

Table S1 Participant characteristics using bowel movement frequency as diagnostic criteria

Characteristic	Constipation			P value
	Overall, N=10418	No, N=10124	Yes, N=294	
Age (years)				0.016
<60	7,624 (81%)	7,384 (81%)	240 (89%)	
≥60	2,794 (19%)	2,740 (19%)	54 (11%)	
Gender				<0.001
Female	5,370 (52%)	5,121 (51%)	249 (90%)	
Male	5,048 (48%)	5,003 (49%)	45 (10.0%)	
Race				0.015
Mexican American	1,072 (4.0%)	1,052 (4.0%)	20 (2.7%)	
Non-Hispanic Black	1,966 (8.7%)	1,878 (8.5%)	88 (15%)	
Non-Hispanic White	6,314 (79%)	6,152 (79%)	162 (76%)	
Other Hispanic	591 (2.9%)	575 (2.9%)	16 (3.2%)	
Other Race	475 (5.1%)	467 (5.2%)	8 (3.0%)	
Education				0.053
High school and above	7,589 (77%)	7,396 (77%)	193 (68%)	
Below High school	2,829 (23%)	2,728 (23%)	101 (32%)	
Income				<0.001
Low	3,202 (21%)	3,036 (20%)	166 (50%)	
Normal	1,619 (15%)	1,589 (15%)	30 (8.4%)	
High	5,597 (64%)	5,499 (64%)	98 (41%)	
BMI				0.2
Thin	154 (1.6%)	143 (1.5%)	11 (4.1%)	
Normal	3,019 (33%)	2,919 (33%)	100 (33%)	
Fat	7,245 (66%)	7,062 (66%)	183 (63%)	
Physical Activity				0.002
Mild	1,646 (11%)	1,581 (11%)	65 (18%)	
Moderate	4,952 (49%)	4,803 (49%)	149 (54%)	
Vigorous	3,820 (39%)	3,740 (40%)	80 (28%)	
Drinker				0.018
No	2,536 (21%)	2,439 (20%)	97 (31%)	
Yes	7,882 (79%)	7,685 (80%)	197 (69%)	
Smoker				0.12
No	8,272 (79%)	8,063 (80%)	209 (73%)	
Yes	2,146 (21%)	2,061 (20%)	85 (27%)	
Hypertension				0.6
No	7,252 (74%)	7,050 (74%)	202 (71%)	
Yes	3,166 (26%)	3,074 (26%)	92 (29%)	
Diabetes				0.3
Normal	6,684 (70%)	6,474 (69%)	210 (76%)	
Prediabetes	2,645 (23%)	2,586 (23%)	59 (18%)	
Diabetes	1,089 (7.9%)	1,064 (8%)	25 (6%)	
DII				<0.001
Q1	2,599 (27%)	2,591 (28%)	8 (3.5%)	
Q2	2,701 (27%)	2,629 (27%)	72 (23%)	
Q3	2,660 (25%)	2,572 (25%)	88 (33%)	
Q4	2,458 (21%)	2,332 (21%)	126 (41%)	

The data are n (unweighted) (%). Chi-squared test with Rao & Scott's second-order correction. BMI, body mass index; DII, Dietary Inflammation Index.

Table S2 Association between DII and constipation for all participants diagnosed by bowel movement frequency in NHANES

Characteristic	Model 1			Model 2			Model 3		
	OR	95% CI	P value	OR	95% CI	P value	OR	95% CI	P value
DII									
Q1	–	–		–	–		–	–	
Q2	6.61	3.39, 12.9	<0.001	5.68	2.90, 11.1	<0.001	5.69	2.89, 11.2	<0.001
Q3	10.5	4.96, 22.4	<0.001	6.59	3.00, 14.5	<0.001	6.46	2.94, 14.2	<0.001
Q4	15.9	8.58, 29.4	<0.001	7.97	4.07, 15.6	<0.001	7.87	3.98, 15.6	<0.001
P for trend			<0.001			<0.001			<0.001
P for continuous	1.63	1.48, 1.81	<0.001	1.36	1.21, 1.52	<0.001	1.36	1.21, 1.52	<0.001

OR, odds ratio; CI, confidence interval; DII, Dietary Inflammation Index; NHANES, National Health and Nutrition Examination Survey.

Table S3 Participant characteristics using stool types as diagnostic criteria before and after IPTW

