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Associations between fruit intake and risk of diabetes in the AusDiab cohort: Supplementary material

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Supplementary Material

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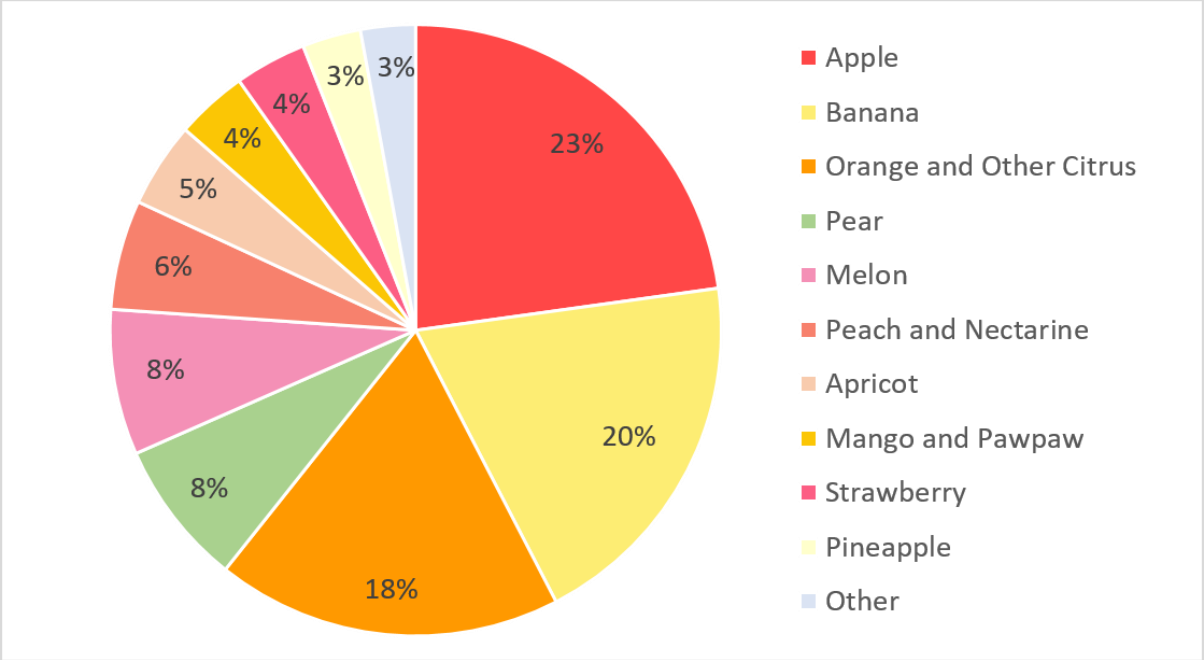
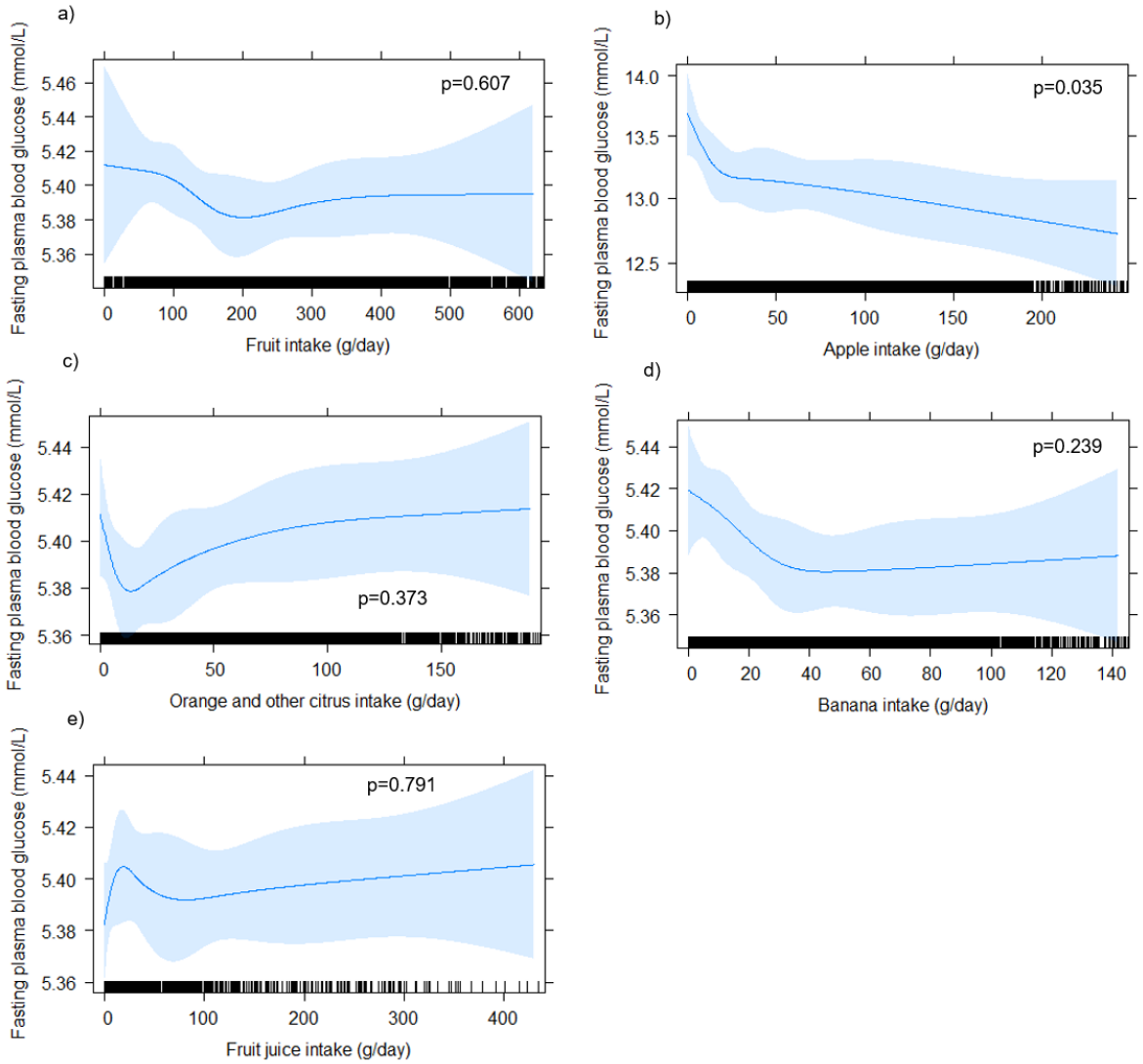


