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Meat consumption and risk of incident dementia: cohort study of 493888 UK Biobank participants

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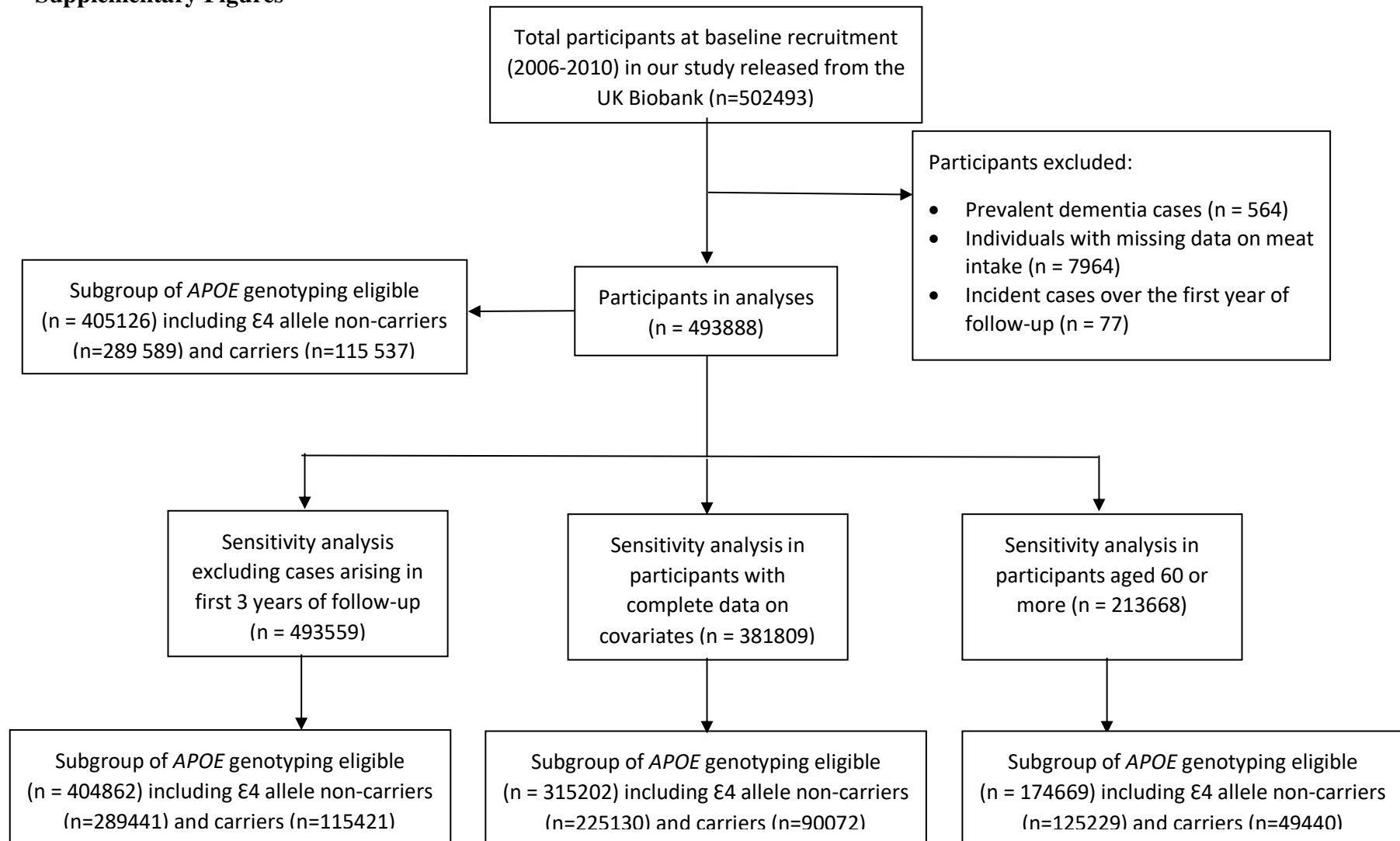
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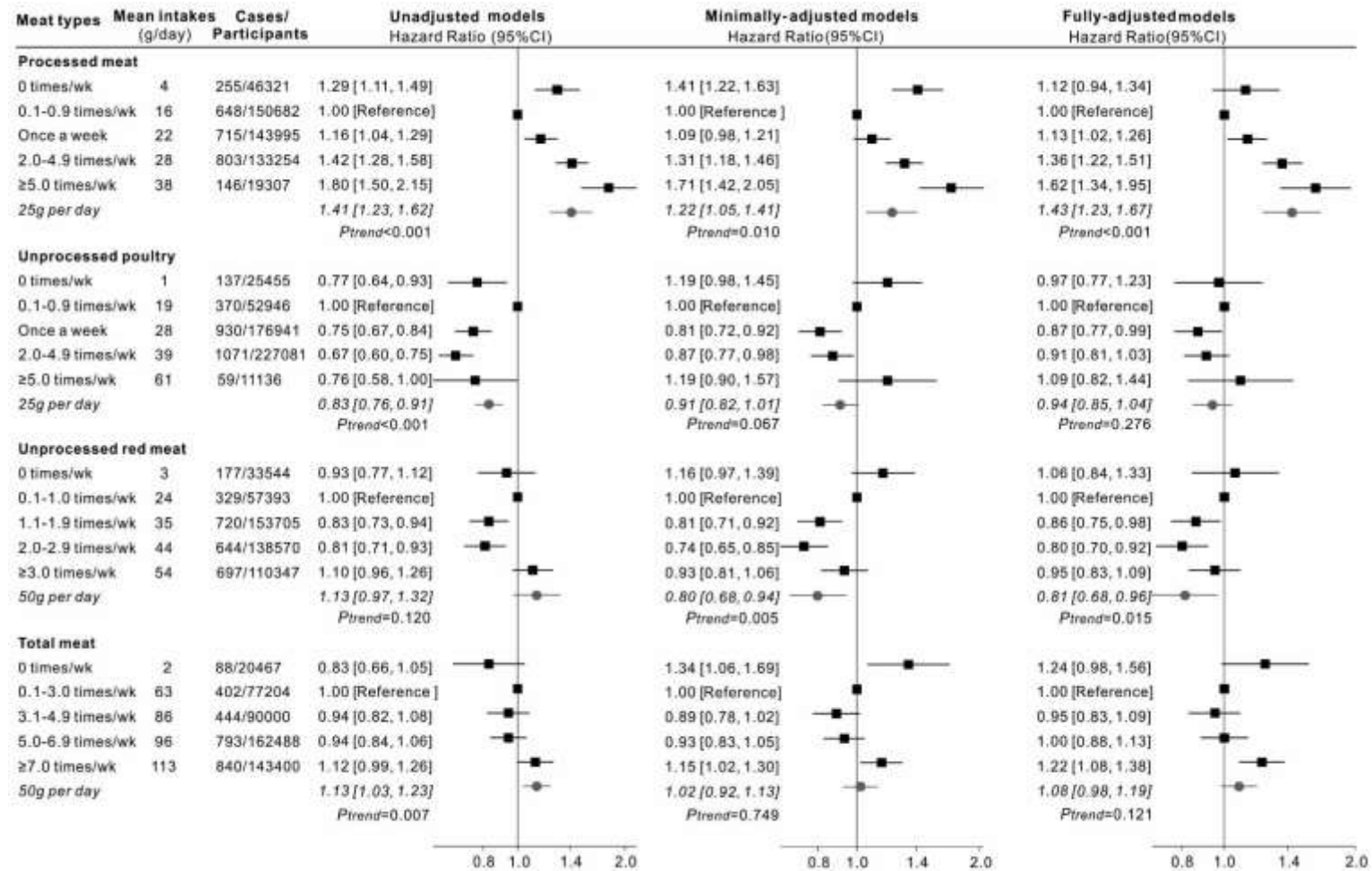
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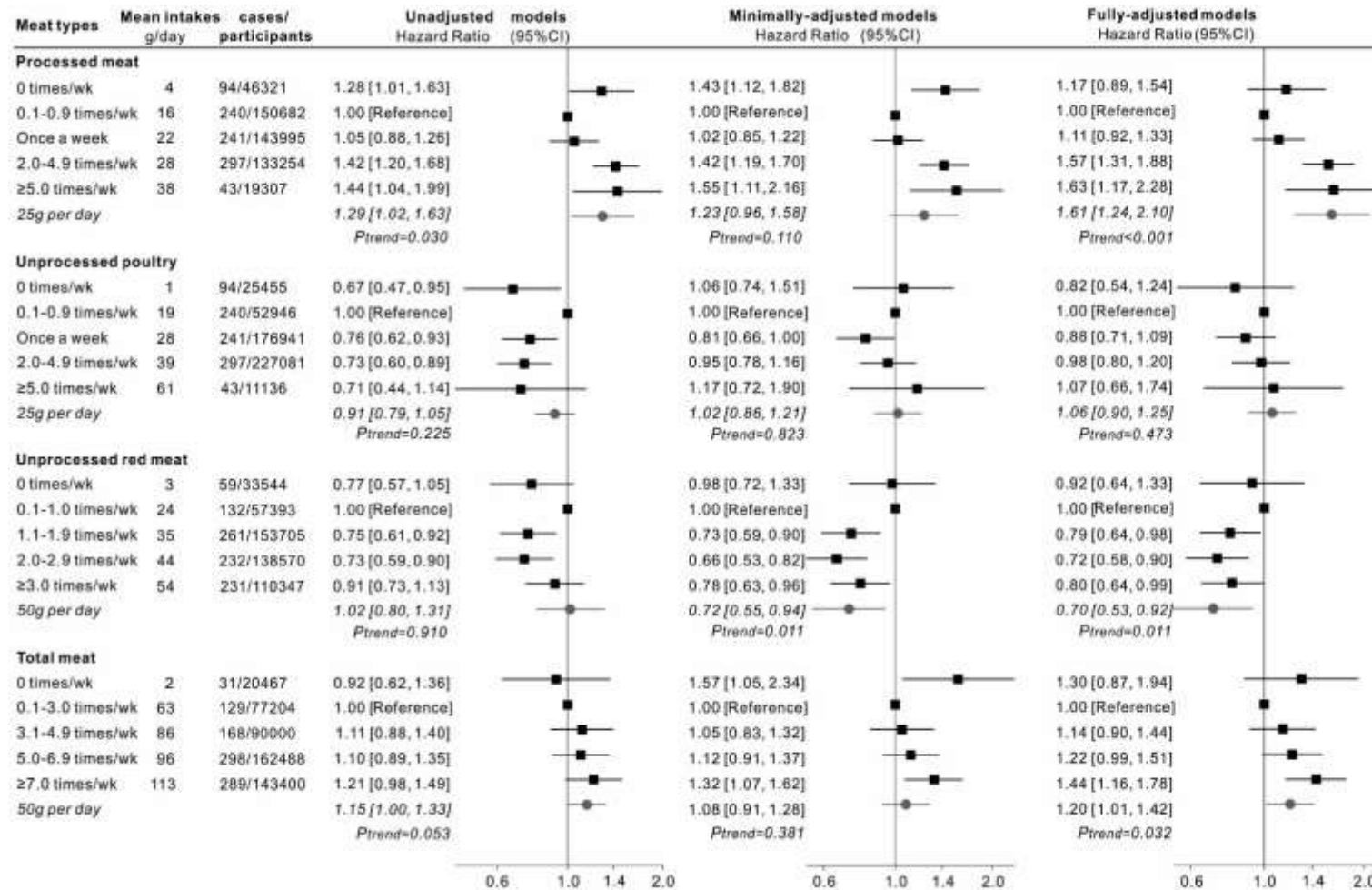
Supplementary Figures



Supplementary Figure 1 Flowchart of participants in the UK Biobank cohort study

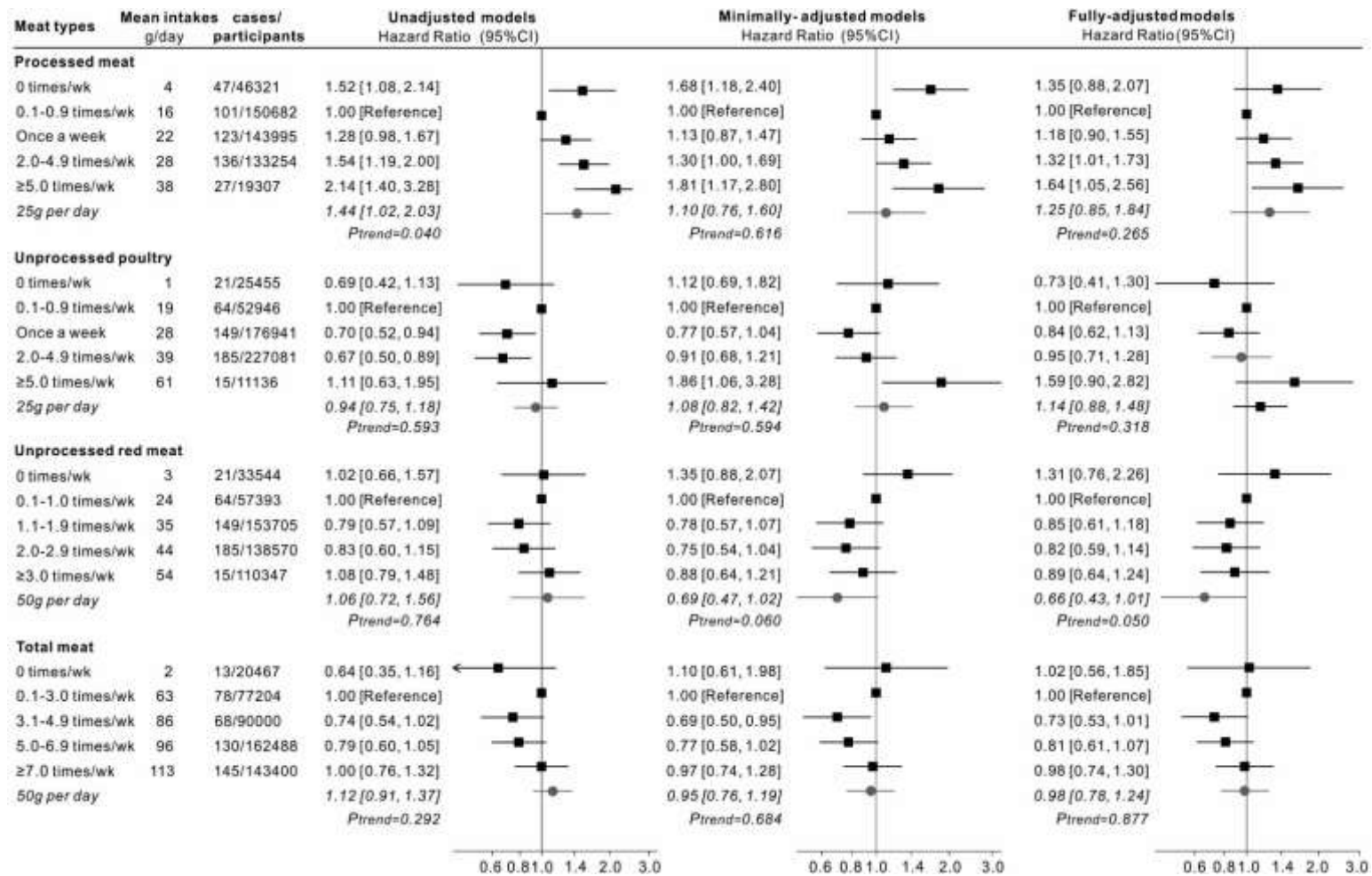


Supplementary Figure 2 Hazard ratios (95% CIs) for the associations between incident all-cause dementia and meat consumption with excluding cases arising in first 3 years of follow-up (n=493559) The black squares and horizontal lines represent hazard ratios and 95% confidence intervals respectively in Cox proportional-hazards regressions. The distribution of ticks on the x axis is exponential. Participants were categorized based on the data distribution of baseline meat intakes. Mean daily intakes in each category is calculated from the multiple 24-h dietary assessments which were used to test the linear trend per increment. Minimally-adjusted models adjusted for age, gender, ethnicity, education, socioeconomic status. Fully-adjusted models additionally adjusted for region, smoking status, physical activity, body mass index, sleep duration, stroke history, family history of dementia, dietary covariates including vegetables and fruits, total fish, tea and coffee, alcohol drinking; processed meat, unprocessed poultry, and unprocessed red meat were also mutually adjusted for.

