

Supplementary Material

The associations between dietary flavonoid intake and the prevalence of diabetes mellitus in the National Health and Nutrition Examination Survey 2007–2010 and 2017–2018

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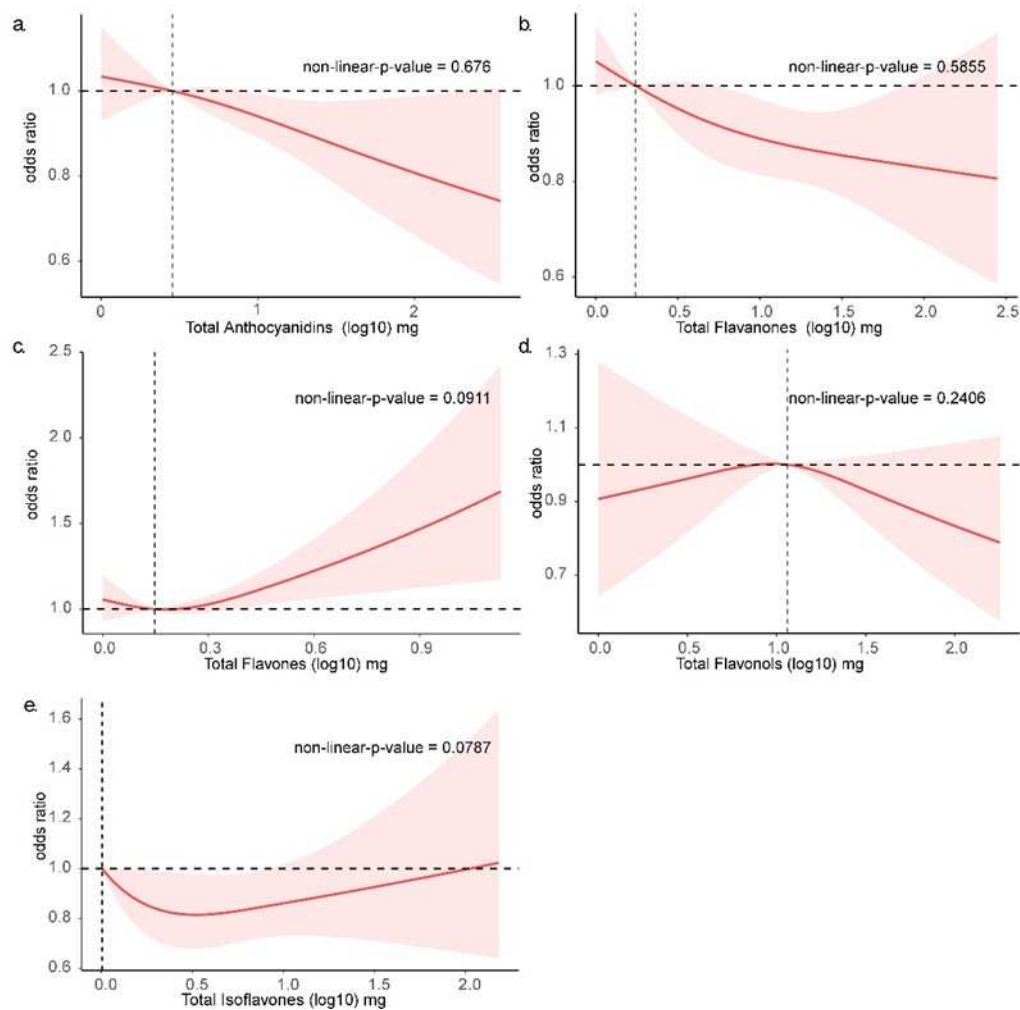
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1 Supplementary Figures

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Supplementary Figure S1. The association of flavonoid intake with incidence of DM by restricted cubic splines. Y axis stands for the Odds ratio of DM, and X axis stands for the log10 transformed intake of total anthocyanidines (a), total flavanones (b), total flavones (c), total flavonols (d), and total isoflavones (e). Models by restricted cubic splines were adjusted for age, sex, race, BMI, daily energy intake, total time of PA, smoking status, alcohol consumption, total score of HEI, hypertension history and hyperlipidaemia history.

2 Supplementary Tables

Supplementary Table S1. The demographic features of the study cohort grouped by racial category.

