 0.07)	0.02 (-0.03, 0.07)	0.50
Multivariable-adjusted ^d	Ref.	0.01 (-0.04, 0.07)	0.05 (-0.003, 0.10)	0.01 (-0.05, 0.06)	-0.002 (-0.05, 0.05)	0.77
^a Energy-adjusted gluten intake was cumu	latively averaged from ²	1991 to the last questionnaire	cycle preceding the cognitiv	le assessment.		
^b <i>P</i> -trend was calculated using the median	gluten intake for each of	quintile as a continuous varia	ble.			
^c Standardized scores for psychomotor spe CogState battery tasks: Detection + Identif higher than the mean.						
^d Model was adjusted for age (years), race income (dollar), history of diabetes (yes, no smoking (never, past, current, missing), as hormone use (pre-menopause, post-meno	o), history of hypertens pirin or non-steroid ant	ion (yes, no), history of hype i-inflammatory drug use (yes,	rcholesterolemia (yes, no), h no), multivitamins use (yes,	istory of myocardial infarction no), physical activity (metal	on (yes, no), current depressio bolic equivalents/week), meno	n status (yes, n pausal status a

eTable 6. Sensitivity Analysis of the Mean Differences in Standardized Cognitive Scores Associated With Quintiles of Gluten Intake Among 11 646 Women Who Completed All Food Frequency Questionnaires During 24-Year Follow-up Prior to Cognitive Assessment^a

		Qui	intiles of average glut	en intake		
Model	Q1 (lowest)	Q2	Q3	Q4	Q5 (Highest)	─ P-trend ^b
Psychomotor speed/attentionv	c					
Standardized score mean (SD)	-0.005 (0.97)	0.001 (1.00)	0.02 (0.95)	-0.01 (1.01)	0.03 (0.99)	
Age-adjusted	Ref.	-0.01 (-0.07, 0.04)	-0.002 (-0.06, 0.05)	-0.05 (-0.10, 0.01)	-0.02 (-0.08, 0.04)	0.33
Multivariable-adjusted ^d	Ref.	-0.01 (-0.07, 0.04)	-0.004 (-0.06, 0.05)	-0.05 (-0.11, 0.01)	-0.03 (-0.09, 0.03)	0.18
Learning/working memory ^c						
Standardized score mean (SD)	-0.04 (0.97)	-0.01 (0.95)	0.09 (0.97)	0.05 (0.98)	0.06 (0.97)	
Age-adjusted	Ref.	0.01 (-0.05, 0.07)	0.10 (0.04, 0.16)	0.05 (-0.004, 0.11)	0.05 (-0.01, 0.11)	0.04
Multivariable-adjusted ^d	Ref.	0.0004 (-0.06, 0.06)	0.09 (0.03, 0.14)	0.04 (-0.02, 0.09)	0.03 (-0.03, 0.09)	0.20
Global cognition [°]				1	1	
Standardized score mean (SD)	-0.03 (1.01)	-0.01 (0.98)	0.05 (0.96)	0.02 (1.02)	0.05 (0.98)	
Age-adjusted	Ref.	-0.004 (-0.06, 0.05)	0.05 (-0.003, 0.11)	-0.002 (-0.06, 0.05)	0.01 (-0.04, 0.07)	0.67
Multivariable-adjusted ^d	Ref.	-0.01 (-0.07, 0.05)	0.04 (-0.01, 0.10)	-0.01 (-0.07, 0.04)	-0.003 (-0.06, 0.05)	0.83
^a Energy-adjusted gluten intake was cumu	latively averaged from	1991 to the last questionnaire	cycle preceding the cognitive	e assessment.		
^b <i>P</i> -trend was calculated using the mediar	n gluten intake for each	quintile as a continuous variab	le.			
^c Standardized scores for psychomotor sp CogState battery tasks: Detection + Ident higher than the mean. ^d Model was adjusted for age (years), race	ification, One Card Lea	rning + One-Back, and all four	tasks, respectively. Higher se	cores indicate better perform	nance, with one unit increase	represents 1 S
income (dollar), history of diabetes (yes, r smoking (never, past, current, missing), a hormone use (pre-menopause, post-meno (excluding alcohol and whole grains).	no), history of hyperten spirin or non-steroid an	sion (yes, no), history of hypero iti-inflammatory drug use (yes, l	cholesterolemia (yes, no), his no), multivitamins use (yes, r	story of myocardial infarction no), physical activity (metabo	n (yes, no), current depression olic equivalents/week), menop	status (yes, no ausal status ar