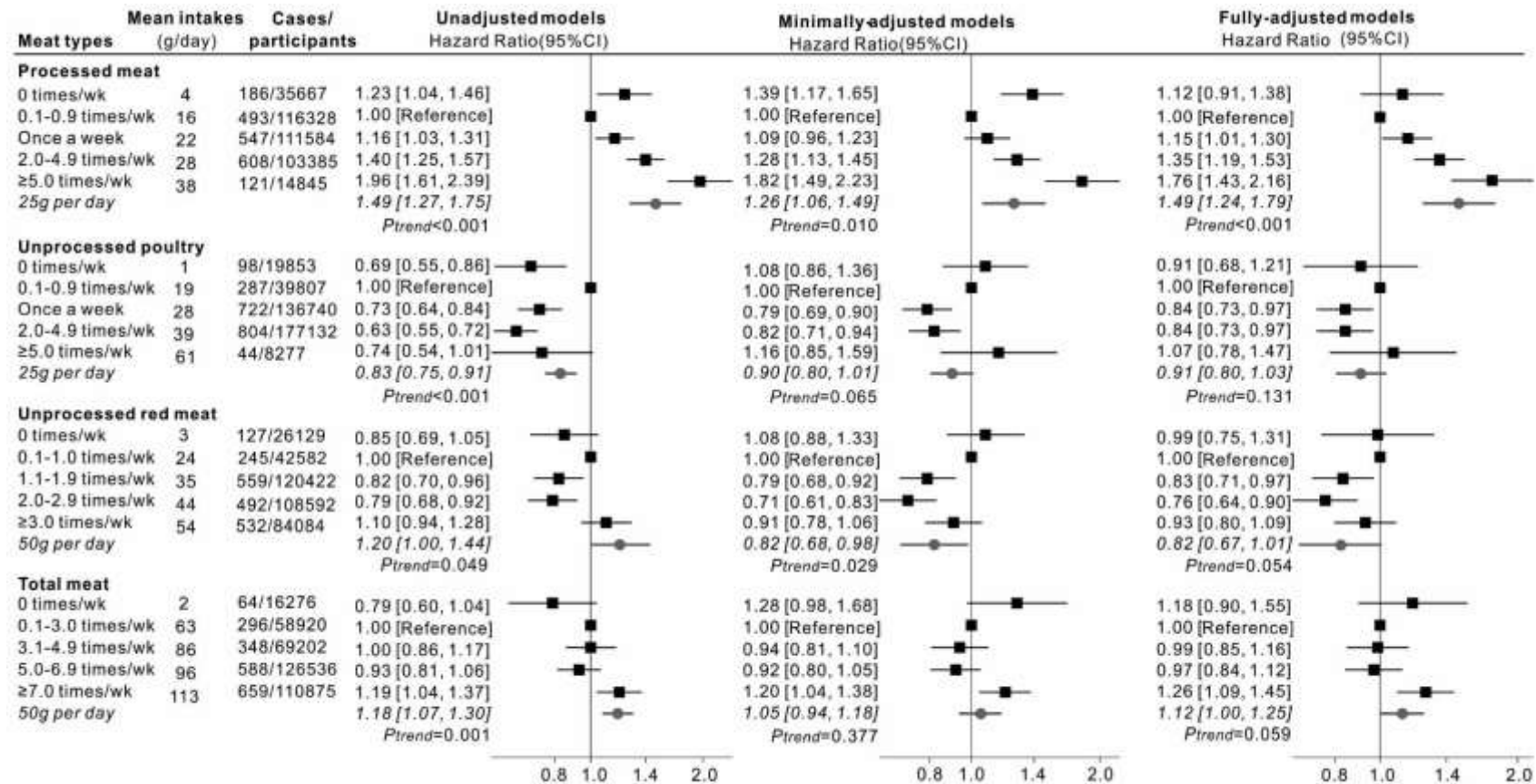


Supplementary Figure 3 Hazard ratios (95% CIs) for the associations between incident Alzheimer's disease and meat consumption with excluding cases arising in first 3 years of follow-up (n=493559) The black squares and horizontal lines represent hazard ratios and 95% confidence intervals respectively in Cox proportional-hazards regressions. The distribution of ticks on the x axis is exponential. Participants were categorized based on the data distribution of baseline meat intakes. Mean daily intakes in each category is calculated from the multiple 24-h dietary assessments which were used to test the linear trend per increment. Minimally-adjusted models adjusted for age, gender, ethnicity, education, socioeconomic status. Fully-adjusted models additionally adjusted for region, smoking status, physical activity, body mass index, sleep duration, stroke history, family history of dementia, dietary covariates including vegetables and fruits, total fish, tea and coffee, alcohol drinking; processed meat, unprocessed poultry, and unprocessed red meat were also mutually adjusted for.

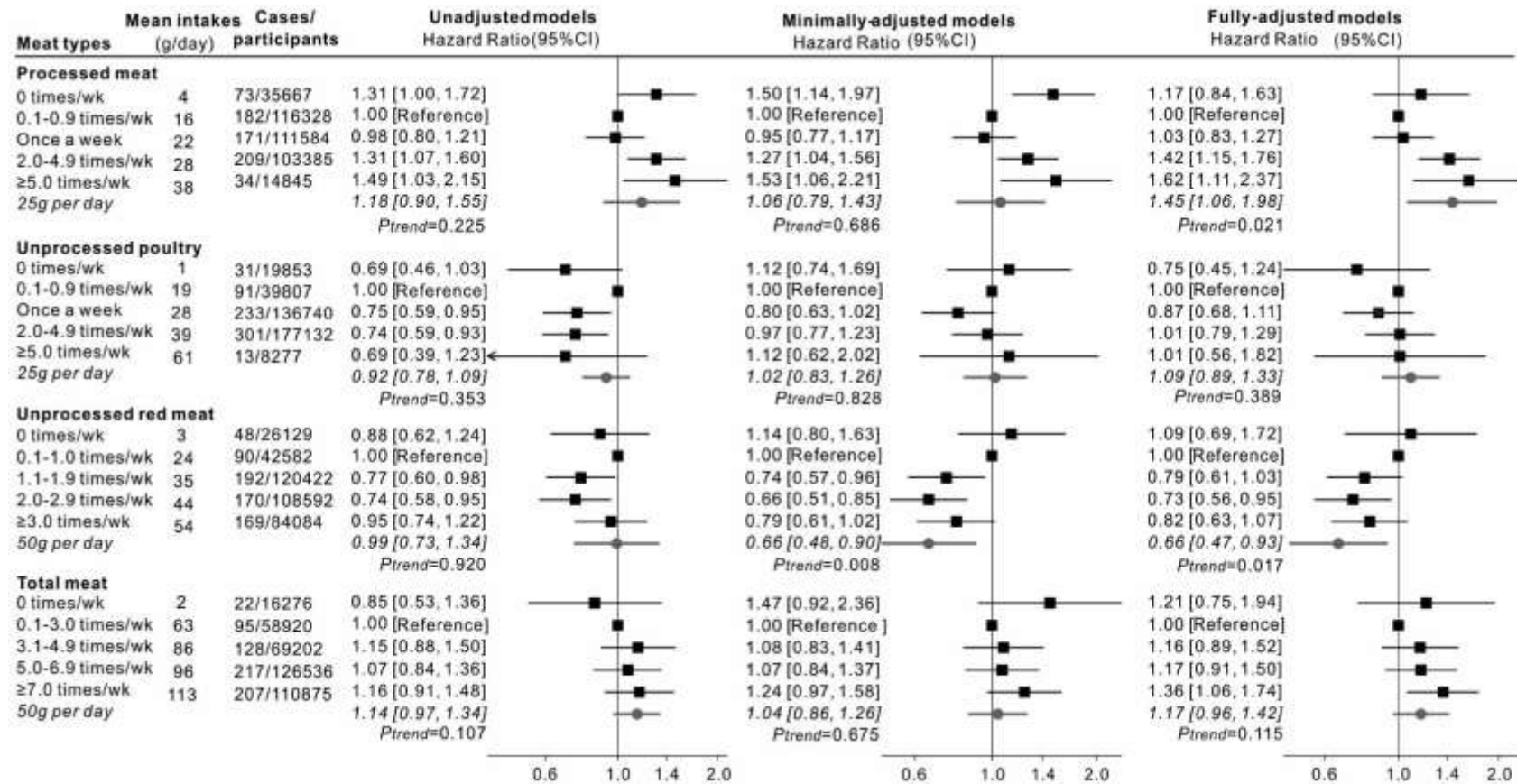
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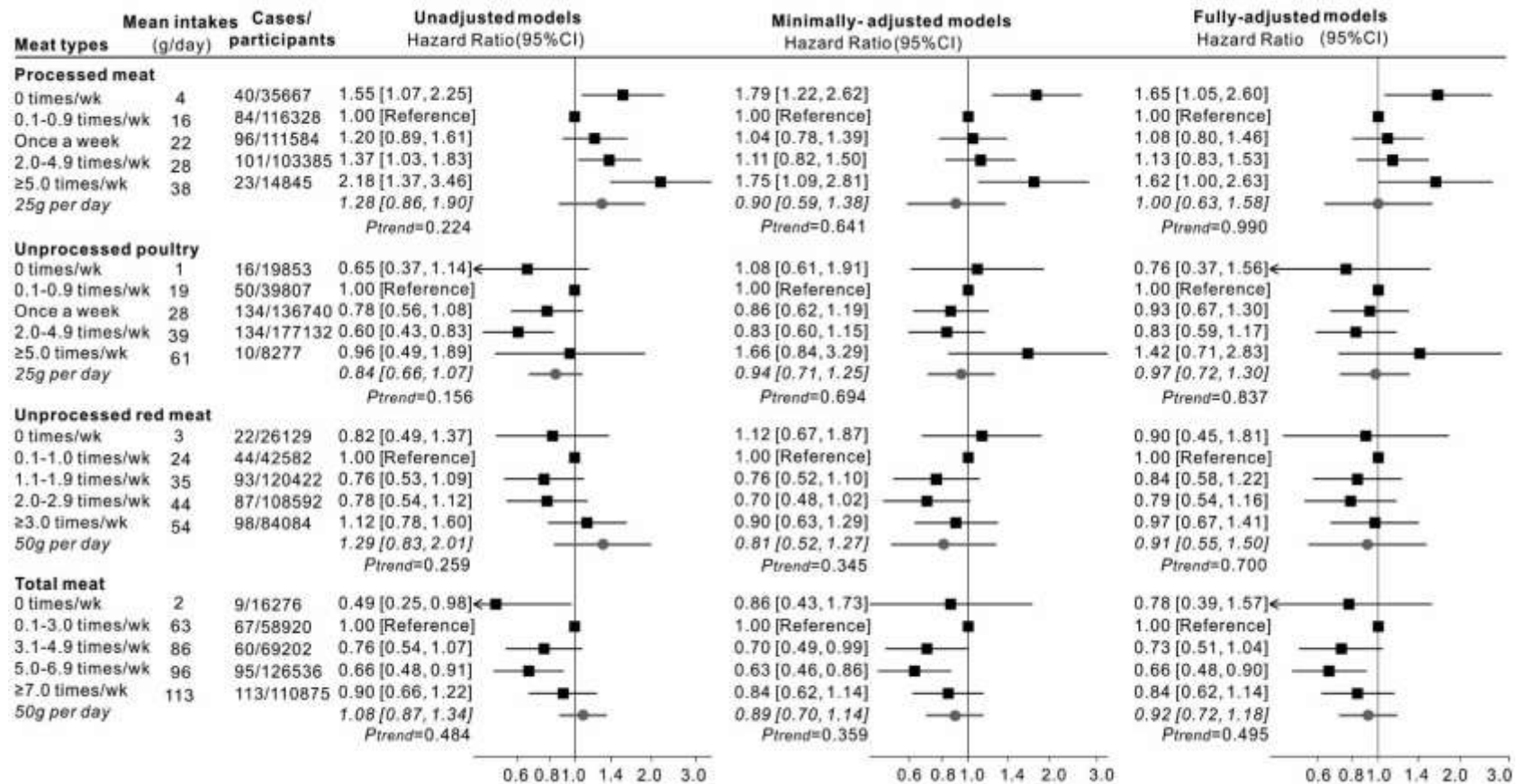
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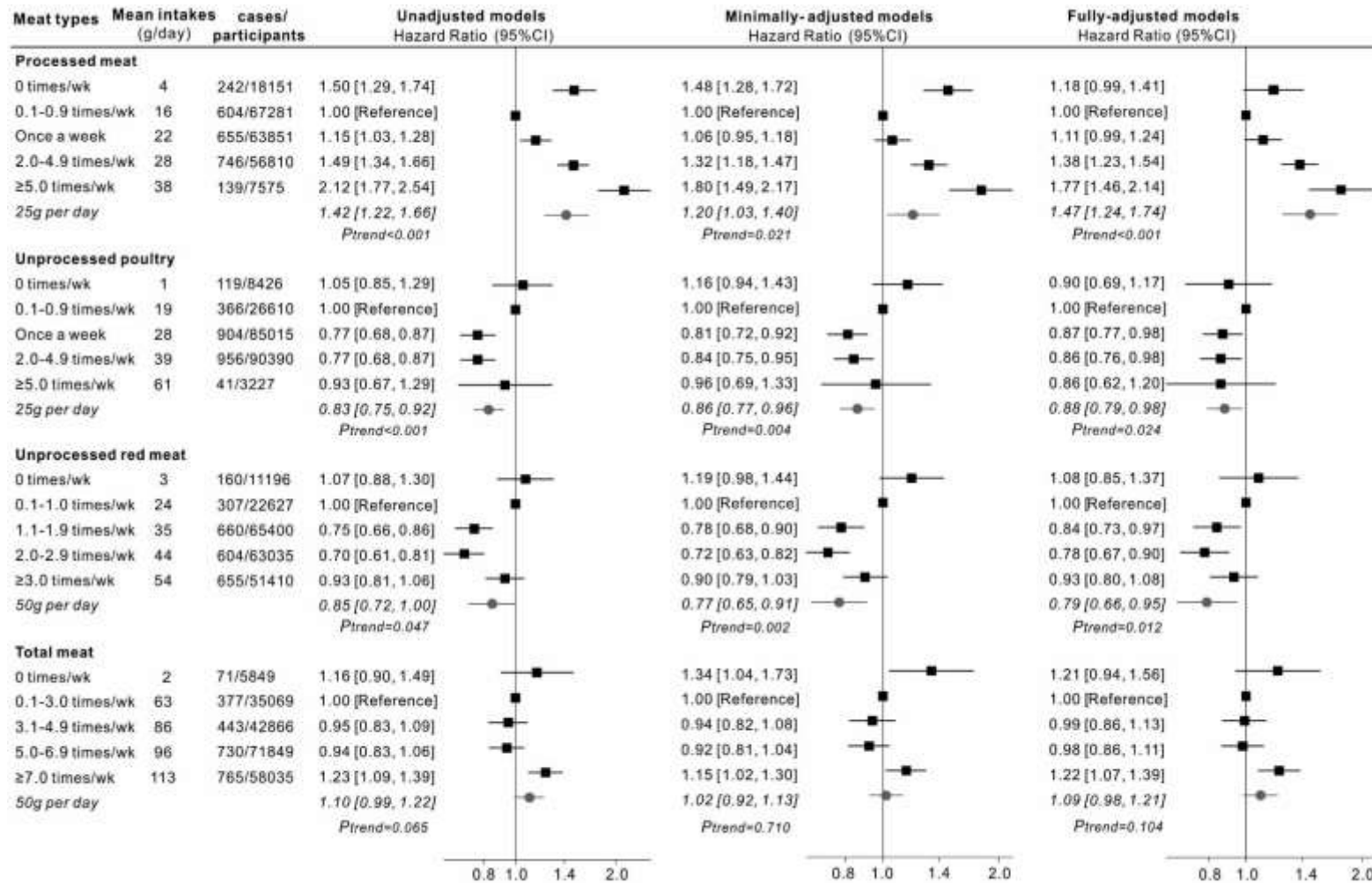
Supplementary Figure 5 Hazard ratios (95% CIs) for the associations between incident all-cause dementia and meat consumption in participants with complete data on covariates (n=381809) The black squares and horizontal lines represent hazard ratios and 95% confidence intervals respectively in Cox proportional-hazards regressions. The distribution of ticks on the x axis is exponential. Participants were categorized based on the data distribution of baseline meat intakes. Mean daily intakes in each category is calculated from the multiple 24-h dietary assessments which were used to test the linear trend per increment. Minimally-adjusted models adjusted for age, gender, ethnicity, education, socioeconomic status. Fully-adjusted models additionally adjusted for region, smoking status, physical activity, body mass index, sleep duration, stroke history, family history of dementia, dietary covariates including vegetables and fruits, total fish, tea and coffee, alcohol drinking; processed meat, unprocessed poultry, and unprocessed red meat were also mutually adjusted for.



