Supplemental Table 1. Initial search strategy[1]

Database	Limits	Search Terms
Cochrane Library	Trials only Search in title, abstract, keywords	“sodium intake" OR "sodium consumption" OR "dietary sodium" OR "sodium chloride intake" OR "sodium chloride consumption" OR "dietary sodium chloride" OR "salt intake" OR "salt consumption" OR "dietary salt" OR "sodium, dietary" OR "salt, dietary" OR "sodium chloride, dietary") **AND** ("BW" OR bmi OR "body mass index" OR "bmi score" OR "bmi z-score" OR "bmi sds" OR "body fat" OR "body fat percentage" OR "% body fat" OR "percent body fat" OR "fat mass" OR "bmi percentile" OR obes* OR overweight OR adipos* OR "waist circumference" OR "waist circumference z-score" OR "waist-to-height-ratio" OR "WHtR" OR "centrally obese" OR "central adiposity" OR "body composition" OR "sugar-sweetened beverage" OR "sugar-sweetened beverages")
Medline Complete (EBSCO Host)	English Language; Human Search modes Boolean/ Phrase	"sodium intake" OR "sodium consumption" OR "dietary sodium" OR "sodium chloride intake" OR "sodium chloride consumption" OR "dietary sodium chloride" OR "salt intake" OR "salt consumption" OR "dietary salt" OR "sodium, dietary" OR "salt, dietary" OR "sodium chloride, dietary") **AND** ("BW" OR bmi OR "body mass index" OR "bmi score" OR "bmi z-score" OR "bmi sds" OR "body fat" OR "body fat percentage" OR "% body fat" OR "percent body fat" OR "fat mass" OR "bmi percentile" OR obes* OR overweight OR adipos* OR "waist circumference" OR "waist circumference z-score" OR "waist-to-height-ratio" OR "WHtR" OR "centrally obese" OR "central adiposity" OR "body composition" OR "sugar-sweetened beverage" OR "sugar-sweetened beverages"
CINAHL (EBSCO Host)	English Language; Human, Peer-reviewed Search modes Boolean/ Phrase	"sodium intake" OR "sodium consumption" OR "dietary sodium" OR "sodium chloride intake" OR "sodium chloride consumption" OR "dietary sodium chloride" OR "salt intake" OR "salt consumption" OR "dietary salt" OR "sodium, dietary" OR "salt, dietary" OR "sodium chloride, dietary") **AND** ("BW" OR bmi OR "body mass index" OR "bmi score" OR "bmi z-score" OR "bmi sds" OR "body fat" OR "body fat percentage" OR "% body fat" OR "percent body fat" OR "fat mass" OR "bmi percentile" OR obes* OR overweight OR adipos* OR "waist circumference" OR "waist circumference z-score" OR "waist-to-height-ratio" OR "WHtR" OR "centrally obese" OR "central adiposity" OR "body composition" OR "sugar-sweetened beverage" OR "sugar-sweetened beverages"
Scopus	English Language, Document type: Article Search mode: Boolean/phrase Search in title, abstract, key words	TITLE-ABS-KEY ("sodium intake" OR "sodium consumption*" OR "dietary sodium" OR "sodium chloride intake" OR "sodium chloride consumption" OR "dietary sodium chloride" OR "salt intake" OR "salt consumption*" OR "dietary salt" AND ("BW" OR bmi OR "body mass index" OR "bmi score" OR "bmi z-score" OR "bmi sds" OR "body fat" OR "body fat percentage" OR "% body fat" OR "percent body fat" OR "fat mass" OR "bmi percentile" OR obes* OR overweight OR adipos* OR "waist circumference" OR "waist circumference z-score" OR "waist-to-height-ratio" OR "WHtR" OR "centrally obese" OR "central

		adiposity" OR "body composition" OR "sugar-sweetened beverage" OR "sugar-sweetened beverages")) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (LANGUAGE , "English")
Embase	English Language, Document type: Article, article in press, Human Search in abstract, article title, index term, subheading	'BW' OR bmi OR 'body mass index' OR 'bmi score' OR 'bmi z-score' OR 'bmi sds' OR 'body fat' OR 'body fat percentage' OR '% body fat' OR 'percent body fat' OR 'fat mass' OR 'bmi percentile' OR obes* OR overweight OR adipos* OR 'waist circumference' OR 'waist circumference z-score' OR 'waist-to-height-ratio' OR 'whtr' OR 'centrally obese' OR 'central adiposity' OR 'body composition' OR 'sugar-sweetened beverage' OR 'sugar-sweetened beverages':de,lnk,ab,ti AND ([article]/lim OR [article in press]/lim) AND [humans]/lim AND [english]/lim AND [embase]/lim

[1]Inital search was completed in October 2015, updated on the 10th of July 2017 and 18th of July 2019.

Supplemental Table 2. Updated search strategy to capture eligible randomized controlled trials[1]

Database	**Limits**	**Search Terms**
Cochrane Library	Trials only Search in title, abstract, keywords	*"sodium intake" OR "sodium consumption" OR "dietary sodium" OR "sodium chloride intake" OR "sodium chloride consumption" OR "dietary sodium chloride" OR "salt intake" OR "salt consumption" OR "dietary salt" OR "sodium, dietary" OR "salt, dietary" OR "sodium chloride, dietary" OR "sodium restrict*" OR "sodium reduc*" OR "salt restrict*" OR "salt reduc*" OR "sodium diet" OR "salt diet" OR "sodium limit*" OR "salt limit*" OR "low sodium" OR "low salt" in Title, Abstract, Keywords in Trials'*
Medline Complete	English Language; Human Search modes Boolean/ Phrase	"sodium intake" OR "sodium consumption" OR "dietary sodium" OR "sodium chloride intake" OR "sodium chloride consumption" OR "dietary sodium chloride" OR "salt intake" OR "salt consumption" OR "dietary salt" OR "sodium, dietary" OR "salt, dietary" OR "sodium chloride, dietary" OR "sodium restrict*" OR "sodium reduc*" OR "salt restrict*" OR "salt reduc*" OR "sodium diet" OR "salt diet" OR "sodium limit*" OR "salt limit*" OR "low sodium" OR "low salt" AND randomized controlled trials or rtc or randomised control trials OR randomized control trial OR randomized clinical trial
CINAHL	English Language; Human, Peer-reviewed Search modes Boolean/ Phrase	"sodium intake" OR "sodium consumption" OR "dietary sodium" OR "sodium chloride intake" OR "sodium chloride consumption" OR "dietary sodium chloride" OR "salt intake" OR "salt consumption" OR "dietary salt" OR "sodium, dietary" OR "salt, dietary" OR "sodium chloride, dietary" OR "sodium restrict*" OR "sodium reduc*" OR "salt restrict*" OR "salt reduc*" OR "sodium diet" OR "salt diet" OR "sodium limit*" OR "salt limit*" OR "low sodium" OR "low salt" AND randomized controlled trials or rtc or randomised control trials OR randomized control trial OR randomized clinical trial
Scopus	English Language, Document type: Article Search mode: Boolean/phrase Search in title, abstract, key words	*TITLE-ABS-KEY ("sodium intake" OR "sodium consumption*" OR "dietary sodium" OR "sodium chloride intake" OR "sodium chloride consumption" OR "dietary sodium chloride" OR "salt intake" OR "salt consumption*" OR "dietary salt" OR "sodium chloride, dietary" OR "sodium restrict*" OR "sodium reduc*" OR "salt restrict*" OR "salt reduc*" OR "sodium diet" OR "salt diet" OR "sodium limit*" OR "salt limit*" OR "low sodium" OR "low salt" AND "randomi*ed controlled trial*" OR "randomi*ed controled trial*" OR "randomi*ed control trial*" OR "randomi*ed clinical trial*" OR "controlled clinical trial" OR "controled clinical trial" OR "rtc") AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "ip")) AND (LIMIT-TO (LANGUAGE , "English"))*
Embase	English Language, Document type: Article, article in press, Human, “randomized controlled trial” OR “controlled clinical trial”	'sodium intake' OR 'sodium consumption' OR 'dietary sodium' OR 'sodium chloride intake' OR 'sodium chloride consumption' OR 'dietary sodium chloride' OR 'salt intake' OR 'salt consumption' OR 'dietary salt' OR 'sodium, dietary' OR 'salt, dietary' OR 'sodium chloride, dietary' OR 'sodium restrict*' OR 'sodium reduc*' OR 'salt restrict*' OR 'salt reduc*' OR 'sodium diet' OR 'salt diet' OR 'sodium limit*' OR 'salt limit*' OR 'low sodium' OR 'low salt' AND ([controlled clinical trial]/lim OR [randomized controlled trial]/lim) AND ([article]/lim OR [article in press]/lim) AND [humans]/lim AND [english]/lim AND [embase]/lim

	Search in abstract, article title, index term, subheading”	

[1]Search was completed on the 10th of July 2017 and 18th of July 2019.

Supplemental Table 3. Study characteristics of included cross-sectional studies assessing the association between sodium intake and adiposity outcomes among adults

Study	Country	Study population/Study Name	N, sample characteristics	Exposure	Adiposity outcome						Included in meta-analyses
					BMI	Weight category	BW	WC	Abdominal obesity	Body composition	
Pan et al. 1990[77]	Taiwan	Convenience sample of men aged 45-64 y recruited via routine health checks with Government Employees Clinic in Taipei, Taiwan	401 Male 100%; mean age 53 y	7 x timed overnight urine samples *Extrapolated to 24-hr period (average of 7 samples) UrNa concentration x 24 and by urine volume / sleep duration	X						N: correlation only
Ferdaus et al.2015[61]	Japan	Adults recruited via existing cohort study Shimane CoHRE Study	1016	1 x spot urine Daily intake estimated using Kawasaki equation	X						N: correlation only
Staessen et al. 1991[35]	London, UK	Male civil servants working at the Department of Environment The Whitehall Department of the Environment Study	301 Male 100%; mean age 45 y; mean BMI 24.1 kg/m^2	1 x 24-hr urine	X						N: correlation only
Ribi et al. 2010[86]	Slovenia	Random sample of adults 25-65 years	143 Male 43%; mean age 45 y; mean BMI 26.1 (kg/m^2)	1 x 24-hr urine	X						N: correlation only
Buranakitjaroen et al. 2015[54]	Thailand	Adults aged >18 years with diagnosed hypertension recruited via hypertension outpatient clinic at Siriraj Hospital	320 Mean age 61 y; mean BMI 25.9 kg/m^2	2 x 24-hr urine (consecutive days, average used)	X						N: correlation only

Strazzullo et al. 1983[92]	Naples, Italy	Men aged 28-56 years employed at Olivetti factory Olivetti Study data collection period 1976-1977	188 Male 100%; mean age 41 y; mean BMI 26.3 kg/m^2	1 x 24-hr urine	X	X		N:correlation only
Polonia et al. 2006[81]	Portugal	Convenience sample of adult population living and working in an urban area of northern Portugal	426 Male 44%; mean age 50 y; mean BMI 27.9 kg/m^2	1 x 24-hr urine	X			N: correlation only
Polonia et al. 2014[82]	Portugal	Nationally representative sample of adults aged 18-90 years PHYSA study	2565 Male 48%, mean age 49 y, mean BMI 27.1 kg/m^2	1 x 24-hr urine	X			N: correlation only
Shim et al. 2013[90]	Korea	Students aged 20-26 years studying at a University in Gyeonggi Province	228 Male 31%	125 item dish frequency questionnaire (validated in adults)	X			N: correlation only
Rashidah et al. 2014[84]	Malaysia	Adults aged 20-56 y recruited via Ministry of Health staff departments	445 Male 46%; mean age 35 y; mean BMI 25.4 kg/m^2	1 x 24-hr urine	X			N: correlation only
Cheung et al. 2000 [56]	China	Convenience sample of Hong Kong Chinese adults aged 18-75 y	117 Male 77%; 60% hypertensive	1 x 24-hr urine	X	X		N: correlation only
Campino et al. 2016[55]	Chile	Convenience sample of adults aged 19-66 years	135	1 x 24-hr urine		X		N: correlation only
Villani et al. 2012[96]	Adelaide, Australia	Adults with diagnosed T2DM aged 18-75 y recruited from local community to	88 Male 59%; mean age male 62 y &	1 x 24-hr urine		X		N: correlation only

		participate in weight loss intervention trial (data from baseline cross-sectional analysis)	female 59 y; mean BMI male 34.5 kg/m^2 & female 35.9 kg/m^2						
Sanchez-Castillo et al. 1987[87]	Cambridgeshire, UK	Random sample of adults aged 20-65 y listed on the local Health Centre's register	83 Male 40%	12 x 24-hr urine		X			N: correlation only
Jiet & Soma 2017[68]	Malaysia	Convenience sample of university students aged 18-25 y recruited from University of Nottingham Malaysia Campus	28 Male 54%; mean age 22 y	1 x 24-hr urine	X	X		X	N: correlation only
Perin et al. 2019[78]	Brazil	Population based random sample of adults aged 20-80 y residing in town of Artur Nogueira, southeast region of Brazil	517 Male 42%; mean age 54 y	1 x 24-hr urine	X		X		N: correlation only
Asfar et al. 2013[52]	Turkey	Adults with newly diagnosed Type 2 Diabetes recruited via outpatient nephrology unit	114 Male 50%, mean age 45 y; mean BMI 30.1 kg/m^2	1 x 24-hr urine (log sodium)	X				N: exposure logarithmic scale
Shay et a. 2012[89]	USA	Adults aged 40-59 years participating in USA arm of International Study of Macro-/Micronutrients and Blood Pressure (INTERMAP)	1794 53% male	2 x 24-hr urine	X				N: standardised regression coefficient
Venezia et al. 2010[94]	Naples, Italy	Men aged 32-81 employed at Olivetti factory	940 Male 100%; mean age 60 y; 56%	1 x 24-hr urine	X				N: standardised regression coefficient

		Olivetti Study data collection period 2002-2004	overweight & 21% obese; 71% hypertensive								
Hashimoto et al. 2016[64]	Japan	Convenience sample of adults aged ≥20 y recruited via local hospital	7629 Male 63%; mean age 56 (12) y	1 x morning spot urine extrapolated to daily sodium intake using Tanaka equation			X				N: standardised regression coefficient
Choi & Run 2017[57]	Korea	Convenience sample of healthy adults aged 19-69 years recruited from Gwangju area, Korea	80 50% male	1 x 24-hr diet recall	X		X	X		X	N: standardised regression coefficient
Crouch et al. 2018[58]	South Africa	Apparently healthy adults aged 20-30 years recruited from the Potchefstroom area of South Africa. African-Predict study (African Prospective study on the Early Detection and Identification of Cardiovascular disease and Hypertension	761 43% male; 46% overweight/obese	1 x 24-hr urine	X		X	X		X	N: exposure logarithmic sodium
Navia et al. 2014[74]	Spain	Nationally representative sample of adults aged 18-60 y FANPE Study	418 Male 47%; mean age 37 y; 34% overweight, 14% obese	1 x 24-hr urine	X	X		X			N: exposure as mmol/L
Yoon et al. 2013[12]	Korea	Nationally representative sample of adults aged ≥19 y KHANES 2007-10	20586 Male 40%; 31% obese	1 x 24-hr diet recall		X		X	X		N: exposure sodium density
Murakami et al. 2015[72]	Japan	Female dietetic students aged 18-22 y from 15 institutions in Japan	1043 Female 100%; mean age 20	1 x 24-hr urine	X	X		X	X		N: exposure sodium density

			y; 7.7% obese i.e. BMI ≥25 kg/m^2						
Aballay et a. 2014[51]	Argentina	Multistage population random sample of adults aged ≥18 y residing in Cordoba Córdoba Obesity and Diet Study (CODIES)	4328 58% male; mean age 43 (18) y; 34% overweight, 17% obese	1 x validated semi-quantitative FFQ (past 12 months)		X			N
Perin et al. 2013[79]	Brazil	Adults diagnosed with HT recruited via cardiology outpatient centre in Sao Paulo	108 Male 48%; mean age 57 y; mean BMI 32 kg/m^2	1 x 24-hr urine	X				Y
Baudrand et al. 2014[53]	Santiago, Chile	Adults recruited from low and middle income primary care centres	370 Male 30%; mean age 50 y; mean BMI 29.3 kg/m^2; 72% hypertensive	1 x 24-hr urine	X		X		Y
Rhee et al. 2014[85]	Korea	Random sample of adults aged 20-65 y	463 28% had metabolic syndrome	1 x 24-hr urine	X				Y
Sharma et al. 2014[88]	USA	Nationally representative sample of adults aged ≥18 years NHANES 2001-06	6985 Mean age 42 y	1 x 24-hr diet recall	X				Y
Lee et al. 2015 [70]	Korea	Population based cohort of healthy Korean adults <70 y Korean Genome Epidemiology Study (2007-2008)	1586 51% male	1 x spot urine (1st morning void following 8hr fast) converted to 24hr excretion using Tanaka's equation, validated for Asian population	X			X	Y

Yan et al. 2016[100]	China	Multi-stage stratified, cluster sample of adults aged 18-69 years residing in 20 districts across north China SMASH (Shandong-Ministry of Health Action on Salt and Hypertension) Study	1975 Male 53%, mean age 41 (14) y, 52% overweight or obese	1 x 24-hr urine	X		X	Y
Yokokawa et al. 2016[101]	Thailand	Baseline data from a cluster randomized trial assessing education messages for reducing salt intake. Recruited via diabetes or hypertension clinics	793 Males 52%; mean age 66.5 (8.9) y	3 x overnight urine (average), extrapolated to daily sodium intake using unspecified published formula	X	X		Y
Radhika et al. 2007[83]	Chennai, India	Random sample of adults aged ≥20 years residing in Chennai Chennai Urban Rural Epidemiology Study (CURES)	1902 27% hypertensive	Semi-quantitative FFQ (22 items, consumption during previous year). Salt intake (g/d) also included quantitative intake used during cooking/table (no description of how this was done)	X		X	Y
Verhave et al. 2004[95]	Netherlands	Adults aged 28-75 y residing in Groningen, Netherlands Prevention of Renal and Vascular End-stage Disease (PREVEND) study	7850 Male 53%	2 x 24-hr urine (consecutive days, average used)	X			Y
Hulthen et al. 2010[67]	Sweden	Males were randomly selected from the existing Gothenburg Obesity and Osteoporosis Determinants (GOOD)	79 Male 100%; mean age 19 y; mean BMI 22.5 kg/m^2	1 x 24-hr urine	X	X		Y

		study, which includes adults aged 18-20 y							
Eufinger et al. 2012[60]	USA	Randomly selected samples of middle aged adult twins who served in US military between 1964-1975 Emory Twins Heart Study	286 Male 100%; mean age 54 y	12 month Willet semi-quantitative FFQ	X		X		Y
Han et al. 2017[63]	China	Stratified random cluster sample of Kazakh population China Altay Kazakh Heart Study	1445 Male 49%	1 x spot urine (2nd morning urine, unclear how factored to daily salt intake)	X	X			Y
Hoffman et al. 2009[65]	Caracas, Venezuela	Adults aged 18-70 years residing in the town of Caracus	766 33% male; mean age 45 (17) y	2 x 24-hr urine (completed within 2 weeks, average used)	X		X	X	Y
Madhavan et al. 1994[71]	New York City, USA	Random selection of adults who were union sponsored employees diagnosed as hypertensive or normotensive at workplace screenings	808 Mean age 51 y; 76% hypertensive; 44% Black, 56% Caucasian	1 x 24-hr urine	X		X		Y
Oh et al. 2015[75]	Korea	Representative sample of adults KHANES 4 & 5 (data collection 2008-11)	18146 Male 46%; mean age 47 y	1 x spot urine after 8 hr fast. Extrapolated to 24-hr sodium intake using Kawasaki formula	X			X	Y
Webster et al. 2016[98]	Samoa	Representative sample of adults aged 18-64 y Samoan STEPS Survey	293 Male 42%; mean age 36±0.9 y; mean BMI 31.9 kg/m^2	1 x 24-hr urine	X				Y
Lee et al. 2014[69]	Korea	Convenience sample of adults aged 31-38 y	79	9-10 x spot urine sample, extrapolated to daily salt intake	X				Y

			Male 60%; median age 35 y; median BMI 22.8 kg/m^2	(g/d) using Kawasaki and Tanaka equations and average used							
Ohta et al. 2017[76]	Japan	Adults recruited from hospital outpatient	429 Male 48%; mean age 71 (11) y	1 x spot urine Daily intake estimated using equation (equation not specified)	X						Y
Song et al 2013[91]	Korea	Representative sample of adults aged 19-64 years KHANES IIII (2007-09)	5955 46% male; 26% overweight (BMI ≥25 Kg/m^2)	1 x 24-hr diet recall		X					Y
Nam et al. 2017[73]	Korea	Healthy adults aged 19-69 y recruited from eight provinces in South Korea	640 Male 50%; 27% obese	2 x non-consecutive 24-hr urine (average)	X	X	X	X	X		Y
Huh et al. 2015 [66]	Korea	Nationally representative sample of Korean adults ≥45 y 2008-2010 KNHANES	7162 50% male; mean age 20 y; mean BMI 22.5 kg/m^2	1 x spot urine (early morning if possible) extrapolated to 24-hr excretion using Tanaka's equation	X			X	X	X	Y
Yi et al. 2014[11]	USA	Representative sample of non-institutionalized adults residing in NYC aged >18 years The New York City (NYC) Heart Follow-Up Study	1656	1 x 24-hr urine	X	X	X	X			Y
Yi et al. 2015[10]	USA	Nationally representative sample of adults aged ≥20 years NHANES 2009-10	4613	2 x 24-hr diet recall (average used)	X		X	X		X	Y
Ma et al. 2015[9]‖	United Kingdom	Nationally representative sample of adults aged ≥18 y	785 47% male; mean age 49	1 x 24-hr urine	X	X		X	X	X	Y

		National Diet and Nutrition Survey Rolling Programme	y; mean BMI 27.7 kg/m^2								
Ge et al. 2015[62]	China	Nationally representative sample of adults aged 18-69 y. SMASH: the Shandong and Ministry of Health Action on Salt and Hypertension Study	1906 53% male	1 x 24-hr urine					X		Y
Elfassy et al. 2018[59]	USA	Population based cohort study 16,415 community-dwelling, self-identified Hispanics/Latinos aged 18-74 y Hispanic Community Health Study/Study of Latinos (HCHS/SOL)	435 sub-sample with 24-hr urine 47% male; mean age 42 y	1 x 24-hr urine sample	X					X	Y
Petermann-Rocha et al. 2019[80]	Chile	Nationally representative sample of Chileans aged ≥15 years Chilean National Health Survey 2009-10	2913 42% male; mean age 46 y	1 x spot urine extrapolated to 24-hr excretion using Tanaka equation	X			X			Y
Vega-Vega et a. 2018[93]	Mexico	Adults were recruited from the National Institute of Medical Sciences and Nutrition Salvador Zubiran Salt and Mexico (SALMEX) cohort study	727 36% male; mean age 39 y	1 x 24-hr urine	X		X				Y
Watanabe et al. 2019[97]	Japan	Community based sample of adults aged ≥40 years recruited from Takahata town	2297 Male 46%; mean age 60 y	1 x spot urine extrapolated to 24-hr excretion using Kawasaki equation	X	X					Y

		Yamagata (Takahata) study									
Zhang et al. 2018 [102]	USA	Nationally representative sample of generally healthy adults aged 24 to 48 years 1999-2006 National Health and Nutrition Examination Survey (NHANES)	9306 Male 53% Median age 35 y 23% obese	1 to 2 x 24-hr diet recall	X	X	X	X	X	X	Y
Zhou et al. 2019 [104]	Japan, China, UK, USA	Adults aged 40-59 y recruited from 17 population samples in Japan (4 samples), China (3 samples), UK (2 samples), USA (8 samples) International Study of Macro-/Micro-nutrients and Blood Pressure (INTERMAP)	4680 (Japan n=1145, China n=839, UK n=501, USA n=2195) Male 50% Mean age 49 y; 52% overweight/obese	2 x 24-hr urine (average)	X	X					Y
Zhao et al. 2019 [103]	USA	Nationally representative sample of non-pregnant adults aged 20-69 years National Health and Nutrition Examination Survey (NHANES 2014)	730 Male 50%; Mean age 43 y; 73% overweight/obese	Up to 2 x 24-hr urine (usual intake estimated from National Cancer Institute (NCI) measurement error model)	X	X		X	X		Y
Welsh et al. 2019 [99]	UK	Population based sample of adults aged 40-69 years recruited from Scotland, England and Wales UK Biobank	430, 110 45% male; Mean age 56 y	1 x spot urine extrapolated to 24-hr excretion using Kawasaki equation	X						Y

Abbreviations: BMI body mass index, BW body weight, WC waist circumference, UK United Kingdom, USA United States of America