Variables	Mexican American N = 4291	Non-Hispanic White N = 11511	Non-Hispanic Black N = 4771	Other Race N = 1908	p value
Age (Years)	28.27(0.56)	39.84(0.36)	34.10(0.45)	33.42(0.80)	< 0.0001
Sex					0.04

Female	2234(50.68%))	5819(51.75%))	2472(54.48%))	955(51.06%)	
Male	2057(49.32%))	5692(48.25%))	2299(45.52%))	953(48.94%)	
Education					< 0.000 1
<9 years	916(17.08%)	793(3.43%)	263(3.93%)	86(3.62%)	
9-12 years	1790(43.39%))	4507(34.72%))	2126(45.30%))	501(27.50%)	
>12 years	1585(39.53%))	6211(61.86%))	2382(50.77%))	1321(68.88%))	
Marital status					< 0.000 1
Without partner	2261(48.70%))	5543(43.38%))	3014(63.53%))	922(45.87%)	
With partner	2030(51.30%))	5968(56.62%))	1757(36.47%))	986(54.13%)	
Smoking status					< 0.000 1
Former	471(19.29%)	2275(26.92%))	579(15.57%)	192(19.48%)	
Never	1429(65.30%))	3915(54.28%))	1625(58.92%))	785(65.55%)	
Now	323(15.41%)	1583(18.80%))	713(25.51%)	168(14.97%)	
Alcohol consumption					< 0.000 1
Former	294(11.50%)	1126(11.42%))	364(11.12%)	53(7.72%)	
Heavy	584(34.48%)	1374(21.19%))	417(19.53%)	137(16.97%)	
Mild	477(23.15%)	2571(39.79%))	913(36.37%)	427(43.80%)	
Moderate	298(16.34%)	1114(18.69%))	464(19.35%)	116(11.40%)	
Never	325(14.52%)	810(8.90%)	355(13.63%)	225(20.11%)	

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BMI (kg/m ²)	26.68(0.21)	26.86(0.13)	28.10(0.15)	25.10(0.31)	< 0.0001
Total score of HEI 2015	52.41(0.39)	52.47(0.39)	50.11(0.39)	54.07(0.45)	< 0.0001
DII	1.67(0.07)	1.62(0.05)	2.08(0.04)	1.55(0.08)	< 0.0001
Total time of PA (mins/week)	1367.63(37.80)	1240.56(31.31)	1373.24(33.62)	1133.85(62.60)	< 0.001
Total MET of PA (/week)	5869.83(239.90)	4915.90(154.03)	5668.97(194.56)	4419.91(328.78)	< 0.0001
Daily energy intake (kcal)	3884.98(40.68)	4087.16(26.25)	3915.75(36.08)	3914.64(60.54)	< 0.0001
PIR	1.87(0.05)	3.16(0.05)	2.16(0.05)	2.86(0.11)	< 0.0001
Hyperlipidemia					< 0.0001
No	1401(38.51%)	3599(36.61%)	2051(49.53%)	743(43.02%)	
Yes	2097(61.49%)	6468(63.39%)	2108(50.47%)	901(56.98%)	
CVD					< 0.001
No	2025(95.05%)	6618(90.67%)	2529(90.73%)	1024(92.88%)	
Yes	156(4.95%)	1069(9.33%)	352(9.27%)	83(7.12%)	
COPD and asthma					< 0.0001
COPD and asthma	19(0.58%)	247(2.43%)	63(1.60%)	23(1.97%)	
Asthma	162(7.56%)	919(11.34%)	457(17.75%)	143(13.65%)	
COPD	22(0.48%)	362(3.66%)	84(2.15%)	16(1.34%)	
No	2037(91.38%)	6273(82.57%)	2330(78.50%)	939(83.04%)	

)))		
Stroke					0.002
No	2125(98.28%)	7314(96.74%)	2703(95.06%)	1068(97.05%)	
))))	
Yes	55(1.72%)	359(3.26%)	175(4.94%)	37(2.95%)	
Cancer					< 0.0001
No	2079(96.66%)	6588(88.24%)	2680(94.76%)	1035(94.60%)	
))))	
Yes	100(3.34%)	1091(11.76%)	200(5.24%)	71(5.40%)	
)			
Hypertension					< 0.0001
No	3548(84.33%)	8078(70.93%)	3180(67.87%)	1490(77.08%)	
))))	
Yes	743(15.67%)	3433(29.07%)	1591(32.13%)	418(22.92%)	
))		
DM					0.03
No	3810(90.58%)	10125(89.68%)	4081(87.47%)	1701(89.82%)	
))))	
Yes	481(9.42%)	1386(10.32%)	690(12.53%)	207(10.18%)	
)			
Dietary intake of flavonoids (mg/day)					
Daidzein	0.58(0.17)	0.70(0.06)	0.49(0.06)	0.97(0.14)	0.01
Genistein	0.86(0.24)	1.00(0.08)	0.65(0.08)	1.27(0.17)	0.004
Glycitein	0.12(0.04)	0.15(0.01)	0.09(0.01)	0.17(0.02)	0.01
Cyanidin	1.84(0.17)	2.73(0.20)	1.33(0.11)	2.43(0.27)	< 0.0001
Petunidin	0.54(0.07)	1.24(0.12)	0.48(0.05)	0.96(0.13)	< 0.0001
Delphinidin	0.74(0.09)	1.68(0.15)	0.65(0.06)	2.12(0.48)	< 0.0001
Malvidin	2.27(0.20)	5.02(0.37)	3.23(0.22)	3.88(0.42)	< 0.0001