Characteristic	Before PSM					After PSM				
	Q1, N=2590	Q2, N=2687	Q3, N=2649	Q4, N=2450	P value	Q1, N=2590	Q2, N=2687	Q3, N=2649	Q4, N=2450	P value
Age (years)					0.051					0.8
<60	1,845 (79%)	1,969 (82%)	2,039 (85%)	1,750 (80%)		1,845 (73%)	1,969 (73%)	2,039 (72%)	1,750 (71%)	
≥60	745 (21%)	718 (18%)	610 (15%)	700 (20%)		745 (27%)	718 (27%)	610 (28%)	700 (29%)	
Gender					<0.001					0.9
Female	949 (38%)	1,225 (46%)	1,548 (60%)	1,624 (68%)		949 (51%)	1,225 (52%)	1,548 (50%)	1,624 (51%)	
Male	1,641 (62%)	1,462 (54%)	1,101 (40%)	826 (32%)		1,641 (49%)	1,462 (48%)	1,101 (50%)	826 (49%)	
Race					<0.001					>0.9
Mexican American	273 (3.7%)	302 (4.1%)	271 (4.2%)	223 (3.8%)		273 (11%)	302 (11%)	271 (9.9%)	223 (10%)	
Non-Hispanic Black	346 (5.4%)	434 (7.0%)	585 (11%)	588 (12%)		346 (19%)	434 (19%)	585 (19%)	588 (19%)	
Non-Hispanic White	1,722 (83%)	1,672 (81%)	1,541 (78%)	1,354 (74%)		1,722 (60%)	1,672 (60%)	1,541 (61%)	1,354 (62%)	
Other Hispanic	116 (2.5%)	140 (2.2%)	145 (2.8%)	189 (4.4%)		116 (5.4%)	140 (6.2%)	145 (6.0%)	189 (5.6%)	
Other Race	133 (5.5%)	139 (5.5%)	107 (4.1%)	96 (5.4%)		133 (4.4%)	139 (4.4%)	107 (4.5%)	96 (4.2%)	
Education					<0.001					>0.9
Above high school	2,108 (85%)	1,996 (78%)	1,926 (77%)	1,530 (65%)		2,108 (73%)	1,996 (72%)	1,926 (73%)	1,530 (73%)	
Below High school	482 (15%)	691 (22%)	723 (23%)	920 (35%)		482 (27%)	691 (28%)	723 (27%)	920 (27%)	
Income					<0.001					>0.9
Low	585 (16%)	692 (16%)	873 (23%)	1,038 (32%)		585 (30%)	692 (32%)	873 (31%)	1,038 (31%)	
Normal	354 (13%)	427 (15%)	423 (15%)	409 (17%)		354 (16%)	427 (15%)	423 (16%)	409 (15%)	
High	1,651 (71%)	1,568 (69%)	1,353 (61%)	1,003 (51%)		1,651 (55%)	1,568 (53%)	1,353 (54%)	1,003 (54%)	
BMI					<0.001					>0.9
Thin	45 (2.2%)	30 (1.0%)	28 (1.1%)	50 (1.9%)		45 (1.1%)	30 (1.5%)	28 (1.1%)	50 (1.2%)	
Normal	915 (40%)	740 (30%)	700 (30%)	655 (29%)		915 (29%)	740 (29%)	700 (29%)	655 (30%)	
Fat	1,630 (57%)	1,917 (69%)	1,921 (69%)	1,745 (69%)		1,630 (70%)	1,917 (70%)	1,921 (70%)	1,745 (69%)	
Physical Activity					<0.001					0.7
Mild	241 (6.8%)	375 (10%)	464 (13%)	559 (18%)		241 (16%)	375 (17%)	464 (16%)	559 (16%)	
Moderate	1,237 (48%)	1,281 (50%)	1,243 (49%)	1,171 (51%)		1,237 (46%)	1,281 (47%)	1,243 (47%)	1,171 (49%)	
Vigorous	1,112 (45%)	1,031 (40%)	942 (39%)	720 (32%)		1,112 (38%)	1,031 (36%)	942 (37%)	720 (36%)	
Drinker					0.001					0.8
No	469 (17%)	585 (18%)	682 (21%)	787 (28%)		469 (23%)	585 (25%)	682 (24%)	787 (24%)	
Yes	2,121 (83%)	2,102 (82%)	1,967 (79%)	1,663 (72%)		2,121 (77%)	2,102 (75%)	1,967 (76%)	1,663 (76%)	
Smoker					<0.001					>0.9
No	2,228 (87%)	2,163 (79%)	2,110 (80%)	1,735 (69%)		2,228 (80%)	2,163 (80%)	2,110 (80%)	1,735 (79%)	
Yes	362 (13%)	524 (21%)	539 (20%)	715 (31%)		362 (20%)	524 (20%)	539 (20%)	715 (21%)	
Hypertension					0.040					0.8
No	1,874 (76%)	1,930 (76%)	1,819 (72%)	1,602 (71%)		1,874 (69%)	1,930 (69%)	1,819 (70%)	1,602 (68%)	
Yes	716 (24%)	757 (24%)	830 (28%)	848 (29%)		716 (31%)	757 (31%)	830 (30%)	848 (32%)	
Diabetes					0.075					0.5
Normal	1,742 (73%)	1,745 (70%)	1,720 (70%)	1,453 (65%)		1,742 (65%)	1,745 (64%)	1,720 (64%)	1,453 (61%)	
Prediabetes	628 (21%)	679 (22%)	642 (22%)	684 (26%)		628 (25%)	679 (25%)	642 (25%)	684 (27%)	
Diabetes	220 (6%)	263 (8%)	287 (8%)	313 (9%)		220 (10%)	263 (11%)	287 (11%)	313 (12%)	

The data are n (unweighted) (%). Chi-squared test with Rao & Scott's second-order correction. BMI, body mass index; IPTW, inverse probability of treatment weighting.

Table S4 Participant characteristics using bowel movement frequency as diagnostic criteria before and after IPTW