Supplemental Table 4. Newcastle Ottawa Scale quality assessment of cross-sectional studies assessing the association between sodium intake and adiposity outcomes among adults

Study	**Country**	**Selection** ***(0-3*)***		**Comparability** ***(0-2*)***[a]	**Outcome** ***(0-2*)***		**Total NOS Score** ***(0-7*)***[b]	**Included in meta-analysis**
		Representativeness of cohort ***(0-1*)***	**Assessment of the exposure (sodium/salt intake)** ***(0-2*)***	**Methods to control confounding** ***(0-2*)***	**Assessment of outcome** ***(0-1*)***	**Non-response rate** ***(0-1*)***		
		a) truly representative of the source population ***(1*)*** b) somewhat representative of the source population ***(1*)*** c) selected group of users e.g. nurses, volunteers ***(0)*** d) no description of the derivation of the cohort ***(0)***	a) 24-hr urine collection (1 or more) ***(2*)*** b) 24-hr dietary recall method ***(1*)*** c) Weighed dietary record (1 or more days) ***(1*)*** d) Urine sample: spot, timed or overnight ***(0)*** e) Food frequency questionnaire ***(0)***	a) study controls for age and sex ***(1*)*** *b) study controls for energy intake* ***(1*)***	a) objectively measured adiposity outcome (e.g. BW and height for BMI) ***(1*)*** b) self-report BW and height ***(0)*** c) no description ***(0)***	a) Non-response rate =<20% ***(1*)*** b) Non-response rate >20% ***(0)*** c) no description ***(0)***		
Pan et al. 1990[77]	Taiwan	0	0	0	1	0	1	N
Ferdaus et al.2015[61]	Japan	1	0	0	1	0	2	N
Staessen et al. 1991[35]	UK	0	2	0	0	0	2	N
Ribi et al. 2010[86]	Slovenia	1	2	0	0	0	3	N
Buranakitjaroen et al. 2015[54]	Thailand	0	2	0	0	0	2	N
Strazzullo et al. 1983[92]	Italy	0	2	0	1	1	4	N
Polonia et al. 2006[81]	Portugal	0	2	0	1	1	4	N

Polonia et al. 2014[82]	Portugal	1	2	0	1	0	4	N
Shim et al. 2013[90]	Korea	0	0	0	0	0	0	N
Rashidah et al. 2014[84]	Malaysia	0	2	0	1	0	3	N
Cheung et al. 2000 [56]	China	0	2	0	1	0	3	N
Campino et al. 2016[55]	Chile	0	2	0	1	0	3	N
Villani et al. 2012i[96]	Australia	0	2	0	1	0	3	N
Sanchez-Castillo et al.[87]	UK	1	2	0	0	0	3	N
Asfar et al. 2013[52]	Turkey	0	2	0	1	0	3	N
Shay et a. 2012[89]	USA	1	2	2	1	0	6	N
Venezia et al. 2010[94]	Italy	0	2	0	1	0	3	N
Hashimoto et al. 2016[64]	Japan	0	0	1	1	1	3	N
Navia et al. 2014[74]	Spain	1	2	2	1	0	6	N
Yoon et al. 2013[12]	Korea	1	1	2	1	1	6	N
Murakami et al. 2015[72]	Japan	0	2	1	1	0	4	N
Perin et al. 2013[79]	Brazil	0	2	0	1	0	3	Y

Baudrand et al. 2014[53]	Chile	0	2	0	1	0	3	Y
Rhee et al. 2014[85]	Korea	1	2	0	1	0	4	Y
Sharma et al. 2014[88]	USA	1	1	0	1	0	3	Y
Lee et al. 2015 [70]	Korea	1	0	0	1	0	2	Y
Yan et al. 2016[100]	China	1	2	0	1	0	4	Y
Aballay et a. 2014[51]	Argentina	1	0	2	1	1	5	N
Yokokawa et al. 2016[101]	Thailand	0	0	0	1	0	1	Y
Radhika et a. 2007[83]	India	1	0	0	1	1	3	Y
Verhave et al. 2004 [95]	Netherlands	1	2	0	1	0	4	Y
Hulthen et al. 2010[67]	Sweden	1	2	0	1	0	4	Y
Eufinger et al. 2012[60]	USA	0	0	0	1	0	1	Y
Han et al. 2017[63]	China	1	0	0	1	1	3	Y
Hoffman et al. 2009 [65]	Venezuela	1	2	0	1	0	4	Y
Madhavan et al. 1994[71]	USA	0	2	0	1	0	3	Y
Oh et al. 2015[75]	Korea	1	0	0	1	0	2	Y
Webster et al. 2016 [98]	Samoa	1	2	1	1	1	6	Y

Lee et al. 2014[69]	Korea	0	0	0	1	0	1	Y
Ohta et al. 2017[76]	Japan	0	0	0	1	0	1	Y
Song et al 2013[91]	Korea	1	1	2	1	0	5	Y
Nam et al. 2017[73]	Korea	1	2	2	1	0	6	Y
Huh et al. 2015 [66]	Korea	1	0	0	1	0	2	Y
Yi et al. 2014[11]	USA	1	2	1	1	0	5	Y
Yi et al. 2015[10]	USA	1	1	2	1	0	5	Y
Ma et al. 2015[9]	UK	1	2	2	1	0	6	Y
Ge et al. 2015[62]	China	1	2	0	1	0	4	Y
Choi & Run 2017[57]	Korea	0	1	2	1	0	4	N
Crouch et al. 2018[58]	South Africa	0	2	2	1	0	5	N
Elfassy et al. 2018 [59]	USA	1	2	2	1	0	6	Y
Jiet & Soma 2017 [68]	Malaysia	0	2	0	1	0	3	N
Perin et al. 2019[78]	Brazil	1	2	0	1	0	4	N
Petermann -Rocha et al. 2019[80]	Chile	1	0	0	1	0	2	Y
Vega-vega et al. 2018[93]	Mexico	0	2	0	1	0	3	Y

Watanabe et al. 2019[97]	Japan	1	0	0	1	0	2	Y
Zhang et al. 2018 [102]	USA	1	1	2	1	0	5	Y
Zhou et al. 2019 [104]	Japan, China, UK, USA	1	2	2	1	0	6	Y
Zhao et al. 2019 [103]	USA	1	2	2	1	0	6	Y
Welsh et al. 2019 [99]	UK	1	0	0	1	0	2	Y

Abbreviations: NOS Newcastle-Ottawa Scale Score; USA United States of America; UK United Kingdom

[a] Scoring for adjustment for confounders is based on the primary outcome model (i.e. BMI or weight category)

[b] Studies with total scores of ≥5*, 3-4* and ≤2* were assessed as high, moderate and low-quality studies, respectively

Supplemental Table 5. Summary of findings from cross-sectional studies among adults, outcome: BMI or weight category

Study	Country	N, sample characteristics	Adiposity outcome	Sodium/salt intake[a]	Covariates; stratification	Findings[b]	Summary[c]	Included in meta-analyses related to this outcome
Pan et al. 1990[(77)]	Taiwan	401 Male 100%; mean age 53 y	BMI (kg/m^2)	Mean Na 168 (63) mmol/d	None	Significant positive correlation between sodium intake (mmol/d) and BMI (kg/m^2) (*r*=0.21 P<0.001)	+ weak BMI (unadjusted)	N
Ferdaus et al.2015[(61)]	Japan	1016	BMI (kg/m^2)	Mean salt 9.6 g/d	None	Significant positive correlation between sodium intake (mmol/d) and BMI (kg/m^2) (*Spearman's pho*=0.11, P=0.0003)	+ very weak BMI (unadjusted)	N
Staessen et al. 1991[(35)]	London, UK	301 Male 100%; mean age 45 y; mean BMI 24.1 kg/m^2	BMI (kg/m^2)	Mean Na 174 (57) mmol/d	None	Significant positive correlation between sodium intake (mmol/d) and BMI (kg/m^2) (*r*=0.29, P<0.001)	+ BMI men (unadjusted)	N
Ribi et al. 2010[(86)]	Slovenia	143 Male 43%; mean age 45 y; mean BMI 26.1 kg/m^2	BMI (kg/m^2)[d]	Mean Na 192 (83) mmol/d	None	Significant positive correlation between sodium intake (mmol/d) and BMI (kg/m^2) (r=0.38, P=0.001).	+ BMI (unadjusted)	N
Buranakitjaroen et al. 2015[(54)]	Thailand	320 Mean age 61 y; mean BMI 25.9 kg/m^2	BMI (kg/m^2)[e]	Mean Na 148 (69) mmol/d	None	Significant positive correlation between sodium intake (mmol/d) and BMI (kg/m^2) (*r*=0.30, P<0.01)	+ BMI (unadjusted)	N
Strazzullo et al. 1983[(92)]	Naples, Italy	188 Male 100%; mean age 41 y; mean BMI 26.3 kg/m^2	BMI (kg/m^2)[d]	Mean Na 177 (59) mmol/d	None	Significant positive correlation between sodium intake (mmol/d) and BMI (kg/m^2) (*r*=0.29, P<0.001)	+ BMI men (unadjusted)	N
Polonia et al. 2006[(81)]	Portugal	426 Male 44%; mean age 50	BMI (kg/m^2)	Mean Na 210 (no SD) mmol/d	None	Significant positive correlation between sodium intake (mmol/d) and BMI (kg/m^2) (*r*=0.13, P<0.05)	+ weak BMI (unadjusted)	N

		y; mean BMI 27.9 (kg/m^2)						
Polonia et al. 2014[82]	Portugal	2565 Male 48%, mean age 49 y, mean BMI 27.1 (kg/m^2)	BMI (kg/m^2)	Mean Na 183 (65) mmol/d	None	Significant positive correlation between sodium intake (mmol/d) and BMI (kg/m^2) (r=0.01, P=0.001)	+ very weak BMI (unadjusted)	N
Shim et al. 2013[90]	Korea	228 Male 31%	BMI (kg/m^2)	Mean Na 231 (166) mmol/d	Age, etoh consumption and smoking	Significant positive correlation between sodium intake (mmol/d) and BMI (kg/m^2) (r=0.207, P=0.002) *adjusted for age, etoh consumption and smoking	+ weak BMI (adjusted)	N
Rashidah et al. 2014[84]	Malaysia	445 Male 46%; mean age 35 y; mean BMI 25.4 kg/m^2	BMI (kg/m^2)	Mean Na 142 (72) mmol/d	None	Significant positive correlation between sodium intake (mmol/d) and BMI (kg/m^2) (r=0.22, P<0.001, R^2=0.05)	+ BMI (unadjusted)	N
Cheung et al. 2000 [56]	China	117 Male 77%; 60% hypertensive	BMI (kg/m^2)	Not reported	None	No correlation between sodium intake and BMI (kg/m^2) (r=0.16, P=NS)	Null BMI (unadjusted)	N
Jiet & Soma 2017 [68]	Malaysia	Convenience sample of university students aged 18-25 y recruited from University of Nottingham Malaysia Campus	BMI (kg/m^2)	Mean Na 175 mmol/d	None	Significant positive correlation between sodium intake (mmol/d) and BMI (kg/m^2) (r=0.45, P=0.02)	+ BMI (unadjusted)	N
Perin et al. 2019[78]	Brazil	Population based random sample of adults aged 20-80 y residing in town of Artur	BMI (kg/m^2)	Mean salt 10.5 (SD 4.5) g/d	None	Significant weak positive correlation between sodium intake (mmol/d) and BMI (kg/m^2) (r=0.16, P<0.001)	+ weak BMI (unadjusted)	N

		Nogueira, southeast region of Brazil						
Asfar et al. 2013[52]	Turkey	114 Male 50%, mean age 45 y; mean BMI 30.1 kg/m^2	BMI (kg/m^2)	Mean Na 171 (92) mmol/d	None	**Difference in BMI (kg/m^2) associated with logarithmic sodium intake (mmol/d)** β=0.013 (95% CI 0.004, 0.022) β(standardised)=0.289, P=0.004.	+ BMI (unadjusted)	N
Shay et a. 2012[89]	USA	1794 53% male	BMI (kg/m^2)	Not reported	Age, smoking status, dietary supplement use, history of HT/CVD, moderate or heavy PA, total energy intake, stratified by sex	**Difference in BMI (kg/m^2) associated with sodium intake (mmol/d), stratified by sex** **Male n=947** *β(standardised)*=1.27±0.15 P<0.001 **Female n=847** *β(standardised)*=1.44±0.19 P<0.001 *adjusted for age, smoking status, dietary supplement use, history of HT/CVD, moderate or heavy PA, total energy intake **note no model without energy adjustment was available	+ BMI men and women (adjusted, including energy intake)	N
Perin et al. 2013[79]	Brazil	108 Male 48%; mean age 57 y; mean BMI 32 kg/m^2	BMI (kg/m^2)	Mean Na 209 (100) mmol/d	None	**Mean BMI (kg/m^2) by quartile of sodium intake (mmol/d)** Q1 BMI 28.8 kg/m^2 (no variance measure reported) [f] Q1 BMI 34.1 kg/m^2 (no variance measure reported) [f] P=0.001	+ BMI (unadjusted)	Y
Baudrand et al. 2014[53]	Santiago, Chile	370 Male 30%; mean age 50 y; mean BMI 29.3 (kg/m^2); 72% hypertensive	BMI (kg/m^2)	Mean Na 195 (81) mmol/d	None	**Mean (SD) BMI kg/m^2 by level of sodium intake i.e. high sodium intake vs. adequate intake** High sodium intake >150 mmol/d, n=255: BMI 29.4 (4.2) kg/m^2 Adequate sodium intake 51, 149 mmol/d, n=115: BMI 29.0 (4.6) kg/m^2 P=NS	Null BMI by high and adequate Na intake	Y
Petermann-Rocha et al. 2019[80]	Chile	2913 42% male; mean age 46 y	BMI (kg/m^2)	Not reported	None	**Mean (SD) BMI (kg/m^2) by category of low <3.6 g/d) or high ≥3.6 g/d salt intake (as defined by median of 3.6 g/d)** Low salt intake <3.6 g/d n=939: 26.5 (5.0) kg/m^2 High salt intake ≥3.6 g/d n=1974: 28.5 (5.5) kg/m^2	No statistical test performed	Y
Vega-Vega et a. 2018[93]	Mexico	727 36% male; mean age 39 y	BMI (kg/m^2)	Mean Na 151 (SD 60) mmol/d	None	**Mean (SD) BMI (kg/m^2) across three groups of sodium intake (mmol/d) (groups based on recommended sodium**	+ BMI (unadjusted)	Y

						intake <2000 mg/d; high sodium 2000-3600 mg/d; very high sodium >3600 mg/d) G1: <2000 mg/d; n=77, BMI 25.3 (3.8) kg/m^2 G2: 2000-3600 mg/d; n=330, BMI 26.8 (4.5) kg/m^2 G3: >3600 mg/d; n=320, BMI 28.8 (4.7) kg/m^2 ANOVA between group difference P<0.0001		
Rhee et al. 2014[85]	Korea	463 28% had metabolic syndrome	BMI (kg/m^2)	Mean Na metabolic syndrome Na 195 (68) mmol/d; Non-MS 195 (68) mmol/d	None	**Mean (SD) BMI (kg/m^2) by tertile of sodium intake (mmold)** T1: <140 mmol/d; BMI 22.5 (2.8) kg/m^2 T2: 140-192 mmol/d; BMI 23.7 (2.8) kg/m^2 T3: >192 mmol/d; BMI 25.2 (3.2) kg/m^2 ANOVA between group difference P<0.0001	+ BMI (unadjusted)	Y
Sharma et al. 2014[88]	USA	6985 42 y	BMI (kg/m^2)	Mean Na 156 (110) mmol/d	None	**Mean±SE BMI kg/m^2 by quartile of sodium intake(mg/d)** Q1 ≤2190: BMI 26.7±0.2 (reference category) Q2 2191-3142: BMI 26.9±0.2* kg/m^2 Q3 3143-4349: BMI 27.5±0.2 kg/m^2 Q4 >4349: BMI 27.5±0.2 kg/m^2 ANOVA between group difference P=<0.01	+ BMI (unadjusted)	Y
Lee et al. 2015 [70]	Korea	1586 51% male	BMI (kg/m^2)	Mean Na 156 (34) mmol/d	None	**Mean (SD) BMI** (kg/m^2) **by tertile of sodium intake** T1 n=528: sodium 119 (16); BMI 23.8 (2.6) kg/m^2 T2 n=529: sodium 154 (8); BMI 24.1 (2.7) kg/m^2 T3 n=529: sodium 193 (18); BMI 24.7 (2.8) kg/m^2 P for trend <0.001	+ BMI (unadjusted)	Y
Yan et al. 2016[100]	China	1975 Male 53%, mean age 41 (14) y, 52% overweight or obese	BMI (kg/m^2)	Mean Na 232 (87) mmol/d	None	**Mean (SD) BMI (kg/m^2) by quartile of sodium intake (mmol/d)** Q1 mean Na 138 (SD 32) mmol/d: 23.6 (3.7) kg/m^2 Q2 mean Na 206 (SD 15) mmol/d: 24.3 (3.9) kg/m^2 Q3 mean Na 247 (SD 8) mmol/d: 24.7 (3.5) kg/m^2 Q4 mean Na 344 (SD 86) mmol/d: 25.56 (4.1) kg/m^2 P<0.001	+ BMI (unadjusted)	Y
Yokokawa et al. 2016[101]	Thailand	793 Males 52%; mean age 66.5 (SD 8.9) y	BMI (kg/m^2)	Mean salt 9.9 (2.3) g/d	None	**Mean (SD) BMI (kg/m^2) by category of low <10.0 g/d or high ≥10 g/d salt intake** Low salt intake <10.0 g/d n=431: 24.1 (3.6) kg/m^2 High salt intake ≥10.0 g/d n=362: 25.1 (3.9) kg/m^2 P=0.18	Null BMI (unadjusted)	Y

Radhika et al. 2007[83]	Chennai, India	1902 27% hypertensive	BMI (kg/m^2)	Mean salt 8.5 g/d	None	**Mean BMI (kg/m2) (SD) by salt (g/d) quintile** Q1 n=385, mean salt 4.9 g/d: 22.1 (3.9) kg/m^2 Q2 n=391, mean salt 6.6 g/d: 23.1 (4.5) kg/m^2 Q3 n=384, mean salt 7.9 g/d: 24.2 (4.7) kg/m^2 Q4 n=376, mean salt 9.6 g/d: 24.7 (4.9) kg/m^2 Q5 n=366), mean salt 13.8 g/d: 24.8 (4.4) kg/m^2 P for trend<0.0001	+ BMI (unadjusted)	Y
Verhave et al. 2004 [95]	Netherlands	7850 Male 53%	BMI (kg/m^2)	Not reported	None	**Mean (SD) BMI (kg/m^2) by quintile of sodium intake (mmol/d)** Q1 n=1613 sodium <99 mmol/d: 24.9 (3.9) kg/m^2 Q2 n=1612 sodium 99, 124 mmol/d: 25.3 (3.9) kg/m^2 Q3 n=1614 sodium 125, 149 mmol/d: 25.9 (4.1) kg/m^2 Q4 n=1613 sodium 150, 180 mmol/d: 26.4 (4.0) kg/m^2 Q5 n=1613 sodium >180 mmol/d: 27.8 (4.7) kg/m^2 P for trend<0.001	+ BMI (unadjusted)	Y
Hulthen et al. 2010[67]	Sweden	79 Male 100%; mean age 19 y; mean BMI 22.5 kg/m^2	BMI (kg/m^2)	Mean Na 198 (69) mmol/d	None	**Mean (SD) BMI kg/m^2 by lowest and highest quartile of sodium intake (mmol/d)** Q1 n=20 mean sodium 100 (18) mmol/d: 21.1 (2.8) kg/m^2 Q4 n=20 mean sodium 297 (40) mmol/d: 24.1 (4.2) kg/m^2 Mann-Whitney U test P=0.006	+ BMI (unadjusted)	Y
Eufinger et al. 2012[60]	USA	286 Male 100%; mean age 54 y	BMI (kg/m^2)	Intake not stated; 81% Na intake ≤1500 mg/d (USDA maximum recommendation for adults ≥51 y)	Adjusted for pair clustering (i.e. twins)	**Mean±SE BMI (kg/m^2) ±SEM by quantile of sodium intake (mg/d)[g]** Q1 n=57 <732 mg/d: BMI 29.2±0.6 kg/m^2 Q2 n=57 732-973 mg/d: BMI 28.8±0.6 kg/m^2 Q3 n=58 974-1179 mg/d: BMI 29.1±0.6 kg/m^2 Q4 n=57 1180-1456 mg/d: BMI 25.5±0.6 kg/m^2 Q5 n=57 >1456mg/d: BMI 30.2±0.6 kg/m^2 P-value for trend across quintiles P=0.35	Null BMI men	Y
Han et al. 2017[63]	China	1445 Male 49%	BMI (kg/m^2), weight category: overweight BMI	Mean salt male 18.7 g/d; female 16.4 g/d	None, stratified by sex	**Mean (SD) BMI (kg/m^2) by quartile of sodium intake (mmol/d), stratified by sex** **Males n=712** Q1 n=178 sodium range 52, 238 mmol/d: 25.1 (4.0) kg/m^2 Q2 n=178 sodium range 239, 289 mmol/d: 25.2 (4.0) kg/m^2 Q3 n=178 sodium range 290, 346 mmol/d: 25.7 (4.0) kg/m^2	+ BMI men, null women (unadjusted) Null weight category	Y

			≥24 kg/m^2			Q4 n=178 sodium range ≥347 mmol/d: 26.3 (4.3) kg/m^2 P for trend 0.004 **Females n=733** Q1 n=183 sodium range 73, 206 mmol/d: 25.9 (4.4) kg/m^2 Q2 n=184 sodium range 207, 258 mmol/d: 26.5 (4.9) kg/m^2 Q3 n=182 sodium range 259, 310 mmol/d: 26.4 (4.9) kg/m^2 Q4 n=184 sodium range ≥310 mmol/d: 26.8 (5.0) kg/m^2 P for trend 0.0964 **Prevalence overweight (BMI ≥24 kg/m^2) n, % by quartile of sodium intake (mmol/d), stratified by sex** **Males n=712** Q1 n=178 sodium range 52, 238 mmol/d: n=96, 53.9%, reference category Q2 n=178 sodium range 239, 289 mmol/d: n=101, 56.7% Q3 n=178 sodium range 290, 346 mmol/d: n=110, 61.8% Q4 n=178 sodium range ≥347 mmol/d: n=113, 63.5%, P for trend 0.0409 *calculated by author OR 1.50 (95%CI 0.96, 2.35, P=0.06) **Females n=733** Q1 n=183 sodium range 73, 206 mmol/d: n=119, 64.7%, reference category Q2 n=184 sodium range 207, 258 mmol/d: n=116, 63.4% Q3 n=182 sodium range 259, 310 mmol/d: n=125, 68.7% Q4 n=184 sodium range ≥310 mmol/d: n=119, 64.7% P for trend 0.7380 *calculated by author OR 0.98 (95%CI 0.63, 1.55, P=0.94)	men and women (unadjusted)	
Watanabe et al. 2019 [97]	Japan	2297 Male 46%; mean age 60 y	BMI (kg/m^2), weight category obesity defined as BMI	Mean Na 204 (SD 53) mmol/d	None	**Mean (SD) BMI kg/m^2 by quartile of sodium intake(mmol/d)** Q1 ≤167 n=574: BMI 22.4 (SD 3.1) kg/m^2 Q2 167-202 n=574: BMI 22.9 (3.1) kg/m^2 Q3 203-235 n=573: BMI 23.2 (3.0) kg/m^2 Q4 ≥236 n=576: BMI 23.8 (3.0) kg/m^2 ANOVA overall P<0.01	+ BMI (unadjusted) + weight category (unadjusted)	Y

			≥25 kg/m²			**Prevalence obese (BMI ≥25 kg/m²) n, % by quartile of sodium intake (mmol/d)** Q1 ≤167 n=574: n=117, 20.4%, reference category Q2 167-202 n=574: n=144, 25.1% Q3 203-235 n=575: n=148 25.8% Q4 ≥236 n=576: n=188, 32.6% ANOVA overall P<0.01 *calculated by author OR 1.89 (95%CI 01.44, 2.50, P<0.001)		
Zhang et al. 2018 [102]	USA	9306 Male 53% Median age 35 y 23% obese	BMI (kg/m²), weight category obesity defined as BMI ≥30 kg/m²	Median Na 3320 mg/d	Age, sex, race, smoking, alcohol drinking, physical activity, education, family annual income, and total energy intake	**Difference in BMI (kg/m²) associated with sodium intake 1000 mg/d** β=0.50 (95%CI 0.09, 0.91), P=not reported *adjusted for age, sex, race, smoking, alcohol drinking, physical activity, education, family annual income, and total energy intake **Odds (OR 95% CI) of obese vs. overweight/healthy weight according sodium intake (mg/d) categories defined as low Na <1500 mg/d, normal Na 1500-2300 mg/d and high Na >2300 mg/d** G1 sodium <1500 mg/d, median 1171 mg/d: OR 1.12 (95%CI 0.84, 1.49) G2 sodium 1500-2300 mg/d, median 1948 mg/d: Reference category G3 sodium >2300 mg/d, median 3771 mg/d: OR 1.12 (95%CI 0.97, 1.29) P for trend=0.33 *adjusted for age, sex and ethnicity **Additional adjustment with energy intake** G1 sodium <1500 mg/d, median 1171 mg/d: OR 0.95 (95%CI 0.48, 1.89) G2 sodium 1500-2300 mg/d, median 1948 mg/d: Reference category G3 sodium >2300 mg/d, median 3771 mg/d: OR 1.55 (95%CI 1.09, 2.20) P for trend=0.01	+ BMI (adjusted, including energy intake) + weight category (adjusted, including energy intake)	Y