assessment Q1 (lowest) Q2 Q3 Q4 Q5 (higher Psychomotor speed/attention 20-24 years Ref. -0.01 (-0.07, 0.04) -0.02 (-0.07, 0.04) -0.01 (-0.07, 0.04) -0.01 (-0.07, 0.04) -0.01 (-0.07, 0.04) -0.01 (-0.07, 0.04) -0.01 (-0.07, 0.04) -0.01 (-0.07, 0.04) -0.01 (-0.07, 0.04) -0.01 (-0.07, 0.04) -0.01 (-0.07, 0.04) -0.01 (-0.07, 0.04) -0.01 (-0.07, 0.04) -0.01 (-0.07, 0.04) -0.01 (-0.07, 0.04) -0.01 (-0.02 (-0.08, 0.04) -0.04 (-0.10, 0.02) -0.03 (-0.08, 0.03) -0.04 (-0.10, 0.02) -0.03 (-0.08, 0.03) -0.04 (-0.10, 0.02) -0.03 (-0.01, 0.00) -0.03 (-0.03, 0.08) -0.01 (-0.07, 0.05) -0.02 (-0.03, 0.08) -0.01 (-0.07, 0.05) -0.02 (-0.03, 0.08) -0.01 (-0.07, 0.05) -0.02 (-0.03, 0.08) -0.01 (-0.07, 0.05) -0.02 (-0.03, 0.08) -0.01 (-0.07, 0.05) -0.02 (-0.02 (-0.03, 0.08) -0.01 (-0.07, 0.05) -0.02 (-0.03, 0.08) -0.01 (-0.07, 0.05) -0.02 (-0.03, 0.08) -0.01 (-0.07, 0.05) -0.02 (-0.03, 0.08) -0.01 (-0.07, 0.05) -0.02 (-0.03, 0.08) -0.01 (-0.07, 0.05) -0.02 (-0.03, 0.08) -0.01 (-0.07, 0.05) -0.02 (-0.03, 0.08) -0.01 (-0.07, 0.05) -0.02 (-0.03, 0.08) -0.01 (-0.	Years prior to cognitive			Quintiles of gluten i	ntake		P-trend ^b
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		Q1 (lowest)	Q2			Q5 (highest)	- P-trend
16-20 years Ref. 0.003 (-0.05, 0.06) 0.005 (-0.05, 0.06) -0.02 (-0.08, 0.04) -0.01 (-0.01) 12-16 years Ref. -0.03 (-0.08, 0.03) 0.01 (-0.05, 0.06) -0.04 (-0.10, 0.01) -0.03 (-0.08, 0.03) -0.04 (-0.10, 0.02) -0.03 (-0.08, 0.03) -0.04 (-0.10, 0.02) -0.03 (-0.08, 0.03) -0.04 (-0.10, 0.02) -0.03 (-0.08, 0.03) -0.04 (-0.10, 0.02) -0.03 (-0.08, 0.03) -0.04 (-0.04 (-0.10, 0.02) -0.03 (-0.08, 0.03) -0.04 (-0.02) -0.03 (-0.03, 0.08) 0.02 (-0.03, 0.08) -0.01 (-0.07, 0.05) -0.02 (-0.03) Secent past (4-12 years) ^d Ref. 0.03 (-0.03, 0.09) 0.002 (-0.06, 0.06) -0.01 (-0.07, 0.05) -0.02 (-0.02) Learning/working memory ^c 20-24 years Ref. 0.03 (-0.03, 0.08) 0.05 (-0.01, 0.11) 0.06 (0.00, 0.11) 0.03 (-0.02) 20-24 years Ref. 0.03 (-0.03, 0.08) 0.05 (-0.01, 0.01) 0.04 (-0.10, 0.02) -0.02 (-0.02) 12-61 years Ref. 0.03 (-0.03, 0.08) 0.05 (-0.01, 0.11) 0.06 (0.00, 0.11) 0.03 (-0.02) 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.04 (-0.02, 0.09) 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.05) 0.02 (-0.03, 0.08)	Psychomotor speed/attention	c			•		
16-20 ýears Ref. 0.003 (-0.05, 0.06) 0.005 (-0.05, 0.06) -0.02 (-0.08, 0.04) -0.01 (-0.01) 12-16 ýears Ref. -0.03 (-0.08, 0.03) 0.01 (-0.05, 0.06) -0.04 (-0.10, 0.01) -0.03 (-0.08, 0.04) 8-12 years Ref. -0.02 (-0.08, 0.04) -0.04 (-0.10, 0.02) -0.03 (-0.08, 0.03) -0.04 (-0.10, 0.02) 4-8 years Ref. -0.04 (-0.10, 0.02) -0.06 (-0.12, -0.001) -0.06 (-0.01, 0.002) -0.03 (-0.03, 0.08) 0.11 (-0.24 years) ⁶ Ref. 0.01 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.02 (-0.03, 0.08) -0.01 (-0.07, 0.05) Recent past (4-12 years) ⁶ Ref. -0.04 (-0.10, 0.02) -0.03 (-0.09, 0.03) -0.04 (-0.10, 0.02) -0.03 (-0.09, 0.03) -0.04 (-0.10, 0.02) -0.03 (-0.09, 0.03) -0.04 (-0.10, 0.02) -0.03 (-0.09, 0.03) -0.04 (-0.10, 0.02) -0.02 (-0.02, 0.09) 0.02 (-0.03, 0.08) 0.05 (-0.01, 0.11) 0.06 (0.00, 0.11) 0.03 (-0.29, 0.09) 0.02 (-0.03, 0.08) 0.05 (-0.01, 0.01) 0.04 (-0.10, 0.02) -0.02 (-0.01) 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.02 (-0.03, 0.08)							
12-16 ýears Ref. -0.03 (-0.08, 0.03) 0.01 (-0.05, 0.06) -0.04 (-0.10, 0.01) -0.03 (-0.08, 0.03) 8-12 years Ref. -0.02 (-0.08, 0.04) -0.04 (-0.10, 0.02) -0.03 (-0.08, 0.03) -0.04 (-0.14, 0.002) 4-8 years Ref. -0.04 (-0.10, 0.02) -0.06 (-0.11, 0.0002) -0.03 (-0.03, 0.008) -0.01 (-0.05, 0.06) 24 years Ref. 0.01 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.02 (-0.03, 0.08) -0.01 (-0.07, 0.05) Distant past (12-24 years) [§] Ref. 0.03 (-0.03, 0.09) 0.002 (-0.06, 0.06) -0.01 (-0.07, 0.05) -0.02 (-0.02, 0.03) Learning/working memory ^c 20-24 years Ref. 0.03 (-0.03, 0.08) 0.05 (-0.01, 0.11) 0.06 (0.00, 0.11) 0.03 (-0.02, 0.03) 20-24 years Ref. 0.04 (-0.02, 0.13) 0.10 (0.04, 0.15) 0.09 (0.03, 0.14) 0.05 (-0.01, 0.11) 12-16 years Ref. 0.02 (-0.03, 0.08) 0.03 (-0.02, 0.09) 0.02 (-0.04, 0.07) 0.04 (-0.02, 0.09) 0.02 (-0.03, 0.08) 0.01 (-0.05, 0.06) 12-16 years Ref. 0.002 (-0.03, 0.08) 0.03 (-0.02, 0.09) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 0.02 (-0.	20-24 years	Ref.	-0.01 (-0.07, 0.04)	-0.02 (-0.07, 0.04)	-0.02 (-0.07, 0.04)	-0.01 (-0.07, 0.04)	0.66
8-12 years Ref. -0.02 (-0.08, 0.04) -0.04 (-0.10, 0.02) -0.03 (-0.08, 0.03) -0.04 (-0 4-8 years Ref. -0.04 (-0.10, 0.02) -0.06 (-0.12, -0.001) -0.06 (-0.11, 0.002) -0.03 (-0.08, 0.03) -0.04 (-0 54 years Ref. 0.01 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.02 (-0.03, 0.08) -0.01 (-0.07, 0.05) Distant past (12-24 years) ⁶ Ref. 0.03 (-0.03, 0.09) 0.002 (-0.06, 0.06) -0.01 (-0.07, 0.05) -0.02 (-0 Learning/working memory ⁶ 20-24 years Ref. 0.03 (-0.03, 0.08) 0.05 (-0.01, 0.11) 0.06 (0.00, 0.11) 0.03 (-0.02 (-0.02) 20-24 years Ref. 0.04 (-0.02, 0.10) 0.02 (-0.04, 0.07) 0.04 (-0.02, 0.9) 0.02 (-0.03) 20-24 years Ref. 0.07 (0.02, 0.13) 0.10 (0.04, 0.15) 0.09 (0.03, 0.14) 0.05 (-0.01) 12-16 years Ref. 0.02 (-0.03, 0.08) 0.03 (-0.02, 0.09) 0.02 (-0.03, 0.08) 0.01 (-0.02) 12-16 years Ref. 0.02 (-0.03, 0.08) 0.03 (-0.02, 0.09) 0.02 (-0.03, 0.08) 0.01 (-0.02) 12-16 years Ref.	16-20 years	Ref.	0.003 (-0.05, 0.06)	0.005 (-0.05, 0.06)	-0.02 (-0.08, 0.04)	-0.01 (-0.07, 0.05)	0.53
4-8 years Ref. -0.04 (-0.10, 0.02) -0.06 (-0.12, -0.001) -0.06 (-0.11, 0.0002) -0.03 (-0.03, 0.08) S4 years Ref. 0.01 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.02 (-0.03, 0.08) -0.01 (-0.07, 0.05) Distant past (12-24 years) [§] Ref. 0.03 (-0.03, 0.09) 0.002 (-0.06, 0.06) -0.01 (-0.07, 0.05) -0.02 (-0.02, 0.03) Recent past (4-12 years) ^g Ref. 0.03 (-0.03, 0.08) 0.05 (-0.01, 0.11) 0.06 (0.00, 0.11) 0.03 (-0.02, 0.03) Learning/working memory ^c 20-24 years Ref. 0.03 (-0.03, 0.08) 0.05 (-0.01, 0.11) 0.06 (0.00, 0.11) 0.03 (-0.02, 0.09) 12-16 years Ref. 0.04 (-0.02, 0.10) 0.02 (-0.04, 0.07) 0.04 (-0.02, 0.09) 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.04 (-0.02, 0.09) 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.02 (-0.03, 0.08) 0.01 (-0.05, 0.06) 0.02 (-0	12-16 years	Ref.	-0.03 (-0.08, 0.03)	0.01 (-0.05, 0.06)	-0.04 (-0.10, 0.01)	-0.03 (-0.09, 0.02)	0.22
≤ 4 years Ref. 0.01 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.02 (-0.03, 0.08) -0.01 (-0.01, 0.02) Distant past (12-24 years) ⁶ Ref. 0.03 (-0.03, 0.09) 0.002 (-0.06, 0.06) -0.01 (-0.07, 0.05) -0.02 (-0 Learning/working memory ^c -0.04 (-0.10, 0.02) -0.03 (-0.09, 0.03) -0.04 (-0.10, 0.02) -0.03 (-0.09, 0.03) -0.04 (-0.10, 0.02) -0.02 (-0 Learning/working memory ^c 20-24 years Ref. 0.03 (-0.03, 0.08) 0.05 (-0.01, 0.11) 0.06 (0.00, 0.11) 0.03 (-0.02 (-0.04) 12-16 years Ref. 0.04 (-0.02, 0.10) 0.02 (-0.04, 0.07) 0.04 (-0.02, 0.09) 0.02 (-0.03, 0.08) 0.01 (-0.04) 12-16 years Ref. 0.02 (-0.03, 0.08) 0.03 (-0.02, 0.09) 0.02 (-0.03, 0.08) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.02 (-0.03, 0.08) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.08) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.08) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.08) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.08) <t< td=""><td>8-12 years</td><td>Ref.</td><td>-0.02 (-0.08, 0.04)</td><td>-0.04 (-0.10, 0.02)</td><td>-0.03 (-0.08, 0.03)</td><td>-0.04 (-0.09, 0.02)</td><td>0.23</td></t<>	8-12 years	Ref.	-0.02 (-0.08, 0.04)	-0.04 (-0.10, 0.02)	-0.03 (-0.08, 0.03)	-0.04 (-0.09, 0.02)	0.23
≤ 4 years Ref. 0.01 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.02 (-0.03, 0.08) -0.01 (-0.01, 0.02) Distant past (12-24 years) ⁶ Ref. 0.03 (-0.03, 0.09) 0.002 (-0.06, 0.06) -0.01 (-0.07, 0.05) -0.02 (-0 Learning/working memory ^c -0.04 (-0.10, 0.02) -0.03 (-0.09, 0.03) -0.04 (-0.10, 0.02) -0.03 (-0.09, 0.03) -0.04 (-0.10, 0.02) -0.02 (-0 Learning/working memory ^c 20-24 years Ref. 0.03 (-0.03, 0.08) 0.05 (-0.01, 0.11) 0.06 (0.00, 0.11) 0.03 (-0.02 (-0.04) 12-16 years Ref. 0.04 (-0.02, 0.10) 0.02 (-0.04, 0.07) 0.04 (-0.02, 0.09) 0.02 (-0.03, 0.08) 0.01 (-0.04) 12-16 years Ref. 0.02 (-0.03, 0.08) 0.03 (-0.02, 0.09) 0.02 (-0.03, 0.08) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.02 (-0.03, 0.08) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.08) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.08) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.08) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.08) <t< td=""><td>4-8 years</td><td>Ref.</td><td>-0.04 (-0.10, 0.02)</td><td>-0.06 (-0.12, -0.001)</td><td>-0.06 (-0.11, 0.0002)</td><td>-0.03 (-0.09, 0.03)</td><td>0.35</td></t<>	4-8 years	Ref.	-0.04 (-0.10, 0.02)	-0.06 (-0.12, -0.001)	-0.06 (-0.11, 0.0002)	-0.03 (-0.09, 0.03)	0.35
Distant past (12-24 years) [§] Ref. 0.03 (-0.03, 0.09) 0.002 (-0.06, 0.06) -0.01 (-0.07, 0.05) -0.02 (-0 Recent past (4-12 years) ^d Ref. -0.04 (-0.10, 0.02) -0.03 (-0.09, 0.03) -0.04 (-0.10, 0.02) -0.02 (-0 Learning/working memory ^c Particle State Ref. 0.03 (-0.03, 0.08) 0.05 (-0.01, 0.11) 0.06 (0.00, 0.11) 0.03 (-0.02 (-0 20-24 years Ref. 0.03 (-0.02, 0.10) 0.02 (-0.04, 0.07) 0.04 (-0.02, 0.09) 0.02 (-0 12-16 years Ref. 0.02 (-0.03, 0.08) 0.03 (-0.04, 0.07) 0.04 (-0.02, 0.09) 0.02 (-0.03, 0.08) 0.01 (-0.05, 0.09) 0.02 (-0.03, 0.08) 0.01 (-0.05, 0.09) 0.02 (-0.03, 0.08) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.02 (-0.03, 0.08) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.08) 0.03 (-0.02, (-0.01, 0.11) 0.04 (-0.02, 0.01) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.03, 0.08) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.03, 0.08) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.08) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.01 (-0.05, 0.06) <t< td=""><td>≤4 years</td><td>Ref.</td><td>0.01 (-0.04, 0.07)</td><td>0.01 (-0.05, 0.06)</td><td>0.02 (-0.03, 0.08)</td><td>-0.01 (-0.07, 0.04)</td><td>0.66</td></t<>	≤4 years	Ref.	0.01 (-0.04, 0.07)	0.01 (-0.05, 0.06)	0.02 (-0.03, 0.08)	-0.01 (-0.07, 0.04)	0.66
Learning/working memory ^c 20-24 years Ref. 0.03 (-0.03, 0.08) 0.05 (-0.01, 0.11) 0.06 (0.00, 0.11) 0.03 (-0.03, 0.08) 16-20 years Ref. 0.04 (-0.02, 0.10) 0.02 (-0.04, 0.07) 0.04 (-0.02, 0.09) 0.02 (-0.03, 0.08) 12-16 years Ref. 0.07 (0.02, 0.13) 0.10 (0.04, 0.15) 0.09 (0.03, 0.14) 0.05 (-0.01, 0.12) 8-12 years Ref. 0.02 (-0.03, 0.08) 0.03 (-0.02, 0.09) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 8-12 years Ref. 0.002 (-0.05, 0.05) -0.01 (-0.06, 0.05) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 8-4 years Ref. 0.05 (-0.01, 0.10) 0.04 (-0.01, 0.10) 0.05 (-0.01, 0.11) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) Obistant past (12-24 years) ^d Ref. 0.002 (-0.02, 0.09) 0.05 (-0.01, 0.11) 0.002 (-0.04, 0.08) 0.03 (-0.02 Recent past (4-12 years) ^d Ref. 0.002 (-0.05, 0.06) 0.04 (-0.02, 0.10) 0.02 (-0.04, 0.08) 0.01 (-0.05 Global cognition ^e 20-24 years Ref. 0.02 (-0.03, 0.08) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) <t< td=""><td>Distant past (12-24 years)§</td><td>Ref.</td><td>0.03 (-0.03, 0.09)</td><td>0.002 (-0.06, 0.06)</td><td></td><td>-0.02 (-0.08, 0.05)</td><td>0.28</td></t<>	Distant past (12-24 years)§	Ref.	0.03 (-0.03, 0.09)	0.002 (-0.06, 0.06)		-0.02 (-0.08, 0.05)	0.28
20-24 years Ref. 0.03 (-0.03, 0.08) 0.05 (-0.01, 0.11) 0.06 (0.00, 0.11) 0.03 (-0.03, 0.08) 16-20 years Ref. 0.04 (-0.02, 0.10) 0.02 (-0.4, 0.07) 0.04 (-0.02, 0.09) 0.02 (-0.03, 0.08) 12-16 years Ref. 0.07 (0.02, 0.13) 0.10 (0.04, 0.15) 0.09 (0.03, 0.14) 0.05 (-0.01, 0.12) 12-16 years Ref. 0.02 (-0.03, 0.08) 0.03 (-0.02, 0.09) 0.02 (-0.03, 0.08) 0.01 (-0.05, 0.09) 0.02 (-0.03, 0.08) 0.01 (-0.05, 0.09) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.08) 0.03 (-0.02, 0.09) 0.05 (-0.01, 0.11) 0.02 (-0.04, 0.08) 0.01 (-0.05, 0.06) 0.04 (-0.02, 0.10) 0.02 (-0.04, 0.08) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.08) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.02 (-0.03, 0.08) 0.01 (-0.02, 0.09) 0.03 (-0.02, 0.09) 0.03 (-0.02, 0.03, 0.08) 0.01 (-0.05, 0.06) 0.002 (-0.03, 0.08) 0.01 (-0.05, 0.06)	Recent past (4-12 years) ^d	Ref.	-0.04 (-0.10, 0.02)	-0.03 (-0.09, 0.03)	-0.04 (-0.10, 0.02)	-0.02 (-0.09, 0.04)	0.56
16-20 years Ref. 0.04 (-0.02, 0.10) 0.02 (-0.04, 0.07) 0.04 (-0.02, 0.09) 0.02 (-0. 12-16 years Ref. 0.07 (0.02, 0.13) 0.10 (0.04, 0.15) 0.09 (0.03, 0.14) 0.05 (-0. 3-12 years Ref. 0.02 (-0.03, 0.08) 0.03 (-0.02, 0.09) 0.02 (-0.03, 0.08) 0.01 (-0. 4-8 years Ref. -0.003 (-0.06, 0.05) -0.01 (-0.06, 0.05) 0.02 (-0.04, 0.07) 0.02 (-0. 4-9 years Ref. 0.05 (-0.01, 0.10) 0.04 (-0.01, 0.10) 0.05 (-0.01, 0.11) 0.04 (-0. 2-24 years Ref. 0.03 (-0.02, 0.09) 0.05 (-0.01, 0.11) 0.02 (-0.04, 0.08) 0.03 (-0. 3 (12-24 years) ^d Ref. 0.03 (-0.02, 0.09) 0.05 (-0.01, 0.11) 0.02 (-0.04, 0.08) 0.01 (-0. Global cognition ^c 20-24 years Ref. 0.002 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.08) 0.01 (-0. 16-20 years Ref. 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.002 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.002 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.	Learning/working memory ^c	•					
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16-20 years Ref. 0.04 (-0.02, 0.10) 0.02 (-0.04, 0.07) 0.04 (-0.02, 0.09) 0.02 (-0. 12-16 years Ref. 0.07 (0.02, 0.13) 0.10 (0.04, 0.15) 0.09 (0.03, 0.14) 0.05 (-0. 3-12 years Ref. 0.02 (-0.03, 0.08) 0.03 (-0.02, 0.09) 0.02 (-0.03, 0.08) 0.01 (-0. 4-8 years Ref. -0.003 (-0.06, 0.05) -0.01 (-0.06, 0.05) 0.02 (-0.04, 0.07) 0.02 (-0. 4-9 years Ref. 0.05 (-0.01, 0.10) 0.04 (-0.01, 0.10) 0.05 (-0.01, 0.11) 0.04 (-0. 24 years Ref. 0.03 (-0.02, 0.09) 0.05 (-0.01, 0.11) 0.02 (-0.04, 0.08) 0.03 (-0. Colstant past (12-24 years) ^d Ref. 0.002 (-0.05, 0.06) 0.04 (-0.02, 0.10) 0.02 (-0.04, 0.08) 0.01 (-0. Global cognition ^o 20-24 years Ref. 0.002 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.02 (-0.04, 0.08) 0.01 (-0. 12-16 years Ref. 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.002 (-0.04, 0.07) 0.01 (-0. 12-16 years Ref. 0.02 (-0.03, 0.08) 0.0	20-24 years	Ref.	0.03 (-0.03, 0.08)	0.05 (-0.01, 0.11)	0.06 (0.00, 0.11)	0.03 (-0.02, 0.09)	0.21
