Appendix H – Funnel plots. Intervention studies on metabolic diseases

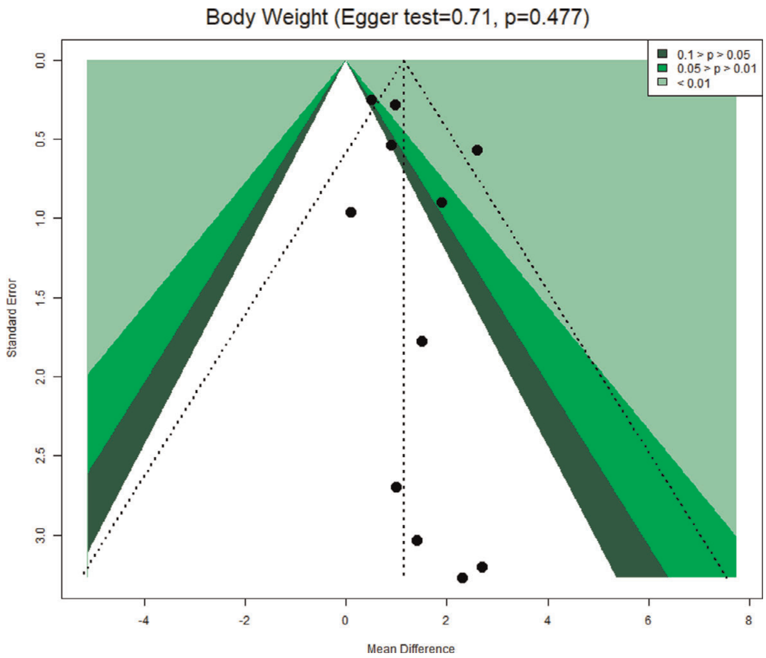


Figure H.1: RCTs on the effect of high vs. low sugar intake ad libitum on body weight

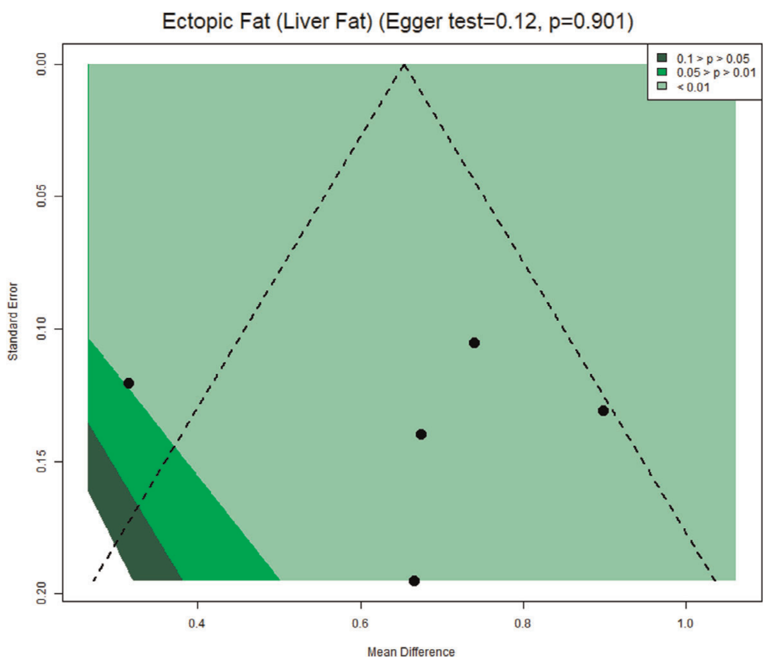


Figure H.2: RCTs on the effect of high vs. low sugar intake on liver fat

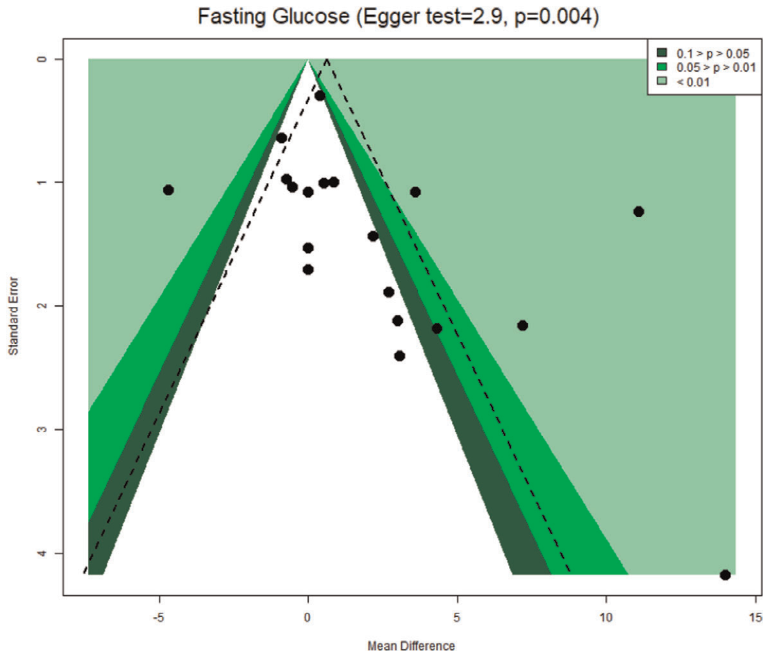


Figure H.3: RCTs on the effect of high vs. low sugar intake on fasting glucose

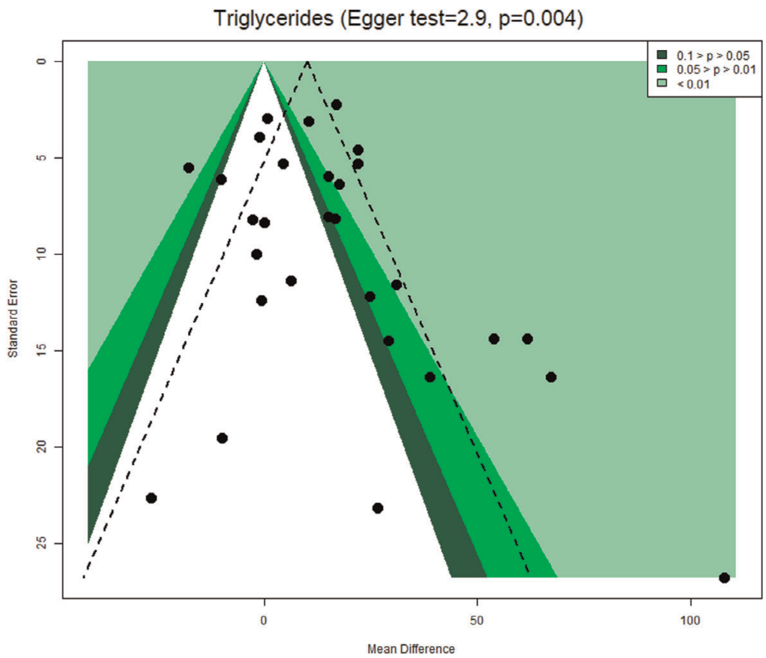


Figure H.4: Funnel plot. RCTs on the effect of high vs. low sugar intake on fasting triglycerides

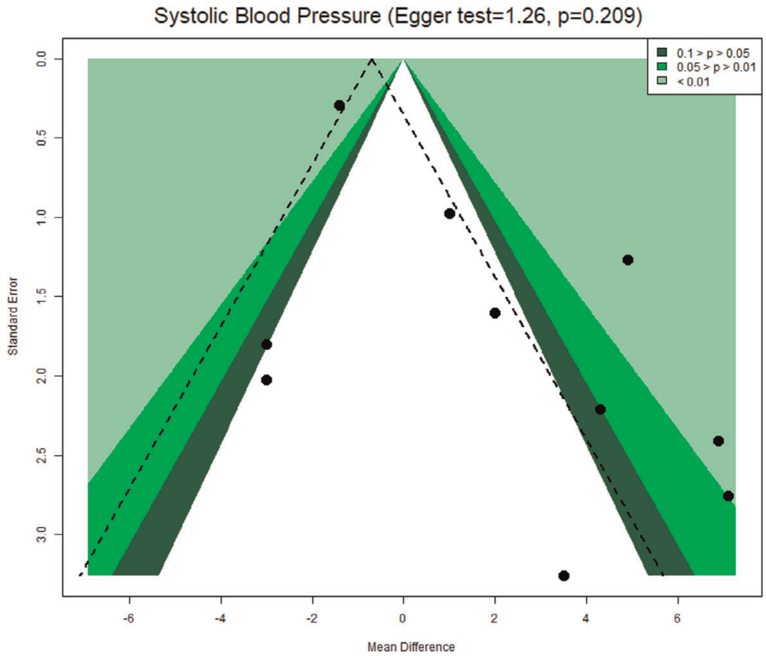


Figure H.5: Funnel plot. RCTs on the effect of high vs. low sugar intake on systolic blood pressure

Appendix I – Summary of risk of bias ratings for randomised controlled trials by type of design and endpoint

Reference	Randomisation	Allocation concealment	Blinding	Attrition	Exposure	Endpoint	Reporting	Other threats to interval validity	Tier
Campos et al. (2015)_SSBs	+	NR	-	+	++	NR	++	++	2
Ebbeling et al. (2012)_SSBs	++	++	--	++	+	++	++	++	1
Ruyter et al. (2014)_ SSBs	++	++	+	+	++	++	++	++	1
Hernandez-Cordero et al. (2014)_SSBs	++	++	--	+	--	++	++	++	2
Hollis et al. (2009)_SSBs	+	NR	+	+	+	+	++	+	1
Maersk et al. (2012)*_SSBs	++	NR	--	--	+	--	++	+	2
Markey et al. (2016)	++	+	++	+	+	++	++	++	1
Saris et al. (2000)*	+	+	-	-	+	+	++	++	1
Raben et al. (2002)*	+	NR	-	++	+	++	++	+	1
Smith et al. (1996)	++	NR	--	-	+	NR	++	+	2
Werner et al. (1984)	+	NR	--	++	+	-	++	-	2

Figure I.1: Summary of Risk of Bias ratings for RCTs on the effect of high vs. low sugar intake on body weight

Reference	Randomisation	Allocation concealment	Blinding	Attrition	Exposure	Endpoint	Reporting	Other threats to interval validity	Tier
Campos et al. (2015)_SSBs	+	NR	-	+	++	+	++	++	1
Lowndes et al. (2014b)*_SSBs	+	NR	-	-	+	+	++	-	2
Maersk et al. (2012)*_SSBs	++	NR	--	--	+	-	++	+	2
Umpleby et al. (2017)	++	++	NR	++	-	+	++	++	2

Figure I.2: Summary of Risk of Bias ratings for RCTs on the effect of high vs. low sugar intake on liver fat

Reference	Randomisation	Allocation concealment	Blinding	Attrition	Exposure	Endpoint	Reporting	Other threats to interval validity	Tier
Black et al. (2006)	++	+	+	+	+	++	++	++	1
Campos et al. (2015)_SSBs	+	NR	-	+	++	-	++	++	1
Hallfrisch et al. (1983a)*	NR	NR	NR	++	+	+	-	+	2
Hernandez-Cordero et al. (2014)_SSBs	++	++	--	+	--	++	++	++	2
Hollis et al. (2009)_SSBs	+	NR	+	+	+	+	++	+	1
Israel et al. (1983)*	+	+	+	++	++	+	++	+	1
Lewis et al. (2013)	++	NR	NR	++	+	+	++	++	1
Lowndes et al. (2014b)*_SSBs	+	NR	-	-	+	+	++	-	2
Lowndes et al. (2015)_SSBs	++	++	+	+	+	+	++	+	1
Maersk et al. (2012)*_SSBs	++	NR	--	--	+	+	++	+	2
Majid et al. (2013)_SSBs	++	NR	--	++	+	++	++	-	2
Markey et al. (2016)	++	+	++	+	+	++	++	++	1
Moser et al. (1986)	+	+	+	++	++	+	++	+	1
Raben et al. (2002)*	+	NR	-	++	+	++	++	+	1
Saris et al. (2000)*	+	+	-	-	+	++	++	+	1
Swanson et al. (1992)	+	NR	NR	++	++	+	++	++	1
Umpleby et al. (2017)	++	++	NR	++	-	+	++	++	2

Figure I.3: Summary of Risk of Bias ratings for RCTs on the effect of high vs low sugar intake on fasting glucose

Reference	Randomisation	Allocation concealment	Blinding	Attrition	Exposure	Endpoint	Reporting	Other threats to interval validity	Tier
Black et al. (2006)	++	+	+	+	+	++	++	++	1
Campos et al. (2015)_SSBs	+	NR	-	+	++	-	++	++	1
Gostner et al. (2005)	+	NR	+	++	++	+	++	+	1
Hallfrisch et al. (1983a)*	NR	NR	NR	++	+	+	-	+	2
Hernandez-Cordero et al. (2014)_SSBs	++	++	--	+	--	++	++	++	2
Hollis et al. (2009)_SSBs	+	NR	+	+	+	+	++	+	1
Huttunen et al. (1976)	--	--	--	++	+	+	++	-	2
Israel et al. (1983)*	+	+	+	++	++	+	++	+	1
Lewis et al. (2013)	++	NR	NR	++	+	+	++	++	1
Lowndes et al. (2014a)_SSBs	+	NR	-	+	+	+	++	++	1
Lowndes et al. (2014b)*_SSBs	+	NR	-	-	+	+	++	-	2
Maersk et al. (2012)*_SSBs	++	NR	--	--	+	+	++	+	2
Majid et al. (2013)_SSBs	++	NR	--	++	+	++	++	-	2
Markey et al. (2016)	++	+	++	+	+	++	++	++	1
Moser et al. (1986)	+	+	+	++	++	+	++	+	1
Raben et al. (2002)*	+	NR	-	++	+	++	++	+	1
Reiser et al. (1979a)*	-	NR	NR	+	+	+	++	++	2
Reiser et al. (1989a)*	NR	NR	+	+	++	++	++	+	2
Saris et al. (2000)*	+	+	-	-	+	++	++	+	1
Smith et al. (1996)	++	NR	--	-	+	+	++	+	2
Swanson et al. (1992)	+	NR	NR	++	++	+	++	++	1
Umpleby et al. (2017)	++	++	NR	++	-	+	++	++	2
Werner et al. (1984)	+	NR	--	++	+	+	++	-	2

Figure I.4: Summary of Risk of Bias ratings for RCTs on the effect of high vs. low sugar intake on fasting triglycerides

Reference	Randomisation	Allocation concealment	Blinding	Attrition	Exposure	Endpoint	Reporting	Other threats to interval validity	Tier
Black et al. (2006)	++	+	+	+	+	++	++	++	1
Campos et al. (2015)_SSBs	+	NR	-	+	++	NR	++	++	2
Hallfrisch et al. (1983b)*	NR	NR	NR	++	+	-	-	+	2
Hernandez-Cordero et al. (2014)_SSBs	++	++	--	+	--	++	++	++	2
Israel et al. (1983)*	+	+	-	++	++	-	++	+	2
Lewis et al. (2013)	++	NR	NR	++	+	-	++	++	2
Lowndes et al. (2014b)*_SSBs	+	NR	-	-	+	-/NR	++	-	2
Maersk et al. (2012)*_SSBs	++	NR	--	--	+	--	++	+	2
Markey et al. (2016)	++	+	++	+	+	++	++	++	1
Raben et al. (2002)*	+	NR	-	++	+	+	++	+	1

Figure I.5: Summary of Risk of Bias ratings for RCTs on the effect of high vs. low sugar intake on systolic blood pressure

Reference	Randomisation	Allocation concealment	Blinding	Attrition	Exposure	Endpoint	Reporting	Other threats to interval validity	Tier
Angelopoulos et al. (2015)*_SSBs	+	NR	-	+	+	+	++	+	1
Silbernagel et al. (2011)_SSBs	++	++	+	++	+	++	++	++	1
Koh et al. (1988)	NR	NR	-	++	++	+	++	+	2
Stanhope et al. (2009)*_SSBs	NR	NR	++	+	++	++	++	+	2

Figure I.6: Summary of Risk of Bias ratings for RCTs on effect of fructose vs. glucose on uric acid

Appendix J – General characteristics of observational studies on metabolic diseases

Note: Under exposure(s) assessed, all the exposures used as independent variables in relation to the endpoints in the original publications are listed. Among these, the exposures used for this scientific assessment are in **bold** and those not considered for the assessment are *in italics*.