						*adjusted for age, sex, race, smoking, alcohol drinking, physical activity, education, family annual income, and total energy intake		
Hoffman et al. 2009 [65]	Caracas, Venezuela	766 33% male; mean age 45 (17) y	BMI (kg/m^2)	Mean Na 143 (69) mmol/d	None, stratified by sex	**Mean±SE BMI (kg/m^2) by quartile of sodium intake (mmol/d), stratified by sex** **Male:** Q1 n=63: <120; BMI 27.8 (1.0) kg/m^2 Q2 n=69: 120-159; BMI 28.2 (1.0) kg/m^2 Q3 n=56: 159-211; BMI 30.7 (1.0) kg/m^2 Q4 n=61: >211; BMI 30.3 (1.0) kg/m^2 P=0.001 **Female:** Q1 n=129: <92; BMI 27.6 (0.4) kg/m^2 Q2 n=146: 92-125; BMI 28.3 (0.4) kg/m^2 Q3 n=113: 125-158; BMI 28.4 (0.4) kg/m^2 Q4 n=127: >158; BMI 29.6 (0.5) kg/m^2 P=0.001	+ BMI (unadjusted)	Y
Madhavan et al. 1994[71]	New York City, USA	808 51 y; 76% hypertensive; 44% Black, 56% Caucasian	BMI (kg/m^2)	Mean Na Black male 137 (70) mmol/d; Black female 112 (50) mmol/d; Caucasian male 139 (70) mmol/d; Caucasian female 113 (56) mmol/d	None, stratified by sex and race	**Mean (SD) BMI (kg/m^2) by tertile of sodium intake (mmol/d) tertile, stratified by sex and race** **Black male:** T1 n=76, <102 mmol/d: 25.4 (2.6) kg/m^2 T2 n=67, 102-156 mmol/d: 26.3 (3.5) kg/m^2 T3 n=74 ≥157 mmol/d: 27.7 (4.1) kg/m^2 Between group difference P≤0.01 **Black females:** T1 n=41, <102mmol/d: 26.2 (5.3) kg/m^2 T2 n=49, 102-156 mmol/d: 27.3 (4.0) kg/m^2 T3 n=48, ≥157 mmol/d: 28.1 (5.1) kg/m^2 Between group difference P≤0.05 **Caucasian males:** T1 n=103, <102 mmol/d: 26.4 (3.4) kg/m^2 T2 n=118, 102-156 mmol/d: 26.1 (3.0) kg/m^2 T3 n=108, ≥157 mmol/d: 27.8 (3.7) kg/m^2 Between group difference P≤0.01 **Caucasian females:** T1 n=46, <102 mmol/d: 23.8 (3.1) kg/m^2	+ BMI male & female, Black & Caucasian (unadjusted)	Y

						T2 n=36, 102-156 mmol/d: 25.2 (4.0) kg/m^2 T3 n=42, ≥157 mmol/d: 27.3 (5.0) kg/m^2 Between group difference P≤0.01		
Oh et al. 2015[75]	Korea	18146 Male 46%; mean age 47 y	BMI (kg/m^2)	Median Na 4100 mg/d	None	**Mean (SD) BMI (kg/m^2) by quartile of salt intake (g/d)** Q1 n=4536 median salt 2.7 (IQR 2.3, 3.1) g/d: 23.0 (3.3) kg/m^2 Q2 n=4537 median salt 3.7 (IQR 3.4, 4.1) g/d: 23.5 (3.2) kg/m^2 Q3 n=4537 median salt 4.6 (IQR 4.1, 5.0) g/d: 23.7 (3.2) kg/m^2 Q4 n=4536 median salt 5.9 (IQR 5.2, 6.5) g/d: 24.5 (3.4) kg/m^2 Between group difference P-value <0.001	+ BMI (unadjusted)	Y
Welsh et al. 2019 [99]	UK	430, 110 45% male; Mean age 56 y	BMI (kg/m^2)	Not reported	None	**Mean (SD) BMI (kg/m^2) by quintile of sodium intake (mg/d)** **Males n=190,964** Q1 n=38193 Na range 740, 3430 mg/d: 26.99 (3.91) kg/m^2 Q2 n=38193 Na range 3431, 4080 mg/d: 27.18 (3.82) kg/m^2 Q3 n=38193 Na range 4081, 4660 mg/d: 27.44 (3.91) kg/m^2 Q4 n=38193 Na range 4661, 5350 mg/d: 27.91 (4.08) kg/m^2 Q5 n=38192 Na range 5351, 7000 mg/d: 28.69 (4.54) kg/m^2 Between group difference P-value <0.001 **Females n=239, 146** Q1 n=47830 Na 710, 2890 mg/d: 26.48 (4.82) kg/m^2 Q2 n=47829 Na range 2891, 3480 mg/d: 26.40 (4.73) kg/m^2 Q3 n=47829 Na range 3481, 4010 mg/d: 26.67 (4.85) kg/m^2 Q4 n=47829 Na range 4010, 4660 mg/d: 27.09 (5.07) kg/m^2 Q5 n=47829 Na range 4661. 7000 mg/d: 28.05 (5.65) kg/m^2 Between group difference P-value <0.001	+ BMI (unadjusted)	Y
Webster et al. 2016 [98]	Samoa	293 Male 42%; mean age 36±0.9 y; mean BMI 31.9 kg/m^2	BMI (kg/m^2)	Mean salt 7.09±0.19 g/d	Adjusted for sex, age, region	**Difference in BMI (kg/m^2) associated with salt intake (g/d)** β= -0.02 (95%CI -0.05, 0.01) g/d, P=0.1663 *adjusted for sex, age, region	Null BMI (adjusted)	Y
Lee et al. 2014[69]	Korea	79 Male 60%; median age 35 y; median BMI 22.8 kg/m^2	BMI (kg/m^2)	Mean salt based on Kawasaki equation 14.2 (3.9) g/d; based on	Adjusted for age, systolic blood pressure and taste perception.	**Difference in BMI (kg/m^2) associated with salt intake 1g/d** **Kawasaki equation salt estimate:** β=0.36 (95%CI 0.08, 0.64), P=0.012 *Adjusted for age, systolic blood pressure and taste perception **Tanaka equation salt estimate**	+ BMI male & female (adjusted)	Y

				Tanaka equation 8.4 (1.8) g/d		β=0.17 (95%CI 0.30, 0.44), P=0.000 *Adjusted for age, systolic blood pressure and taste perception		
Ohta et al. 2017[76]	Japan	429 Male 48%; mean age 71 (11) y	BMI (kg/m^2)	Mean salt 9.2 (2.8) g/d	Adjusted for age, chronic kidney disease and hyperuricemia	**Difference in BMI kg/m^2 associated with salt intake 1 g/d** β= 0.125 kg/m^2, P<0.001 *Adjusted for age, chronic kidney disease and hyperuricemia	+ BMI (adjusted)	Y
Venezia et al. 2010[94]	Naples, Italy	940 Male 100%; mean age 60 y; 56% overweight & 21% obese; 71% hypertensive	BMI (kg/m^2)	Mean Na 203 (71) mmol/d	Adjusted for frequency consumption of pasta, cold cuts, bread, meat, fish, canned food and cheese, anti-HT treatment	**Difference in BMI (Kg/m^2) associated with sodium intake (mmol/d)** β(standardised)=0.127 (95% CI 0.104, 0.150), P-value<0.001 *adjusted for frequency consumption of pasta, cold cuts, bread, meat, fish, canned food and cheese, anti-HT treatment	+ BMI men (adjusted)	N
Crouch et al. 2018 [58]	South Africa	761 43% male; 46% overweight/obese	BMI (kg/m^2)	Mean Na 130 mmol/d	Age, SES, energy expenditure, energy intake derived from 3 x 24-hr diet recalls, cotinine, y-glutamyltransferase, high-density lipoprotein cholesterol, SBP, glucose, C-reactive protein, aldosterone	**Difference in BMI kg/m^2 associated with logarithmic sodium sodium intake (mg/d)** β=0.38 ±0.58 (P=0.52) *adjusted for age, SES, energy expenditure, cotinine, y-glutamyltransferase, high-density lipoprotein cholesterol, SBP, glucose, C-reactive protein, aldosterone **Additional adjustment with energy intake** β=0.49 ±0.58 (P=0.41) *adjusted for age, SES, energy expenditure, energy intake, cotinine, y-glutamyltransferase, high-density lipoprotein cholesterol, SBP, glucose, C-reactive protein, aldosterone, energy intake	Null BMI (adjusted, including energy intake)	N
Song et al 2013[91]	Korea	5955 46% male; 26% overweight (BMI ≥25 kg/m^2)	Weight category: overweight defined as BMI >25 kg/m^2	Not reported	Age, sex, energy intake, calcium, water, coffee, tea and soda, smoking, etoh consumption, PA, educational attainment, income, survey	**Odds (OR 95% CI) of overweight by quintile of sodium intake (mg/d), stratified by sex** **Male: n=2765** Q1 Na range <3565, median 2742 mg/d: Reference category Q2 Na range 3565-4932, median 4247 mg/d: OR 1.33 (95%CI 1.02, 1.73) Q3 Na range 4936-6248, median 5564 mg/d: OR 1.20 (95%CI 0.92, 1.56)	+ weight category men (adjusted model, including energy intake)	Y

	year and menopausal status in females	Q4 Na range 6249-8230, median 7132 mg/d: OR 1.33 (95%CI 1.02, 1.73) Q5 Na range ≥8231, median 9804 mg/d: OR 1.56 (95%CI 1.20, 2.03) P for trend=0.0021 *only adjusted for age **Female: n=3190** Q1 Na range <2394, median 1788 mg/d: Reference category Q2 Na range 2394-3293, median 2861 mg/d: OR 0.92 (95%CI 0.71, 1.21) Q3 Na range 3294-4371, median 3782 mg/d: OR 0.93 (95%CI 0.71, 1.22) Q4 Na range 4372-5879, median 4982 mg/d: OR 0.97 (95%CI 0.75, 1.27) Q5 Na range ≥5880, median 7475 mg/d: OR 1.10 (95%CI 0.85, 1.43) P for trend=0.3046 *only adjusted for age **Model with energy intake adjustment** **Odds (OR 95% CI) of overweight by quintile of sodium intake (mg/d), stratified by sex** **Male: n=2765** Q1 Na range <3565, median 2742 mg/d: Reference category Q2 Na range 3565-4932, median 4247 mg/d: OR 1.35 (95%CI 1.03, 1.78) Q3 Na range 4936-6248, median 5564 mg/d: OR 1.22 (95%CI 0.92, 1.61) Q4 Na range 6249-8230, median 7132 mg/d: OR 1.37 (95%CI 1.02, 1.82) Q5 Na range ≥8231, median 9804 mg/d: OR 1.67 (95%CI 1.23, 2.27) P for trend=0.0033 *adjusted for age, sex, energy intake, calcium, water, coffee, tea and soda, smoking, etoh consumption, PA, educational attainment, income, survey year	null weight category women (adjusted model including energy intake)

						Female: n=3190 Q1 Na range <2394, median 1788 mg/d: Reference category Q2 Na range 2394-3293, median 2861 mg/d: OR 1.02 (95%CI 0.77, 1.35) Q3 Na range 3294-4371, median 3782 mg/d: OR 1.03 (95%CI 0.77, 1.37) Q4 Na range 4372-5879, median 4982 mg/d: OR 1.10 (95%CI 0.82, 1.48) Q5 Na range ≥5880, median 7475 mg/d: OR 1.31 (95%CI 0.96, 1.79) P for trend=0.0580 *adjusted for age, sex, energy intake, calcium, water, coffee, tea and soda, smoking, etoh consumption, PA, educational attainment, income, survey year and menopausal status		
Nam et al. 2017[73]	Korea	640 Male 50%; 27% obese	BMI (kg/m^2), weight category: obesity defined as BMI ≥25 kg/m^2	Not reported	Adjusted for age, smoking status, physical activity, monthly household income, education level, and daily energy intake	**Mean±SE BMI (kg/m^2) by quartile of sodium intake (mmol/d), stratified by sex** **Male n=320** Q1n=46 mean Na 86 mmol/d: 23.3 (0.4) kg/m^2 Q2 n=71 mean Na 128 mmol/d: 23.7 (0.4) kg/m^2 Q3 n=97 mean Na 166 mmol/d: 23.9 (0.3) kg/m^2 Q4 n=112 mean Na 232 mmol/d: 25.3 (0.3) kg/m^2 P for trend<0.001 *Adjusted for age, smoking status, physical activity, monthly, household income, education level, and daily energy intake **Female n=320** Q1 n=115 mean Na 86 mmol/d: 21.5 (0.5) kg/m^2 Q2 n=88 mean Na 128 mmol/d: 22.5 (0.5) kg/m^2 Q3 n=69 mean Na 166 mmol/d: 22.7 (0.6) kg/m^2 Q4 n=48 mean Na 232 mmol/d: 24.1 (0.6) kg/m^2 P for trend<0.001 *Adjusted for age, smoking status, physical activity, monthly, household income, education level, and daily energy intake **Odds (OR 95% CI) of obesity associated with higher sodium intake (Q4 compared to Q1-Q3), stratified by sex** **Male n=320**	+ BMI men & women (adjusted, including energy intake) + obesity men & women (adjusted, including energy intake)	Y

						Healthy weight BMI <25 kg/m^2: reference category Obese BMI ≥25 kg/m^2: OR 2.86 (95%CI 1.72, 4.75) *Adjusted for age, smoking status, physical activity, monthly, household income, education level, and daily energy intake **Female n=320** Healthy weight BMI <25 kg/m^2: reference category Obese BMI ≥25 kg/m^2: OR 3.60 (95%CI 1.81, 7.15) *Adjusted for age, smoking status, physical activity, monthly, household income, education level, and daily energy intake **Note no base model without inclusion of energy intake available		
Huh et al. 2015 [66]	Korea	7162 50% male; mean age 20 y; mean BMI 22.5 kg/m^2	BMI (kg/m^2)	Not reported	Unadjusted	**Mean (SD) BMI (kg/m^2) by tertile of sodium intake (mmol/d), stratified by sex** **Male n=3544:** T1 n=1181 sodium ≤133 mmol/d: BMI 23.5 (3.1) T2 n=1182 sodium 133, 164 mmol/d: BMI 23.7 (3.0) T3 n=1181 sodium >164 mmol/d: BMI 24.1 (3.0) Overall between group P<0.001; T1 vs. T2 P=NS; T1 vs. T3 P<0.05; T2 vs. T3 P<0.05 *note unadjusted **Female n=3618:** T1 n=1205 sodium <135 mmol/d: BMI 23.6 (3.3) T2 n=1206 sodium 135, 166 mmol/d: BMI 24.0 (3.) T3 n=1206 sodium >166 mmol/d: BMI 25.0 (3.2) Overall between group P<0.001; T1 vs. T2 P<0.05; T1 vs. T3 P<0.05; T2 vs. T3 P<0.05 *note unadjusted	+ BMI men & women (unadjusted)	Y
Yi et al. 2014[11]	USA	1656	BMI (kg/m^2), weight category	Not reported	Adjusted for age, sex, race/ethnicity, poverty, education, physical activity, sugary drinks, and self-reported diet quality	**Difference in BMI (kg/m^2) associated with sodium intake (1000 mg/d)** **Overall:** β=0.57 (95% CI 0.26, 0.89), P<0.001 **Male:** β=0.61 (95% CI 0.19, 1.02), P<0.001 **Female:** β=0.75 (95% CI 0.31, 1.19), P<0.001 *All models adjusted for age, sex (in main model), race/ethnicity, poverty, education, physical activity, sugary drinks, and self-reported diet quality	+ BMI men & women (adjusted) + weight category men &	Y

						Odds (OR 95% CI) of obesity associated with sodium intake (1000 mg/d) **Overall:** OR 1.26 (95% CI 1.11, 1.42), P<0.001 **Male:** OR 1.26 (95% CI 1.07, 1.49), P<0.05 **Female:** OR 1.39 (95% CI 1.18, 1.64), P<0.001 *All models adjusted for age, sex (in main model), race/ethnicity, poverty, education, physical activity, sugary drinks, and self-reported diet quality **note no base models without adjustment for sugary drink consumption were available however authors reported in text that inclusion of sugar drinks consumption did not appear to mediate the association between Na intake and measures of body size	women (adjusted)	
Yi et al. 2015[10]	USA	4613	BMI (kg/m^2)	Mean Na 154 (104) mmol/d	Adjusted for sex, age, race/ethnicity, education and energy intake using residual method *note excludes mis-reporters (n=165) for energy intake outside range of 500-3500 kcal/d for women & 800-4000 kcal/day for men (n=165)	**Difference in BMI (kg/m^2) associated with sodium intake (1000 mg/d)** **Overall:** β=0.47 kg/m^2 (95%CI 0.24, 0.71), P<0.01 **Male:** β=0.37 kg/m^2 (95%CI 0.14, 0.60), P<0.01 **Female:** β=0.56 kg/m^2 (95%CI 0.21, 0.91), P<0.01 *adjusted for sex, age, race/ethnicity, education **Additional adjustment energy intake** **Overall:** β=1.03 kg/m^2 (95%CI 0.70, 1.35), P<0.001 **Male:** β=0.81 kg/m^2 (95%CI 0.38, 1.24), P<0.01 **Female:** β=1.32 kg/m^2 (95%CI 0.74, 1.90), P<0.001 *adjusted for sex, age, race/ethnicity, education and energy intake using residual method	+ BMI overall, male & female (adjusted, including energy intake)	Y
Aballay et a. 2014[51]	Argentina	4328 58% male; mean age 43 (18) y; 34% overweight, 17% obese	Weight category	Mean Na 2000 mg/d	Age, sex, SES, physical activity and energy intake	**Odds (OR 95% CI) of obese vs. overweight/normal weight intake above or below Upper Level (i.e. 2300 mg/d)** ≤UL 2300 mg/d: reference group >UL 2300 mg/d: OR 1.5 (95%CI 1.1, 1.8) *adjusted for age, sex, SES, physical activity and energy intake *Note no base model without inclusion of energy intake provided	+ weight category only when comparing obese vs. overweight/ normal (adjusted, including	N

							energy intake)	
Ma et al. 2015[9]I	UK	785 Male 47%; mean age 49 y; mean BMI 27.7 kg/m^2	BMI (kg/m^2), weight category	Mean salt 7.6 (3.3) g/d	Adjusted for age sex, ethnic group, household income, physical activity level, energy intake, etoh intake, smoking, education level	**Mean±SE BMI (kg/m2) by tertile of salt intake (g/d)** T1 mean salt 4.3 (1.1) g/d n=261: 27.3±0.6 kg/m^2 T2 mean salt 7.2 (0.8) g/d n=265: 27.3±0.6 kg/m^2 T3 mean salt 11.5 (2.4) g/d n=259: 28.6±0.6 kg/m^2 P for trend <0.001 *adjusted for age, sex, ethnic group, household income, physical activity level, energy intake, misreporting of energy intake, etoh intake, smoking, education level **Odds (OR 95% CI) of overweight/obesity associated with salt intake (g/d)** Healthy weight n=266, salt intake 6.2±0.2 g/d: reference group Overweight/obese n=519, salt intake 9.7±0.2: OR 1.26 (95% CI 1.16, 1.37), P<0.001 *adjusted for age, sex, ethnic group, household income, physical activity level, energy intake, misreporting of energy intake, etoh intake, smoking, education level ***Alternative adjustment with SSB intake*** Healthy weight n=266, salt intake 6.2±0.2 g/d: reference group Overweight/obese n=519, salt intake 9.7±0.2: OR 1.28 (95% CI 1.17, 1.39), P<0.001 *adjusted for age, sex, ethnic group, household income, physical activity level, SSB intake, misreporting of energy intake, etoh intake, smoking, education level *Note no base models without inclusion of energy intake provided	+ BMI (adjusted, including energy intake) + weight category (adjusted, including energy intake)	Y
Navia et al. 2014[74]	Spain	418 Male 47%; 37 y; BMI 25.3; 34% overweight, 14% obese	BMI (kg/m^2), weight category	Mean Na 168 (79) mmol/d	Adjusted for age, sex *additional adjustment for energy intake only	**Difference in BMI (kg/m^2) associated with sodium intake (mmol/L)** β=0.0082±0.0024, P<0.001 , R^2=0.30 *adjusted for age, sex	+ very weak BMI (adjusted, including energy intake)	N

					in weight category model	**Odds (OR 95% CI) of overweigh/obesity associated with sodium intake *(mmol/L)*** OR=1.0041 (95%CI 1.0015, 1.0067) P<0.01 *adjusted for age, sex and energy intake **note no base model without inclusion of energy intake provided		
Zhou et al. 2019 [104]	Japan, China, UK, USA	4680 (Japan n=1145, China n=839, UK n=501, USA n=2195) Male 50% Mean age 49 y	BMI (kg/m^2), weight category (overweight/obese defined as BMI ≥25 kg/m^2	Mean salt intake (g/d) Japan 11.6 (3.3), China 13.3 (5.9), UK 8.5 (2.9), USA 9.5 (3.5), total sample 10.6 (4.2)	Adjusted for age, gender, sample centre, smoking status, drinking status, years of education, PA in leisure time, dietary fibre intake, and total energy intake (derived from 4 x 24-hr diet recalls)	**Difference in BMI (kg/m^2) associated with salt intake (1 g/d)** **Japan n=1145** β=0.28 (95% CI 0.23, 0.33), P<0.0001 **China n=839** β=0.11 (95% CI 0.06, 0.15), P<0.0001 **UK n=501** β=0.41 (95% CI 0.27, 0.56), P<0.0001 **USA n=2195** β=0.53 (95% CI 0.46, 0.60), P<0.0001 **All n=4680** β=0.35 (95% CI 0.31, 0.38), P<0.0001 *all models adjusted for age, gender, sample centre, smoking status, drinking status, years of education, PA in leisure time **Additional adjustment energy intake + fibre intake** **Japan n=1145** β=0.28 (95% CI 0.23, 0.34), P<0.0001 **China n=839** β=0.10 (95% CI 0.05, 0.14), P=0.0001 **UK n=501** β=0.42 (95% CI 0.27, 0.56), P<0.0001 **USA n=2195** β=0.52 (95% CI 0.45, 0.59), P<0.0001 **All n=4680** β=0.34 (95% CI 0.30, 0.38), P<0.0001 *all models adjusted for age, gender, sample centre, smoking status, drinking status, years of education, PA in leisure time, energy intake, fibre intake **Odds (OR 95% CI) of overweight/obesity vs. healthy weight associated with salt intake (1 g/d)**	+ BMI (adjusted, including energy intake) + weight category (adjusted, including energy intake)	Y

	Japan n=1145 Overweight/obese n=306, 27%: OR=1.21 (95% CI 1.16, 1.27), P<0.0001 **China n=839** Overweight/obese n=214, 26%: OR=1.05 (95% CI 1.02, 1.09), P=0.0041 **UK n=501** Overweight/obese n=349, 70%: OR=1.26 (95% CI 1.15, 1.39), P<0.0001 **USA n=2195** Overweight/obese n=1575, 72%: OR=1.24 (95% CI 1.19, 1.29), P<0.0001 **All n=4680** Overweight/obese n=2444, 52%: OR=1.16 (95% CI 1.14, 1.18), P<0.0001 *all models adjusted for age, gender, sample centre, smoking status, drinking status, years of education, PA in leisure time **Additional adjustment energy intake + fibre intake** **Japan n=1145** Overweight/obese n=306, 27%: OR=1.21 (95% CI 1.16, 1.27), P<0.0001 **China n=839** Overweight/obese n=214, 26%: OR=1.04 (95% CI 1.00, 1.08), P=0.0332 **UK n=501** Overweight/obese n=349, 70%: OR=1.29 (95% CI 1.17, 1.42), P<0.0001 **USA n=2195** Overweight/obese n=1575, 72%: OR=1.24 (95% CI 1.19, 1.29), P<0.0001 **All n=4680** Overweight/obese n=2444, 52%: OR=1.16 (95% CI 1.13, 1.18), P<0.0001 *all models adjusted for age, gender, sample centre, smoking status, drinking status, years of education, PA in leisure time, energy intake, fibre intake