B-12 years Ref. 0.02 (-0.03, 0.08) 0.03 (-0.02, 0.09) 0.02 (-0.03, 0.08) 0.01 (-0. 4-8 years Ref. -0.003 (-0.06, 0.05) -0.01 (-0.06, 0.05) 0.02 (-0.04, 0.07) 0.02 (-0.04) 54 years Ref. 0.05 (-0.01, 0.10) 0.04 (-0.01, 0.10) 0.05 (-0.01, 0.11) 0.02 (-0.04, 0.08) 0.03 (-0.02 Distant past (12-24 years) ^d Ref. 0.03 (-0.02, 0.09) 0.05 (-0.01, 0.11) 0.02 (-0.04, 0.08) 0.03 (-0.03 Recent past (4-12 years) ^d Ref. 0.002 (-0.05, 0.06) 0.04 (-0.02, 0.10) 0.02 (-0.04, 0.08) 0.01 (-0.05 Global cognition ^e Ref. 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.002 (-0.04) 12-16 years Ref. 0.02 (-0.03, 0.08) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.002 (-0.04) 20-24 years Ref. 0.02 (-0.03, 0.08) 0.01 (-0.07, 0.07) 0.01 (-0.05, 0.06) 0.002 (-0.04) 20-24 years Ref. 0.02 (-0.03, 0.08) 0.01 (-0.07, 0.05) -0.01 (-0.06) 0.02 (-0.04) 0.01 (-0.02)		Ref.	0.04 (-0.02, 0.10)	0.02 (-0.04, 0.07)	0.04 (-0.02, 0.09)	0.02 (-0.04, 0.07)	0.71
B-12 years Ref. 0.02 (-0.03, 0.08) 0.03 (-0.02, 0.09) 0.02 (-0.03, 0.08) 0.01 (-0. 4-8 years Ref. -0.003 (-0.06, 0.05) -0.01 (-0.06, 0.05) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.07) 54 years Ref. 0.05 (-0.01, 0.10) 0.04 (-0.01, 0.10) 0.05 (-0.01, 0.11) 0.02 (-0.04, 0.08) 0.03 (-0.02, 0.09) Distant past (12-24 years) ^d Ref. 0.03 (-0.02, 0.09) 0.05 (-0.01, 0.11) 0.02 (-0.04, 0.08) 0.03 (-0.03 (-0.02, 0.09) Recent past (4-12 years) ^d Ref. 0.002 (-0.05, 0.06) 0.04 (-0.02, 0.10) 0.02 (-0.04, 0.08) 0.01 (-0.03 (-0.08) Global cognition ^o 3002 (-0.04, 0.07) 0.02 (-0.04, 0.08) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) <td>12-16 years</td> <td>Ref.</td> <td>0.07 (0.02, 0.13)</td> <td>0.10 (0.04, 0.15)</td> <td>0.09 (0.03, 0.14)</td> <td>0.05 (-0.00, 0.11)</td> <td>0.11</td>	12-16 years	Ref.	0.07 (0.02, 0.13)	0.10 (0.04, 0.15)	0.09 (0.03, 0.14)	0.05 (-0.00, 0.11)	0.11
4-8 years Ref. -0.003 (-0.06, 0.05) -0.01 (-0.06, 0.05) 0.02 (-0.04, 0.07) 0.02 (-0.4, 0.07) ≤4 years Ref. 0.05 (-0.01, 0.10) 0.04 (-0.01, 0.10) 0.05 (-0.01, 0.11) 0.05 (-0.01, 0.11) 0.04 (-0.02) Distant past (12-24 years) ^d Ref. 0.03 (-0.02, 0.09) 0.05 (-0.01, 0.11) 0.02 (-0.04, 0.08) 0.03 (-0.03) Recent past (4-12 years) ^d Ref. 0.002 (-0.05, 0.06) 0.04 (-0.02, 0.10) 0.02 (-0.03, 0.08) 0.01 (-0.05) Global cognition ^c 20-24 years Ref. 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.08) 0.01 (-0.05) 20-24 years Ref. 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.002 (-0.04, 0.07) 16-20 years Ref. 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.002 (-0.04, 0.07) 0.01 (-0.05, 0.06) 12-16 years Ref. 0.02 (-0.03, 0.08) 0.06 (-0.00, 0.11) 0.02 (-0.04, 0.07) 0.01 (-0.02, 0.02) 3-12 years Ref. -0.002 (-0.06, 0.05) -0.01 (-0.07, 0.05) -0.01 (-0.06, 0.05) -0.02 (-0.04, 0.07) 0.01 (-0.02, 0.02) 4-8 years Ref. -						0.01 (-0.05, 0.07)	0.79
E4 years Ref. 0.05 (-0.01, 0.10) 0.04 (-0.01, 0.10) 0.05 (-0.01, 0.11) 0.04 (-0.01, 0.10) Distant past (12-24 years) ^d Ref. 0.03 (-0.02, 0.09) 0.05 (-0.01, 0.11) 0.02 (-0.04, 0.08) 0.03 (-0.03, 0.09) Recent past (4-12 years) ^d Ref. 0.002 (-0.05, 0.06) 0.04 (-0.02, 0.10) 0.02 (-0.03, 0.08) 0.01 (-0.05, 0.06) Global cognition ^c Co.2 (-0.03, 0.08) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.08) 0.01 (-0.05, 0.06) 20-24 years Ref. 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 16-20 years Ref. 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.002 (-0.04, 0.07) 12-16 years Ref. 0.02 (-0.03, 0.08) 0.06 (-0.00, 0.11) 0.02 (-0.04, 0.07) 0.01 (-0.05, 0.06) 3-12 years Ref. -0.002 (-0.06, 0.05) -0.01 (-0.07, 0.05) -0.01 (-0.06, 0.05) -0.02 (-0.04, 0.07) 0.01 (-0.06, 0.05) -0.02 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.01 (-0.05, 0.06) 0.01 (-0.05, 0.06) 0.01 (-0.05, 0.06) 0.01 (-0.05, 0.06) 0.01 (-0.02, 0.09)		Ref.				0.02 (-0.04, 0.07)	0.38
Distant past (12-24 years) ^d Ref. 0.03 (-0.02, 0.09) 0.05 (-0.01, 0.11) 0.02 (-0.04, 0.08) 0.03 (-0.2 Recent past (4-12 years) ^d Ref. 0.002 (-0.05, 0.06) 0.04 (-0.02, 0.10) 0.02 (-0.03, 0.08) 0.01 (-0.05 Global cognition ^c Constraint Ref. 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.08) 0.01 (-0.05 20-24 years Ref. 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.08) 0.01 (-0.05 20-24 years Ref. 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.02 (-0.04, 0.08) 0.01 (-0.05 20-24 years Ref. 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.002 (-0.04 20-24 years Ref. 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.002 (-0.04 20-24 years Ref. 0.02 (-0.03, 0.08) 0.01 (-0.07, 0.05) -0.01 (-0.04, 0.07) 0.01 (-0.06 3-12 years Ref. -0.002 (-0.08, 0.03) -0.04 (-0.10, 0.02) -0.03 (-0.09, 0.03) -0.01 (-0.06 4-8 years Ref. -0.03 (-0.08, 0.03) <		Ref.				0.04 (-0.02, 0.09)	0.28
Recent past (4-12 years) ^d Ref. 0.002 (-0.05, 0.06) 0.04 (-0.02, 0.10) 0.02 (-0.03, 0.08) 0.01 (-0.05, 0.06) Global cognition ^c Constraint Ref. 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.08) 0.01 (-0.05, 0.06) 20-24 years Ref. 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.02 (-0.04, 0.08) 0.01 (-0.05, 0.06) 16-20 years Ref. 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.002 (-0.03, 0.08) 12-16 years Ref. 0.02 (-0.03, 0.08) 0.06 (-0.00, 0.11) 0.02 (-0.04, 0.07) 0.01 (-0.05, 0.06) 3-12 years Ref. -0.002 (-0.06, 0.05) -0.01 (-0.07, 0.05) -0.01 (-0.06, 0.05) -0.02 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.002 (-0.06, 0.05) -0.01 (-0.07, 0.05) -0.01 (-0.06, 0.05) -0.02 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.001 (-0.06, 0.05) -0.02 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.001 (-0.06, 0.05) -0.02 (-0.04, 0.07) 0.01 (-0.06, 0.05) -0.02 (-0.04, 0.07) 0.01 (-0.06, 0.06) 0.001 (-0.06, 0.06) 0.002 (-0.06, 0.06) 0.01 (-0.06, 0.06) 0.002 (-0.06, 0.06) 0.01 (-0.06, 0.06) 0.00		Ref.				0.03 (-0.03, 0.09)	0.50
Global cognition ^c Ref. 0.01 (-0.05, 0.06) 0.02 (-0.04, 0.07) 0.02 (-0.04, 0.08) 0.01 (-0.05, 0.06) 16-20 years Ref. 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.002 (-0.02, 0.03) 12-16 years Ref. 0.02 (-0.03, 0.08) 0.06 (-0.00, 0.11) 0.02 (-0.04, 0.07) 0.01 (-0.05, 0.06) 12-16 years Ref. 0.02 (-0.03, 0.08) 0.06 (-0.00, 0.11) 0.02 (-0.04, 0.07) 0.01 (-0.05, 0.06) 12-16 years Ref. -0.002 (-0.06, 0.05) -0.01 (-0.07, 0.05) -0.01 (-0.06, 0.05) -0.02 (-0.04, 0.07) 3-12 years Ref. -0.002 (-0.06, 0.05) -0.01 (-0.07, 0.05) -0.01 (-0.06, 0.05) -0.02 (-0.08, 0.03) 3-12 years Ref. -0.03 (-0.08, 0.03) -0.04 (-0.10, 0.02) -0.03 (-0.09, 0.03) -0.01 (-0.02, 0.09) 3-12 years Ref. 0.04 (-0.02, 0.09) 0.03 (-0.03, 0.08) 0.04 (-0.01, 0.10) 0.01 (-0.02, 0.09) 4-8 years Ref. 0.04 (-0.02, 0.10) 0.03 (-0.03, 0.08) 0.002 (-0.06, 0.06) 0.01 (-0.02, 0.09) 24 years) ^d Ref. 0.003 (-0.08, 0.03)						0.01 (-0.06, 0.07)	0.70
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16-20 years Ref. 0.02 (-0.03, 0.08) 0.01 (-0.04, 0.07) 0.01 (-0.05, 0.06) 0.002 (-0.02) 12-16 years Ref. 0.02 (-0.03, 0.08) 0.06 (-0.00, 0.11) 0.02 (-0.04, 0.07) 0.01 (-0.05, 0.06) 8-12 years Ref. -0.002 (-0.06, 0.05) -0.01 (-0.07, 0.05) -0.01 (-0.06, 0.05) -0.02 (-0.02 (-0.06, 0.05) 8-12 years Ref. -0.03 (-0.08, 0.03) -0.04 (-0.10, 0.02) -0.03 (-0.09, 0.03) -0.01 (-0.04, 0.07) 0.01 (-0.02 (-0.04, 0.07) 4-8 years Ref. -0.03 (-0.08, 0.03) -0.04 (-0.10, 0.02) -0.03 (-0.09, 0.03) -0.01 (-0.02 (-0.09, 0.03) -0.01 (-0.04) ≤4 years Ref. 0.04 (-0.02, 0.09) 0.03 (-0.03, 0.08) 0.04 (-0.01, 0.10) 0.01 (-0.02) Distant past (12-24 years) ^d Ref. 0.04 (-0.02, 0.10) 0.03 (-0.03, 0.08) 0.002 (-0.06, 0.06) 0.01 (-0.02) Recent past (4-12 years) ^d Ref. -0.03 (-0.08, 0.03) 0.0001 (-0.06, 0.06) -0.02 (-0.08, 0.04) -0.01 (-0.01) ¹ Energy-adjusted gluten intake was derived from individual assessment conducted in the respective year category, except for distant past and recent past intakes, which whrough 12-24 years and 4-12	C C						
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B-12 years Ref. -0.002 (-0.06, 0.05) -0.01 (-0.07, 0.05) -0.01 (-0.06, 0.05) -0.02 (-0.02) 4-8 years Ref. -0.03 (-0.08, 0.03) -0.04 (-0.10, 0.02) -0.03 (-0.09, 0.03) -0.01 (-0.02) ≤4 years Ref. 0.04 (-0.02, 0.09) 0.03 (-0.03, 0.08) 0.04 (-0.01, 0.10) 0.01 (-0.01) ⊆4 years Ref. 0.04 (-0.02, 0.09) 0.03 (-0.03, 0.08) 0.04 (-0.01, 0.10) 0.01 (-0.01) Distant past (12-24 years) ^d Ref. 0.04 (-0.02, 0.10) 0.03 (-0.03, 0.08) 0.002 (-0.06, 0.06) 0.01 (-0.02) Recent past (4-12 years) ^d Ref. -0.03 (-0.08, 0.03) 0.0001 (-0.06, 0.06) -0.02 (-0.08, 0.04) -0.01 (-0.02) ^a Energy-adjusted gluten intake was derived from individual assessment conducted in the respective year category, except for distant past and recent past intakes, which we through 12-24 years and 4-12 years prior to cognitive assessment, respectively. Model was adjusted for age (years), race (white, non-white), body mass index (kg/m ²), hu	16-20 years	Ref.	0.02 (-0.03, 0.08)	0.01 (-0.04, 0.07)	0.01 (-0.05, 0.06)	0.002 (-0.05, 0.06)	0.83
A-8 years Ref. -0.03 (-0.08, 0.03) -0.04 (-0.10, 0.02) -0.03 (-0.09, 0.03) -0.01 (-0.02) ≤4 years Ref. 0.04 (-0.02, 0.09) 0.03 (-0.03, 0.08) 0.04 (-0.01, 0.10) 0.01 (-0.01, 0.02) Distant past (12-24 years) ^d Ref. 0.04 (-0.02, 0.10) 0.03 (-0.03, 0.08) 0.002 (-0.06, 0.06) 0.01 (-0.01, 0.02) Distant past (4-12 years) ^d Ref. -0.03 (-0.08, 0.03) 0.0001 (-0.06, 0.06) -0.02 (-0.08, 0.04) -0.01 (-0.02, 0.01) Percent past (4-12 years) ^d Ref. -0.03 (-0.08, 0.03) 0.0001 (-0.06, 0.06) -0.02 (-0.08, 0.04) -0.01 (-0.02, 0.01) Percent past (4-12 years) ^d Ref. -0.03 (-0.08, 0.03) 0.0001 (-0.06, 0.06) -0.02 (-0.08, 0.04) -0.01 (-0.02, 0.01) Percent past (4-12 years) ^d Ref. -0.03 (-0.08, 0.03) 0.0001 (-0.06, 0.06) -0.02 (-0.08, 0.04) -0.01 (-0.02, 0.01) Percent past (4-12 years prior to cognitive assessment conducted in the respective year category, except for distant past and recent past intakes, which we hrough 12-24 years and 4-12 years prior to cognitive assessment, respectively. Model was adjusted for age (years), race (white, non-white), body mass index (kg/m²), hu	12-16 years	Ref.	0.02 (-0.03, 0.08)	0.06 (-0.00, 0.11)	0.02 (-0.04, 0.07)	0.01 (-0.05, 0.06)	0.98
Set years Ref. 0.04 (-0.02, 0.09) 0.03 (-0.03, 0.08) 0.04 (-0.01, 0.10) 0.01 (-0.01, 0.10) Distant past (12-24 years) ^d Ref. 0.04 (-0.02, 0.10) 0.03 (-0.03, 0.08) 0.002 (-0.06, 0.06) 0.01 (-0.02, 0.01) Recent past (4-12 years) ^d Ref. -0.03 (-0.08, 0.03) 0.0001 (-0.06, 0.06) -0.02 (-0.08, 0.04) -0.01 (-0.02, 0.01) ^a Energy-adjusted gluten intake was derived from individual assessment conducted in the respective year category, except for distant past and recent past intakes, which we hrough 12-24 years and 4-12 years prior to cognitive assessment., respectively. Model was adjusted for age (years), race (white, non-white), body mass index (kg/m ²), hu	8-12 years	Ref.	-0.002 (-0.06, 0.05)	-0.01 (-0.07, 0.05)	-0.01 (-0.06, 0.05)	-0.02 (-0.08, 0.04)	0.51
Distant past (12-24 years)dRef.0.04 (-0.02, 0.10)0.03 (-0.03, 0.08)0.002 (-0.06, 0.06)0.01 (-0.02)Recent past (4-12 years)dRef0.03 (-0.08, 0.03)0.0001 (-0.06, 0.06)-0.02 (-0.08, 0.04)-0.01 (-0.02)Energy-adjusted gluten intake was derived from individual assessment conducted in the respective year category, except for distant past and recent past intakes, which we hrough 12-24 years and 4-12 years prior to cognitive assessment., respectively. Model was adjusted for age (years), race (white, non-white), body mass index (kg/m²), hu	4-8 years	Ref.	-0.03 (-0.08, 0.03)	-0.04 (-0.10, 0.02)	-0.03 (-0.09, 0.03)	-0.01 (-0.07, 0.05)	0.88
Distant past (12-24 years)dRef.0.04 (-0.02, 0.10)0.03 (-0.03, 0.08)0.002 (-0.06, 0.06)0.01 (-0.02)Recent past (4-12 years)dRef0.03 (-0.08, 0.03)0.0001 (-0.06, 0.06)-0.02 (-0.08, 0.04)-0.01 (-0.02)Energy-adjusted gluten intake was derived from individual assessment conducted in the respective year category, except for distant past and recent past intakes, which whrough 12-24 years and 4-12 years prior to cognitive assessment., respectively. Model was adjusted for age (years), race (white, non-white), body mass index (kg/m²), hu	≤4 years	Ref.	0.04 (-0.02, 0.09)	0.03 (-0.03, 0.08)	0.04 (-0.01, 0.10)	0.01 (-0.05, 0.07)	0.78
^a Energy-adjusted gluten intake was derived from individual assessment conducted in the respective year category, except for distant past and recent past intakes, which v through 12-24 years and 4-12 years prior to cognitive assessment., respectively. Model was adjusted for age (years), race (white, non-white), body mass index (kg/m ²), hu	Distant past (12-24 years) ^d	Ref.		0.03 (-0.03, 0.08)	0.002 (-0.06, 0.06)	0.01 (-0.06, 0.07)	0.69
Energy-adjusted gluten intake was derived from individual assessment conducted in the respective year category, except for distant past and recent past intakes, which who hrough 12-24 years and 4-12 years prior to cognitive assessment., respectively. Model was adjusted for age (years), race (white, non-white), body mass index (kg/m ²), hu	Recent past (4-12 years) ^d	Ref.	-0.03 (-0.08, 0.03)	0.0001 (-0.06, 0.06)	-0.02 (-0.08, 0.04)	-0.01 (-0.08, 0.05)	0.85
hrough 12-24 years and 4-12 years prior to cognitive assessment., respectively. Model was adjusted for age (years), race (white, non-white), body mass index (kg/m ²), hu	Energy-adjusted gluten intake was der	ived from individual	assessment conducted in the re	espective year category, except	for distant past and recent past	intakes, which were cumulative	averaged
	rough 12-24 years and 4-12 years pric	or to cognitive asses	sment., respectively. Model was	s adjusted for age (years), race ((white, non-white), body mass ir	ndex (kg/m²), husband's educat	ional
ttainment (high school or below, college, graduate school, unmarried/missing), family income (dollar), history of diabetes (yes, no), history of hypertension (yes, no), history et an or non-steroid anti-inflammatory dr							
nultivitamins use (yes, no), physical activity (metabolic equivalents/week), menopausal status and hormone use (pre-menopause, post-menopause and never/past/current	nultivitamins use (ves. no), physical act	ivity (metabolic equi	valents/week), menopausal stat	tus and hormone use (pre-meno	pause, post-menopause and ne	ever/past/current user of hormo	ne therapy).
otal energy intake (kcal/d), alcohol intake (g/d), and Alternative Healthy Eating Index score (excluding alcohol and whole grains).							
P-trend was calculated using the median gluten intake for each quintile as a continuous variable	P-trend was calculated using the media	an aluten intake for e	each quintile as a continuous va	riable			