Characteristic	Before IPTW					After IPTW						
	Q1, N=2599	Q2, N=2701	Q3, N=2660	Q4, N=2458	P value	Q1, N=2599	Q2, N=2701	Q3, N=2660	Q4, N=2458	P value		
Age (years)						0.049						0.8
<60	1,848 (79%)	1,979 (81%)	2,043 (85%)	1,754 (80%)		1,848 (73%)	1,979 (73%)	2,043 (72%)	1,754 (71%)			
≥60	751 (21%)	722 (19%)	617 (15%)	704 (20%)		751 (27%)	722 (27%)	617 (28%)	704 (29%)			
Gender						<0.001						0.9
Female	950 (38%)	1,234 (46%)	1,555 (60%)	1,631 (68%)		950 (51%)	1,234 (52%)	1,555 (51%)	1,631 (51%)			
Male	1,649 (62%)	1,467 (54%)	1,105 (40%)	827 (32%)		1,649 (49%)	1,467 (48%)	1,105 (49%)	827 (49%)			
Race						<0.001						>0.9
Mexican American	273 (3.7%)	303 (4.1%)	272 (4.2%)	224 (3.8%)		273 (11%)	303 (11%)	272 (9.8%)	224 (10%)			
Non-Hispanic Black	346 (5.3%)	436 (7.1%)	591 (11%)	593 (12%)		346 (20%)	436 (19%)	591 (19%)	593 (19%)			
Non-Hispanic White	1,731 (83%)	1,683 (81%)	1,544 (78%)	1,356 (74%)		1,731 (60%)	1,683 (60%)	1,544 (61%)	1,356 (61%)			
Other Hispanic	116 (2.5%)	140 (2.2%)	146 (2.8%)	189 (4.4%)		116 (5.4%)	140 (6.2%)	146 (6.0%)	189 (5.6%)			
Other Race	133 (5.5%)	139 (5.5%)	107 (4.1%)	96 (5.4%)		133 (4.3%)	139 (4.5%)	107 (4.6%)	96 (4.2%)			
Education						<0.001						>0.9
Above high school	2,114 (85%)	2,006 (77%)	1,935 (77%)	1,534 (65%)		2,114 (73%)	2,006 (72%)	1,935 (73%)	1,534 (73%)			
Below High school	485 (15%)	695 (23%)	725 (23%)	924 (35%)		485 (27%)	695 (28%)	725 (27%)	924 (27%)			
Income						<0.001						>0.9
Low	588 (16%)	697 (16%)	874 (23%)	1,043 (32%)		588 (30%)	697 (32%)	874 (31%)	1,043 (31%)			
Normal	357 (13%)	428 (15%)	424 (15%)	410 (17%)		357 (16%)	428 (15%)	424 (16%)	410 (15%)			
High	1,654 (71%)	1,576 (69%)	1,362 (62%)	1,005 (51%)		1,654 (54%)	1,576 (53%)	1,362 (54%)	1,005 (54%)			
BMI						<0.001						>0.9
Thin	45 (2.2%)	31 (1.0%)	28 (1.1%)	50 (1.9%)		45 (1.2%)	31 (1.4%)	28 (1.1%)	50 (1.3%)			
Normal	920 (40%)	744 (30%)	700 (29%)	655 (29%)		920 (28%)	744 (29%)	700 (29%)	655 (30%)			
Fat	1,634 (57%)	1,926 (69%)	1,932 (69%)	1,753 (69%)		1,634 (70%)	1,926 (70%)	1,932 (70%)	1,753 (68%)			
Physical Activity						<0.001						0.8
Mild	243 (6.8%)	376 (10%)	466 (13%)	561 (18%)		243 (16%)	376 (17%)	466 (16%)	561 (16%)			
Moderate	1,240 (48%)	1,290 (50%)	1,248 (49%)	1,174 (50%)		1,240 (46%)	1,290 (47%)	1,248 (47%)	1,174 (49%)			
Vigorous	1,116 (45%)	1,035 (40%)	946 (39%)	723 (32%)		1,116 (38%)	1,035 (36%)	946 (37%)	723 (36%)			
Drinker						0.001						>0.9
No	469 (17%)	589 (18%)	686 (21%)	792 (28%)		469 (24%)	589 (24%)	686 (24%)	792 (24%)			
Yes	2,130 (83%)	2,112 (82%)	1,974 (79%)	1,666 (72%)		2,130 (76%)	2,112 (76%)	1,974 (76%)	1,666 (76%)			
Smoker						<0.001						>0.9
No	2,237 (87%)	2,175 (79%)	2,118 (80%)	1,742 (69%)		2,237 (80%)	2,175 (80%)	2,118 (80%)	1,742 (79%)			
Yes	362 (13%)	526 (21%)	542 (20%)	716 (31%)		362 (20%)	526 (20%)	542 (20%)	716 (21%)			
Hypertension						0.036						0.8
No	1,881 (76%)	1,941 (76%)	1,823 (72%)	1,607 (71%)		1,881 (69%)	1,941 (69%)	1,823 (70%)	1,607 (68%)			
Yes	718 (24%)	760 (24%)	837 (28%)	851 (29%)		718 (31%)	760 (31%)	837 (30%)	851 (32%)			
Diabetes						0.066						0.4
Normal	1,749 (73%)	1,754 (70%)	1,724 (70%)	1,457 (65%)		1,749 (65%)	1,754 (64%)	1,724 (64%)	1,457 (61%)			
Prediabetes	631 (21%)	682 (22%)	648 (22%)	684 (26%)		631 (26%)	682 (25%)	648 (25%)	684 (27%)			
Diabetes	219 (6%)	265 (8%)	288 (8%)	317 (9%)		219 (9%)	265 (11%)	288 (11%)	317 (12%)			

The data are n (unweighted) (%). Chi-squared test with Rao & Scott's second-order correction. BMI, body mass index; IPTW, inverse probability of treatment weighting.

Table S5 Association between DII and constipation using the data after IPTW for all participants diagnosed by bowel movement frequency in NHANES

Characteristic	Model 1			Model 2			Model 3		
	OR	95% CI	P value	OR	95% CI	P value	OR	95% CI	P value
DII									
Q1	–	–		–	–		–	–	
Q2	5.59	2.60, 12.0	<0.001	5.50	2.53, 12.0	<0.001	5.45	2.49, 11.9	<0.001
Q3	4.62	2.05, 10.4	<0.001	4.71	2.10, 10.5	<0.001	4.68	2.07, 10.6	<0.001
Q4	6.35	3.03, 13.3	<0.001	6.45	3.11, 13.4	<0.001	6.43	3.06, 13.5	<0.001
P for trend			<0.001			<0.001			<0.001
P for continuous	1.35	1.22, 1.51	<0.001	1.33	1.20, 1.47	<0.001	1.33	1.20, 1.47	<0.001

OR, odds ratio, CI, confidence interval; DII, Dietary Inflammation Index; NHANES, National Health and Nutrition Examination Survey; IPTW, inverse probability of treatment weighting.