Supplementary Figure 1. Percentage contribution of individual fruit types to total fruit intake.

Note: 'Melon' included watermelon, rockmelon (cantaloupe) and honeydew melon.



Supplementary Figure 2. Graphic representation of the multivariable-adjusted dose-response relationship between fasting plasma glucose and baseline (a) total fruit intake, (b) apple intake (c) orange and other citrus intake, (d) banana intake, and (e) fruit juice intake, obtained by generalized regression models with the exposure included as a restricted cubic spline. Blue shading represents 95% confidence intervals. The rug plot along the bottom of each graph depicts each observation. All analyses were adjusted for age, sex, physical activity levels, level of education, SEIFA (socio-economical index for areas), income, BMI, smoking status, prevalence of cardiovascular disease, parental history of diabetes, and intakes of vegetables, alcohol, red meat, processed meat and energy. P-values for the effect of the exposure on the response (false discovery rate corrected) were obtained using likelihood ratio tests.

Supplementary Table 1. Baseline characteristics of the study population with and without follow-up data

	With follow-up data (n=4,674)	Without follow-up data (n=3,001)
Total fruit intake (g/day), median [IQR]	170 [98 – 291]	152 [86 – 273]
Demographics		
Age (years)	53 ± 11	55 ± 14
Sex (male), n (%)	2,123 (45.4)	1,316 (43.9)
BMI (kg/m^2)	26.7 ± 4.5	27.0 ± 4.9
SEIFA score, median [IQR]	1,045 [979 – 1,080]	1,009 [962 – 1,075]
Physical activity, n (%)		
Sedentary	732 (15.7)	576 (19.2)
Insufficient	1,453 (31.1)	924 (30.8)
Sufficient	2,489 (53.3)	1,501 (50.0)
Smoking status, n (%)		
Current	494 (10.6)	603 (20.1)
Former	1,422 (30.4)	897 (29.9)
Never	2,758 (59.0)	1,501 (50.0)
Education, n (%)		
Never, primary or high school	1,728 (37.0)	1,386 (46.2)