^dDistant and recent past intakes were mutually adjusted.

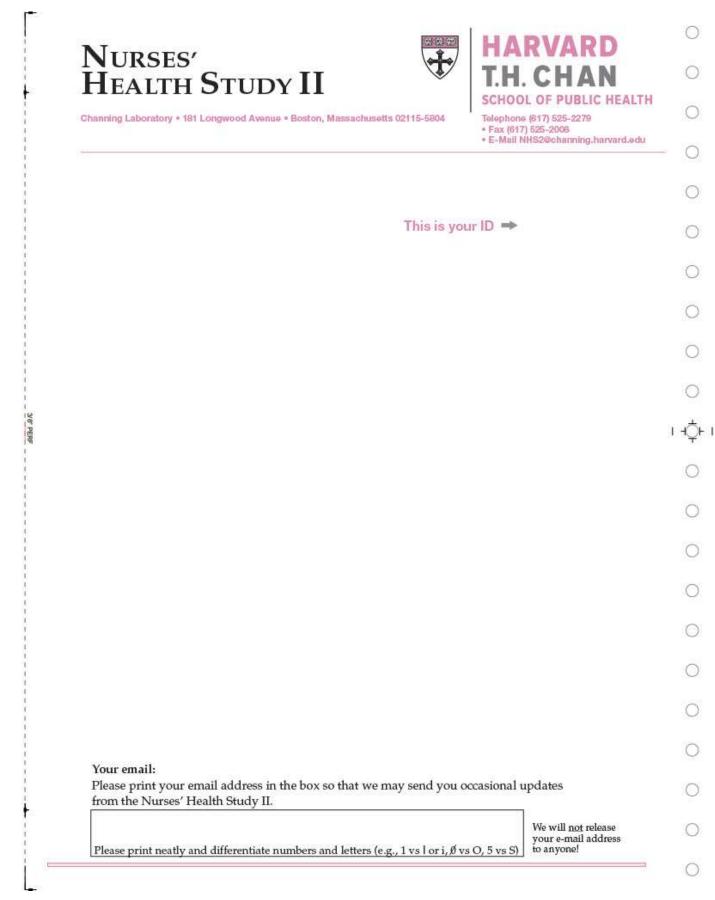
eTable 8. Multivariable-Adjusted Mean Differences in Standardized Cognitive Scores Associated With 1 SD (1.98 g/d) Increase in Mean Gluten Intake From Distant Past (12-24 y) to Recent Past (4-12 y) of Cognitive Assessment Among 11 646 Women^a