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Pelargonidin	1.14(0.09)	1.91(0.18)	0.89(0.10)	1.56(0.16)	< 0.0001
Peonidin	1.06(0.25)	1.99(0.17)	1.03(0.14)	2.10(0.66)	0.002
Catechin	5.40(0.17)	7.52(0.20)	5.13(0.12)	7.60(0.36)	< 0.0001
Epigallocatechin	6.59(0.65)	14.92(0.87)	8.88(0.50)	17.72(1.73)	< 0.0001
Epicatechin	7.73(0.26)	9.96(0.27)	7.97(0.22)	10.90(0.65)	< 0.0001
Epicatechin gallate	3 4.06(0.42)	9.64(0.56)	5.71(0.33)	11.40(1.08)	< 0.0001
Epigallocatechin gallate	3 11.78(1.23)	25.47(1.74)	14.93(0.87)	31.69(3.87)	< 0.0001
Theaflavin	0.50(0.06)	1.45(0.08)	0.87(0.06)	1.53(0.12)	< 0.0001
Thearubigins	30.64(3.53)	83.51(4.62)	50.52(3.06)	83.08(6.29)	< 0.0001
Eriodictyol	0.22(0.02)	0.14(0.01)	0.22(0.01)	0.19(0.03)	< 0.0001
Hesperetin	11.87(0.54)	8.15(0.26)	10.25(0.46)	9.72(0.87)	< 0.0001
Naringenin	4.22(0.28)	2.95(0.15)	3.42(0.15)	3.64(0.36)	< 0.001
Apigenin	0.13(0.02)	0.22(0.03)	0.11(0.01)	0.18(0.02)	< 0.0001
Luteolin	0.64(0.03)	0.63(0.02)	0.40(0.02)	0.78(0.04)	< 0.0001
Isorhamnetin	0.72(0.03)	0.73(0.02)	0.55(0.03)	0.93(0.06)	<

										0.0001
Kaempferol			2.56(0.10)	4.10(0.11)	3.20(0.11)	4.43(0.19)				<0.0001
Myricetin			0.83(0.05)	1.40(0.05)	0.92(0.04)	1.36(0.08)				<0.0001
Quercetin			8.35(0.24)	10.43(0.24)	7.83(0.13)	11.24(0.39)				<0.0001
Theaflavin digallate	3	3	0.54(0.06)	1.60(0.09)	0.96(0.06)	1.68(0.14)				<0.0001
Theaflavin gallate		3q	0.46(0.05)	1.36(0.08)	0.82(0.05)	1.44(0.12)				<0.0001
Theaflavin gallate		3	0.39(0.05)	1.15(0.07)	0.69(0.04)	1.20(0.10)				<0.0001
Galocatechin			0.61(0.06)	1.54(0.08)	0.92(0.06)	1.70(0.13)				<0.0001
Subtotal Catechins			36.19(2.63)	69.04(3.59)	43.54(1.99)	81.02(7.60)				<0.0001
Total Isoflavones			1.56(0.45)	1.85(0.15)	1.24(0.16)	2.42(0.33)				0.01
Total Anthocyanidins			7.59(0.68)	14.57(0.85)	7.61(0.46)	13.06(1.34)				<0.0001
Total Flavan 3-ols			68.71(6.15)	158.12(7.74)	97.40(5.02)	169.93(11.80)				<0.0001
Total Flavanones			16.31(0.73)	11.23(0.39)	13.89(0.55)	13.55(1.19)				<0.0001
Total Flavones			0.77(0.03)	0.85(0.04)	0.52(0.02)	0.96(0.04)				<0.0001
Total Flavonols			12.46(0.36)	16.67(0.40)	12.50(0.27)	17.96(0.61)				<0.0001

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Total Sum of all flavonoids	107.40(6.38)	203.28(8.22)	133.17(5.11)	217.88(12.36)	< 0.0001

PIR: poverty income ratio; BMI: body mass index; DII: dietary inflammatory index; HEI: healthy eating index. Continuous normal variables were presented as weighted mean \pm standard deviation, One-way ANOVA was employed to compare difference between groups. Categorical variables were presented as frequencies and percentages and compared using Chi-Squared test.

Supplementary Table S2. The characteristics of study population stratified by total flavonoid intake quartiles.

Variables	1Q N = 5624	2Q N = 5618	3Q N = 5619	4Q N = 5620	p-value
Age (years)	32.83(0.55)	33.23(0.55)	37.26(0.48)	44.25(0.45)	< 0.0001
Sex					0.3
Female	2850(51.45%)	2869(50.94%)	2813(51.29%)	2948(53.49%)	
Male	2774(48.55%)	2749(49.06%)	2806(48.71%)	2672(46.51%)	
Ethnicity					< 0.0001
Non-Hispanic White	2820(68.45%)	2738(67.38%)	2765(68.31%)	3188(74.49%)	
Non-Hispanic Black	1314(14.31%)	1219(12.80%)	1127(12.09%)	1111(9.82%)	
Mexican American	1101(11.30%)	1232(12.68%)	1262(12.66%)	696(6.09%)	
Other Race	389(5.94%)	429(7.15%)	465(6.94%)	625(9.60%)	
Education					< 0.0001
<9 years	583(6.29%)	574(5.47%)	544(5.13%)	357(3.30%)	
9-12 years	2783(48.09%)	2244(36.20%)	1954(31.80%)	1943(31.31%)	
>12 years	2258(45.61%)	2800(58.32%)	3121(63.08%)	3320(65.38%)	