Zhao et al. 2019 [103]	USA	730 Male 50%; Mean age 43 y; 73% overweight/obese	BMI (kg/m^2), weight category (overweight/obese defined as BMI ≥25 kg/m^2	Mean Na 3567±40 mg/d	Adjusted for age, sex, race-Hispanic origin, PA, ETOH consumption, smoking status, educational attainment and either usual intake of total energy or SSB (diet measures derived from up to 2 x 24-hr diet recalls adjusted to usual intakes)	**Difference in BMI (kg/m^2) associated with sodium intake (1000 mg/d)** β=3.8 (95% CI 2.8, 4.8), P<0.001 *adjusted for age, sex, race-Hispanic origin, PA, ETOH consumption, smoking status, educational attainment **Additional adjustment usual energy intake (kcal/d)** β=3.8 (95% CI 2.8, 4.8), P<0.001 *adjusted for age, sex, race-Hispanic origin, PA, ETOH consumption, smoking status, educational attainment, usual total energy intake **Alternative additional adjustment usual SSB intake (g/d)** β=3.8 (95% CI 2.8, 4.7), P<0.001 *adjusted for age, sex, race-Hispanic origin, PA, ETOH consumption, smoking status, educational attainment, usual SSB intake **Odds (Or 95% CI) of overweight/obesity by quartile of sodium intake (mg/d)** Q1 median sodium 2505 mg/d: Reference category Q2 median sodium 3176 mg/d: OR 1.36 (95%CI 1.26, 1.46) Q3 median sodium 3753 mg/d: OR 1.60 (95%CI 1.44, 1.79) Q4 median sodium 4662 mg/d: OR 1.87 (95% CI 1.65, 2.13) P for trend<0.001 *adjusted for age, sex, race-Hispanic origin, PA, ETOH consumption, smoking status, educational attainment **Additional adjustment usual energy intake (kcal/d)** Q1 median sodium 2505 mg/d: Reference category Q2 median sodium 3176 mg/d: OR 1.38 (95%CI 1.28, 1.49) Q3 median sodium 3753 mg/d: OR 1.65 (95%CI 1.48, 1.85) Q4 median sodium 4662 mg/d: OR 1.93 (95% CI 1.69, 2.20) P for trend<0.001 *adjusted for age, sex, race-Hispanic origin, PA, ETOH consumption, smoking status, educational attainment, usual total energy intake **Alternative additional adjustment usual SSB intake (g/d)** Q1 median sodium 2505 mg/d: Reference category	+ BMI (adjusted, including energy intake) + weight category (adjusted, including energy intake)	Y

						Q2 median sodium 3176 mg/d: OR 1.35 (95%CI 1.26, 1.45) Q3 median sodium 3753 mg/d: OR 1.60 (95%CI 1.44, 1.77) Q4 median sodium 4662 mg/d: OR 1.86 (95% CI 1.64, 2.11) P for trend<0.001 *adjusted for age, sex, race-Hispanic origin, PA, ETOH consumption, smoking status, educational attainment, usual total SSB intake		
Choi & Run 2017[57]	Korea	80 Male 50%; mean age 43 y; mean BMI 22.4 kg/m^2; 18% obese (BMI>25)	BMI (kg/m^2)	Mean Na 3960 (1824) mg/d	Adjusted for age, sex, total energy intake, potassium intake, smoking status, household income, education level, PA	**Difference in BMI (kg/m^2) associated with sodium intake (mg/d)** β (standardised)=0.11±0.18, P=NS, R^2=0.20	Null BMI (adjusted, including energy intake)	N
Elfassy et al. 2018 [59]	USA	435 sub-sample with 24-hr urine 47% male; mean age 42 y	BMI (kg/m^2)	Not reported	*adjusted for age, sex, heritage, education, income, language preference, nativity/years in the US, study site, missing one urine void + smoking, hypertension, diabetes, alcohol use, depression, PA (total METs/wk), energy intake derived from DLW	**Difference in BMI (kg/m^2) associated with sodium intake (500 mg/d)** β=0.46 kg/m^2 (95%CI 0.26, 0.66), P<0.05 *adjusted for age, sex, heritage, education, income, language preference, nativity/years in the US, study site, missing one urine void **Additional adjustment energy intake)** β=0.27 kg/m^2 (95%CI 0.08, 0.45), P<0.05 *adjusted for age, sex, heritage, education, income, language preference, nativity/years in the US, study site, missing one urine void + smoking, hypertension, diabetes, alcohol use, depression, PA (total METs/wk), energy intake derived from DLW Alternative model using sodium density (250 mg/1000 kcal) as independent variable β=0.12 kg/m^2 (95%CI -0.13, 0.37), P=NS *adjusted for age, sex, heritage, education, income, language preference, nativity/years in the US, study site, missing one urine void + smoking, hypertension, diabetes, alcohol use, depression, PA (total METs/wk)	+ BMI (adjusted, including energy intake) Null BMI (adjusted based on sodium density)	Y

Yoon et al. 2013[12]	Korea	20586 Male 40%; 31% obese	BMI (kg/m^2), weight category: obesity defined as BMI ≥25 kg/m^2	Mean Na 5057 mg/d	Adjusted for age, sex, household income, total weekly physical activity (MET/week) and energy intake (kcal/day) ***exposure is sodium density mg/g/d**	**Odds (OR 95% CI) of obesity by quintile of sodium density (mg/g/d)** Q1 sodium density 0.1, 2.1 mg/g/d: reference category Q2 sodium density 2.2, 3.0 mg/g/d: OR 1.02 (95%CI 0.89, 1.16) Q3 sodium density 3.1, 3.9 mg/g/d: OR 1.04 (95%CI 0.91, 1.18) Q4 sodium density 4.0, 5.2 mg/g/d: OR 1.08 (95%CI 0.96, 1.21) Q5 sodium density 5.3, 29.3 mg/g/d: OR 1.18 (95%CI 1.04, 1.35) P for trend =0.002 *adjusted for age, sex, household income, total weekly physical activity (MET/week) and energy intake (kcal/day) *Note no base models without inclusion of estimated energy intake provided	+ weight category (adjusted, including energy intake))	N
Murakami et al. 2015[72]	Japan	1043 Female 100%; mean age 20 y; 7.7% obese i.e. BMI ≥25	BMI (kg/m^2), weight category: obesity defined as BMI ≥25 kg/m^2	Mean Na density 1962 (751) mg/4184 kJ/d	Adjusted for estimated energy intake (EER), survey year, region, municipality level, residential status, physical activity, potassium and protein intake ***exposure sodium density mg/4184 kJ/d**	**Mean±SE BMI (kg/m^2) by quartile of energy adjusted sodium intake (mg/4184 kJ)** Q1 median sodium 1155 mg/4184 kJ: 21.0± 0.2 Q2 median sodium 1659 mg/4184 kJ: 21.2±0.2 Q3 median sodium 2124 mg/4184 kJ: 21.1±0.2 Q4: median 2766 mg/4184 kJ: 21.7±0.2 P for trend=0.005 * adjusted for survey year, region, municipality level, residential status, current etoh, current smoking status, PA, estimated energy intake (EER) and 24 h urine K and protein **Odds (OR 95% CI) of obesity by quartile of energy adjusted sodium intake (mg/4184 kJ)** Q1 median sodium 1155 mg/4184 kJ: reference category Q2 median sodium 1659 mg/4184 kJ: OR 1.81 (95% CI 0.88, 3.74) Q3 median sodium 2124 mg/4184 kJ: OR 1.43 (95%CI 0.66, 3.09) Q4: median 2766 mg/4184 kJ: OR 2.49 (95%CI 1.15, 5.42) P for trend=0.04	+ BMI (adjusted, including energy intake) + weight category (adjusted, including energy intake)	N

	* adjusted for survey year, region, municipality level, residential status, current etoh, current smoking status, PA, estimated energy intake (EER) and 24 h urine K and protein *Note no base models without inclusion of estimated energy intake were provided

Abbreviations: Na sodium; BMI body mass index; WHO World Health Organization; WC waist circumference; SES socio-economic status; FFQ food Frequency Questionnaire; PA physical Activity; SSB sugar sweetened beverage; ETOH alcohol consumption, UK United Kingdom, USA United States of Australia

Red text is used to highlight those studies which have considered adjustment with energy or SSB intake

[a] Measures of variance represent (SD) or ±SE unless otherwise specified

[b] *r* correlation coefficient, *β* represents unstandardized regression beta-coefficient unless otherwise stated

[c] Where possible summary based on most adjusted model

[d] Self-reported measure of BW and height

[e] methods used to measure BW and height not stated

Supplemental Table 6. Summary of findings from cross-sectional studies among adults, outcome: body weight (BW)

Study	Country	N, sample characteristics	Adiposity outcome	Sodium/salt intake[a]	Covariates; stratification	Findings[b]	Summary[c]	Included in meta-analyses related to this outcome
Strazzullo et al. 1983[92]	Naples, Italy	188 Male 100%; mean age 41 y; mean BMI 26.3 kg/m^2	BW (kg)[d]	Mean Na 177 (59) mmol/d	None	Significant positive correlation between sodium intake (mmol/d) and BW (kg) (*r*=0.30, P<0.001)	+ BW men (unadjusted)	N
Cheung et al. 2000 [56]	China	117 Male 77%; 60% hypertensive	BW (kg)	Not reported	None	No correlation between sodium intake and BW (kg) (*r*=0.23, P=0.06)	Null BW (unadjusted)	N
Campino et al. 2016[55]	Chile	135	BW (kg)	Mean Na 4160 (SD 1651) mg/d	None	Significant positive correlation between sodium intake (mmol/d) and BW (kg) (*r*=0.46, P<0.001))	+ BW (unadjusted)	N
Villani et al. 2012i[96]	Adelaide, Australia	88 Male 59%; mean age male 62 y & female 59 y; mean BMI male 34.5 kg/m^2 & female 35.9 kg/m^2	BW (kg)	Mean Na male 195 (74) mmol/d; female 144 (42) mmol/d	None	Significant positive correlation between sodium intake (mmol/d) and BW (kg) (*r*=0.36, P <0.001).	+ weak BW	N
Sanchez-Castillo et al.[87]	Cambridgeshire, UK	83 Male 40%	BW (kg)[d]	Mean Na male 187 (55) mmol/d;	None, sex stratified	Significant positive correlation between sodium intake (mmol/d) and BW (kg) in both men (P<0.05) and women (P<0.001). Regression equations:	+ BW men & women (unadjusted)	N

				female 131 (35) mmol/d		Male: Salt (g/d)=0.10 BW + 2.4 Female: Salt (g/d)=0.10 BW+0.8		
Baudrand et al. 2014[53]	Santiago, Chile	370 Male 30%; mean age 50 y; mean BMI 29.3 (kg/m^2); 72% hypertensive	BW (kg)	Mean Na 195 (81) mmol/d	None	Significant positive correlation between sodium intake (mmol/d) and BW (kg) (*r*=0.29, P<0.001).	+ weak BW (unadjusted)	N
Jiet & Soma 2017 [68]	Malaysia	Convenience sample of university students aged 18-25 y recruited from University of Nottingham Malaysia Campus	BW (kg)	Mean Na 175 mmol/d	None	Significant positive correlation between sodium intake (mmol/d) and BW (kg) (r=0.47, P=0.01)	+ BW (unadjusted)	N
Hashimoto et al. 2016[64]	Japan	7629 Male 63%; mean age 56 (12) y	BW (kg)	Mean salt 8.8 (1.9) g/d	Age, sex, SBP, DBP, heart rate, FPG, LDL-C, HDL-C, TG, serum Cr, uric acid, smoking status, eGFR, ECG voltage, urine albumin-to-creatinine ratio	**Difference in BW (kg) associated with salt intake (g/d)** β(standardised)=0.317, P<0.001 *adjusted for age, sex, SBP, DBP, heart rate, FPG, LDL-C, HDL-C, TG, serum Cr, uric acid, smoking status, eGFR, ECG voltage, urine albumin-to-creatinine ratio	+ BW (adjusted)	N
Yi et al. 2014[11]	USA	1656	BW (kg)	Not reported	Adjusted for age, sex, race/ethnicity, poverty, education,	**Difference in BW (pounds) associated with sodium intake (1000 mg/d)** **Overall:** β=4.18 (95% CI 2.01, 6.36), P<0.001 **Male:** β=4.88 (95% CI 1.73, 8.02), P<0.001 **Female:** β=4.61 (95% CI 1.81, 7.41), P<0.001	+ BW men & women (adjusted)	N

					physical activity, sugary drinks, and self-reported diet quality	*All models adjusted for age, sex (in main model), race/ethnicity, poverty, education, physical activity, sugary drinks, and self-reported diet quality **note no base models without adjustment for sugary drink consumption were available however authors reported in text that inclusion of sugar drinks consumption did not appear to mediate the association between Na intake and measures of body size		
Yi et al. 2015[10]	USA	4613	BW (kg)	Mean Na 154 (104) mmol/d	Adjusted for sex, age, race/ethnicity, education and energy intake using residual method *note excludes mis-reporters (n=165) for energy intake outside range of 500-3500 kcal/d for women & 800-4000 kcal/day for men (n=165)	**Difference in BW (kg) associated with sodium intake (1000 mg/d)** **Overall:** β=1.72 kg (95%CI 1.00, 2.44), P<0.001 **Male:** β=1.47 kg (95%CI 0.66, 2.28), P<0.01 **Female:** β=1.92 kg (95%CI 0.85, 2.99), P-value <0.01 *adjusted for sex, age, race/ethnicity, education **Additional adjustment energy intake** **Overall:** β=2.75 kg (95%CI 1.90, 3.60), P-value <0.001 **Male:** β=2.51 kg (95%CI 1.12, 3.90), P<0.01 **Female:** β=3.02 kg (95%CI 1.36, 4.68), P<0.01 *adjusted for sex, age, race/ethnicity, education and energy intake using residual method	+ BW overall, male & female (adjusted, including energy intake)	N
Yokokawa et al. 2016[101]	Thailand	793 Males 52%; mean age 66.5 (SD 8.9) y	BW (kg)	Mean salt 9.9 (2.3) g/d	None	**Mean (SD) BW (kg) by category of low <10.0 g/d) or high ≥10 g/d salt intake** Low salt intake <10.0 g/d n=431: 56.8 (10.5) kg High salt intake ≥10.0 g/d n=362: 61.8 (11.6) kg P<0.01	+ BW (unadjusted)	Y
Vega-Vega et a. 2018[93]	Mexico	727 36% male; mean age 39 y	BW (kg)	Mean Na 151 (SD 60) mmol/d	None	**Mean (SD) BW (kg) across three groups of sodium intake (mmold) (groups based on recommended sodium intake**	+ BW (unadjusted)	Y

						<2000 mg/d; high sodium 2000-3600 mg/d; very high sodium >3600 mg/d) G1: <2000 mg/d; n=77, BW 62.2 (11.6) G2: 2000-3600 mg/d; n=330, BW 67.7 (12.4) G3: >3600 mg/d; n=320, BW 76.9 (15.1) ANOVA between group difference P<0.0001		
Hulthen et al. 2010(67)	Sweden	79 Male 100%; mean age 19 y; mean BMI 22.5 (kg/m^2)	BW (kg)	Mean Na 198 (69) mmol/d	None	**Mean (SD) BW (kg) by lowest and highest quartile of sodium intake (mmol/d)** Q1 n=20 mean sodium 100 (18) mmol/d: 69.8 (10.9) kg Q4 n=20 mean sodium 297 (40) mmol/d: 79.5 (14.6) kg Mann-Whitney U test P=0.002	+ BW (unadjusted)	Y
Eufinger et al. 2012(60)	USA	286 Male 100%; mean age 54 y	BW (kg)	Intake not stated; 81% sodium intake ≤1500 mg/d (USDA maximum recommendation for adults ≥51 y)	Adjusted for pair clustering (i.e. twins)	**Mean±SE BW (kg) by quantile of sodium intake (mg/d)[h]** Q1 n=57 <732 mg/d: 89.6±2.0 kg Q2 n=57 732-973 mg/d: 89.1±2.1 kg Q3 n=58 974-1179 mg/d: 89.41±2.0 kg Q4 n=57 1180-1456 mg/d: 88.6±2.0 kg Q5 n=57 >1456mg/d: BMI 95.0±2.0 kg P for trend across quintiles P=0.09	Null BW men	Y
Hoffman et al. 2009 (65)	Caracas, Venezuela	766 33% male; mean age 45 (17) y	BW (kg)	Mean Na 143 (69) mmol/d	None, stratified by sex	**Mean±SE BW (kg) (SEM) by quartile of sodium intake (mmol/d), stratified by sex** **Male:** Q1 n=63: <120; BW 79.0 (2.0) kg Q2 n=69: 120-159; BW 80.0 (2.0) kg Q3 n=56: 159-211; BW 91.0 (2.0) kg Q4 n=61: >211; BW 88.0 (2.0) kg P<0.001 **Female:** Q1 n=129: <92; BW 67.5 (1.0) kg Q2 n=146: 92-125; BW 69.8 (1.0) kg Q3 n=113: 125-158; BW 71.0 (1.0) kg Q4 n=127: >158; BW 74.0 (1.0) kg	+ BW (unadjusted)	Y

						P<0.001		
Madhavan et al. 1994[71]	New York City, USA	808 51 y; 76% hypertensive; 44% Black, 56% Caucasian	BW (kg)	Mean Na Black male 137 (70) mmol/d; Black female 112 (50) mmol/d; Caucasian male 139 (70) mmol/d; Caucasian female 113 (56) mmol/d	None, stratified by race	**Mean (SD) BW (kg) by tertile of sodium intake (mmol/d), stratified by sex and race** **Black male:** T1 n=76, <102 mmol/d: 78.1 (9.7) kg T2 n=67, 102-156 mmol/d: 81.9 (12.4) kg T3 n=74 ≥157 mmol/d: 87.7 (12.5) kg Between group difference P≤0.01 **Black females:** T1 n=41, <102mmol/d: 69.7 (13.0) kg T2 n=49, 102-156 mmol/d: 74.0 (11.6) kg T3 n=48, ≥157 mmol/d: 78.1 (15.7) kg Between group difference P≤0.05 **Caucasian males:** T1 n=103, <102 mmol/d: 78.2±10.4 kg T2 n=118, 102-156 mmol/d: 80.6±10.0 kg T3 n=108, ≥157 mmol/d: 86.6±12.6 kg Between group difference P≤0.01 v **Caucasian females:** T1 n=46, <102 mmol/d: 62.8 (8.9) kg T2 n=36, 102-156 mmol/d: 65.6 (10.4) kg T3 n=42, ≥157 mmol/d: 70.5 (12.7) kg Between group difference P≤0.01	+ BW male & female, Black & Caucasian (unadjuste d)	Y
Nam et al. 2017[73]	Korea	640 Male 50%; 27% obese	BW (kg)	Not reported	Adjusted for age, smoking status, physical activity, monthly household income, education level, and daily energy intake	**Mean±SE BW (kg) by quartile of sodium intake (mmol/d), stratified by sex** **Male n=320** Q1 mean Na 86 mmol/d: 68.0 (1.4) kg Q2 mean Na 128 mmol/d: 69.5 (1.1) kg Q3 mean Na 166 mmol/d: 70.4 (1.1) kg Q4 mean Na 232 mmol/d: 75.5 (1.0) kg P-value for trend<0.001	+ BW men & women (adjusted, including energy intake)	Y

						*Adjusted for age, smoking status, physical activity, monthly, household income, education level, and daily energy intake **Female n=320** Q1 mean Na 86 mmol/d: 55.7 (1.6) kg Q2 mean Na 128 mmol/d: 58.9 (1.6) kg Q3 mean Na 166 mmol/d: 58.9 (1.7) kg Q4 mean Na 232 mmol/d: 63.5 (1.8) kg *P for trend<0.001 *Adjusted for age, smoking status, physical activity, monthly, household income, education level, and daily energy intake		
Yi et al. 2014[11]	USA	1656	BW (kg)	Not reported	Adjusted for age, sex, race/ethnicity, poverty, education, physical activity, sugary drinks, and self-reported diet quality	**Difference in BW (pounds) associated with sodium intake (1000 mg/d)** **Overall:** β=4.18 (95% CI 2.01, 6.36), P<0.001 **Male:** β=4.88 (95% CI 1.73, 8.02), P<0.001 **Female:** β=4.61 (95% CI 1.81, 7.41), P<0.001 *All models adjusted for age, sex (in main model), race/ethnicity, poverty, education, physical activity, sugary drinks, and self-reported diet quality **note no base models without adjustment for sugary drink consumption were available however authors reported in text that inclusion of sugar drinks consumption did not appear to mediate the association between Na intake and measures of body size	+ BW men & women (adjusted with sugary drinks)	N
Yi et al. 2015[10]	USA	4613	BW (kg)	Mean Na 154 (104) mmol/d	Adjusted for sex, age, race/ethnicity, education and energy intake using residual method	**Difference in BW (kg) associated with sodium intake (1000 mg/d)** **Overall:** β=1.72 kg (95%CI 1.00, 2.44), P<0.001 **Male:** β=1.47 kg (95%CI 0.66, 2.28), P<0.01 **Female:** β=1.92 kg (95%CI 0.85, 2.99), P-value <0.01 *adjusted for sex, age, race/ethnicity, education	+ BW overall, male & female (adjusted, including	N

					*note excludes mis-reporters (n=165) for energy intake outside range of 500-3500 kcal/d for women & 800-4000 kcal/day for men (n=165)	**Additional adjustment energy intake** **Overall:** β=2.75 kg (95%CI 1.90, 3.60), P-value <0.001 **Male:** β=2.51 kg (95%CI 1.12, 3.90), P<0.01 **Female:** β=3.02 kg (95%CI 1.36, 4.68), P<0.01 *adjusted for sex, age, race/ethnicity, education and energy intake using residual method	energy intake)	
Crouch et al. 2018 [58]	South Africa	761 43% male; 46% overweight/obese	BW (kg)	Mean Na 130 mmol/d	Age, SES, energy expenditure, energy intake derived from 3 x 24-hr diet recalls, cotinine, y-glutamyltransferase, high-density lipoprotein cholesterol, SBP, glucose, C-reactive protein, aldosterone	**Difference in BW (kg) associated with logarithmic sodium sodium intake (mg/d)** β=2.83±1.65 (P=0.09) *adjusted for age, SES, energy expenditure, cotinine, y-glutamyltransferase, high-density lipoprotein cholesterol, SBP, glucose, C-reactive protein, aldosterone **Additional adjustment with energy intake** β=03.13±1.64 (P=0.06) *adjusted for age, SES, energy expenditure, energy intake, cotinine, y-glutamyltransferase, high-density lipoprotein cholesterol, SBP, glucose, C-reactive protein, aldosterone, energy intake	Null BW (adjusted, including energy intake)	N
Choi & Run 2017[57]	Korea	80 Male 50%; 43 y; BMI 22.4; 18% obese (BMI>25)	BW (kg)	Mean Na 3960 (1824) mg/d)	Adjusted for age, sex, total energy intake, potassium intake, smoking status, household income, education level, PA	**Difference in BW (kg) associated with sodium intake (mg/d)** β (standardised)=0.42±0.52, P=NS, R^2=0.38	Null BW (adjusted, including energy intake)	N
Zhang et al. 2018 [102]	USA	9306 Male 53%	BW (kg)	Median Na 3320 mg/d	Age, sex, race, smoking, alcohol	**Difference in BW (kg) associated with sodium intake 1g/d**	+ BW (adjusted,	N

	Median age 35 y; 23% obese	drinking, physical activity, education, family annual income, and total energy intake	β=1.38 (95%CI 0.14, 2.62), P=not reported *adjusted for age, sex, race, smoking, alcohol drinking, physical activity, education, family annual income, and total energy intake	including energy intake)

Abbreviations: Na sodium; BW body weight; BMI body mass index; WHO World Health Organization; WC waist circumference; SES socio-economic status; FFQ food Frequency Questionnaire; PA physical Activity; SSB sugar sweetened beverage; ETOH alcohol consumption, UK United Kingdom, USA United States of Australia

Red text is used to highlight those studies which have considered adjustment with energy or SSB intake

[a] Measures of variance represent (SD) or ±SE unless otherwise specified

[b] *r* correlation coefficient, *β* represents unstandardized regression beta-coefficient unless otherwise stated

[c] Where possible summary based on most adjusted model

[d] Self-reported measure of BW and height

Supplemental Table 7. Summary of findings from cross-sectional studies among adults, outcome: waist circumference (WC) or abdominal obesity