Composite cognitive scores ^b	Estimate (95% confidence interval)	Р
Psychomotor speed/attention	-0.01 (-0.03, 0.01)	0.32
Learning/working memory	-0.003 (-0.02, 0.02)	0.75
Global cognition	-0.01 (-0.02, 0.01)	0.62
^a Energy-adjusted gluten intake was cumulatively averaged f	rom 1991 to the last questionnaire cycle preceding the cognitive assessment. Mod	lel was adjusted for age (vears), race (white, non-white)

^a Energy-adjusted gluten intake was cumulatively averaged from 1991 to the last questionnaire cycle preceding the cognitive assessment. Model was adjusted for age (years), race (white, non-white), body mass index (kg/m²), husband's educational attainment (high school or below, college, graduate school, unmarried/missing), family income (dollar), history of diabetes (yes, no), history of hypertension (yes, no), history of hypercholesterolemia (yes, no), history of myocardial infarction (yes, no), current depression status (yes, no), smoking (never, past, current, missing), aspirin or non-steroid anti-inflammatory drug use (yes, no), multivitamins use (yes, no), physical activity (metabolic equivalents/week), menopausal status and hormone use (pre-menopause, post-menopause and never/past/current user of hormone therapy), total energy intake (kcal/d), alcohol intake (g/d), and Alternative Healthy Eating Index score (excluding alcohol and whole grains).

^b Standardized scores for psychomotor speed/attention, learning/working memory, and global cognition were calculated by standardizing as the mean of the standardized scores of the following CogState battery tasks: Detection + Identification, One Card Learning + One-Back, and all four tasks, respectively. Higher scores indicate better performance, with one unit increase represents 1 SD higher than the mean.

eFigure 1. Nurses' Health Study II Questionnaire in 2015 Questionnaire Cycle



)	HARVARD UNIVERSITY NURSES' HEALTH STUDY	п
)	INSTRUCTIONS	
)	INTERNET: Go to our website at www.NHS2.org and use your ID number (see front of this page) a your birth date to log in. Follow the instructions on the screen to complete the surv	
	online. PAPER FORM:	1120
	Please use an ordinary No. 2 pencil to answer all questions. Fill in the appropria response circles completely. The form is designed to be read by optical-scanni equipment, so it is important that you keep any write-in responses within the space	ng
	provided and erase any incorrect marks completely. If you have comments, please wr them on a separate piece of paper.	
	USE A NO. 2 PENCIL ONLY	
1		
	EXAMPLE A) Mark "Yes" bubble and Year of Diagnosis bubble for each illness you have had diagnosed. 19 Since lune 2013 have you had any of YEAR OF DIAGNOSIS IN Please fill in t	
01	these clinician-diagnosed illnesses? LEAVE BLANK FOR 'NO', MARK HERE FOR 'YES' - 2013 May '15 2015 Myore field in the second standy of the second standy o	letely
ΗI	Myocardial infarction (heart attack)	
	Coronary bypass, angioplasty or stent	
	EXAMPLE B) AGE natural periods AGE Print numbers neatly within boxes. Your writing will be read by our scanne	er.
	ceased: 46	the
	 Please tear off the cover letter (to preserve confidentiality) and return questionnaire in the enclosed postage-paid envelope. 	the
	 If your name and address as printed on this questionnaire are no long correct or are incomplete, or if you are providing your email address, please make any necessary changes on the letter and return it to us. 	jer
	Thank you for completing the 2015 Nurses' Health Study II Questionn	aire.
	Federal research regulations require us to include the following information There are no direct benefits to you from participating in this study. The risk of breach of confidentiality associated with participation in this study	
	very small. Your choice to participate in this study is completely voluntary and you may decl. or withdraw at any time without penalty.	
	You may skip any question you do not wish to answer. You will not receive monetary compensation for participating.	_
	If you have any questions regarding your rights as a research participant, you are	