Secondary education	2,946 (63.0)	1,615 (53.8)
Prevalent CVD, n (%)	302 (6.5)	307 (10.2)
Family history of diabetes, n (%)	858 (18.4)	508 (16.9)
Dietary characteristics, *median [IQR]*		
Total energy intake (kj)	8,315 ± 2,759	8,128 ± 2,849
Alcohol intake (g/d)	7 [1 – 19]	4 [0 – 17]
Sugar intake (g/d)	88 [68 – 113]	85 [65 – 111]
Vegetable intake (g/d)	165 [121 – 220]	159 [111 – 213]
Red meat (g/d)	61 [35 – 97]	58 [32 – 96]
Processed meat (g/d)	17 [8 – 31]	16 [7 – 31]

Results are presented as means ± unless otherwise stated.
CVD, cardiovascular disease; SEIFA, Socio-Economic Indexes for Areas

Supplementary Table 2. Associations between baseline fruit intake and incident diabetes at 5 years

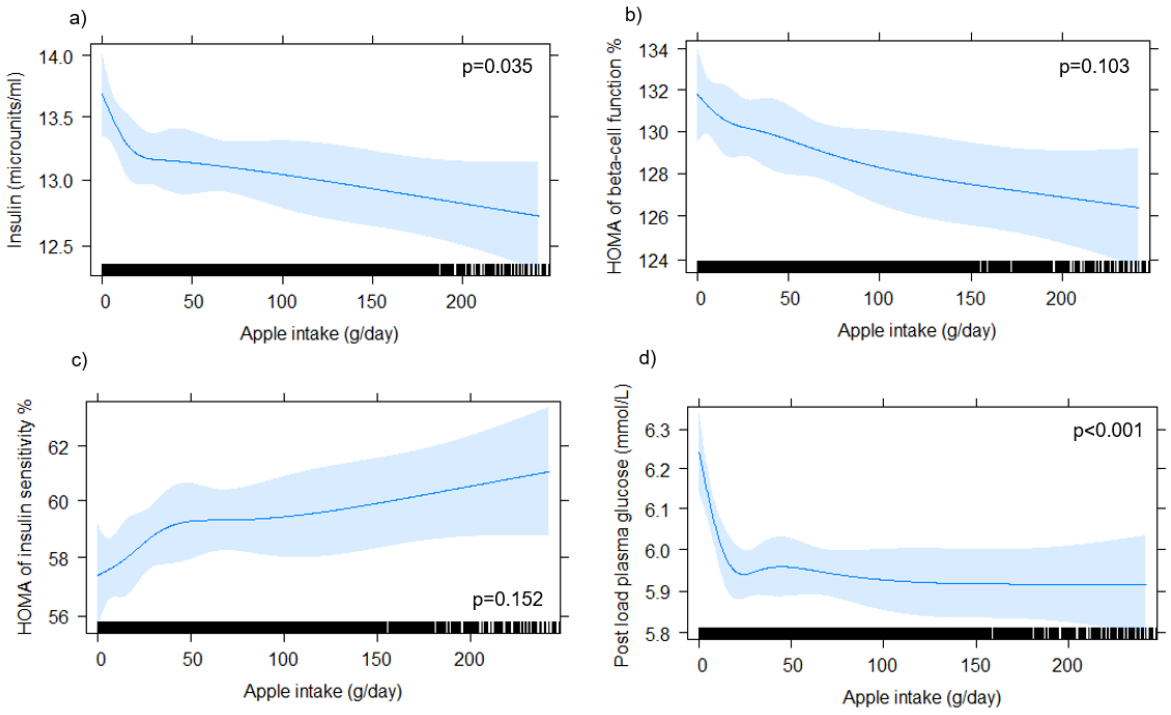
	Fruit intake quartiles			
	Q1	Q2	Q3	Q4
Total fruit				
Model 1	ref.	0.65 (0.49, 0.88)	0.49 (0.35, 0.69)	0.49 (0.33, 0.73)
Model 2	ref.	0.72 (0.53, 0.98)	0.58 (0.41, 0.84)	0.59 (0.40, 0.89)
Model 3	ref.	0.75 (0.55, 1.03)	0.64 (0.44, 0.92)	0.67 (0.44, 1.02)
Apples				
Model 1	ref.	0.72 (0.53, 0.97)	0.61 (0.43, 0.86)	0.57 (0.37, 0.86)
Model 2	ref.	0.75 (0.55, 1.03)	0.69 (0.48, 0.99)	0.67 (0.44, 1.04)
Model 3	ref.	0.79 (0.57, 1.08)	0.74 (0.52, 1.08)	0.75 (0.48, 1.17)
Orange and other citrus				
Model 1	ref.	0.91 (0.66, 1.26)	0.77 (0.55, 1.07)	0.65 (0.43, 0.98)
Model 2	ref.	0.96 (0.69, 1.34)	0.88 (0.63, 1.23)	0.78 (0.51, 1.19)
Model 3	ref.	0.97 (0.70, 1.35)	0.92 (0.66, 1.30)	0.85 (0.55, 1.31)
Bananas				
Model 1	ref.	0.93 (0.68, 1.26)	0.68 (0.49, 0.96)	0.59 (0.39, 0.88)
Model 2	ref.	0.96 (0.70, 1.32)	0.76 (0.54, 1.08)	0.70 (0.46, 1.06)
Model 3	ref.	1.01 (0.74, 1.38)	0.82 (0.58, 1.18)	0.77 (0.50, 1.18)
Fruit juice				
Model 1	ref.	0.92 (0.66, 1.27)	0.82 (0.58, 1.18)	0.73 (0.49, 1.09)
Model 2	ref.	0.91 (0.65, 1.26)	0.87 (0.60, 1.25)	0.84 (0.55, 1.26)
Model 3	ref.	0.94 (0.68, 1.31)	0.92 (0.64, 1.34)	0.91 (0.60, 1.39)