Table S6 Subgroup analysis for the association between DII and constipation in all participants diagnosed by stool type in NHANES

Variable	Group	Count	OR	OR Low	OR High	P value	P for interaction
Age (years)							0.229
<60	Q1	1845					
	Q2	1969	1.45	0.74	2.86	0.271	
	Q3	2039	1.89	0.94	3.82	0.074	
	Q4	1750	3.1	1.73	5.55	<0.001	
≥60	Q1	745					
	Q2	718	1.83	0.81	4.13	0.144	
	Q3	610	1.7	0.83	3.48	0.145	
	Q4	700	1.96	1.03	3.75	0.042	
Gender							0.627
Female	Q1	949					
	Q2	1225	1.38	0.65	2.94	0.393	
	Q3	1548	1.48	0.63	3.46	0.36	
	Q4	1624	1.93	0.9	4.12	0.087	
Male	Q1	1641					
	Q2	1462	1.34	0.69	2.58	0.381	
	Q3	1101	1.21	0.69	2.12	0.491	
	Q4	826	2.71	1.54	4.74	0.001	
Race							0.309
Mexican American	Q1	273					
	Q2	302	1.62	0.58	4.56	0.349	
	Q3	271	2.96	1.34	6.54	0.009	
	Q4	223	1.88	0.96	3.68	0.066	
Non-Hispanic Black	Q1	346					
	Q2	434	1.71	0.45	6.42	0.418	
	Q3	585	3.38	1.11	10.29	0.033	
	Q4	588	3.66	1.13	11.83	0.031	
Non-Hispanic White	Q1	1722					
	Q2	1672	1.48	0.74	2.95	0.261	
	Q3	1541	1.5	0.7	3.22	0.292	
	Q4	1354	2.81	1.6	4.94	0.001	
Other Hispanic	Q1	116					
	Q2	140	5.34	1.91	14.89	0.002	
	Q3	145	3.03	0.7	13.13	0.133	
	Q4	189	2.62	0.84	8.24	0.095	
Other Race	Q1	133					
	Q2	139	0.98	0.23	4.19	0.979	
	Q3	107	3.14	0.61	16.2	0.166	
	Q4	96	2.75	0.71	10.69	0.138	
Education							0.879
Above high school	Q1	2108					
	Q2	1996	1.45	0.72	2.93	0.288	
	Q3	1926	1.84	0.92	3.7	0.084	
	Q4	1530	2.54	1.52	4.26	0.001	
Below High school	Q1	482					
	Q2	691	1.73	0.88	3.41	0.112	
	Q3	723	1.85	0.85	4.03	0.12	
	Q4	920	3.32	1.62	6.81	0.002	
Income							0.189
Low	Q1	585					
	Q2	692	1.91	0.99	3.66	0.052	
	Q3	873	1.59	0.82	3.08	0.169	
	Q4	1038	1.64	0.95	2.84	0.074	
Normal	Q1	354					
	Q2	427	2.71	0.59	12.55	0.197	
	Q3	423	4.49	1.64	12.3	0.004	
	Q4	409	5.75	2.14	15.43	0.001	
High	Q1	1651					
	Q2	1568	1.22	0.64	2.33	0.537	
	Q3	1353	1.46	0.59	3.62	0.409	
	Q4	1003	2.91	1.57	5.37	0.001	
BMI							0.159
Thin	Q1	45					
	Q2	30	12.4	1.35	113.6	0.028	
	Q3	28	2.13	0.17	26.22	0.532	
	Q4	50	13.91	1.58	122.71	0.021	
Normal	Q1	915					
	Q2	740	2.36	0.94	5.91	0.066	
	Q3	700	3.28	1.26	8.49	0.016	
	Q4	655	4.22	2.02	8.79	<0.001	
Fat	Q1	1630					
	Q2	1917	1.1	0.58	2.08	0.761	
	Q3	1921	1.27	0.57	2.83	0.544	
	Q4	1745	2.19	1.25	3.83	0.007	
Smoker							0.576
No	Q1	2228					
	Q2	2163	1.64	0.83	3.26	0.154	
	Q3	2110	1.83	0.92	3.66	0.085	
	Q4	1735	2.83	1.69	4.76	<0.001	
Yes	Q1	362					
	Q2	524	1.16	0.43	3.13	0.765	
	Q3	539	2.18	0.74	6.41	0.151	
	Q4	715	3.46	1.22	9.78	0.02	
Hypertension							0.379
No	Q1	1874					
	Q2	1930	1.38	0.76	2.51	0.288	
	Q3	1819	1.61	0.79	3.25	0.181	
	Q4	1602	2.53	1.41	4.56	0.003	
Yes	Q1	716					
	Q2	757	2.69	0.81	8.87	0.103	
	Q3	830	3.84	1.43	10.34	0.009	
	Q4	848	5.6	2.49	12.59	<0.001	
Drinker							0.363
No	Q1	469					
	Q2	585	1.75	0.67	4.61	0.25	
	Q3	682	2.56	1.27	5.17	0.01	
	Q4	787	2.6	1.48	4.56	0.001	
Yes	Q1	2121					
	Q2	2102	1.46	0.79	2.68	0.22	
	Q3	1967	1.59	0.75	3.39	0.223	
	Q4	1663	2.84	1.64	4.92	<0.001	
Physical Activity							0.137
Mild	Q1	241					
	Q2	375	2.94	1.48	5.87	0.003	
	Q3	464	2.45	1.18	5.13	0.019	
	Q4	559	4.21	2.23	7.96	<0.001	
Moderate	Q1	1237					
	Q2	1281	1.15	0.52	2.57	0.722	
	Q3	1243	1.85	0.89	3.82	0.095	
	Q4	1171	3.05	1.82	5.14	<0.001	
Vigorous	Q1	1112					
	Q2	1031	1.74	0.86	3.5	0.118	
	Q3	942	1.74	0.87	3.45	0.113	
	Q4	720	2.05	1.01	4.16	0.046	
Diabetes							0.698
Normal	Q1	1742					
	Q						