Cohort Country References Funding	Population (original cohort)	Age (years) Gender	Exposure(s) assessed	Exposure assessment, time coverage and validation	Endpoints
AGAHLS Amsterdam Growth and Health Longitudinal Study The Netherlands Stoof et al. (2013) Mixed funding	N = 409 Children from two secondary schools in Amsterdam and the surrounding area Caucasian	13 year (mean) 52.1% females	**SSSD, SSFD, SSFJ** **SSSD, SSFD, TFJ**	Cross-check dietary history face-to-face interviews by a dietitian. Subjects were asked to recall the frequency of use and the amount of different foods and beverages during the previous month. No information on validation.	BMI Body fat Trunk fat
ALSPAC Avon Longitudinal Study of Parents and Children UK Johnson et al. (2007) Bigornia et al. (2015) Anderson et al. (2015) Cowin and Emmett (2001) Mixed funding	N = 15,247 General population living within a defined part of the country Caucasian	Birth 58.1% females	**Total sugars** **SSSD, SSFD** **100% FJs** *Carbohydrates* *Starch* *Protein* *Fat* *Milk* *Water* *PUFA* *SFA* *Vegetables* *Individual food items*	Three-day food diary covering 2 weekdays and 1 weekend day. Parents recorded their child's diet until the child reached age 10 year. SFFQ were also used at specified examinations, covering 43 items originally and growing to 68 items. FFQs had no portion size information included. No information on validation.	Body weight BMI WC Body fat NAFLD Blood lipids
ALSWH Australian Longitudinal Study on Women's Health Australia Looman et al. (2018) Public funding	N = 40,000 approximately Women from Australia's national health care system Caucasian	18–75 year Females	**Total sugars** **TFJ** *Carbohydrates* *LCD score* *Total dietary fibre* *Glycaemic index* *Glycaemic load* *Individual food groups/ items*	One self-administered SFFQ of 101 items – previous year. Portion sizes estimated with photo album. Two SFFQ completed but only the one done at baseline used for analysis. Validation for nutrients against 7-day food diaries of 63 women. Correlation coefficient of 0.78 for carbohydrates and 0.73 for total sugars.	GDM

Cohort **Country** **References** **Funding**	**Population (original cohort)**	**Age (years)** **Gender**	**Exposure(s) assessed**	**Exposure assessment, time coverage and validation**	**Endpoints**
Amsterdam The Netherlands Weijs et al. (2011) Public Funding	N = 226 General population Caucasian	4–13 mo 46.7% females	**SSSD, SSFD, TFJ** *Animal protein*	Two-day food record (1 weekday and 1 weekend) of actual consumption in portions (translated into weight by standard portion sizes) or weighed. Parents were asked to subtract spilled or not consumed amounts. No information on validation.	Overweight
ARIC Atherosclerosis Risk in Communities Study USA Bomback et al. (2010) Paynter et al. (2006) Public funding	N = 15,792 General population 78.1% White, 21.9% African American	45–64 year 55.2% females	**SSSD** **SSSD, FD and all FJs** *ASSD* *Coffee*	One interview administered SFFQ of 66 items – previous year. Specified portion sizes (frequency). Two SFFQ completed but only the one done at baseline used for analysis. Validation against four one-week records with a sample of 173 women who answered the 1980 Nurses' Health Study questionnaire.[23] Sucrose Pearson correlation coefficients (0.71).	Hyperuricaemia T2DM
BMES Blue Mountain Eyes Study Australia Goletzke et al. (2013a) Public funding	N = 3,654 General population Caucasian	67 year (median) 62.7% females	**Total sugars** *Glycaemic index* *Glycaemic load* *Starch* *Fibre*	One self-administered SFFQ of 145 items – previous year. Validated against 4-day weighed food records collected on three occasions during 1 year (sub-sample of the cohort n = 79). Correlation coefficient of 0.62 for carbohydrates and for total sugars.	Blood lipids
BWHS Black Women's Health Study USA Boggs et al. (2013)	N = 59,001 African American women	21–69 year Females	**SSSD** **SSFD and SSFJ** **100% FJs** (orange and grapefruit)	One self-administered SFFQ of 68 items – previous year. Specified portion sizes (frequency).	Obesity T2DM

[23] Willett WC, Sampson L, Stampfer MJ, Rosner B, Bain C, Witschi J, Hennekens CH and Speizer FE, 1985. Reproducibility and validity of a semiquantitative food frequency questionnaire. American Journal of Epidemiology, 122.

Cohort Country References Funding	Population (original cohort)	Age (years) Gender	Exposure(s) assessed	Exposure assessment, time coverage and validation	Endpoints
Palmer et al. (2008) Public funding			*Individual food items*	Baseline SFFQ validated for nutrients against 3-day food diaries and three 24-h recalls.[24] Pearson correlation coefficients (95% CI) for carbohydrates: – SFFQ vs. mean of 3 24-h recalls (n = 408): Crude 0.09 (−0.03, 0.25); energy-adjusted 0.30 (0.18,0.41); energy-adjusted and deattenuated 0.48 (0.29, 0.66) – FFQ vs. mean of a 3-day diary (n = 245): crude 0.20 (0.04, 0.32); energy-adjusted 0.26 (0.05, 0.39); energy-adjusted and deattenuated 0.35 (0.08, 0.48) – FFQ vs. mean of combined recall and diary data (n = 408): crude 0.13 (−0.03, 0.25); energy adjusted 0.30 (0.18, 0.40); energy adjusted and deattenuated 0.43 (0.26, 0.53)	
Camden USA Lenders et al. (1997) Public funding	N = 594 Pregnant adolescents 61% Black 30% Hispanic 9% White	12–19 year Females	**Total sugars**	Three 24-h dietary recall (interviewer administered) analysed for energy intake and nutrients, including total sugars No information about validation.	Birth weight
CARDIA Coronary Artery Risk Development in Young Adults USA	N = 5,115 General population of 4 centres selected to balance subgroups of	18–30 year 53.5% females	**Sucrose** **SSSD, SSFD** **100% FJ** *Low-fat milk* *Whole fat milk*	One interview-administered SFFQ – previous month Validation against a second SFFQ and seven 24-h recalls (n = 128 young adults)[25]	T2DM HTN Abdominal obesity Glucose homeostasis (FI)

[24] Kumanyika SK, Mauger D, Mitchell DC, Phillips B, Smiciklas-Wright H and Palmer J, 2003. Relative validity of food frequency questionnaire nutrient estimates in the Black Women's Health study. Annals of Epidemiology, 13, 111–118.

[25] McDonald A, Van Horn L, Slattery M, Hilner J, Bragg C and Caan B, 1991. The CARDIA dietary history: development, implementation and evaluation. Journal of American Diet Association, 91, 1104–1112.

Cohort Country References Funding	Population (original cohort)	Age (years) Gender	Exposure(s) assessed	Exposure assessment, time coverage and validation	Endpoints
Archer et al. (1998) Duffey et al. (2010) Folsom et al. (1996) Mixed funding	race, sex, education and age 52.6% Black, 47.4% White			Pearson correlation coefficients for total carbohydrates: White men 0.79 White women 0.89 Black men 0.43 Black women −0.22	Blood lipids
CoSCIS Copenhagen School Child Intervention Study Denmark Jensen et al. (2013) Mixed funding	N = 1,024 Children entering a public school in two suburbs of Copenhagen Caucasian	6 year (mean) 51.1% females	**SSSD** **SSSD, SSFD**	A 7-day food record administered by parents/caregivers when the children were 6 and 9 years, respectively. No information on validation.	BMI Body fat
CTS California Teachers Study USA Pacheco et al. (2020)‡ Public funding	N = 133,477 Female teachers from California 87.3% Caucasian and 12.7% all other races	22–104 year Females	**SSSD** **SSFD** **SSSD, SSFD** *Sweetened bottled water or tea*	One self-administered SFFQ of 103 items – previous year. Validated against a sub-sample of CTS using another FFQ and 4 x 24 h dietary recalls.[26] Correlation coefficient for SFFQ vs. 24 h recalls was 0.7 for carbohydrates.	CVD CHD Stroke Revascularisation
Daily-D Daily-D Health Study USA Van Rompay et al. (2015) Public funding	N = 690 General population from Boston area schools 45% Caucasian, 13% Black, 18% Hispanic, 9% Asian and 15% multi-racial/other	8–15 year 50.8% females	**SSSD, SSFD**	Three SFFQs of 78 items – past week use to estimate mean SSBs intake over 12 months. Validation against 2 x 24 hrs dietary recall by telephone in a sample of 83 children aged 10–17 years.[27] Deattenuated adjusted correlations (whole sample) for E% from carbohydrates = 0.69.	Blood lipids

[26] Horn-Ross PL, Lee VS, Collins CN, Stewart SL, Canchola AJ, Lee MM, Reynolds P, Clarke CA, Bernstein L and Stram DO, 2008. Dietary assessment in the California Teachers Study: reproducibility and validity. Cancer Causes Control, 19, 595–603.
[27] Cullen KW, Watson K and Zakeri I, 2008. Relative reliability and validity of the Block Kids Questionnaire among youth aged 10 to 17 years. Journal of American Diet Association, 108, 862–866.

Cohort Country References Funding	Population (original cohort)	Age (years) Gender	Exposure(s) assessed	Exposure assessment, time coverage and validation	Endpoints
DCH Diet, Cancer and Health Study Denmark Olsen et al. (2016) Mixed funding	N = 57,053 Inhabitants from Copenhagen and Aarhus counties Caucasian	50–64 year 49.4% females	**SSSD**	One self-administered SFFQ of 192 items – previous year. Validated against two 7-day diet records in a random sample of men and women from Copenhagen (aged 40–64 year).[28] Correlation coefficients for carbohydrates: 0.40 and 0.47 and for sucrose: 0.50 and 0.41, for men and women, respectively.	Body weight WC
DDHP Detroit Dental Health Project USA Lim et al. (2009) Mixed funding	N = 1,021 Low-income African American children from Detroit	3–5 year 51.6% females	**SSSD** **SSFD** **SSSD, SSFD**	One interview administered SFFQ (Block Kids Food Frequency Questionnaire) containing 75 questions and measuring intake of previous week. Validation against a similar cohort (age: 8.3 ± 0.3) of n = 129 that completed 3-day diaries (for 2 weekdays and 1 weekend day during a 7-day period.) Validity in the estimates of beverage intakes established for children aged 7–9y Spearman correlation coefficients (SFFQ vs. Diary)[29]: – SSSD+SSFD: 0.326 – Carbohydrate: 0.203	Overweight/obesity
DONALD Dortmund Nutritional and Anthropometric Longitudinally Designed Study Germany	N = > 1,300 General population from Dortmund Caucasian	birth 53.5% Females	**Free sugars** **SSSD, SSFD, SSFJ** **100% FJ** *Sugar from individual food groups* *Energy drinks*	3-day weighed dietary records (over 3 consecutive days). No information on validation.	BMIz-score Body fat Glucose homeostasis (HOMA-IR)

[28] Tjønneland A, Overvad K, Haraldsdottir J, Bang S, Ewertz M and Jensen OM, 1991. Validation of a semiquantitative food frequency questionnaire developed in Denmark. International Journal of Epidemiology, 20, 906–912.
[29] Teresa A, Marshall JM, Eichenberger G, Barbara B, Stumbo PJ and Levy SM, 2008. Relative validity of the Iowa Fluoride Study targeted nutrient semi-quantitative questionnaire and the Block Kids' Food questionnaire for estimating beverage, calcium, and vitamin D intakes by children. Journal of the American Dietetic Association, 108, 465–472.

Cohort Country References Funding	Population (original cohort)	Age (years) Gender	Exposure(s) assessed	Exposure assessment, time coverage and validation	Endpoints
Herbst et al. (2011) Libuda et al. (2008) Goletzke et al. (2013b) Public funding			*Carbohydrate* *Glycaemic index* *Glycaemic load* *Fibre* *Whole grain*		
ELEMENT Early Life Exposure in Mexico to Environmental Toxicants Mexico Cantoral et al. (2015) Public funding	N = 1,079 General population Hispanics	Birth 54% females	**SSSD, SSFD, SSFJ**	SFFQ of previous 3 months administered in each visit (8 visits, from when the child was 12mo to 5y in 6-months intervals). SFFQ included 116 foods grouped into 10 categories and beverages (natural juice, milk, sodas, commercial fruit drinks and flavoured water with sugar). Standard serving size used to obtain average daily intakes. SFFQ validated (24-h recall) with a random sample of women from medium to low socioeconomic status living in Mexico City. To assess the validity for carbohydrates of the questionnaire Pearson correlation coefficients between the average of 16 24-hour recalls and the first and second administration of the FFQ were calculated. – FFQ1 vs. 24-hr recall: Unadjusted 0.51; adjusted* 0.49; de-attenuated 0.52 – FFQ2 vs. 24-hr recall: Unadjusted 0.56; de-attenuated 0.57 – FFQ1 vs. FFQ2: Unadjusted 0.56; adjusted* 0[30] *adjusted for total energy intake At revisit (8 and 14y of age) SFFQ (ENSANUT 2006) was 'administered to the children who	Obesity Abdominal obesity

[30] HERNÁNDEZ-AVILA, Mauricio et al. Validity and reproducibility of a food frequency questionnaire to assess dietary intake of women living in Mexico City. **Salud Pública de México**, [S.l.], v. 40, n. 2, p. 133-140, mar. 1998. ISSN 1606-7916. Available online: https://saludpublica.mx/index.php/spm/article/view/6068/7081 [Accessed: 20 September 2019].