Odds ratios and 95% CIs for incident diabetes at 5 years (n=4,674) 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 adjusted for age, sex, physical activity levels, level of education, SEIFA (socio-economical index for areas), income, BMI, smoking status, self-reported prevalence of cardiovascular disease, and parental history of diabetes; Model 3 adjusted for all covariates in Model 2 plus energy intake, and intakes (g/day) of alcohol, vegetables, red meat, and processed meat.

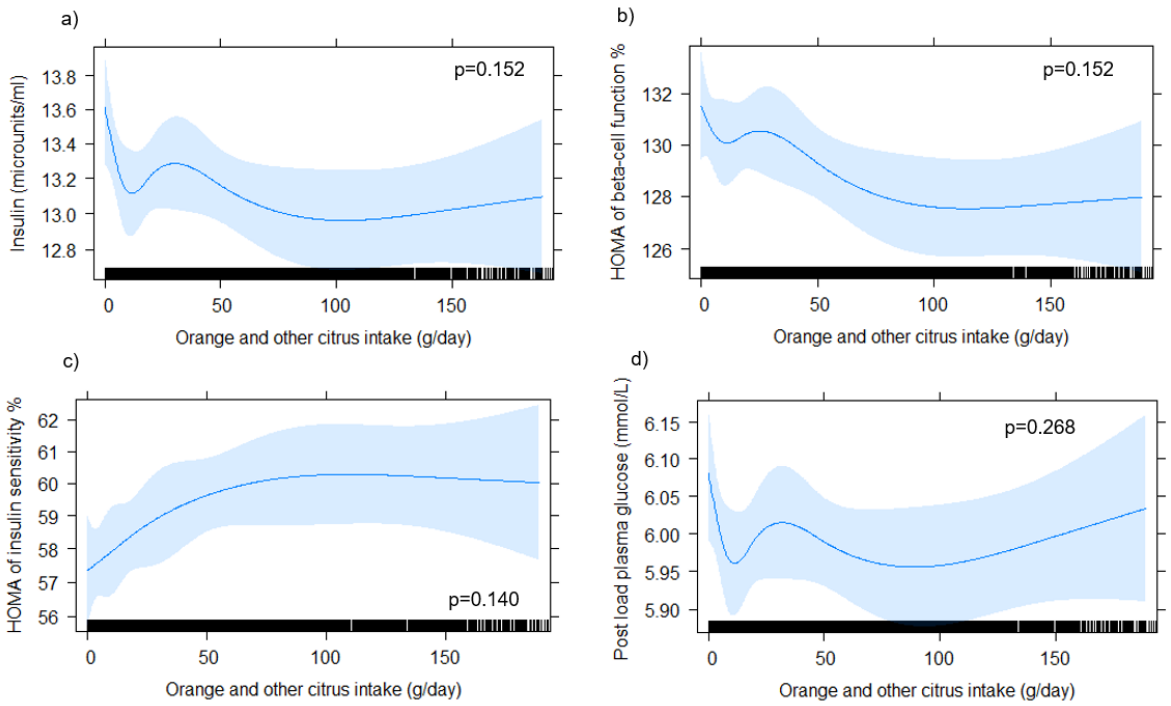
Supplementary Table 3. Associations between baseline fruit intake and incident diabetes at 12 years