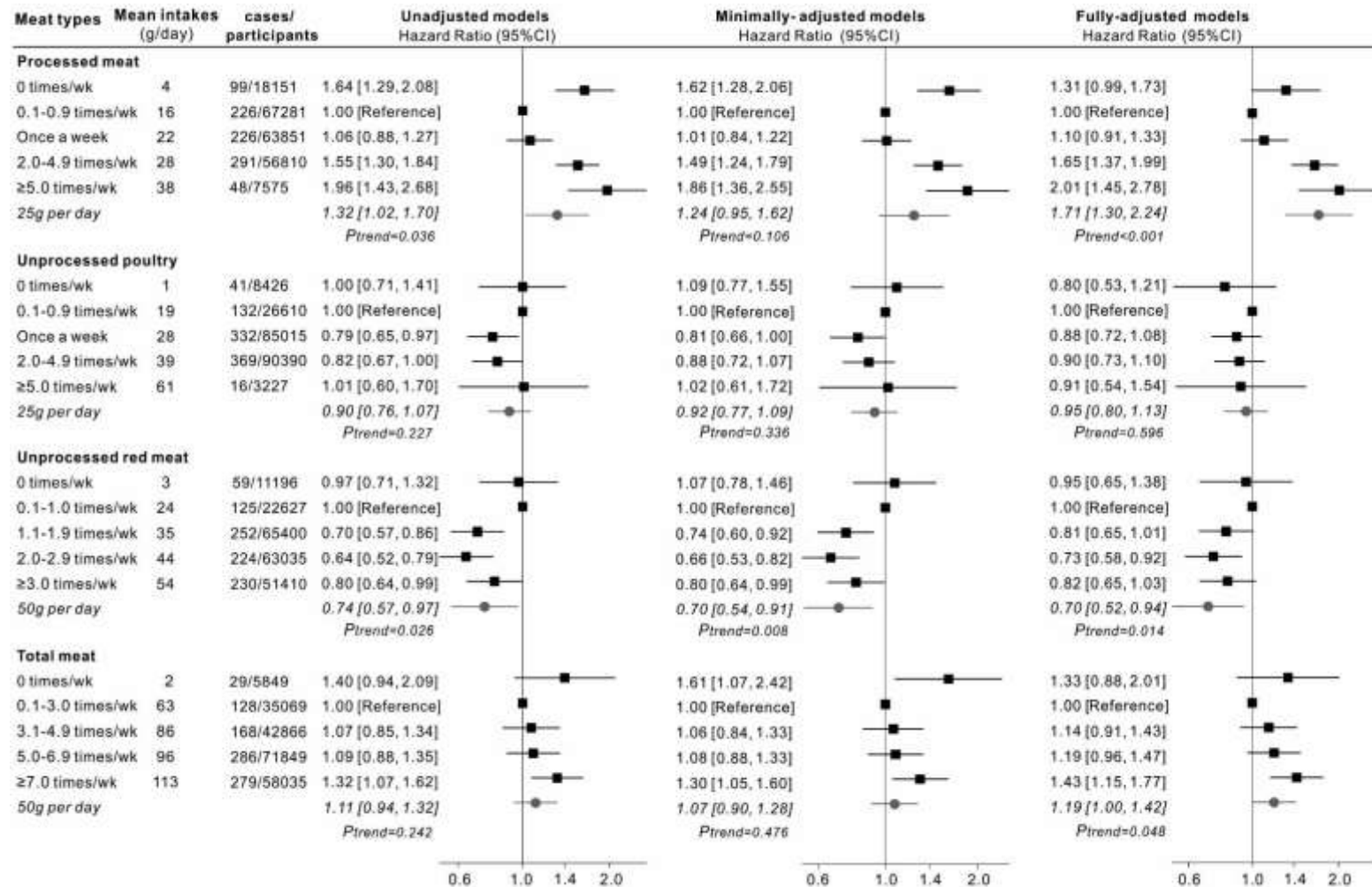
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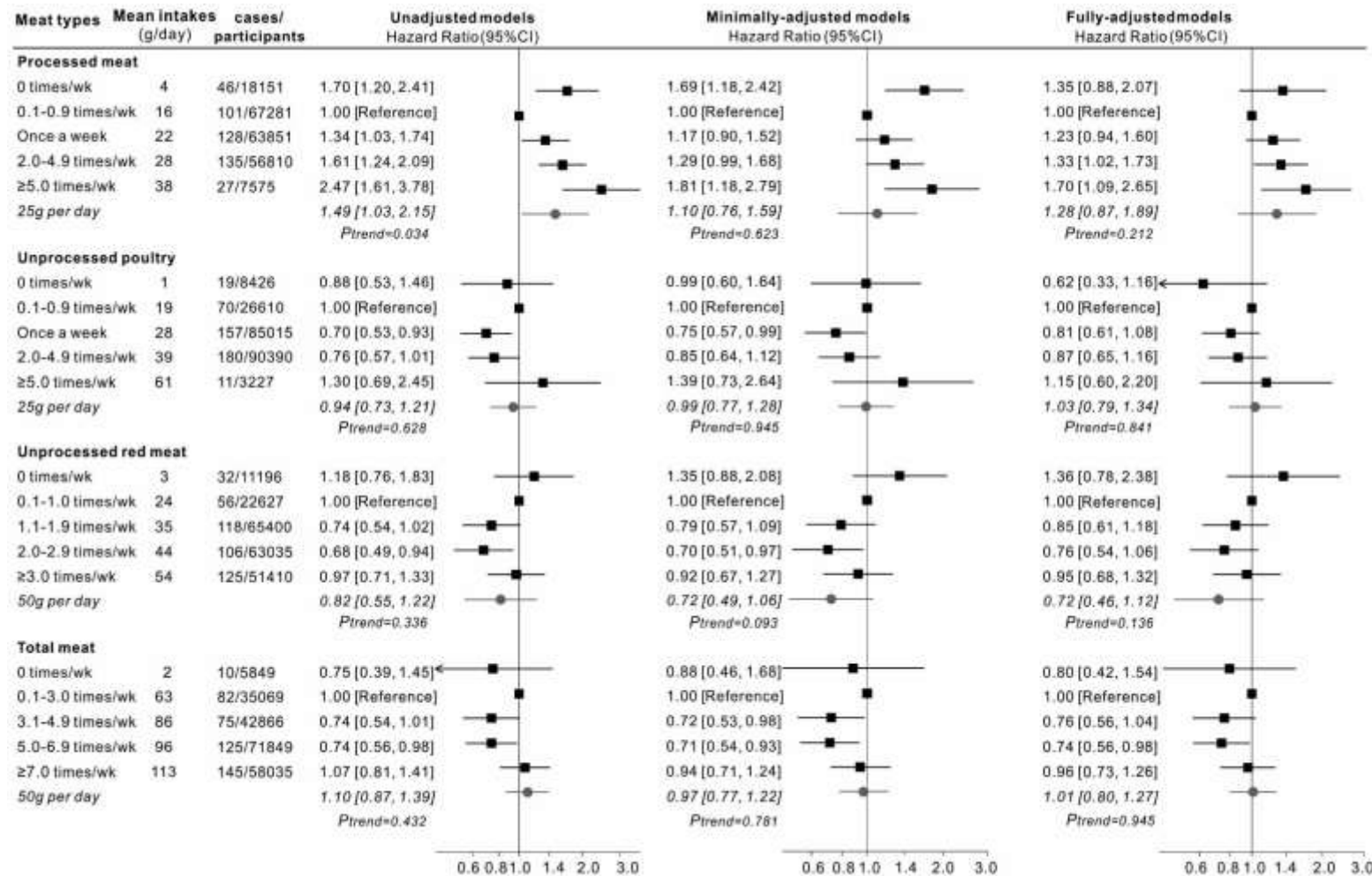
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Supplementary Figure 8 Hazard ratios (95% CIs) for the associations between incident all-cause dementia and meat consumption in participants aged 60 or more (n=213668) The black squares and horizontal lines represent hazard ratios and 95% confidence intervals respectively in Cox proportional-hazards regressions. The distribution of ticks on the x axis is exponential. Participants were categorized based on the data distribution of baseline meat intakes. Mean daily intakes in each category is calculated from the multiple 24-h dietary assessments which were used to test the linear trend per increment. Minimally-adjusted models adjusted for age, gender, ethnicity, education, socioeconomic status. Fully-adjusted models additionally adjusted for region, smoking status, physical activity, body mass index, sleep duration, stroke history, family history of dementia, dietary covariates including vegetables and fruits, total fish, tea and coffee, alcohol drinking; processed meat, unprocessed poultry, and unprocessed red meat were also mutually adjusted for.



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Supplementary Figure 10 Hazard ratios (95% CIs) for the associations between incident vascular dementia and meat consumption in participants aged 60 or more (n=213668) The black squares and horizontal lines represent hazard ratios and 95% confidence intervals respectively in Cox proportional-hazards regressions. The distribution of ticks on the x axis is exponential. Participants were categorized based on the data distribution of baseline meat intakes. Mean daily intakes in each category is calculated from the multiple 24-h dietary assessments which were used to test the linear trend per increment. Minimally-adjusted models adjusted for age, gender, ethnicity, education, socioeconomic status. Fully-adjusted models additionally adjusted for region, smoking status, physical activity, body mass index, sleep duration, stroke history, family history of dementia, dietary covariates including vegetables and fruits, total fish, tea and coffee, alcohol drinking; processed meat, unprocessed poultry, and unprocessed red meat were also mutually adjusted for.

Supplementary Tables

Supplementary Table 1 Baseline characteristics of participants with various numbers of completions of 24-h dietary assessment in UK Biobank cohort study

		Response times to the Oxford WebQ			
		Non responders	Once or more	Twice or more	At least three
Participants (n)		291487	211006	126844	78725
Age at baseline (years)		56.9 (8.2)	56.1 (7.9)	56.1 (7.8)	56.3 (7.7)
Gender					
	Men	134348 (46.1%)	94767 (44.9%)	56128 (44.2%)	34605 (44.0%)
	Women	157139 (53.9%)	116239 (55.1%)	70716 (55.8%)	44120 (56.0%)
Ethnicity					
	White	271408 (93.1%)	201282 (95.4%)	122439 (96.5%)	76273 (96.9%)
	Asian	7881 (2.7%)	3532 (1.7%)	1519 (1.2%)	796 (1.0%)
	Black	5423 (1.9%)	2611 (1.2%)	1018 (0.8%)	510 (0.6%)
	Mixed	1757 (0.6%)	1271 (0.6%)	693 (0.5%)	429 (0.5%)
	Others/unknown	1757 (0.6%)	2310 (1.1%)	1175 (0.9%)	717 (0.9%)
Region					
	England	251349 (86.2%)	194496 (92.2%)	116168 (91.6%)	72185 (91.7%)
	Wales	14635 (5.0%)	6172 (2.9%)	3971 (3.1%)	2403 (3.1%)
	Scotland	25503 (8.7%)	10338 (4.9%)	6705 (5.3%)	4137 (5.3%)
Townsend deprivation index					
	Low deprivation	92708 (31.8%)	74668 (35.4%)	45681 (36.0%)	28198 (35.8%)
	Moderate deprivation	94685 (32.5%)	72520 (34.4%)	43777 (34.5%)	27160 (34.5%)
	High deprivation	103736 (35.6%)	63553 (30.1%)	37237 (29.4%)	23272 (29.6%)
	Unknown	358 (0.1%)	265 (0.1%)	149 (0.1%)	95 (0.1%)
Educational level					
	Without college/university degree	213440 (73.2%)	120278 (57.0%)	67026 (52.8%)	40492 (51.4%)
	With college/university degree	72803 (25.0%)	89759 (42.5%)	59474 (46.9%)	38047 (48.3%)
	Unknown	5244 (1.8%)	969 (0.5%)	344 (0.3%)	186 (0.2%)
Smoking status					
	Never	154521 (53.0%)	119027 (56.4%)	72401 (57.1%)	45239 (57.5%)
	Past	98210 (33.7%)	74923 (35.5%)	45412 (35.8%)	28225 (35.9%)

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	Current	36427 (12.5%)	16556 (7.8%)	8808 (6.9%)	5140 (6.5%)
	Unknown	2329 (0.8%)	500 (0.2%)	223 (0.2%)	121 (0.2%)
Physical activity					
	Low level	43279 (14.8%)	32937 (15.6%)	20147 (15.9%)	12438 (15.8%)
	Moderate level	88401 (30.3%)	75617 (35.8%)	46909 (37.0%)	29469 (37.4%)
	High level	91909 (31.5%)	70229 (33.3%)	41849 (33.0%)	25971 (33.0%)
	Unknown	67898 (23.3%)	32223 (15.3%)	17939 (14.1%)	10847 (13.8%)
Body mass index (BMI)					
	Normal/underweight (<25 Kg/m ²)	86527 (29.7%)	78541 (37.2%)	50079 (39.5%)	32081 (40.8%)
	Overweight (25-29.9 Kg/m ²)	124782 (42.8%)	87365 (41.4%)	51658 (40.7%)	31593 (40.1%)
	Obese (≥30 Kg/m ²)	77717 (26.7%)	44556 (21.1%)	24857 (19.6%)	14899 (18.9%)
	Unknown	2461 (0.8%)	544 (0.3%)	250 (0.2%)	152 (0.2%)
Sleep duration					
	<7 hours/day	75349 (25.8%)	47962 (22.7%)	27446 (21.6%)	16605 (21.1%)
	7-8 hours/day	188033 (64.5%)	148721 (70.5%)	91224 (71.9%)	57006 (72.4%)
	>8 hours/day	24687 (8.5%)	13669 (6.5%)	7911 (6.2%)	4968 (6.3%)
	Unknown	3418 (1.2%)	654 (0.3%)	263 (0.2%)	146 (0.2%)
With stroke history		5360 (1.8%)	2308 (1.1%)	1262 (1.0%)	741 (0.9%)
With family history of dementia		30868 (10.6%)	27558 (13.1%)	16908 (13.3%)	10820 (13.7%)
APOE ε4 carrying status					
	Non-carriers	168917 (58.0%)	126338 (59.9%)	76229 (60.1%)	47411 (60.2%)
	Carriers	68315 (23.4%)	49541 (23.5%)	29630 (23.4%)	18381 (23.3%)
	Missing	54255 (18.6%)	35127 (16.6%)	20985 (16.5%)	12933 (16.4%)
Total meat					
	Never	9693 (3.3%)	10808 (5.1%)	7088 (5.6%)	4647 (5.9%)
	≤3 times/week	43414 (14.9%)	33938 (16.1%)	21116 (16.6%)	13499 (17.1%)
	3-5 times/week	52667 (18.1%)	37502 (17.8%)	22439 (17.7%)	13941 (17.7%)
	≥5 times/week	93630 (32.1%)	69112 (32.8%)	41204 (32.5%)	25334 (32.2%)
	≥7 times/week	85383 (29.3%)	58354 (27.7%)	34429 (27.1%)	20996 (26.7%)
Vegetables/Fruits					
	<2 serving/day	19660 (6.7%)	10017 (4.7%)	5464 (4.3%)	3330 (4.2%)
	<4 servings/day	78883 (27.1%)	56009 (26.5%)	33116 (26.1%)	20188 (25.6%)
	4-6 servings/day	107799 (37.0%)	84799 (40.2%)	51790 (40.8%)	32256 (41.0%)

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	>6 servings/day	73135 (25.1%)	56776 (26.9%)	34868 (27.5%)	22007 (28.0%)
	Unknown	12010 (4.1%)	3405 (1.6%)	1606 (1.3%)	944 (1.2%)
Total fish					
	≤1 times/week	76434 (26.2%)	52474 (24.9%)	31052 (24.5%)	19234 (24.4%)
	1-2 times/week	59857 (20.5%)	48445 (23.0%)	29720 (23.4%)	18574 (23.6%)
	≥2 times/week	87150 (29.9%)	64762 (30.7%)	39078 (30.8%)	24313 (30.9%)
	≥4 times/week	63233 (21.7%)	44389 (21.0%)	26621 (21.0%)	16405 (20.8%)
	Unknown	4813 (1.7%)	936 (0.4%)	373 (0.3%)	199 (0.3%)
Alcohol					
	Less than once a week	96892 (33.2%)	57608 (27.3%)	32830 (25.9%)	20419 (25.9%)
	Once or twice a week	76840 (26.4%)	52449 (24.9%)	31114 (24.5%)	19122 (24.3%)
	Three or four times a week	62811 (21.5%)	52624 (24.9%)	32608 (25.7%)	20203 (25.7%)
	Daily or almost daily	53620 (18.4%)	48148 (22.8%)	30216 (23.8%)	18942 (24.1%)
	Unknown	1324 (0.5%)	177 (0.1%)	76 (0.1%)	39 (0.0%)
Tea/Coffee					
	≤3 cups/day	63286 (21.7%)	47480 (22.5%)	28897 (22.8%)	18141 (23.0%)
	≤5 cups/day	93364 (32.0%)	70742 (33.5%)	42869 (33.8%)	26855 (34.1%)
	≤7 cups/day	77355 (26.5%)	56871 (27.0%)	34301 (27.0%)	21137 (26.8%)
	>7 cups/day	54850 (18.8%)	35521 (16.8%)	20616 (16.3%)	12509 (15.9%)
	Unknown	2632 (0.9%)	392 (0.2%)	161 (0.1%)	83 (0.1%)
Dietary consumption from 24h					
WebQ					
Processed meat (g/d)					
	—		20.5 (32.2)	20.6 (26.5)	20.6 (24.5)
Non-consumers	—	109870 (52.1%)	51029 (40.2%)	27037 (34.3%)	
Consumers	—				
	Mean (SD)	—	42.7 (34.9)	34.5 (26.3)	31.4 (24)
	Median (IQR)	—	30 (20-60)	27.5 (15-45)	26.7 (13.3-40)
Unprocessed poultry (g/d)					
	—		28.5 (46.3)	28.3 (36.6)	27.9 (33.1)
Non-consumers	—	127844 (60.6%)	63292 (49.9%)	34703 (44.1%)	
Consumers	—				
	Mean (SD)	—	72.2 (47.6)	56.5 (32.9)	49.9 (29.2)
	Median (IQR)	—	60 (40-120)	60 (30-60)	40 (30-60)
Unprocessed red meat (g/d)					
	—		38 (52.4)	37.4 (41.6)	37.2 (37.9)

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Non-consumers	—	110335 (52.3%)	51844 (40.9%)	27421 (34.8%)
Consumers	—			
Mean (SD)	—	79.6 (49.3)	63.3 (36)	57 (32.8)
Median (IQR)	—	60 (40-120)	60 (40-80)	40 (30-80)
Total meat (g/d)	—	86.9 (68.9)	86.4 (57.9)	85.7 (54.4)
Non-consumers	—	40483 (19.2%)	14347 (11.3%)	7424 (9.4%)
Consumers	—			
Mean (SD)	—	107.6 (60.4)	97.4 (52)	94.6 (49.2)
Median (IQR)	—	107.5 (60-125)	90 (60-120)	90 (60-120)