Cohort Country References Funding	Population (original cohort)	Age (years) Gender	Exposure(s) assessed	Exposure assessment, time coverage and validation	Endpoints
				were assisted – this instrument used a 1-week recall period and queried about the consumption of natural juices, commercial fruit drinks, flavoured water with sugar, tap water, sodas, diet sodas, whole fat milk, coffee and tea'.	
EPIC-Diogenes European Prospective Investigation into Cancer and Nutrition-Diet, Obesity and Genes project IT, UK, NL, DE, DK Romaguera et al. (2011) Public funding	N = 146,543 General population from 5 countries (8 sites) Caucasian	20–60 year 59.5% females	**SSSD** **TFJ** *Individual food items/ groups*	Country-specific self-administered SFFQs. Validation against 24-h dietary recalls or weighted food records.[31]	WC_{BMI}
EPIC-Interact European Prospective Investigation into Cancer and Nutrition-InterAct project DK, FR, DE, IT, NL, ES, SE, UK Sluijs et al. (2013) InterAct consortium (2013) Public funding	**N** = 29,238 Mainly general population Caucasian	35–70 year 62% females	**Total sugars** **SSSD, SSFD** **TFJ** *ASSD* *ASSD, SSSD, SSFD* *Glycaemic index* *Glycaemic load* *Digestible carbohydrates* *Starch*	One baseline assessment Quantitative dietary questionnaire with individual portion sizes: France, Spain, The Netherlands, Germany and Italy. SFFQ: Denmark, Naples (Italy), Sweden and the UK. Each dietary assessment tool was validated locally.[32] Validation against 24-h dietary recalls or weighted food records. Correlation coefficients varied from 0.40 in Denmark to 0.84 in Spain for men and from	T2DM

[31] Kaaks R and Riboli E, 1997. Validation and calibration of dietary intake measurements in the EPIC project: methodological considerations. European Prospective Investigation into Cancer and Nutrition. International Journal of Epidemiology, 26(Suppl 1), S15–S25.

[32] Bingham SA, Gill C, Welch A, Day K, Cassidy A, Khaw KT, Sneyd MJ, Key TJ, Roe L and Day NE, 1994. Comparison of dietary assessment methods in nutritional epidemiology: weighed records v. 24 h recalls, food-frequency questionnaires and estimated-diet records. British Journal of Nutrition, 72, 619–643; Margetts BM and Pietinen P, 1997. European Prospective Investigation into Cancer and Nutrition: validity studies on dietary assessment methods. International Journal of Epidemiology, 26:S1–5. Available online: https://epic.iarc.fr/about/dietaryexposure.php

Cohort Country References Funding	Population (original cohort)	Age (years) Gender	Exposure(s) assessed	Exposure assessment, time coverage and validation	Endpoints
				0.46 in Malmo (Sweden) to 0.78 in Spain for women.	
EPIC-Morgen European Prospective Investigation into Cancer and Nutrition-Morgen cohort The Netherlands Burger et al. (2011) Public funding	N = 22,654 General population Caucasian	20–65 year 54.8% females	**Total sugars** *Glycaemic index* *Glycaemic load* *Carbohydrates* *Starch*	One self-administered SFFQ of 79 items– previous year. The questionnaire contained photographs of 21 foods in different sizes. For most other items, the consumption frequency was asked in number of specified units; for a few foods a standard portion size was assumed.[33] Validation against twelve 24-h recall. Person correlation for carbohydrate was 0.74 (men) and 0.76 (women)	CHD Stroke
EPIC-Multicentre European Prospective Investigation into Cancer and Nutrition- Multiple countries DK, DE, GR, FR, NL, UK, NO, ES, SE, IT Mullee et al. (2019)‡ Sieri et al. (2020)‡ Public funding	N = 521,330 General population Caucasian	35–70 year 71% females	**Total sugars** **SSSD, SSFD** *ASSD* *SSSD, SSFD, ASSD* *Glycaemic load* *Glycaemic index* *Carbohydrates* *Starch*	Self-administered SFFQ (no. of items varied depending on study location – up to 260 items) were used in all centres, except in Greece, Spain and Ragusa (Italy), where data were collected during personal interviews. In Malmö (Sweden), a combined SFFQ and 7-day dietary diary and diet interview was used. Validation methods varied on type of assessment method used at each site. Correlation coefficients were country specific, but range from 0.46 to 0.77 for soft or non-alcoholic drinks (in the Netherlands, France, Germany and Spain).	CVD CHD Stroke
EPIC-Norfolk European Prospective Investigation into Cancer and Nutrition-Norfolk cohort	N = 25,639 General population Caucasian	39–79 year 54% females	**Total sucrose** **Free glucose** **Free fructose** **SSSD, SSFD**	7-day diet diary (several completed throughout the year, for four years) and a self-administered SFFQ of 130-item. First day of diary completed as a 24-h recall with a trained interviewer.	WC BMI T2DM

[33] Ocké, MC, Bueno-de-Mesquita, HB, Goddijn, HE, Jansen, A, Pols, MA, van Staveren, WA & Kromhout, D. (1997). The Dutch EPIC food frequency questionnaire. I. Description of the questionnaire, and relative validity and reproducibility for food groups. International journal of epidemiology, 26 Suppl 1, S37–S48.

Cohort Country References Funding	Population (original cohort)	Age (years) Gender	Exposure(s) assessed	Exposure assessment, time coverage and validation	Endpoints
UK Ahmadi-Abhari et al. (2014) Kuhnle et al. (2015) Public funding			**TFJ** *ASBs* *Sweetened tea or coffee* *Sweetened-milk beverages* *Starch* *Total carbohydrates* *Lactose* *Maltose*	The 7-day diet diary and the SFFQ were repeated at 18 months to ascertain details of changes in health since recruitment.[34] Validation was done for nutrients. (n = 300, subsample of the original Norfolk cohort) Pearson correlation coefficients for sugars: – 1st vs. 2nd diary: 0.75 – 1st vs. 2nd SFFQ: 0.67 – 1st diary vs. 1st SFFQ: 0.53 – 1st diary vs. 1st 24-h recall: 0.57	
EPICOR European Prospective Investigation into Cancer and Nutrition-Italian cohort Italy Sieri et al. (2010) Sieri et al. (2013) Public funding	N = 47,749 General population Caucasian	35–75 year 69% females	**Total sugars** *Carbohydrates* *Carbohydrates from high-GI food* *Carbohydrates from low-GI food* *Starch* *Glycaemic index* *Glycaemic load* *Fibre*	SFFQ – previous year. Three different types: One for northern and central Italian centres (self-administered), one for Ragusa (administered by trained interviewers) and one for Naples (administered by trained interviewers) Validation for food groups and sugar against 24-h recall and between questionnaires. Correlation coefficient for sugar: Men Q1-Q2 0.62; Q1-24-h 0.51. for women Q1-Q2 0.66; Q1-24-h 0.26[35]	CHD Stroke
EPIC-Utrecht European Prospective Investigation into Cancer and Nutrition-Utrecht cohort The Netherlands Beulens et al. (2007) Public funding	N = 17,357 Breast cancer screening participants Caucasian	49–70 year Females	**Total sugars** *Carbohydrates* *Polysaccharides* *Glycaemic load* *Glycaemic index*	SFFQ – previous year. 77 main food items. Portion sizes assessed for 28 items. Total of 178 foods. Validation against 12 24-h recalls. Spearman correlations were 0.76 for carbohydrates and 0.74 for fibre, and 0.78, 0.56, 0.69 and 0.70 for bread, fruit, sweets and potatoes, respectively	CVD CHD Stroke

[34] Bingham SA, Welch AA, McTaggart A, Mulligan AA, Runswick SA and Luben R. Nutritional methods in the European prospective investigation of cancer in Norfolk. Public Health Nutrition, 4, 847–858.
[35] Pisani P, Faggiano F, Krogh V, Palli D, Vineis P and Berrino F, 1997. Relative validity and reproducibility of a food frequency dietary questionnaire for use in the Italian EPIC centres International Journal of Epidemiology, 26(Suppl. 1), S152–S60.

Cohort Country References Funding	Population (original cohort)	Age (years) Gender	Exposure(s) assessed	Exposure assessment, time coverage and validation	Endpoints
FMCHES Finnish Mobile Clinic Health Examination Survey Finland Montonen et al. (2007) Public funding	N = 51,522 General population Caucasian	40–69 year 47% females	**Total sugars** **Sucrose** **Fructose+glucose** **Free fructose** **Free glucose** **SSSD** *Lactose* *Maltose* *Honey and syrup* *Jam and marmalade* *SS berry juice* *Table sugar*	Dietary history interview[36] SFFQ of 100 food items and mixed dishes and administered by trained interviewers – previous year Validated against dietary history interviews repeated after 4–7 years. Intraclass correlation coefficient for carbohydrates: men 0.41, women 0.39	T2DM
Framingham-3Gen Framingham-Third Generation cohort USA Ma et al. (2016b) Haslam et al. (2020)‡ Public funding	**N** = 4,095 General population Caucasian	19–72 year 45% females	**SSSD, SSFD** **100% FJ** *ASSD* *LCSB*	SFFQ of 126 items – previous year Validation against 7-day diet record with 157 men. Correlation coefficient for SSBs was 0.51, 0.84 for sugar sweetened cola, 0.55 for other sweetened soft drinks and for diet soda 0.66.	Ectopic fat (VAT and VAT:SAAT ratio) Blood lipids
Framingham-Offspring Framingham-Offspring cohort USA Ma et al. (2016a) Pase et al. (2017) Haslam et al. (2020)‡ Public funding	N = 5,135 General population Caucasian	30–59 year 53.1% females	**SSSD, SSFD** **SSSD, SSFD, 100% FJ** **100% FJ** *ASSD* *LCSB*	Three self-administered SFFQ of 126 items – previous year Average of all available SFFQs until diagnosis of the outcome Validation against 7-day diet record with 157 men. Correlation coefficient for SSBs was 0.51, 0.84 for sugar sweetened cola, 0.55 for other sweetened soft drinks and for diet soda 0.66.	Glucose homeostasis (HOMA-IR) Prediabetes or T2DM (composite endpoint) Stroke Blood lipids

[36] Järvinen R, 1996. Epidemiological follow-up study on dietary antioxidant vitamins. Results from the Finnish Mobile Clinic Health Examination Survey. Helsinki: Social Insurance Institution, Studies in Social Security and Health 11.

Cohort Country References Funding	Population (original cohort)	Age (years) Gender	Exposure(s) assessed	Exposure assessment, time coverage and validation	Endpoints
GeliS Germany Günther et al. (2019)‡ Public funding	N = 2,286 Pregnant women with a singleton pregnancy Caucasian	18–43 year Females	**SSSD** *Carbohydrates* *Saccharose* *Protein* *Fat* *Alcohol* *Caffeine* *Light drinks* *Vegetables* *Fruits* *Dairy products* *Meat* *Sweets and snacks* *Fast food*	Two (early and late pregnancy) self-administered SFFQs of 54 items – past month. Validated against two 24-h dietary recalls (in sample of 161 participants aged 18–80y). Correlation coefficient of 0.61 for non-alcoholic beverages for all participants and 0.59 for females only.[37]	Birthweight
Generation R Generation R Study The Netherlands Leermakers et al. (2015) Mixed funding	N = 9,749 General population Caucasian	1.08 year (median) 50.1% females	**SSSD, SSFD, TFJ**	A SFFQ of 211 items completed by primary caregiver – previous year. Validated against 3-day 24-h recalls carried out by trained nutritionists. Correlation coefficient of 0.4 for carbohydrates and of 0.76 for sugar-containing beverages.	Obesity
Girona Spain Funtikova et al. (2015) Public funding	N = 3,058 General population Caucasian	25–74 year 49% females	**SSSD** **100% FJ** *Whole milk* *Skim and low-fat milk*	Interview administered SFFQ administered at baseline and follow-up. 166-item food list including alcoholic and non-alcoholic beverages. Medium servings and units (slices, glass, teaspoons etc.) were specified for each food item. A subset of participants repeated the 72-h recall (n = 19) and the FFQ (n = 29) for repeatability analysis purposes.[38] Correlation coefficient for carbohydrates was 0.71.	Abdominal obesity

[37] Haftenberger M, Heuer T, Heidemann C, Kube F, Krems C and Mensink GBM, 2010. Relative validation of a food frequency questionnaire for national health and nutrition monitoring. Nutrition Journal, 9, 36.
[38] Schroder H, Covas MI, Marrugat J, Vila J, Pena A, Alcantara M and Masia R, 2001. Use of a three-day estimated food record, a 72-hour recall and a food-frequency questionnaire for dietary assessment in a Mediterranean Spanish population. Clinical Nutrition, 20, 429–437.

Cohort **Country** **References** **Funding**	**Population (original cohort)**	**Age (years)** **Gender**	**Exposure(s) assessed**	**Exposure assessment, time coverage and validation**	**Endpoints**
GUTS Growing Up Today Study USA Field et al. (2003) Berkey et al. (2004) Mixed funding	N = 16,882 Offspring of participants from NHSII Majority (94.7%) Caucasian	9–14 year 55% females	**SSSD, SSFD** **100% FJ** *Milk* *ASSD* *Fruit* *Vegetables*	A self-administered SFFQ of 132 items -previous year.[39] Validated against three 24-h recalls.[40] Correlation coefficient for nutrients from the FFQ compared with three 24-h recalls was r = 0.54.	BMIz-score
GUTSII Growing Up Today Study-II USA Field et al. (2014) Study USA Bernstein et al. (2012) Choi and Curhan (2008) Choi et al. (2010) Cohen et al. (2012) de Koning et al. (2011) Forman et al. (2009) Muraki et al. (2013) Pan et al. (2013) Joshipura et al. (1999) Malik et al. (2019)‡ Public funding	N = 51,529 Health professional males (dentists, optometrists, osteopaths, pharmacists, podiatrists and veterinarians) Majority (~90%+) Caucasian	40–75 year Males	**Total fructose** **Free fructose** **SSSD** **SSSD and FD** **100% FJ** *ASSD* *ASB* *Glycaemic index* *Glycaemic load* *Orange or apple FJ* *Orange or apple (fruit)* *Total whole fruit* *Individual fruits* *Whole-fat milk* *Low-fat milk* *Total coffee* *Sweetened cola* *Other sweetened soft drinks* *Carbonated beverages*	One self-administered[41] SFFQ of 131 items-previous year. Additional SFFQs carried out throughout follow-up. A second SFFQ was completed by a subsample of 127 men that participated in the validation study. Validation against two 7-day diet records. Correlation coefficients were 0.84 for colas, 0.74 for low-calorie colas and 0.55 for other carbonated sugar-sweetened beverages, 0.88 low-fat milk and 0.75–0.89 fruit juice	Body weight CVD CHD Stroke Gout HTN T2DM

[39] Rockett HRH, Wolf AM and Colditz GA, 1995. Development and reproducibility of a food frequency questionnaire to assess diet of adolescents. Journal of American Diet Association, 95, 336–340.
[40] Rockett HRH, Breitenbach M and Frazier AL, 1997. Validation of a youth/adolescent food frequency questionnaire. Preventive of Medicine, 26, 808–816.
[41] Feskanich D, Rimm EB and Giovannucci EL, 1993. Reproducibility and validity of food intake measurements from a semiquantitative food frequency questionnaire. Journal of American Diet Association, 93, 790–796.