	Fruit intake quartiles			
	Q1	Q2	Q3	Q4
Total fruit				
Model 1	ref.	0.78 (0.59, 1.04)	0.61 (0.45, 0.84)	0.61 (0.44, 0.86)
Model 2	ref.	0.85 (0.63, 1.16)	0.74 (0.53, 1.04)	0.74 (0.52, 1.07)
Model 3	ref.	0.86 (0.63, 1.17)	0.73 (0.52, 1.03)	0.75 (0.51, 1.09)
Apples				
Model 1	ref.	0.83 (0.63, 1.08)	0.67 (0.49, 0.91)	0.60 (0.41, 0.86)
Model 2	ref.	0.85 (0.64, 1.14)	0.75 (0.54, 1.05)	0.72 (0.49, 1.06)
Model 3	ref.	0.85 (0.64, 1.14)	0.75 (0.54, 1.06)	0.73 (0.49, 1.09)
Orange and other citrus				
Model 1	ref.	1.12 (0.84, 1.50)	0.84 (0.62, 1.13)	0.59 (0.40, 0.86)
Model 2	ref.	1.25 (0.92, 1.69)	0.98 (0.71, 1.34)	0.70 (0.47, 1.05)
Model 3	ref.	1.24 (0.92, 1.68)	0.97 (0.71, 1.33)	0.71 (0.47, 1.06)
Bananas				
Model 1	ref.	0.80 (0.61, 1.06)	0.70 (0.52, 0.95)	0.62 (0.44, 0.88)
Model 2	ref.	0.84 (0.63, 1.13)	0.83 (0.60, 1.14)	0.78 (0.54, 1.13)
Model 3	ref.	0.84 (0.62, 1.13)	0.82 (0.59, 1.14)	0.77 (0.53, 1.14)
Fruit juice				
Model 1	ref.	1.16 (0.87, 1.56)	1.09 (0.79, 1.49)	0.99 (0.70, 1.40)
Model 2	ref.	1.18 (0.87, 1.59)	1.19 (0.86, 1.67)	1.14 (0.79, 1.64)
Model 3	ref.	1.19 (0.87, 1.61)	1.21 (0.86, 1.70)	1.17 (0.80, 1.70)

