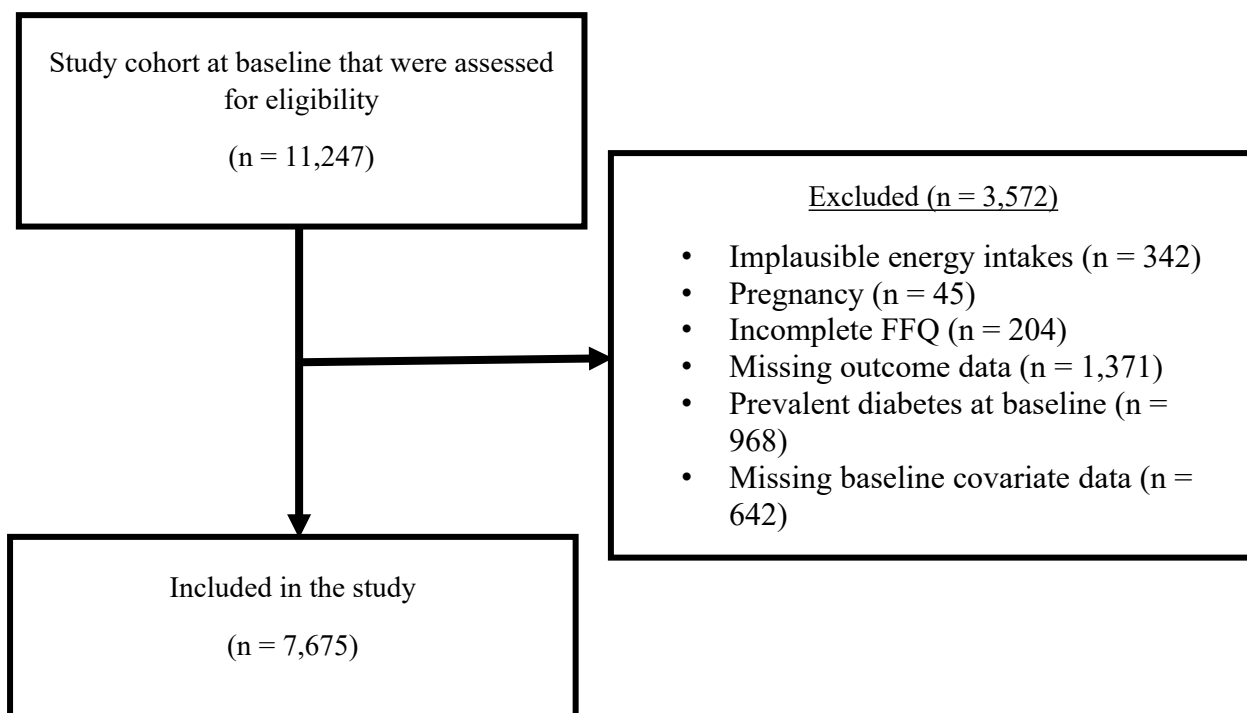


### Supplementary Tables and Figures

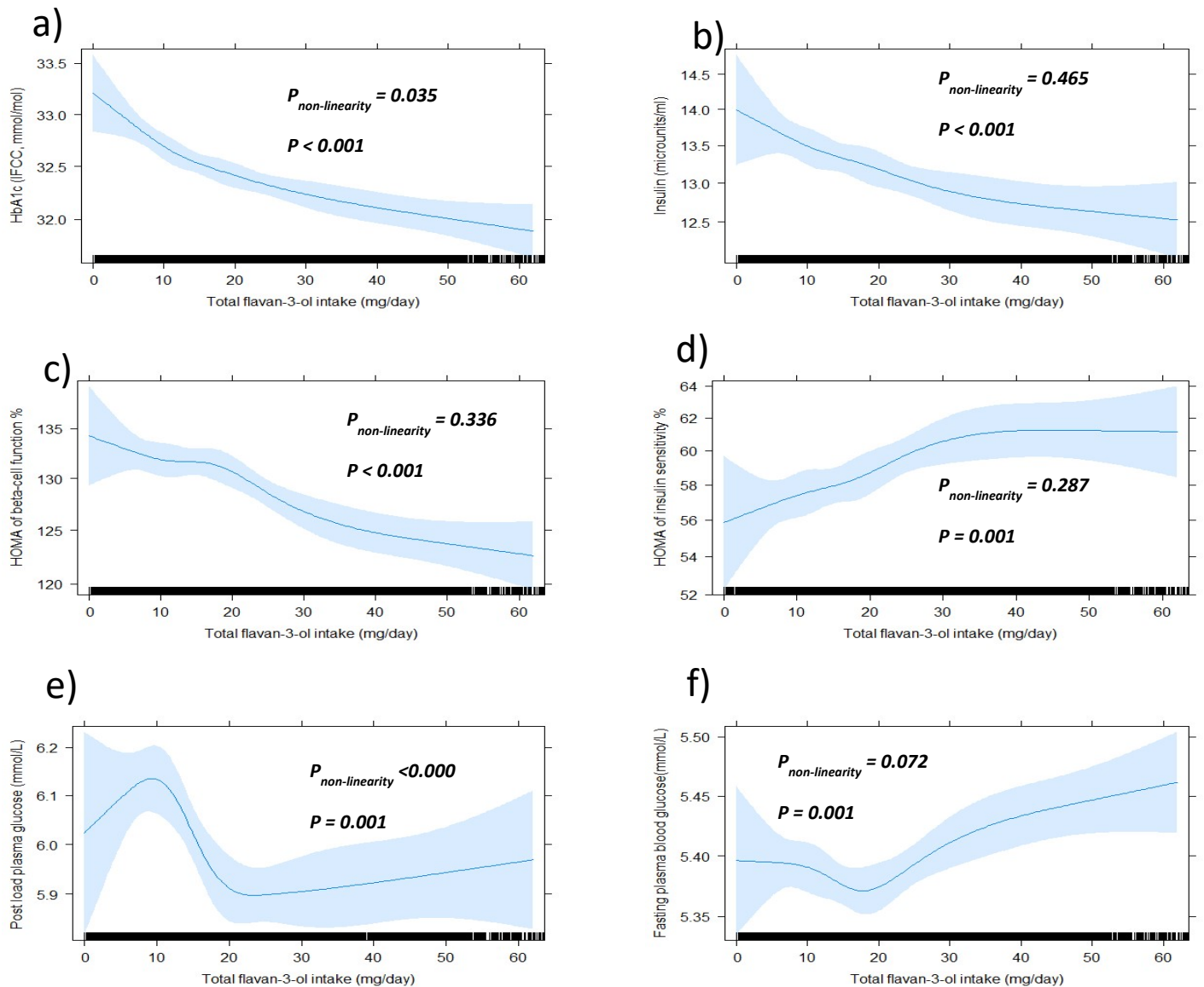
**Supplementary Table 1.** Baseline flavonoid intake for the study population (n=7675)