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6	6	(E)		lad menopause b			periods ceased:		C) Natural	Surgery 6
	6	(8)		periods induced			uedseu:		6) Endometria	1725 C 1026 C 1027 C 10
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100	ő	0	b. Are you	currently using	g oral contr	aceptives fo	or any reas	ion?			0 0 6
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		22		gen gels, creams,						n box below)	
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		Ot	er hormones	Bioldentical estr		Testoster	one			-	2220
		66	RRENTLY used:	Bioldentical prog	jesterone	Other (spe	ecify in box)				333
		d) If		njugated estrog						take?	(4) (4) (d)
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· · ·	40,000		vusing any of	these over-the	-counter (C	TC) prepara	A CONTRACTOR OF	and the second second second		,	7 7 7 8
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	Soy n the p	estrogen p ast two y	oducts OB	ack cohosh (e.g., u had two weel	Remifemin) ks or longe	Natural pr	ations for I ogesterone	ormone rej cream/wild ya	acement		7 7 7 8
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Since June 2013, have you had any o these clinician-diagnosed illnesses?		Before	OF DIAG	After	20. In the past two years have you had: No Yee, for (if yes, mark all that apply) Yee, for screening symptom
LEAVE BLANK FOR "NO", MARK HERE FOR "YES" -	-	June 1 2013	to May '15	June 1 2015	A physical exam?
Myocardial infarction (heart attack)	(Y)	-0	0	0	Mammogram (or other breast imaging)?
	(Y)=	0	Õ	O.	Eye exam by doctor?
	Yes		~		Fasting blood sugar?
Coronary bypass, angioplasty or stent	R	-0	0	0	Upper endoscopy? (N) No (Y) Yes
	(Y)=	0	õ	ŏ	(Virtual) CT Colonoscopy? (N) No (Y) Yes -
service and the service of the servi	$(\mathbf{v})^{\dagger}$	0	õ	O.	Colonoscopy? (N) No (Y) Yes
	(Y)=1	-0	O.	0	Sigmoidoscopy? (N) No (Y) Yes
Record and and an extension of the second second	(W)	ň	ŏ	IO	Initial reason(s) you had Colonoscopy/Sigmoidoscopy
Fibrocystic/other benign breast disease		Ň	ŏ	õ	Visible bloed Occult fecal blood Abdominal pain
	Yes				Diamhea/constipation Family history of colori cancer
	(Y)	-01	0	a	Fecal/stool DNA testing Follow-up of (virtual) CT colonoscopy
	(Y)ed	50	10	X	Prior polyps Asymptomatic or routine screening
	(Y)	10 I	ă	in in	21. Regular Medication (Mark if used regularly in past 2 years
An and the second s	0	0	10	0	Acetaminophen (e.g., Tylenol)
 Setting the set of t	m	100	ŏ	105	Days/week: 1 2-3 4-5 6+ days
	0	X	X	0	Tablets/wk: 01-2 03-5 06-14 015+ tablet
	Ø.	20	a	0	"Baby" or low dose aspirin (100 mg or less/tablet)
	0	8	X	10	Days/week: 01 02-3 04-5 06+ days
	(γ)	X	X	X	Tablets/wk: 01-2 03-5 06-14 015+ tablet
	W 1	0	00	0	
Specify site of					Aspirin or aspirin-containing products (325 mg or more/tablet) Days/week: 1 2-3 4-5 6+ days
other cancer	-8 I	-	131		
inconstruction and all the construction to the state of the state of the	(V):	2	2	2	Tablets/wk: 0 1-2 0 3-5 0 6-14 0 15+ tablet
	(Y)	20	Q	1 QN	O Ibuprofen (e.g., Advil, Motrin, Nuprin)
	0	-Q	Q.	Q	Days/week: Q1 Q2-3 Q4-5 Q6+ days
	0	>()	Q	Q.	Tablets/wk: 0 1-2 0 3-5 0 6-14 0 15+ tablet
a second a second s	0	-0	0	0	Celebrex (COX-2 inhibitors)
	(Y)=	PO	0	0	Days/week: () 1 () 2-3 () 4-5 () 6+ days
and an experimental processing of the second s	0	×0-	0	0	Other anti-inflammatory analgesics, 2+ times/week
High blood pressure	(Y)=		0	0	(e.g., Aleve, Clinoril, Relafen, Indocin)
and the second se	(V)	-Q.	0	0	Thiazide diuretic Lasix Potassium
And the second			0	0	Calcium blocker (e.g., Calan, Procardia, Cardizem, Norvasc)
Asthma, Clinician diagnosed	0	-0	0	10	 Beta-blocker (e.g., Lopressor, Tenormin, Corgard, Coreg)
Emphysema/Chronic bronchitis	00		0	0	ACE inhibitors (e.g., Capoten, Vasotec, Zestril)
Graves' disease/Hyperthyroidism	0	D.	0	0	Angiotensin receptor blocker (e.g., Diovan, Cozaar, Avapro)
Hypothyroidism	0		0	0	Other anti-hypertensive (e.g., clonidine, doxazosin)
Hyperparathyroidism	0	0	0	0	Coumadin O Pradaxa/Xarelto/Eliquis O Plavix
Gout	0		0	0	O Prasugrel (Effient) O Digoxin O Antiamhythmic
Peripheral neuropathy	3	0	0	O	Mevacor (lovastatin) OZocor (simvastatin) OCrestor
SLE (systemic lupus)	(Y)=	0	0	0	O Pravachol (pravastatin) O Lipitor (atorvastatin) O Other stati
Rheumatoid arthritis	00	0	O	0	Other cholesterol-lowering drug [e.g., niacin, Lopid (gemfibroz
Other arthritis	Y	-0	O.	0	Tricor (fenofibrate), Questran (cholestyramine), Colestid, Zetia]
	8	-0	0	0	Steroids taken orally (e.g., Prednisone, Decadron, Medrol)
	(Y)=	301	0	101	Insulin Metformin Other oral hypoglycemic agent
	0	0	0	0	Thyroid hormone (e.g., Synthroid, Levothroid, Levoxyl)
and a function of the function	0	0	a	O	Triptans (e.g., Imitrex, Maxalt, Zornig, Amerge, Replax)
	0	-0	õ	0	Bisphosphonates (e.g., Fosamax, Boniva, Actonel)
	00	-0	õ	0	Evista (raloxifene) Notvadex (tamoxifen)
1222-046-0	0	0	a	0	Anticholinergics (e.g., Detrol, Ditropan, Vesicare)
	(v)	X	X	X	SSRIs (e.g., Celexa, Lexapro, Prozac, Paxil, Zoloft, Luvox)
June 2013	221	The state	C.A.	100	
			4 5 1		Tricyclics (e.g., amitriptyline, nortriptyline, imipramine)
Please specify: Date: 0					
0.7	10.2	100000	4 (5) (3		Minor tranquilizers (e.g., Valium, alprazolam, lorazepam)
1210		2.00			Prilosec, Nexium, Prevacid, Protonix, Aciphex, Dexilant
	-	- 250	8 2 3		H2 blocker (e.g., Pepcid, Tagamet, Zantac, Axid)
The second se	4 (9)	(Provide	4 4 4 6 8 4		22. Is this your correct date of birth? ==>
0 1 2 3 4 5 6 7 8 9 15 16 17	di a	P	PP	p p	Yes If no, please

	HOOL	OF PUBLIC I	HEALTH			PAGE 3						N	urses'	Healt	h Stud
3. Do you	current	ly take multi	vitamins? (Please	report oth	er individual vi	tami	ns in t	he ne	xt sea	ction.)				
	a }	How many do	you take pe	ar week?	2 () 2 or 1	ess () 3-5 ()									_
O No		What specific		Confirm of		in the destruction									
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) Vitamin C	O No	Vac eos	sonal only	lî n	Dose per	C Less than	-	400 to		750			300 mg		Don't
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add to y 6. What br cereal d Don't 7. What for None 8. For eacl you haw 1 2 3 4 5 0 1 2 3 4 5 0 1 2 3 4 5 0 8	any teas your be and an lo you u eat cold rrm of m Form Type' h food e used form t form t for	spoons of su verages or fo d type of col isually eat? breakfast cere argarine or ? Stick Reg listed, fill in t the amount kiw Milk (8 Cream Non-di Frozen Regula Spreac food of exclud cookin	Igar do you ood each da d breakfast sal. spread do ' Tub Light the circle in specified d oz. glass) , e.g., coffee, airy coffee wh tryogurt, shert ar ice cream (' ts added to r bread; le use in g Plain Artificially	Vitami ay? t → you ust Sp No ndicatin luring th RV FOOD S sour (ex hitener (ex bet, sorb 1 cup) Pure b Marga "Spree blend	n B12 Zero 1 5 pecify cereal b (e.g., Kelogg's i ually use (e ray nfat g how ofte he past yea skim milk or 2 % milk vhole milk soy milk vhole milk soy milk volude fat free xclude fat) Niacin tsp. 2 tsp. (tsp. 7 tsp. (rand & type Reisin Bran) exclude pure b) Squeeze (liquid) en on average ar. Never, or let once per n (in to s) ee) (1 Tbs) ice cream (1 c) puntry Crock) r"- butter/oil Spread But.) it peach)) 3 tsp) 8 tsp utter s than	ycoper . 4 . 9 ?) -> AVE 1-3 per	e (1 tsp. (tsp. (tsp. (fsg. (eg wask Win (eg (eg (eg (eg (eg (eg (eg (eg	5 tsj) 10 tr) 10 tr x specific , Sheddh	D. MW sp. he brand 8 th Country C	YEA 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ar 2 3 4 2 3	d vitamir	6+
add to y 6. What br cereal d Don't 7. What for None 8. For eacl you haw 1 2 3 4 5 0 1 2 3 4 5 0 1 2 3 4 5 0 8	any teas your be and an lo you u eat cold rrm of m Form Type' h food e used form t form t for	spoons of su verages or fo d type of col isually eat? breakfast cere argarine or ? Stick ? Reg listed, fill in t the amount Milk (8 Cream Non-di Frozen Regula Spreac food or exclud cookin Yogurt (4–6 oz	Igar do you ood each da d breakfast sal. spread do ' Tub Light the circle in specified d oz. glass) , e.g., coffee, airy coffee wh tryogurt, shert ar ice cream (' ts added to r bread; le use in g Plain Artificially	Vitami ay? t → you ust Sp No ndicatin luring th RV FOOD S sour (ex nitener (ex bet, sorb 1 cup) Pure b Marga "Spree blend	n B12 Zero 1 Specify coreal b (e.g., Kelloga's f ually use (e ray infat g how ofte he past yea b g how ofte he past yea b kim milk or 2 % milk vhole milk soy milk solude fat free xxclude fat) Niacin tsp. 2 tsp. (tsp. 7 tsp. (rand & type Reisin Bran) exclude pure b) Squeeze (liquid) en on average ar. Never, or let once per n (in to s) ee) (1 Tbs) ice cream (1 c) puntry Crock) r"- butter/oil Spread But.) it peach)) 3 tsp) 8 tsp utter s than	ycoper . 4 . 9 ?) -> AVE 1-3 per	te (1 tsp. (tsp. (tsp. (lsp. (lsp	5 tsj) 10 tr) 10 tr x specific , Sheddh	D. MW sp. he brand 8 th Country C	YEA 1 0 0 0 0 0 0 0 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ar 2 3 4 2 3	d vitamir	6+
add to y 6. What br cereal d Don't 7. What for None 8. For eacl you haw 1 2 3 4 5 0 1 2 3 4 5 0 1 2 3 4 5 0 8	any teas your be and an lo you u eat cold rrm of m Form Type' h food e used form t form t for	spoons of su verages or fo d type of col isually eat? breakfast cere argarine or ? Stick ? Reg listed, fill in 1 the amount % Milk (8 Cream Non-di Frozen Regula Spreac food or exclud cookin Yogurt (4-6 oz Cottag	Igar do you ood each da d breakfast sal. spread do ' Tub Light the circle in specified d roz. glass) , e.g., coffee, airy coffee wh ryogurt, shert ar ice cream (' ts added to r bread; le use in g Plain Artificially Sweetene	Vitami ay? t	n B12 Zero 1 Specify coreal b (e.g., Kelloga's f ually use (e ray infat g how ofte he past yea b g how ofte he past yea b kim milk or 2 % milk vhole milk soy milk solude fat free xxclude fat) Niacin tsp. 2 tsp. (tsp. 7 tsp. (rand & type Reisin Bran) exclude pure b) Squeeze (liquid) en on average ar. Never, or let once per n (in to s) ee) (1 Tbs) ice cream (1 c) puntry Crock) r"- butter/oil Spread But.) it peach)) 3 tsp) 8 tsp utter s than	ycoper . 4 . 9 ?) -> AVE 1-3 per	te (1 tsp. (tsp. (tsp. (lsp. (lsp	5 tsj) 10 tr) 10 tr x specific , Sheddh	D. MW sp. he brand 8 th Country C	TYEAL 1 0 0 0 0 0 0 0 0 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 <td>ar 2 3 4 2 3</td> <td>d vitamir</td> <td>6+</td>	ar 2 3 4 2 3	d vitamir	6+
add to y 6. What br cereal d Don't 7. What for None 8. For eacl you haw 1 2 3 4 5 0 1 2 3 4 5 0 1 2 3 4 5 0 8	any teas your be and an lo you u eat cold rrm of m Form Type' h food e used form t form t for	spoons of su verages or fo d type of col isually eat? breakfast cere margarine or ? Stick ? Reg listed, fill in t the amount Milk (8 Cream Non-di Frozen Regula Spreac food o exclud cookin Yogurt (4–6 oz Cottag Cream	Igar do you ood each da d breakfast sal. spread do you Tub Light the circle in specified d roz. glass) a cz.	Vitami ay? t	n B12 Zero 1 Specify cereal b (e.g., Kelloga's 7 ually use (e ray 0 nfat g how ofte he past yes g kim milk or 2 % milk or 2 % milk vhole milk soy milk toclude fat free exclude fat) Niacin tsp. 2 tsp. (tsp. 7 tsp. (rand & type Ration Bran) exclude pure b) Squeeze (liquid) en on average ar. Never, or let once per n (e) (1 Tbs) ee) (1 Tbs) i coe cream (1 c) ountry Crock) r"- butter/oil Spread But.) anilla) etc., plain or) 3 tsp) 8 tsp utter s than	ycoper . 4 . 9 ?) -> AVE 1-3 per	te (150, 150, 150, 150, 150, 150, 150, 150,	5 tsj) 10 tr) 10 tr x specific , Sheddh	D. MW sp. he brand 8 th Country C	Type Type 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	ar 2 3 4 2 3	d vitamir	6+