Study	Country	N, sample characteristics	Adiposity outcome	Sodium/salt intake	Covariates; stratification	Findings[b]	Summary[c]	Included in meta-analyses related to this outcome
Perin et al. 2019[78]	Brazil	Population based random sample of adults aged 20-80 y residing in town of Artur Nogueira, southeast region of Brazil	WC (cm)	Mean salt 10.5 (SD 4.5) g/d	None	Significant weak positive correlation between sodium intake (mmol/d) and WC (cm) in males (r=0.226, P<0.001) and in females (r=0.166, P=0.004).	+ weak WC (unadjusted)	N
Yi et al. 2014[11]	USA	1656	WC (cm)	Not reported	Adjusted for age, sex, race/ethnicity, poverty, education, physical activity, sugary drinks, and self-reported diet quality	**Difference in WC (inches) associated with sodium intake (1000 mg/d)** **Overall:** β=0.51 (95% CI 0.22, 0.79), P<0.001 **Male:** β=0.57 (95% CI 0.19, 0.96), P<0.001 **Female:** β=0.61 (95% CI 0.21, 1.00), P<0.001 *All models adjusted for age, sex (in main model), race/ethnicity, poverty, education, physical activity, sugary drinks, and self-reported diet quality **note no base models without adjustment for sugary drink consumption were available however authors reported in text that inclusion of sugar drinks consumption did not appear to mediate the association between Na intake and measures of body size	+ WC men & women (adjusted for sugary drinks)	N

Yi et al. 2015[10]	USA	4613	WC (cm)	Mean Na 154 (104) mmol/d	Adjusted for sex, age, race/ethnicity, education and energy intake using residual method *note excludes mis-reporters (n=165) for energy intake outside range of 500-3500 kcal/d for women & 800-4000 kcal/day for men (n=165)	**Difference in WC (cm) associated with sodium intake (1000 mg/d)** **Overall:** β=2.15 cm (95%CI 1.41, 2.90), P<0.001 **Male:** β=1.85 cm (95%CI 0.70, 3.00), P<0.01 **Female:** β=2.48 cm (95%CI 1.04, 3.93), P<0.01 *adjusted for sex, age, race/ethnicity, education **Additional adjustment energy intake** **Overall:** β=1.12 cm (95%CI 0.61, 1.63), P<0.001 **Male:** β=0.87 cm (95%CI 0.24, 1.50), P<0.05 **Female:** β=1.40 cm (95%CI 0.68, 2.13), P<0.01 *adjusted for sex, age, race/ethnicity, education and energy intake using residual method	+ WC overall, male & female (adjusted, including energy intake)	N
Navia et al. 2014[74]	Spain	418 Male 47%; mean age 37 y; mean BMI 25.3; 34% overweight, 14% obese	WC (cm)	Mean Na 168 (79) mmol/d	Adjusted for age, sex	**Difference in WC (cm) associated with sodium intake (mmol/L)** β=1.11±0.34, P<0.001, R^2=0.37 *adjusted for age, sex	+ WC (adjusted)	N
Yoon et al. 2013[12]	Korea	20586 Male 40%; 31% obese	WC (cm), abdominal obesity defined as WC ≥90 cm for men &	Mean sodium 5057 mg/d	Adjusted for age, sex, household income, total weekly physical activity	**Odds (OR 95% CI) of abdominal obesity by quintile of sodium density (mg/g/d)** Q1 sodium density 0.1, 2.1 mg/g/d: reference category Q2 sodium density 2.2, 3.0 mg/g/d: OR 1.03 (95%CI 0.90, 1.18)	+ abdominal obesity (adjusted, including energy intake)	N

			≥85 cm for women		(MET/week) and energy intake (kcal/day) ***exposure is sodium density mg/g/d**	Q3 sodium density 3.1, 3.9 mg/g/d: OR 1.07 (95%CI 0.93, 1.22) Q4 sodium density 4.0, 5.2 mg/g/d: OR 1.04 (95%CI 0.91, 1.18) Q5 sodium density 5.3, 29.3 mg/g/d: OR 1.13 (95%CI 0.99, 1.29) P for trend =0.043 * adjusted for age, sex, sleep duration (5 h or less, 6, 7, 8, and 9 h) smoking status, alcohol intake (g/d), total weekly physical activity (MET/week), education level and energy intake (kcal/day) *Note no base models without inclusion of estimated energy intake were provided		
Murakami et al. 2015[72]	Japan	1043 Female 100%; mean age 20 y; 7.7% obese i.e. BMI ≥25	WC (cm), abdominal obesity defined as WC ≥80cm	Mean sodium density 1962 (751) mg/4184 kJ/d	Adjusted for estimated energy intake (EER), survey year, region, municipality level, residential status, physical activity, potassium and protein intake ***exposure sodium density mg/4184 kJ/d**	**Mean±SE WC (cm) by quartile of energy adjusted sodium intake (mg/4184 kJ)** Q1 median sodium 1155 mg/4184 kJ: 72.3± 0.4 Q2 median sodium 1659 mg/4184 kJ: 72.6±0.4 Q3 median sodium 2124 mg/4184 kJ: 72.6±0.4 Q4: median 2766 mg/4184 kJ: 73.3±0.4 P for trend=0.14 * adjusted for survey year, region, municipality level, residential status, current etoh, current smoking status, PA, estimated energy intake (EER) and 24 h urine K and protein **Odds (OR 95% CI) of abdominal obesity by quartile of energy adjusted sodium intake (mg/4184 kJ)** Q1 median sodium 1155 mg/4184 kJ: reference category Q2 median sodium 1659 mg/4184 kJ: OR 1.06 (95% CI 0.61, 1.83) Q3 median sodium 2124 mg/4184 kJ: OR 1.20 (95%CI 0.69, 2.09)	Null WC (adjusted, including energy intake) + abdominal obesity (adjusted, including energy intake)	N

						Q4: median 2766 mg/4184 kJ: OR 1.77 (95%CI 1.00, 3.16) P for trend=0.04 * adjusted for survey year, region, municipality level, residential status, current etoh, current smoking status, PA, estimated energy intake (EER) and 24 h urine K and protein *Note no base models without inclusion of estimated energy intake were provided		
Petermann -Rocha et al. 2019[80]	Chile	2913 42% male; mean age 46 y	WC (cm)	Not reported	None	**Mean (SD) WC (cm) by category of low <3.6 g/d) or high ≥3.6 g/d salt intake (as defined by median of 3.6 g/d)** Low salt intake <3.6 g/d n=939: 87.7 (12.3) cm High salt intake ≥3.6 g/d n=1974: 93.4 (12.9) cm	No statistical test performed	Y
Lee et al. 2015 [70]	Korea	1586 51% male	WC (cm)	Mean Na 156 (34) mmol/d	None	**Mean (SD) WC by tertile of sodium intake (mmol/d)** T1 n=528: 119 (16); WC 77.7 (8.2) cm T2 n=529: 154 (8); WC 78.7 (8.0) cm T3 n=529: 193 (18); WC 81.0 (8.0) cm P for trend <0.001	+ WC (unadjusted)	Y
Radhika et al. 2007[83]	Chennai, India	1902 27% hypertensive	WC (cm)	Mean salt 8.5 g/d	None	**Mean WC (cm) (SD) by salt (g/d) quintile** Q1 n=385, mean salt 4.9 g/d: 79.3 (10.8) cm Q2 n=391, mean salt 6.6 g/d: 81.3 (11.0) cm Q3 n=384, mean salt 7.9 g/d: 84.5 (11.7) cm Q4 n=376, mean salt 9.6 g/d: 85.9 (11.9) cm Q5 n=366), mean salt 13.8 g/d: 87.0 (11.1) cm P for trend<0.0001	+ WC (unadjusted)	Y
Yan et al. 2016[100]	China	1975 Male 53%, mean age 41 (14) y, 52% overweight or obese	WC (cm)	Mean Na 232 (87) mmol/d	None	**Mean (SD) WC (cm) by quartile of sodium intake (mmol/d)** Q1 mean Na 138 (SD 32) mmol/d: 80.3 (10.5) cm Q2 mean Na 206 (SD 15) mmol/d: 83.3 (11.0) cm Q3 mean Na 247 (SD 8) mmol/d: 84.2 (10.1) cm Q4 mean Na 344 (SD 86) mmol/d: 86.7 (12.2) cm P<0.001	+ WC (unadjusted)	Y

Hoffman et al. 2009 [65]	Caracas, Venezuela	766 33% male; mean age 45 (17) y	WC (cm)	Mean Na 143 (69) mmol/d	None, stratified by sex	**Mean±SE WC (cm) by quartile of sodium intake (mmol/d), stratified by sex** **Male:** Q1 n=63: <120; WC 97.0 (1.0) cm Q2 n=69: 120-159; WC 98.3 (2.0) cm Q3 n=56: 159-211; WC 104.0 (2.0) cm Q4 n=61: >211; WC 103.0 (2.0) cm P=0.007 **Female:** Q1 n=129: <92; WC 87.1 (1.0) cm Q2 n=146: 92-125; WC 89.4 (1.0) cm Q3 n=113: 125-158; WC 91.4 (1.0) cm Q4 n=127: >158; WC 93.9 (1.0) cm P<0.001	+ WC (unadjusted)	Y
Oh et al. 2015[75]	Korea	18146 Male 46%; mean age 47 y	WC (cm)	Median Na 4100 mg/d	None	**Mean (SD) WC (cm) by quartile of salt intake (g/d)** Q1 n=4536 median salt 2.7 (IQR 2.3, 3.1) g/d: 79.2 (10.1) cm Q2 n=4537 median salt 3.7 (IQR 3.4, 4.1) g/d: 80.5 (9.6) cm Q3 n=4537 median salt 4.6 (IQR 4.1, 5.0) g/d: 81.7 (9.5) cm Q4 n=4536 median salt 5.9(IQR 5.2, 6.5) g/d: 83.9 (9.7) cm Overall group difference P-value <0.001	+ WC (unadjusted)	Y
Nam et al. 2017[73]	Korea	640 Male 50%; 27% obese	WC (cm) and abdominal obesity defined as ≥90 cm in men and ≥85	Not reported	Adjusted for age, smoking status, physical activity, monthly household income, education	**Mean±SE WC (cm) by quartile of sodium intake (mmol/d), stratified by sex** **Male n=320** Q1 mean Na 86 mmol/d: 83.4 (1.2) cm Q2 mean Na 128 mmol/d: 84.3 (1.0) cm Q3 mean Na 166 mmol/d: 85.2 (0.9) cm Q4 mean Na 232 mmol/d: 88.9 (0.8) cm *P for trend<0.001	+ WC men & women (adjusted, including energy intake) + abdominal obesity men & women	Y

			cm in women		level, and daily energy intake	*Adjusted for age, smoking status, physical activity, monthly, household income, education level, and daily energy intake **Female n=320** Q1 mean Na 86 mmol/d: 74.8 (1.6) cm Q2 mean Na 128 mmol/d: 76.8 (1.6) cm Q3 mean Na 166 mmol/d: 77.6 (1.7) cm Q4 mean Na 232 mmol/d: 81.0 (1.8) cm *P for trend<0.001 *Adjusted for age, smoking status, physical activity, monthly, household income, education level, and daily energy intake **Odds (OR 95% CI) of abdominal obesity and higher sodium intake (Q4 compared to Q1-Q3), stratified by sex** **Male n=320** Healthy WC <90 cm : reference category Abdominal obesity ≥90 cm: OR 3.49 (2.08, 5.86) *Adjusted for age, smoking status, physical activity, monthly, household income, education level, and daily energy intake **Female n=320** Healthy WC <85 cm : reference category Abdominal obesity ≥85 cm: OR 3.00 (1.49, 6.07) *Adjusted for age, smoking status, physical activity, monthly, household income, education level, and daily energy intake **Note no base model without inclusion of energy intake available	(adjusted, including energy intake)	
Huh et al. 2015 [66]	Korea	7162 50% male; mean age 20	WC (cm), abdomina l obesity	Overall intake not reported	Abdominal obesity adjusted for	**Mean (SD) WC by tertile of sodium intake (mmol/d), stratified by sex** **Male:**	+ WC men & women (unadjusted)	Y

	y; mean BMI 22.5 kg/m^2	defined as WC ≥90 cm for men & ≥85 cm for women	age, current smoking status, regular exercise, serum creatinine , serum vitamin D, HOMA-IR, daily energy intake and hormone replacement therapy (women)	T1 sodium ≤133 mmol/d: 84.1 (10.0) cm T2 sodium 133, 164 mmol/d: 84.9 (8.4) cm T3 sodium >164 mmol/d: 86.3 (8.5) cm Overall between group P<0.001; T1 vs. T2 P<0.05; T1 vs. T3 P<0.05; T2 vs. T3 P<0.05 *note unadjusted **Female:** T1 sodium <135 mmol/d: 80.5 (9.3) cm T2 sodium 135, 166 mmol/d: 81.7 (8.8) cm T3 sodium >166 mmol/d: 84.7 (9.0) cm Overall between group P<0.001; T1 vs. T2 P<0.05; T1 vs. T3 P<0.05; T2 vs. T3 P<0.05 *note unadjusted **Odds (OR 95%CI) of abdominal obesity by tertile of sodium intake (mmol/d), stratified by sex** **Male:** T1 sodium ≤133 mmol/d: reference category T2 sodium 133, 164 mmol/d: OR 1.16 (95% CI 0.94, 1.42) T3 sodium >164 mmol/d: OR 1.46 (95% CI 1.19, 1.79) *adjusted for age, current smoking status, regular exercise, serum creatinine, serum vitamin D, HOMA-IR, daily energy intake **Female:** T1 sodium <135 mmol/d: reference category T2 sodium 135, 166 mmol/d: OR 1.23 (1.02, 1.49) T3 sodium >166 mmol/d: OR 2.01 (1.67, 2.43) * adjusted for age, current smoking status, regular exercise, serum creatinine, serum vitamin D, HOMA-IR and daily energy intake and hormone replacement therapy	+ abdominal obesity men & women (adjusted, including energy intake)

						**note no base model without inclusion of energy intake was available		
Ma et al. 2015[(9)I]	UK	785 Male 47%; mean age 49 y; mean BMI 27.7 kg/m^2	WC (cm), central adiposity defined as WC >102 cm men & >88 cm female	Mean salt 7.6 (3.3) g/d	Adjusted for age sex, ethnic group, household income, physical activity level, energy intake, etoh intake, smoking, education level	**Mean±SE WC (cm) by tertile of salt intake (g/d)** T1 mean salt 4.3 (1.1) g/d n=261: 88.0±1.5cm T2 mean salt 7.2 (0.8) g/d n=265: 93.3±1.4 cm T3 mean salt 11.5 (2.4) g/d n=259: 95.8±1.5 cm P for trend <0.001 *adjusted for age, sex, ethnic group, household income, physical activity level, energy intake, misreporting of energy intake, etoh intake, smoking, education level **Odds (OR 95% CI) of central obesity and salt intake (g/d)** Not centrally obese n=464, salt intake 7.0±0.1 g/d: reference group Centrally obese n=314, salt intake 8.6±0.2: OR 1.22 (95% CI 1.14, 1.32), P<0.001 * adjusted for age, sex, ethnic group, household income, physical activity level, energy intake, misreporting of energy intake, etoh intake, smoking, education level ***Alternative adjustment for SSB intake*** Not centrally obese n=464, salt intake 7.0±0.1 g/d: reference group Centrally obese n=314, salt intake 8.6±0.2: OR 1.24 (95% CI 1.16, 1.32), P<0.001 * adjusted for age, sex, ethnic group, household income, physical activity level, SSB intake, misreporting of energy intake, etoh intake, smoking, education level	+ WC (adjusted, including energy intake) + central adiposity (adjusted, including energy intake)	Y

						*Note no base models without inclusion of energy intake provided		
Ge et al. 2015[62]	China	1906 Male 53%	Central adiposity (defined male WC ≥90 cm, female ≥80 cam)	Mean Na 229 *mmol/d*	Age, sex, high school education, urbanisation, leisure-time PA, etoh consumption, smoking habit and hypertension	**Odds (OR 95% CI) of central adiposity by tertile of sodium intake (mmol/d)** T1: <195 mmol/d; OR 1.00 (reference category) T2: 195-252 mmol/d; OR 1.45 (95%CI 1.14, 1.85) T3: ≥252 mmol/d; OR 2.32 (95%CI 1.82, 2.96) P for trend <0.001	+ central adiposity (adjusted)	Y
Choi & Run 2017[57]	Korea	80 Male 50%; 43 y; BMI 22.4; 18% obese (BMI>25)	WC (cm)	Mean Na 3960 (1824) mg/d)	Adjusted for age, sex, total energy intake, potassium intake, smoking status, household income, education level, PA	**Difference in WC (cm) associated with sodium intake (mg/d)** β (standardised)=0.60±0.50, P=NS, R^2=0.23	Null WC (adjusted, including energy intake)	N
Crouch et al. 2018 [58]	South Africa	761 43% male; 46% overweight/obese	WC (cm)	Mean Na 130 mmol/d	Age, SES, energy expenditure, energy intake derived from 3 x 24-hr diet recalls, cotinine, y-glutamyltransferase, high-	**Difference in WC (cm) associated with logarithmic sodium intake (mg/d)** β=2.02±1.30 (P=0.12) *adjusted for age, SES, energy expenditure, cotinine, y-glutamyltransferase, high-density lipoprotein cholesterol, SBP, glucose, C-reactive protein, aldosterone **Additional adjustment with energy intake** β=0.2.21±1.29 (P=0.09)	Null WC (adjusted, including energy intake)	N

					density lipoprotein cholesterol, SBP, glucose, C-reactive protein, aldosterone	*adjusted for age, SES, energy expenditure, energy intake, cotinine, y-glutamyltransferase, high-density lipoprotein cholesterol, SBP, glucose, C-reactive protein, aldosterone, energy intake		
Zhang et al. 2018 [102]	USA	9306 Male 53% Median age 35 y; 23% obese	central obesity (defined male WC>120 cm, female >88 cm)	Median Na 3320 mg/d	Age, sex, race, smoking, alcohol drinking, physical activity, education, family annual income, and total energy intake	**Odds (OR 95% CI) of central obesity by category of sodium intake (mg/d) (categories defined as low Na <1500 mg/d, normal Na 1500-2300 mg/d and high Na >2300 mg/d** G1 sodium <1500 mg/d, median 1171 mg/d: OR 1.22 (95%CI 0.96, 1.57) G2 sodium 1500-2300 mg/d, median 1948 mg/d: Reference category G3 sodium >2300 mg/d, median 3771 mg/d: OR 1.28 (95%CI 1.10, 1.50) P for trend=0.03 *adjusted for age, sex and ethnicity **Additional adjustment with energy intake** G1 sodium <1500 mg/d, median 1171 mg/d: OR 1.28 (95%CI 0.72, 2.29) G2 sodium 1500-2300 mg/d, median 1948 mg/d: Reference category G3 sodium >2300 mg/d, median 3771 mg/d: OR 1.78 (95%CI 1.29, 2.45) P for trend=0.003 *adjusted for age, sex, race, smoking, alcohol drinking, physical activity, education, family annual income, and total energy intake	+ central adiposity (adjusted, including energy intake)	Y

Zhao et al. 2019 [103]	USA	730 Male 50%; Mean age 43 y; 73% overweight/obese	WC (cm), central obesity (defined male WC>102 cm, female >88 cm)	Mean Na 3567±40 mg/d	Adjusted for age, sex, race-Hispanic origin, PA, ETOH consumption, smoking status, educational attainment and either usual intake of total energy or SSB (diet measures derived from up to 2 x 24-hr diet recalls adjusted to usual intakes)	**Difference in WC (cm) associated with sodium intake (1000 mg/d)** β=9.2 (95% CI 6.9, 11.5), P<0.001 *adjusted for age, sex, race-Hispanic origin, PA, ETOH consumption, smoking status, educational attainment **Additional adjustment usual energy intake (kcal/d)** β=9.2 (95% CI 6.9, 11.5), P<0.001 *adjusted for age, sex, race-Hispanic origin, PA, ETOH consumption, smoking status, educational attainment, usual total energy intake **Alternative additional adjustment usual SSB intake (g/d)** β=9.2 (95% CI 7.0, 11.4), P<0.001 *adjusted for age, sex, race-Hispanic origin, PA, ETOH consumption, smoking status, educational attainment, usual SSB intake **Odds (OR 95% CI) of central adiposity by quartile of sodium intake (mg/d)** Q1 median Na 2505 mg/d: Reference category Q2 median Na 3176 mg/d: OR 1.33 (95%CI 1.20, 1.40) Q3 median Na 3753 mg/d: OR 1.60 (95%CI 1.41, 1.81) Q4 median Na 4662 mg/d: OR 2.00 (95% CI 1.69, 2.37) P for trend<0.001 *adjusted for age, sex, race-Hispanic origin, PA, ETOH consumption, smoking status, educational attainment **Additional adjustment usual energy intake (kcal/d)** Q1 median Na 2505 mg/d: Reference category Q2 median Na 3176 mg/d: OR 1.35 (95%CI 1.25, 1.46) Q3 median Na 3753 mg/d: OR 1.65 (95%CI 1.45, 1.88) Q4 median Na 4662 mg/d: OR 2.07 (95% CI 1.74, 2.46) P for trend<0.001	+ WC (adjusted, including energy or SSB intake) + central adiposity (adjusted, including energy or SSB intake)	Y

		*adjusted for age, sex, race-Hispanic origin, PA, ETOH consumption, smoking status, educational attainment, usual total energy intake **Alternative additional adjustment usual SSB intake (g/d)** Q1 median Na 2505 mg/d: Reference category Q2 median Na 3176 mg/d: OR 1.32 (95%CI 1.22, 1.43) Q3 median Na 3753 mg/d: OR 1.60 (95%CI 1.41, 1.81) Q4 median Na 4662 mg/d: OR 1.99 (95% CI 1.68, 2.36) P for trend<0.001 *adjusted for age, sex, race-Hispanic origin, PA, ETOH consumption, smoking status, educational attainment, usual total SSB intake

Abbreviations: Na sodium; BMI body mass index; WHO World Health Organization; WC waist circumference; SES socio-economic status; FFQ food Frequency Questionnaire; PA physical Activity; SSB sugar sweetened beverage; ETOH alcohol consumption, UK United Kingdom, USA United States of Australia

Red text is used to highlight those studies which have considered adjustment with energy or SSB intake

[a] Measures of variance represent (SD) or ±SE unless otherwise specified

[b] *r* correlation coefficient, *β* represents unstandardized regression beta-coefficient unless otherwise stated

[c] Where possible summary based on most adjusted model

Supplemental Table 8. Summary of findings from cross-sectional studies among adults, outcome: body composition

Study	Country	N, sample characteristics	Adiposity outcome	Sodium/salt intake[a]	Covariates; stratification	Findings[b]	Summary[c]	Included in meta-analyses related to this outcome
Jiet & Soma 2017 [68]	Malaysia	Convenience sample of university students aged 18-25 y recruited from University of Nottingham Malaysia Campus	Body fat mass, fat free mass, body fat % (measured using BIA)	Mean Na 175 mmol/d	Unadjusted	Significant positive correlation between sodium intake (mmol/d) and fat free mass (kg) (*r*=0.44, P=0.02) No correlation between sodium intake (mmol/d) and body fat mass or body fat % (data not reported)	+ fat free mass (unadjusted) Null body fat mass Null body fat %	N
Huh et al. 2015 [66]	Korea	7162 50% male; mean age 20 y; mean BMI 22.5 kg/m^2	total fat free mass, body fat %	Overall intake not reported	Unadjusted	**Mean (SD) total fat mass (kg) tertile of sodium intake (mmol/d), stratified by sex** **Male:** T1 sodium ≤133 mmol/d: 14.7 (4.8) kg T2 sodium 133, 164 mmol/d: 15.0 (4.8) kg T3 sodium >164 mmol/d: 15.6 (4.9) kg Overall between group P=0.014; T1 vs. T2 P=NS; T1 vs. T3 P<0.05; T2 vs. T3 P<0.05 **Female:** T1 sodium <135 mmol/d: 33.9 (5.7) kg T T2 sodium 135, 166 mmol/d: 34.2 (5.2) kg T3 sodium >166 mmol/d: 35.0 (5.3) kg Overall between group P<0.001; T1 vs. T2 P<0.05; T1 vs. T3 P<0.05; T2 vs. T3 P<0.05	+ total body fat mass (unadjusted) Null body fat % total fat mass men (unadjusted) + % body fat mass women (unadjusted)	N