Flavonoids		Respective compounds (Percent contribution to class intake)	Top five dietary contributors (Percent contribution to class intake)
Class	Intake (mg/d) <sup>a</sup>		
<b>Proanthocyanidins</b>	101.8 [0–877.7] (61.2%)	Polymers (32.6%), 4-6mers (26.2%), dimers (17.0%), 7-10mers (15.3%), trimers (8.9%)	Apples (40.0%), chocolate (14.7%), red wine (9.5%), fruit juice (7.0%), strawberries (5.6%)
<b>Flavan-3-ols</b>	17.5 [0–132.2] (10.6%)	Epicatechin (52.5%), catechin (43.6%), epigallocatechin (2.0%), epigallocatechin 3-gallate (0.9%), gallic acid (0.7%), epicatechin 3-gallate (0.3%)	Apples (23.1%), red wine (20.7%), banana (10.7%), chocolate (10.6%), fruit juice (10.5%)
<b>Anthocyanins</b>	12.6 [0–241.8] (7.6%)	Malvidin (39.9%), cyanidin (24.9%), delphinidin (15.8%), pelargonidin (10.3%), petunidin (5.6%), peonidin (3.5%)	Red wine (38.4%), fruit juice (21.7%), port & sherry (11.4%), strawberries (9.0%), tinned fruit (8.8%)
<b>Flavanones</b>	11.3 [0–132.8] (6.8%)	Hesperetin (63.6%), naringenin (36.0%), eriodictyol (0.4%)	Oranges and other citrus fruit (67.10%), fruit juice (25.0%), red wine (5.8%), white wine (1.0%), cabbage & Brussels sprouts (0.5%)
<b>Flavonols</b>	8.6 [0–45.2] (5.2%)	Quercetin (70.4%), kaempferol (23.0%), myricetin (5.8%), isorhamnetin (0.8%)	Apples (20.1%), fruit juice (12.1%), onions & leeks (9.3%), salad greens (6.9%), potatoes (6.6%)
<b>Flavones</b>	0.9 [0–3.5] (0.5%)	Luteolin (86.5%), apigenin (13.5%)	Pumpkin (21.6%), salad greens (16.4%), celery (12.0%), orange (9.2%), apple (6.4%)
<b>Isoflavones</b>	0.6 [0.01–159.9] (0.4%)	Genistein (52.3%), daidzein (39.4%), glycitein (8.3%)	Soy milk (61.4%), soybeans (26.2%), chicken (3.1%), multigrain bread (1.8%), white bread (1.6%)

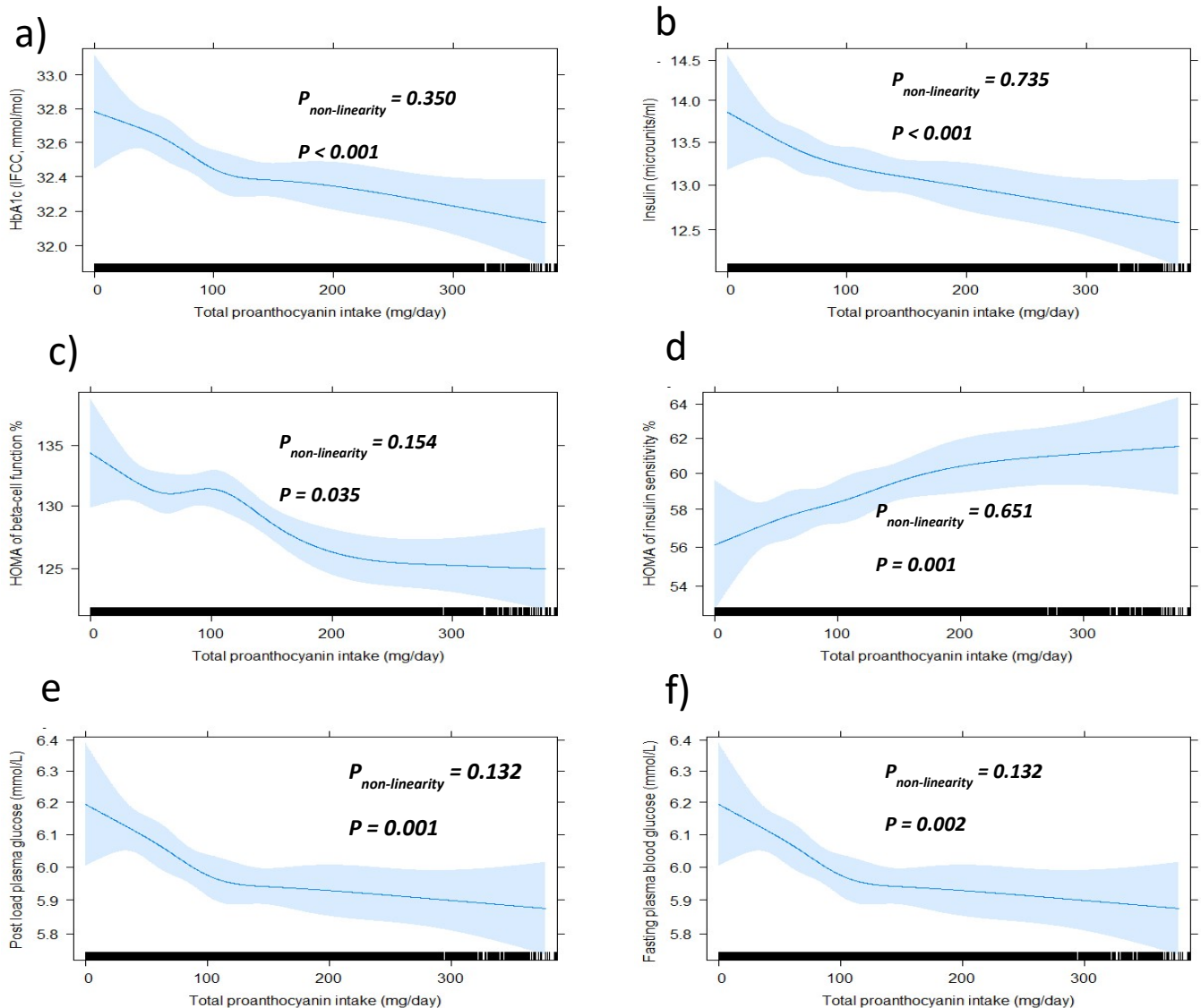
<sup>a</sup>Intakes presented as median [range] (percent contribution to total flavonoid intake)



