Supplementary Online Content

Semnani-Azad Z, Khan TA, Blanco Mejia S, et al. Association of major food sources of fructose-containing sugars with incident metabolic syndrome: a systematic review and meta-analysis. *JAMA Netw Open*. 2020;3(7):e209993. doi:10.1001/jamanetworkopen.2020.9993

This supplementary material has been provided by the authors to give readers additional information about their work.

eAppendix 1. Details on GRADE

GRADE (Grading of Recommendations Assessment, Development and Evaluation) was used to evaluate the quality of each study. Evidence extracted from observational studies were defaulted to 'low'- certainty and were downgraded or upgraded based on pre-specified criteria. Criteria to downgrade included risk of bias (weight of studies show risk of bias as assessed by NOS<6), inconsistency (substantial unexplained inter-study heterogeneity I^2>50%, P_Q<0.10), indirectness (presence of factors that limit the generalizability of the results), imprecision in the pooled risk estimate (the 95% CI for risk estimates that cross a minimally important difference of 5% for benefit or harm [RR 0.95–1.05]), and publication bias (evidence of small-study effects). Upgraded criteria included a large magnitude of effect (RR>2 or RR<0.5 in the absence of plausible confounders), dose–response gradient, and attenuation of the pooled effect estimate by plausible confounders.

eAppendix 2. Conversion of OR to RR

For studies with reported hazard ratios, low incidence of MetS (<10%) or odds ratios (OR) between 0.5 and 2.5, values were treated as RRs. OR were converted to RR if OR was less than 0.5 or greater than 2.5 with an incident of MetS greater than 10%. As outlined by Zhang et al.[1], the following formulae and logic were applied:

$$OR = \frac{\left(\frac{P_1}{1 - P_1}\right)}{\left(\frac{P_0}{1 - P_0}\right)}$$

Thus,

$$\frac{P_1}{P_0} = \frac{OR}{[(1 - P_0) + (P_0 \, x \, OR)\,]}$$

RR = $\frac{P_1}{P_0}$, therefore:

$$RR = \frac{OR}{[(1 - P_0) + (P_0 \, x \, OR)\,]}$$

P_0 = incidence of the outcome of interest in the non-exposed group; P_1 = incidence of the outcome of interest in the exposed group.

eAppendix 3. Method for Dose-Response Analysis

We modelled dose-response model using RR and 95% CIs from dose categories to understand the shape of the association between the dose of the food source of fructose-containing sugar and the risk of MetS. Data on the dose, distribution of cases and person-years, RRs and 95% CIs were extracted from each study. We defined the assigned dose as the mean consumption in each reported category or quantile. If the assigned were not reported, we approximated the mean dose for each category by using the midpoint of its lower and upper bounds. If the lowest category of a study was open ended, we defined the lowest dose as zero. For open-ended upper categories, we took half of the adjacent category range to estimate the assigned dose. When cohort size or person-year per category were not available, categories were regarded equal in size and follow-up and the case number per category was obtained by the method of Bekkering[2]. We excluded studies from the dose–response meta-analysis that did not report any dose category cut points for the particular food source and studies that provided only RR estimates based on 1-unit increment in dose based on a linear model because these studies were unable to contribute to the assessment of departure from linearity. We fitted a dose-response relationship using restricted cubic splines with 3 knots at 15th, 50th and 85th percentiles of distribution taking into account the correlation within each category of published RRs and combining the study-specific estimates the one-stage linear mixed-effects meta-analysis [3]. This method estimates the study specific slope lines and combines them to obtain an overall average slope based upon the work of Greenland [4] and Orsini [5]. If restricted cubic splines could not be calculated due to limited number of observations, we fitted a second order fractional polynomial curve to the data [5] and tested for goodness-of-fit of the model using Akaike information criterion (AIC), deviance test (D) and the coefficient of determination (R2) to select the best-fitting model [6]. We reported non-linear associations for a study if Wald test for departure from linearity was significant at $p<0.10$. RRs below 1 were considered as protective and above 1 as adverse association.

eAppendix 4. Definition of MetS

The harmonized criteria classification for MetS takes into account definitions set by the International Diabetes Federation (IDF) and the American Heart Association/ National Heart, Lung, and Blood Institute ATPIII.[7] Both IDF and ATP III definitions include thresholds for waist circumference, elevated triglycerides of ≥150 mg/dL, low HDL of <40 mg/dL in males and <50 mg/ in females, elevated blood pressure of systolic ≥130 and/or diastolic ≥85 mm Hg, and elevated fasting blood glucose of ≥150 mg/d.[8] The ATP III identifies MetS as the presence of any 3 of 5 risk factors. The IDF defines MetS as the presence of abdominal obesity measured through waist circumference, with the addition of any 2 of 4 risk factors. The harmonized criteria defines MetS as the presence of any 3 of 5 risk factors, with specific waist circumference cut-points depending on ethnicity.[8]

eTable 1. Search Strategy.