Supplementary Table 2 Baseline characteristics of participants across categories of processed meat intakes in UK Biobank cohort study

		Processed meat (n=493,888)				
		0 times/wk	0.1-0.9 times/wk	Once a week	2.0-4.9 times/wk	≥5.0 times/wk
Participants (%)		46358 (9%)	150758 (31%)	144076 (29%)	133365 (27%)	19331 (4%)
Age at baseline (years)		55.9 (8.1)	56.9 (7.9)	56.7 (8.1)	56.3 (8.2)	55.6 (8.4)
Gender						
	Men	12265 (26.5%)	48180 (32.0%)	66897 (46.4%)	82866 (62.1%)	14483 (74.9%)
	Women	34093 (73.5%)	102578 (68.0%)	77179 (53.6%)	50499 (37.9%)	4848 (25.1%)
Ethnicity						
	White	40430 (87.2%)	141456 (93.8%)	138166 (95.9%)	128433 (96.3%)	18350 (94.9%)
	Asian	3281 (7.1%)	3362 (2.2%)	2060 (1.4%)	1681 (1.3%)	353 (1.8%)
	Black	1160 (2.5%)	2900 (1.9%)	1710 (1.2%)	1414 (1.1%)	270 (1.4%)
	Mixed	392 (0.8%)	1012 (0.7%)	778 (0.5%)	668 (0.5%)	101 (0.5%)
	Others/unknown	1095 (2.4%)	2028 (1.3%)	1362 (0.9%)	1169 (0.9%)	257 (1.3%)
Region						
	England	41014 (88.5%)	132308 (87.8%)	127804 (88.7%)	119691 (89.7%)	17361 (89.8%)
	Wales	1832 (4.0%)	6178 (4.1%)	6190 (4.3%)	5526 (4.1%)	779 (4.0%)
	Scotland	3512 (7.6%)	12272 (8.1%)	10082 (7.0%)	8148 (6.1%)	1191 (6.2%)
Townsend deprivation index						
	Low deprivation	13110 (28.3%)	52041 (34.5%)	50965 (35.4%)	44112 (33.1%)	5692 (29.4%)
	Moderate deprivation	14797 (31.9%)	51043 (33.9%)	48873 (33.9%)	44413 (33.3%)	5997 (31.0%)
	High deprivation	18393 (39.7%)	47488 (31.5%)	44051 (30.6%)	44687 (33.5%)	7616 (39.4%)
	Unknown	58 (0.1%)	186 (0.1%)	187 (0.1%)	153 (0.1%)	26 (0.1%)
Educational level						
	Without college/university degree	26170 (56.5%)	98085 (65.1%)	97847 (67.9%)	92379 (69.3%)	13157 (68.1%)
	With college/university degree	19559 (42.2%)	51341 (34.1%)	44851 (31.1%)	39763 (29.8%)	5982 (30.9%)
	Unknown	629 (1.4%)	1332 (0.9%)	1378 (1.0%)	1223 (0.9%)	192 (1.0%)
Smoking status						
	Never	27327 (58.9%)	85447 (56.7%)	78802 (54.7%)	68768 (51.6%)	9255 (47.9%)
	Past	15124 (32.6%)	51769 (34.3%)	50196 (34.8%)	47240 (35.4%)	6612 (34.2%)
	Current	3712 (8.0%)	13100 (8.7%)	14547 (10.1%)	16967 (12.7%)	3408 (17.6%)
	Unknown	195 (0.4%)	442 (0.3%)	531 (0.4%)	390 (0.3%)	56 (0.3%)

Online Supporting Material

Physical activity						
Low level	5965 (12.9%)	22016 (14.6%)	22324 (15.5%)	21634 (16.2%)	3396 (17.6%)	
Moderate level	14709 (31.7%)	49888 (33.1%)	48102 (33.4%)	43813 (32.9%)	6076 (31.4%)	
High level	17232 (37.2%)	49608 (32.9%)	45666 (31.7%)	42155 (31.6%)	6123 (31.7%)	
Unknown	8452 (18.2%)	29246 (19.4%)	27984 (19.4%)	25763 (19.3%)	3736 (19.3%)	
Body mass index (BMI)						
Normal/underweight (<25 Kg/m ²)	22042 (47.5%)	54846 (36.4%)	44773 (31.1%)	35917 (26.9%)	5328 (27.6%)	
Overweight (25-29.9 Kg/m ²)	16470 (35.5%)	62408 (41.4%)	62952 (43.7%)	58688 (44.0%)	8294 (42.9%)	
Obese (≥30 Kg/m ²)	7462 (16.1%)	32841 (21.8%)	35747 (24.8%)	38070 (28.5%)	5582 (28.9%)	
Unknown	384 (0.8%)	663 (0.4%)	604 (0.4%)	690 (0.5%)	127 (0.7%)	
Sleep duration						
<7 hours/day	12150 (26.2%)	36468 (24.2%)	33777 (23.4%)	33146 (24.9%)	5446 (28.2%)	
7-8 hours/day	30352 (65.5%)	102400 (67.9%)	98689 (68.5%)	89221 (66.9%)	12190 (63.1%)	
>8 hours/day	3553 (7.7%)	11142 (7.4%)	10953 (7.6%)	10338 (7.8%)	1578 (8.2%)	
Unknown	303 (0.7%)	748 (0.5%)	657 (0.5%)	660 (0.5%)	117 (0.6%)	
With stroke history	622 (1.3%)	1992 (1.3%)	2182 (1.5%)	2215 (1.7%)	386 (2.0%)	
With family history of dementia	5386 (11.6%)	18136 (12.0%)	16637 (11.5%)	15310 (11.5%)	2259 (11.7%)	
APOE ε4 carrying status						
Non-carriers	27495 (59.3%)	88948 (59.0%)	84889 (58.9%)	77768 (58.3%)	11282 (58.4%)	
Carriers	11264 (24.3%)	35666 (23.7%)	33624 (23.3%)	30966 (23.2%)	4353 (22.5%)	
Missing	7599 (16.4%)	26144 (17.3%)	25563 (17.7%)	24631 (18.5%)	3696 (19.1%)	
Total meat						
Never	20473 (44.2%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	
≤3 times/week	13873 (29.9%)	49740 (33.0%)	13489 (9.4%)	159 (0.1%)	0 (0.0%)	
3-5 times/week	6861 (14.8%)	35096 (23.3%)	45028 (31.3%)	3080 (2.3%)	0 (0.0%)	
≥5 times/week	3542 (7.6%)	52064 (34.5%)	62328 (43.3%)	44422 (33.3%)	214 (1.1%)	
≥7 times/week	1609 (3.5%)	13858 (9.2%)	23231 (16.1%)	85704 (64.3%)	19117 (98.9%)	
Vegetables/Fruits						
<2 serving/day	1309 (2.8%)	5869 (3.9%)	7983 (5.5%)	11066 (8.3%)	2733 (14.1%)	
<4 servings/day	7290 (15.7%)	33820 (22.4%)	41863 (29.1%)	43716 (32.8%)	6661 (34.5%)	
4-6 servings/day	16410 (35.4%)	61263 (40.6%)	57479 (39.9%)	49684 (37.3%)	6017 (31.1%)	
>6 servings/day	20177 (43.5%)	46296 (30.7%)	33345 (23.1%)	25349 (19.0%)	3320 (17.2%)	
Unknown	1172 (2.5%)	3510 (2.3%)	3406 (2.4%)	3550 (2.7%)	600 (3.1%)	

Online Supporting Material

Total fish						
	≤1 times/week	16525 (35.6%)	36704 (24.3%)	33181 (23.0%)	33810 (25.4%)	6760 (35.0%)
	1-2 times/week	5053 (10.9%)	33321 (22.1%)	32970 (22.9%)	31312 (23.5%)	4563 (23.6%)
	≥2 times/week	10749 (23.2%)	45380 (30.1%)	47628 (33.1%)	41619 (31.2%)	4824 (25.0%)
	≥4 times/week	13730 (29.6%)	34469 (22.9%)	29413 (20.4%)	25737 (19.3%)	2982 (15.4%)
	Unknown	301 (0.6%)	884 (0.6%)	884 (0.6%)	887 (0.7%)	202 (1.0%)
Alcohol						
	Less than once a week	20274 (43.7%)	49730 (33.0%)	40575 (28.2%)	34602 (25.9%)	5394 (27.9%)
	Once or twice a week	10267 (22.1%)	39529 (26.2%)	39233 (27.2%)	33966 (25.5%)	4534 (23.5%)
	Three or four times a week	8605 (18.6%)	33208 (22.0%)	34745 (24.1%)	33712 (25.3%)	4231 (21.9%)
	Daily or almost daily	7166 (15.5%)	28199 (18.7%)	29436 (20.4%)	30998 (23.2%)	5145 (26.6%)
	Unknown	46 (0.1%)	92 (0.1%)	87 (0.1%)	87 (0.1%)	27 (0.1%)
Tea/Coffee						
	≤3 cups/day	14568 (31.4%)	36280 (24.1%)	29135 (20.2%)	24986 (18.7%)	3867 (20.0%)
	≤5 cups/day	14184 (30.6%)	50759 (33.7%)	48588 (33.7%)	42842 (32.1%)	5592 (28.9%)
	≤7 cups/day	10186 (22.0%)	39242 (26.0%)	40272 (28.0%)	37896 (28.4%)	5064 (26.2%)
	>7 cups/day	7216 (15.6%)	24102 (16.0%)	25714 (17.8%)	27224 (20.4%)	4731 (24.5%)
	Unknown	204 (0.4%)	375 (0.2%)	367 (0.3%)	417 (0.3%)	77 (0.4%)
Energy intakes (KJ/day)		8389 (2466)	8404 (2163)	8852 (2197)	9417 (2326)	9889 (2611)
Protein intakes (g/day)		72.6 (22)	80 (20.7)	83.5 (21)	87.3 (21.9)	91.7 (24.8)
Fat intakes (g/day)		72.4 (27.1)	73 (24.5)	78.8 (25.4)	85.2 (27.1)	91.4 (31.7)
Saturated fat intakes (g/day)		27.1 (12.3)	28 (10.8)	30.4 (11.2)	33 (11.9)	35.4 (13.7)
Carbohydrate intakes (g/day)		257.5 (89.9)	244.9 (75.5)	253.3 (75.1)	263.4 (76.8)	273 (87.1)
Iron intakes (mg/day)		14 (4.2)	13.4 (3.7)	13.7 (3.7)	14.1 (3.8)	14.5 (4.1)

Supplementary Table 3 Baseline characteristics of participants across categories of unprocessed poultry intakes in UK Biobank cohort study

		Unprocessed poultry (n=493,888)				
		0 times/wk	0.1-0.9 times/wk	Once a week	2.0-4.9 times/wk	≥5.0 times/wk
Participants (%)		25471 (5%)	53001 (11%)	177074 (36%)	227200 (46%)	11142 (2%)
Age at baseline (years)		54.6 (8.2)	57.9 (7.9)	57.4 (7.9)	55.9 (8.1)	53.6 (8.3)
Gender						
	Men	8778 (34.5%)	25422 (48.0%)	83126 (46.9%)	102311 (45.0%)	5054 (45.4%)
	Women	16693 (65.5%)	27579 (52.0%)	93948 (53.1%)	124889 (55.0%)	6088 (54.6%)
Ethnicity						
	White	22507 (88.4%)	50301 (94.9%)	169706 (95.8%)	214932 (94.6%)	9389 (84.3%)
	Asian	2048 (8.0%)	1161 (2.2%)	2896 (1.6%)	4131 (1.8%)	501 (4.5%)
	Black	303 (1.2%)	577 (1.1%)	1808 (1.0%)	3974 (1.7%)	792 (7.1%)
	Mixed	218 (0.9%)	300 (0.6%)	876 (0.5%)	1444 (0.6%)	113 (1.0%)
	Others/unknown	395 (1.6%)	662 (1.2%)	1788 (1.0%)	2719 (1.2%)	347 (3.1%)
Region						
	England	22943 (90.1%)	47232 (89.1%)	157485 (88.9%)	200654 (88.3%)	9864 (88.5%)
	Wales	994 (3.9%)	2215 (4.2%)	7255 (4.1%)	9593 (4.2%)	448 (4.0%)
	Scotland	1534 (6.0%)	3554 (6.7%)	12334 (7.0%)	16953 (7.5%)	830 (7.4%)
Townsend deprivation index						
	Low deprivation	6601 (25.9%)	15112 (28.5%)	61500 (34.7%)	79624 (35.0%)	3083 (27.7%)
	Moderate deprivation	8092 (31.8%)	17320 (32.7%)	59620 (33.7%)	76760 (33.8%)	3331 (29.9%)
	High deprivation	10743 (42.2%)	20516 (38.7%)	55774 (31.5%)	70494 (31.0%)	4708 (42.3%)
	Unknown	35 (0.1%)	53 (0.1%)	180 (0.1%)	322 (0.1%)	20 (0.2%)
Educational level						
	Without college/university degree	13175 (51.7%)	33257 (62.7%)	118624 (67.0%)	154906 (68.2%)	7676 (68.9%)
	With college/university degree	11999 (47.1%)	19180 (36.2%)	56700 (32.0%)	70283 (30.9%)	3334 (29.9%)
	Unknown	297 (1.2%)	564 (1.1%)	1750 (1.0%)	2011 (0.9%)	132 (1.2%)
Smoking status						
	Never	14526 (57.0%)	26978 (50.9%)	95483 (53.9%)	126322 (55.6%)	6290 (56.5%)
	Past	8454 (33.2%)	18845 (35.6%)	61639 (34.8%)	78497 (34.5%)	3506 (31.5%)
	Current	2383 (9.4%)	6984 (13.2%)	19342 (10.9%)	21716 (9.6%)	1309 (11.7%)
	Unknown	108 (0.4%)	194 (0.4%)	610 (0.3%)	665 (0.3%)	37 (0.3%)

Online Supporting Material

Physical activity						
	Low level	3407 (13.4%)	8243 (15.6%)	27348 (15.4%)	34567 (15.2%)	1770 (15.9%)
	Moderate level	8314 (32.6%)	17200 (32.5%)	59429 (33.6%)	74428 (32.8%)	3217 (28.9%)
	High level	9171 (36.0%)	16531 (31.2%)	55834 (31.5%)	75345 (33.2%)	3903 (35.0%)
	Unknown	4579 (18.0%)	11027 (20.8%)	34463 (19.5%)	42860 (18.9%)	2252 (20.2%)
Body mass index (BMI)						
	Normal/underweight (<25 Kg/m ²)	12273 (48.2%)	20050 (37.8%)	59814 (33.8%)	67975 (29.9%)	2794 (25.1%)
	Overweight (25-29.9 Kg/m ²)	8884 (34.9%)	21389 (40.4%)	76158 (43.0%)	97745 (43.0%)	4636 (41.6%)
	Obese (≥30 Kg/m ²)	4094 (16.1%)	11250 (21.2%)	40216 (22.7%)	60495 (26.6%)	3647 (32.7%)
	Unknown	220 (0.9%)	312 (0.6%)	886 (0.5%)	985 (0.4%)	65 (0.6%)
Sleep duration						
	<7 hours/day	6613 (26.0%)	13269 (25.0%)	41643 (23.5%)	56144 (24.7%)	3318 (29.8%)
	7-8 hours/day	16861 (66.2%)	34827 (65.7%)	120782 (68.2%)	153532 (67.6%)	6850 (61.5%)
	>8 hours/day	1818 (7.1%)	4505 (8.5%)	13797 (7.8%)	16556 (7.3%)	888 (8.0%)
	Unknown	179 (0.7%)	400 (0.8%)	852 (0.5%)	968 (0.4%)	86 (0.8%)
With stroke history		300 (1.2%)	952 (1.8%)	2731 (1.5%)	3227 (1.4%)	187 (1.7%)
With family history of dementia		2834 (11.1%)	6551 (12.4%)	21148 (11.9%)	26093 (11.5%)	1102 (9.9%)
APOE ε4 carrying status						
	Non-carriers	15154 (59.5%)	31155 (58.8%)	104224 (58.9%)	133469 (58.7%)	6380 (57.3%)
	Carriers	6144 (24.1%)	12300 (23.2%)	41215 (23.3%)	53452 (23.5%)	2762 (24.8%)
	Missing	4173 (16.4%)	9546 (18.0%)	31635 (17.9%)	40279 (17.7%)	2000 (18.0%)
Total meat						
	Never	20473 (80.4%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
	≤3 times/week	2775 (10.9%)	29906 (56.4%)	42602 (24.1%)	1978 (0.9%)	0 (0.0%)
	3-5 times/week	755 (3.0%)	7173 (13.5%)	62541 (35.3%)	19596 (8.6%)	0 (0.0%)
	≥5 times/week	745 (2.9%)	11088 (20.9%)	49764 (28.1%)	100019 (44.0%)	954 (8.6%)
	≥7 times/week	723 (2.8%)	4834 (9.1%)	22167 (12.5%)	105607 (46.5%)	10188 (91.4%)
Vegetables/Fruits						
	<2 serving/day	1132 (4.4%)	4834 (9.1%)	10793 (6.1%)	11402 (5.0%)	799 (7.2%)
	<4 servings/day	4666 (18.3%)	14509 (27.4%)	51523 (29.1%)	59971 (26.4%)	2681 (24.1%)
	4-6 servings/day	9104 (35.7%)	18638 (35.2%)	68968 (38.9%)	90387 (39.8%)	3756 (33.7%)
	>6 servings/day	9894 (38.8%)	13229 (25.0%)	41199 (23.3%)	60631 (26.7%)	3534 (31.7%)
	Unknown	675 (2.7%)	1791 (3.4%)	4591 (2.6%)	4809 (2.1%)	372 (3.3%)