Cohort **Country** **References** **Funding**	**Population (original cohort)**	**Age (years)** **Gender**	**Exposure(s) assessed**	**Exposure assessment, time coverage and validation**	**Endpoints**
			Non-carbonated beverages *Water* *Tea* *Vitamin C*		
HPP Harvard Pooling Project of Diet and Coronary Disease (ARIC, ATBC, HPFS, IWHS, WHS, NHS80, NHS86) USA Keller et al. (2020)‡ Public funding	N = 284,345 Health professionals and general population Majority Caucasian	≥ 35 year 76.1% females	**SSSD, SSFD** *Fruit juice* *Caffeinated coffee* *Total coffee* *Tea* *Low fat milk* *Whole fat milk* *Total milk* *ASB*	SFFQ at baseline – no further information on amount of items. No information on validation.	CHD
HSS-DK Healthy Start Study-Denmark Denmark (Zheng et al., 2015) Mixed funding	N = 552 Children who had a high predisposition for future overweight based on specific criteria Caucasian	2–6 year 45% females	**SSSD, SSFD, TFJ** *Water* *Milk* *ASB*	A 4-day dietary record completed by parents (covering weekdays and weekends). No information on validation.	Body weight BMIz-score
HSS-USA Healthy Start Study-USA USA Crume et al. (2016) Public funding	N = 1,410 Pregnant women White 54.81% Hispanic 24.62% Black 14.71% Other 5.87%	> 16 year Females	**Total sugars** *Total fat* *SFA* *Unsaturated fat* *MUFA* *PUFA* *Carbohydrates* *Protein*	Repeated (8x) 24-h dietary recall. No information on validation.	Birth weight
Inter99 Inter99 study	N = 13,016	30–60 year 49.3% females	**SSSD**	One self-administered SFFQ of 198 items – previous year.	Body weight WC

Cohort Country References Funding	Population (original cohort)	Age (years) Gender	Exposure(s) assessed	Exposure assessment, time coverage and validation	Endpoints
Denmark Olsen et al. (2016) Mixed funding	Inhabitants from Copenhagen county Caucasian			Validated against 28-day diet history.[42] Correlation coefficients for carbohydrate: crude 0.45 and 0.46 (men and women, respectively); adjusted for total for total energy intake 0.51 and 0.46 (men and women, respectively).	
JPHC Japan Public Health centre-based Study Cohort Japan Eshak et al. (2012) Eshak et al. (2013) Public funding	N = 43,149 General population Asian	40–59 year 52.13% females	**SSSD, SSFD, SSFJ** **100% FJ** *Vegetable juice*	Self-administered FFQ: 1990, 44 items – previous month; 1995 and 2000, 147 foods – previous year. Validation: 1990 and 1995 FFQ, validated against four 7-day weighed dietary records (DR) over one year. Correlation coefficient for SSSD, FD and SFJ: – 1990 SFFQ vs. four 7-day DR was 0.29 for men and 0.31 for women – 1995 SFFQ vs. four 7-day DR was 0.35 for men and 0.41 for women – 1990 SFFQ vs. 1995 SFFQ was 0.52 for men and 0.51 for women Correlation coefficient for 100% FJ: – 1990 SFFQ vs. four 7-day DR was 0.17 for men and for women – 1990 SFFQ vs. 1995 SFFQ was 0.22 for men and 0.33 for women.	CHD Stroke T2DM
KoCAS Korean Child–Adolescent Cohort Study South Korea	N = 811 Children from four schools from city of Gwacheon	9–10 year 48.3% females	**Total sugars** **Free sugars from beverages** *Milk sugar* *Fruit sugar*	A three-day (two weekdays, one weekend day) food record – with parental assistance. No information on validity.	BMIz-score Body fat

[42] Toft U, Kristoffersen L, Ladelund S, Bysted A, Jakobsen J, Lau C, Jorgensen T, Borch-Johnsen K and Ovesen L, 2008. Relative validity of a food frequency questionnaire used in the Inter99 study. European Journal of Clinical Nutrition, 62, 1038–1046.

Cohort Country References Funding	Population (original cohort)	Age (years) Gender	Exposure(s) assessed	Exposure assessment, time coverage and validation	Endpoints
Hur et al. (2015) Public funding	Asian		*Other sources sugar*		
KoGES Korean Genome and Epidemiology Study South Korea Kang and Kim (2017) Kwak et al. (2018) Public funding	N = 10,030 General population Asian	> 30 year 54% females	**SSSD**	Two SFFQ of 103 items – previous year Validation against four 3-day dietary recall for 1 year of each participant (adherence of 85%).[43] Pearson's correlation coefficient for carbohydrate: Crude model: – Dietary recall vs. SFFQ1 was 0.27 – Dietary recall vs. SFFQ2 was 0.42 Sex, age and energy-adjusted: – Dietary recall vs. SFFQ1 was 0.37 – Dietary recall vs. SFFQ2 was 0.54 Sex, age, energy-adjusted and de-attenuated (corrected for within-person variation): – Dietary recall vs. SFFQ1 was 0.49 – Dietary recall vs. SFFQ2 was 0.64	Abdominal obesity Blood lipids T2DM HTN
MDCS Malmo Diet Cancer Study Sweden Ericson et al. (2018) Sonestedt et al. (2012) Sonestedt et al. (2015) Warfa et al. (2016)	N = 28,098 General population Caucasian	44–74 year 62% females	**Added sugars** **Sucrose** **SSSD** **100% FJ** *Carbohydrates* *Fat* *Protein* *Fibre*	Interview-based: 7-day food record combined with SFFQ of 168-items of previous year + diet history interview for checks Validation against 18-day weight food records collected over one year (n = ca. 100 aged 50–69 randomly extracted from Malmö's computerised population registry).	T2DM CVD CHD Stroke

[43] Ahn Y, Kwon E, Shim JE, Park MK, Joo Y and Kimm K, 2007. Validation and reproducibility of food frequency questionnaire for Korean genome epidemiologic study. European Journal of Clinical Nutrition, 61, 1435–1441.

Cohort Country References Funding	Population (original cohort)	Age (years) Gender	Exposure(s) assessed	Exposure assessment, time coverage and validation	Endpoints
Public funding			*Milk* *ASSD* *Sweets* *Cakes and biscuits* *Cakes and pastries* *Tea* *Coffee* *Chocolates* *Fruits and berries* *Vegetables* *Processed meat* *Whole grains* *Refined grains* *Potatoes* *Sugar and sweets* *Sugar and jam*	Energy-adjusted Person correlation coefficient for sugars: 0.60 for men and 0.74 for women.	
MIT-GDS Massachusetts Institute of Technology Growth and Development Study USA Phillips et al. (2004) Mixed funding	N = 196 Premenarcheal girls from Cambridge, MA 75% Caucasian, 14% Black and 11% other	8–12 year Females	**SSSD** *Candy* *Chips* *Baked goods* *Ice-cream*	Self-administered SFFQ of 116 items – previous year. Validation against four one-week records with a sample of 173 women who answered the 1980 Nurses' Health Study questionnaire.[44] Correlation coefficient for sucrose of 0.71.	BMIz-score BF
MoBA Norwegian Mother and Child Cohort Study Norway Grundt et al. (2017)	N = 75,075 mother-child dyads Pregnant women Caucasian	Mean age per intake category: 27.9 – 30.7 year Females	**SSSD** *ASSD*	Self-administered SFFQ of 255 food items – since the beginning of the pregnancy[45] Validated with a 4-day weighed food diary and one 24-h urine collection and blood sample (n = 119)	Birth weight

[44] Willett WC, Sampson L and Stampfer MJ, 1985. et Reproducibility and validity of a semiquantitative food frequency questionnaire. American Journal of Epidemiology, 122, 51–65.
[45] Brantsæter AL, Haugen M, Alexander J and Meltzer HM, 2008. Validity of a new food frequency questionnaire for pregnant women in the Norwegian Mother and Child Cohort Study (MoBa). Maternal and Child Nutrition, 4, 28–43.

Cohort Country References Funding	Population (original cohort)	Age (years) Gender	Exposure(s) assessed	Exposure assessment, time coverage and validation	Endpoints
Public funding				Spearman correlation coefficient for added sugars of SFFQ vs. food diary: 0.36 Energy-adjusted correlation coefficient for added sugars of SFFQ vs. food diary: 0.29	
MONICA Monitoring Trends and Determinants of Cardiovascular Disease Denmark Olsen et al. (2016) Public funding	N = 4,581 Inhabitants from Copenhagen county Caucasian	30–60 years 52.1% females	**SSSD**	7-day dietary record; information provided on the mean weight of 19 frequently consumed foods. Entries were expressed at estimated, or preferably weighted, grams. No information on validation.	Body weight
MOVE MOVE project USA Carlson et al. (2012) Public funding	N = 271 Children with history of parental obesity 39% Caucasian, 48% Latino, 13% other	6–7 year 56% females	**SSSD, SSFD** **100% FJ** *High fat foods* *Fruit and vegetables* *Fast food/restaurants*	One SFFQ administered by parents – no information on number of items. No data on validation against reference method – unclear validity.	BMIz-score BF
Mr and Ms OS Mr and Ms OS project of Hong Kong China Liu et al. (2018) Public funding	N = 4,000 General population Asian	≥ 6.5 year 50.2% females	**Added sugars** **Free sugars** *Added sugars from cereals/milk/sweets*	One self-administered SFFQ of 329 items (in which sugar intakes were estimated from 130 food items) – previous year. Validated by the basal metabolic rate calculation and the 24-h sodium/creatinine and potassium/creatinine analysis.[46]	Body weight BMI Body fat CVD
MTC Mexican Teachers' Cohort	N = 27,992 Female teachers	≥ 25 year Females	**SSSD** *ASSD*	Two self-administered SSFQ of 139 items – previous year.	Body weight WC

[46] Woo J, Leung SSF, Ho SC, Lam TH and Janus ED, 1997. A food frequency questionnaire for use in the Chinese population in Hong Kong: description and examination of validity. Nutrition Research, 17, 1633–1641.

Cohort Country References Funding	Population (original cohort)	Age (years) Gender	Exposure(s) assessed	Exposure assessment, time coverage and validation	Endpoints
Mexico Stern et al. (2017) Unclear funding	Hispanic			Validated against another FFQ and four 4-day 24-hour recalls.[47] Correlation coefficient between the SFFQ and the average of sixteen 24-h recalls (de-attenuated) was 0.52 for carbohydrates.	
NGHS National Lung, Heart and Blood Institute's Growth and Health Study USA Lee et al. (2014) Lee et al. (2015) Striegel-Moore et al. (2006) Unclear funding	N = 2,379 Non-Hispanic Caucasian and African American girls with racially concordant parents from 3 sites 51% Caucasian and 49% Black	9–10 year Females	**Total sugars** **Added sugars** **SSSD** **SSFD** **100% FJ** *Natural sugar* *Milk* *Coffee/tea*	An annually (10x) collected 3-day food record (2 weekdays and 1 weekend day). Validated against observation of a sub-sample of 60 participants. Correlation coefficient 0.78 for carbohydrates.	BMIz-score Body weight WC Blood lipids
NHS Nurses Health Study USA Bernstein et al. (2012) Choi and Curhan (2008) Choi et al. (2010) Cohen et al. (2012) Forman et al. (2009) Muraki et al. (2013) Pan et al. (2013) Joshipura et al. (1999) Malik et al. (2019)‡ Public funding	N = 121,770 Female nurses Majority (~93%+) Caucasian	30–55 year Females	**Total Fructose** **Free fructose** **SSSD** **100% FJ** **SSSD, SSFD** *ASSD* *ASB* *Lactose* *Sugar-sweetened cola* *Carbonated beverages* *Non-carbonated beverages* *Vitamin C* *Total whole fruit*	Six self-administered SFFQ of 61 foods – previous year (number of SFFQs varied per outcome assessed due to different lengths of follow). Additional SFFQs carried out throughout follow-up. Validation for food source against two 7-day diet records. Correlation coefficients were 0.84 for cola-type soft drinks (SSSD and ASSD combined), 0.36 for other carbonated soft drinks, 0.84 for orange juice and 0.56 for fruit punch.	Body weight CVD Stroke Gout HTN T2DM

[47] Hernández-Avila M, Romieu I and Parra S, 1998. Validity and reproducibility of a food frequency questionnaire to assess dietary intake of women living in Mexico City. Salud Publica Mex, 40, 133–140.

Cohort Country References Funding	Population (original cohort)	Age (years) Gender	Exposure(s) assessed	Exposure assessment, time coverage and validation	Endpoints
			Individual fruits *Water* *Coffee* *Tea* *Low-fat milk* *Whole-fat milk* *Other sweetened soft drinks* *Glycaemic index* *Glycaemic load* *Orange or apple FJ* *Orange or apple (fruit)*		
NHS-II Nurses Health Study-II USA Chen et al. (2009b) Cohen et al. (2012) Forman et al. (2009) Chen et al. (2012) Muraki et al. (2013) Pan et al. (2013) Schulze et al. (2004) Public funding	N = 116,671 Female nurses Majority (~90%+) Caucasian	24–44 year Females	**Total fructose** **100% FJ** **SSSD, SSFD** *ASSD* *Total whole fruit* *Individual fruits* *Carbonated beverages* *Non-carbonated beverages* *Vitamin C* *Water* *Coffee* *Tea* *Low-fat milk* *Whole-fat milk*	Three self-administered SFFQ of 133 items – previous year Validation against two 7-day diet records Correlation coefficients for cola-type soft drinks (including diet) 0.84; other carbonated soft drinks 0.36; orange juice 0.84; and fruit punch 0.56.	Body weight GDM HTN T2DM
NIH-AARP National Institutes of Health-American Association for Retired Persons Diet and Health Study	N = 567,169 General population from 6 states ~ 93% White, 3% African-American, 2%	50–71 year 41.7% females	**Total sugars** **Added sugars** **Total sucrose** *Added sucrose* **Total fructose**	Self-administered SFFQ of 124 items – past year Validated with four 24-h dietary recall interviews (in subjects of the EATS study, a nationally representative sample of men and women aged 20–79 year).[48]	CVD

[48] Millen A, Midthune D, Thompson F, Kipnis V and Subar A, 2005. The National Cancer Institute Diet History Questionnaire: Validation of Pyramid Food Servings. American Journal of Epidemiology, 163, 279–288. https://doi.org/10.1093/aje/kwj031

Cohort **Country** **References** **Funding**	**Population (original cohort)**	**Age (years)** **Gender**	**Exposure(s) assessed**	**Exposure assessment, time coverage and validation**	**Endpoints**
USA Tasevska et al. (2014b) Public funding	Hispanic, 2% Asian/ Other		*Added free fructose*	Correlation coefficients (deattenuated and energy-adjusted) for added sugars: 0.79 for women and 0.68 for men.	
NSHDS Northern Sweden Health and Disease Study Sweden Winkvist et al. (2017) Mixed funding	N = 40,066 General population Caucasian	30–60 year 52.2% females	**Sucrose**	Two self-administered SFFQ of 64 items–previous year. Validated against 10x 24-h dietary recalls in a random subsample (n = 99) Vasterbotten county cardiovascular disease (CVD) study.[49] Correlation coefficients for sucrose de-attenuated: 0.65 for men and 0.37 for women.	BMI Blood lipids
PHHP Pawtucket Heart Health Program USA Parker et al. (1997) Public funding	N = 1,081 General population 94% Caucasian	18–64 year 62.2% females	**Sucrose** *Total fat* *Animal fat* *Vegetable fat* *Protein* *Carbohydrate* *Cholesterol* *Caffeine* *Saccharin* *Individual food items*	One self-administered SFFQ – previous year. Validated against one FFQ and 4x 7-day diet records (covering 1 year) for women (subsample of NHS) and for men against one FFQ and 2 one-week diet records (subsample of HPFS). Correlation coefficient for sucrose for women of 0.37 and for men for carbohydrates (deattenuated) 0.65 and 0.73.	Body weight
PHI Planet Health Intervention USA Ludwig et al. (2001) Public funding	N = 780 Children from four communities in the Boston metropolitan area	11–12 year 48% females	**SSSD, SSFD**	Self-administered (under supervision of trained personnel) SFFQ of 131 items – past year Validation in a similar cohort of 261 children and adolescents (9 to 18y) that completed three 24-h recalls and two FFQ (1 year apart). Correlation coefficients for carbohydrates:	Obesity

[49] Johansson I, Hallmans G, Wikman A, Biessy C, Riboli E and Kaaks R, 2002. Validation and calibration of food-frequency questionnaire measurements in the Northern Sweden Health and Disease cohort. Public Health Nutrition, 5, 487–496.