Table S7 The characteristics of each element of DII using stool types as diagnostic criteria

Characteristic	Constipation			P value
	Overall, N=10376	No, N=9680	Yes, N=696	
ALCOHOL				0.002
Q1	7,824 (72%)	7,237 (71%)	587 (83%)	
Q2	2,552 (28%)	2,443 (29%)	109 (17%)	
VITB12				0.053
Q1	2,601 (22%)	2,381 (22%)	220 (31%)	
Q2	2,593 (25%)	2,422 (25%)	171 (27%)	
Q3	2,590 (26%)	2,423 (26%)	167 (21%)	
Q4	2,592 (27%)	2,454 (27%)	138 (21%)	
VITB6				0.002
Q1	2,596 (23%)	2,368 (23%)	228 (32%)	
Q2	2,592 (24%)	2,407 (24%)	185 (30%)	
Q3	2,596 (26%)	2,424 (26%)	172 (22%)	
Q4	2,592 (26%)	2,481 (27%)	111 (16%)	
BCAROTENE				0.016
Q1	2,609 (24%)	2,370 (23%)	239 (33%)	
Q2	2,579 (25%)	2,400 (25%)	179 (25%)	
Q3	2,595 (25%)	2,446 (25%)	149 (21%)	
Q4	2,593 (26%)	2,464 (26%)	129 (21%)	
CAFFEINE				0.3
Q1	2,616 (21%)	2,402 (21%)	214 (25%)	
Q2	2,576 (23%)	2,384 (23%)	192 (24%)	
Q3	2,591 (26%)	2,435 (26%)	156 (28%)	
Q4	2,593 (30%)	2,459 (30%)	134 (23%)	
CARB				0.2
Q1	2,594 (24%)	2,386 (24%)	208 (28%)	
Q2	2,594 (25%)	2,438 (25%)	156 (26%)	
Q3	2,594 (25%)	2,412 (25%)	182 (27%)	
Q4	2,594 (25%)	2,444 (26%)	150 (19%)	
CHOLES				<0.001
Q1	2,606 (25%)	2,389 (24%)	217 (34%)	
Q2	2,585 (25%)	2,365 (25%)	220 (31%)	
Q3	2,591 (25%)	2,459 (26%)	132 (21%)	
Q4	2,594 (25%)	2,467 (25%)	127 (14%)	
KCAL				<0.001
Q1	2,602 (23%)	2,361 (22%)	241 (33%)	
Q2	2,589 (24%)	2,402 (24%)	187 (31%)	
Q3	2,593 (25%)	2,449 (26%)	144 (21%)	
Q4	2,592 (27%)	2,468 (28%)	124 (16%)	
TOTALFAT				<0.001
Q1	2,594 (23%)	2,353 (22%)	241 (32%)	
Q2	2,597 (24%)	2,403 (24%)	194 (30%)	
Q3	2,593 (26%)	2,452 (26%)	141 (21%)	
Q4	2,592 (27%)	2,472 (28%)	120 (16%)	
FIBER				0.003
Q1	2,595 (23%)	2,354 (23%)	241 (34%)	
Q2	2,598 (25%)	2,437 (25%)	161 (21%)	
Q3	2,589 (26%)	2,409 (25%)	180 (28%)	
Q4	2,594 (26%)	2,480 (27%)	114 (16%)	
FOLICACID				0.10
Q1	2,599 (24%)	2,404 (23%)	195 (32%)	
Q2	2,604 (25%)	2,437 (25%)	167 (23%)	
Q3	2,580 (24%)	2,403 (24%)	177 (24%)	
Q4	2,593 (28%)	2,436 (28%)	157 (21%)	
IRON				<0.001
Q1	2,596 (23%)	2,355 (22%)	241 (35%)	
Q2	2,592 (25%)	2,414 (25%)	178 (27%)	
Q3	2,601 (26%)	2,464 (26%)	137 (19%)	
Q4	2,587 (27%)	2,447 (27%)	140 (19%)	
MG				<0.001
Q1	2,616 (22%)	2,371 (21%)	245 (33%)	
Q2	2,587 (24%)	2,401 (24%)	186 (25%)	
Q3	2,579 (26%)	2,417 (26%)	162 (27%)	
Q4	2,594 (28%)	2,491 (28%)	103 (15%)	
MUFA				<0.001