Marital status						< 0.0001
Without partner	3301(53.11%)	3146(51.29%)	2886(45.68%)	2407(38.81%)		
With partner	2323(46.89%)	2472(48.71%)	2733(54.32%)	3213(61.19%)		
Smoking status						< 0.0001
Never	1421(46.29%)	1657(56.86%)	2004(60.56%)	2672(59.75%)		
Past	709(23.68%)	765(24.04%)	896(25.33%)	1147(24.47%)		
Current	895(30.03%)	614(19.10%)	506(14.11%)	772(15.78%)		
Alcohol consumption						< 0.0001
Never	363(10.95%)	333(8.78%)	440(11.92%)	579(10.81%)		
Former	510(14.96%)	387(11.05%)	365(8.78%)	575(10.58%)		
Mild	717(28.64%)	895(36.39%)	1148(40.54%)	1628(43.14%)		
Moderate	429(19.10%)	432(17.09%)	483(18.56%)	648(17.70%)		
Heavy	611(26.34%)	637(26.69%)	589(20.19%)	675(17.77%)		
Daily energy intake (kcal/day)	3511.58(30.23)	3984.08(34.56)	4230.20(31.40)	4299.92(38.85)		< 0.0001
PIR	2.50(0.05)	2.78(0.05)	2.94(0.05)	3.21(0.05)		< 0.0001
BMI (kg/m ²)	27.10(0.18)	25.87(0.17)	26.30(0.19)	27.86(0.16)		< 0.0001
Total score of HEI (2015)	43.91(0.27)	52.22(0.28)	56.93(0.30)	54.94(0.46)		< 0.0001
DII	2.63(0.04)	1.86(0.04)	1.17(0.04)	1.23(0.06)		< 0.0001
Total time of PA (mins/week)	1416.25(49.45)	1237.63(35.07)	1168.26(29.19)	1238.36(41.75)		< 0.0001

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Total MET of PA (/week)	5828.21(245.93)	5037.67(206.66)	4617.09(141.37)	4887.95(179.39)	< 0.001
Hyperlipidemia					0.003
No	1921(40.64%)	2030(41.66%)	1937(38.34%)	1906(36.00%)	
Yes	2615(59.36%)	2588(58.34%)	2844(61.66%)	3527(64.00%)	
CVD					0.35
No	2546(90.29%)	579(10.81%)	3005(92.02%)	4018(91.37%)	
Yes	399(9.71%)	368(9.11%)	362(7.98%)	531(8.63%)	
COPD and asthma					0.11
COPD and asthma	92(2.54%)	81(2.05%)	80(1.88%)	99(2.14%)	
Asthma	412(14.08%)	365(11.84%)	387(11.60%)	517(10.97%)	
COPD	133(3.54%)	101(2.85%)	96(2.90%)	154(2.96%)	
No	2370(79.84%)	2530(83.26%)	2868(83.62%)	3811(83.92%)	
Stroke					0.16
No	2784(96.02%)	2843(96.26%)	3228(97.44%)	4355(96.86%)	
Yes	154(3.98%)	150(3.74%)	132(2.56%)	190(3.14%)	
Cancer					0.01
No	2663(91.37%)	2702(91.93%)	2989(88.30%)	4028(89.69%)	
Yes	278(8.63%)	290(8.07%)	375(11.70%)	519(10.31%)	
Hypertension					< 0.0001
No	4277(74.67%)	4274(75.09%)	4118(73.36%)	3627(68.00%)	
Yes	1347(25.33%)	1344(24.91%)	1501(26.64%)	1993(32.00%)	

PIR: poverty income ratio; BMI: body mass index; DII: dietary inflammatory index; HEI: healthy eating index. Continuous normal variables were presented as weighted mean \pm standard deviation, One-way ANOVA was employed to compare difference between groups. Categorical variables were presented as frequencies and percentages and compared using Chi-Squared test.

Supplementary Table S3. Stratified association between DM incidence and total flavan 3-ol intake in the NHANSE (2007-2010 and 2017-2018).