Cohort Country References Funding	**Population (original cohort)**	**Age (years) Gender**	**Exposure(s) assessed**	**Exposure assessment, time coverage and validation**	**Endpoints**
	64% white, 15% Hispanic, 14% Afro-American, 8% Asian, 8% American Indian or other			– Mean 24-h recalls vs. mean FFQ: unadjusted 0.37; adjusted 0.40; de-attenuated 0.46 – Mean 24-h recalls vs. 2nd FFQ: unadjusted 0.38; adjusted 0.41; de-attenuated 0.47.[50]	
Project Viva USA Sonneville et al. (2015) Mixed funding	N = 2,128 Infants from eight urban and suburban obstetric offices in Massachusetts 70.3% Caucasian, 11.7% Black, 3.7% Hispanic, 3.1% Asian and 11.2% other	1 year 49.8% females	**100% FJ** *Water*	Two SFFQ of 103 items administered by the parents or guardian – past month. Validated against three 24-h dietary recalls (2x weekdays and 1x weekend).[51] Correlation coefficient of 0.52 for carbohydrates.	BMIz-score
QUALITY Quebec Adipose and Lifestyle InvesTigation in Youth USA Wang et al. (2014) Public funding	N = 630 General population from Quebec with at least one biological parent that had obesity and/or abdominal obesity Caucasian	8–10 year 44.5% females	**Added sugars**	Three 24-h dietary recalls on non-consecutive days of the week, including one weekend day. Completed by registered dietician. No information on validation.	Body weight BMI WC Body fat Glucose homeostasis (FG, FI, HOMA-IR, Matsuda-ISI)
REGARDS Reasons for Geographic and Racial Differences in Stroke study USA	N = 30,183 General population Caucasian 68.9%, African-America 31.1%	≥ 45 year 40.7% females	**SSSD, SSFD** **SSSD, SSFD, 100% FJ** **100% FJ**	Self-administered SFFQ of 98 items – past year Validation with three 4-day diet records (sample of 260 females from Women's Health Trial) Correlation coefficient of 0.51 for carbohydrates.	CHD

[50] Rockett H, Breitenbach M and Frazier A, 1997. Validation of a Youth/Adolescent Food Frequency Questionnaire. Preventive Medicine 26, 808–816.
[51] Blum R, Wei E and Rockett H, 1993. Validation of a food frequency questionnaire in native American and Caucasian children 1 to 5 years of age. Journal of Maternal Child Health, 3, 167–172.

Cohort Country References Funding	Population (original cohort)	Age (years) Gender	Exposure(s) assessed	Exposure assessment, time coverage and validation	Endpoints
Collin et al. (2019)‡ Public funding					
SCES Sidney Childhood Eye Study Australia Gopinath et al. (2013) Gopinath et al. (2012) Mixed funding	N = 2,353 Schoolchildren from Sydney 61.1% Caucasian, 19.5% East Asian, 4% Middle Eastern, 15.4% Other	12 year 49.2% females	**Total sugars** **Added sugars** **Fructose** *Glycaemic index* *Glycaemic load* *Carbohydrates* *Fibre* *Fruits*	One self-administered SFFQ of 120 items – previous year. Validated against four 24-h food records in children aged 9–16y.[52] The de-attenuated, energy-adjusted Pearson correlation coefficient for total sugars was 0.41.	BMI WC Body fat Blood pressure
SCHS Singapore Chinese Health Study Singapore Rebello et al. (2014) Public funding	N = 63,257 General population of Chinese adults living in Singapore Asian	45–74 year 56% females	**Total sugars** *Carbohydrates* *Starch* Dietary fibre *Vegetables* *Fruits* Rice Noodles	Interview administered SFFQ of 165 items– past year. with serving sizes reported as number based or coloured photographs representing the 15th, 50th and 85th percentiles of the portion size. Validated with 24-h dietary recall interviews (sub-group of n = 1022) Correlation coefficients for carbohydrate intake for Cantonese 0.37 and 0.32 (men and women, respectively) and for Hokkien 0.58 and 0.56 (men and women, respectively).	CHD
Seven Countries The Netherlands, Finland Feskens et al. (1995) Public funding	N = 2,589 General population Caucasian	50–70 year Males	**Total sugars**	Cross-check dietary history method at baseline and end of follow-up and at 10-year follow-up habitual food consumption pattern and checklist of foods. No validation for the method used in the study.	Dynamic glucose homeostasis (OGTT)

[52] Watson JF, Collins CE, Sibbritt DW, Dibley MJ and Garg ML, 2009. Reproducibility and comparative validity of a food frequency questionnaire for Australian children and adolescents. International Journal of Behaviour Nutrition Physcian Action, 6, 62.

Cohort **Country** **References** **Funding**	**Population (original cohort)**	**Age (years)** **Gender**	**Exposure(s) assessed**	**Exposure assessment, time coverage and validation**	**Endpoints**
SUN Seguimiento Universidad de Navarra Spain Barrio-Lopez et al. (2013) Donazar-Ezcurra et al. (2018) Sayon-Orea et al. (2015) Fresan et al. (2017) Public funding	N = 21,678 University graduates, mainly health professionals Caucasian	> 18 year 69% females	**SSSD** **SSSD, SSFD** **100% FJ** **TFJ** SSFD SSFD, SSFJ, 100%	Self-reported SFFQ of 136 items – previous year. Four 4-day diet (n = 147)[53] Pearson correlation coefficient for carbohydrates: – Q1 vs. mean 4-day records: unadjusted 0.40; adjusted (for total caloric intake) 0.36; de-attenuated 0.40. – Q2 vs. mean 4-day records: unadjusted 0.44; adjusted (for total caloric intake) 0.42; de-attenuated 0.46.	GDM HTN Body weight T2DM
Takayama Japan Nagata et al. (2019)‡ Public funding	N = 34,018 General population Asian	≥ 35 year 54.1% females	**Total sugars** **Total fructose** *Added sugars* *Glucose*	One self-administered SFFQ of 169 items – previous year. Validated in subsamples in this population by comparing twelve 1-day diet records kept over a 1-year period.[54] Spearman's correlation coefficients between the questionnaire and twelve 1-day diet records kept over a 1-year period for intakes of total sugars, glucose, fructose, sucrose, maltose and lactose were 0·28, 0·46, 0·51, 0·48, 0·35 and 0·85, respectively, in men (n 17) and 0·68, 0·80, 0·46, 0·56 and 0·71, respectively, in women (n 20).	CVD
TLGS Teheran Lipid and Glucose Study	N = 15,005 General population	≥ 3 year 56.7% females	**Total fructose** **SSSD, SSFD, TFJ** **SSSD, SSFD, SSFJ**	Three interview-administered SFFQ of 168 items – previous year Validation against twelve 24-h recall (n = 132).[55]	Abdominal obesity WC

[53] Martin-Moreno JM, Boyle P, Gorgojo L, Maisonneuve P, Fernandez-Rodriguez JC, Salvini S and Willett WC, 1993. Development and validation of a food frequency questionnaire in Spain. International Journal of Epidemiology, 22.
[54] Shimizu H, Ohwaki A and Kurisu Y, 1999. Validity and reproducibility of a quantitative food frequency questionnaire for a cohort study in Japan. Japan Journal of Clinical Oncology, 29, 38–44.
[55] Asghari G, Rezazadeh A, Hosseini-Esfahani F, Mehrabi Y, Mirmiran P and Azizi F, 2012. Reliability, comparative validity and stability of dietary patterns derived from an FFQ in the Tehran Lipid and Glucose Study. British Journal of Nutrition, 108, 1109–1117.

Cohort Country References Funding	Population (original cohort)	Age (years) Gender	Exposure(s) assessed	Exposure assessment, time coverage and validation	Endpoints
Iran Bahadoran et al. (2017) Mirmiran et al. (2015) Public funding	Caucasian		*Added fructose* *Natural fructose*	Spearman correlation coefficient for carbonated drinks: – SFFQ2 vs. 24-h recall: 0.43 (crude), 0.40 (energy adjusted) – SFFQ2 vs. SFFQ3: 0.50 (crude), 0.23 (energy adjusted) Spearman correlation coefficient for sugars, sweets and desserts: – SFFQ2 vs. 24-h recall: 0.52 (crude), 0.37 (energy adjusted) – SFFQ2 vs. SFFQ3: 0.40 (crude), 0.34 (energy adjusted)	Glucose homeostasis (FI, HOMA-IR) Blood lipids Blood pressure HTN T2DM CVD
Toyama Japan Sakurai et al. (2014) Public funding	N = 2,275 Male employees of a factory Asian	35–55 year Males	**SSSD** *ASSD*	Self-administered diet history questionnaire including SFFQ of 110 items– previous month Validation against 3-day diet record (n = 47 women from a similar cohort)[56] Pearson correlation coefficient for carbohydrates: 0.48 (crude); 0.46 (energy adjusted); 0.48 (energy adjusted and de-attenuated).	T2DM
WAPCS Western Australia Pregnancy Cohort (Raine) Study Australia	N = 2,868 Offspring from mothers from the Raine study	14 year 48.2% females	**SSSD, SSFD and SSFJ**	SFFQ of previous year completed in every follow-up by primary caregiver – 212 food items (individual foods, mixed dishes and beverages).[57]	BMI WC Blood lipids Blood pressure

[56] Sasaki S, Yanagibori R and Amano K, 1998. Self-administered diet history questionnaire developed for health education: a relative validation of the Test-Version by comparison with 3-day diet record in women. Journal of Epidemiology, 8, 203–215.

[57] Ambrosini GL, de Klerk NH and O'Sullivan TA, 2009. The reliability of a food frequency questionnaire for use among adolescents.Patterson RE, Kristal AR, Tinker LF, Carter RA, Bolton MP and Agurs-Collins T, 1999. Measurement characteristics of the Women's Health Initiative Food Frequency Questionnaire. Annals of Epidemiology, 9, 178–187. Ambrosini GL, Oddy WH and Robinson M, 2009. Adolescent dietary patterns are associated with lifestyle and family psycho-social factors.

Cohort Country References Funding	Population (original cohort)	Age (years) Gender	Exposure(s) assessed	Exposure assessment, time coverage and validation	Endpoints
Ambrosini et al. (2013) Unclear funding	Caucasian			Serving sizes measured in household units (cups, spoons, slices, etc.) Validation against 3-day food record. Pearson's correlation coefficient of total sugars: 0.29 ($p < 0.001$)[58]	Glucose homeostasis (FI, FG and HOMA-IR)
WHI Women's Health Initiative USA Auerbach et al. (2017) Auerbach et al. (2018) Huang et al. (2017) Tasevska et al. (2018) Public funding	N = 122,970 Postmenopausal women enrolled into the WHI Observational Study (n = 93,676) and the comparison arm of the Dietary Modification Clinical Trial (n = 29,294) ~ 84% Caucasian, 7.6% Black, Hispanic/ Latino 4% and 3% Asian/Pacific	50–79 year Females	**Total sugars** **100% FJ** **SSSD** **SSFD** **SSSD, SSFD and TFJ** *ASB* *Whole fruit*	SFFQ of 122 items – previous 3 months Validated with: four 24-h dietary recalls conducted by trained staff; and four self-completed food records (n = 113 in 1995). Correlation coefficients for carbohydrates was 0.41 (unadjusted), 0.63 (energy-adjusted), 0.67 (de-attenuated)[59]	T2DM CVD CHD Stroke Heart failure CABG PCI HTN Body weight
WHS Women's Health Study USA Janket et al. (2003) Public funding	N = 39,876 Women (health professionals) whom participated in a RCT on low dose aspirin and vitamin E in the primary prevention of cardiovascular disease and cancer	≥ 45 year Females	**Total sugars** **Sucrose** **Free fructose** **Free glucose** **SSSD** *Lactose* *Starch* *Jam and marmalade* *Maltose* *SS berry juice*	SFFQ of 131 items – previous year The SFFQ used was the same as for HPFS and NHS, validation described previously. Also validated against a diet record in a similar group of women. Correlation coefficient for energy-adjusted carbohydrates ranged from 0.59 to 0.73.	T2DM

58 Ambrosini GL, de Klerk NH and O'Sullivan TA, 2009. The reliability of a food frequency questionnaire for use among adolescents.

59 Patterson RE, Kristal AR, Tinker LF, Carter RA, Bolton MP and Agurs-Collins T, 1999. Measurement characteristics of the women's health initiative food frequency questionnaire. Annals of Epidemiology, 9, 178–187.

Cohort Country References Funding	Population (original cohort)	Age (years) Gender	Exposure(s) assessed	Exposure assessment, time coverage and validation	Endpoints
	94.8 White, 2.3% African American, 1.1% Hispanic, 1.4% Asian/Pacific Islander, 0.3% American Indian/Alaskan Native, and 0.1% more than one race.				
Dental caries					
Finnish Cohort Finland Bernabé et al. (2016) Public funding	N = 6,335 General population Caucasian	30–89 year 56% females	**Total sugars**	SFFQ of 128 food items and mixed dishes – previous year. SFFQ only administered at baseline. Standard portion size assigned to each FFQ item and specified with natural units. The overall frequency of sugars intake (times/day) was estimated by adding the weighted responses for 15 sugary food items The amount of sugars intake (g/day) was estimated by multiplying the food consumption frequency by fixed portion sizes. Validated against a 3-day food record (n = 294; 137 men and 157 women).[60]	DMFT
IFS Iowa Fluoride Study Chankanka et al. (2011) USA	N = 608 General population 94% Caucasian, 6% Other	5–9 year 55% females	**Total sugars** **SSSD** **100% FJ** *Milk* *Powder-sugared beverages*	3-day food diaries (2 weekdays, 1 weekend day) were obtained every 1.5 to 6 months during the study period. Intakes were averaged for each child to reflect sugar intakes from 5 to 8 years of age.[61]	Caries increment

[60] Paalanen L, Männistö S, Virtanen MJ, Knekt P, Räsänen L, Montonen J and Pietinen P, 2006. Validity of a food frequency questionnaire varied by age and body mass index. Journal of Clinical Epidemiology, 59, 994–1001.