Online Supporting Material

Total fish						
	≤1 times/week	13348 (52.4%)	17732 (33.5%)	42158 (23.8%)	50307 (22.1%)	3435 (30.8%)
	1-2 times/week	2095 (8.2%)	11885 (22.4%)	42485 (24.0%)	48782 (21.5%)	1972 (17.7%)
	≥2 times/week	4126 (16.2%)	13475 (25.4%)	58044 (32.8%)	71784 (31.6%)	2771 (24.9%)
	≥4 times/week	5771 (22.7%)	9400 (17.7%)	33254 (18.8%)	55067 (24.2%)	2839 (25.5%)
	Unknown	131 (0.5%)	509 (1.0%)	1133 (0.6%)	1260 (0.6%)	125 (1.1%)
Alcohol						
	Less than once a week	10728 (42.1%)	18209 (34.4%)	50816 (28.7%)	66163 (29.1%)	4659 (41.8%)
	Once or twice a week	5420 (21.3%)	12615 (23.8%)	46648 (26.3%)	60264 (26.5%)	2582 (23.2%)
	Three or four times a week	5039 (19.8%)	10991 (20.7%)	41588 (23.5%)	54871 (24.2%)	2012 (18.1%)
	Daily or almost daily	4249 (16.7%)	11140 (21.0%)	37898 (21.4%)	45781 (20.2%)	1876 (16.8%)
	Unknown	35 (0.1%)	46 (0.1%)	124 (0.1%)	121 (0.1%)	13 (0.1%)
Tea/Coffee						
	≤3 cups/day	7616 (29.9%)	12195 (23.0%)	37062 (20.9%)	48860 (21.5%)	3103 (27.8%)
	≤5 cups/day	7516 (29.5%)	16847 (31.8%)	59803 (33.8%)	74574 (32.8%)	3225 (28.9%)
	≤7 cups/day	5894 (23.1%)	13548 (25.6%)	48399 (27.3%)	62318 (27.4%)	2501 (22.4%)
	>7 cups/day	4311 (16.9%)	10224 (19.3%)	31267 (17.7%)	40937 (18.0%)	2248 (20.2%)
	Unknown	134 (0.5%)	187 (0.4%)	543 (0.3%)	511 (0.2%)	65 (0.6%)
Energy intakes (KJ/day)		8669 (2482)	8831 (2355)	8842 (2223)	8861 (2322)	9122 (2732)
Protein intakes (g/day)		69.2 (20.8)	78.4 (21.4)	82.2 (20.8)	85.3 (21.7)	90.9 (29.5)
Fat intakes (g/day)		76.2 (28)	78.6 (26.8)	78.8 (26.2)	78.2 (26.5)	78 (31)
Saturated fat intakes (g/day)		28.7 (12.9)	30.6 (12.1)	30.5 (11.6)	29.9 (11.5)	29.4 (13)
Carbohydrate intakes (g/day)		268.8 (91.5)	255.9 (78.5)	253.3 (76.3)	252.6 (76.8)	252.4 (90.1)
Iron intakes (mg/day)		14.3 (4.3)	13.7 (3.9)	13.8 (3.7)	13.7 (3.8)	13.5 (4.4)

Supplementary Table 4 Baseline characteristics of participants across categories of unprocessed red meat intakes in UK Biobank cohort study

		Unprocessed red meat (n=493,888)				
		0 times/wk	0.1-1.0 times/wk	1.1-1.9 times/wk	2.0-2.9 times/wk	≥3.0 times/wk
Participants (%)		33569 (7%)	57433 (12%)	153797 (31%)	138648 (28%)	110441 (22%)
Age at baseline (years)		54.6 (8.2)	55.7 (8.3)	56.5 (8.0)	56.9 (8.0)	57.1 (8.0)
Gender						
	Men	10359 (30.9%)	21133 (36.8%)	69590 (45.2%)	65875 (47.5%)	57734 (52.3%)
	Women	23210 (69.1%)	36300 (63.2%)	84207 (54.8%)	72773 (52.5%)	52707 (47.7%)
Ethnicity						
	White	29744 (88.6%)	51815 (90.2%)	148348 (96.5%)	133918 (96.6%)	103010 (93.3%)
	Asian	2547 (7.6%)	2949 (5.1%)	1483 (1.0%)	1224 (0.9%)	2534 (2.3%)
	Black	501 (1.5%)	1246 (2.2%)	1806 (1.2%)	1561 (1.1%)	2340 (2.1%)
	Mixed	266 (0.8%)	382 (0.7%)	827 (0.5%)	729 (0.5%)	747 (0.7%)
	Others/unknown	511 (1.5%)	1041 (1.8%)	1333 (0.9%)	1216 (0.9%)	1810 (1.6%)
Region						
	England	30127 (89.7%)	50451 (87.8%)	139093 (90.4%)	123268 (88.9%)	95239 (86.2%)
	Wales	1379 (4.1%)	2395 (4.2%)	7181 (4.7%)	5818 (4.2%)	3732 (3.4%)
	Scotland	2063 (6.1%)	4587 (8.0%)	7523 (4.9%)	9562 (6.9%)	11470 (10.4%)
Townsend deprivation index						
	Low deprivation	8951 (26.7%)	16721 (29.1%)	53261 (34.6%)	49819 (35.9%)	37168 (33.7%)
	Moderate deprivation	10734 (32.0%)	18562 (32.3%)	52317 (34.0%)	47243 (34.1%)	36267 (32.8%)
	High deprivation	13837 (41.2%)	22061 (38.4%)	48041 (31.2%)	41425 (29.9%)	36871 (33.4%)
	Unknown	47 (0.1%)	89 (0.2%)	178 (0.1%)	161 (0.1%)	135 (0.1%)
Educational level						
	Without college/university degree	18104 (53.9%)	40318 (70.2%)	100637 (65.4%)	92968 (67.1%)	75611 (68.5%)
	With college/university degree	15055 (44.8%)	16363 (28.5%)	52016 (33.8%)	44513 (32.1%)	33549 (30.4%)
	Unknown	410 (1.2%)	752 (1.3%)	1144 (0.7%)	1167 (0.8%)	1281 (1.2%)
Smoking status						
	Never	19810 (59.0%)	33242 (57.9%)	84230 (54.8%)	75212 (54.2%)	57105 (51.7%)
	Past	10905 (32.5%)	18035 (31.4%)	54149 (35.2%)	49053 (35.4%)	38799 (35.1%)
	Current	2723 (8.1%)	5941 (10.3%)	14976 (9.7%)	13973 (10.1%)	14121 (12.8%)

Online Supporting Material

	Unknown	131 (0.4%)	215 (0.4%)	442 (0.3%)	410 (0.3%)	416 (0.4%)
Physical activity						
	Low level	4304 (12.8%)	8484 (14.8%)	23659 (15.4%)	21719 (15.7%)	17169 (15.5%)
	Moderate level	10886 (32.4%)	17989 (31.3%)	51569 (33.5%)	46831 (33.8%)	35313 (32.0%)
	High level	12366 (36.8%)	18715 (32.6%)	49677 (32.3%)	44022 (31.8%)	36004 (32.6%)
	Unknown	6013 (17.9%)	12245 (21.3%)	28892 (18.8%)	26076 (18.8%)	21955 (19.9%)
Body mass index (BMI)						
	Normal/underweight (<25 Kg/m2)	16440 (49.0%)	20794 (36.2%)	52206 (33.9%)	43128 (31.1%)	30338 (27.5%)
	Overweight (25-29.9 Kg/m2)	11674 (34.8%)	23171 (40.3%)	65796 (42.8%)	60294 (43.5%)	47877 (43.4%)
	Obese (≥30 Kg/m2)	5178 (15.4%)	13086 (22.8%)	35192 (22.9%)	34667 (25.0%)	31579 (28.6%)
	Unknown	277 (0.8%)	382 (0.7%)	603 (0.4%)	559 (0.4%)	647 (0.6%)
Sleep duration						
	<7 hours/day	8747 (26.1%)	15546 (27.1%)	37424 (24.3%)	32232 (23.2%)	27038 (24.5%)
	7-8 hours/day	22212 (66.2%)	36961 (64.4%)	105031 (68.3%)	95417 (68.8%)	73231 (66.3%)
	>8 hours/day	2384 (7.1%)	4528 (7.9%)	10646 (6.9%)	10404 (7.5%)	9602 (8.7%)
	Unknown	226 (0.7%)	398 (0.7%)	696 (0.5%)	595 (0.4%)	570 (0.5%)
With stroke history		384 (1.1%)	920 (1.6%)	2105 (1.4%)	2009 (1.4%)	1979 (1.8%)
With family history of dementia		3771 (11.2%)	6201 (10.8%)	135520 (88.1%)	16383 (11.8%)	13096 (11.9%)
<i>APOE</i> ε4 carrying status						
	Non-carriers	19975 (59.5%)	33576 (58.5%)	90340 (58.7%)	81709 (58.9%)	64782 (58.7%)
	Carriers	8199 (24.4%)	13633 (23.7%)	36476 (23.7%)	32335 (23.3%)	25230 (22.8%)
	Missing	5395 (16.1%)	10224 (17.8%)	26981 (17.5%)	24604 (17.7%)	20429 (18.5%)
Total meat						
	Never	20473 (61.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
	≤3 times/week	9109 (27.1%)	23310 (40.6%)	40945 (26.6%)	3861 (2.8%)	36 (0.0%)
	3-5 times/week	2611 (7.8%)	17337 (30.2%)	20870 (13.6%)	42201 (30.4%)	7046 (6.4%)
	≥5 times/week	1087 (3.2%)	9826 (17.1%)	64548 (42.0%)	62867 (45.3%)	24242 (22.0%)
	≥7 times/week	289 (0.9%)	6960 (12.1%)	27434 (17.8%)	29719 (21.4%)	79117 (71.6%)
Vegetables/Fruits						
	<2 serving/day	1383 (4.1%)	4276 (7.4%)	8865 (5.8%)	7414 (5.3%)	7022 (6.4%)
	<4 servings/day	5930 (17.7%)	14093 (24.5%)	41202 (26.8%)	40224 (29.0%)	31901 (28.9%)
	4-6 servings/day	12000 (35.7%)	20579 (35.8%)	60431 (39.3%)	55699 (40.2%)	42144 (38.2%)
	>6 servings/day	13332 (39.7%)	16726 (29.1%)	39715 (25.8%)	32347 (23.3%)	26367 (23.9%)

Online Supporting Material

	Unknown	924 (2.8%)	1759 (3.1%)	3584 (2.3%)	2964 (2.1%)	3007 (2.7%)
Total fish						
	≤1 times/week	14683 (43.7%)	16265 (28.3%)	37577 (24.4%)	30233 (21.8%)	28222 (25.6%)
	1-2 times/week	3067 (9.1%)	10412 (18.1%)	35170 (22.9%)	33537 (24.2%)	25033 (22.7%)
	≥2 times/week	6343 (18.9%)	16183 (28.2%)	47173 (30.7%)	46068 (33.2%)	34433 (31.2%)
	≥4 times/week	9278 (27.6%)	14021 (24.4%)	33068 (21.5%)	28120 (20.3%)	21844 (19.8%)
	Unknown	198 (0.6%)	552 (1.0%)	809 (0.5%)	690 (0.5%)	909 (0.8%)
Alcohol						
	Less than once a week	14567 (43.4%)	24467 (42.6%)	45648 (29.7%)	35940 (25.9%)	29953 (27.1%)
	Once or twice a week	7338 (21.9%)	14693 (25.6%)	41645 (27.1%)	36803 (26.5%)	27050 (24.5%)
	Three or four times a week	6449 (19.2%)	10281 (17.9%)	36515 (23.7%)	34792 (25.1%)	26464 (24.0%)
	Daily or almost daily	5179 (15.4%)	7946 (13.8%)	29898 (19.4%)	31039 (22.4%)	26882 (24.3%)
	Unknown	36 (0.1%)	46 (0.1%)	91 (0.1%)	74 (0.1%)	92 (0.1%)
Tea/Coffee						
	≤3 cups/day	10451 (31.1%)	15556 (27.1%)	32947 (21.4%)	27303 (19.7%)	22579 (20.4%)
	≤5 cups/day	10058 (30.0%)	18254 (31.8%)	51484 (33.5%)	47067 (33.9%)	35102 (31.8%)
	≤7 cups/day	7542 (22.5%)	13900 (24.2%)	42064 (27.4%)	39137 (28.2%)	30017 (27.2%)
	>7 cups/day	5368 (16.0%)	9457 (16.5%)	26947 (17.5%)	24866 (17.9%)	22349 (20.2%)
	Unknown	150 (0.4%)	266 (0.5%)	355 (0.2%)	275 (0.2%)	394 (0.4%)
Energy intakes (KJ/day)		8566 (2459)	8469 (2333)	8791 (2283)	8907 (2205)	9151 (2394)
Protein intakes (g/day)		70.5 (21.2)	78.8 (22.1)	81.7 (21)	84.5 (20.8)	87.5 (22.6)
Fat intakes (g/day)		75 (27.5)	74.1 (26.4)	77.6 (26)	79.3 (26)	81.6 (27.7)
Saturated fat intakes (g/day)		28.1 (12.6)	28.2 (11.7)	29.8 (11.4)	30.6 (11.3)	31.8 (12.2)
Carbohydrate intakes (g/day)		265.9 (90.3)	254 (82.7)	253.4 (76.5)	252.5 (73.5)	253.6 (79.3)
Iron intakes (mg/day)		14.1 (4.3)	13.2 (3.9)	13.6 (3.8)	13.8 (3.7)	14 (3.9)

Supplementary Table 5 Baseline characteristics of participants across categories of total meat intakes in UK Biobank cohort study

		Total meat (n=493,888)				
		0 times/wk	0.1-3.0 times/wk	3.1-4.9 times/wk	5.0-6.9 times/wk	≥7.0 times/wk
Participants (%)		20473 (4%)	77261 (16%)	90065 (18%)	162570 (33%)	143519 (29%)
Age at baseline (years)		53.8 (8.0)	57.1 (7.9)	57.3 (7.9)	56.7 (8.0)	55.9 (8.2)
Gender						
	Men	6213 (30.3%)	26124 (33.8%)	36297 (40.3%)	73034 (44.9%)	83023 (57.8%)
	Women	14260 (69.7%)	51137 (66.2%)	53768 (59.7%)	89536 (55.1%)	60496 (42.2%)
Ethnicity						
	White	17804 (87.0%)	71872 (93.0%)	85921 (95.4%)	156026 (96.0%)	135212 (94.2%)
	Asian	1957 (9.6%)	2533 (3.3%)	1497 (1.7%)	2099 (1.3%)	2651 (1.8%)
	Black	225 (1.1%)	1195 (1.5%)	1170 (1.3%)	2046 (1.3%)	2818 (2.0%)
	Mixed	174 (0.8%)	520 (0.7%)	488 (0.5%)	857 (0.5%)	912 (0.6%)
	Others/unknown	313 (1.5%)	1141 (1.5%)	989 (1.1%)	1542 (0.9%)	1926 (1.3%)
Region						
	England	18529 (90.5%)	68784 (89.0%)	79888 (88.7%)	144459 (88.9%)	126518 (88.2%)
	Wales	816 (4.0%)	3221 (4.2%)	3890 (4.3%)	7067 (4.3%)	5511 (3.8%)
	Scotland	1128 (5.5%)	5256 (6.8%)	6287 (7.0%)	11044 (6.8%)	11490 (8.0%)
Townsend deprivation index						
	Low deprivation	5463 (26.7%)	23531 (30.5%)	31533 (35.0%)	57671 (35.5%)	47722 (33.3%)
	Moderate deprivation	6647 (32.5%)	25654 (33.2%)	30331 (33.7%)	55141 (33.9%)	47350 (33.0%)
	High deprivation	8336 (40.7%)	27985 (36.2%)	28096 (31.2%)	49558 (30.5%)	48260 (33.6%)
	Unknown	27 (0.1%)	91 (0.1%)	105 (0.1%)	200 (0.1%)	187 (0.1%)
Educational level						
	Without college/university degree	9633 (47.1%)	48094 (62.2%)	60315 (67.0%)	111382 (68.5%)	98214 (68.4%)
	With college/university degree	10622 (51.9%)	28312 (36.6%)	28795 (32.0%)	49883 (30.7%)	43884 (30.6%)
	Unknown	218 (1.1%)	855 (1.1%)	955 (1.1%)	1305 (0.8%)	1421 (1.0%)
Smoking status						
	Never	12240 (59.8%)	43313 (56.1%)	49895 (55.4%)	89228 (54.9%)	74923 (52.2%)
	Past	6706 (32.8%)	26113 (33.8%)	31008 (34.4%)	56932 (35.0%)	50182 (35.0%)
	Current	1447 (7.1%)	7550 (9.8%)	8836 (9.8%)	15933 (9.8%)	17968 (12.5%)