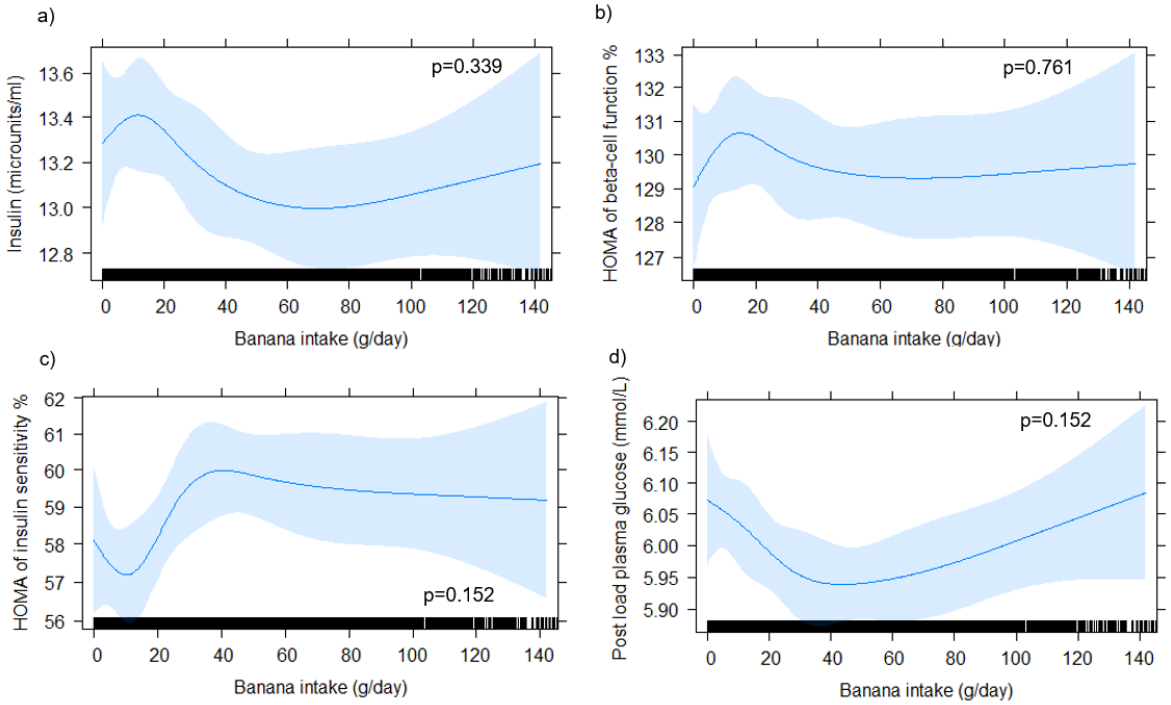
Odds ratios and 95% CIs for incident diabetes at 12 years (n=3,518) were obtained from the model with the exposure fitted as a continuous variable through a restricted cubic spline and are reported for the median intake in each quartile relative to the median intake in quartile 1. Model 1 adjusted for age and sex; Model 2 adjusted for age, sex, physical activity levels, level of education, SEIFA (socio-economical index for areas), income, BMI, smoking status, self-reported prevalence of cardiovascular disease, and parental history of diabetes; Model 3 adjusted for all covariates in Model 2 plus energy intake, and intakes (g/day) of alcohol, vegetables, red meat, and processed meat.