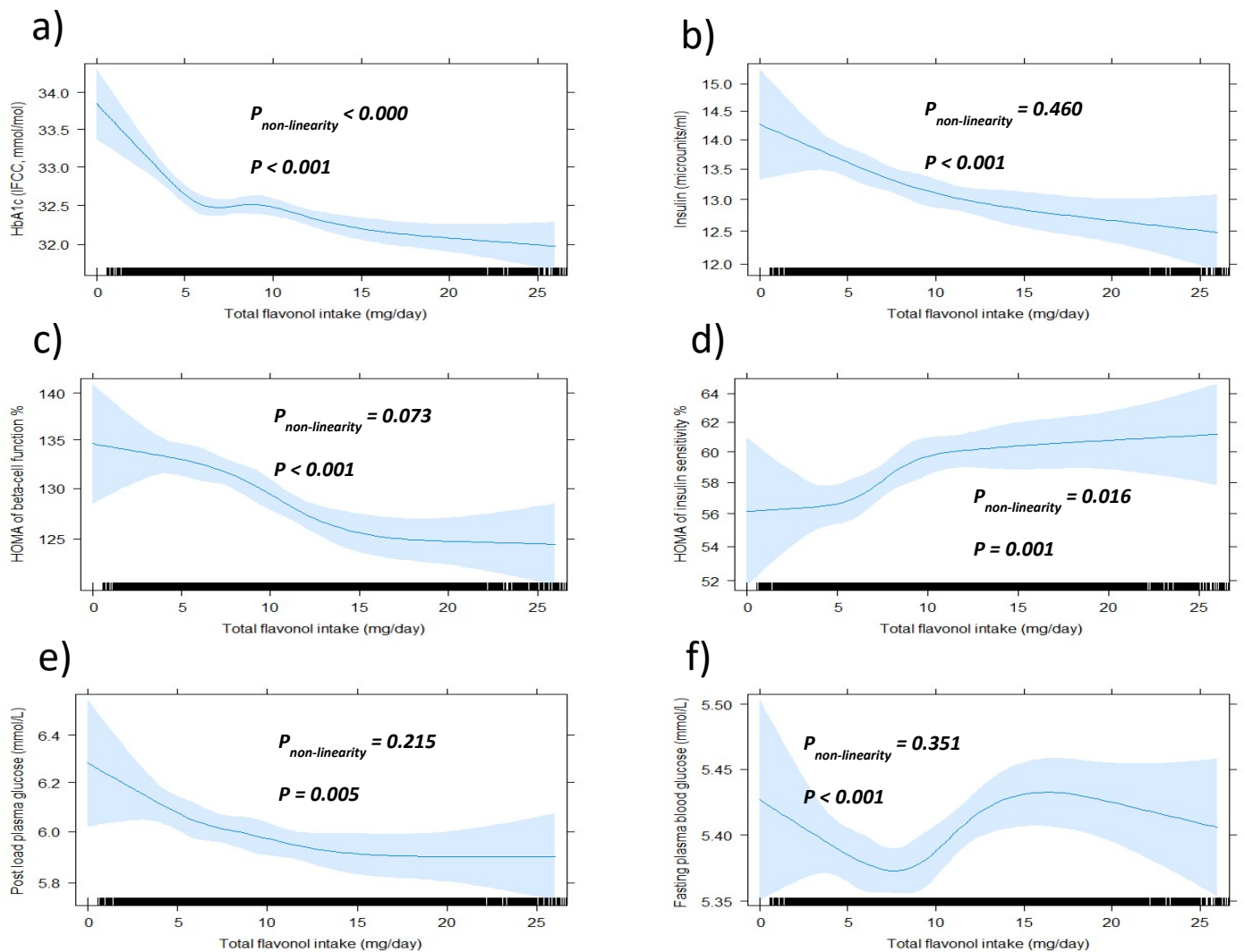
**Supplementary Figure 1.** Consort Flow Chart



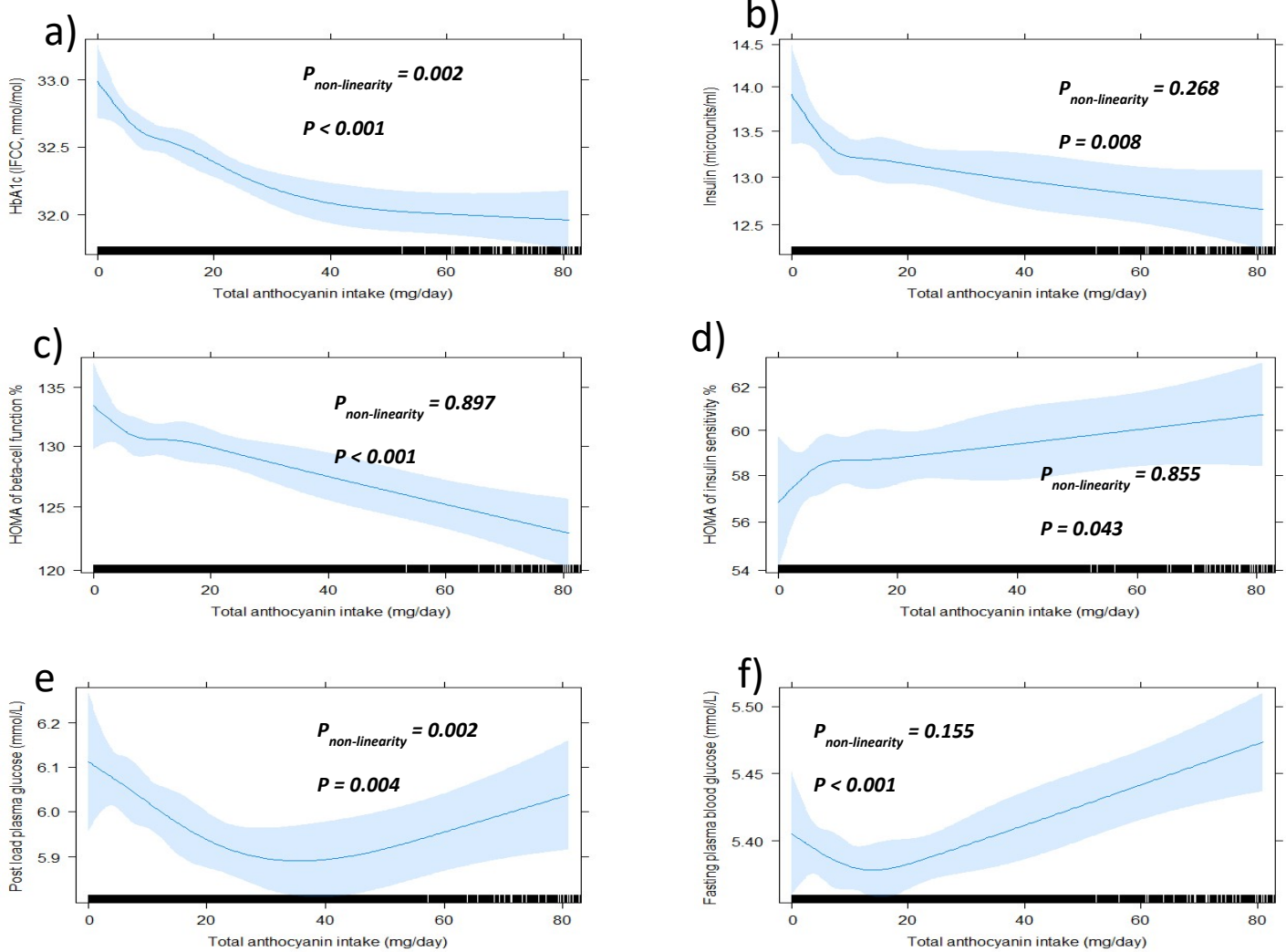
**Supplementary Figure 2.** Graphical representation of the multivariable-adjusted dose-response relationship between flavan-3-ol monomer intake and baseline (a) glycosylated haemoglobin, (b) fasting serum insulin, (c) HOMA2 of  $\beta$ -cell function, (d) HOMA2 of insulin sensitivity, (e) 2-hour post-load plasma glucose and (f) fasting plasma glucose, obtained by generalised regression models with exposure included as a restricted cubic spline ( $n = 7,675$ ). HOMA of  $\beta$ -cell function and HOMA of insulin sensitivity were estimated using HOMA2 computer model. The blue shaded areas represent 95% confidence intervals. The distribution of the exposure variable is provided in the rug plot on the x-axis of each graph. All analyses were adjusted for age, sex, level of education, physical activity levels, income, smoking status, Socio-economic index for areas (SEIFA), BMI, parental history of diabetes, prevalence of cardiovascular disease and intakes of beer, spirits, red meat, processed meat, and energy. P-values for the association between exposure and outcomes (false discovery rate corrected) and tests of non-linearity were obtained using likelihood ratio tests.