						Mean body fat (%) (SD) by tertile of sodium intake (mmol/d), stratified by sex **Male:** T1 sodium ≤133 mmol/d: 22.3 (5.2) % T2 sodium 133, 164 mmol/d: 22.4 (5.0) % T3 sodium >164 mmol/d: 22.7 (5.1) % Overall between group P=0.147; T1 vs. T2 P=NS; T1 vs. T3 P=NS; T2 vs. T3 P=NS **Female:** T1 sodium <135 mmol/d:33.9 (5.7) % T2 sodium 135, 166 mmol/d: 34.2 (5.2) % T3 sodium >166 mmol/d: 35.0 (5.3) % Overall between group P<0.001; T1 vs. T2 P=NS; T1 vs. T3 P<0.05; T2 vs. T3 P<0.05		
Yi et al. 2015[10]	USA	4613	Predictive body fatness (%) calculated using sex-specific formula recently validated using NHANES data	Mean Na 154 (104) mmol/d	Adjusted for sex, age, race/ethnicity, education and energy intake using residual method *note excludes mis-reporters (n=165) for energy intake outside range of 500-3500 kcal/d for women &	**Difference in predictive body fatness (%) (dep variable) associated with sodium intake (1000 mg/d)** **Overall:** β=0.44% (95%CI 0.16, 0.73), P<0.05 **Male:** β=0.36% (95%CI 0.05, 0.67), P<0.05 **Female:** β=0.43% (95%CI -0.01, 0.87), P=NS *adjusted for sex, age, race/ethnicity, education **Additional adjustment energy intake** **Overall:** β=1.18% (95%CI 0.73, 1.64), P<0.001 **Male:** β=0.97% (95%CI 0.36, 1.59), P<0.01 **Female:** β=1.48% (95%CI 0.78, 2.17), P<0.001 *adjusted for sex, age, race/ethnicity, education and energy intake using residual method	+ body fat % overall, male & female (adjusted, including energy intake)	N

					800-4000 kcal/day for men (n=165)			
Ma et al. 2015[(9)I]	UK	785 Male 47%; mean age 49 y; mean BMI 27.7 kg/m^2	Body composition (fat mass kg and lean fat mass kg) derived from doubly labelled water study in representative sub-sample n=117	Mean salt 7.6 (3.3) g/d	Adjusted for age sex, ethnic group, household income, physical activity level, energy intake, etoh intake, smoking, education level	**Sub-sample n=117 with body composition data** **Difference in body fat mass (kg) associated with salt intake (g/d)** β=0.91 kg, P=0.001 *adjusted for age, sex, ethnic group, energy intake **Difference in body fat mass (kg) associated with salt density (g/2000kcal)** β=1.16, P=0.003 *adjusted for age, sex, ethnic group **Difference in body lean mass (kg) associated with salt intake (g/d)** β=0.32 kg, P=0.054 *adjusted for age, sex, ethnic group, energy intake **Difference in body lean mass (kg) associated with salt density (g/2000kcal)** β=-0.007, P=0.984 *adjusted for age, sex, ethnic group *Note no base models without inclusion of energy intake provided	+ body fat mass (adjusted, including energy intake) Null body lean mass (adjusted, including energy intake)	N
Choi & Run 2017[(57)]	Korea	80 Male 50%; 43 y; BMI 22.4; 18% obese (BMI>25)	Body fat %, visceral fat area (cm^2)	Mean Na 3960 (1824) mg/d)	Adjusted for age, sex, total energy intake, potassium intake, smoking status,	**Difference in body fat % associated with sodium intake (mg/d)** β (standardised)=0.20±0.36, P=NS, R^2=0.50 * Adjusted for age, sex, total energy intake, potassium intake, smoking status, household income, education level, PA	Null body fat % (adjusted, including energy intake) Null visceral fat area (adjusted,	N

					household income, education level, PA	**Difference in visceral fat area (cm^2) associated with sodium intake (mg/d)** β (standardised)=1.55±1.41, P=NS, R^2=0.55 Adjusted for age, sex, total energy intake, potassium intake, smoking status, household income, education level, PA	including energy intake)	
Crouch et al. 2018 [58]	South Africa	761 43% male; 46% overweight/ obese	Lean mass (kg), fat mass (kg), body fat % (measured with BIA)	Mean Na 130 mmol/d	Age, SES, energy expenditure, energy intake derived from 3 x 24-hr diet recalls, cotinine, y-glutamyltransferase, high-density lipoprotein cholesterol, SBP, glucose, C-reactive protein, aldosterone	**Difference in lean mass (kg) associated with logarithmic sodium sodium intake (mg/d)** β=-0.78±2.09 (P=0.71) *adjusted for age, SES, energy expenditure, cotinine, y-glutamyltransferase, high-density lipoprotein cholesterol, SBP, glucose, C-reactive protein, aldosterone **Additional adjustment with energy intake** β=-1.55±2.08 (P=0.46) *adjusted for age, SES, energy expenditure, energy intake, cotinine, y-glutamyltransferase, high-density lipoprotein cholesterol, SBP, glucose, C-reactive protein, aldosterone, energy intake **Difference in fat mass (kg) associated with logarithmic sodium sodium intake (mg/d)** β=0.08±1.06 (P=0.94) *adjusted for age, SES, energy expenditure, cotinine, y-glutamyltransferase, high-density lipoprotein cholesterol, SBP, glucose, C-reactive protein, aldosterone **Additional adjustment with energy intake** β=0.19±1.05 (P=0.86) *adjusted for age, SES, energy expenditure, energy intake, cotinine, y-glutamyltransferase, high-density	Null lean mass (adjusted, including energy intake) Null body fat (adjusted, including energy intake) Null body fat % (adjusted, including energy intake)	N

						lipoprotein cholesterol, SBP, glucose, C-reactive protein, aldosterone, energy intake **Difference in body fat % area a associated with logarithmic sodium sodium intake (mg/d)** β=-0.54±0.87 (P=0.54) *adjusted for age, SES, energy expenditure, cotinine, y-glutamyltransferase, high-density lipoprotein cholesterol, SBP, glucose, C-reactive protein, aldosterone **Additional adjustment with energy intake** β=-0.52±0.87 (P=0.55) *adjusted for age, SES, energy expenditure, energy intake, cotinine, y-glutamyltransferase, high-density lipoprotein cholesterol, SBP, glucose, C-reactive protein, aldosterone, energy intake		
Elfassy et al. 2018 [59]	USA	435 sub-sample with 24-hr urine 47% male; mean age 42 y	Body fat (kg), body fat % (derived from DLW methods)	Not reported	Age, sex, heritage, education, income, language preference, nativity/years in the US, study site, missing one urine void + smoking, hypertension, diabetes, alcohol use, depression, PA (total	**Difference in body fat (kg) associated with sodium intake (500 mg/d)** β=0.83 kg/m^2 (95%CI 0.41, 1.25), P<0.05 *adjusted for age, sex, heritage, education, income, language preference, nativity/years in the US, study site, missing one urine void **Additional adjustment energy intake** β=0.54 kg/m^2 (95%CI 0.15, 0.93), P<0.05 *adjusted for age, sex, heritage, education, income, language preference, nativity/years in the US, study site, missing one urine void + smoking, hypertension, diabetes, alcohol use, depression, PA (total METs/wk), energy intake Alternative model using sodium density (250 mg/1000 kcal) as independent variable β=0.37 kg/m^2 (95%CI -0.-0.11, 0.86), P=NS	+ body fat (kg) but null findings when using sodium density + body fat % (adjusted, including energy intake)	N

					METs/wk), energy intake derived from DLW	*adjusted for age, sex, heritage, education, income, language preference, nativity/years in the US, study site, missing one urine void + smoking, hypertension, diabetes, alcohol use, depression, PA (total METs/wk) **Difference in body fat % associated with sodium intake (500 mg/d)** β=0.40 kg/m^2 (95%CI 0.16, 0.64), P<0.05 *adjusted for age, sex, heritage, education, income, language preference, nativity/years in the US, study site, missing one urine void **Additional adjustment energy intake** β=0.35 kg/m^2 (95%CI 0.11, 0.58), P<0.05 *adjusted for age, sex, heritage, education, income, language preference, nativity/years in the US, study site, missing one urine void + smoking, hypertension, diabetes, alcohol use, depression, PA (total METs/wk), energy intake Alternative model using sodium density (250 mg/1000 kcal) as independent variable β=0.39 kg/m^2 (95%CI 0.09, 0.68), P<0.05 *adjusted for age, sex, heritage, education, income, language preference, nativity/years in the US, study site, missing one urine void + smoking, hypertension, diabetes, alcohol use, depression, PA (total METs/wk)		
Zhang et al. 2018 [102]	USA	9306 Male 53% Median age 35 y 23% obese	Body fat (%), lean mass (kg), fat mass (kg)	Median Na 3320 mg/d	Age, sex, race, smoking, alcohol drinking,	**Difference in body fat (%) associated with sodium intake 1g/d** β=0.44 (95%CI 0.07, 0.81), P=not reported	+ body fat % (adjusted, including energy intake)	N

	measures derived from DXA in sub-sample n=7654 participants	physical activity, education, family annual income, and total energy intake	*adjusted for age, sex, race, smoking, alcohol drinking, physical activity, education, family annual income, and total energy intake **Difference in body lean mass (kg) associated with sodium intake 1g/d** β=0.53 (95%CI 0.14, 0.92), P=not reported *adjusted for age, sex, race, smoking, alcohol drinking, physical activity, education, family annual income, and total energy intake **Difference in body fat mass (kg) associated with sodium intake 1g/d** β=0.79 (95%CI 0.17, 1.40), P=not reported *adjusted for age, sex, race, smoking, alcohol drinking, physical activity, education, family annual income, and total energy intake	+ lean body mass (adjusted, including energy intake) + body fat mass (adjusted, including energy intake)

Abbreviations: Na sodium; BMI body mass index; WHO World Health Organization; WC waist circumference; SES socio-economic status; FFQ food Frequency Questionnaire; PA physical Activity; SSB sugar sweetened beverage; ETOH alcohol consumption; BIA bioelectrical impedance analysis; DLW doubly labelled water; DXA dual energy x-ray absorptiometry , UK United Kingdom, USA United States of Australia

Red text is used to highlight those studies which have considered adjustment with energy or SSB intake

[a] Measures of variance represent (SD) or ±SE unless otherwise specified

[b] *r* correlation coefficient, *β* represents unstandardized regression beta-coefficient unless otherwise stated

[c] Where possible summary based on most adjusted model

Supplemental Table 9. Characteristics of longitudinal studies examining the association between sodium intake and adiposity outcomes among adults and children

Study	Country	Study population /Study Name	N, Sample characteristics	Follow up duration	Adiposity outcome	Exposure	Covariates; stratification	Main findings	Summary
Larsen et al. 2013[(8)]	Denmark	Adults from the Danish MONICA (Monitoring Trends in Cardiovascular Disease) study. Includes a sub-sample who provided a 24-hr urine collection.	215 ~48% female	6 y	BW (kg), WC (cm), body fat (kg), FFM (kg)[a]	1 x 24hr urine completed at baseline	baseline age, sex, education level, smoking, PA, ETOH, menopausal status (women), height, baseline measure of outcome, baseline total energy intake, change in BW between baseline and follow up.	Median sodium intake by tertile T1 100 mmol/d, T2 153 mmol/d, T3 213 mmol/d **Change (95% CI) in BW (kg) per 100 mmol/d Na increase** **Model 1:** -0.18 (95% CI -1.16, 0.80) kg *Adjusted for baseline age, sex, education level, smoking, PA, ETOH, menopausal status (women), height, baseline BW **Additional adjustment with energy intake** **Model 2:** -0.15 (95% CI -1.12, 0.83) kg *Adjusted for Model 1 + energy intake **Change (95% CI) in WC (cm) per 100 mmol/d Na increase** **Model 1:** 0.18 (95% CI -0.81, 1.18) cm *Adjusted for baseline age, sex, education level, smoking, PA, ETOH, menopausal status (women), height, baseline WC **Additional adjustment with energy intake** **Model 2:** 0.22 (95% CI -0.77, 1.21) cm *Adjusted for Model 1 + energy intake **Model 3:** 0.35 (95% CI -0.31, 1.02) cm *Adjusted for Model 2 + change in BW between baseline and follow up **Change (95% CI) in body fat (kg) per 100 mmol/d Na increase**	Null BW Null WC + body fat (only with additional adjustment for change in BW) - fat free mass (only with additional adjustment for change in BW)

								Model 1: 0.15 (95% CI -0.59, 0.89)kg *Adjusted for baseline age, sex, education level, smoking, PA, ETOH, menopausal status (women), height, baseline body fat **Additional adjustment with energy intake** **Model 2:** 0.17 (95% CI -0.57, 0.91) kg *Adjusted for Model 1 + energy intake **Model 3:** 0.24 (95% CI 0.05, 0.43) kg *Adjusted for Model 2 + change in BW between baseline and follow up **Change (95% CI) in fat free mass (kg) per 100 mmol/d Na increase** **Model 1:** -0.28 (95% CI -0.63, 0.06)kg *Adjusted for baseline age, sex, education level, smoking, PA, ETOH, menopausal status (women), height, baseline FFM. **Additional adjustment with energy intake** **Model 2:** -0.27 (95% CI -0.62, 0.07) kg *Adjusted for Model 1 + energy intake **Model 3:** -0.21 (95% CI -0.40, -0.01) kg *Adjusted for Model 2 + change in BW between baseline and follow up	
Ard et al. 2004[105]	USA	Follow-up of participants in the Dietary Approaches to Stop Hypertension (DASH)-Na trial	56 Mean age 47 y Female n=40	1 y	BW (kg)	1 x 24-hr urine at 1, 6, 12 month	None, stratified by original RCT group i.e. DASH-Na intervention vs. control group	**DASH-Na intervention group (n=28)** **Mean (SD) sodium intake (mmol/d)** Baseline (i.e. post-intervention value): 93.6 (SD 46.6) mmol/d Follow-up: 100.8 (SD 48.7) mmol/d Change from baseline to follow-up: 7.1 (95%CI -11.9, 26.1) mmol/d **Mean (SD) BW (kg)** Baseline (i.e. post-intervention value): 78.2 (SD 16.2) kg	Null BW No change in sodium intake or BW during follow up period for either group, no change in BW in DASH-

								Follow-up: 79.9 (SD 15.5) kg Change from baseline to follow-up: 1.7 (95%CI -0.1, 3.6) kg **Control group (n=25)** **Mean (SD) sodium intake (mmol/d)** Baseline (i.e. post-intervention value): 104.8 (SD 75.8) mmol/d Follow-up: 116.2 (SD 43.0) mmol/d Change from baseline to follow-up: 11.4 (95%CI -28.5, 51.3) mmol/d **Mean (SD) BW (kg)** Baseline (i.e. post-intervention value): 83.2 (SD 15.2) kg Follow-up: 85.1 (SD 15.1) kg Change from baseline to follow-up: 1.93 (95%CI 0.72, 3.14) kg	Na group, increase in BW among control group.
Takahashi et al. 2006[(107)]	Japan	Follow up of participants who completed a 1 y RCT assessing effect of reduced Na diet and increased vitamin C and carotene on BP and stomach	278 of 550 in original RCT Female 67% Baseline mean age 67 y	3-4 y	BW(kg)[b]	Validated self-administered diet history questionnaire assessed intake over past 1 month	Sodium is adjusted for energy (mg/1000 kcal)	Maintenance of the diet between original intervention and control groups was similar; results were combined as one group for follow up analysis. **Mean (SD) sodium intake (mg/1000 kcal)** Baseline (i.e. post RCT): 2651 (SD 660) mg/1000 kcal Follow-up: 2700 (SD 729) mg/1000 kcal Change from baseline to follow-up: 49 (698) mg/1000 kcal, P=0.243 **Mean (SD) BW (kg)** Baseline (i.e. post RCT): 57.5 (SD 8.5) kg Follow-up: 57.5 (SD 8.8) kg Change from baseline to follow-up: 0.0 (SD 3.0) kg, P=0.426	Null BW No change in sodium density of diet or BW during follow up period.

		cancer. Included free living healthy adults aged 40-69 y recruited from two rural villages in north-eastern Japan.							
Sakaki et al. 2014[106]	Japan	Outpatients with HT recruited from National Kyushu Medical Centre, Fukuoka, Japan	248 Male 43% Baseline mean age 58 y	Mean follow up 9.4 (SD 3.1) y (range 3, 14)	BW(kg)	Mean 11 x 24-hr urine over follow-up period (range 5, 22)	None, stratified by compliance for long term salt restriction	**Mean (SD) salt intake (g/d)** Overall: 8.9 (2.4) g/d (during study period) Baseline: 9.6 (4.0) g/d (range 0.8, 25.9) Final visit: 8.6 (3.2) g/d (range 1.8, 19.1) Baseline vs. final visit P<0.01 **Mean (SD) BW (kg)** Baseline: 61.0 (11.3) kg (range 31, 95) Final visit: 61.3 (11.2) kg (range 31, 95) Baseline vs. final visit P=NS Subjects grouped by good (<8g/d), moderate (8-10 g/d) and poor compliance (≥10 g/d) for long term salt restriction (i.e. based on average salt intake over follow-up period) **<u>Good compliance <8 g/d n=88</u>** **Mean (SD) salt intake (g/d)** Baseline: 7.0 (2.7) g/d Final visit: 6.4 (2.0) g/d *Baseline vs. final visit P<0.01	Null BW Significant decrease salt intake over time but no change in BW. This was for group overall and stratified analysis by compliance for salt restriction

								Mean (SD) BW (kg) Baseline: 55.5 (10.1) kg Last visit: 56.1 (10.1) kg *Baseline vs. final visit P=NS **<u>Moderate compliance 8-10 g/d n=81</u>** **Mean (SD) salt intake (g/d)** Baseline: 9.6 (2.8) g/d Final visit: 8.3 (2.3) g/d *Baseline vs. final visit P<0.01 **Mean (SD) BW (kg)** Baseline: 62.0 (10.1) kg Final visit: 62.1 (10.0) kg *Baseline vs. final visit P=NS **<u>Poor compliance ≥10 g/d n=81</u>** **Mean (SD) salt intake (g/d)** Baseline: 9.6 (2.8) g/d Final visit: 8.3 (2.3) g/d *Baseline vs. final visit P=NS **Mean (SD) BW (kg)** Baseline: 66.1 (11.2) kg Final visit: 66.4 (11.2) kg *Baseline vs. final visit P=NS	
Lee et al. 2017[126]	Korea	Children aged 8-9 y recruited from 7 x elementary schools located in Seoul	798 (includes healthy weight children with BMI <85th p)	3 y	Incidence of obesity during 3 y follow up Obesity defined by age and sex BMI	3 x24-hr diet recall (2 weekdays, 1 weekend day)	Sodium intake adjusted for energy intake using residual method	10.3% of children developed obesity during 3 y follow up **Mean (SD) energy adjusted sodium intake mg/d (SD) stratified by participants who at 3 y remained non-obese and those who developed obesity** **Non-obese** Baseline n=532: 3502 (819) mg/d	Reduced incidence of obesity among children with greatest reductions in Na intake.

	percentiles using Korean National Growth Chart. Obese ≥85th p; Non-obese <85th p		Follow-up n=633: 3323 (983) mg/d Difference n=506: -231 (1147) mg/d, P-value <0.001 **Obese** Baseline n=61: 3371 (677) mg/d Follow-up n=73: 3440 (860) mg/d Difference n=58: -37 (970) mg/d, P-value NS *Note there was no between group 3 y difference in sodium intake P-value=NS **Relative frequency of obesity during 3 y follow up** There was no change (P-value=NS) in relative frequency of obesity (%) over 3 y period across variation of changes in sodium intake expressed as quartiles Q1 change in Na intake -1610 (SD 641) mg/d; Q2 change in Na intake -517 (189) mg/d, Q3 change in Na intake 118 (199) mg/d, Q4 change in Na intake 1181 (710) mg/d. Consistent for total sample and sex stratification analysis. There was a significant change in relative frequency (%) of obesity over 3 y period when comparing change in sodium intake from Q1 (mean Na -1451 mg/d) to combined Q2-Q4 (mean Na 115.8 mg/d). Relative frequency of obesity in Q2-Q4 was almost 3 x higher compared with Q1 P=0.015. Among girls but not boys the risk of developing obesity associated with change in	Effect more pronounced in girls with specific genetic mutations

								Na intake was more pronounced in those with hetero/mutant types of 2 salt sensitive genes NEDD4L and CYP11β2. - Odds ratio (95% CI) for risk of developing obesity was 5.75 (1.30, 25.3) for those with hetero/mutant of NEDD4L with higher Na intakes (Q2-Q4) compared with those with wild type and lowest Na intake (Q1) - Trend (P=0.047) for higher frequency of obesity with higher sodium intake (across quartiles) among those with hetero/mutant CYP11 β2 vs wild type - There were no other interactions for genetic variation on 7 other salt sensitive genes investigated	
Libuda et al. 2012[(6)]	Germany	Children aged 3-18 years, a sub-sample of participants from the Dortmund Nutritional and Anthropometric Longitudinally Designed (DONALD) Study	364	5 y	BMI-SDS, % body fat	At least 2 x 24-hr urine (range 2, 7)	Time (years after first individual data assessment), age, parental BMI, sugary drink intake, energy intake. Note maternal education and sex were explored as confounders but not included in final models as no effect.	Boys median sodium intake increased from 41 mmol/d in 3-4 y/o to 139 mmol/d in 15-18 y/o. Girls median sodium intake increased from 49 mmol/d in 3-4 y/o to 108 mmol/d in 15-18 y/o **Change in BMI-SDS associated with difference in baseline sodium excretion of 1000 mg/d** **Model 1:** β=0.084, P=0.602 *Adjusted for time, age, age x age, parental BMI **Additional adjustment with SSB intake** **Model 2:** β=0.146, P=0.704	Null BMI-SDS + % body fat with higher baseline Na intake (independent of sugary drinks and energy intake) Null % body fat with change in Na intake

	*Adjusted for model 1 + baseline sugar drink intake, baseline sugary drink intake x time and change in drink intake **Additional adjustment with energy intake** **Model 3:** β=0.146, P=0.704 *Adjusted for model 1 + baseline energy intake, baseline energy intake x time and change in energy intake **Change in BMI-SDS associated with a 1000 mg/d change in sodium intake** **Model 1:** β=0.00074, P=0.945 *Adjusted for time, age, age x age, parental BMI **Additional adjustment with SSB intake** **Model 2:** β= -0.002, P=0.983 *Adjusted for model 1 + baseline sugar drink intake, baseline sugary drink intake x time and change in drink intake **Additional adjustment with energy intake** **Model 3:** β= - 0.0002, P=0.982 *Adjusted for model 1 + baseline energy intake, baseline energy intake x time and change in energy intake **Change in % body fat associated with difference in baseline sodium excretion of 1000 mg/d** **Model 1:** β=0.364, P=0.07 *Adjusted for time, age, age x age, parental BMI **Additional adjustment with SSB intake** **Model 2:** β=0.610, P=0.056

*Adjusted for model 1 + baseline sugar drink intake, baseline sugary drink intake x time and change in drink intake

Additional adjustment with energy intake

Model 3: β=0.476, P=0.004

*Adjusted for model 1 + baseline energy intake, baseline energy intake x time and change in energy intake

Change in % body fat associated with a 1000 mg/d change in sodium intake

Model 1: β=0.021, P=0.854

*Adjusted for time, age, age x age, parental BMI

Additional adjustment with SSB intake

Model 2: β=0.050, P=0.661

*Adjusted for model 1 + baseline sugar drink intake, baseline sugary drink intake x time and change in drink intake

Additional adjustment with energy intake

Model 3: β=0.075, P=0.529

*Adjusted for model 1 + baseline energy intake, baseline energy intake x time and change in energy intake

Abbreviations: BMI body mass index; FFM Fat free mass; WC waist circumference; PA physical activity; SSB sugar sweetened beverage; ETOH alcohol consumption, USA United States of America

[a] Measured using bioelectrical impedance

[b] Self-reported measure of BW and height

Supplemental Table 10. Newcastle Ottawa Scale quality assessment of longitudinal studies assessing the association between sodium intake and adiposity outcomes among adults and children

Longitudinal studies	Country	Selection *(0-3*)*		Comparability *(0-2*)*	Outcome *(0-2*)*		Total NOS Score *(0-7*)*[1]
		Representativeness of cohort *(0-1*)*	Assessment of the exposure (sodium/salt intake) *(0-2*)*	Methods to control confounding *(0-2*)*	Assessment of outcome *(0-1*)*	Non-response Adequacy of follow up of cohorts *(0-1*)*	
		a) truly representative of the source population ***(1*)*** b) somewhat representative of the source population ***(1*)*** c) selected group of users e.g. nurses, volunteers ***(0)*** d) no description of the derivation of the cohort ***(0)***	a) 24-hr urine collection (1 or more) ***(2*)*** b) 24-hr dietary recall method ***(1*)*** c) Weighed dietary record (1 or more days) ***(1*)*** d) Urine sample: spot, timed or overnight ***(0)*** e) Food frequency questionnaire ***(0)***	a) study controls for age and sex ***(1)*** b) study controls for energy intake (1*) c) only unadjusted model presented (0)	a) objectively measured adiposity outcome (e.g. BW and height for BMI) ***(1*)*** b) self-report BW and height ***(0)*** c) no description ***(0)***	a) Complete follow up – all subjects accounted for ***(1*)*** b) Subjects lost to follow up unlikely to introduce bias (>75% follow up, or description provided of those lost) ***(1*)*** c) follow up rate <75% and no description of those lost ***(0)*** d) no statement ***(0)***	
Larsen et al. 2013[8]	Denmark	1	2	2	1	1	7
Ard et al. 2004[105]	USA	0	2	0	1	0	3
Takahashi et al. 2006[107]	Japan	1	0	1	0	1	3
Sakaki et al. 2014[106]	Japan	0	2	0	0	1	3
Lee et al. 2017[126]	Korea	1	1	1	1	0	4
Libuda et al. 2012[6]	Germany	1	2	2	2	0	7

Abbreviations: NOS Newcastle-Ottawa Scale Score; USA United States of America

[1] Studies with total scores of ≥5*, 3-4* and ≤2* were assessed as high, moderate and low-quality studies, respectively.