MEDLINE		EMBASE		Cochrane	
1	sugar*.mp.	1	sugar*.mp.	1	sugar*.mp.
2	exp fructose/	2	exp sugar/	2	exp fructose/
3	fructose.mp.	3	exp fructose/	3	fructose.mp.
4	HFCS.mp.	4	fructose.mp.	4	HFCS.mp.
5	exp High Fructose Corn Syrup/	5	HFCS.mp.	5	exp Nutritive Sweeteners/
6	sucrose.mp.	6	exp high fructose corn syrup/	6	sucrose.mp.
7	exp Dietary Sucrose/	7	sucrose.mp.	7	exp dietary sucrose/
8	sugar sweetened beverage*.mp.	8	exp dietary sucrose/	8	sugar sweetened beverage*.mp.
9	SSB.mp.	9	sugar sweetened beverage*.mp.	9	ssb.mp.
10	soda.mp.	10	SSB.mp.	10	soda.mp.
11	soft drink*.mp.	11	soda.mp.	11	soft drink*.mp.
12	exp Carbonated Beverages/	12	soft drink*.mp.	12	exp carbonated beverages/
13	carbonated beverages.mp.	13	exp soft drink/	13	non alcoholic beverage*.mp.
14	non alcoholic beverage*.mp.	14	exp Carbonated Beverages/	14	nonalcoholic beverage*.mp.
15	nonalcoholic beverage*.mp.	15	carbonated beverages.mp.	15	exp energy drinks/
16	exp Energy Drinks/	16	non alcoholic beverage*.mp.	16	energy drink*.mp.
17	energy drink*.mp.	17	nonalcoholic beverage*.mp.	17	smoothie*.mp.
18	smoothie*.mp.	18	exp energy drink/	18	((fruit or vegetable) and juice*).mp.
19	exp "Fruit and Vegetable Juices"/	19	energy drink*.mp.	19	fruit.mp.
20	fruit.mp.	20	smoothie*.mp.	20	exp fruit/
21	exp Fruit/	21	exp "fruit and vegetable juice"/	21	exp honey/
22	exp Honey/	22	fruit.mp.	22	y*g*rt.mp.
23	y*g*rt.mp.	23	exp fruit/	23	exp yogurt/
24	exp Yogurt/	24	exp honey/	24	ice cream*.mp.
25	ice cream*.mp.	25	y*g*rt.mp.	25	icecream*.mp.
26	icecream*.mp.	26	exp yoghurt/	26	exp ice cream/
27	exp Ice Cream/	27	exp ice cream/	27	cereal*.mp.
28	cereal*.mp.	28	ice cream*.mp.	28	dessert*.mp.
29	exp edible grain/	29	icecream*.mp.	29	sweets.mp.
30	dessert*.mp.	30	cereal*.mp.	30	confection*.mp.
31	sweets.mp.	31	dessert*.mp.	31	pastries.mp.
32	confection*.mp.	32	sweets.mp.	32	biscuit*.mp.
33	pastries.mp.	33	confection*.mp.	33	cookie*.mp.
34	biscuit*.mp.	34	exp bakery product/	34	cake*.mp.
35	cookie*.mp.	35	pastries.mp.	35	candy.mp.

36	cake*.mp.	36	biscuit*.mp.	36	candies.mp.
37	candy.mp.	37	cookie*.mp.	37	exp candy/
38	candies.mp.	38	cake*.mp.	38	(chocolate adj2 milk).mp.
39	exp Candy/	39	candy.mp.	39	exp chocolate/
40	(chocolate adj2 milk).mp.	40	candies.mp.	40	Chocolate.mp
41	exp chocolate/	41	(chocolate adj2 milk).mp.	41	exp cacao/
42	Chocolate.mp	42	exp chocolate/	42	cacao.mp.
43	exp cacao/	43	Chocolate.mp	43	or/1-42
44	cacao.mp.	44	exp cacao/	44	cohort.mp.
45	or/1-44	45	cacao.mp.	45	exp Prospective Studies/
46	cohort.mp.	46	or/1-45	46	(prospective adj2 (cohort or study)).mp.
47	exp prospective study/	47	cohort.mp.	47	exp follow-up studies/
48	(prospective adj2 (cohort or study)).mp.	48	exp prospective study/	48	exp multivariate analysis/
49	exp Follow-Up Studies/	49	(prospective adj2 (cohort or study)).mp.	49	exp proportional hazards models/
50	exp Multivariate Analysis/	50	exp multivariate analysis/	50	follow up study.mp.
51	exp Proportional Hazards Models/	51	exp proportional hazards model/	51	(longitudinal adj2 study).mp.
52	follow up study.mp.	52	follow up study.mp.	52	or/44-51
53	(longitudinal adj2 study).mp.	53	(longitudinal adj2 study).mp.	53	metabolic syndrome.mp.
54	or/46-53	54	or/47-53	54	syndrome x.mp.
55	metabolic syndrome.mp.	55	metabolic syndrome.mp.	55	cardio-metabolic syndrome.mp.
56	syndrome x.mp.	56	syndrome x.mp.	56	MetS.mp.
57	cardio-metabolic syndrome.mp.	57	cardio-metabolic syndrome.mp.	57	or/53-56
58	MetS.mp.	58	MetS.mp.	58	43 and 52 and 57
59	or/55-58	59	or/55-58		
60	45 and 54 and 59	60	46 and 55 and 59		