Total flavan 3-ol	Q1	Q2	Q3	Q4	p	for
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intake (mg/day)	(≤4.605)	(4.605-13.245)		(13.245-59.525)		(≥59.525)	interaction
	N = 5624	N = 5615		N = 5622		N = 5620	
		OR (95%CI)	p value	OR (95%CI)	p value	OR (95%CI)	p value
Age (Years)							0.415
<50	Ref	1.00 (0.98, 1.01)	0.483	0.99 (0.97, 1.00)	0.061	1.00 (0.98, 1.01)	0.508
≥50	Ref	0.95 (0.91, 0.99)	0.017	0.94 (0.90, 0.98)	0.004	0.96 (0.92, 1.00)	0.035
Sex							0.600
Female	Ref	1.00 (0.98, 1.03)	0.877	0.98 (0.96, 1.01)	0.219	1.00 (0.97, 1.02)	0.682
Male	Ref	0.98 (0.95, 1.00)	0.079	0.97 (0.95, 1.00)	0.034	0.97 (0.94, 1.00)	0.025
Race							0.135
Non-Hispanic White	Ref	0.99 (0.96, 1.02)	0.408	0.98 (0.96, 1.01)	0.161	0.98 (0.95, 1.01)	0.134
Non-Hispanic Black	Ref	0.98 (0.95, 1.02)	0.353	0.97 (0.93, 1.00)	0.043	0.98 (0.95, 1.01)	0.19
Mexican American	Ref	0.99 (0.96, 1.03)	0.693	0.99 (0.96, 1.02)	0.498	1.03 (0.98, 1.08)	0.246

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Other Race	Ref	1.02 (0.96, 1.07)	0.5 31	0.96 1.01)	(0.92, 0.0	0.0 95	0.98 (0.92, 1.04)	0.5 33	
BMI (kg/m2)									0.090
<25.3	Ref	1.00 (0.98, 1.01)	0.9 18	1.00 1.02)	(0.99, 0.9	0.9 39	1.00 (0.99, 1.02)	0.7 89	
>=25.3	Ref	0.97 (0.94, 1.00)	0.0 5	0.95 0.98)	(0.92, 0.0	0.0 01	0.97 (0.94, 1.00)	0.0 46	
Daily energy intake (kcal)									0.140
<3584	Ref	0.98 (0.95, 1.01)	0.1 6	0.97 1.00)	(0.94, 0.0	0.0 29	0.98 (0.95, 1.01)	0.1 95	
>=3584	Ref	1.00 (0.97, 1.02)	0.6 94	0.98 1.00)	(0.96, 0.0	0.0 91	0.98 (0.95, 1.01)	0.1 67	
Total time of PA (mins/week)									0.479
<600	Ref	0.99 (0.95, 1.02)	0.4 77	0.97 1.00)	(0.93, 0.0	0.0 53	0.97 (0.94, 1.00)	0.0 25	
>=600	Ref	0.99 (0.97, 1.01)	0.4 62	0.99 1.01)	(0.97, 0.4	0.4 42	1.00 (0.98, 1.03)	0.9 25	
Smoking habits									0.527
Never	Ref	0.99 (0.96, 1.01)	0.3 24	0.98 1.00)	(0.96, 0.0	0.0 64	0.98 (0.96, 1.01)	0.1 57	

Former	Ref	0.96 (0.93, 1.01)	0.0 86	0.95 (0.92, 0.99)	0.0 14	0.99 (0.95, 1.03)	0.5
Current	Ref	1.01 (0.97, 1.06)	0.4 7	1.00 (0.96, 1.04)	0.9 5	0.98 (0.95, 1.02)	0.3 53
Alcohol Consumption							0.630
Never	Ref	0.96 (0.91, 1.02)	0.1 69	0.98 (0.93, 1.04)	0.5 78	0.99 (0.94, 1.05)	0.6 94
Former	Ref	1.01 (0.96, 1.07)	0.6 49	1.00 (0.95, 1.05)	0.8 58	0.96 (0.91, 1.01)	0.1 02
Mild	Ref	0.98 (0.93, 1.03)	0.3 88	0.94 (0.90, 0.99)	0.0 19	0.97 (0.92, 1.01)	0.1 42
Moderate	Ref	0.99 (0.92, 1.06)	0.7 76	0.99 (0.93, 1.06)	0.8 08	1.04 (0.97, 1.12)	0.2 94
Heavy	Ref	0.98 (0.93, 1.03)	0.3 87	0.95 (0.91, 0.99)	0.0 18	0.98 (0.94, 1.02)	0.2 51
Total score of HEI (2015 Edition)							0.445
<51.44187	Ref	0.99 (0.96, 1.02)	0.3 68	0.98 (0.95, 1.00)	0.0 91	0.97 (0.94, 0.99)	0.0 13
>=51.44187	Ref	1.00 (0.98, 1.03)	0.7 32	1.00 (0.97, 1.02)	0.8 18	1.01 (0.99, 1.04)	0.3 21
Hypertension							0.634
No	Ref	0.99 (0.98,	0.5	0.99 (0.98,	0.5	0.99 (0.98,	0.5

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		1.01)	4	1.01)	4	1.01)	81	
Yes	Ref	0.96 (0.90, 1.01)	0.1 25	0.91 (0.87, 0.96)	0.0 01	0.95 (0.91, 1.00)	0.0 55	
Hyperlipidemia								0.375
No	Ref	0.99 (0.98, 1.01)	0.2 16	0.98 (0.97, 1.00)	0.0 12	0.99 (0.97, 1.01)	0.3 37	
Yes	Ref	0.99 (0.95, 1.02)	0.4 51	0.97 (0.94, 1.01)	0.1 02	0.98 (0.95, 1.01)	0.2 49	

BMI: body mass index; HEI: healthy eating index; PA: physical activity.