Supplemental Table 11. Characteristics of randomised controlled trials conducted in adults (n=15) and children (n=2)

Study, Country	Design/Study Name[a]	Sample characteristics	No. (C/E)	Intervention	Control	Duration	Exposure assessment	Primary outcome	Diuretic use	Na intake	Included in meta-analysis
Beard et al. 1982[36], Australia	Parallel 2 groups: control; reduced Na diet	Adults aged 25-69 y receiving antihypertensive medication, recruited via general practitioners Mean age 49 y Male n=51	45/45	Self-selected low Na diet. Nutrition education and shopping lists provided to include lower salt foods in diet. Instructed not to diet for weight loss during trial.	Small group discussions, urged to maintain their usual Na intake.	12 wk	1 x 24-hr urine	BP	Some participants were using diuretics however the total no.is unclear. Data is only provided as no. of tablets taken per day by group. No of tablets per day **Control** Baseline n=32 End n=27 **Experimental** Baseline n=32 End n=1	**Control** Baseline 175 mmol/d, end 161 mmo/ld, change -14 mmol/d, P=NS **Experimental** Baseline 150 mmol/d, end , 37 mmol/d, change -113, P<0.001 mmol/d Net Na difference: -99 mmol/d	Y
Hypertension Prevention Trial Research Group 1990[108], USA	Parallel 5 groups: **control**; reduced calories; reduced Na and calories; **reduced**	Community dwelling adults aged 25-49 y free of cardiovascular disease, not using antihypertensive	175/172	Self-selected reduced Na diet, individual target ≤70 mmol/d. Group face-to-face dietary counselling sessions	Passive control (no instructions or counselling provided)	3 y	8-hr overnight urine[b]	BP	NA	**Control** Baseline 165 mmol/d, change 0 mmol/d **Experimental** Baseline 163 mmol/d, change – 16 mmol/d	Y

	Na; reduced Na and increased K Hypertension Prevention Trial (HPT)	medications, DBP between 76-99 mm Hg at the first baseline visit or no more than 89 mm Hg at the second baseline visit 7-30 days later (i.e. normotensive population) Mean age 39 y Female 37%		targeting behaviour changes related to shopping, cooking and eating practices. Other resources included check-in telephone calls, newsletters, cook books and 'food counter' document of portion sizes.						Net Na difference: -16±8 mmol/d, P=0.053	
Appel et al. 2001[29], USA	Parallel 2 groups: control, reduced Na Trial of Nonpharmacologic Interventions in the Elderly (TONE)	Community dwelling adults aged 60-80 y with BP <145/<85 mmHg while taking 1 antihypertensive medication Mean age 66 y Male 53%	320/319	Self-selected reduced Na diet target <80 mmol/d. Nutrition education and behavioural based strategies provided via face-to-face sessions. No other	Face-to-face meetings held on a regular basis to enhance follow up. Topics discussed were unrelated to blood pressure, cardiovascul	Range 15-36 mo Mean 27.8 mo	2 x 24-hr urine collection (average used)	Composite endpoint that included recurrence of high BP, resumption of antihypertensive medication, or a clinical	Baseline 32% of participants were taking a diuretic	**Control** Baseline 145 mmol/d, end 150 mmol/d, change -5 mmol/d **Experimental** Baseline 144 mmol/d, end 99 mmol/d, change -45 mmol/d Net Na difference:	Y

		23% African-American		component of diet was targeted.	ar disease or nutrition.			cardiovascular event		-40 mmol/d, P<0.001	
Kumanyika et al. 1993[32], USA	Parallel 2 groups: control, reduced Na Trials of Hypertension Prevention, Phase 1 (TOPH 1)	Healthy community dwelling adults aged 30-54 y, with normal-high DBP (i.e. between 80-89 mm Hg), not taking antihypertensive medications and free of cardiovascular disease. Mean age 43 y Female 29% White 77%	304/395	Self-selected reduced Na diet, counselled (group & one-to-one sessions) to target 60 mmol/d without changing other nutrient intakes. Sessions incorporated behavioural change strategies, food tasting and peer support. Information provided on Na content of foods, food shopping, eating out and label reading. Take home packages of	Control participants received no information.	18 m	1 x 24-hr urine	DBP	NA	**Control** Baseline 157 mmol/d, end 145 mmol/d, change -11 mmol/d **Experimental** Baseline 155 mmol/d, end 99 mmol/d, change -55 mmol/d Net Na difference: -44 mmol/d, P<0.001	Y

				low Na food samples provided.							
The Trials of Hypertension Prevention Collaborative Research Group 1997[111], USA	Parallel 4 groups: **control**, weight loss, **reduced Na**, combined reduced Na + weight loss Trials of Hypertension Prevention, Phase II (TOPH II)	Adults aged 30-54 years, with DBP between 83-89 mm Hg) not taking antihypertensive medications and free of cardiovascular disease recruited from nine academic medical centres. Mean age 43 y Female 37% White 80%	554/549	Self-selected reduced Na diet. Participants counselled to target goal 70 mmol/d. Intensive 10 wk phase: weekly group sessions, provided with core knowledge and behavioural skills to reduce Na. Transitional phase: 4 monthly sessions. Then, once or twice monthly contacts with all active participants and attempts to reengage	Individual and group sessions provided (topics of discussion not reported)	36 m	1 x 24-hr urine	DBP	NA	**Control** Baseline 188 mmol/d, end 178 mmol/d, change -11 mmol/d **Experimental** Baseline 186 mmol/d, end 135 mmol/d, change -51 mmol/d Net Na difference: -40 mmol/d, P<0.001	Y

				inactive participants. Additionally, a series of 3-6 refresher sessions were offered on intervention-related topics.							
Bulpitt et al. 1984[30], UK	Parallel 2 groups: control, reduced Na	Patients attending hospital hypertension clinic with unsatisfactory blood pressure control, defined as DBP >95 mm Hg on two successive occasions despite drug treatment. Mean age 54 y Female 55%	33/32	Self-selected reduced Na diet, target of 44 mmol/d. Participants received dietary counselling from dietitian and instructed to avoid salty foods such as cured foods, most processed foods, cheese, salted butter and shell fish and limit other moderate sources of salt e.g. bread. Instructed not to use regular	Not described	3 m	1 x 48-hr urine	BP & adherence to low Na diet	94% of experimental group and 85% of control group were receiving a diuretic at baseline	**Control** Baseline 343 mmol/d, end 321 mmol/d, change -22 mmol/d **Experimental** Baseline 262 mmol/d, end 204 mmol/d, change -58 mmol/d Net Na difference: -36 mmol/d	Y

				salt at the table or during cooking and instead provided with a KCL salt substitute for use.								
Dodson et al. 1989[37], UK	Parallel 2 groups: control, reduced Na	Patients recruited from the hospital's outpatient diabetic clinic who also had mild hypertension and no past or current insulin treatment. Mean age 62 y Control female 35% Experimental female 29%	17/17	A dietitian counselled participants and advised them to avoid: a) adding table salt; b) adding salt in cooking; c) salted meats and smoked fish; d) tinned foods - in particular tinned meats, vegetables, fish and tinned and packeted soups; e) salted cheeses; f) Oxo, Bovril and Marmite; g) bottled sauces and	Instructed to continue with their usual diet. No advice was given about salt intake.	3 mo	1 x 24-hr urine	BP		None. Use of diuretics was an exclusion criteria.	**Control** Baseline 183 mmol/d, end 181 mmol/d, change -3 mmol/d, P=NS **Experimental** Baseline 199 mmol/d, end 137 mmol/d, change -62 mmol/d, P<0.001 Net Na difference: -59 mmol/d, P<0.05	Y

				savoury snacks, including crisps and peanuts. No advice was given on other aspects of diet (e.g. carbohydrate, fat)							
Gelejinse et al. 1994[38], Netherlands	Parallel 2 groups: control, reduced Na and increased K, Mg	Participants were part of the Rotterdam Study (large, population-based cohort study) and included adults aged 55-75 y without antihypertensive treatment and SBP 140-200 mm Hg or DBP 85-100 mm Hg at two measurements 1 week apart. Mean age 61 y Female 40%	50/47	Participants were provided with a reduced Na, increased potassium and magnesium mineral salt for use in cooking and at the table (Na, K, Mg 8:6:1 mmol; SagaSalt) and trial foods (bread, cheese, luncheon meats, canned and instant soups and smoked sausage) that	Participants received common salt (Na chloride) as table salt and trial foods (bread, cheese, luncheon meats, canned and instant soups and smoked sausage) that were prepared with common salt. Participants were asked to avoid	24 wk	2 x 24-hr urine	BP	None	**Control** Baseline 138 mmol/d, end 148 mmol/d **Experimental** Baseline 139 mmol/d, end 116 mmol/d Net Na difference: -38 mmol/d, P<0.001	Y

				were prepared with the mineral salt. Participants were asked to avoid changes in dietary habits and lifestyle as much as possible.	changes in dietary habits and lifestyle as much as possible.						
Takahashi et al. 2006[110], Japan	Parallel 2 groups: control, reduced Na and increased vitamin C and carotene Hiraka Dietary Intervention Study	Free living healthy adults aged 40-69 y were recruited from two rural villages in north-eastern Japan Mean age 56 y Female 67%	224/224	Self-selected diet with a focus on reduced Na intake (target <8-10 g/d salt in women & men), increased carotene intake >5000 ug/d and increased vitamin C intake >200 mg/d. Achieved by decreasing consumption of salted foods (miso, salted vegetable	Not described	1 y	1 x 48-hr urine	BP	11% receiving antihypertensive medication at the start of the study and this did not change during the trial, no further detail provided on drug type.	**Control** Baseline 248 mmol/d, end 237 mmol/d change -11 mmol/d **Experimental** Baseline 248 mmol/d, end 199 mmol/d change -49 mmol/d Net Na difference: -39 mmol/d, P<0.001	Y

				pickles, salted fish and seasonings) and increasing consumption of fruit and vegetables. Two dietary counselling sessions, a group lecture and two newsletters were provided.							
Nowson et al. 2009[33], Australi a	Parallel 2 groups: control (reference healthy diet); vitality diet (low Na + lean red meat)	Community dwelling women aged 45-75 y with hypertension	49/46	Dietary counselling provided by trained dietitians. Vitality Diet designed to have low dietary acid load and based on the low Na (60-70 mmol/d) DASH diet. Rich in fruits and vegetables, included lean red meat (6	Dietary counselling provided by trained dietitians. The reference healthy diet was designed to have high dietary acid load production, no reduction in Na intake. Participants received	14 wk	24-hr urine	BP	No. of participants taking a diuretic at the end of the study Control n=4 Experimental n=7	**Control (reference healthy diet)** Baseline 109 mmol/d, end 113 mmol/d change -4 mmol/d, P=NS **Experimental (Vitality diet)** Baseline 107 mmol/d, end 69 mmol/d change -38 mmol/d, P<0.001 Net Na difference:	Y

				servings/wk), higher in K and Mg. Participants received 810 g raw lean red meat, low-Na bread (75 mg Na/100 g), no-added-salt baked beans (20 mg Na/100 g), salt free margarine, and low-Na stock powder (approximately 50 mg Na/100 g). Both groups aimed to maintain usual energy intake.	regular-salt margarine and regular-salt baked beans, and canned tuna as an incentive. Both groups aimed to maintain usual energy intake.					-42 mmol/d, P<0.001	
Peterson et al. 2013[34], Australia	Parallel 2 groups: control, reduced Na	Adults >18 y diagnosed with Type 2 Diabetes Mellitus were recruited from a hospital	35/30	Participants were educated in a single session to use the nutrition information panel on food	Instructed to continue with their usual diet	3 mo	24-hr urine	Na intake	Individuals prescribed diuretics were eligible for inclusion, no data reported on diuretic usage	**Control** Baseline 167 mmol/d, end 161 mmol/d change -6 mmol/d **Experimental**	Y

		Diabetes Centre Mean age 62 y Female 37%		labels to choose products which complied with the Food Standards Australia New Zealand (FSANZ) guideline of <120 mg Na/100 g food. As no low Na bread available on the market the brand of bread with lowest Na content was recommended (280 mg Na/100 g).						Baseline 174 mmol/d, end 175 mmol/d change +1 mmol/d Net Na difference: +7 mmol/d, P=0.74	
He et al. 2015[39], China	Parallel 2 groups: control, reduced Na	Family based intervention study, children in grade 5 attending primary schools located in urban Changzhi,	261/271 adults	Children received education materials over one school term to pass onto their family members to reduce salt in	Children in the control group carried on with their usual health education lessons as in the curriculum,	3.5 mo	2 x consecutive 24-hr urine (average used)	Na intake	No information on antihypertensive medication reported.	**Control** Baseline 193 mmol/d, end 207 mmol/d change +13 mmol/d (95%CI 3.8, 22.6) **Experimental**	Y

	northern China were invited to participate along with two family member adults (i.e. one male & one female, in order of preference grandparents, parents, uncles and aunts) Mean age 44 y Female 41% Parents 74%; grandparents 26%	the family diet i.e. study slogan ‘small hands leading big hands, together let’s reduce salt’. The target was a 20% reduction in daily salt intake. The education programme included lessons plans, activity worksheets, homework assignments. Parents also received educational materials via newsletters. Key content included the harmful effects of salt, sources of salt in diet and cooking.	and these lessons did not contain information on salt			Baseline 215 mmol/d, end 179 mmol/d change -37 mmol/d (95%CI -46, -27) Net Na difference: -50 mmol/d, P<0.001

				Participants were encouraged to replace usual salt with a mineral salt substitute high in K and low in Na. Discretionary salt use in the home was monitored and fortnightly feedback was provided to help the family reach a 50% reduction target.							
Nouvenne et al. 2010[40], Italy	Parallel 2 groups: control 'usual diet' + water therapy, reduced Na diet + water therapy	Patients with iodiopathic calcium nephrolithiasis were recruited from an out-patient hospital clinic Mean age 40 y Female 39%	100/97	Self-selected reduced Na diet target 60 mmol/d. Participants were instructed to eliminate kitchen salt (cooking and at table) from their diet and	Participants instruction to consume their usual diet with the exception of beverage consumption that amounted to 2 L/d in colder	3 m	1 x 24-hr urine	Proportion of participants with urinary calcium normalization at follow-up.	No information on antihypertensive medication reported	**Control** Baseline 220 mmol/d, end 200 mmol/d change -20 mmol/d **Experimental** Baseline 228 mmol/d, end 68 mmol/d change -160 mmol/d	Y

			limit consumption of food with a high salt content. Counselling and instruction sheets provided by food scientist. In addition participants were instructed to consume daily intake of calcium of 800-1000 mg/d via milk, yoghurt and low salt cheese and meet beverage consumption that amounted to 2 L/d in colder months and 3L/d in warmer months.	months and 3L/d in warmer months. Water consumed had a low Na content 7 mg Na/L			Net Na difference: -140 mmol/d, P<0.001

				Water consumed had a low Na content 7 mg Na/L							
Gilleran et al. 1996, UK	Parallel 2 groups: control, reduced Na	Participants were patients attending the diabetic clinics at a hospital, with hypertension and type 11 diabetes. Only patients that reported adding salt at the table or in cooking as assessed by dietary recall were included. Mean age 63 y Female 40%	8/11	Throughout the trial participants received a salt substitute (Seltin) containing 50% Na chloride, 40% potassium chloride, and 10% magnesium sulphate. They were instructed to use the salt substitute when using salt during cooking or at the table.	Throughout the trial participants received ordinary table salt to use during cooking and at the table. .	9 months	1 x 24-hr urine	Blood pressure and metabolic parameters	None, patients were instructed to discontinue antihypertensive medication 1 month prior to the trial.	**Control** Baseline 169 mmol/d, end 159 mmol/d, change -10 mmol/d, P=NS **Experimental** Baseline 146 mmol/d, end 1167 mmol/d, change 20 mmol/d, ns Net Na difference: + 30 mmol/d	Y
Staessen et al. 1988 [109], Belgium	Parallel community based RCT 2 groups: control town; low	Adults residing in two Belgian towns, population of 12 000 and 9000. Towns	Baseline 117/410 End 236/747	Community based intervention focused on consumer awareness	Any mention of salt as a possible health hazard was carefully	4 years	1 x 24-hr urine	Feasibility of reducing population Na intake, BP	About 10% of participants pre and post were on antihypertensive medication, no further	**MALES** **Control** Baseline n=57: 186 mmol/d; end n=120: 173 mmol/d	Y

	Na intervention in another town	were 50 km away from one another in distance. At baseline a 10% random sample of households in the intervention town and 5% random sample of households in the control area were identified and those aged ≥10 years were invited to participate, however analysis only includes ≥19 years due to wide variability in BP in younger years. Follow-up sample size was doubled, those	campaign to raise awareness of health implications of high salt intake and 3 key messages to reduce salt i) banning the salt cellar from the table ii) avoiding the use of salt during food preparation at home iii) only purchasing food stuffs without added salt. Messages were distributed via the community via multiple mediums e.g. radio, newspaper adverts, leaflets distributed to	avoided and with the exception of pre and post measurements there was no other contact with the population.			information provided on type.	change -13 mmol/d, P=NS **Experimental** Baseline n=215: 182 mmol/d; end n=385: 170 mmol/d change -12 mmol/d, P<0.05 Net Na difference: +1 mmol/d, P=0.98 **FEMALES** **Control** Baseline n=60: 131 mmol/d; end n=116: 139 mmol/d change +8 mmol/d, P=NS **Experimental** Baseline n=195: 149 mmol/d; end n=362: 132 mmol/d change -17 mmol/d, P<0.001 Net Na difference:

		completing baseline measures were excluded from follow-up participation.		all homes, support from GP in medical practices. Bakers and butchers encouraged to reduce Na content of bread or meat. Caterers/local food industry encouraged to prepare dishes with less added salt.						-25 mmol/d, P=0.01	
Studies in children[c]											
Gillum et al. 1981[127], USA	Parallel 2 groups: control; reduced Na diet	Participants were children (grades 1-3; 6-9 y) enrolled in the Minneapolis Public School system, who had systolic BP over the 95th percentile for age and sex as assessed in a large survey of students in 1978. The	32/16	12-m family education program. Goal was for parents to obtain maximum 70 mmol/day Na intake for each family member. 4 x biweekly 90-minute lectures followed by bimonthly 90-	No contact with researchers for the full year.	1 year	1 x 10-hr overnight urine	Feasibility of family education program to reduce Na intake.	NA	**Na intake** **Control n=32** Baseline Na intake: 31 (SD 20) mmol/10 hr End Na intake : 35 (20) mmol/10 hr 1 year change: +3.7 (20.9) mmol/10hr **Experimental attenders n=16** Baseline: 26 (SD 11) mmol/10 hr End: 29 (16) mmol/10 hr	N

	families of children who met these criteria were invited to participate in study and randomised to either the control group (n=39 families) or family education program (n=41 families). Child characteristics Mean age 8 y Control group: female 31% Intervention group: female 61%	minute maintenance sessions for the rest of the year. Sessions consisted of separate parent and children groups followed by joint discussion period. Topics delivered to parents: relationship between Na and BP, dietary sources of Na, salt point counting, cooking without salt, avoiding salt when eating out, low Na			1 year change: +2.9 (16.5) mmol/10hr **Net Na difference:** -1 mmol/d, P=NS **BW** **Control n=35** Baseline BW: 26.8 (SD 4.1) kg End BW: 30.7 (4.7) kg 1 year change: 3.9 kg. **Experimental attenders n=15** Baseline BW: 26.4 (SD 4.6) kg End BW: 28.9 (5.3) kg 1 year change: +2.5 kg. **Net between group BW difference:** -1.4 kg, no statistical tests performed

				cookbooks provided. Topics delivered to children: low Na eating style presented via games, craft & tasting activities, food preparation.							
He et al. 2015[39], China	Parallel 2 groups: control, reduced Na	Family based intervention study, children in grade 5 attending primary schools located in urban Changzhi, northern China were invited to participate along with two family member adults (i.e. one male & one female, in order of preference	135/139 children	Children received education materials over one school term to pass onto their family members to reduce salt in the family diet i.e. study slogan 'small hands leading big hands, together let's reduce salt'. The target was a 20% reduction in daily salt intake.	Children in the control group carried on with their usual health education lessons as in the curriculum, and these lessons did not contain information on salt	3.5 m	2 x consecutive 24-hr urine (average)	Na intake	NA	**Na intake** **Control** Baseline 193 mmol/d, end 207 mmol/d change +13 mmol/d (95%CI 3.8, 22.6) **Experimental** Baseline 215 mmol/d, end 179 mmol/d change -37 mmol/d (95%CI -46, -27) Net Na difference: -50 mmol/d, <0.001 **BW** **Control**	N

	grandparents, parents, uncles and aunts) Child characteristics Mean age 10 y Female 52%	The education programme included lessons plans, activity worksheets, homework assignments. Parents also received educational materials via newsletters. Key content included the harmful effects of salt, sources of salt in diet and cooking. Participants were encouraged to replace usual salt with a mineral salt substitute high in K and low in Na. Discretionary salt use in the		Within group change in BW +3.8 (SD 1.8) kg **Experimental** Within group change in BW +4.1 (SD 2.1) kg **Net between group BW difference**: +0.29 kg, no statistical tests performed.

	home was monitored and fortnightly feedback was provided to help the family reach a 50% reduction target.		

Abbreviations. C control, E experimental USA United States of America, UK United Kingdom, Na sodium, BP blood pressure, SBP systolic blood pressure, DBP diastolic blood pressure, wk week, mo month

[a] When more than two groups are listed, data was extracted for those groups bolded.

[b]-Overnight urinary Na was extrapolated to 24-hr excretion using means of multipliers derived from an ancillary study within the Hypertension Prevention Trial i.e. 3.8 for Na

[c]-For studies not included in meta-analyses main findings for the outcome of body weight are also reported. For the other studies included in meta-analysis information on net difference in body weight is displayed in the corresponding forest plot.

Supplemental Table 12. Risk of bias assessment of individual randomised controlled trials conducted in adults (n=15) and children (n=2)

Study	Selection Bias		Performance Bias	Detection Bias	Attrition Bias	Selective Reporting
	Random Sequence Generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment[a]	Incomplete outcome data	Selective outcome reporting[b]
Beard 1992	Unclear	Unclear	High	Low	Low	NA
HPT 1990	Low	Low	High	Low	Low	NA
Appel 2001	Unclear	Unclear	High	Low	Low	NA
Kumanyika 1993	Unclear	Low	High	Low	Low	NA
Cutler 1997	Unclear	Low	High	Low	Low	NA
Bulpitt 1984	Unclear	Unclear	High	Low	Unclear	NA
Dodson 1989	Low	Unclear	High	Low	Unclear	NA
Gilleran 1996	Unclear	Unclear	Low	Low	High	NA
Gelejinse 1994	Low	Unclear	Low	Low	Low	NA
Nowson 2009	Unclear	Unclear	High	Low	Low	NA
Takahashi 2006	Low	Low	Low	Low	Low	NA
Staessen 1988	Unclear	Unclear	High	Low	Unclear	NA
Petersen 2013	Low	Unclear	High	Low	Low	NA
[c]He 2015	Low	Low	High	Low	Low	NA
Nouvenne 2010	Low	Low	High	Low	Low	NA
Gillum 1981	Unclear	Unclear	High	Low	Low	NA
[c]He 2015	Low	Low	High	Low	Low	NA

[a] Blinding of outcome assessment (BW) was not completed in most studies but the authors judge that the outcome measurement is unlikely to be influenced by lack of blinding as BW was not a primary outcome being assessed in trials

[b] Selective outcome reporting was omitted as it was deemed inapplicable as our primary outcome BW was not listed as an outcome in assessed trials.