Database	**Total**
MEDLINE: March week 3, 2020	402
EMBASE: March week 3, 2020	584
Cochrane: March week 3, 2020	76
Manual search	8
Total	**1071**
Duplicates	**396**
Final Total	**675**

eTable 2. Analysis of confounding variables among 13 studies of food sources of fructose-containing sugars and incident MetS.

Study	Appelhans et al., 2017 – SWAN[9]	Babio et al., 2015 - PREDIMED[10]	Cheraghi et al., 2016 – TLGS[11]	Duffey et al., 2010 – CARDIA[12]	Ferreira-Pego et al., 2016 – PREDIMED[13]	Hur et al., 2016 – KoCAS[14]	Kang and Kim, 2017 – KoGES[15]	Kim and Kim, 2017 – KoGES[16]	Lim and Kim , 2019 - KoGES[17]	Lutsey et al., 2008 - ARIC[18]	Mirmiran et al., 2014 – TLGS[19]	Mirmiran et al., 2015 – TLGS[20]	Sayon-Orea et al., 2015 – SUN[21]
Number of variables in fully adjusted model	10	23	0	10	26	4	14	12	14	14	15	12	15
PRESPECIFIED VARIABLES													
Age	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sex		✓		✓	✓	✓				✓	✓	✓	✓
Markers of overweight/ obesity (body mass index, weight, waist circumference, waist to hip ratio)		✓		✓	✓		✓	✓	✓		✓	✓	✓
Smoking	✓	✓		✓	✓		✓	✓	✓	✓	✓		✓
Family history of MetS								✓				✓	
Energy or caloric intake				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Diabetes							✓						
Physical activity	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓
Alcohol		✓		✓	✓		✓	✓	✓				✓
OTHER COVARIATE VARIABLES													
Ethnicity	✓			✓						✓			
Education	✓						✓	✓	✓	✓	✓		
Hypertension/SBP		✓			✓								
HDL cholesterol		✓			✓								
Vegetables		✓			✓				✓	✓	✓	✓	
Fruit		✓			✓					✓	✓	✓	
Whole grain									✓	✓			
Fibre							✓	✓		✓	✓	✓	
Saturated fat							✓						
Unsaturated fat							✓						
Red meat		✓			✓				✓	✓		✓	✓
Coffee												✓	
Meat and fish		✓			✓								
Anti-hypertensive medication		✓			✓								
HRT		✓			✓								
Menopause	✓												

Insulin		✓			✓								
OTHER													
Hormone therapy use	✓												
Depressive symptoms	✓												
Income	✓					✓	✓	✓	✓				
Study site	✓			✓					✓				
Hypoglycemia and hypolipidemic drug		✓											
Legume		✓			✓								
Cereal		✓			✓								
Baked goods		✓			✓								
Nuts		✓			✓								
Olive oil		✓			✓								
High fasting plasma glucose		✓			✓								
Hypertriglycermidemia		✓			✓								
Trans fat													
Glycemic index													
Magnesium													
Dairy products					✓				✓	✓			
Percentage of fat							✓						
Presence of disease							✓						
Income													
Residential location								✓					
Calcium								✓					
Weight change											✓		
Phytochemical index											✓		
Dietary total antioxidant capacity											✓		
Tea												✓	
French fries													✓
Fast food													✓
Mediterranean diet													✓
Sedentary behaviour													
Hours sitting													✓
Snacking between meals													✓
Special diet													✓
Refined grains									✓	✓			

✓ Means variable adjusted for in the most adjusted model.

eTable 3. Newcastle-Ottawa Scale (NOS) for assessing the quality of cohort studies.