[61] Marshall TA, Broffitt B, Eichenberger-Gilmore J, Warren JJ, Cunningham MA and Levy SM, 2005. The roles of meal, snack, and daily total food and beverage exposures on caries experience in young children. Journal of Public Health Dentrics, 65, 166–73. [PubMed: 16171262].

Cohort Country References Funding	Population (original cohort)	Age (years) Gender	Exposure(s) assessed	Exposure assessment, time coverage and validation	Endpoints
Public funding			*ASSD* *Water* *Individual food items*		
Michigan cohort USA Burt et al. (1988) Burt and Szpunar (1994) Szpunar et al. (1995) Unclear funding	N = 747 General population from three towns with non-fluoridated water supply	10–15 year 47.9% females	**Total sugars**	Dietary interviews – 3 times two 24-h diet recalls administered for the previous day. Included weekdays and weekends and covered seasonal variations during the study period. Models provided to assess quantities Intake data from all the interviews for the same child over the 3-year follow-up were averaged.	DMFS DMFS (AP) DMFS (FS)
STRIP-1 Special Turku Coronary Risk Factor Intervention Project Finland Ruottinen et al. (2004) Unclear funding	N = 1,066 Children attending well-baby clinics of the city of Turku, where the fluoride concentration in drinking water is 0.3 ppm Caucasian	13 months 31% females	**Sucrose**	3-day food records (at 13 months) and 4-day food records (thereafter every 6 months until 7 years of age, every 2 years thereafter in the intervention group and every year in the control group until 10 years of age. Records included one weekend day and were reviewed by nutritionist at next visit.	$d_3$mft, $d_3$mft+D_3MFT D_3MFT scores
STRIP-2 Special Turku Coronary Risk Factor Intervention Project Finland Karjalainen et al. (2001) Karjalainen et al. (2015) Unclear funding	N = 1,066 Children attending well-baby clinics of the city of Turku, where the fluoride concentration in drinking water is 0.3 ppm Caucasian	3 year 45.8% females	**Sucrose**	4-day food records at 3, 6, 9, 12 and 16 years of age. Records included one weekend day and were reviewed by nutritionist at next visit.	D3MFT scores d3mft

Cohort Country References Funding	Population (original cohort)	Age (years) Gender	Exposure(s) assessed	Exposure assessment, time coverage and validation	Endpoints
UK cohort United Kingdom Rugg-Gunn et al. (1984) Rugg-Gunn et al. (1987) Public funding	N = 466 Children in their final 2 years of middle school from the area of south Northumberland Caucasian	11.5 year (mean) 52.4% females	**Total sugars** *Individual food items* *Starch*	5 times 3-day food diaries (3 consecutive days) in the 2 years of the study (total of 15 days of dietary intake). All days of the week covered. Children were instructed to record all foods and beverages consumed, the amounts and the time of the day in which these were consumed. Interview the day of completion to check quantities and uncertainties. Food models and graduated cups used for quantification of the amount.	DMFS DMFT DFS DFS(FS) DFS (SS) DFS (AP)
VA-DLS Department of Veterans Affairs-Dental Longitudinal Study USA Kaye et al. (2015) Public funding	N = 687 U.S Veterans from greater Boston area	47–90 year Males	**Total sugars** **SSSD** *Starch* *DASH adherence score* *DASH vegetable score* *DASH total grain score* *DASH sweets score*	Repeated administration of an expanded self-administered 131-item SFFQ at each visit. Average dietary variables were computed from all SFFQs after the first root surface was exposed until edentulism or the end of the study for analyses of root caries increment. Validation against two 7-day diet records administered 6 months apart[62,63]. The SFFQ was administered twice to 127 men at one-year interval.	Root caries increment

ASBs, artificially sweetened beverages; ASSD, artificially sweetened soft drinks; BMI, body mass index; CABG, coronary artery bypass grafting; CHD, coronary heart disease; CVD, cardiovascular disease; DASH, Dietary Approaches to Stop Hypertension; D3MFT, decayed into dentine, missing and filled permanent teeth; d3mft, decayed into dentine, missing and filled primary teeth; DFS: decayed, filled surfaces; DFS (AP), approximal surfaces; DFS (FS), pit and fissure surfaces; DFS (SS), free smooth surfaces; DMFS: decayed, missing and filled surfaces; DMFT: decayed, missing and filled permanent teeth; dmft: decayed, missing and filled primary teeth; FD, fruit drinks; FG, fasting glucose; FI, fasting insulin; FJ, fruit juice; GI, glycaemic index; GL, glycaemic load; GDM, gestational diabetes mellitus; HOMA, homeostatic model of assessment; HTN, hypertension; IR, insulin resistance; LCDS, Low-carbohydrates diet score; LCSB, low-calorie sweetened beverage; MUFA, monounsaturated fatty acid; NAFLD, non-alcoholic fatty liver disease; PCI, percutaneous coronary intervention; PUFA, polyunsaturated fatty acid; RCT, randomised control trial; SAT, subcutaneous adipose tissue; SFA, saturated fatty acid; SFFQ, semiquantitative food frequency questionnaire; SSBs, sugar-sweetened beverages, SSFDs, sugar-sweetened fruit drinks, SSFJs, sugar-sweetened fruit juices, SSSDs, sugar-sweetened soft drinks, T2DM, type 2 diabetes mellitus; TFJ, total fruit juice; VAT, visceral adipose tissue; WC, waist circumference; WC_{BMI}, waist circumference regressed on body mass index.
‡: Study identified through the update of the literature search.

62 Rimm EB, Giovannucci EL and Stampfer MJ, 1992. Reproducibility and validity of an expanded self-administered semiquantitative food frequency questionnaire among male health professionals. American Journal of Epidemiology, 135, 1114–1126.

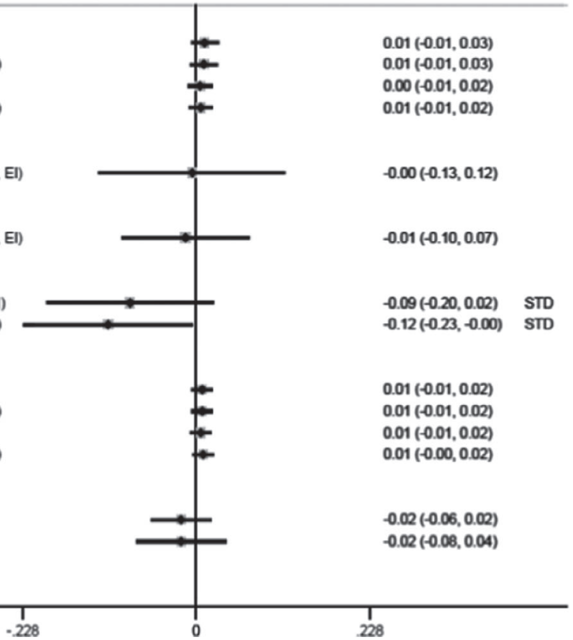
63 Feskanich D, Rimm EB, Giovannucci EL, et al. Reproducibility and validity of food intake measurements from a semiquantitative food frequency questionnaire. J Am Diet Assoc. 1993;93:790–796.

Appendix K – Forest plots. Observational studies on metabolic diseases

Figure K.1: Intake of added and free sugars and continuous variables related to the risk of obesity and abdominal obesity

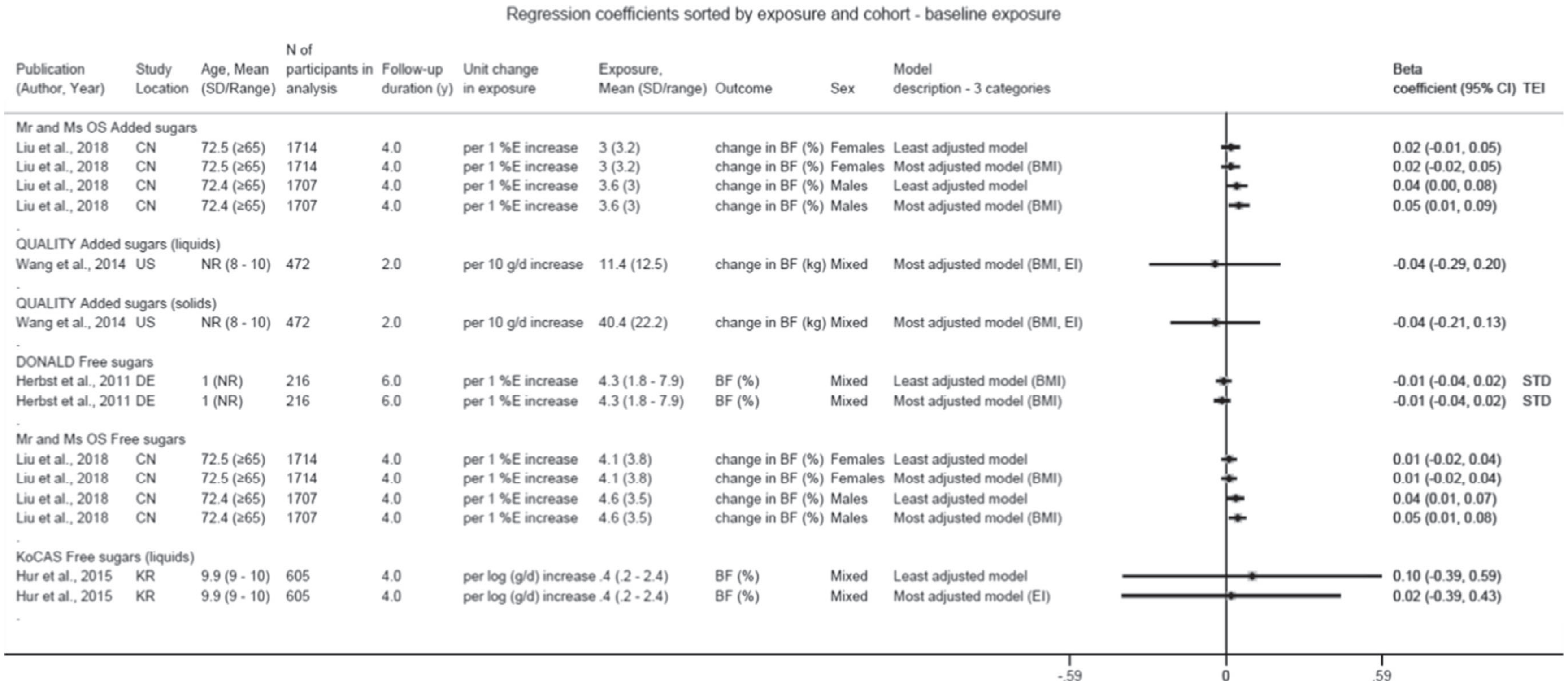
Regression coefficients sorted by exposure and cohort - baseline exposure

Publication (Author, Year)	Study Location	Age, Mean (SD/Range)	N of participants in analysis	Follow-up duration (y)	Unit change in exposure	Exposure, Mean (SD/range)	Outcome	Sex	Model description - 3 categories	Beta coefficient (95% CI)	TEI
Mr and Ms OS Added sugars											
Liu et al., 2018	CN	72.5 (≥65)	1714	4.0	per 1 %E increase	3 (3.2)	change in BMI (kg/m²)	Females	Least adjusted model	0.01 (-0.01, 0.03)	
Liu et al., 2018	CN	72.5 (≥65)	1714	4.0	per 1 %E increase	3 (3.2)	change in BMI (kg/m²)	Females	Most adjusted model (BMI)	0.01 (-0.01, 0.03)	
Liu et al., 2018	CN	72.4 (≥65)	1707	4.0	per 1 %E increase	3.6 (3)	change in BMI (kg/m²)	Males	Least adjusted model	0.00 (-0.01, 0.02)	
Liu et al., 2018	CN	72.4 (≥65)	1707	4.0	per 1 %E increase	3.6 (3)	change in BMI (kg/m²)	Males	Most adjusted model (BMI)	0.01 (-0.01, 0.02)	
QUALITY Added sugars (liquids)											
Wang et al., 2014	US	NR (8 - 10)	472	2.0	per 10 g/d increase	11.4 (12.5)	change in BMI (kg/m²)	Mixed	Most adjusted model (BMI, EI)	-0.00 (-0.13, 0.12)	
QUALITY Added sugars (solids)											
Wang et al., 2014	US	NR (8 - 10)	472	2.0	per 10 g/d increase	40.4 (22.2)	change in BMI (kg/m²)	Mixed	Most adjusted model (BMI, EI)	-0.01 (-0.10, 0.07)	
DONALD Free sugars											
Herbst et al., 2011	DE	1 (NR)	216	6.0	per 1 %E increase	4.3 (1.8 - 7.9)	BMI z-score	Mixed	Least adjusted model (BMI)	-0.09 (-0.20, 0.02)	STD
Herbst et al., 2011	DE	1 (NR)	216	6.0	per 1 %E increase	4.3 (1.8 - 7.9)	BMI z-score	Mixed	Most adjusted model (BMI)	-0.12 (-0.23, -0.00)	STD
Mr and Ms OS Free sugars											
Liu et al., 2018	CN	72.5 (≥65)	1714	4.0	per 1 %E increase	4.1 (3.8)	change in BMI (kg/m²)	Females	Least adjusted model	0.01 (-0.01, 0.02)	
Liu et al., 2018	CN	72.5 (≥65)	1714	4.0	per 1 %E increase	4.1 (3.8)	change in BMI (kg/m²)	Females	Most adjusted model (BMI)	0.01 (-0.01, 0.02)	
Liu et al., 2018	CN	72.4 (≥65)	1707	4.0	per 1 %E increase	4.6 (3.5)	change in BMI (kg/m²)	Males	Least adjusted model	0.01 (-0.01, 0.02)	
Liu et al., 2018	CN	72.4 (≥65)	1707	4.0	per 1 %E increase	4.6 (3.5)	change in BMI (kg/m²)	Males	Most adjusted model (BMI)	0.01 (-0.00, 0.02)	
KoCAS Free sugars (liquids)											
Hur et al., 2015	KR	9.9 (9 - 10)	605	4.0	per log (g/d) increase	.4 (.2 - 2.4)	BMI z-score	Mixed	Least adjusted model	-0.02 (-0.06, 0.02)	
Hur et al., 2015	KR	9.9 (9 - 10)	605	4.0	per log (g/d) increase	.4 (.2 - 2.4)	BMI z-score	Mixed	Most adjusted model (EI)	-0.02 (-0.08, 0.04)	



Note: STD = Standardised for Total Energy Intake.
EPIC-Norfolk (Kuhnle et al., 2015) and PHHP (Parker et al., 1997) excluded.