**Supplementary Figure 3.** Graphical representation of the multivariable-adjusted dose-response relationship between proanthocyanidin intake and baseline (a) glycated haemoglobin, (b) fasting serum insulin, (c) HOMA2 of  $\beta$ -cell function, (d) HOMA2 of insulin sensitivity, (e) 2-hour post-load plasma glucose and (f) fasting plasma glucose, obtained by generalised regression models with exposure included as a restricted cubic spline ( $n = 7,675$ ). HOMA of  $\beta$ -cell function and HOMA of insulin sensitivity were estimated using HOMA2 computer model. The blue shaded areas represent 95% confidence intervals. The distribution of the exposure variable is provided in the rug plot on the x-axis of each graph. All analyses were adjusted for age, sex, level of education, physical activity levels, income, smoking status, Socio-economic index for areas (SEIFA), BMI, parental history of diabetes, prevalence of cardiovascular disease and intakes of beer, spirits, red meat, processed meat, and energy. P-values for the association between exposure and outcomes (false discovery rate corrected) and tests of non-linearity were obtained using likelihood ratio tests.



**Supplementary Figure 4.** Graphical representation of the multivariable-adjusted dose-response relationship between flavonol intake and baseline (a) glycosylated haemoglobin, (b) fasting serum insulin, (c) HOMA2 of  $\beta$ -cell function, (d) HOMA2 of insulin sensitivity, (e) 2-hour post-load plasma glucose and (f) fasting plasma glucose, obtained by generalised regression models with exposure included as a restricted cubic spline ( $n = 7,675$ ). HOMA of  $\beta$ -cell function and HOMA of insulin sensitivity were estimated using HOMA2 computer model. The blue shaded areas represent 95% confidence intervals. The distribution of the exposure variable is provided in the rug plot on the x-axis of each graph. All analyses were adjusted for age, sex, level of education, physical activity levels, income, smoking status, Socio-economic index for areas (SEIFA), BMI, parental history of diabetes, prevalence of cardiovascular disease and intakes of beer, spirits, red meat, processed meat, and energy. P-values for the association between exposure and outcomes (false discovery rate corrected) and tests of non-linearity were obtained using likelihood ratio tests.



**Supplementary Figure 5.** Graphical representation of the multivariable-adjusted dose-response relationship between anthocyanin intake and baseline (a) glycosylated haemoglobin, (b) fasting serum insulin, (c) HOMA2 of  $\beta$ -cell function, (d) HOMA2 of insulin sensitivity, (e) 2-hour post-load plasma glucose and (f) fasting plasma glucose, obtained by generalised regression models with exposure included as a restricted cubic spline ( $n = 7,675$ ). HOMA of  $\beta$ -cell function and HOMA of insulin sensitivity were estimated using HOMA2 computer model. The blue shaded areas represent 95% confidence intervals. The distribution of the exposure variable is provided in the rug plot on the x-axis of each graph. All analyses were adjusted for age, sex, level of education, physical activity levels, income, smoking status, Socio-economic index for areas (SEIFA), BMI, parental history of diabetes, prevalence of cardiovascular disease and intakes of beer, spirits, red meat, processed meat, and energy. P-values for the association between exposure and outcomes (false discovery rate corrected) and tests of non-linearity were obtained using likelihood ratio tests.

**Supplementary Table 2.** Associations between intakes of total flavonoid, subclasses and biomarkers of  $\beta$ -cell dysfunction and insulin resistance (n=7,675).