Study, year	Selection*	Outcome†	Comparability‡	Total§
Appelhans et al. 2017[9]	4	2	2	8
Babio et al. 2015[10]	3	2	2	7
Cheraghi et al. 2016[11]	4	2	0	6
Duffey et al. 2010[12]	4	2	2	8
Ferreira-Pego et al. 2016[13]	3	3	2	8
Hur et al. 2016[14]	4	2	1	6
Kang and Kim 2017[15]	4	2	2	8
Kim and Kim 2017[16]	4	2	2	8
Lim and Kim 2019 [17]	4	2	2	8
Lutsey et al. 2008[18]	3	3	2	8
Mirmiran et al. 2014[19]	3	2	2	7
Mirmiran et al. 2015[20]	3	2	2	7
Sayon-Orea et al. 2015[21]	3	3	2	8

*Maximum 4 points awarded for cohort representativeness, selection of non-exposed cohort, exposure assessment, and demonstration outcome not present at baseline

†Maximum 3 points awarded for follow-up length, adequacy of follow-up, and outcome assessment

‡ Maximum 2 points awarded for controlling for the pre-specified primary confounding variable (age) and additional confounding variables.

§ A maximum of 9 points could be awarded

eTable 4. GRADE Assessment.

Quality assessment								Study event rates (%)	Estimate	Quality Importance
No. of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Publication bias**	**Other consideration**		**Relative Risk (95% CI)**	
SSB intake on incident MetS (follow-up mean 7.5 years)										
7[9,13,15,18-20]	Observational Studies	Not serious	Not serious*	Not serious	Not serious[≠]	Undetected[±]	Dose-response association[Θ]	7,406/20,480 (36%)	1.21 [1.06-1.37] **Linear DRM** $RR_{355\text{-ml/day}}$ 1.14 [1.05, 1.23]	⊕⊕⊕⊖ **MODERATE***[,≠,±,Θ] Upgrade due to dose-response association.
Mixed fruit juice intake on incident MetS (follow-up mean 3.4 years)										
3[13,14,20]	Observational Studies	Not serious	Not serious	Not serious	Not serious[≠≠]	Undetected[±]	Dose-response association[ΘΘ]	1,322/3,062 (43%)	1.13 [0.91-1.41] **Non-linear DRM** $RR_{125\text{-ml/day}}$ 0.58 [0.42, 0.79]	⊕⊕⊕⊖ **MODERATE**[≠≠, ±, ΘΘ] Upgrade for dose-response association.
100% Fruit juice intake on incident MetS (follow-up mean 5.1 years)										
2[12,13]	Observational Studies	Not serious	Not serious**	Not serious	Not serious[≠≠]	Undetected[±]	Dose-response association[ΘΘΘ]	1,389/5,464 (25%)	1.10 [0.84-1.44] **Non-linear DRM** $RR_{125\text{-ml/day}}$ 0.77 [0.61, 0.97]	⊕⊕⊕⊖ **MODERATE****[, ≠≠, ±, ΘΘΘ] Upgrade for dose-response association.
Fruit on incident MetS (follow-up mean 4.7 years)										
4[11,14,17]	Observational Studies	Not serious	Not serious	Not serious	Not serious[≠≠≠]	Undetected[±]	Dose-response association[ΘΘΘΘ]	3,002/10,074 (30%)	0.91 [0.89, 0.93] **Non-linear DRM** $RR_{80gl/day}$ 0.82 [0.78, 0.86]	⊕⊕⊕⊖ **MODERATE**[≠≠≠, ±,ΘΘΘΘ] Upgrade for dose-response association.
Yogurt intake on incident MetS (follow-up mean 3.4 years)										

5[10,11,16,21]	Observational Studies	Not serious	Not serious***	Not serious	Not serious####	Undetected±	Dose-response association ΘΘΘΘ	3,877/19,057 (20%)	0.83 [0.77, 0.90] **Non-linear DRM** $RR_{85\text{-g/day}}$ 0.66 [0.58, 0.76]	⊕⊕⊕⊖ **MODERATE*****,**####, ±, ΘΘΘΘ** Due to an upgrade for dose-response association.