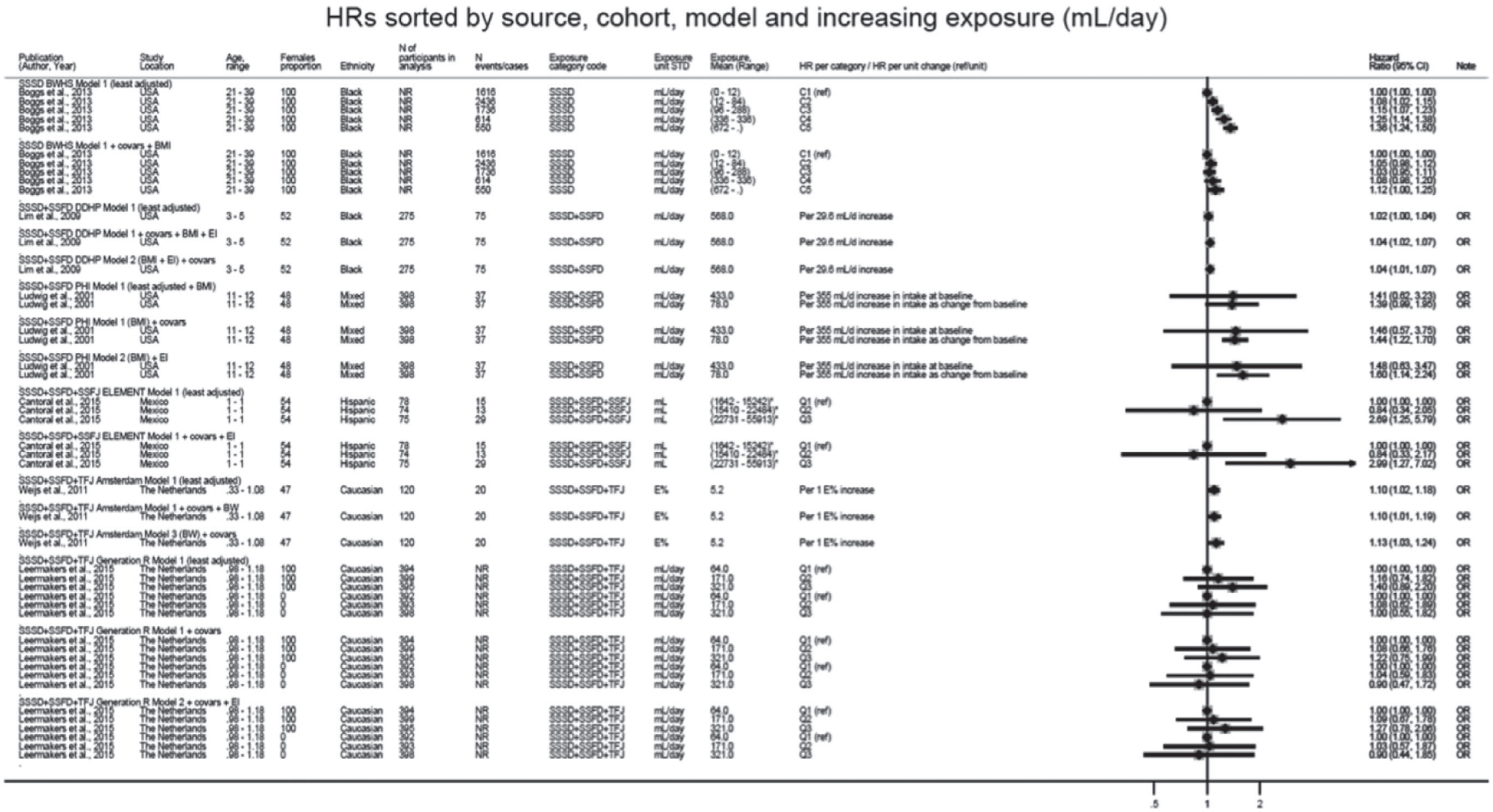
Figure K.1a: Intake of added and free sugars at baseline and measures of body mass index



Note: STD = Standardised for Total Energy Intake.

Figure K.1b: Intake of added and free sugars at baseline and measures of body fat

Figure K.2: Intake of SSBs and Fruit Juices and incidence of overweight/obesity and abdominal obesity



Note: * = cumulative exposure; RR = Rate Ratio; OR = Odds Ratio.

Figure K.2a: Intake of SSBs at baseline and incidence of overweight/obesity

HRs sorted by source, cohort, model and increasing exposure (mL/day)

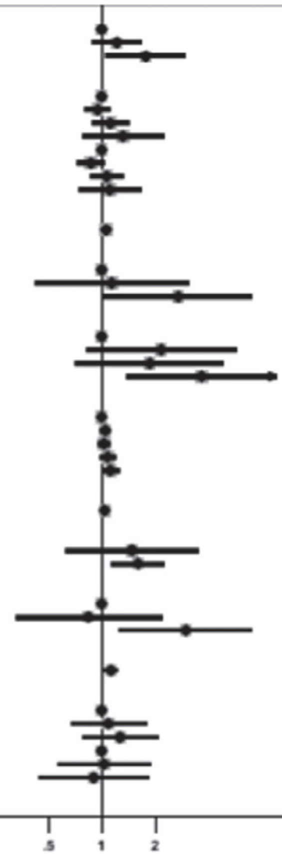
Publication (Author, Year)	Study Location	Age, range	Females proportion	Ethnicity	N of participants in analysis	N events/cases	Exposure category code	Exposure unit STD	Exposure, Mean (Range)	HR per category / HR per unit change (ref/unit)	Hazard Ratio (95% CI)	Note
100%FJ CARDIA Model 1 (covars + BW + EI)												
Duffey et al., 2010	USA	18 - 30	55	Mixed	2444	637	100%FJ	mL/day	.	Per 250 mL/d increase	0.98 (0.90, 1.06)	RR
100%FJ Girona Model 1 + covars + EI												
Funtikova et al., 2015	Spain	25 - 74	49	Caucasian	NR	NR	100%FJ	mL/day	(0)	NC (ref)	1.00 (1.00, 1.00)	OR
Funtikova et al., 2015	Spain	25 - 74	49	Caucasian	NR	NR	100%FJ	mL/day	(1 - 199)	C1	0.98 (0.73, 1.32)	OR
Funtikova et al., 2015	Spain	25 - 74	49	Caucasian	NR	NR	100%FJ	mL/day	(200 - .)	C2	0.74 (0.49, 1.12)	OR
SSSD Girona Model 1 + covars + EI												
Funtikova et al., 2015	Spain	25 - 74	49	Caucasian	NR	NR	SSSD	mL/day	(0)	NC (ref)	1.00 (1.00, 1.00)	OR
Funtikova et al., 2015	Spain	25 - 74	49	Caucasian	NR	NR	SSSD	mL/day	(1 - 199)	C1	1.22 (0.90, 1.66)	OR
Funtikova et al., 2015	Spain	25 - 74	49	Caucasian	NR	NR	SSSD	mL/day	(200 - .)	C2	1.77 (1.07, 2.93)	OR
SSSD KoGES Model 1 (least adjusted)												
Kang et al., 2017	South Korea	40 - 69	100	Asian	993	405	SSSD	mL/day	(0)	NC (ref)	1.00 (1.00, 1.00)	
Kang et al., 2017	South Korea	40 - 69	100	Asian	646	254	SSSD	mL/day	(1 - 28)	Q1	0.96 (0.82, 1.12)	
Kang et al., 2017	South Korea	40 - 69	100	Asian	206	82	SSSD	mL/day	(29 - 113)	Q2	1.11 (0.87, 1.41)	
Kang et al., 2017	South Korea	40 - 69	100	Asian	29	15	SSSD	mL/day	(114 - .)	Q3	1.78 (1.06, 2.99)	
Kang et al., 2017	South Korea	40 - 69	0	Asian	1127	278	SSSD	mL/day	(0)	NC (ref)	1.00 (1.00, 1.00)	
Kang et al., 2017	South Korea	40 - 69	0	Asian	1237	273	SSSD	mL/day	(1 - 28)	Q1	0.84 (0.71, 0.99)	
Kang et al., 2017	South Korea	40 - 69	0	Asian	665	167	SSSD	mL/day	(29 - 113)	Q2	1.08 (0.89, 1.31)	
Kang et al., 2017	South Korea	40 - 69	0	Asian	109	28	SSSD	mL/day	(114 - .)	Q3	1.11 (0.75, 1.65)	
SSSD KoGES Model 1 + covars + BMI + EI												
Kang et al., 2017	South Korea	40 - 69	100	Asian	993	405	SSSD	mL/day	(0)	NC (ref)	1.00 (1.00, 1.00)	
Kang et al., 2017	South Korea	40 - 69	100	Asian	646	254	SSSD	mL/day	(3 - 26)	Q1	0.95 (0.81, 1.11)	
Kang et al., 2017	South Korea	40 - 69	100	Asian	206	82	SSSD	mL/day	(29 - 86)	Q2	1.12 (0.88, 1.43)	
Kang et al., 2017	South Korea	40 - 69	100	Asian	29	15	SSSD	mL/day	(114 - .)	Q3	1.32 (0.78, 2.23)	
Kang et al., 2017	South Korea	40 - 69	0	Asian	1127	278	SSSD	mL/day	(0)	NC (ref)	1.00 (1.00, 1.00)	
Kang et al., 2017	South Korea	40 - 69	0	Asian	1237	273	SSSD	mL/day	(3 - 26)	Q1	0.87 (0.73, 1.03)	
Kang et al., 2017	South Korea	40 - 69	0	Asian	665	167	SSSD	mL/day	(29 - 86)	Q2	1.07 (0.87, 1.31)	
Kang et al., 2017	South Korea	40 - 69	0	Asian	109	28	SSSD	mL/day	(114 - .)	Q3	1.11 (0.74, 1.66)	
SSSD+SSFD CARDIA Model 1 (covars + BW + EI)												
Duffey et al., 2010	USA	18 - 30	55	Mixed	2444	637	SSSD+SSFD	mL/day	.	Per 250 mL/d increase	1.06 (1.02, 1.10)	RR
SSSD+SSFD+SSFJ ELEMENT Model 1 (least adjusted)												
Cantoral et al., 2015	Mexico	1 - 1	54	Hispanic	78	13	SSSD+SSFD+SSFJ	mL	(1642 - 15242)*	Q1 (ref)	1.00 (1.00, 1.00)	OR
Cantoral et al., 2015	Mexico	1 - 1	54	Hispanic	74	14	SSSD+SSFD+SSFJ	mL	(15410 - 22484)*	Q2	1.15 (0.47, 2.81)	OR
Cantoral et al., 2015	Mexico	1 - 1	54	Hispanic	75	22	SSSD+SSFD+SSFJ	mL	(22731 - 55913)*	Q3	2.29 (1.01, 5.19)	OR
SSSD+SSFD+SSFJ ELEMENT Model 1 + covars + EI												
Cantoral et al., 2015	Mexico	1 - 1	54	Hispanic	78	13	SSSD+SSFD+SSFJ	mL	(1642 - 15242)*	Q1 (ref)	1.00 (1.00, 1.00)	OR
Cantoral et al., 2015	Mexico	1 - 1	54	Hispanic	74	14	SSSD+SSFD+SSFJ	mL	(15410 - 22484)*	Q2	1.14 (0.42, 3.08)	OR
Cantoral et al., 2015	Mexico	1 - 1	54	Hispanic	75	22	SSSD+SSFD+SSFJ	mL	(22731 - 55913)*	Q3	2.70 (1.03, 7.05)	OR
SSSD+SSFD+TFJ TLGS Model 1 (least adjusted + EI)												
Mirmiran et al., 2015	Iran	6 - 18	68	Caucasian	NR	NR	SSSD+SSFD+TFJ	mL/day	9.3	Q1 (ref)	1.00 (1.00, 1.00)	OR
Mirmiran et al., 2015	Iran	6 - 18	68	Caucasian	NR	NR	SSSD+SSFD+TFJ	mL/day	32.0	Q2	1.53 (0.63, 3.71)	OR
Mirmiran et al., 2015	Iran	6 - 18	68	Caucasian	NR	NR	SSSD+SSFD+TFJ	mL/day	58.6	Q3	1.65 (0.65, 4.19)	OR
Mirmiran et al., 2015	Iran	6 - 18	68	Caucasian	NR	NR	SSSD+SSFD+TFJ	mL/day	142.2	Q4	2.94 (1.27, 6.81)	OR
SSSD+SSFD+TFJ TLGS Model 1 (EI) + covars												
Mirmiran et al., 2015	Iran	6 - 18	68	Caucasian	NR	NR	SSSD+SSFD+TFJ	mL/day	9.3	Q1 (ref)	1.00 (1.00, 1.00)	OR
Mirmiran et al., 2015	Iran	6 - 18	68	Caucasian			SSSD+SSFD+TFJ	mL/day	32.0	Q2	1.58 (0.65, 3.85)	OR
Mirmiran et al., 2015	Iran	6 - 18	68	Caucasian	NR	NR	SSSD+SSFD+TFJ	mL/day	58.6	Q3	1.70 (0.70, 4.11)	OR
Mirmiran et al., 2015	Iran	6 - 18	68	Caucasian	NR	NR	SSSD+SSFD+TFJ	mL/day	142.2	Q4	2.97 (1.23, 7.18)	OR
SSSD+SSFD+TFJ TLGS Model 2 (EI) + BMI												
Mirmiran et al., 2015	Iran	6 - 18	68	Caucasian	NR	NR	SSSD+SSFD+TFJ	mL/day	9.3	Q1 (ref)	1.00 (1.00, 1.00)	OR
Mirmiran et al., 2015	Iran	6 - 18	68	Caucasian	NR	NR	SSSD+SSFD+TFJ	mL/day	32.0	Q2	2.16 (0.82, 5.68)	OR
Mirmiran et al., 2015	Iran	6 - 18	68	Caucasian	NR	NR	SSSD+SSFD+TFJ	mL/day	58.6	Q3	1.86 (0.71, 4.86)	OR
Mirmiran et al., 2015	Iran	6 - 18	68	Caucasian	NR	NR	SSSD+SSFD+TFJ	mL/day	142.2	Q4	3.66 (1.40, 9.58)	OR

Note: in Funtikova et al. (2015) total N analysed = 1479, total N of events = 336; in Duffey et al. (2010) exposure = average across years 0 and 7; NC (ref) = non-consumers; * = cumulative exposure; RR = Rate Ratio; OR = Odds Ratio.