Online Supporting Material

	Unknown	80 (0.4%)	285 (0.4%)	326 (0.4%)	477 (0.3%)	446 (0.3%)
Physical activity						
	Low level	2615 (12.8%)	11063 (14.3%)	13650 (15.2%)	25159 (15.5%)	22848 (15.9%)
	Moderate level	6809 (33.3%)	25502 (33.0%)	29913 (33.2%)	54014 (33.2%)	46350 (32.3%)
	High level	7633 (37.3%)	25482 (33.0%)	28706 (31.9%)	52242 (32.1%)	46721 (32.6%)
	Unknown	3416 (16.7%)	15214 (19.7%)	17796 (19.8%)	31155 (19.2%)	27600 (19.2%)
Body mass index (BMI)						
	Normal/underweight (<25 Kg/m2)	10609 (51.8%)	32136 (41.6%)	31555 (35.0%)	50771 (31.2%)	37835 (26.4%)
	Overweight (25-29.9 Kg/m2)	6946 (33.9%)	30439 (39.4%)	38361 (42.6%)	70506 (43.4%)	62560 (43.6%)
	Obese (≥30 Kg/m2)	2751 (13.4%)	14234 (18.4%)	19737 (21.9%)	40578 (25.0%)	42402 (29.5%)
	Unknown	167 (0.8%)	452 (0.6%)	412 (0.5%)	715 (0.4%)	722 (0.5%)
Sleep duration						
	<7 hours/day	5161 (25.2%)	19466 (25.2%)	21174 (23.5%)	38792 (23.9%)	36394 (25.4%)
	7-8 hours/day	13923 (68.0%)	51233 (66.3%)	61594 (68.4%)	111073 (68.3%)	95029 (66.2%)
	>8 hours/day	1284 (6.3%)	6012 (7.8%)	6876 (7.6%)	12008 (7.4%)	11384 (7.9%)
	Unknown	105 (0.5%)	550 (0.7%)	421 (0.5%)	697 (0.4%)	712 (0.5%)
With stroke history		178 (0.9%)	1129 (1.5%)	1356 (1.5%)	2317 (1.4%)	2417 (1.7%)
With family history of dementia		2251 (11.0%)	9207 (11.9%)	10747 (11.9%)	19084 (11.7%)	16439 (11.5%)
<i>APOE</i> ε4 carrying status						
	Non-carriers	12293 (60.0%)	45649 (59.1%)	53255 (59.1%)	95343 (58.6%)	83842 (58.4%)
	Carriers	5018 (24.5%)	18437 (23.9%)	20944 (23.3%)	38129 (23.5%)	33345 (23.2%)
	Missing	3162 (15.4%)	13175 (17.1%)	15866 (17.6%)	29098 (17.9%)	26332 (18.3%)
Total meat						
	Never	20473 (100%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
	≤3 times/week	0 (0.0%)	77261 (100%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
	3-5 times/week	0 (0.0%)	0 (0.0%)	90065 (100%)	0 (0.0%)	0 (0.0%)
	≥5 times/week	0 (0.0%)	0 (0.0%)	0 (0.0%)	162570 (100%)	0 (0.0%)
	≥7 times/week	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	143519 (100%)
Vegetables/Fruits						
	<2 serving/day	512 (2.5%)	4173 (5.4%)	4763 (5.3%)	8769 (5.4%)	10743 (7.5%)
	<4 servings/day	3392 (16.6%)	17244 (22.3%)	24354 (27.0%)	44694 (27.5%)	43666 (30.4%)
	4-6 servings/day	7485 (36.6%)	29257 (37.9%)	35502 (39.4%)	64908 (39.9%)	53701 (37.4%)
	>6 servings/day	8586 (41.9%)	24349 (31.5%)	23220 (25.8%)	40581 (25.0%)	31751 (22.1%)

Online Supporting Material

	Unknown	498 (2.4%)	2238 (2.9%)	2226 (2.5%)	3618 (2.2%)	3658 (2.5%)
Total fish						
	≤1 times/week	11325 (55.3%)	20475 (26.5%)	20968 (23.3%)	37181 (22.9%)	37031 (25.8%)
	1-2 times/week	1413 (6.9%)	15411 (19.9%)	20724 (23.0%)	37238 (22.9%)	32433 (22.6%)
	≥2 times/week	2989 (14.6%)	22160 (28.7%)	29221 (32.4%)	52294 (32.2%)	43536 (30.3%)
	≥4 times/week	4673 (22.8%)	18606 (24.1%)	18616 (20.7%)	34954 (21.5%)	29482 (20.5%)
	Unknown	73 (0.4%)	609 (0.8%)	536 (0.6%)	903 (0.6%)	1037 (0.7%)
Alcohol						
	Less than once a week	8534 (41.7%)	28750 (37.2%)	28290 (31.4%)	46693 (28.7%)	38308 (26.7%)
	Once or twice a week	4332 (21.2%)	19609 (25.4%)	23924 (26.6%)	43736 (26.9%)	35928 (25.0%)
	Three or four times a week	4224 (20.6%)	15711 (20.3%)	20030 (22.2%)	39165 (24.1%)	35371 (24.6%)
	Daily or almost daily	3360 (16.4%)	13124 (17.0%)	17768 (19.7%)	32889 (20.2%)	33803 (23.6%)
	Unknown	23 (0.1%)	67 (0.1%)	53 (0.1%)	87 (0.1%)	109 (0.1%)
Tea/Coffee						
	≤3 cups/day	6464 (31.6%)	20176 (26.1%)	19863 (22.1%)	33512 (20.6%)	28821 (20.1%)
	≤5 cups/day	6081 (29.7%)	25440 (32.9%)	30735 (34.1%)	54393 (33.5%)	45316 (31.6%)
	≤7 cups/day	4603 (22.5%)	18972 (24.6%)	24176 (26.8%)	45508 (28.0%)	39401 (27.5%)
	>7 cups/day	3231 (15.8%)	12395 (16.0%)	15037 (16.7%)	28812 (17.7%)	29512 (20.6%)
	Unknown	94 (0.5%)	278 (0.4%)	254 (0.3%)	345 (0.2%)	469 (0.3%)
Energy intakes (KJ/day)		8670 (2519)	8409 (2185)	8606 (2193)	8811 (2212)	9341 (2443)
Protein intakes (g/day)		68.3 (20.2)	76.4 (20.6)	80.8 (20.3)	83.7 (20.6)	88.7 (23)
Fat intakes (g/day)		76 (27.7)	73.5 (25.4)	75.9 (25.1)	77.9 (25.7)	83.8 (28.2)
Saturated fat intakes (g/day)		28.4 (12.8)	28.2 (11.5)	29.3 (11.1)	30 (11.2)	32.4 (12.3)
Carbohydrate intakes (g/day)		269.7 (91)	250.3 (80)	248.6 (74.9)	252.1 (74.4)	259.8 (80)
Iron intakes (mg/day)		14.4 (4.3)	13.5 (3.9)	13.6 (3.7)	13.7 (3.7)	14.1 (3.9)

Supplementary Table 6 Risks of Alzheimer's disease and vascular dementia under different meat types among APOE ε4 non-carriers (n=289 589) and carriers (n=115 537) respectively

	Unadjusted models (n = 405 126)				Minimally-adjusted Models ¹ (n = 405 126)				Fully-adjusted models ² (n = 405 126)			
	HR	LCI	UCI	P	HR	LCI	UCI	P	HR	LCI	UCI	P
Risk of Alzheimer's disease												
<i>APOE ε4 carriers vs. non-carriers</i>	5.74	3.24	10.2	<0.001	6.30	3.24	12.2	<0.001	5.87	3.06	11.2	<0.001
Processed meat (25 g per day)												
<i>Stratified analysis</i>												
<i>APOE ε4 non-carriers</i>	1.41	0.94	2.12	0.100	1.28	0.82	2.00	0.270	1.56	0.96	2.52	0.071
<i>APOE ε4 carriers</i>	0.97	0.72	1.31	0.828	0.92	0.66	1.28	0.624	1.37	0.96	1.93	0.079
<i>P for interaction with APOE ε4 allele</i>				0.148				0.137				0.342
Unprocessed poultry (25 g per day)												
<i>Stratified analysis</i>												
<i>APOE ε4 non-carriers</i>	0.90	0.71	1.14	0.377	1.02	0.77	1.35	0.884	1.02	0.77	1.35	0.883
<i>APOE ε4 carriers</i>	0.84	0.70	1.01	0.069	0.91	0.73	1.13	0.391	0.98	0.79	1.23	0.886
<i>P for interaction with APOE ε4 allele</i>				0.681				0.601				0.975
Unprocessed red meat (50 g per day)												
<i>Stratified analysis</i>												
<i>APOE ε4 non-carriers</i>	1.20	0.77	1.88	0.422	0.88	0.56	1.38	0.579	0.87	0.52	1.44	0.577
<i>APOE ε4 carriers</i>	0.82	0.60	1.13	0.221	0.58	0.42	0.81	0.001	0.61	0.42	0.87	0.007
<i>P for interaction with APOE ε4 allele</i>				0.174				0.174				0.392
Total meat (50 g per day)												
<i>Stratified analysis</i>												
<i>APOE ε4 non-carriers</i>	1.19	0.93	1.52	0.179	1.13	0.85	1.49	0.412	1.23	0.93	1.63	0.147
<i>APOE ε4 carriers</i>	1.04	0.87	1.24	0.672	0.95	0.77	1.18	0.646	1.05	0.85	1.30	0.649
<i>P for interaction with APOE ε4 allele</i>				0.395				0.335				0.329
Risk of Vascular dementia												
<i>APOE ε4 carriers vs. non-carriers</i>	4.85	2.48	9.46	<0.001	5.04	2.57	9.92	<0.001	4.65	1.88	11.5	0.001
Processed meat (25 g per day)												
<i>Stratified analysis</i>												

Online Supporting Material

<i>APOE</i> ε4 non-carriers	1.97	1.12	3.45	0.018	1.52	0.85	2.74	0.161	1.57	0.85	2.89	0.149
<i>APOE</i> ε4 carriers	1.11	0.69	1.80	0.673	0.92	0.54	1.54	0.738	1.10	0.62	1.95	0.749
<i>P for interaction with APOE ε4 allele</i>				0.128				0.112				0.198
Unprocessed poultry (25 g per day)												
<i>Stratified analysis</i>												
<i>APOE</i> ε4 non-carriers	0.96	0.65	1.40	0.820	1.10	0.71	1.72	0.665	1.11	0.72	1.73	0.632
<i>APOE</i> ε4 carriers	1.00	0.75	1.33	0.990	1.17	0.83	1.66	0.362	1.20	0.83	1.73	0.325
<i>P for interaction with APOE ε4 allele</i>				0.863				0.968				0.617
Unprocessed red meat (50 g per day)												
<i>Stratified analysis</i>												
<i>APOE</i> ε4 non-carriers	1.42	0.76	2.68	0.275	0.99	0.53	1.84	0.971	0.88	0.45	1.73	0.706
<i>APOE</i> ε4 carriers	0.96	0.57	1.62	0.876	0.66	0.39	1.11	0.118	0.64	0.36	1.14	0.129
<i>P for interaction with APOE ε4 allele</i>				0.346				0.305				0.563
Total meat (50 g per day)												
<i>Stratified analysis</i>												
<i>APOE</i> ε4 non-carriers	1.33	0.91	1.93	0.138	1.19	0.80	1.76	0.393	1.23	0.83	1.83	0.298
<i>APOE</i> ε4 carriers	1.08	0.85	1.39	0.526	0.96	0.72	1.29	0.791	0.98	0.73	1.32	0.906
<i>P for interaction with APOE ε4 allele</i>				0.374				0.289				0.263

¹ Minimally-adjusted models: Cox proportional-hazards regression adjusted for age, gender, ethnicity, education, socioeconomic status. ²

Fully-adjusted models: Cox proportional-hazards regression additionally adjusted for region, smoking status, physical activity, body mass index, sleep duration, stroke history, family history of dementia, genetic kinship to other participants, dietary covariates including vegetables and fruits, total fish, tea and coffee, alcohol drinking; processed meat, unprocessed poultry, and unprocessed red meat were also mutually adjusted for. Mean daily intakes per increment calculated from the multiple 24-h dietary assessments were used as continuous variables in Cox models. Abbreviations: *APOE*, apolipoprotein E; HR, hazard ratio; LCI, lower confidence interval (95%); UCI, upper confidence interval (95%).

Supplementary Table 7 Risks of all-cause dementia, Alzheimer's disease and vascular dementia under different meat types among APOE ε4 non-carriers (n=289 441) and carriers (n=115 421) respectively in sensitivity analysis excluding dementia cases within first 3 years of follow-up

	Unadjusted models (n = 404 862)				Minimally-adjusted Models ¹ (n = 404 862)				Fully-adjusted models ² (n = 404 862)			
	HR	LCI	UCI	P	HR	LCI	UCI	P	HR	LCI	UCI	P
Risk of All-cause dementia												
<i>APOE ε4 carriers vs. non-carriers</i>	3.29	2.32	4.65	<0.001	3.55	2.40	5.24	<0.001	3.46	2.35	5.08	<0.001
Processed meat (25 g per day)												
<i>Stratified analysis</i>												
<i>APOE ε4 non-carriers</i>	1.60	1.28	2.00	<0.001	1.34	1.05	1.70	0.018	1.45	1.13	1.86	0.004
<i>APOE ε4 carriers</i>	1.18	0.95	1.45	0.128	1.11	0.89	1.40	0.352	1.46	1.15	1.85	0.002
<i>P for interaction with APOE ε4 allele</i>				0.049				0.048				0.176
Unprocessed poultry (25 g per day)												
<i>Stratified analysis</i>												
<i>APOE ε4 non-carriers</i>	0.85	0.74	0.98	0.026	0.93	0.79	1.10	0.392	0.96	0.81	1.14	0.670
<i>APOE ε4 carriers</i>	0.84	0.73	0.95	0.007	0.91	0.78	1.06	0.226	0.95	0.82	1.11	0.546
<i>P for interaction with APOE ε4 allele</i>				0.847				0.698				0.880
Unprocessed red meat (50 g per day)												
<i>Stratified analysis</i>												
<i>APOE ε4 non-carriers</i>	1.24	0.96	1.58	0.095	0.89	0.69	1.14	0.336	0.87	0.65	1.15	0.311
<i>APOE ε4 carriers</i>	0.93	0.74	1.18	0.558	0.68	0.54	0.86	0.001	0.68	0.52	0.88	0.003
<i>P for interaction with APOE ε4 allele</i>				0.108				0.104				0.333
Total meat (50 g per day)												
<i>Stratified analysis</i>												
<i>APOE ε4 non-carriers</i>	1.18	1.03	1.36	0.017	1.07	0.92	1.25	0.368	1.13	0.97	1.32	0.122
<i>APOE ε4 carriers</i>	1.04	0.92	1.18	0.541	0.95	0.82	1.10	0.513	1.02	0.88	1.18	0.793
<i>P for interaction with APOE ε4 allele</i>				0.170				0.123				0.109
Risk of Alzheimer's disease												
<i>APOE ε4 carriers vs. non-carriers</i>	6.53	3.54	12.1	<0.001	7.37	3.62	15.0	<0.001	6.78	3.39	13.6	<0.001
Processed meat (25 g per day)												
<i>Stratified analysis</i>												

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<i>APOE</i> ε4 non-carriers	1.58	1.04	2.42	0.034	1.48	0.94	2.35	0.093	1.75	1.05	2.90	0.031
<i>APOE</i> ε4 carriers	1.04	0.76	1.42	0.798	1.01	0.72	1.42	0.959	1.49	1.05	2.12	0.025
<i>P for interaction with APOE ε4 allele</i>				0.120				0.110				0.305
Unprocessed poultry (25 g per day)												
<i>Stratified analysis</i>												
<i>APOE</i> ε4 non-carriers	0.97	0.75	1.25	0.789	1.11	0.83	1.50	0.484	1.10	0.82	1.48	0.541
<i>APOE</i> ε4 carriers	0.85	0.70	1.03	0.102	0.91	0.72	1.16	0.458	0.98	0.78	1.24	0.864
<i>P for interaction with APOE ε4 allele</i>				0.432				0.370				0.690
Unprocessed red meat (50 g per day)												
<i>Stratified analysis</i>												
<i>APOE</i> ε4 non-carriers	1.24	0.78	1.97	0.370	0.91	0.57	1.45	0.701	0.82	0.48	1.40	0.459
<i>APOE</i> ε4 carriers	0.85	0.61	1.18	0.329	0.60	0.43	0.85	0.004	0.61	0.42	0.90	0.011
<i>P for interaction with APOE ε4 allele</i>				0.196				0.193				0.508
Total meat (50 g per day)												
<i>Stratified analysis</i>												
<i>APOE</i> ε4 non-carriers	1.28	0.98	1.67	0.071	1.24	0.92	1.67	0.168	1.34	0.99	1.80	0.059
<i>APOE</i> ε4 carriers	1.04	0.86	1.25	0.687	0.95	0.76	1.20	0.684	1.06	0.85	1.33	0.614
<i>P for interaction with APOE ε4 allele</i>				0.213				0.174				0.174
Risk of Vascular dementia												
<i>APOE</i> ε4 carriers vs. non-carriers	3.95	1.59	9.83	0.003	4.42	1.60	12.2	0.004	4.34	1.62	11.6	0.004
Processed meat (25 g per day)												
<i>Stratified analysis</i>												
<i>APOE</i> ε4 non-carriers	1.78	0.98	3.24	0.057	1.35	0.72	2.54	0.346	1.37	0.71	2.65	0.346
<i>APOE</i> ε4 carriers	1.11	0.68	1.83	0.677	0.94	0.55	1.62	0.833	1.09	0.61	1.96	0.773
<i>P for interaction with APOE ε4 allele</i>				0.231				0.220				0.367
Unprocessed poultry (25 g per day)												
<i>Stratified analysis</i>												
<i>APOE</i> ε4 non-carriers	1.02	0.67	1.54	0.937	1.16	0.72	1.89	0.543	1.21	0.76	1.92	0.427
<i>APOE</i> ε4 carriers	1.10	0.79	1.52	0.582	1.30	0.89	1.90	0.184	1.35	0.92	1.99	0.124
<i>P for interaction with APOE ε4 allele</i>				0.784				0.876				0.590
Unprocessed red meat (50 g per day)												
<i>Stratified analysis</i>												

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<i>APOE</i> ε4 non-carriers	1.41	0.71	2.79	0.324	0.94	0.48	1.82	0.853	0.87	0.42	1.78	0.698
<i>APOE</i> ε4 carriers	0.92	0.53	1.58	0.758	0.64	0.37	1.11	0.115	0.58	0.31	1.06	0.075
<i>P for interaction with APOE ε4 allele</i>				0.335				0.311				0.465
Total meat (50 g per day)												
<i>Stratified analysis</i>												
<i>APOE</i> ε4 non-carriers	1.30	0.87	1.94	0.200	1.13	0.74	1.73	0.561	1.18	0.78	1.81	0.435
<i>APOE</i> ε4 carriers	1.09	0.84	1.43	0.515	0.98	0.72	1.34	0.892	0.98	0.72	1.34	0.915
<i>P for interaction with APOE ε4 allele</i>				0.479				0.404				0.375

¹Minimally-adjusted models: Cox proportional hazards regression adjusted for age, gender, ethnicity, education, socioeconomic status.