	Flavonoid intake quartiles			
	Q1	Q2	Q3	Q4
<b>HbA1c (mmol/mol)</b>				
<b>Total flavonoid</b>				
HbA1c (mmol/mol)	5.2 (4.2 – 6.6)	5.1 (3.8 – 6.4)	5.1 (4.2 – 6.3)	5.1 (4.0 – 6.4)
Model 1	ref.	0.99 (0.99, 0.99)	0.99 (0.98, 0.99)	0.98 (0.98, 0.99)
Model 2	ref.	0.99 (0.99, 1.00)	0.99 (0.99, 1.00)	0.98 (0.98, 0.99)
Model 3	ref.	0.99 (0.99, 1.00)	0.99 (0.99, 1.00)	0.98 (0.98, 0.99)
<b>Flavan-3-ol</b>				
HbA1c (mmol/mol)	5.2 (4.2 – 6.6)	5.1 (4.2 – 6.4)	5.1 (3.8 – 6.2)	5.1 (3.9 – 6.3)
Model 1	ref.	0.99 (0.99, 1.00)	0.98 (0.98, 0.99)	0.98 (0.98, 0.99)
Model 2	ref.	0.99 (0.99, 1.00)	0.99 (0.99, 1.00)	0.99 (0.98, 0.99)
Model 3	ref.	0.99 (0.98, 1.00)	0.99 (0.98, 0.99)	0.99 (0.98, 0.99)
<b>Proanthocyanidin</b>				
HbA1c (mmol/mol)	5.1 (4.2 – 6.6)	5.1 (3.8 – 6.4)	5.1 (4.2 – 6.4)	5.0 (4.0 – 6.4)
Model 1	ref.	1.00 (0.99, 1.00)	0.99 (0.99, 1.00)	0.99 (0.98, 0.99)
Model 2	ref.	1.00 (0.99, 1.01)	1.00 (0.99, 1.00)	0.99 (0.98, 0.99)
Model 3	ref.	0.99 (0.99, 1.00)	1.00 (0.99, 1.00)	0.99 (0.98, 0.99)
<b>Flavonol</b>				
HbA1c (mmol/mol)	5.1 (4.2 – 6.3)	5.1 (4.9 – 6.4)	5.1 (4.9 – 6.6)	5.1 (4.0 – 6.1)
Model 1	ref.	0.99 (0.99, 1.00)	0.99 (0.98, 0.99)	0.99 (0.98, 0.99)
Model 2	ref.	0.99 (0.99, 1.00)	0.99 (0.98, 0.99)	0.99 (0.98, 0.99)
Model 3	ref.	0.99 (0.99, 1.00)	0.99 (0.99, 1.00)	0.99 (0.98, 0.99)
<b>Anthocyanin</b>				
HbA1c (mmol/mol)	5.2 (4.0 – 6.4)	5.1 (4.2 – 6.6)	5.1 (3.8 – 6.4)	5.1 (4.2 – 6.1)
Model 1	ref.	0.99 (0.99, 1.00)	0.99 (0.99, 0.99)	0.99 (0.98, 0.99)
Model 2	ref.	0.99 (0.99, 1.00)	0.99 (0.99, 1.00)	0.99 (0.98, 1.00)
Model 3	ref.	0.99 (0.98, 1.00)	0.99 (0.97, 1.00)	0.98 (0.97, 1.00)
<b>Flavanone</b>				
HbA1c (mmol/mol)	5.1 (4.0 – 6.6)	5.1 (4.1 – 6.4)	5.1 (3.8 – 6.3)	5.1 (4.2 – 6.4)
Model 1	ref.	1.00 (0.99, 1.00)	0.99 (0.99, 1.00)	0.99 (0.98, 1.00)
Model 2	ref.	1.00 (0.99, 1.00)	1.00 (0.99, 1.00)	1.00 (0.99, 1.00)
Model 3	ref.	1.00 (0.99, 1.01)	1.00 (0.99, 1.02)	1.01 (0.99, 1.02)
<b>Post load Glucose (PLG)</b>				
<b>Total flavonoid</b>				
PLG (mmol/L)	5.9 (1.4 – 11)	6.0 (4.9 – 7.1)	5.8 (2.1 – 11.0)	5.7 (1.9 – 11.0)
Model 1	ref.	0.99 (0.98, 1.00)	0.97 (0.96, 0.98)	0.96 (0.94, 0.97)
Model 2	ref.	0.99 (0.98, 1.00)	0.97 (0.96, 0.99)	0.96 (0.95, 0.98)
Model 3	ref.	0.99 (0.98, 1.00)	0.98 (0.96, 0.99)	0.97 (0.95, 0.99)
<b>Flavan-3-ol</b>				
PLG (mmol/L)	5.9 (1.4 – 11.0)	6.2 (1.5 – 11.0)	5.9 (2.1 – 11.0)	5.9 (1.9 – 11.0)
Model 1	ref.	0.99 (0.98, 1.00)	0.97 (0.96, 0.98)	0.96 (0.95, 0.97)
Model 2	ref.	0.99 (0.98, 1.00)	0.97 (0.96, 0.98)	0.96 (0.95, 0.98)
Model 3	ref.	0.99 (0.98, 1.00)	0.97 (0.96, 0.99)	0.96 (0.95, 0.98)

**Proanthocyanin**

PLG (mmol/L)	5.9 (1.5 – 11.0)	5.9 (1.5 – 11.0)	5.8 (1.9 – 11.0)	5.7 (2.0 – 11.0)
Model 1	ref.	0.99 (0.97, 1.00)	0.97 (0.96, 0.99)	0.96 (0.95, 0.98)
Model 2	ref.	0.98 (0.97, 1.00)	0.97 (0.96, 0.99)	0.96 (0.95, 0.98)
Model 3	ref.	0.99 (0.97, 1.00)	0.98 (0.96, 0.99)	0.97 (0.95, 0.99)

**Flavonol**

PLG (mmol/L)	5.9 (1.4 – 11.0)	5.8 (1.5 – 11.0)	5.8 (1.9 – 11.0)	5.9 (1.9 – 11.0)
Model 1	ref.	0.99 (0.98, 1.00)	0.97 (0.95, 0.99)	0.97 (0.95, 0.98)
Model 2	ref.	0.99 (0.98, 1.00)	0.98 (0.96, 0.99)	0.97 (0.96, 0.99)
Model 3	ref.	0.99 (0.98, 1.00)	0.98 (0.97, 0.99)	0.97 (0.95, 0.99)

**Anthocyanidin**

PLG (mmol/L)	5.9 (1.4 – 11.0)	5.9 (1.5 – 11.0)	5.9 (1.4 – 11.0)	5.9 (1.9 – 11.0)
Model 1	ref.	0.99 (0.98, 1.00)	0.98 (0.96, 0.99)	0.96 (0.94, 0.97)
Model 2	ref.	0.99 (0.98, 1.00)	0.98 (0.96, 0.99)	0.96 (0.95, 0.98)
Model 3	ref.	0.97 (0.95, 1.00)	0.98 (0.97, 0.99)	0.97 (0.95, 0.99)

**Flavanone**

PLG (mmol/L)	5.9 (1.4 – 11.0)	6.0 (1.5 – 11.0)	5.8 (1.9 – 11.0)	5.8 (1.9 – 11.0)
Model 1	ref.	1.00 (0.98, 1.01)	1.00 (0.98, 1.01)	0.98 (0.97, 1.01)
Model 2	ref.	1.00 (0.98, 1.01)	0.99 (0.98, 1.01)	0.99 (0.97, 1.01)
Model 3	ref.	1.00 (0.99, 1.01)	1.00 (0.98, 1.01)	0.99 (0.98, 1.01)

**Serum insulin****Total flavonoid**

Insulin (microunits/mL)	12.6 (2.0 – 75.1)	12.2 (2.0 – 75.1)	12.1 (2.0 – 130.2)	11.1 (2.0 – 176.4)
Model 1	ref.	0.97 (0.94, 0.99)	0.94 (0.91, 0.96)	0.91 (0.88, 0.94)
Model 2	ref.	0.97 (0.95, 0.99)	0.96 (0.94, 0.98)	0.94 (0.92, 0.97)
Model 3	ref.	0.97 (0.96, 0.99)	0.96 (0.94, 0.98)	0.95 (0.92, 0.97)