eTable 4. GRADE Assessment *(Continued).*

Quality assessment								Study event rates (%)	Estimate	Quality Importance
No. of studies	**Design**	**Risk of bias**	**Inconsistency**	**Indirectness**	**Imprecision**	**Publication bias**	**Other consideration**		**Relative Risk (95% CI)**	
Honey intake on incident MetS (follow-up 2.05 years)										
1[11]	Observational Studies	Not serious	Undetected****	Serious ₸	Serious####	Undetected±	None	590/3,616 (16%)	1.00 [0.5, 2.00]	⊕⊖⊖⊖ **VERY LOW****, ₸,####,± Due to downgrade for serious indirectness and serious imprecision.
Ice-cream intake on incident MetS (follow-up 2.05 years)										
1[11]	Observational Studies	Not serious	Undetected****	Serious ₸	Serious####	Undetected±	None	590/3,616 (16%)	0.94 [0.84, 1.06]	⊕⊖⊖⊖ **VERY LOW****, ₸,####,± Due to downgrade for serious indirectness and serious imprecision.
Confectionary intake on incident MetS (follow-up 3 years)										
2[19]	Observational Studies	Not serious	Not serious	Serious ₸	Serious####	Undetected±	None	250/1,476 (17%)	1.21 [0.92, 1.60]	⊕⊖⊖⊖ **VERY LOW** ₸,####,± Due to downgrade for serious indirectness and serious imprecision.

* Although there was evidence of substantial inter-study heterogeneity (I^2 = 68%), the estimates were all in the same direction and there was considerable overlap. Therefore, we did not consider this as serious inconsistency.

** There was substantial heterogeneity (I^2 = 73%, P_Q= 0.05) in the pairwise analysis. This was explained by the non-linear dose-response model. Therefore, we did not downgrade for serious inconsistency.

*** Although there was evidence of substantial inter-study heterogeneity (I^2 = 65%), the estimates were all in the same direction and there was considerable overlap. Therefore, we did not consider this as serious inconsistency.

**** Not able to assess inconsistency due to only one study included.

Ŧ Downgrade for serious indirectness due to only one cohort available, therefore affecting the generalizability to the general population.

≠ No downgrade for serious imprecision as lower bound of 95% CI does not cross the clinically unimportant effects (RR 0.95 – 1.05).

The potential imprecision from pairwise meta-analysis was explained by the non-linear dose-response model. Therefore, we did not downgrade for serious imprecision for mixed fruit juice.

The potential imprecision from pairwise meta-analysis was explained by the non-linear dose-response model. Therefore, we did not downgrade for serious imprecision for 100% fruit juice.

No downgrade for serious imprecision as lower bound of 95% CI does not cross the clinically unimportant effects (RR 0.95 – 1.05).

No downgrade for serious imprecision as the upper bound of 95% CI (RR 0.90) does not include the threshold for clinically unimportant effects (RR 0.95 – 1.05).

Downgrade for serious imprecision as the lower bound of 95% CI (RR 0.50) includes clinically important benefit (RR <0.90) while the upper bound of the 95% CI (RR 2.00) includes the clinically important harm (RR >1.05).

Downgrade for serious imprecision as the lower bound of 95% CI (RR 0.84) includes clinically important benefit (RR <0.90) while the upper bound of the 95% CI (RR 1.06) includes the unimportant effects (RR 0.95 – 1.05).

####### Downgrade for serious imprecision as the lower bound of 95% CI (RR, 0.92) includes clinically unimportant effects (RR 0.95 – 1.05) while the upper bound of the 95% CI (RR, 1.60) includes the clinically important harm (RR >1.05).

± No downgrade for publication bias, as publication bias could not be assessed due to lack of power for assessing funnel plot asymmetry and small study effects (<10 cohorts included in our meta-analysis).

ɵ Linear dose response relationship with suggestion of positive association with risk SSB (P=0.001).

ɵɵ Non-linear dose response relationship with suggestion of inverse association with risk for mixed fruit juice (P<0.001).

ɵɵɵ Non-linear dose response relationship with suggestion of inverse association with risk for 100% fruit juice (P<0.01).

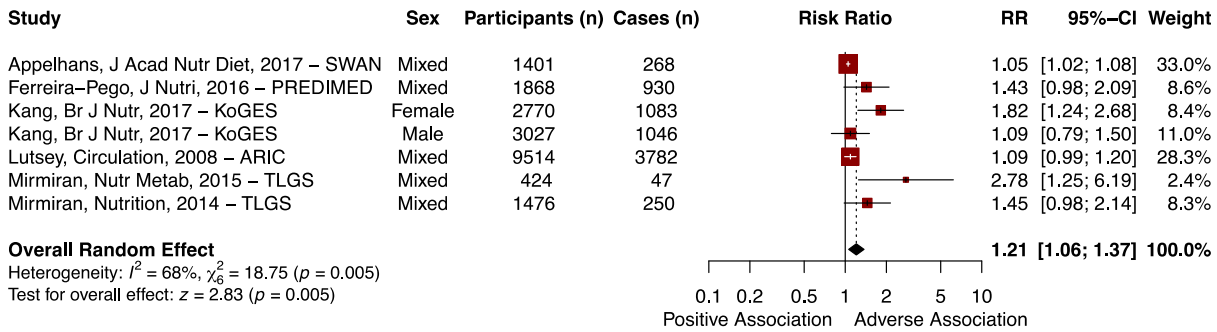
ɵɵɵɵ Linear and non-linear dose response relationship with suggestion of inverse association with risk for fruit (both P<0.001).