RVARD SCHOOL OF	PUBLIC HEALTH	PAGE	4 1					N	urses	Healt	h St
	ach food listed, fill in th specified during the pa		w often <u>o</u>	n aver	age y	ou ha	ve				
		Nev	er, or less than	1-3 per	1 per	2-4 per	5-6 per	1	2-3	4-5	6+
BI SHARE SHE AND A SHE AND	FRUIT		ce per month	month	and the second s	week	week		perday	perday	perda
	Raisins (1 oz. or small pack		0	0	W	2	0	0	0	0	0
	Prunes or dried plums (1/2	cup canned or 1/4 cup dr	ied)	0	(W)	0	0	(1)	0	0	0
	Bananas (1)		0	0	(W).	0	0	0	0	0	0
	Cantaloupe (1/4 melon)		0	O.	W	0	0	0	0	0	0
the entire year.	Avocado (1/2 fruit or 1/2 cu	ip)	10	10	W	0		0	0	no	
For example, if	Fresh apples or pears (1)		0	0	W)	0	0	(D)	0	0	0
a food such as	Apple juice or cider (small g	glass)	0	100	(W)	0.	101	(D)	10	10	0
ntaloupe is	Tangerines, clementines, m	andarin oranges (1)	0	0	(W)	O.	0	(0)	0	Õ	0
en 4 times a	Oranges (1)		6	0	(W)	10	0	(0)	16.31	0	10
eek during are	orangeo (r)	Calcium or Vit. D fortified	X	X	(W)	X	X	0	TO	X	X
proximate 3	Orange juice (small glass)	In the second	- ×	X		X	X	0	X	X	×
nths that it is	0	Regular (not calcium fortifi		1 AN	W	0	Q.	12	0	0	2
	Grapefruit (1/2)	v.	0	0	W	0	0	0	0	0	0
	Grapefruit juice (small glass	()	0	0	(W)	01	0	0	0	0	0
	Other fruit juices (e.g., cran	berry, grape) (small glass)	0	0	W	0	0	D	0	0	0
rweek.	Strawberries, fresh, frozen (or canned (1/2 cup)	0	0	(W).	0		(D)	O	0	
	Blueberries, fresh, frozen or	r canned (1/2 cup)	0	0	W	01	0	(D)	0	0	0
1	Peaches, plums or apricots	(1 fresh or 1/2 cup canne	d) ()	10	W)	0)	0	(0)	0	0	0
		G G G G G G G G G G G G G G G G G G G	al Justice	10000		-				1	1
1	VEGETAB	Nev 00	er, or less than be per month	1-3 per month		2-4 per week	5–6 per week		2-3 perdev	4-5 perday	6+ nerda
	Tomatoes (2 slices)		ve per montin	in contin	(W)	HOOK	HOON	D	porciary	perciary	perda
+		mall alasa)	- 18	X	11000	X	2	1.000	18	X	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
-	Tomato juice or V-8 juice (si	2	12	(W)	0	- CA	0	2	2	2	
-	Tomato sauce (1/2 cup) e.g	0	0	W	01	101	(0)	0	0	0	
	Salsa, picante or taco sauc	e (1/4 cup)	0	0	1	0	0	(9)	0	0	0
1	Hummus (1/4 cup)		0	NO1	1	0	0	0	0	0	
1	String beans (1/2 cup)		0	10	W)	0	0	0	0	0	0
	Beans or lentils, baked, drie	ed (1/2 cup) or soup	0	17 Oak	W)	0		(D)	0	0	(4)
-	Tofu, soy burger, soybeans,	0	0	(W)	0	0	(D)	0	0	0	
1-	Peas or lima beans (1/2 cup		Contraction of the second	1 m	(W)	1 OF	1 O	0	a	ŏ	0
1	Broccoli (1/2 cup)		X	X	(W)	10	10	(0)	6	18	X
-	and the second			K	(W)	1	X		K	X	X
-	Cauliflower (1/2 cup)	description -	- 18	10		10	12	D	0	18	0
1	Cabbage or colesiaw (1/2 c	up)	0	0	W	0	0		0	0	Q.
1	Brussels sprouts (1/2 cup)	nii secenii	0.1	0	(W).	0	0	0	0	0	0
4	Carrots, raw (1/2 carrot or 2	2-4 sticks)	0	0	W)	0	0	(D)	0	\odot	0
	Carrots, cooked (1/2 cup) o	or carrot juice (2–3 oz.)	10	0	(W):			(1)	0	10	0
	Corn (1 ear or 1/2 cup froze	en or canned)	0	0	(W)	0	0	0	0	0	0
1	Mixed or stir fry vegetables	(1/2 cup) or soup	0	0	W)	Di	0	(D).	0	0	10
144	Yams or sweet potatoes (1/		ŏ	10	W	0	0	(0)	0	Õ	6
	Dark orange (winter) squasi		- In	1 AU	W	- O	10	(0)	A	TA	TA
1		and the second	X	X	W)	X	X	and the second second	2	X	×
1	Eggplant, zucchini or other		X	X		X	X	0	R	X	×
	Kale, mustard greens or ch	ard (1/2 cup)	0	1900	W	0.	U.	(0)	1 OI	0	0
-	Spinach, cooked (1/2 cup)		0	0	W	0	0	(D)	0	0	0
	Spinach, raw as in salad (1	cup)	0	0	W	0	10	0	0	0	0
1	ceberg or head lettuce (1 s	erving)	0	0	(W).	0	0	D	0	0	0
1	Romaine or leaf lettuce (1 s	erving)	10	0	(W).	0	0	(D)	O	0	0
1	Peppers: green, yellow or re	ed (2 rings or 1/4 small)	0	0	(W)	0	0	(0)	0	0	0
-	Onions as a gamish or in sa		Ő	0	(W)	0	O	0	0	O	0
1	Onions as a cooked vegeta			1X	(W)	1 O	0		0	0	X
1	omono ao a coorieu vegeta	and or rings (in 2 oup) of s	wh 10	19	1.00	0	0	0	0	9	0
	10000000000		er, or less than		1 per	2-4 per	5-6 per	1	2-3	4-5	6+
1	EGGS, MEA	II, ETG. on	ce per month	month	week	week	week	per day	perday	perday	perda
	Eags (1)	ified including yolk	0	Q	(W):	0	0	0	0	10	0
1	Regular eggs	including yolk	0	0	()	0	O	0	0	0	0
	Beef or pork hot dogs (1)		0	10	W	0	0	(0)	0	10	0
F	Chicken or turkey hot dogs	or sausage (1)	0	0	(W)	0	0	(0)	0	0	67
	Chicken/turkey sandwich o	V 4 2 A 77 A 22 W 4 A 22 W	ă	1 G	(1)	a	a	6	6	X	X
-	Other chicken or turkey, wit	al per se se la secta de la compaña de la	A N	X	W	K	X	0	175	X	×
-			X	X		2	X	10	X	X	10
1	Other chicken or turkey, wit	nout skin (3 02.)		10	W	0			100	NO.	10
-	Bacon (2 slices)	Commission and a standard and consideration	1	1000	(W):	100		(D)	1000	1.1	