**Flavan-3-ol**

Insulin (microunits/mL)	11.9 (2.0 – 15.7)	12.4 (2.0 – 130.2)	11.9 (2.0 – 96.4)	11.8 (2.0 – 176.4)
Model 1	ref.	0.97 (0.95, 0.99)	0.93 (0.91, 0.96)	0.90 (0.87, 0.93)
Model 2	ref.	0.97 (0.95, 0.99)	0.95 (0.93, 0.97)	0.93 (0.90, 0.95)
Model 3	ref.	0.98 (0.96, 1.00)	0.96 (0.94, 0.98)	0.94 (0.91, 0.97)

**Proanthocyanidin**

Insulin (microunits/mL)	12.3 (2.0 – 69.8)	12.2 (2.0 – 65.8)	12.2 (2.0 – 176.4)	11.9 (2.0 – 130.2)
Model 1	ref.	0.98 (0.95, 1.00)	0.95 (0.93, 0.98)	0.93 (0.90, 0.96)
Model 2	ref.	0.98 (0.96, 0.99)	0.96 (0.95, 0.98)	0.95 (0.93, 0.98)
Model 3	ref.	0.98 (0.96, 1.00)	0.97 (0.95, 0.99)	0.96 (0.93, 0.98)

**Flavonol**

Insulin (microunits/mL)	12.5 (2.0 – 69.8)	12.1 (2.0 – 75.1)	12.2 (2.0 – 130.2)	11.8 (2.0 – 176.4)
Model 1	ref.	0.97 (0.95, 0.99)	0.94 (0.92, 0.97)	0.91 (0.88, 0.94)
Model 2	ref.	0.97 (0.96, 0.99)	0.95 (0.93, 0.97)	0.92 (0.89, 0.94)
Model 3	ref.	0.98 (0.96, 0.99)	0.96 (0.94, 0.98)	0.94 (0.91, 0.96)

**Anthocyanidin**

Insulin (microunits/mL)	12.3 (2.0 – 69.8)	12.4 (2.0 – 130.2)	12.1 (2.0 – 176.4)	11.9 (2.0 – 96.4)
Model 1	ref.	0.98 (0.95, 1.00)	0.96 (0.93, 0.98)	0.93 (0.90, 0.96)
Model 2	ref.	0.98 (0.96, 1.00)	0.96 (0.94, 0.99)	0.95 (0.93, 0.98)