Supplementary Table S4. Stratified association between DM incidence and subtotal catechin intake in the NHANSE (2007-2010 and 2017-2018).

		Q1 (≤4.505)	Q2 (4.505- 12.745)	Q3 (12.745- 37.725)	Q4 (>37.725)	p for interaction		
		N = 5619	N = 5622	N = 5621	N = 5619			
		OR (95%CI)	p value	OR (95%CI)	p value	OR (95%CI)	p value	
Age (Years)								0.152
<50	Ref	1.00 (0.98, 1.01)	0.5 65	0.99 (0.97, 1.00)	0.0 58	0.99 (0.98, 1.01)	0.3 41	
>=50	Ref	0.96 (0.92, 1.00)	0.0 36	0.94 (0.90, 0.99)	0.0 12	0.96 (0.92, 1.00)	0.0 46	

Gender									0.791
Female	Ref	1.00 (0.98, 1.03)	0.708	0.99 (0.97, 1.02)	0.532	0.99 (0.97, 1.02)	0.606		
Male	Ref	0.98 (0.95, 1.01)	0.106	0.97 (0.95, 1.00)	0.034	0.97 (0.94, 0.99)	0.014		
Race									0.125
Non-HispanicWhite	Ref	0.99 (0.96, 1.02)	0.571	0.99 (0.96, 1.01)	0.216	0.98 (0.95, 1.00)	0.087		
Non-Hispanic Black	Ref	0.98 (0.95, 1.01)	0.243	0.98 (0.95, 1.02)	0.269	0.98 (0.95, 1.01)	0.148		
Mexican American	Ref	0.99 (0.95, 1.03)	0.601	0.99 (0.96, 1.03)	0.735	1.02 (0.98, 1.07)	0.299		
Other Race	Ref	1.02 (0.97, 1.08)	0.364	0.96 (0.93, 1.00)	0.076	0.98 (0.92, 1.04)	0.518		
BMI (kg/m2)									0.047
<25.3	Ref	1.00 (0.98, 1.01)	0.817	1.00 (0.99, 1.02)	0.527	1.00 (0.99, 1.01)	0.995		
>=25.3	Ref	0.98 (0.95, 1.00)	0.101	0.95 (0.93, 0.98)	0.001	0.97 (0.94, 0.99)	0.018		
Daily energy intake (kcal)									0.318
<3584	Ref	0.99 (0.96, 1.02)	0.379	0.98 (0.95, 1.01)	0.144	0.98 (0.95, 1.00)	0.078		

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>=3584	Ref	0.99 (0.97, 1.02)	0.649	0.98 (0.96, 1.01)	0.117	0.98 (0.95, 1.01)	0.143	
Total time of PA (mins/week)								0.523
<600	Ref	0.99 (0.96, 1.03)	0.722	0.97 (0.94, 1.00)	0.067	0.97 (0.94, 0.99)	0.013	
>=600	Ref	0.99 (0.97, 1.01)	0.357	1.00 (0.98, 1.02)	0.792	1.00 (0.97, 1.03)	0.931	
Smoking status								0.275
Never	Ref	0.99 (0.96, 1.01)	0.304	0.99 (0.97, 1.01)	0.192	0.98 (0.95, 1.00)	0.083	
Former	Ref	0.96 (0.92, 1.00)	0.078	0.94 (0.90, 0.98)	0.009	0.98 (0.94, 1.02)	0.361	
Current		1.04 (0.98, 1.09)	0.172	1.01 (0.97, 1.05)	0.638	0.99 (0.96, 1.03)	0.63	
Alcohol Consumption								0.871
Never	Ref	0.95 (0.90, 1.01)	0.097	0.97 (0.92, 1.03)	0.356	1.00 (0.94, 1.06)	0.996	
Former	Ref	1.03 (0.97, 1.09)	0.281	0.99 (0.94, 1.04)	0.657	0.95 (0.91, 1.00)	0.044	
Mild	Ref	0.97 (0.92, 1.02)	0.188	0.95 (0.91, 0.99)	0.026	0.97 (0.92, 1.01)	0.147	
Moderate	Ref	1.02 (0.95, 1.10)	0.587	1.02 (0.96, 1.09)	0.495	1.04 (0.97,	0.3	