ɵɵɵɵɵ Linear and non-linear dose response relationship with suggestion of inverse association with risk for yogurt (both P<0.001).

DRM: Dose-response meta-analysis.

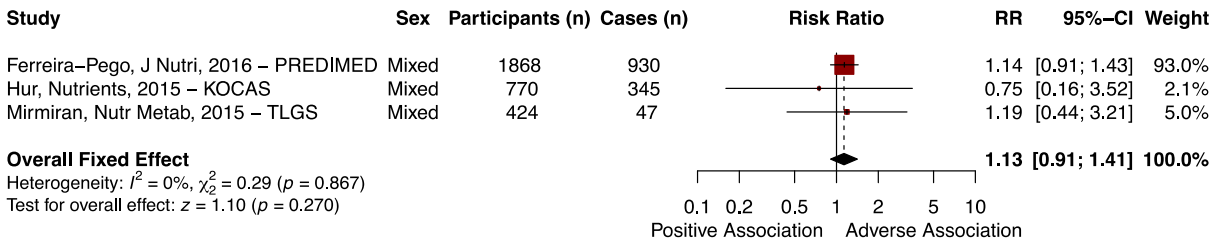
eTable 5. Sensitivity analysis for all food sources with more than 2 studies.

Removed Study	RR [95% CI]	P-value	Heterogeneity	
			I^2	P_Q
SSB				
All Studies Included	*1.21 [1.06, 1.37]*	*0.005*	*68%*	*0.005*
Appelhans, J Acad Nutr Diet, 2017 – SWAN[9]	1.37 [1.09, 1.71]	0.006	64%	0.016
Ferreira-Pêgo, J Nutri, 2016 – PREDIMED[13]	1.18 [1.04, 1.35]	0.013	69%	0.006
Kang, Br J Nutr, 2017 – KoGES (Female)[15]	1.13 [1.02, 1.26]	0.025	55%	0.048
Kang, Br J Nutr, 2017 – KoGES (Male) [15]	1.23 [1.07, 1.42]	0.005	73%	0.002
Lutsey, Circulation, 2008 – ARIC[18]	1.36 [1.07, 1.74]	0.012	73%	0.002
Mirmiran, Nutr Metab, 2015 – TLGS[20]	1.16 [1.03, 1.30]	0.011	62%	0.022
Mirmiran, Nutrition, 2014 – TLGS[19]	1.18 [1.04, 1.35]	0.013	69%	0.006
Mixed Fruit Juice				
All Studies Included	*1.13 [0.91, 1.43]*	*0.270*	*0%*	*0.867*
Ferreira-Pêgo, J Nutri, 2016 – PREDIMED[13]	1.04 [0.45, 2.40]	0.927	0%	0.622
Hur, Nutrients, 2015 - KoCAS[14]	1.14 [0.91, 1.43]	0.243	0%	0.934
Mirmiran, Nutr Metab, 2015 – TLGS[20]	1.13 [0.90, 1.42]	0.292	0%	0.599
FRUIT				
All Studies Included	*0.91 [0.89, 0.93]*	*<0.001*	*0%*	*0.778*
Cheraghi, Public Health, 2016 – TLGS[11]	0.91 [0.89, 0.93]	<0.001	0%	0.919
Hur, Nutrients, 2015 - KoCAS[14]	0.91 [0.89, 0.93]	<0.001	0%	0.628
Lim, Eur J Nutr, 2019 – KoGES (Female)[17]	0.91 [0.88, 0.95]	<0.001	0%	0.583
Lim, Eur J Nutr, 2019 – KoGES (Male)[17]	0.91 [0.88, 0.94]	<0.001	0%	0.580
YOGURT				
All Studies Included	*0.83 [0.77, 0.90]*	*<0.001*	*65%*	*0.021*
Babio, J Nutr, 2015 – PREDIMED[10]	0.85 [0.78, 0.92]	<0.001	72%	0.014
Cheraghi, Public Health, 2016 – TLGS[11]	0.74 [0.66, 0.82]	<0.001	0%	0.654
Kim, Br J Nutr, 2017 – KoGES (Female)[16]	0.85 [0.79, 0.93]	<0.001	66%	0.032
Kim, Br J Nutr, 2017 – KoGES (Male)[16]	0.85 [0.79, 0.93]	<0.001	61%	0.051
Sayon-Orea, BMC Public Health, 2015 – SUN[21]	0.83 [0.77, 0.90]	<0.001	74%	0.009