Figure K.2b: Intake of SSBs at baseline and Fruit juices and incidence of abdominal obesity

HRs sorted by source, outcome and increasing exposure (mL/day) from MOST ADJUSTED MODELS

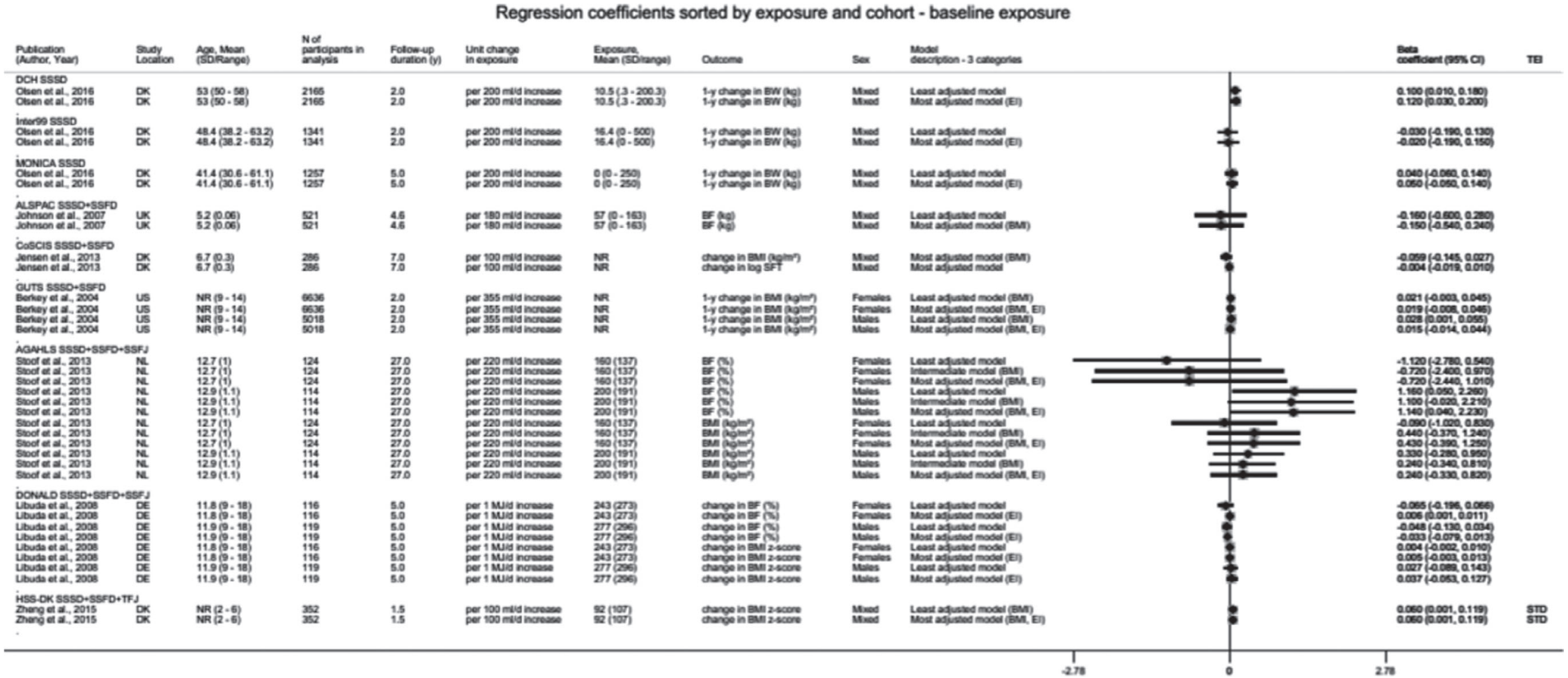
Publication (Author, Year)	Study Location	Age, range	Females proportion	Ethnicity	N of participants in analysis	N events/cases	Exposure category code	Exposure unit STD	Exposure, Mean (Range)	HR per category / HR per unit change (ref/unit)	Hazard Ratio (95% CI)	Note
SSSD AO Girona Model 1 + covars + EI												
Funtikova et al., 2015	Spain	25 - 74	49	Caucasian	NR	NR	SSSD	mL/day	(0)	NC (ref)	1.00 (1.00, 1.00)	OR
Funtikova et al., 2015	Spain	25 - 74	49	Caucasian	NR	NR	SSSD	mL/day	(1 - 199)	C1	1.22 (0.90, 1.66)	OR
Funtikova et al., 2015	Spain	25 - 74	49	Caucasian	NR	NR	SSSD	mL/day	(200 - .)	C2	1.77 (1.07, 2.93)	OR
SSSD AO KoGES Model 1 + covars + BMI + EI												
Kang et al., 2017	South Korea	40 - 69	100	Asian	993	405	SSSD	mL/day	(0)	NC (ref)	1.00 (1.00, 1.00)	
Kang et al., 2017	South Korea	40 - 69	100	Asian	646	254	SSSD	mL/day	(3 - 26)	Q1	0.95 (0.81, 1.11)	
Kang et al., 2017	South Korea	40 - 69	100	Asian	206	82	SSSD	mL/day	(29 - 86)	Q2	1.12 (0.88, 1.43)	
Kang et al., 2017	South Korea	40 - 69	100	Asian	29	15	SSSD	mL/day	(114 - .)	Q3	1.32 (0.78, 2.23)	
Kang et al., 2017	South Korea	40 - 69	0	Asian	1127	278	SSSD	mL/day	(0)	NC (ref)	1.00 (1.00, 1.00)	
Kang et al., 2017	South Korea	40 - 69	0	Asian	1237	273	SSSD	mL/day	(3 - 26)	Q1	0.87 (0.73, 1.03)	
Kang et al., 2017	South Korea	40 - 69	0	Asian	665	167	SSSD	mL/day	(29 - 86)	Q2	1.07 (0.87, 1.31)	
Kang et al., 2017	South Korea	40 - 69	0	Asian	109	28	SSSD	mL/day	(114 - .)	Q3	1.11 (0.74, 1.66)	
SSSD+SSFD AO CARDIA Model 1 (covars + BW + EI)												
Duffey et al., 2010	USA	18 - 30	55	Mixed	2444	637	SSSD+SSFD	mL/day	.	Per 250 mL/d increase	1.06 (1.02, 1.10)	RR
SSSD+SSFD+SSFJ AO ELEMENT Model 1 + covars + EI												
Cantoral et al., 2015	Mexico	1 - 1	54	Hispanic	78	13	SSSD+SSFD+SSFJ	mL	(1642 - 15242)*	Q1 (ref)	1.00 (1.00, 1.00)	OR
Cantoral et al., 2015	Mexico	1 - 1	54	Hispanic	74	14	SSSD+SSFD+SSFJ	mL	(15410 - 22484)*	Q2	1.14 (0.42, 3.08)	OR
Cantoral et al., 2015	Mexico	1 - 1	54	Hispanic	75	22	SSSD+SSFD+SSFJ	mL	(22731 - 55913)*	Q3	2.70 (1.03, 7.05)	OR
SSSD+SSFD+TFJ AO TLGS Model 2 (EI) + BMI												
Mirmiran et al., 2015	Iran	6 - 18	68	Caucasian	NR	NR	SSSD+SSFD+TFJ	mL/day	9.3	Q1 (ref)	1.00 (1.00, 1.00)	OR
Mirmiran et al., 2015	Iran	6 - 18	68	Caucasian	NR	NR	SSSD+SSFD+TFJ	mL/day	32.0	Q2	2.16 (0.82, 5.68)	OR
Mirmiran et al., 2015	Iran	6 - 18	68	Caucasian	NR	NR	SSSD+SSFD+TFJ	mL/day	58.6	Q3	1.86 (0.71, 4.86)	OR
Mirmiran et al., 2015	Iran	6 - 18	68	Caucasian	NR	NR	SSSD+SSFD+TFJ	mL/day	142.2	Q4	3.66 (1.40, 9.58)	OR
SSSD OB BWHS Model 1 + covars + BMI												
Boggs et al., 2013	USA	21 - 39	100	Black	NR	1616	SSSD	mL/day	(0 - 12)	C1 (ref)	1.00 (1.00, 1.00)	
Boggs et al., 2013	USA	21 - 39	100	Black	NR	2436	SSSD	mL/day	(12 - 84)	C2	1.05 (0.98, 1.12)	
Boggs et al., 2013	USA	21 - 39	100	Black	NR	1736	SSSD	mL/day	(96 - 288)	C3	1.03 (0.95, 1.11)	
Boggs et al., 2013	USA	21 - 39	100	Black	NR	614	SSSD	mL/day	(336 - 336)	C4	1.08 (0.98, 1.20)	
Boggs et al., 2013	USA	21 - 39	100	Black	NR	550	SSSD	mL/day	(672 - .)	C5	1.12 (1.00, 1.25)	
SSSD+SSFD OB DOHP Model 2 (BMI + EI) + covars												
Lim et al., 2009	USA	3 - 5	52	Black	275	75	SSSD+SSFD	mL/day	568.0	Per 29.6 mL/d increase	1.04 (1.01, 1.07)	OR
SSSD+SSFD OB PHI Model 2 (BMI) + EI												
Ludwig et al., 2001	USA	11 - 12	48	Mixed	398	37	SSSD+SSFD	mL/day	433.0	Per 355 mL/d increase in intake at baseline	1.48 (0.63, 3.47)	OR
Ludwig et al., 2001	USA	11 - 12	48	Mixed	398	37	SSSD+SSFD	mL/day	78.0	Per 355 mL/d increase in intake as change from baseline	1.60 (1.14, 2.24)	OR
SSSD+SSFD+SSFJ OB ELEMENT Model 1 + covars + EI												
Cantoral et al., 2015	Mexico	1 - 1	54	Hispanic	78	15	SSSD+SSFD+SSFJ	mL	(1642 - 15242)*	Q1 (ref)	1.00 (1.00, 1.00)	OR
Cantoral et al., 2015	Mexico	1 - 1	54	Hispanic	74	13	SSSD+SSFD+SSFJ	mL	(15410 - 22484)*	Q2	0.84 (0.33, 2.17)	OR
Cantoral et al., 2015	Mexico	1 - 1	54	Hispanic	75	29	SSSD+SSFD+SSFJ	mL	(22731 - 55913)*	Q3	2.99 (1.27, 7.02)	OR
SSSD+SSFD+TFJ OB Amsterdam Model 3 (BW) + covars												
Weijs et al., 2011	The Netherlands	.33 - 1.08	47	Caucasian	120	20	SSSD+SSFD+TFJ	E%	5.2	Per 1 E% increase	1.13 (1.03, 1.24)	OR
SSSD+SSFD+TFJ OB Generation R Model 2 + covars + EI												
Leermakers et al., 2015	The Netherlands	.98 - 1.18	100	Caucasian	394	NR	SSSD+SSFD+TFJ	mL/day	64.0	Q1 (ref)	1.00 (1.00, 1.00)	OR
Leermakers et al., 2015	The Netherlands	.98 - 1.18	100	Caucasian	399	NR	SSSD+SSFD+TFJ	mL/day	171.0	Q2	1.09 (0.67, 1.78)	OR
Leermakers et al., 2015	The Netherlands	.98 - 1.18	100	Caucasian	395	NR	SSSD+SSFD+TFJ	mL/day	321.0	Q3	1.27 (0.78, 2.06)	OR
Leermakers et al., 2015	The Netherlands	.98 - 1.18	0	Caucasian	392	NR	SSSD+SSFD+TFJ	mL/day	64.0	Q1 (ref)	1.00 (1.00, 1.00)	OR
Leermakers et al., 2015	The Netherlands	.98 - 1.18	0	Caucasian	393	NR	SSSD+SSFD+TFJ	mL/day	171.0	Q2	1.03 (0.57, 1.87)	OR
Leermakers et al., 2015	The Netherlands	.98 - 1.18	0	Caucasian	398	NR	SSSD+SSFD+TFJ	mL/day	321.0	Q3	0.90 (0.44, 1.85)	OR



Note: * = cumulative exposure; NC (ref) = non-consumers; RR = Rate Ratio; OR = Odds Ratio

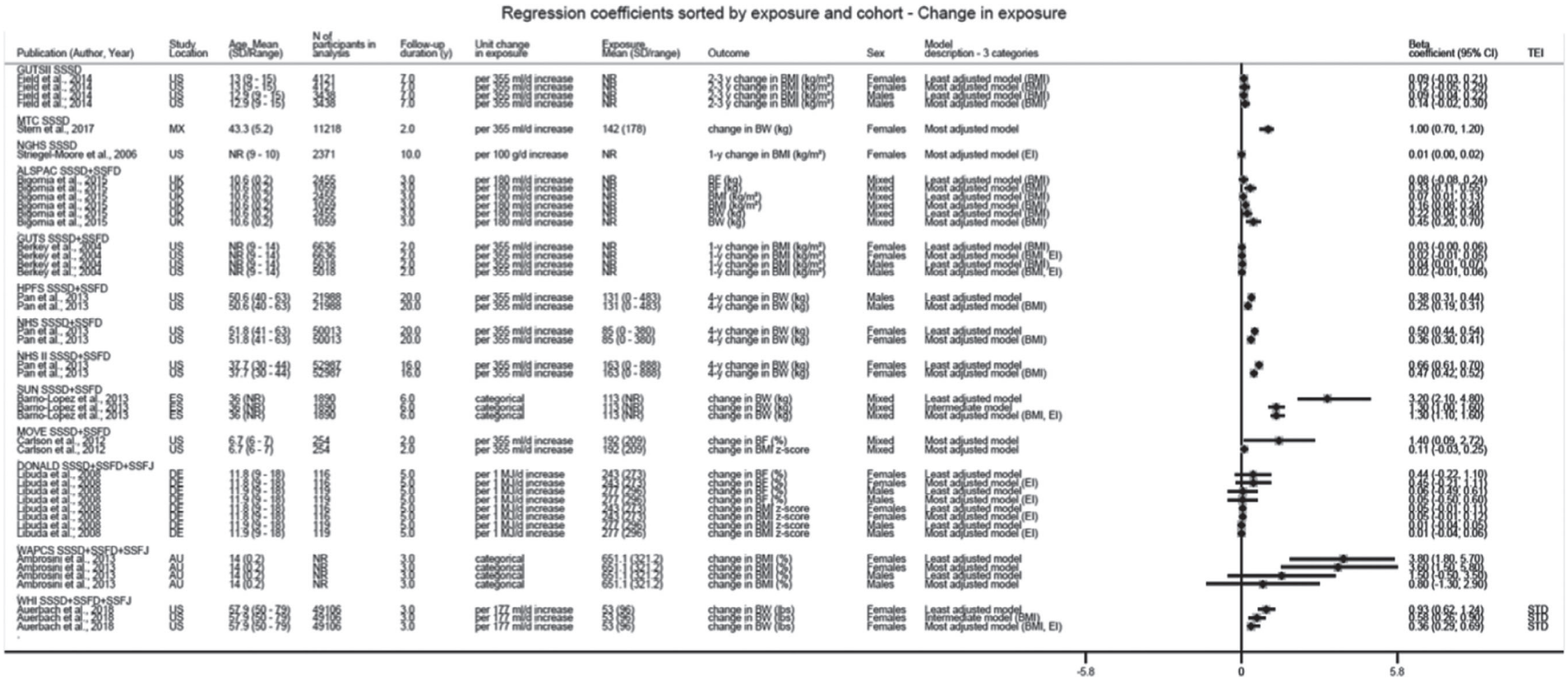
Figure K.3: Intake of SSBs at baseline and incidence of overweight/obesity and abdominal obesity

Figure K.4: Intake of SSBs and continuous variables related to the risk of obesity and abdominal obesity



Note: STD = Standardised for Total Energy Intake.
MIT-GDS (Phillips et al., 2014) and Framingham-3Gen (Ma et al., 2016) excluded.

Figure K.4a: Intake of SSBs at baseline and measures of body weight, body mass index and body fat



Note: STD = Standardised for Total Energy Intake; Ambrosini et al. (2013) and Barrio-Lopez et al. (2013) = only coefficients from highest categories (categorical analysis).

Figure K.4b: Change in intake of SSBs and measures of body weight, body mass index, and body fat