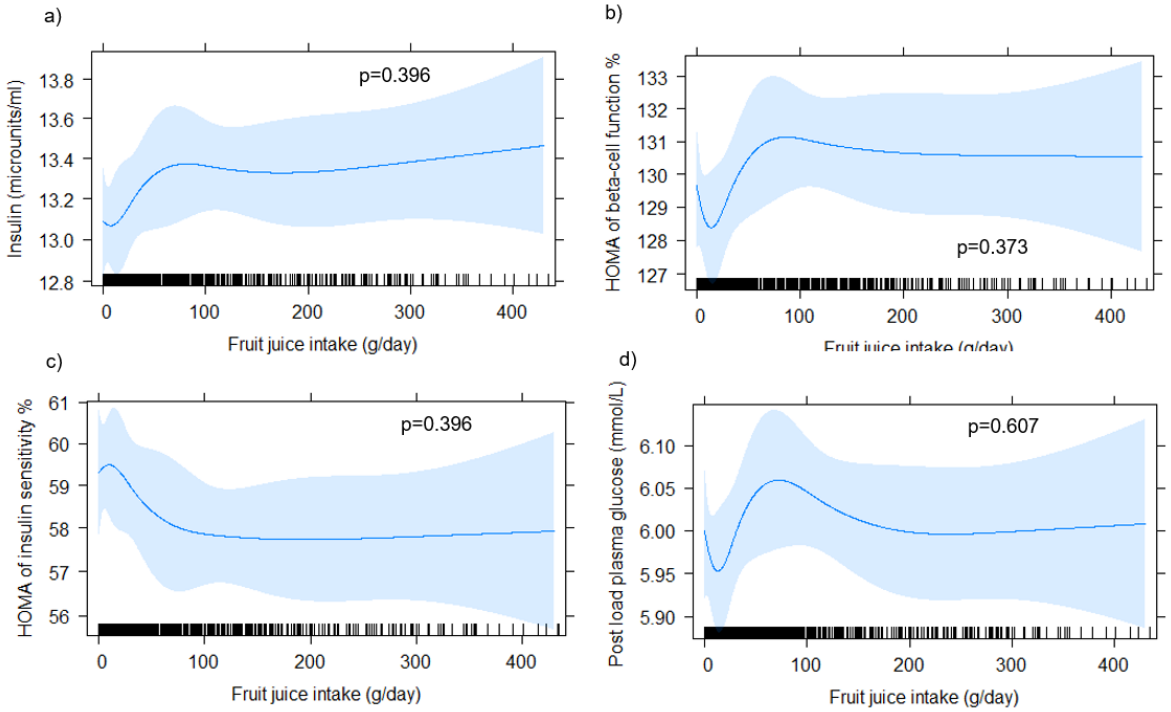
Supplementary Figure 3. Graphic representation of the multivariable-adjusted dose-response relationship between apple intake and baseline (a) serum insulin, (b) HOMA of β-cell function (c) HOMA of insulin sensitivity, and (d) post load plasma glucose, obtained by generalized regression models with the exposure included as a restricted cubic spline. Blue shading represents 95% confidence intervals. The rug plot along the bottom of each graph depicts each observation. All analyses were adjusted for age, sex, physical activity levels, level of education, SEIFA (socio-economical index for areas), income, BMI, smoking status, prevalence of cardiovascular disease, parental history of diabetes, and intakes of vegetables, alcohol, red meat, processed meat and energy. P-values for the effect of the exposure on the response (false discovery rate corrected) were obtained using likelihood ratio tests.



Supplementary Figure 4. Graphic representation of the multivariable-adjusted dose-response relationship between orange and other citrus fruit intake and baseline (a) serum insulin, (b) HOMA of β-cell function (c) HOMA of insulin sensitivity, and (d) post load plasma glucose, obtained by generalized regression models with the exposure included as a restricted cubic spline. Blue shading represents 95% confidence intervals. The rug plot along the bottom of each graph depicts each observation. All analyses were adjusted for age, sex, physical activity levels, level of education, SEIFA (socio-economical index for areas), income, BMI, smoking status, prevalence of cardiovascular disease, parental history of diabetes, and intakes of vegetables, alcohol, red meat, processed meat and energy. P-values for the effect of the exposure on the response (false discovery rate corrected) were obtained using likelihood ratio tests.



Supplementary Figure 5. Graphic representation of the multivariable-adjusted dose-response relationship between banana intake and baseline (a) serum insulin, (b) HOMA of β-cell function (c) HOMA of insulin sensitivity, and (d) post load plasma glucose, obtained by generalized regression models with the exposure included as a restricted cubic spline. Blue shading represents 95% confidence intervals. The rug plot along the bottom of each graph depicts each observation. All analyses were adjusted for age, sex, physical activity levels, level of education, SEIFA (socio-economical index for areas), income, BMI, smoking status, prevalence of cardiovascular disease, parental history of diabetes. P-values for the effect of the exposure on the response (false discovery rate corrected) were obtained using likelihood ratio tests.



Supplementary Figure 6. Graphic representation of the multivariable-adjusted dose-response relationship between fruit juice intake and baseline (a) serum insulin, (b) HOMA of β-cell function (c) HOMA of insulin sensitivity, and (d) post load plasma glucose, obtained by generalized regression models with the exposure included as a restricted cubic spline. Blue shading represents 95% confidence intervals. The rug plot along the bottom of each graph depicts each observation. All analyses were adjusted for age, sex, physical activity levels, level of education, SEIFA (socio-economical index for areas), income, BMI, smoking status, prevalence of cardiovascular disease, parental history of diabetes, and intakes of vegetables, alcohol, red meat, processed meat and energy. P-values for the effect of the exposure on the response (false discovery rate corrected) were obtained using likelihood ratio tests.