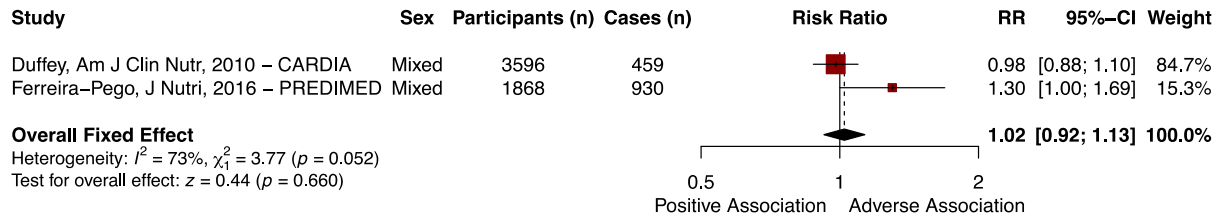
eFigure 1. Relationship between SSB intake and incident MetS.

The black diamond represents the pooled risk estimate. Inter-study heterogeneity was tested using the Cochran Q statistic (Chi^2) at a significance level of $P < 0.10$, and quantified by the I^2 statistic. An I^2 value $\geq 50\%$ is considered to indicate substantial heterogeneity. All results are presented as Relative Risks (RR) with 95% Confidence Intervals where estimable.



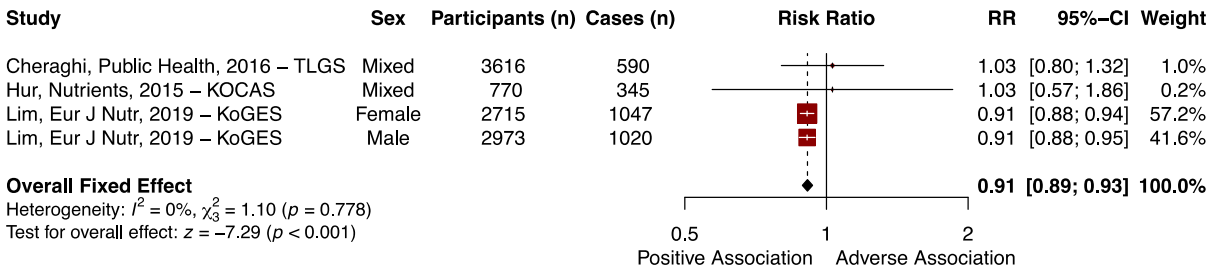
eFigure 2. Relationship between mixed fruit juice intake and incident MetS.

The black diamond represents the pooled risk estimate. Inter-study heterogeneity was tested using the Cochran Q statistic (Chi^2) at a significance level of $P < 0.10$, and quantified by the I^2 statistic. An I^2 value $\geq 50\%$ is considered to indicate substantial heterogeneity. All results are presented as Relative Risks (RR) with 95% Confidence Intervals where estimable.



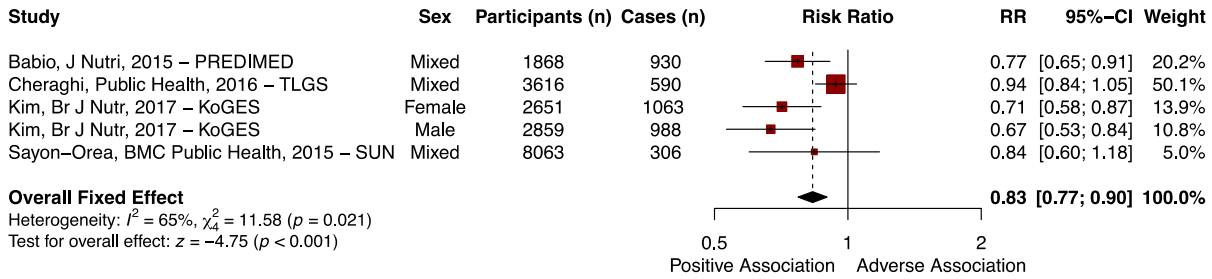
eFigure 3. Relationship between 100% fruit juice intake and incident MetS.

The black diamond represents the pooled risk estimate. Inter-study heterogeneity was tested using the Cochran Q statistic (Chi^2) at a significance level of $P < 0.10$, and quantified by the I^2 statistic. An I^2 value $\geq 50\%$ is considered to indicate substantial heterogeneity. All results are presented as Relative Risks (RR) with 95% Confidence Intervals where estimable.