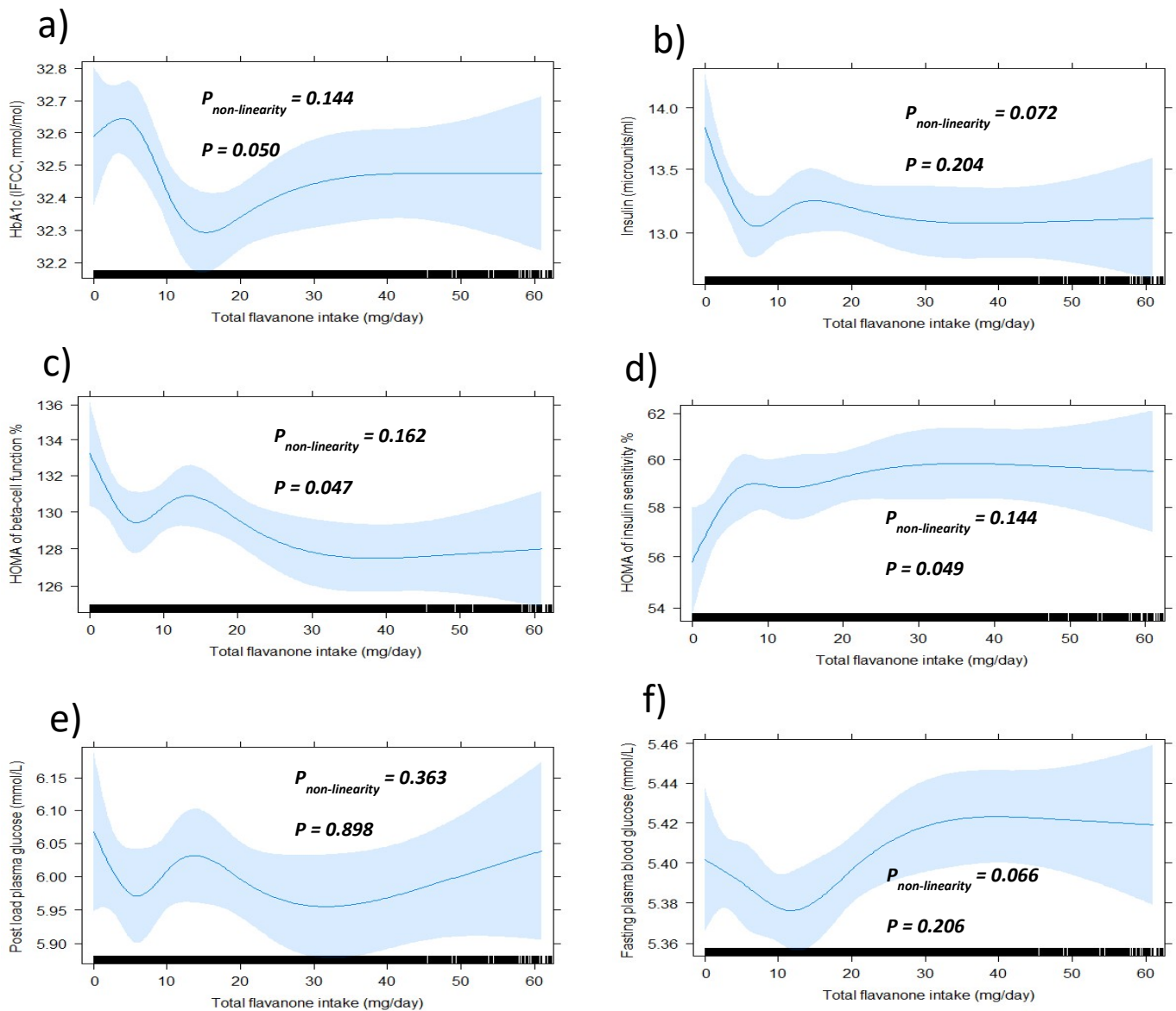
Model 3	ref.	0.98 (0.96, 1.00)	0.97 (0.95, 0.99)	0.95 (0.93, 0.98)
<b>Flavanone</b>				
Insulin (microunits/mL)	12.3 (2.0 – 69.8)	12.2 (2.0 – 65.8)	12.2 (2.0 – 176.4)	11.9 (2.0 – 130.2)
Model 1	ref.	0.97 (0.94, 0.99)	0.95 (0.92, 0.98)	0.95 (0.92, 0.98)
Model 2	ref.	0.98 (0.96, 1.00)	0.97 (0.95, 0.99)	0.97 (0.95, 1.00)
Model 3	ref.	0.98 (0.96, 1.00)	0.97 (0.95, 1.00)	0.98 (0.95, 1.00)
<b>HOMA2 of <math>\beta</math>, cell function</b>				
<b>Total flavonoid</b>				
HOMA2, % $\beta$	128.2 (32.6 – 444.6)	126.9 (36.3 – 505.4)	125.5 (30.5 – 576.3)	120.4 (23.1 – 600.3)
Model 1	ref.	0.99 (0.97, 1.00)	0.97 (0.95, 0.98)	0.94 (0.92, 0.96)
Model 2	ref.	0.99 (0.98, 1.00)	0.97 (0.96, 0.99)	0.96 (0.94, 0.97)
Model 3	ref.	0.99 (0.98, 1.00)	0.97 (0.96, 0.99)	0.95 (0.94, 0.97)
<b>Flavan-3-ol</b>				
HOMA2, % $\beta$	128.4 (32.6 – 444.6)	127.5 (36.3 – 576.3)	124.7 (36.0 – 81.5)	120.4 (23.1 – 600.3)
Model 1	ref.	0.99 (0.98, 1.00)	0.96 (0.95, 0.98)	0.93 (0.91, 0.95)
Model 2	ref.	0.99 (0.98, 1.00)	0.97 (0.96, 0.99)	0.95 (0.93, 0.96)
Model 3	ref.	0.99 (0.96, 1.01)	0.98 (0.96, 0.99)	0.95 (0.93, 0.97)
<b>Proanthocyanidin</b>				
HOMA2, % $\beta$	127.2 (32.6 – 389.3)	125.9 (35.0 – 505.4)	126.4 (23.1 – 576.3)	121.8 (31.5 – 00.3)
Model 1	ref.	0.99 (0.98, 1.01)	0.99 (0.96, 0.99)	0.99 (0.93, 0.97)
Model 2	ref.	0.99 (0.98, 1.00)	0.98 (0.97, 0.99)	0.96 (0.95, 0.98)
Model 3	ref.	1.00 (0.98, 1.01)	0.98 (0.97, 0.99)	0.96 (0.94, 0.98)
<b>Flavonol</b>				
HOMA2, % $\beta$	138.4 (32.6 – 444.6)	128.8 (36.3 – 505.4)	124.9 (23.1 – 576.3)	118.3 (36.0 – 600.3)
Model 1	ref.	0.99 (0.98, 1.00)	0.96 (0.95, 0.98)	0.93 (0.91, 0.94)
Model 2	ref.	0.99 (0.98, 1.00)	0.97 (0.95, 0.98)	0.93 (0.92, 0.95)
Model 3	ref.	0.99 (0.98, 1.00)	0.97 (0.95, 0.98)	0.94 (0.92, 0.96)
<b>Anthocyanidin</b>				
HOMA2, % $\beta$	127.1 (32.0 – 505.4)	128.0 (36.0 – 576.3)	125.6 (35.0 – 600.3)	120.8 (23.1 – 349.5)
Model 1	ref.	0.99 (0.98, 1.01)	0.98 (0.97, 1.00)	0.95 (0.94, 0.97)
Model 2	ref.	0.99 (0.98, 1.01)	0.98 (0.97, 1.01)	0.97 (0.95, 0.99)
Model 3	ref.	0.99 (0.98, 1.01)	0.99 (0.97, 1.00)	0.97 (0.95, 0.99)
<b>Flavanone</b>				
HOMA2, % $\beta$	127.2 (35.0 – 369.7)	127.1 (36.3 – 505.4)	125.7 (30.5 – 600.3)	121.8 (23.1 – 576.3)
Model 1	ref.	0.99 (0.97, 1.01)	0.98 (0.96, 0.99)	0.96 (0.95, 0.98)
Model 2	ref.	0.99 (0.98, 1.01)	0.99 (0.96, 1.00)	0.98 (0.96, 1.00)
Model 3	ref.	0.99 (0.98, 1.01)	0.99 (0.97, 1.00)	0.98 (0.96, 1.00)
<b>HOMA2 of insulin sensitivity</b>				
<b>Total flavonoid</b>				
HOMA2, % S	52.9 (10.2 – 338.1)	54.0 (9.6 – 338.1)	55.0 (6.4 – 340.6)	54.0 (9.6 – 338.1)
Model 1	ref.	1.01 (0.99, 1.04)	1.05 (1.02, 1.07)	1.08 (1.04, 1.12)
Model 2	ref.	1.02 (1.00, 1.04)	1.04 (1.02, 1.07)	1.07 (1.04, 1.10)
Model 3	ref.	1.02 (0.99, 1.04)	1.04 (1.01, 1.07)	1.07 (1.03, 1.10)
<b>Flavan-3-ol</b>				
HOMA2, % S	53.1 (10.5 – 338.1)	53.7 (6.4 – 340.6)	55.6 (7.7 – 331.2)	55.9 (5.9 – 343.2)