²Fully-adjusted models: Cox proportional hazards regression additionally adjusted for region, smoking status, physical activity, body mass index, sleep duration, stroke history, family history of dementia, genetic kinship to other participants, dietary covariates including vegetables and fruits, total fish, tea and coffee, alcohol drinking; processed meat, unprocessed poultry, and unprocessed red meat were also mutually adjusted for. Mean daily intakes per increment calculated from the multiple 24-h dietary assessments were used as continuous variables in Cox models. Abbreviations: HR, hazard ratio; LCI, lower confidence interval (95%); UCI, upper confidence interval (95%); *APOE*, apolipoprotein E.

Supplementary Table 8 Risks of all-cause dementia, Alzheimer's disease and vascular dementia under different meat types among APOE ε4 non-carriers (n=225 130) and carriers (n=90 072) respectively in sensitivity analysis excluding participants with missing data of covariates

	Unadjusted models (n = 315 202)				Minimally-adjusted Models ¹ (n = 315 202)				Fully-adjusted models ² (n = 315 202)			
	HR	LCI	UCI	P	HR	LCI	UCI	P	HR	LCI	UCI	P
Risk of All-cause dementia												
<i>APOE ε4 carriers vs. non-carriers</i>	3.25	2.16	4.89	<0.001	3.47	2.20	5.48	<0.001	3.34	2.13	5.24	<0.001
Processed meat (25 g per day)												
<i>Stratified analysis</i>												
<i>APOE ε4 non-carriers</i>	1.70	1.33	2.17	<0.001	1.41	1.08	1.84	0.011	1.51	1.14	2.01	0.004
<i>APOE ε4 carriers</i>	1.20	0.94	1.55	0.148	1.07	0.82	1.41	0.611	1.44	1.08	1.92	0.012
<i>P for interaction with APOE ε4 allele</i>				0.056				0.048				0.205
Unprocessed poultry (25 g per day)												
<i>Stratified analysis</i>												
<i>APOE ε4 non-carriers</i>	0.83	0.71	0.97	0.021	0.90	0.75	1.08	0.265	0.89	0.73	1.08	0.227
<i>APOE ε4 carriers</i>	0.81	0.70	0.94	0.006	0.88	0.74	1.05	0.165	0.92	0.76	1.10	0.360
<i>P for interaction with APOE ε4 allele</i>				0.816				0.763				0.674
Unprocessed red meat (50 g per day)												
<i>Stratified analysis</i>												
<i>APOE ε4 non-carriers</i>	1.41	1.07	1.87	0.017	0.99	0.75	1.32	0.964	0.99	0.72	1.37	0.958
<i>APOE ε4 carriers</i>	0.97	0.74	1.28	0.847	0.67	0.51	0.89	0.005	0.69	0.50	0.94	0.019
<i>P for interaction with APOE ε4 allele</i>				0.065				0.063				0.228
Total meat (50 g per day)												
<i>Stratified analysis</i>												
<i>APOE ε4 non-carriers</i>	1.25	1.06	1.47	0.008	1.13	0.94	1.35	0.187	1.18	0.98	1.42	0.075
<i>APOE ε4 carriers</i>	1.07	0.93	1.24	0.344	0.97	0.82	1.15	0.738	1.04	0.88	1.23	0.635
<i>P for interaction with APOE ε4 allele</i>				0.176				0.156				0.164
Risk of Alzheimer's disease												
<i>APOE ε4 carriers vs. non-carriers</i>	6.89	3.34	14.2	<0.001	7.69	3.31	17.9	<0.001	7.05	3.10	16.0	<0.001
Processed meat (25 g per day)												
<i>Stratified analysis</i>												

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<i>APOE</i> ε4 non-carriers	1.75	1.08	2.84	0.024	1.58	0.92	2.71	0.098	1.90	1.07	3.39	0.029
<i>APOE</i> ε4 carriers	0.83	0.58	1.20	0.317	0.76	0.51	1.14	0.185	1.15	0.76	1.75	0.517
<i>P</i> for interaction with <i>APOE</i> ε4 allele				0.017				0.016				0.086
Unprocessed poultry (25 g per day)												
<i>Stratified analysis</i>												
<i>APOE</i> ε4 non-carriers	0.96	0.71	1.29	0.760	1.09	0.76	1.56	0.633	1.05	0.74	1.49	0.802
<i>APOE</i> ε4 carriers	0.85	0.67	1.07	0.167	0.92	0.69	1.21	0.543	1.05	0.80	1.37	0.714
<i>P</i> for interaction with <i>APOE</i> ε4 allele				0.541				0.519				0.872
Unprocessed red meat (50 g per day)												
<i>Stratified analysis</i>												
<i>APOE</i> ε4 non-carriers	1.42	0.82	2.48	0.212	0.99	0.56	1.75	0.976	0.88	0.47	1.64	0.683
<i>APOE</i> ε4 carriers	0.75	0.51	1.11	0.145	0.51	0.34	0.76	0.001	0.56	0.35	0.88	0.012
<i>P</i> for interaction with <i>APOE</i> ε4 allele				0.063				0.064				0.317
Total meat (50 g per day)												
<i>Stratified analysis</i>												
<i>APOE</i> ε4 non-carriers	1.29	0.94	1.79	0.120	1.22	0.84	1.77	0.306	1.33	0.92	1.93	0.132
<i>APOE</i> ε4 carriers	1.00	0.81	1.22	0.969	0.90	0.70	1.16	0.419	1.00	0.78	1.28	0.997
<i>P</i> for interaction with <i>APOE</i> ε4 allele				0.182				0.174				0.176
Risk of Vascular dementia												
<i>APOE</i> ε4 carriers vs. non-carriers	4.71	1.76	12.6	0.002	5.30	1.78	15.8	0.003	5.07	1.77	14.6	0.003
Processed meat (25 g per day)												
<i>Stratified analysis</i>												
<i>APOE</i> ε4 non-carriers	1.84	0.96	3.51	0.066	1.32	0.66	2.64	0.432	1.23	0.59	2.56	0.576
<i>APOE</i> ε4 carriers	0.96	0.53	1.72	0.881	0.74	0.40	1.40	0.357	0.86	0.43	1.72	0.667
<i>P</i> for interaction with <i>APOE</i> ε4 allele				0.142				0.132				0.226
Unprocessed poultry (25 g per day)												
<i>Stratified analysis</i>												
<i>APOE</i> ε4 non-carriers	0.95	0.62	1.46	0.816	1.08	0.65	1.79	0.762	1.07	0.65	1.77	0.797
<i>APOE</i> ε4 carriers	0.84	0.61	1.18	0.318	0.96	0.63	1.45	0.828	0.90	0.57	1.43	0.669
<i>P</i> for interaction with <i>APOE</i> ε4 allele				0.665				0.615				0.857
Unprocessed red meat (50 g per day)												
<i>Stratified analysis</i>												

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<i>APOE</i> $\epsilon 4$ non-carriers	2.00	0.95	4.24	0.070	1.31	0.64	2.70	0.464	1.31	0.60	2.83	0.499
<i>APOE</i> $\epsilon 4$ carriers	1.26	0.65	2.44	0.487	0.82	0.42	1.61	0.559	1.02	0.50	2.11	0.952
<i>P</i> for interaction with <i>APOE</i> $\epsilon 4$ allele				0.364				0.348				0.795
Total meat (50 g per day)												
<i>Stratified analysis</i>												
<i>APOE</i> $\epsilon 4$ non-carriers	1.36	0.89	2.09	0.158	1.17	0.74	1.83	0.505	1.22	0.77	1.91	0.397
<i>APOE</i> $\epsilon 4$ carriers	1.01	0.76	1.36	0.929	0.87	0.61	1.24	0.441	0.89	0.62	1.26	0.504
<i>P</i> for interaction with <i>APOE</i> $\epsilon 4$ allele				0.261				0.236				0.230

¹Minimally-adjusted models: Cox proportional hazards regression adjusted for age, gender, ethnicity, education, socioeconomic status.

²Fully-adjusted models: Cox proportional hazards regression additionally adjusted for region, smoking status, physical activity, body mass index, sleep duration, stroke history, family history of dementia, genetic kinship to other participants, dietary covariates including vegetables and fruits, total fish, tea and coffee, alcohol drinking; processed meat, unprocessed poultry, and unprocessed red meat were also mutually adjusted for. Mean daily intakes per increment calculated from the multiple 24-h dietary assessments were used as continuous variables in Cox models. Abbreviations: HR, hazard ratio; LCI, lower confidence interval (95%); UCI, upper confidence interval (95%); *APOE*, apolipoprotein E.

Supplementary Table 9 Risks of all-cause dementia, Alzheimer's disease and vascular dementia under different meat types among APOE $\epsilon 4$ non-carriers (n=125 229) and carriers (n=49 440) respectively in participants aged 60 or more

	Unadjusted models (n = 174 669)				Minimally-adjusted Models ¹ (n = 174 669)				Fully-adjusted models ² (n = 174 669)			
	HR	LCI	UCI	P	HR	LCI	UCI	P	HR	LCI	UCI	P
Risk of All-cause dementia												
<i>APOE $\epsilon 4$ carriers vs. non-carriers</i>	3.85	2.52	5.88	<0.001	3.99	2.62	6.08	<0.001	3.89	2.57	5.89	<0.001
Processed meat (25 g per day)												
<i>Stratified analysis</i>												
<i>APOE $\epsilon 4$ non-carriers</i>	1.60	1.24	2.07	<0.001	1.30	1.01	1.69	0.045	1.44	1.10	1.88	0.009
<i>APOE $\epsilon 4$ carriers</i>	1.21	0.96	1.52	0.110	1.11	0.87	1.40	0.409	1.53	1.19	1.96	0.001
<i>P for interaction with APOE $\epsilon 4$ allele</i>				0.107				0.098				0.471
Unprocessed poultry (25 g per day)												
<i>Stratified analysis</i>												
<i>APOE $\epsilon 4$ non-carriers</i>	0.85	0.72	1.01	0.068	0.89	0.75	1.06	0.180	0.89	0.74	1.07	0.207
<i>APOE $\epsilon 4$ carriers</i>	0.82	0.70	0.96	0.011	0.84	0.72	0.98	0.026	0.89	0.76	1.04	0.144
<i>P for interaction with APOE $\epsilon 4$ allele</i>				0.747				0.669				0.726
Unprocessed red meat (50 g per day)												
<i>Stratified analysis</i>												
<i>APOE $\epsilon 4$ non-carriers</i>	1.02	0.78	1.35	0.884	0.93	0.71	1.22	0.586	0.95	0.70	1.28	0.724
<i>APOE $\epsilon 4$ carriers</i>	0.66	0.52	0.84	0.001	0.62	0.49	0.79	<0.001	0.62	0.47	0.81	<0.001
<i>P for interaction with APOE $\epsilon 4$ allele</i>				0.021				0.016				0.044
Total meat (50 g per day)												
<i>Stratified analysis</i>												
<i>APOE $\epsilon 4$ non-carriers</i>	1.18	0.99	1.40	0.068	1.09	0.92	1.29	0.339	1.14	0.96	1.36	0.123
<i>APOE $\epsilon 4$ carriers</i>	1.00	0.87	1.16	0.962	0.95	0.82	1.10	0.506	1.02	0.88	1.18	0.835
<i>P for interaction with APOE $\epsilon 4$ allele</i>				0.176				0.126				0.109
Risk of Alzheimer's disease												
<i>APOE $\epsilon 4$ carriers vs. non-carriers</i>	6.32	3.05	13.1	<0.001	6.59	3.16	13.7	<0.001	6.14	3.00	12.6	<0.001
Processed meat (25 g per day)												
<i>Stratified analysis</i>												

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<i>APOE</i> ε4 non-carriers	1.54	0.94	2.51	0.086	1.36	0.82	2.24	0.231	1.66	0.97	2.84	0.063
<i>APOE</i> ε4 carriers	1.03	0.73	1.45	0.873	1.01	0.71	1.44	0.969	1.52	1.05	2.20	0.027
<i>P</i> for interaction with <i>APOE</i> ε4 allele				0.190				0.176				0.422
Unprocessed poultry (25 g per day)												
<i>Stratified analysis</i>												
<i>APOE</i> ε4 non-carriers	0.89	0.66	1.22	0.469	0.94	0.69	1.27	0.687	0.91	0.67	1.24	0.567
<i>APOE</i> ε4 carriers	0.86	0.68	1.09	0.217	0.87	0.69	1.10	0.254	0.93	0.74	1.18	0.569
<i>P</i> for interaction with <i>APOE</i> ε4 allele				0.872				0.827				0.720
Unprocessed red meat (50 g per day)												
<i>Stratified analysis</i>												
<i>APOE</i> ε4 non-carriers	0.96	0.58	1.59	0.880	0.92	0.56	1.51	0.747	0.92	0.53	1.60	0.760
<i>APOE</i> ε4 carriers	0.61	0.44	0.87	0.005	0.59	0.41	0.84	0.003	0.60	0.41	0.88	0.009
<i>P</i> for interaction with <i>APOE</i> ε4 allele				0.152				0.137				0.257
Total meat (50 g per day)												
<i>Stratified analysis</i>												
<i>APOE</i> ε4 non-carriers	1.15	0.84	1.59	0.386	1.11	0.81	1.52	0.522	1.21	0.88	1.65	0.240
<i>APOE</i> ε4 carriers	1.00	0.81	1.25	0.976	0.97	0.78	1.22	0.818	1.08	0.86	1.35	0.528
<i>P</i> for interaction with <i>APOE</i> ε4 allele				0.491				0.431				0.423
Risk of Vascular dementia												
<i>APOE</i> ε4 carriers vs. non-carriers	6.26	2.17	18.1	<0.001	6.56	2.35	18.4	<0.001	6.49	2.37	17.8	<0.001
Processed meat (25 g per day)												
<i>Stratified analysis</i>												
<i>APOE</i> ε4 non-carriers	2.02	1.06	3.84	0.033	1.49	0.79	2.82	0.216	1.55	0.79	3.06	0.201
<i>APOE</i> ε4 carriers	1.05	0.62	1.76	0.861	0.85	0.50	1.43	0.529	1.08	0.60	1.93	0.799
<i>P</i> for interaction with <i>APOE</i> ε4 allele				0.122				0.110				0.263
Unprocessed poultry (25 g per day)												
<i>Stratified analysis</i>												
<i>APOE</i> ε4 non-carriers	1.02	0.62	1.66	0.940	1.07	0.66	1.74	0.780	1.05	0.64	1.72	0.855
<i>APOE</i> ε4 carriers	0.98	0.69	1.38	0.886	1.04	0.73	1.47	0.831	1.08	0.75	1.58	0.673
<i>P</i> for interaction with <i>APOE</i> ε4 allele				0.884				0.831				0.736
Unprocessed red meat (50 g per day)												
<i>Stratified analysis</i>												

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<i>APOE</i> $\epsilon 4$ non-carriers	1.16	0.57	2.36	0.687	1.03	0.53	2.01	0.924	0.94	0.44	2.01	0.881
<i>APOE</i> $\epsilon 4$ carriers	0.63	0.37	1.08	0.094	0.57	0.33	0.98	0.042	0.59	0.32	1.08	0.088
<i>P</i> for interaction with <i>APOE</i> $\epsilon 4$ allele				0.182				0.152				0.327
Total meat (50 g per day)												
<i>Stratified analysis</i>												
<i>APOE</i> $\epsilon 4$ non-carriers	1.36	0.84	2.20	0.214	1.21	0.78	1.88	0.406	1.24	0.79	1.95	0.342
<i>APOE</i> $\epsilon 4$ carriers	0.95	0.71	1.27	0.724	0.87	0.65	1.16	0.345	0.89	0.67	1.19	0.448
<i>P</i> for interaction with <i>APOE</i> $\epsilon 4$ allele				0.212				0.168				0.148

¹Minimally-adjusted models: Cox proportional hazards regression adjusted for age, gender, ethnicity, education, socioeconomic status.