Q1	2,594 (23%)	2,342 (22%)	252 (34%)	
Q2	2,597 (25%)	2,405 (24%)	192 (30%)	
Q3	2,592 (25%)	2,456 (26%)	136 (22%)	
Q4	2,593 (27%)	2,477 (28%)	116 (14%)	
NIACIN				<0.001
Q1	2,599 (22%)	2,369 (22%)	230 (34%)	
Q2	2,589 (24%)	2,411 (24%)	178 (26%)	
Q3	2,594 (26%)	2,410 (26%)	184 (25%)	
Q4	2,594 (28%)	2,490 (28%)	104 (15%)	
N3FAT				<0.001
Q1	2,595 (24%)	2,339 (23%)	256 (36%)	
Q2	2,594 (24%)	2,407 (24%)	187 (28%)	
Q3	2,593 (25%)	2,458 (25%)	135 (20%)	
Q4	2,594 (27%)	2,476 (28%)	118 (16%)	
N6FAT				<0.001
Q1	2,599 (23%)	2,356 (22%)	243 (33%)	
Q2	2,589 (25%)	2,404 (25%)	185 (29%)	
Q3	2,597 (25%)	2,460 (26%)	137 (20%)	
Q4	2,591 (27%)	2,460 (27%)	131 (19%)	
PROTEIN				0.009
Q1	2,594 (23%)	2,371 (22%)	223 (32%)	
Q2	2,595 (24%)	2,399 (24%)	196 (27%)	
Q3	2,593 (26%)	2,425 (26%)	168 (24%)	
Q4	2,594 (27%)	2,485 (28%)	109 (17%)	
PUFA				<0.001
Q1	2,594 (23%)	2,353 (22%)	241 (33%)	
Q2	2,596 (25%)	2,400 (24%)	196 (30%)	
Q3	2,592 (25%)	2,461 (26%)	131 (20%)	
Q4	2,594 (27%)	2,466 (27%)	128 (17%)	
RIBOFLAVIN				<0.001
Q1	2,594 (21%)	2,365 (20%)	229 (30%)	
Q2	2,596 (25%)	2,406 (24%)	190 (29%)	
Q3	2,592 (27%)	2,435 (28%)	157 (24%)	
Q4	2,594 (27%)	2,474 (28%)	120 (17%)	
SATFAT				0.026
Q1	2,594 (23%)	2,378 (22%)	216 (30%)	
Q2	2,594 (24%)	2,411 (24%)	183 (26%)	
Q3	2,594 (26%)	2,435 (26%)	159 (25%)	
Q4	2,594 (27%)	2,456 (28%)	138 (18%)	
SE				0.003
Q1	2,595 (23%)	2,373 (23%)	222 (33%)	
Q2	2,595 (25%)	2,381 (24%)	214 (30%)	
Q3	2,592 (25%)	2,443 (25%)	149 (20%)	
Q4	2,594 (27%)	2,483 (28%)	111 (17%)	
THIAMIN				0.004
Q1	2,595 (22%)	2,368 (22%)	227 (34%)	
Q2	2,593 (25%)	2,429 (25%)	164 (21%)	
Q3	2,594 (26%)	2,416 (26%)	178 (28%)	
Q4	2,594 (27%)	2,467 (28%)	127 (18%)	
VITA				0.071
Q1	2,597 (23%)	2,387 (22%)	210 (31%)	
Q2	2,591 (25%)	2,410 (25%)	181 (26%)	
Q3	2,595 (26%)	2,423 (26%)	172 (22%)	
Q4	2,593 (26%)	2,460 (27%)	133 (21%)	
VITC				0.2
Q1	2,594 (26%)	2,386 (26%)	208 (30%)	
Q2	2,601 (26%)	2,415 (26%)	186 (28%)	
Q3	2,587 (24%)	2,413 (24%)	174 (25%)	
Q4	2,594 (24%)	2,466 (24%)	128 (18%)	
VITE				0.001
Q1	2,596 (22%)	2,359 (22%)	237 (30%)	
Q2	2,592 (24%)	2,402 (24%)	190 (30%)	
Q3	2,594 (26%)	2,466 (26%)	128 (19%)	
Q4	2,594 (28%)	2,453 (28%)	141 (21%)	
ZN				0.004
Q1	2,595 (22%)	2,360 (22%)	235 (34%)	
Q2	2,598 (25%)	2,416 (25%)	182 (24%)	
Q3	2,590 (25%)	2,446 (26%)	144 (22%)	
Q4	2,593 (27%)	2,458 (28%)	135 (20%)	