							1.11)	05
Heavy	Ref	0.99 (0.94, 1.03)	0.5 87	0.95 (0.92, 0.99)	0.0 17	0.98 (0.94, 1.01)	0.1 83	
Total score of HEI (2015 Edition)								0.567
<51.44187	Ref	0.99 (0.96, 1.02)	0.4 77	0.98 (0.96, 1.00)	0.0 65	0.97 (0.94, 0.99)	0.0 15	
>=51.44187	Ref	1.01 (0.98, 1.03)	0.6 69	1.00 (0.98, 1.03)	0.8 99	1.01 (0.98, 1.04)	0.6 35	
Hypertension								0.270
No	Ref	1.00 (0.98, 1.02)	0.9 71	0.99 (0.98, 1.01)	0.3 99	1.00 (0.98, 1.02)	0.9 67	
Yes	Ref	0.95 (0.90, 1.01)	0.0 94	0.93 (0.89, 0.99)	0.0 15	0.94 (0.89, 0.99)	0.0 15	
Hyperlipidemia								0.183
No	Ref	0.99 (0.98, 1.00)	0.1 74	0.98 (0.97, 1.00)	0.0 16	0.99 (0.97, 1.01)	0.4 16	
Yes	Ref	0.99 (0.96, 1.03)	0.5 93	0.98 (0.95, 1.01)	0.2 44	0.98 (0.95, 1.01)	0.1 69	

BMI: body mass index; HEI: healthy eating index; PA: physical activity.

Supplementary Table S5. ORs (95% CIs) of DM prevalence according to flavonoid intake in the NHANSE (2007-2010 and 2017-2018) excluding the population with impaired fasting glycaemia and impaired glucose tolerance.

Supplementary Material

Flavonoid intake	Q1	Q2		Q3		Q4		OR (95%CI)	p for trend
		OR (95%CI)	p Val ue	OR (95%CI)	p Val ue	OR (95%CI)	p Val ue		
Total Sum of all 29 flavonoids (mg/day)	≤20 .64 5	20.645- 49.735		49.735- 140.145		>140.14 5			
Crude Model	Ref	0.79 (0.66, 0.94)	0.0 1	0.90 (0.73, 1.09)	0.26 7	1.04 (0.87, 1.25)	0.64 1	1.03 (0.97, 1.10)	0.28 6
Model 1	Ref	0.79 (0.63, 0.99)	0.0 39	0.76 (0.61, 0.96)	0.02 5	0.76 (0.62, 0.93)	0.01	0.93 (0.87, 0.99)	0.02 3
Model 2	Ref	0.76 (0.62, 0.95)	0.0 15	0.74 (0.58, 0.94)	0.01 6	0.76 (0.63, 0.93)	0.01	0.93 (0.87, 1.00)	0.04 3
Model 3	Ref	0.78 (0.63, 0.97)	0.0 25	0.76 (0.60, 0.97)	0.03	0.80 (0.65, 0.98)	0.02 9	0.94 (0.88, 1.01)	0.10 4
Total Flavan 3-ols (mg/day)	≤4. 605	4.605- 13.245		13.245- 59.525		>59.525			
Crude Model	Ref	0.76 (0.60, 0.95)	0.0 17	0.62 (0.49, 0.79)	<0.0 01	1.02 (0.83, 1.25)	0.87 8	1.00 (0.94, 1.08)	0.89 2
Model 1	Ref	0.80 (0.63, 1.02)	0.0 74	0.65 (0.50, 0.84)	0.00 2	0.81 (0.64, 1.02)	0.06 8	0.93 (0.86, 1.01)	0.07
Model 2	Ref	0.78 (0.61, 1.00)	0.0 52	0.64 (0.49, 0.83)	0.00 1	0.81 (0.63, 1.02)	0.07 5	0.94 (0.87, 1.01)	0.10 9
Model 3	Ref	0.79 (0.61,	0.0	0.65 (0.50,	0.00	0.84 (0.66,	0.15	0.95 (0.88,	0.22

			1.01)	58	0.84)	2	1.07)	4	1.03)	4
Subtotal (mg/day)	Catechins	≤4.505	4.505-12.745		12.745-37.725		>37.725			
Crude Model	Ref		0.80 (0.65, 0.98)	0.036	0.66 (0.54, 0.81)	<0.001	0.97 (0.80, 1.18)	0.757	0.99 (0.92, 1.05)	0.683
Model 1	Ref		0.83 (0.65, 1.06)	0.123	0.70 (0.55, 0.88)	0.004	0.81 (0.64, 1.02)	0.069	0.93 (0.87, 1.01)	0.069
Model 2	Ref		0.81 (0.63, 1.03)	0.082	0.69 (0.54, 0.88)	0.004	0.80 (0.64, 1.01)	0.065	0.94 (0.87, 1.01)	0.087
Model 3	Ref		0.82 (0.64, 1.04)	0.097	0.70 (0.55, 0.89)	0.005	0.83 (0.66, 1.05)	0.124	0.95 (0.88, 1.02)	0.165
Total (mg/day)	Isoflavones	≤0.010	0.010-0.065							
Crude Model	Ref		0.98 (0.86, 1.12)	0.771						
Model 1	Ref		1.00 (0.86, 1.15)	0.963						
Model 2	Ref		1.01 (0.86, 1.18)	0.946						
Model 3	Ref		1.02 (0.87, 1.19)	0.835						
Total (mg/day)	Anthocyanidins	≤0.125	0.125-1.910		1.910-9.340		>9.340			
Crude Model	Ref		0.88	0.2	1.07	0.53	0.93	0.51	0.99	0.86