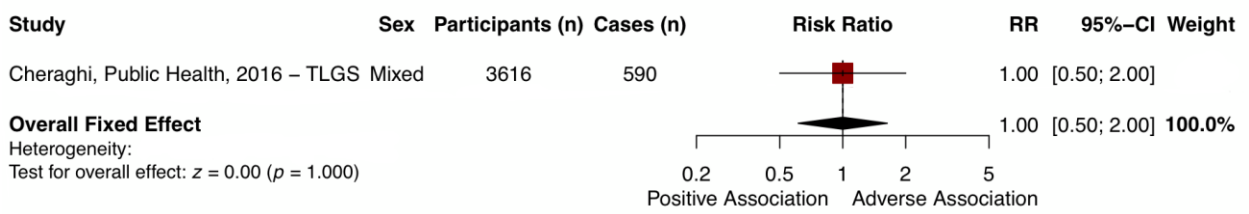
eFigure 4. Relationship between fruit intake and incident MetS.

The black diamond represents the pooled risk estimate. Inter-study heterogeneity was tested using the Cochran Q statistic (Chi^2) at a significance level of $P < 0.10$, and quantified by the I^2 statistic. An I^2 value $\geq 50\%$ is considered to indicate substantial heterogeneity. All results are presented as Relative Risks (RR) with 95% Confidence Intervals where estimable.



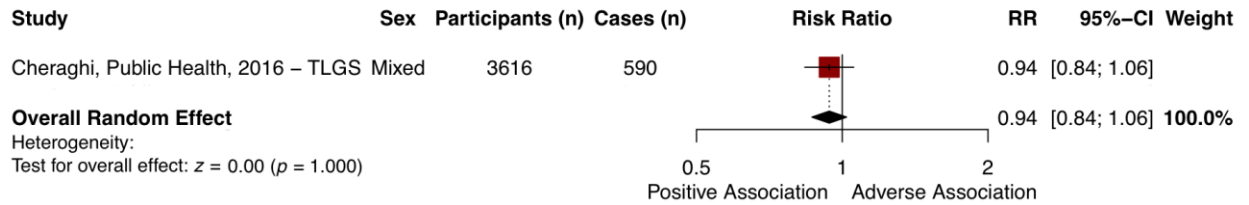
eFigure 5. Relationship between yogurt intake and incident MetS.

The black diamond represents the pooled risk estimate. Inter-study heterogeneity was tested using the Cochran Q statistic (Chi^2) at a significance level of $P < 0.10$, and quantified by the I^2 statistic. An I^2 value $\geq 50\%$ is considered to indicate substantial heterogeneity. All results are presented as Relative Risks (RR) with 95% Confidence Intervals where estimable.



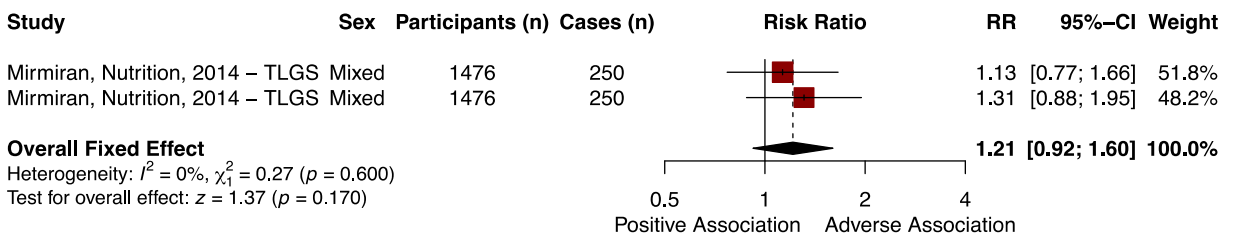
eFigure 6. Relationship between honey intake and incident MetS.

The black diamond represents the pooled risk estimate. Inter-study heterogeneity was tested using the Cochran Q statistic (Chi^2) at a significance level of $P < 0.10$, and quantified by the I^2 statistic. An I^2 value $\geq 50\%$ is considered to indicate substantial heterogeneity. All results are presented as Relative Risks (RR) with 95% Confidence Intervals where estimable.



eFigure 7. Relationship between ice-cream intake and incident MetS.

The black diamond represents the pooled risk estimate. Inter-study heterogeneity was tested using the Cochran Q statistic (Chi^2) at a significance level of $P < 0.10$, and quantified by the I^2 statistic. An I^2 value $\geq 50\%$ is considered to indicate substantial heterogeneity. All results are presented as Relative Risks (RR) with 95% Confidence Intervals where estimable.



eFigure 8. Relationship between confectionary intake (including cakes, biscuits, chocolate and candies) and incident MetS.

The black diamond represents the pooled risk estimate. Inter-study heterogeneity was tested using the Cochran Q statistic (Chi^2) at a significance level of $P < 0.10$, and quantified by the I^2 statistic. An I^2 value $\geq 50\%$ is considered to indicate substantial heterogeneity. All results are presented as Relative Risks (RR) with 95% Confidence Intervals where estimable.

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