²Fully-adjusted models: Cox proportional hazards regression additionally adjusted for region, smoking status, physical activity, body mass index, sleep duration, stroke history, family history of dementia, genetic kinship to other participants, dietary covariates including vegetables and fruits, total fish, tea and coffee, alcohol drinking; processed meat, unprocessed poultry, and unprocessed red meat were also mutually adjusted for. Mean daily intakes per increment calculated from the multiple 24-h dietary assessments were used as continuous variables in Cox models. Abbreviations: HR, hazard ratio; LCI, lower confidence interval (95%); UCI, upper confidence interval (95%); *APOE*, apolipoprotein E.

Supplementary Methods

1. Assessment of dietary meat consumption

1.1 The baseline touchscreen questionnaire

The baseline touchscreen questionnaire contained 29 food items and 18 alcohol and beverage items. There were 5 questions on meat (fish not included) including processed meat (such as bacon, ham, sausages, meat pies, kebabs, burgers, chicken nuggets), poultry (processed poultry not counted), beef (processed beef not counted), lamb/mutton (processed lamb/mutton not counted), and pork (processed pork not counted). Participants were asked how often each item was consumed with eight options to select being: ‘never’, ‘less than once a week’, ‘once a week’, ‘2-4 times a week’, ‘5-6 times a week’, ‘once or more daily’, ‘do not know’, ‘prefer not to answer’. We converted the responses on meat into weekly-based consumption frequencies as follows: 0, 0.5, 1, 3, 5.5, and 7 times per week, where responses like ‘do not know’, ‘prefer not to answer’ were converted into missing values. Then we summed unprocessed beef, lamb/mutton, and pork into one group titled ‘unprocessed red meat’, and then we combined processed meat, unprocessed poultry, and unprocessed red meat into one group titled ‘total meat’. To rank participants by weekly meat consumption according to the distribution of data, we categorized intake frequencies for each meat type into five groups: processed meat (0, 0.1-0.9, once, 2.0-4.9 and ≥ 5.0 times per week); unprocessed poultry (0, 0.1-0.9, once, 2.0-4.9 and ≥ 5.0 times per week); unprocessed red meat (0, 0.1-1.0, 1.1-1.9, 2.0-2.9 and ≥ 3.0 times per week); and total meat (0, 0.1-3.0, 3.1-4.9, 5.0-6.9 and ≥ 7.0 times per week). These categories were determined for similar-sized groups where data distribution allowed.

1.2 The Oxford WebQ questionnaire for 24-h dietary assessments

The Oxford WebQ questionnaire containing up to 206 food items and 32 alcohol and beverage items assessed dietary consumption information over the previous 24 hours. Participants were asked to select how many portions they consumed for each item with instructions specifying what one portion size is, such as one sausage, one rasher of bacon, one slice of ham, or one ‘serving’ for some specific foods. The food intake weight in grams for each item was calculated by multiplying amounts of portion size by standard portion sizes in grams [1]; then daily intakes of energy and nutrients were estimated by multiplying the food weight consumed by its nutrient composition based on McCance and Widdowson’s the Composition of Foods (Seventh Summary Edition) [2]. There were 10 items on meat (fish not included) asking the amount of portion size consumed for previous 24 hours with 7 options to select being ‘none’, ‘half’, ‘1’, ‘2’, ‘3’, ‘4’, ‘5+’, where the top open-ended category was coded as 5 in analyses. To match meat groups from the baseline touchscreen questionnaire as closely as possible, meat-related items from the Oxford WebQ 24-h dietary assessments were grouped as follows: processed meat (sum of sausage, bacon, ham, crumbed chicken or turkey), unprocessed poultry (chicken or turkey), unprocessed red meat (sum of beef, lamb/mutton, pork), and total meat (sum of processed meat, unprocessed poultry, and unprocessed red meat).

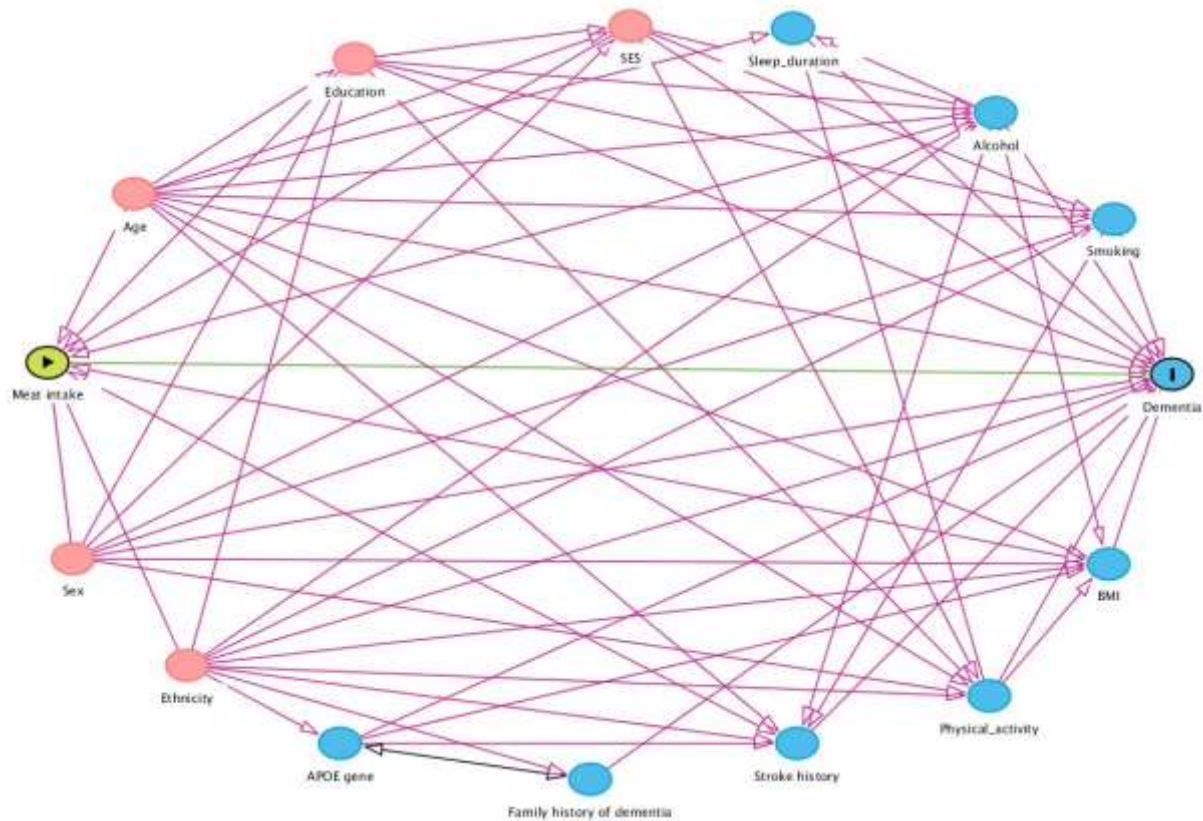
The Oxford WebQ questionnaire was introduced into the baseline recruitment visit as an enhancement to the baseline measures for the last 70724 participants. After recruitment,

participants who agreed to be contacted by e-mails were invited to complete an online Oxford WebQ questionnaire for 24-hour dietary assessments. The Oxford WebQ questionnaire was administrated online once every 3–4 months for a total of four separate occasions between February 2011 and June 2012. A large sub-sample of participants ($n = 175402$) completed at least one online WebQ questionnaire. Taking respondents to the WebQ questionnaire at the baseline assessment visit into account, there were in total 211006 participants who completed at least one (1+) WebQ questionnaire, 126844 participants who completed at least two (2+) WebQ questionnaire, 78725 participants who completed at least three (3+) WebQ questionnaire. Meat intakes in grams were averaged for participants who completed more than one Oxford WebQ questionnaire. Comparisons of baseline characteristics and meat consumption from 24-h dietary assessment across participants with 1+, 2+ and 3+ completions of WebQ questionnaire were summarized in Supplementary table 1, showing that participants with more numbers of completion to the WebQ questionnaire were more likely to be women, older, of white ethnic background, less deprived, and more educated; however, the mean daily intakes of the meat groups were similar across participants with 1+, 2+ and 3+ completions with narrower 95% confidence intervals as number of completion increases. Although the more numbers of completion the more stable the mean consumption is, the restriction to 3+ completions of the WebQ questionnaire increased the risk of selection bias; so, we included participants who completed at least two Oxford WebQ questionnaires as indicated in previous study [3].

Within each category of meat groups (processed meat, unprocessed poultry, unprocessed red meat, and total meat) defined from the baseline touchscreen questionnaire, we calculated the mean intakes in grams of the same food group from participants who completed the Oxford WebQ questionnaires; then we assigned the mean intakes from the 24-h dietary assessment correspondingly to each category of the meat groups to indicate a level of meat consumption from low to high categories. Since there might be a disproportionate number of participants who reported meat consumption lower or higher than their ‘true intake’ in the lowest category and highest category respectively, regression dilution bias might have occurred in the baseline touchscreen dietary assessment [4,5]. To correct for the potential regression dilution bias, we generated a trend variable based on mean intakes in grams for each category of meat groups using the following increments: processed meat (25 g/day); unprocessed poultry (25 g/day); unprocessed red meat (50 g/day); and total meat (50 g/day). These increments were chosen based on average increases across category differences of each meat type consumed in this cohort and were used for estimation of risk of disease per increment (in g/d) in meat consumption.

2. Determination of the minimal adjustment set

We used the Directed acyclic graph (DAG) via the online tool DAGitty (<http://www.dagitty.net/>) to determine the minimal adjustment set. The DAG below shows the relationships among the exposure (Meat intake; represented by the green oval with the triangle), the outcome (Dementia; represented by the blue oval with the line), and related factors.



Variables represented as pink ovals are ancestors of exposure and outcome while variables represented as blue ovals are ancestors only of the outcome. Pink lines are biasing paths and the green line between the exposure and outcome is the causal path of interest. SES, social economic status; BMI, body mass index.

3. Covariates

3.1 Dietary variables

The baseline touchscreen questionnaire was designed to collect basic dietary information on some commonly consumed foods or food groups; thus, it was recognised that this questionnaire was not suitable to assess total energy or nutrients intakes. In general, we grouped participants into four categories for each food group according to the distribution of data to get approximately equal-sized categories. A 'unknown' category was additionally created to replace missing values for each covariate. Three food groups (total fish, fruits and vegetables, tea and coffee) that potentially confounds associations between meat consumption and risk of dementia were adjusted for in fully-adjusted models as categorical variables.

Fish

There were 2 questions on fish including oily fish (such as sardines, salmon, mackerel, herring), and other types of fish (such as cod, tinned tuna, haddock) with eight options to select. The same approach used for meat-related items was used to deal with fish items. We summed oily fish and

other types of fish into ‘total fish’, and then grouped weekly-based consumption frequencies of total fish into four categories as follows: ≤ 1.0 , 1-2, ≥ 2 , and ≥ 3 times per week.

Fruit and vegetables

Participants were asked to either direct input the specific daily numbers of consumed pieces of fresh fruit (one apple, one banana, 10 grapes etc as one piece), pieces of dried fruit (one prune, one dried apricot, 10 raisins etc as one piece), heaped tablespoons of cooked vegetables and heaped tablespoons of salad/raw vegetables, or select ‘less than one’, ‘do not know’ or ‘prefer not to answer’ over four separate questions. One piece of fresh fruit, two ‘pieces’ of dried fruit, two heaped tablespoons of cooked vegetables, and two heaped tablespoons of salad/raw vegetables were counted as one serving respectively. We summed these four items into one ‘fruits and vegetables’, and then we grouped the daily servings of fruits and vegetables into four categories as follows: < 2 , < 4 , 4-6, and > 6 servings per day.

Tea and coffee

Participants were asked to either direct input the specific numbers of cups of tea (including black and green tea), cups of coffee (including decaffeinated coffee) drunk per day, or select ‘less than one’, ‘do not know’ or ‘prefer not to answer’ over two separate questions. We summed cups of tea and coffee together, and grouped participants into four categories as follows: ≤ 3 , ≤ 5 , ≤ 7 , and > 7 cups per day.

Alcohol drinking

Participants were asked how often they drink alcohol with 7 options: daily or almost daily, 3-4 times a week, once or twice a week, 1-3 times a month, special occasions only, never, or prefer not to answer. We grouped these options into four categories as follows: less than once a week, once or twice a week, three or four times a week, and daily or almost daily.

3.2 Socio-demographics

Age at baseline

Age at baseline was calculated as year differences between birth dates and dates of assessment center visits and was treated as a continuous variable in adjustment sets.

Ethnicity

Participants were asked to select their ethnic group among ‘White’ (including British, Irish, any other White background), ‘Mixed’ (including White and Black Caribbean, White and Black African, White and Asian, any other mixed background), ‘Asian or Asian British’ (including Indian, Pakistani, Bangladeshi, any other Asian background), ‘Black or Black British’ (including Caribbean, African, any other Black background), ‘Chinese’, ‘Other ethnic group’, ‘Do not know’ or ‘Prefer not to answer’. We re-grouped ethnicity into 5 categories as follows: White (White, British, Irish or any other white background); Asian or Asian British (Asian or Asian British, Chinese, Indian, Pakistani, Bangladeshi or any other Asian background); Black or Black British (Black or Black British, Caribbean, African or any other Black background); Mixed Race or Other (any other ethnic groups or mixed ethnicity); and unknown (included participants who did

not know or preferred not to answer)

Region

Participants were recruited via 22 assessment centers across UK. We grouped the centers into three regions as follows: England (St Bartholomew's Hospital, Hounslow, Croydon, Stockport, Manchester, Liverpool, Bury, Newcastle, Middlesbrough, Leeds, Sheffield, Stoke, Birmingham, Nottingham, Oxford, Reading, Bristol), Wales (Swansea, Wrexham, Cardiff), Scotland (Glasgow, Edinburgh).

Townsend deprivation Index (TDI)

The Townsend deprivation index was calculated to reflect the socio-economic level of participants based on postcode-specific information on percentage of unemployment, percentage of overcrowded households, percentage of people with no car ownership, and percentage of non-home owners [6]. The higher the score was the more deprived the participants were. We then categorized the score into three equal-sized groups as follows: low deprivation, moderate deprivation, and high deprivation. Given the risk of over-adjustment, we only included TDI as a categorical variable in adjustment sets without extra adjusting for employment and home incomes.

Education

Participants were asked to select their acquired qualifications among 'College or University degree', 'A levels/AS levels or equivalent', 'O levels/GCSEs or equivalent', 'CSEs or equivalent', 'NVQ or HND or HNC or equivalent', 'Other professional qualifications e.g.: nursing, teaching', 'None of the above' and 'Prefer not to answer'. We regrouped these qualifications into 'with college/university degree' and 'without college/university degree' based on higher education criteria in UK (<https://www.nidirect.gov.uk/articles/what-higher-education>).

3.3 Lifestyle related and other covariates

Body Mass Index (BMI)

Standing height and weight were measured at baseline according to standard protocol. BMI was calculated using the formula $\text{BMI (kg/m}^2\text{)} = \text{Weight (kg)} / \text{Height}^2 \text{ (m}^2\text{)}$. We then categorized the BMI into three groups based on the data distribution as follows: normal or underweight $<25 \text{ kg/m}^2$, overweight $25\text{--}29.9 \text{ kg/m}^2$, and obese $\geq 30 \text{ kg/m}^2$ according to the World Health Organisation (WHO) and the National Institute for Health and Clinical Excellence (NICE) [7].

Physical activity

Participants were asked a series of questions about their usual daily activities at baseline that were taken from the International Physical activity questionnaire (IPAQ) short form [8]. Physical activity was calculated and categorized into three levels being low, moderate, and high, according to the official guidelines for data processing and analysis of the IPAQ Short Forms (https://biobank.ctsu.ox.ac.uk/crystal/crystal/docs/ipaq_analysis.pdf).

Smoking status

Participants were asked about specific smoking behaviours in current days and previous days separately. We regrouped these behaviours into ‘Current’ (meaning smoking in current days no matter what situations of previous days were), ‘Past’ (meaning smoking or alcohol drinking in previous days only but not in current days), and ‘Never’ (mean no smoking or alcohol drinking in either current days or previous days).

Sleep duration

Participants were asked about their sleep duration over a question "how many hours sleep do you get in every 24 hours? (include naps)" with rejection of <1 hour or >23 hours, and requests to confirmation of <3 hour or >12 hours. We categorized the sleep duration into <7, 7-8, >8 hours/day based on data distribution and used it as a categorical variable in adjustment sets.

Stroke history

Participants were asked to report whether they have suffered from the following illnesses including heart disease, stroke, diabetes etc. with multiple choices available. Participants who have selected stroke were considered to be having a stroke history.

Family history of dementia

Participants were asked to report whether their family members (father, adopted father, mother, adopted mother, brothers or sisters, adopted brothers or sisters) have suffered from any of listed illnesses (including heart disease, stroke, diabetes etc. with multiple choices available). Participants who have any biological family members with Alzheimer’s disease/dementia were considered to be having family history of dementia.

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