The data are n (unweighted) (%). Chi-squared test with Rao & Scott's second-order correction. DII, Dietary Inflammation Index.

Table S8 Association between each element of DII and constipation for all participants diagnosed by stool type in NHANES

Characteristic	Model 1			Model 2			Model 3		
	OR	95% CI	P value	OR	95% CI	P value	OR	95% CI	P value
ALCOHOL									
Q1	—	—		—	—		—	—	
Q2	0.51	0.33, 0.77	0.002	0.69	0.43, 1.11	0.12	0.68	0.43, 1.09	0.11
VITB12									
Q1	—	—		—	—		—	—	
Q2	0.74	0.43, 1.29	0.3	0.88	0.49, 1.56	0.6	0.87	0.49, 1.54	0.6
Q3	0.58	0.38, 0.88	0.012	0.82	0.52, 1.30	0.4	0.82	0.52, 1.28	0.4
Q4	0.53	0.30, 0.93	0.028	0.87	0.49, 1.54	0.6	0.87	0.49, 1.54	0.6
VITB6									
Q1	—	—		—	—		—	—	
Q2	0.90	0.54, 1.52	0.7	1.04	0.62, 1.77	0.9	1.04	0.61, 1.77	0.9
Q3	0.59	0.42, 0.82	0.003	0.85	0.60, 1.21	0.3	0.85	0.59, 1.22	0.4
Q4	0.41	0.24, 0.69	0.001	0.72	0.40, 1.29	0.3	0.72	0.40, 1.30	0.3
BCAROTENE									
Q1	—	—		—	—		—	—	
Q2	0.69	0.44, 1.06	0.088	0.79	0.50, 1.24	0.3	0.78	0.50, 1.22	0.3
Q3	0.57	0.37, 0.88	0.012	0.61	0.39, 0.97	0.039	0.61	0.39, 0.95	0.032
Q4	0.54	0.36, 0.82	0.005	0.56	0.35, 0.89	0.016	0.55	0.35, 0.86	0.011
CAFFEINE									
Q1	—	—		—	—		—	—	
Q2	0.89	0.56, 1.44	0.6	0.91	0.55, 1.52	0.7	0.91	0.55, 1.50	0.7
Q3	0.93	0.57, 1.55	0.8	1.09	0.63, 1.88	0.8	1.08	0.61, 1.91	0.8
Q4	0.65	0.47, 0.92	0.016	0.89	0.63, 1.27	0.5	0.89	0.63, 1.27	0.5
CARB									
Q1	—	—		—	—		—	—	
Q2	0.91	0.62, 1.33	0.6	1.04	0.70, 1.54	0.8	1.03	0.69, 1.54	0.9
Q3	0.91	0.57, 1.45	0.7	1.19	0.73, 1.92	0.5	1.17	0.72, 1.89	0.5
Q4	0.64	0.42, 0.97	0.038	1.25	0.77, 2.03	0.4	1.21	0.74, 1.98	0.4
CHOLES									
Q1	—	—		—	—		—	—	
Q2	0.88	0.58, 1.34	0.5	1.05	0.68, 1.60	0.8	1.06	0.69, 1.62	0.8
Q3	0.56	0.37, 0.85	0.007	0.77	0.52, 1.16	0.2	0.78	0.52, 1.16	0.2
Q4	0.39	0.27, 0.57	<0.001	0.67	0.45, 0.99	0.047	0.67	0.45, 1.00	0.052
KCAL									
Q1	—	—		—	—		—	—	
Q2	0.88	0.62, 1.24	0.4	1.03	0.71, 1.49	0.9	1.03	0.71, 1.49	0.9
Q3	0.56	0.35, 0.92	0.022	0.81	0.50, 1.32	0.4	0.80	0.49, 1.31	0.4
Q4	0.38	0.27, 0.54	<0.001	0.85	0.56, 1.29	0.4	0.84	0.55, 1.28	0.4
TOTALFAT									
Q1	—	—		—	—		—	—	
Q2	0.86	0.58, 1.28	0.4	0.99	0.64, 1.54	>0.9	0.99	0.64, 1.54	>0.9
Q3	0.56	0.35, 0.91	0.019	0.75	0.45, 1.23	0.2	0.74	0.44, 1.22	0.2
Q4	0.38	0.25, 0.59	<0.001	0.73	0.44, 1.22	0.2	0.73	0.43, 1.22	0.2
FIBER									
Q1	—	—		—	—		—	—	
Q2	0.56	0.38, 0.83	0.005	0.66	0.44, 0.97	0.036	0.65	0.45, 0.93	0.021
Q3	0.72	0.45, 1.14	0.2	0.90	0.56, 1.44	0.6	0.88	0.56, 1.38	0.6
Q4	0.41	0.25, 0.66	<0.001	0.61	0.35, 1.07	0.083	0.60	0.34, 1.04	0.065
FOLICACID									
Q1	—	—		—	—		—	—	
Q2	0.66	0.42, 1.04	0.071	0.74	0.47, 1.18	0.2	0.75	0.47, 1.20	0.2
Q3	0.72	0.42, 1.25	0.2	0.90	0.53, 1.54	0.7	0.90	0.53, 1.53	0.7
Q4	0.56	0.36, 0.86	0.009	0.77	0.49, 1.20	0.2	0.77	0.50, 1.20	0.2
IRON									
Q1	—	—		—	—		—	—	
Q2	0.70	0.51, 0.95	0.025	0.87	0.62, 1.22	0.4	0.86	0.62, 1.19	0.3
Q3	0.45	0.26, 0.75	0.003	0.68	0.39, 1.19	0.2	0.68	0.39, 1.19	0.2
Q4	0.45	0.29, 0.71	<0.001	0.81	0.50, 1.30	0.4	0.80	0.49, 1.31	0.4
MG									
Q1	—	—		—	—		—	—	
Q2	0.69	0.45, 1.04	0.074	0.82	0.53, 1.26	0.4	0.82	0.54, 1.24	0.3
Q3	0.66	0.43, 1.02	0.061	0.91	0.57, 1.47	0.7	0.91	0.57, 1.44	0.7
Q4	0.35	0.22, 0.56	<0.001	0.62	0.36, 1.06	0.078	0.62	0.36, 1.06	0.078
MUFA									
Q1	—	—		—	—		—	—	
Q2	0.81	0.50, 1.32	0.4	0.95	0.56, 1.59	0.8	0.94	0.55, 1.59	0.8
Q3	0.56	0.32, 0.99	0.045	0.75	0.42, 1.32	0.3	0.74	0.41, 1.32	0.3
Q4	0.33	0.22, 0.50	<0.001	0.64	0.39, 1.04	0.068	0.64	0.39, 1.05	0.074
NIACIN									
Q1	—	—		—	—		—	—	
Q2	0.68	0.45, 1.05	0.082	0.83	0.52, 1.33	0.4	0.83	0.52, 1.33	0.4
Q3	0.63	0.42, 0.96	0.031	0.95	0.60, 1.50	0.8	0.95	0.60, 1.49	0.8
Q4	0.35	0.20, 0.60	<0.001	0.73	0.40, 1.35	0.3	0.73	0.39, 1.36	0.3
N3FAT									
Q1	—	—		—	—		—	—	
Q2	0.75								

Table S9 The information of exposure and outcome GWAS

Exposure	Name	Sample size exposure	Outcome	Sample size outcome
30860_raw	Total protein (g/L)	314921	constipation	412181
ebi-a-GCST90092933	n-6 Fatty acids	115006	constipation	412181
ebi-a-GCST90092928	MUFA	115006	constipation	412181
ebi-a-GCST90092980	Saturated fat	115006	constipation	412181
30690_raw	Cholesterol (mmol/L)	344278	constipation	412181
ebi-a-GCST90092931	n-3 Fatty acids	115006	constipation	412181
1488_irnt	Tea intake	349376	constipation	412181
20414	Frequency of drinking alcohol	117914	constipation	412181
100580	Alcohol consumed	51427	constipation	412181
100002_irnt	Energy	51453	constipation	412181
100012_irnt	Vitamin B6	51453	constipation	412181

GWAS, Genome-Wide Association Study; MUFA, monounsaturated fatty acid.