Model 1	ref.	1.01 (0.99, 1.04)	1.05 (1.02, 1.08)	1.09 (1.06, 1.13)
Model 2	ref.	1.02 (1.00, 1.04)	1.05 (1.02, 1.07)	1.08 (1.04, 1.11)
Model 3	ref.	1.01 (.099, 1.04)	1.04 (1.01, 1.07)	1.07 (1.03, 1.11)
<b>Proanthocyanidin</b>				
HOMA2, % S	53.5 (10.2 – 338.1)	54.7 (9.6 – 338.1)	54.4 (6.4 – 340.6)	55.5 (5.9 – 343.2)
Model 1	ref.	1.01 (0.99, 1.04)	1.04 (1.01, 1.06)	1.06 (1.03, 1.10)
Model 2	ref.	1.02 (1.00, 1.04)	1.04 (1.01, 1.06)	1.06 (1.02, 1.09)
Model 3	ref.	1.02 (0.99, 1.04)	1.03 (1.01, 1.06)	1.06 (1.02, 1.09)
<b>Flavonol</b>				
HOMA2, % S	53.1 (10.5 – 338.1)	54.3 (6.4 – 338.1)	54.3 (6.4 – 340.6)	56.0 (5.9 – 343.2)
Model 1	ref.	1.01 (0.99, 1.04)	1.05 (1.02, 1.07)	1.09 (1.05, 1.12)
Model 2	ref.	1.02 (1.00, 1.04)	1.05 (1.03, 1.08)	1.09 (1.05, 1.12)
Model 3	ref.	1.02 (1.00, 1.04)	1.05 (1.02, 1.07)	1.07 (1.03, 1.11)
<b>Anthocyanidin</b>				
HOMA2, % S	54.0 (10.6 – 343.2)	53.6 (6.4 – 331.2)	55.1 (5.9 – 340.6)	55.5 (7.7 – 335.7)
Model 1	ref.	1.01 (0.98, 1.03)	1.02 (0.99, 1.05)	1.05 (1.01, 1.09)
Model 2	ref.	1.01 (0.99, 1.04)	1.02 (0.99, 1.05)	1.03 (1.00, 1.06)
Model 3	ref.	1.01 (0.99, 1.04)	1.02 (0.99, 1.05)	1.03 (0.99, 1.06)
<b>Flavanone</b>				
HOMA2, % S	53.9 (10.5 – 338.1)	63.8 (11.5 – 338.1)	54.4 (5.9 – 340.6)	55.8 (6.4 – 343.2)
Model 1	ref.	1.03 (1.00, 1.05)	1.05 (1.02, 1.08)	1.06 (1.02, 1.09)
Model 2	ref.	1.03 (1.00, 1.05)	1.04 (1.01, 1.07)	1.04 (1.01, 1.08)
Model 3	ref.	1.03 (1.00, 1.05)	1.04 (1.01, 1.07)	1.04 (1.01, 1.07)
<b>Fasting Plasma Glucose (FPG)</b>				
<b>Total flavonoid</b>				
FPG	5.3 (3.8 – 6.9)	5.3 (2.5 – 6.9)	5.4 (4.1 – 6.9)	5.4 (3.6 – 6.9)
Model 1	ref.	1.00 (1.00, 1.00)	1.00 (0.99, 1.00)	1.00 (0.99, 1.01)
Model 2	ref.	1.00 (1.00, 1.00)	1.00 (0.99, 1.00)	1.00 (0.99, 1.01)
Model 3	ref.	1.00 (1.00, 1.00)	1.00 (0.99, 1.00)	1.00 (1.00, 1.00)
<b>Flavan-3-ol</b>				
FPG	5.3 (3.8 – 6.9)	5.3 (2.5 – 6.9)	5.4 (3.8 – 6.9)	5.4 (3.6 – 6.9)
Model 1	ref.	1.00 (0.99, 1.00)	1.00 (0.99, 1.00)	1.00 (0.99, 1.00)
Model 2	ref.	1.00 (1.00, 1.00)	1.00 (0.99, 1.00)	1.00 (0.99, 1.00)
Model 3	ref.	1.00 (1.00, 1.00)	1.00 (0.99, 1.00)	1.00 (0.99, 1.01)
<b>Proanthocyanidin</b>				
FPG	5.3 (3.5 – 6.9)	5.3 (2.5 – 6.9)	5.4 (3.8 – 6.9)	5.4 (3.6 – 6.9)
Model 1	ref.	1.00 (0.99, 1.00)	1.00 (0.99, 1.00)	1.00 (0.99, 1.01)
Model 2	ref.	1.00 (0.99, 1.00)	1.00 (0.99, 1.00)	1.00 (0.99, 1.01)
Model 3	ref.	1.00 (0.99, 1.00)	1.00 (1.00, 1.00)	1.01 (1.00, 1.01)
<b>Flavonol</b>				
FPG	5.3 (3.5 – 6.9)	5.3 (2.5 – 6.9)	5.4 (3.7 – 6.9)	5.5 (3.6 – 6.9)
Model 1	ref.	1.00 (0.99, 1.01)	1.00 (1.00, 1.00)	1.01 (1.00, 1.01)
Model 2	ref.	1.00 (0.99, 1.00)	1.00 (1.00, 1.00)	1.01 (1.00, 1.01)
Model 3	ref.	1.00 (0.99, 1.00)	1.00 (1.00, 1.01)	1.01 (1.00, 1.01)
<b>Anthocyanidin</b>				
FPG	5.3 (2.5 – 6.9)	5.3 (3.7 – 6.8)	5.3 (3.5 – 6.9)	5.4 (3.6 – 6.9)
Model 1	ref.	1.00 (0.99, 1.00)	1.00 (0.99, 1.00)	1.00 (0.99, 1.00)
Model 2	ref.	1.00 (1.00, 1.00)	1.00 (0.99, 1.00)	1.00 (1.00, 1.01)

Model 3	ref.	1.00 (1.00, 1.00)	1.00 (0.99, 1.00)	1.00 (0.99, 1.00)
<b>Flavanone</b>				
FPG	5.3 (3.8 – 6.9)	5.3 (2.5 – 6.9)	5.4 (3.6 – 6.9)	5.4 (3.5 – 6.9)
Model 1	ref.	1.00 (1.00, 1.00)	1.00 (0.99, 1.00)	1.00 (1.00, 1.01)
Model 2	ref.	1.00 (0.99, 1.00)	1.00 (0.99, 1.00)	1.00 (1.00, 1.01)
Model 3	ref.	1.00 (1.00, 1.00)	1.00 (0.99, 1.00)	1.00 (1.00, 1.01)

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Ratios of means and 95% CIs were obtained from the model with the exposure fitted as a continuous variable through a restricted cubic spline and are reported for the median intake in each quartile relative to the median intake in quartile 1. Model 1 adjusted for age and sex; Model 2 was adjusted for age, sex, SEIFA (socio, economical index for areas), level of education, income, BMI, smoking status, physical activity levels, parental history of diabetes and self, reported prevalence of cardiovascular disease; Model 3 was adjusted for all covariates in Model 2 plus energy intake, and intakes (g/day) of beer, spirits, red meat, and processed meat. HbA1c, HOMA2, %  $\beta$ , HOMA2, % S, Insulin, FPG and PLG are presented as median (range).



**Supplementary Figure 6.** Graphical representation of the multivariable, adjusted dose, response relationship between flavanone intake and baseline (a) glycated haemoglobin, (b) fasting serum insulin, (c) HOMA2 of  $\beta$ , cell function, (d) HOMA2 of insulin sensitivity, (e) 2, hour post, load plasma glucose and (f) fasting plasma glucose, obtained by generalised regression models with exposure included as a restricted cubic spline ( $n= 7,675$ ). HOMA of  $\beta$ , cell function and HOMA of insulin sensitivity were estimated using HOMA2 computer model. The blue shaded areas represent 95% confidence intervals. The distribution of the exposure variable is provided in the rug plot on the x, axis of each graph. All analyses were adjusted for age, sex, level of education, physical activity levels, income, smoking status, Socio, economic index for areas (SEIFA), BMI, parental history of diabetes, prevalence of cardiovascular disease and intakes of beer, spirits, red meat, processed meat, and energy. P, values for the association between exposure and outcomes (false discovery rate corrected) and tests of non, linearity were obtained using likelihood ratio tests.