Supplementary Material

			(0.72, 1.09)	5	(0.86, 1.34)	8	(0.74, 1.16)	(0.92, 1.07)	5
Model 1	Ref	0.85 (0.66, 1.10)	0.2 02	0.96 (0.75, 1.24)	0.75 7	0.77 (0.61, 0.98)	0.03 3	0.93 (0.87, 1.01)	0.08 4
Model 2	Ref	0.83 (0.65, 1.07)	0.1 47	0.95 (0.74, 1.23)	0.69 4	0.78 (0.60, 1.00)	0.04 6	0.94 (0.86, 1.02)	0.12 4
Model 3	Ref	0.86 (0.67, 1.11)	0.2 4	0.99 (0.77, 1.27)	0.92 7	0.82 (0.65, 1.05)	0.11	0.95 (0.88, 1.04)	0.25 1
Total Flavanones (mg/day)	≤ 0.0 20	0.020- 0.660		0.660- 17.730		>17.730			
Crude Model	Ref	1.23 (1.02, 1.48)	0.0 29	0.90 (0.73, 1.11)	0.32 2	1.01 (0.84, 1.23)	0.87 8	0.97 (0.91, 1.03)	0.31 6
Model 1	Ref	1.09 (0.89, 1.33)	0.3 87	0.89 (0.70, 1.13)	0.33 9	0.85 (0.68, 1.07)	0.15 6	0.93 (0.87, 1.00)	0.05
Model 2	Ref	1.09 (0.89, 1.34)	0.3 93	0.91 (0.70, 1.18)	0.46 5	0.86 (0.67, 1.10)	0.21 9	0.93 (0.86, 1.02)	0.10 9
Model 3	Ref	1.11 (0.90, 1.36)	0.3 23	0.95 (0.74, 1.23)	0.7	0.87 (0.69, 1.11)	0.25 7	0.94 (0.87, 1.02)	0.14 2
Total Flavones (mg/ day)	≤0. 110	0.110- 0.345		0.345- 0.845		>0.845			
Crude Model	Ref	1.28 (1.08, 1.53)	0.0 06	1.25 (1.01, 1.55)	0.03 9	1.52 (1.26, 1.83)	<0 .001	1.13 (1.06, 1.20)	<0. 001

Model 1	Ref	1.00 (0.82, 1.21)	0.9 73	0.94 (0.74, 1.19)	0.6	0.99 (0.84, 1.18)	0.95 1	1.00 (0.94, 1.05)	0.87 9
Model 2	Ref	0.98 (0.80, 1.21)	0.8 79	0.95 (0.73, 1.23)	0.68 9	1.02 (0.83, 1.25)	0.87 2	1.01 (0.93, 1.08)	0.88 5
Model 3	Ref	1.02 (0.83, 1.24)	0.8 79	1.00 (0.77, 1.30)	0.98 9	1.05 (0.86, 1.29)	0.62 9	1.01 (0.94, 1.09)	0.68
Total (mg/day)	Flavonols	≤4.735- 735 9.245		9.245- 17.330		>17.330			
Crude Model	Ref	1.31 (1.11, 1.55)	0.0 03	1.51 (1.27, 1.80)	<0 .001	1.43 (1.19, 1.70)	<0 .001	1.11 (1.05, 1.18)	0.00 1
Model 1	Ref	1.15 (0.88, 1.49)	0.2 99	1.02 (0.83, 1.26)	0.81 5	0.89 (0.72, 1.10)	0.28 2	0.94 (0.88, 1.00)	0.05 5
Model 2	Ref	1.16 (0.88, 1.52)	0.2 89	1.06 (0.85, 1.33)	0.59	0.90 (0.71, 1.15)	0.39 3	0.94 (0.88, 1.01)	0.09 2
Model 3	Ref	1.17 (0.89, 1.55)	0.2 43	1.08 (0.86, 1.35)	0.47 9	0.92 (0.73, 1.17)	0.49 2	0.95 (0.88, 1.02)	0.12 8

Crude model: unadjusted; Model 1: adjusted by age, race, BMI, and daily energy intake (kcal); Model 2: adjusted by age, race, BMI, and daily energy intake (kcal), total time of PA, smoking status, alcohol consumption, total score of HEI 2015 Edition, hypertension history, and hyperlipidemia history; Model 3: adjusted by age, sex, race, BMI, and daily energy intake (kcal), total time of PA, smoking status, alcohol consumption, total score of HEI 2015 Edition, hypertension history, and hyperlipidemia history. BMI: body mass index; HEI: healthy eating index; PA: physical activity.