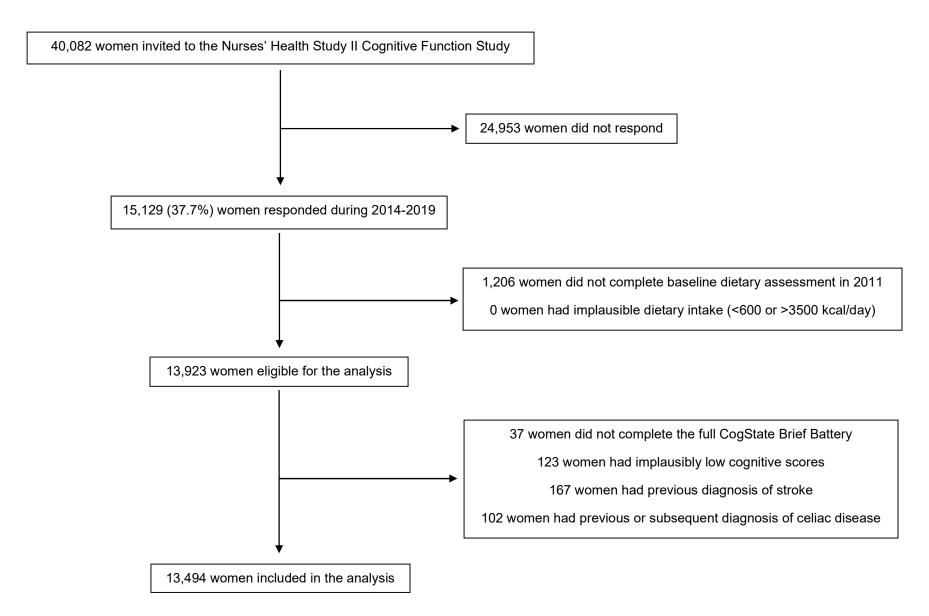
ARVARD SCHOOL OF PUBLIC HEALTH PAGE 5 8. (continued) For each food listed, fill in the circle indicating how of						ften on average you have											
used the ar	nount specifi	t specified during the past year.				essthan 1-3 per 1 per 2-4 per 5-6 per 1 2-3 4-5 1											
		ME	AT, FISH	once per l		month		week					per day				
	Salami,	bologna, or oth	ner processed mea	t sandwiches	0	0	(W)	10	0	D	0	LO.	O.				
	Other pr	rocessed meats	s, e.g., sausage, kie	elbasa,													
	etc. (2 o	z. or 2 small lin	iks)		0	0	(W) .	0	0	(D)	0	0	0				
	002 - 00	1995 - 1999	Lean or extra lea	ເກ	0	0	(W)	00	0	(D)	0	0	0				
	Hambur	ger (1 patty)	Regular		0	O.	(W)	Õ	Ŏ.	(D)	0	10	O				
	100 KG 10 KG 00 KG		a sandwich or mixe	이 옷을 많은 것 같아요.													
	1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.		asagna, frozen dinn	Service March	0	0	(W)	0	0	0	0	0	0				
	Enter and the second se	A second s	g., ham or chops (4	the second s	0	0	W	0	0	0	0	0	O				
	a hitse and a second	Contractory of Contractory and	i dish, e.g., steak, r	oast (4-6 oz.)	0	0	(W)	10	NO1	0	0	Q	Q				
		tuna fish (3-4)		0	0	W	0	0	0	0	O	0					
	and the second s		eces, or fish sticks							l.							
	(1 servin	ig, store bough	π)		0	0	W	0	0	0	0	0	0				
	Shellfish	i e.g., shrimp, k	obster, scallops, cla	ms as main dish	O.	0	W	0	0	0	0	0	0				
		at fish, e.g., tu s, bluefish, swo	, salmon,	0	0	Ŵ	10	in	6	0	0	0					
	Other fis	hea cod h	addock, halibut (3-	0	K	(W)	0	K	(D)	K	0	0					
	other he	n, e.g., cod, n	addoord, manbar (o					10			~	12					
		BREADS CER	EALS, STARCHES	Never, or le once per l	es than	1-3 per month	1 per week	2-4 per week	5-6 per	1 ner dav	2-3 per day	4-5 per day	6+ perday				
	Cold bre	akfast cereal (9 10 D.B		0	0	(W)	0	0	(B)	0	0					
			oatmeal/cooked oat bran (including instant) (1				(W)	0	0	0	Ő	0	O I				
	1000	ooked breakfas		0	1 O	(W)	0	Ó	(0)	ŏ	To	To l					
	outor of		d, including pita		TO	1X	(W)	K	0	0	X	K	X				
	Bread	Rye/Pumpe			X	X	W	X	G	(0)	X	X	X				
	(1 slice)	where the cost and contraction of the	et, oatmeal, other	ubolo grain	~	X	Ŵ	2	0	1	0	18	8				
	0.1			whole gram		X	-	X	X	0	X	8	2				
	Cracker	and the second second second second second	n/whole wheat		32	X	(W)	12	100	and had been	0	N.	2				
	(6)		Other crackers					12	1.0	0	2	1.02	2				
	and and the second second	English muffine	s, or rolls (1)		100	U.	(W)	NO.	0	0	0	10	0				
	and strength of the local division of the lo	or biscuits (1)	2	Q	W	0	0	0	0	0	Q						
	Real Property and Advancements	es or waffles (2	small pieces)		10	Q.	W	O:	0	0	0	00	0				
	and the second s	vn rice (1 cup)				0	(1)	0	0	0	0	0	0				
		ce (1 cup)			0.	0.	(W) (0	.0	D	0	U.O.	O.				
			noodles, couscous	. etc. (1 cup)	Q.	0	W	0	0	0	0	0	0				
	the second s	corn or flour (Q	Q.	(W)	VO.	DO1	D	0	UQ.	Q.				
	and the second sec	Fries (6 oz. or 1	and the second se		0	Q.	(W)	0	0	(D)	0	Q.	Q				
	and a second second	Contraction of the second s	d (1) or mashed (1		<u>Q</u> .	0	W	0	(O)	0	0	UQ.	Q				
	Potato chips or cor			agor 1 oz.)	Q	0	(W):	0	0	(D)	0	0	0				
	Pizza (2	slices)			0	0	W	1:0	0	(D)	10	10	0				
		200	ALC: NOT THE REAL PROPERTY OF	Never, or le	es than	1-3 per	1 per	2-4 per	5-6 per	1	2-3	4-5	6+				
			VERAGES	once per l	month	month	week	week	week	per day	per day	per day	per day				
CARBONATED	(BUGBI-TEE) Massan	and the local part of the second s	age with caffeine, e	and the second se	1.52	2	(W)	0	0	0	10	Cr.	0				
BEVERAGES Consider the	19 19 19 19 19 19 19 19 19 19 19 19 19 1	and the second	without caffeine, e		0	0	W	0	0	۲	0	0	0				
serving size as	Regular e.g		age with caffeine & s Mt. Dew, Dr. Pepper		0	0	(W).	0	Ó	(6)	0	0	0				
or can for these	types (not sugar-tree) Oth	er carbonated	beverage with sugar	Lan an analysis													
carbonated beverages.			eer, Ginger Ale, Caff		0	0	(W)	10	0	10	0	0	0				
OTHER BEVE	THAL																
		11 A. 11	ce tea (1 glass, bottle	, canj	0	0	(W)	0	0	(D)	0	0	0				
	george bet	a product of the second se	ass, bottle, can)		0	0	(W)	0	0	(D)	0	0	0				
	Contraction of the second s	ht Beer, e.g., B	ottle, can)	Q.	0	(W)	DO.	0	0	0	10	0.					
	- Andrews	d wine (5 oz. gl	and the second se		0	0	W	0	0	0	0	0	O				
	Wh	nite wine (5 oz.	glass)		10	O	(1)	0	0	0	10	10	0				
	Liq	uor, e.g., vodka	a, gin, etc. (1 drink	or shot)	0	0	1	0	0	0	0	0	0				
	Pla	in water: bottle	d, sparkling, or tap) (8 oz. cup)	0	0	W	O	O	0	0	0	O				
	De	caffeinated tea	, exclude herbal (8	oz. cup)	0	0	W	0	0	(D)	0	0					
	Tea	a with caffeine ((8 oz. cup), includin	ig green tea	()	0	W	0	0	D	0	EG.	O.				
	De	caffeinated cof	fee (8 oz. cup)		0	0	(Ŵ)	0	0	(D)	0	0	0				
		ffee with caffei			0	O.	(W)	0	a	0	Õ	6	0				
			(hot/cold), e.g., Cap	(ro ot)	25	0	(W)	0	101	(0)	0	0	0				
	1 13	IV COTTEE CITINE I	novcolul, e.d., Cam	DUCCHO LIZ DZ.													

1 1

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0.492.00122.5567.2	C	pecified <u>durin</u>	Never, or lea	5-25 (124)	1-3 per	1 per	2-4 per	5-6 per	1	2-3	4-5	6+	ř.			(m)
SWEETS, BAKED	and the second se		once per n		month	week	week	week	per day			per day	-	1000		-
Milk chocolate (ba				0	0	W	0	0	0	0	0	0	0	2		1
Dark chocolate, e	and the second	and the second se		0	10	(W)	0	0	(D)	Q	0	O.	0			1
Candy bars, e.g.,			se's	10	PO	W	0	Q	(D)	Q.	0	0	0	<u>10</u>		1
Candy without ch	construction of the second			LQ.	Q	W	0	Q	(D)	Q.	0	Q	0			
0000063(1)	and the second second second	reduced fat		0	0	(W);	0	0	0	0	0	0	0			
223 0000000 - 22200	or and the subscription of the	y made or from		10	10	W	2	2	0	2	2	0	20	8		
the second secon	Home-bak	ed, from scratcl	0.	10X	10	Sec.	10	2	Sec.	2	0	1 US	10	-		
Doughnuts (1)		made (elles)		10	12	- Li marte	18	2	- had	2	0	9	2			
Cake, homemade	C			19	N	1000	19	2	-	2	2	2	10			
Pie, homemade o		and the second	The	18	18	-	18	8	and the second	X	8	2	-			
Jams, jellies, pres Peanut butter (1	Contractor and the Contractor	up, or noney (1	1DSJ	10	10	-	2	8		8	0	Mbe sbray) 3 1 1/wesk or moze 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0				
Feallul Dutter (1		t fraa or light		K	1×	-	18	X	100	12	8	2	*	1		
Popcorn (2-3 cup	18)	t free or light sqular		K	12	1.11	R	K	and the second	X	8	- 0	20	8		
Swoot call and	A second	and the second sec		X	X	1	K	X	and the second	X	X	X	0	3		
Sweet roll, coffee Snack bars, e.g.,	contain the state of the local division of the	and an extension of the second second	Diantoria (4)	18	18	1	10	8	1	R	8	8	2			
Energy bars or hi				K	K		K	10		X	10	K	2	111		
Diet nutrition drin			Lone, etc.	X	K	-	W O O O O O O W O O O O O O O W O O O O O O O W O O O O O O O W O O O O O O O W O O O O O O O W O O O O O O O W O O O O O O O W O O O O O O O W O O O O O O O W O O O O O O O W O O O O O O O W O O O O O O O W									
Ensure, Boost or			rinke (1)	10	K	-	10	X		X	8	X	1	ŧ		
Pretzels (1 small		CO NO		X	X	-	K	8		X	X	0				
Peanuts (small pa	-	- Chi		10	18	100	10	X	1.00	X	X	8	X	4		
Walnuts (1 oz.)	acher of T	02.)		10	X	-	K	X	1000	X	100	A	10			
Other nuts (small	nacket or	1 07)		18	1 a	No.C	10	X	100	X	1 OF	0				
Dried cranberries	a contration of the second	1 02.)		G	X	- in the second	a	X	- And	X	a	A	R	2		
Mixed dried fruit				0	10	124	10	10		X	0	0	TA			
Oat bran, other br	VOID THE OWNER OF THE OWNER OWNE OWNER OWNE	atc) added to fr	ood (1 The)	X	1X	-	K	X	- Marine	X	8	TA				
Wheat germ (1 Th	a state in the second se	etc.), added to h		18	10	-	6	a	1000	0	0	6	10			
Chowder or creat		cup)		X	X		To	X		K	X	1 A	10	9		
Tomato soup (1 c	A REAL PROPERTY AND A REAL	sup,		0	1 O	-	10	10	-	Ó	O.	0	0			
Ketchup or red cl		1 Tbs)		10	TO		Ĭŏ	TO		Õ	ŏ	a	õ	12		
Flaxseed (1 Tbs)				10	10	1.1	10	0		10	0	Õ	10	8		
Garlic, fresh or po	owdered (1	clove or 4 shall	(es)	0	DO	(W)	To	Ó	(D)	Õ	O	0	0	6		
Olives, any type (3)			O	Ŏ	(W)	0	O	(D)	Ŏ.	O.	O.	0			
Olive oil added to		read (1 Tbs)		O	10	(W)	0	0	(D)	0	0	0	0			
Low-fat or fat-fre	e mayonna	aise (1 Tbs)		O	0	(W)	0	0	(D)	O	Õ	O	10	8		
Regular mayonna	ise (1 Tbs)	62		0	0	(W);	0	0	(D)	O	O	0	10			
Salad dressing (1-2 Tbs)	How often? =		0	0	(W)	0	0	(D)	0	0	O	10			
		Type(s):	ionfat 01	.cw-fa	1 (Oliv	e oil	0	Other v	egetab	le oil		0			
Artificial sweete	ners	How often?		10	10	(W)	10	0	(D)	0	O	O		<u></u>		
(1 packet)		Type(s):	Splenda 🔘 B	Equal	01	NutraS	weet	0	Sweet7	V Low	() Sac	harin	0		
29. Liver: bee		F			s than 1/				2-3	mo: () 1/we	ek or m	ore	A 25		
	and the second se	urkey (1 oz.) 🤇	and the second se		s than 1/							ek or m	ore	Contraction of the		
	Contraction of the second				nome?				1000000000	spray)				8		
C Less that			-3 times per	100.00	(-	times (Daily					
31. What kin		and the second	Contraction of the second s			100 million (1990)		12.110.011		10 California (* 1990)				3	100	1
		arganne 🔘 C			etable		Veg.	snorte	gring	01	ard:	UN	I/A	60	2	2
32. What kin		argarine () (etable i		ne? Veq.	abarte	nine	01	hand	ON	UA.	32	2	3
33. What typ	e of cool	king oil is usu	ally used a	t hom	e?		o weg.	orturie	n in (ig	01	aru.	U.A	ers.	33 0	AN	5
(e.g., Ma: 34. How ofte	n do you	eat deep frie	1100 P.1.	fish, :	shrimp							home	?	24	08	6
35. How ofte		0.000	-3 times per	COLUMN TO THE			times p ffin (sl				ally	_	_	25	1	8
CLess that	The second s		times per we		4-8				Dail		Contraction of the	mes/di	iy			1000
			A CONTRACTOR OF A CONTRACT	363	- Alberto		10 CO.	Si.				1000	1.			

eFigure 2. Study Flow Diagram



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