Table S10 The results of mendelian randomization between dietary element and constipation

Exposure	Outcome	Method	NSNP	b	SE	Pval
Energy	Constipation	Wald ratio	1	-0.490981304	0.210798926	0.019851375
Vitamin B6	Constipation	Wald ratio	1	0.118681531	0.219476573	0.588681248
Alcohol consumed	Constipation	Wald ratio	1	-0.105701836	0.784183322	0.892776132
Tea intake	Constipation	MR Egger	22	-0.116847967	0.266189555	0.665392399
Tea intake	Constipation	Weighted median	22	-0.119262642	0.116987897	0.307992099
Tea intake	Constipation	IVW	22	-0.160167956	0.111009481	0.149067994
Tea intake	Constipation	Simple mode	22	-0.348266936	0.205033649	0.104166586
Tea intake	Constipation	Weighted mode	22	-0.131468371	0.131264613	0.327961582
Frequency of drinking alcohol	Constipation	MR Egger	7	0.047206243	0.428300634	0.916524081
Frequency of drinking alcohol	Constipation	Weighted median	7	-0.039269265	0.127887341	0.758796646
Frequency of drinking alcohol	Constipation	IVW	7	-0.041366685	0.125565003	0.741819825
Frequency of drinking alcohol	Constipation	Simple mode	7	-0.074643938	0.196624029	0.717295242
Frequency of drinking alcohol	Constipation	Weighted mode	7	-0.042098762	0.169097917	0.811694194
Cholesterol (mmol/L)	Constipation	MR Egger	151	-0.029014673	0.03213402	0.368022051
Cholesterol (mmol/L)	Constipation	Weighted median	151	-0.024957302	0.029438332	0.396559129
Cholesterol (mmol/L)	Constipation	IVW	151	-0.016740766	0.020298255	0.409519698
Cholesterol (mmol/L)	Constipation	Simple mode	151	-0.046049038	0.061188035	0.452880326
Cholesterol (mmol/L)	Constipation	Weighted mode	151	-0.008349263	0.030528006	0.784848799
Total protein (g/L)	Constipation	MR Egger	216	0.017597518	0.015784266	0.266153522
Total protein (g/L)	Constipation	Weighted median	216	0.003450831	0.010764993	0.748543479
Total protein (g/L)	Constipation	IVW	216	0.001148034	0.007126964	0.872027858
Total protein (g/L)	Constipation	Simple mode	216	-0.000640709	0.029170019	0.982496544
Total protein (g/L)	Constipation	Weighted mode	216	0.005249926	0.017490644	0.764347994
Monounsaturated fatty acid levels id:ebi-a-GCST90092928	Constipation	MR Egger	63	0.018689126	0.037995026	0.624567212
Monounsaturated fatty acid levels id:ebi-a-GCST90092928	Constipation	Weighted median	63	0.022058154	0.036547543	0.546144973
Monounsaturated fatty acid levels id:ebi-a-GCST90092928	Constipation	IVW	63	0.0252	0.022399745	0.260583614
Monounsaturated fatty acid levels id:ebi-a-GCST90092928	Constipation	Simple mode	63	-0.039416802	0.076193094	0.606768221
Monounsaturated fatty acid levels id:ebi-a-GCST90092928	Constipation	Weighted mode	63	0.030620967	0.040844059	0.456268211
Omega-3 fatty acid levels id:ebi-a-GCST90092931	Constipation	MR Egger	45	-0.03018228	0.031680761	0.346066721
Omega-3 fatty acid levels id:ebi-a-GCST90092931	Constipation	Weighted median	45	-0.001268474	0.026686311	0.962088635
Omega-3 fatty acid levels id:ebi-a-GCST90092931	Constipation	IVW	45	0.002403861	0.021166932	0.909581214
Omega-3 fatty acid levels id:ebi-a-GCST90092931	Constipation	Simple mode	45	-0.052587655	0.049497562	0.293837471
Omega-3 fatty acid levels id:ebi-a-GCST90092931	Constipation	Weighted mode	45	-0.005903573	0.023015011	0.798752908
Omega-6 fatty acid levels id:ebi-a-GCST90092933	Constipation	MR Egger	54	0.032338721	0.058124728	0.580345998
Omega-6 fatty acid levels id:ebi-a-GCST90092933	Constipation	Weighted median	54	0.025880152	0.037207333	0.486700725
Omega-6 fatty acid levels id:ebi-a-GCST90092933	Constipation	IVW	54	-0.012785567	0.030061993	0.670613106
Omega-6 fatty acid levels id:ebi-a-GCST90092933	Constipation	Simple mode	54	-0.037119981	0.066363156	0.57828162
Omega-6 fatty acid levels id:ebi-a-GCST90092933	Constipation	Weighted mode	54	-0.004469123	0.047668793	0.925658391
Saturated fatty acid levels id:ebi-a-GCST90092980	Constipation	MR Egger	49	-0.002977723	0.057379976	0.958832453
Saturated fatty acid levels id:ebi-a-GCST90092980	Constipation	Weighted median	49	0.026184014	0.041118821	0.524262273
Saturated fatty acid levels id:ebi-a-GCST90092980	Constipation	IVW	49	0.023396429	0.030346148	0.440715749
Saturated fatty acid levels id:ebi-a-GCST90092980	Constipation	Simple mode	49	-0.035026689	0.082025942	0.671274399
Saturated fatty acid levels id:ebi-a-GCST90092980	Constipation	Weighted mode	49	0.000226198	0.055100228	0.996741534

IVW, inverse variance weighted.