[c] This study provided data for adults and children

Supplemental Table 13. Study characteristics of cross-sectional studies assessing the association between sodium intake and adiposity outcomes among children and adolescents

Study	Country	Study population /Study Name	N, sample characteristics	Exposure	Adiposity outcome							Included in meta-analyses
					BMI	Weight category	BW	WC	Abdominal obesity	WtHR	Body composition	
Ellison et al. 1980[115]	USA	Adolescents aged 16-17 y recruited from existing longitudinal study National High Blood Pressure in the Young Program	248 Boys 52%	3 x overnight urine collections (not extrapolated to daily intake)			X				X	N: correlation only
Campino et al. 2016[55]	Chile	Convenience sample of children aged 9-18 years	59	1 x 24-hr urine			X					N: correlation only
Maldonado-Martin et al. 2002[121]	Spain	Random sample of children aged 6-14 y who were attending public primary schools in Almeria Province in Southern Spain	553 Boys 50%; mean age 10 y	1 x 24-hr urine			X					N: correlation only
Lurbe et al 2000[120]	Spain	Convenience sample of children aged 4-19 y recruited from paediatric outpatient clinic for which they attended for routine health maintenance (none were taking medications or had medical illness)	173 Boys 43%; 49% obese	1 x 24-hr urine			X					N: correlation only

Yamauchi et al. 1994[125]	Japan	Convenience sample of children aged 6-11 y recruited from an after-school nursery centre located in Kita ward, Nagoya city	322 Boys 53%	1 x overnight urine (not extrapolated to daily intake, mean collection time 9.8 (1.4) hr	X	X		N: correlation only
De Santo et al. 1987[114]	Italy	Children aged 3-16 y residing in small town 20 km from Naples, Cimitile Sampling procedures not specified.	220 Boys 56%	1 x 24-hr urine	X	X		N: correlation only
Lakatos et al. 2015[117]	Hungary	Convenience sample of children aged 1-18 years recruited via a hospital admitted for elective survey or routine clinical examination (i.e. no serious health conditions present)	200 50% Male	1 x 24-hr urine	X			N: correlation only
Campanozzi et al. 2015[113]	Italy	Healthy children aged 6-18 y recruited via paediatricians and GPs across 10 regions in Italy MINISAL Study	1424 Boys 54%; mean age 10 y	1 x 24-hr urine	X[b]			N: correlation only
Okuda et al. 2016[122]	Japan	Convenience sample of secondary school students aged 12-15 y	68 Boys 35%' 14 y	1 x 24-hr urine		X		N: could not be pooled
Gilardini et al 2015[116]	Italy	Convenience sample of obese children aged 7-18 y recruited via a referral for a weight loss intervention at the	360 Boys 36%	7 x day diet history (dietitian administrated,			X	N: could not be pooled

		obesity centre of the Instiuto Auxologico Italiano in Milan		mother present)								
Zhu et al. 2014[7]	USA	Adolescents aged 14-18 years attending public high schools located in Augusta, Georgia. Schools were sampled to include those with enrolments of both African American and Caucasian students.	766 Boys 50%; mean age 16 y; 49% African American, 51% Caucasian; 25% overweight or obese	24-hr diet recall, minimum 3 x non-consecutive (max of 7), average sodium mg/d	X		X	X			X	N: could not be pooled
Woodruff et al 2013[124]	Canada	Children in grades 6-8 recruited from 26 schools located in Ontario. Schools of varying socioeconomic backgrounds	1088 Boys 52%; age range 10-14 y; 1% underweight, 56% healthy weight, 23% overweight, 20% obese	1 x 24-hr diet recall (web-based, self-administered)		X						Y
Rafie et al. 2017[123]	Iran	Random cluster sample of children aged 11-18 y recruited from 13 schools in 4 districts of Isfahan	374 41% boys; mean age 14 (2) y; 18% overweight, 9% obese;	1 x 24-hr urine (all completed Fri-Sun)		X			X			Y

			27% centrally obese							
Lee et al. 2015[118]	South Korea	Children aged 8-9 y recruited from 7 x elementary schools located in Seoul Sampling procedures not specified.	2163 Boys 51%; 14% overweight, 4% obese	3 x24-hr diet recall (2 weekdays, 1 weekend day)		X				Y
Ma et al. 2015[9]	UK	Nationally representative sample of children aged 4-17 y National Diet and Nutrition Survey Rolling Programme	458 Boys 52%; mean age 10 y	1 x 24-hr urine	X	X	X		X	N: could not be pooled
Grimes et al. 2016[5]	Australia	Convenience sample of children aged 4-12 years recruited via schools located in state of Victoria	666 Boys 55%; mean age 9.3 (1.8) y; 14% overweight, 3% obese	1 x 24-hr urine	X	X	X			N: could not be pooled
Lee et al. 2016[119]	Korea	Nationally representative sample of children and adolescents aged 10-18 y KHANES 2010-11	1467 Boys 64%; mean age 13 y; 7% overweight, 12% obese	1 x 24-hr diet recall (sodium density mg/1000 kcal)		X		X	X	N: exposure sodium density
Yoon et al. 2013[12]	South Korea	Nationally representative sample of children and adolescents aged 7-18 y	5025 Boys 53%; 4.5% obese	1 x 24-hr diet recall (sodium density mg/gram of		X		X		N: exposure sodium density

	KHANES 2007-10	food consumed/d)

Abbreviations: BMI body mass index; BW body weight; WC waist circumference; WtHR waist-to-height ratio, UK United Kingdom, USA United States of America

Supplemental Table 14. Newcastle Ottawa Scale quality assessment of cross-sectional studies assessing the association between sodium intake and adiposity outcomes among children and adolescents

Study	Country	Selection *(0-3*)*		Comparability *(0-2*)*	Outcome *(0-2*)*		Total NOS Score *(0-7*)*[b]	Included in meta-analysis
		Representativeness of cohort *(0-1*)* a) truly representative of the source population ***(1*)*** b) somewhat representative of the source population ***(1*)*** c) selected group of users e.g. nurses, volunteers ***(0)*** d) no description of the derivation of the cohort ***(0)***	**Assessment of the exposure (sodium/salt intake) *(0-2*)*** a) 24-hr urine collection (1 or more) ***(2*)*** b) 24-hr dietary recall method ***(1*)*** c) Weighed dietary record (1 or more days) ***(1*)*** d) Urine sample: spot, timed or overnight ***(0)*** e) Food frequency questionnaire ***(0)***	**Methods to control confounding *(0-2*)*** [a] a) study controls for age and sex ***(1*)*** *b) study controls for energy intake* ***(1*)***	**Assessment of outcome *(0-1*)*** a) objectively measured adiposity outcome (e.g. BW and height for BMI) ***(1*)*** b) self-report BW and height ***(0)*** c) no description ***(0)***	**Non-response rate *(0-1*)*** a) Non-response rate =<20% ***(1*)*** b) Non-response rate >20% ***(0)*** c) no description ***(0)***		
Ellison et al. 1980[115]	USA	1	0	0	1	0	2	N
[8]Campino et al. 2016[55]	Chile	0	2	0	1	0	3	N
Maldonado-Martin et al. 2002[121]	Spain	1	2	0	1	0	4	N
Lurbe et al 2000[120]	Spain	0	2	0	1	0	3	N

Yamauchi et al. 1994[125]	Japan	0	0	0	1	0	1	N
De Santo et al. 1987[114]	Italy	0	2	0	1	0	3	N
Lakatos et al. 2015[117]	Hungary	0	2	0	1	0	3	N
Campanozzi et al. 2015[113]	Italy	1	2	0	1	1	5	N
Okuda et al. 2016[122]	Japan	0	2	0	1	0	3	N
Gilardini et al 2015[116]	Northern Italy	0	1	2	1	0	4	N
Zhu et al. 2014[7]	USA	1	1	2	1	0	5	N
Woodruff et al 2013[124]	Canada	1	1	0	1	1	4	Y
Rafie et al. 2017[123]	Iran	1	2	2	1	1	7	Y
Lee et al. 2015[118]	South Korea	1	1	2	1	0	5	Y
Ma et al. 2015[9]	UK	1	2	2	1	0	6	N
Grimes et al. 2016[5]	Australia	0	2	2	1	0	5	N

Lee et al. 2016[119]	Korea	1	2	2	1	0	6	N
Yoon et al. 2013[12]	South Korea	1	1	2	1	1	6	N

Abbreviations: NOS Newcastle-Ottawa Scale Score; USA United States of America; UK United Kingdom

[a] Scoring for adjustment for confounders is based on the primary outcome model (i.e. BMI or weight category)

[b] Studies with total scores of ≥5*, 3-4* and ≤2* were assessed as high, moderate and low-quality studies, respectively.

Supplemental Table 15. Summary of findings from cross-sectional studies among children, outcome: BMI or weight category

Study	Country	N, sample characteristics	Adiposity outcome	Sodium/salt intake [a]	Covariates, stratification	Findings[b]	Summary[c]	Included in meta-analyses related to this outcome
Yamauchi et al. 1994[(125)]	Japan	322 Boys 53%	BMI kg/m^2	Mean overnight salt excretion 1.5 (0.8) g/d	None	No correlation between overnight salt (g) and BMI (*r*=0.081, P=NS)	Null BMI (unadjusted)	N
De Santo et al. 1987[(114)]	Italy	220 Boys 56%	BMI kg/m^2	Mean Na 3 y: 79 (22) mmol/d; 16 y: 183 (55) mmo/d	None	Significant positive correlation between sodium intake (mmol/d) and BMI (kg/m^2) (*r*=0.44, P<0.001)	+ BMI (unadjusted)	N
Lakatos et al. 2015[(117)]	Hungary	200 50% Male	BMI kg/m^2	Mean Na 1-3 y: 54 (28) mmol/d; 14-18 y 165 (84) mmol/d	None	Sodium intake (mmol/d) was positively associated with BMI (kg/m^2) *r*=0.49, P<0.001, R^2=0.236, P<0.001)	+ BMI (unadjusted)	N
Campanozzi et al. 2015[(113)]	Italy	1424 Boys 54%; mean age 10 y	BMI z-score based on CDC growth charts	Median Na boys: 120 (IQR 84, 162) mmol/d; girls: 107 (IQR 77, 146) mmol/d	None, sex stratified	Significant positive correlation between sodium intake and BMI z-score (boys Spearman's *r*=0.09, P<0.001; girls Spearman's *r*=0.09, P<0.05)	+ weak BMI z-score (unadjusted)	N
Zhu et al. 2014[(7)]	USA	766 Boys 50%; mean age 16 y; 49% African American,	BMI kg/m^2	Mean Na 3281 (1150) mg/d	Adjusted for age, sex, race, Tanner stage, birth weight, PA, energy	**Difference in BMI (kg/m^2) associated with sodium intake (mg/d)** BMI: β (standardised)=0.23, P=0.01 *adjusted for age, sex, race, Tanner stage, birth weight, physical activity, energy intake, potassium intake, SSB intake	+ BMI (adjusted, including energy intake)	N

		51% Caucasian; 25% overweight or obese			intake, potassium intake, SSB intake			
Woodruff et al 2013[124]	Canada	1088 Boys 52%; age range 10-14 y; 1% underweight, 56% healthy weight, 23% overweight, 20% obese	Weight category based on WHO Growth Reference Charts	Mean Na 2799 (1539) mg/d	Adjusted for sex, ethnicity, SBP, DBP and under-reporting ratio (i.e. EI:estBMR variable)	**Odds (OR 95% CI) of overweight/obesity by quartile of sodium intake (mg/d)** Q1 sodium <1679 mg/d: OR 1.00 (reference group) Q2 sodium 1697, 2539 mg/d: OR 1.26 (95%CI 0.86, 1.83), P-value=0.238 Q3 sodium 2540, 3632 mg/d: OR 1.72 (95%CI 1.14, 2.59), P-value=0.009 Q4 sodium ≥3633 mg/d: OR 2.88 (95%CI 1.76, 4.73), P-value=<0.001 *note excluded n=44 (4%) for implausible EI intake <200kcal/d or > 6000kcal/d	+ weight category only for sodium intake Q4 vs. Q1 and Q3 vs. Q1 (adjusted)	Y
Rafie et al. 2017[123]	Iran	374 41% boys; mean age 14 (2) y; 18% overweight, 9% obese; 27% centrally obese	Weight category based on IOTF BMI reference cut-offs	Not reported	Adjusted for age, sex ,parents' education level, household income, PA + SSB intake and energy intake	**Odds (OR 95% CI) of overweight/obesity by tertile of sodium intake (mg/d)** T1 Na intake <1750 mg/d: reference category T2 Na intake 1750, 3420 mg/d: OR 1.47 (95% CI 0.69, 3.14) T3 Na intake >3420 mg/d: OR 8.33 (95% CI 4.14, 16.80) P-value <0.001 *base model adjusted for age, sex, parents education level, household income, PA ***Additional adjustment with energy intake*** T1 Na intake <1750 mg/d: reference category T2 Na intake 1750, 3420 mg/d: OR 1.12 (95%CI 0.50, 2.51) T3 Na intake >3420 mg/d: OR 4.97 (95%CI 2.34, 10.6) P-value <0.010 *adjusted for base model + energy intake (kcal/d)	+ weight category (adjusted, including energy intake)	Y

						Additional adjustment with SSB intake T1 Na intake <1750 mg/d: reference category T2 Na intake 1750, 3420 mg/d: OR 1.43 (95%CI 0.67, 3.08) T3 Na intake >3420 mg/d: OR 7.80 (95%CI 3.86, 15.8) P-value <0.001 * adjusted for base model + SSB (g/d)		
Lee et al. 2015[118]	South Korea	2163 Boys 51%; 14% overweight, 4% obese	Weight category based on age and sex BMI percentiles using Korean National Growth Charts. Healthy weight <85th p, overweight ≥85th p to 9=<95th p, obese ≥95th p	Mean Na healthy weight: 3357 (995) mg/d; overweight/obese 3806 (1064) mg/d	Adjusted for age, sex, mother's BMI, father's BMI, mother and father's education level, dietary fat, SBP, PA and energy intake using residual method	**Odds (OR 95% CI) of obesity by quintile of energy-adjusted (residual method) sodium intake (mg/d)** Q1 mean residual Na intake 2288 mg/d: reference group Q5 mean residual Na intake 5059 mg/d: OR 2.80±0.47 P-value for trend=0.03 ***a**djusted for age, sex, mother's BMI, father's BMI, mother and father's education level, dietary fat, systolic blood pressure, physical activity and energy intake using residual method **note data not reported for Q2, Q3 or Q4 **Odds (OR 95% CI) of obesity by quintile of energy-adjusted (residual method) sodium intake (mg/d), comparing Q1 vs. Q2-Q5** Q1 mean residual Na intake 2288 mg/d: reference group Q2 to Q5: OR 5.27±SE not reported P-value for trend <0.05 ***a**djusted for age, sex, mother's BMI, father's BMI, mother and father's education level, dietary fat, systolic blood pressure, physical activity and energy intake using residual method	+ weight category (adjusted, including energy intake)	Y

Ma et al. 2015[9]	UK	458 Boys 52%; mean age 10 y	BMI kg/m^2, weight category defined as overweight BMI ≥85th p, obese BMI ≥95th p according to UK reference data	Mean salt 5.5 (2.7) g/d	Adjusted for age sex, ethnic group, household income, physical activity, energy intake or SSB intake and energy misreporting	**Mean±SE BMI (kg/m2) by tertile of salt intake (g/d)** T1 mean salt 3.1 (0.8) g/d n=152: 18.5±0.5 kg/m^2 T2 mean salt 5.1 (0.6) g/d n=155: 19.0±0.4 kg/m^2 T3 mean salt intake 8.5 (2.2) g/d n=151: 20.2±0.5 kg/m^2 P-value for trend <0.001 *adjusted for age, sex, ethnic group, household income. PA, energy intake, energy mis-reporting **Odds (OR 95% CI) of overweight/obesity associated with 1g/d of salt** Healthy weight n=318, salt intake 5.2±0.1 g/d: reference group Overweight/obese n=140, salt intake 6.4±0.3: OR 1.28 (95% CI 1.12, 1.45), P-value<0.001 *adjusted for age, sex, ethnic group, household income, physical activity level, energy intake, misreporting of energy intake ***Alternative adjustment with SSB intake*** Healthy weight n=318, salt intake 5.2±0.1 g/d: reference group Overweight/obese n=140, salt intake 6.4±0.3: OR 1.28 (95% CI 1.12, 1.47), P-value<0.001 *adjusted for age, sex, ethnic group, household income, physical activity level, SSB intake, misreporting of energy intake *Note no base models without inclusion of energy intake provided	+ BMI (adjusted) + weight category (adjusted, including energy intake)	N
Grimes et al. 2016[5]	Australia	666 Boys 55%; mean age 9.3 (1.8) y; 14%	BMI z-score based on CDC Growth Charts, weight category based on IOTF	Mean salt intake 6.1 g/d	Adjusted for age, sex, SES. Additional models in 8-12 y with 1x24-hr	**Difference in BMI z-score associated with 1 g/d salt** **All children 4-12 years n=666** β=0.10 (95% CI 0.07, 0.13), P<0.001 *adjusted for age, sex, SES ***Additional adjustment with energy intake*** **8-12 years n=498**	+ BMI z-score (adjusted, including energy intake)	N

		overweight, 3% obese	BMI reference cut-offs		dietary recall data used to adjust for energy and SSB intake	β=0.08 (95% CI 0.05, 0.11), P<0.001 *adjusted for age, sex, SES + energy intake (kg/d) ***Alternative adjustment with SSB intake*** **8-12 years n=498** B=0.08 (95% CI 0.05, 0.11), P<0.001 *adjusted for age, sex, SES + SSB intake (g/d) **Odds (OR 95% CI) of overweight/obesity associated with 1g/d of salt** **All children 4-12 years n=666** Underweight/healthy weight: reference group Overweight/obese: OR 1.23 (95%CI 1.16, 1.31), P<0.001 *adjusted for age, sex, SES ***Additional adjustment with energy intake*** **8-12 years n=498** Underweight/healthy weight: reference group Overweight/obese: OR 1.20 (95%CI 1.13, 1.27), P<0.001 *adjusted for age, sex, SES + energy intake (kg/d) ***Alternative adjustment with SSB intake*** **8-12 years n=498** Underweight/healthy weight: reference group Overweight/obese: OR 1.20 (95%CI 1.13, 1.28), P<0.001 *adjusted for age, sex, SES + SSB intake (g/d)	+ weight category (adjusted, including energy intake)	
Lee et al. 2016[119]	Korea	1467 Boys 64%; mean age 13 y; 7% overweight, 12% obese	Weight category (overweight defined as BMI ≥85th to <95th p for age and sex, obese defined as BMI ≥95th p for	Mean Na intake 4305 mg/d	Adjusted for age, sex, household income, PA, energy intake or SSB intake	**Odds (OR 95%CI) of overweight by tertile of sodium density (mg/1000 kcal)** T1 154, 1589 mg/1000 kcal: reference category T2 1446, 2304 mg/1000 kcal: OR 1.35 (95%CI 0.79, 2.32) T3 2046, 12039 mg/1000 kcal: OR 2.11 (95%CI 1.14, 3.90) P for trend=0.0207 * adjusted for age, sex, household income, PA, energy intake (kcal/d)	+ overweight (adjusted, including energy intake) + obese (adjusted, including	N

			age and sex or ≥25 kg/m^2)			***Additional adjustment with SSB intake*** T1 154, 1589 mg/1000 kcal: reference category T2 1446, 2304 mg/1000 kcal: OR 1.41 (95%CI 0.82, 2.41) T3 2046, 12039 mg/1000 kcal: OR 2.23 (95%CI 1.22, 4.08) P for trend=0.0116 *adjusted for base model above + SSB intake (g/d) **Odds (OR 95% CI) of obesity by tertile of sodium density (mg/1000 kcal/d)** T1 154, 1589 mg/1000 kcal: reference category T2 1446, 2304 mg/1000 kcal: OR 1.41 (95%CI 0.82, 2.43)) T3 2046, 12039 mg/1000 kcal: OR 2.73 (95%CI 1.65, 4.51) P for trend<0.0001 * adjusted for age, sex, household income, PA, energy intake (kcal/d) ***Additional adjustment with SSB intake*** T1 154, 1589 mg/1000 kcal: reference category T2 1446, 2304 mg/1000 kcal: OR 1.44 (95%CI 0.83, 2.49) T3 2046, 12039 mg/1000 kcal: OR 2.79 (95%CI 1.66, 4.68) P for trend<0.0001 *adjusted for base model above + SSB intake (g/d)	energy intake)	
Yoon et al. 2013[12]	South Korea	5025 Boys 53%; 4.5% obese	Weight category defined as BMI ≥95th p for age and sex or ≥25 kg/m^2	Mean sodium 3880 mg/d	Adjusted for age, sex, household income, total weekly PA (MET/week) and energy intake	**Odds (OR 95% CI) of obesity by quintile of sodium density (mg/g/d)** Q1 sodium density 0.1, 2.0 mg/g/d: reference category Q2 sodium density 2.0, 2.7 mg/g/d: OR 1.24 (95%CI 0.78, 1.97) Q3 sodium density 2.7, 3.3 mg/g/d: OR 1.21 (95%CI 0.76, 1.93)	+ weight category (adjusted, including energy intake)	N

		Q4 sodium density 3.3, 4.4 mg/g/d: OR 1.79 (95%CI 1.12, 2.85) Q5 sodium density 4.4, 22.6 mg/g/d: OR 1.58 (95%CI 1.01, 2.45) P-value for trend <0.001 *Adjusted for age, sex, household income, total weekly PA (MET/week) and energy intake

Abbreviations: BMI body mass index; BW body weight; WC waist circumference; WtHR waist-to-height ratio; Na sodium; SES socio-economic status; UK United Kingdom; USA United States of America; ITOF International Obesity Taskforce; WHO World Health Organization; CDC Centres for Disease Control and Prevention; SBP Systolic blood pressure; DBP Diastolic blood pressure; SSB sugar sweetened beverage; PA physical activity

Red text is used to highlight those studies which have considered adjustment with energy or SSB intake

[a] Measures of variance represent (SD) or ±SE unless otherwise specified

[b] *r* correlation coefficient, *β* represents unstandardized regression beta-coefficient unless otherwise stated

[c] Where possible summary based on most adjusted model

Supplemental Table 16. Summary of findings from cross-sectional studies among children, outcome: BW

Study	Country	N, sample characteristics	Adiposity outcome	Sodium/salt intake[a]	Covariates, stratification	Findings[b]	Summary[c]	Included in meta-analyses related to this outcome
Ellison et al. 1980[(115)]	USA	248 Boys 52%	BW (kg)	Boys overnight mean Na 43 mmol; Girls overnight mean Na 31 mmol	None	Significant positive correlation between overnight sodium (mmol) and BW (kg) (r=0.23, P=0.01)	+ weak BW (unadjusted)	N
[8]Campino et al. 2016[(55)]	Chile	59	BW (kg)	Mean Na 3114 (1353) mg/d	None	Significant positive correlation between sodium intake (mmol/d) and BW (kg) (r=0.35, P<0.006)	+ BW (unadjusted)	N
Maldonado-Martin et al. 2002[(121)]	Spain	553 Boys 50%; mean age 10 y	BW (kg)	Mean Na 137 (63) mmol/d	None	Significant positive correlation between sodium intake (mmol/d) and BW (kg) (r=0.48, 95% CI 0.43, 0.55).	+ BW (unadjusted)	N
Lurbe et al 2000[(120)]	Spain	173 Boys 43%; 49% obese	BW (kg)	Not reported	Adjusted for age	Significant positive correlation between sodium intake and BW (kg) among non-obese and obese children (r=0.41 to 0.55, both P-value <0.05)	+ BW (age adjusted)	N
Yamauchi et al. 1994[(125)]	Japan	322 Boys 53%	BW (kg)	Mean overnight salt excretion 1.5 (0.8) g/d	None	Weak significant positive correlation between overnight salt excretion (g) and BW (kg) (r=0.18, P<0.01)	weak + BW (unadjusted)	N
De Santo et al. 1987[(114)]	Italy	220 Boys 56%	BW (kg)	Mean Na 3 y: 79 (22) mmol/d; 16 y: 183 (55) mmo/d	None	Significant positive correlation between sodium intake (mmol/d) and BW (kg) (r=0.63, P<0.001)	+ BW (unadjusted)	N

Okuda et al. 2016[122]	Japan	68 Boys 35%' 14 y	BW (kg)	Boys Na 163 (37) mmol/d; girls Na 150 (45) mmol/d	None	**Mean (SD) BW (kg) by tertile of sodium intake** T1 median Na intake 104 mmol/d, n=22: 53.4 (13.7) kg) T2 median Na intake 151 mmol/d, n=23): 46.5 (7.1) kg T3 median Na intake 206 mmol/d, n=23): 52.2 (9.8) kg P-value for trend=0.726	Null BW (unadjusted)	N
Zhu et al. 2014[7]	USA	766 Boys 50%; mean age 16 y; 49% African American, 51% Caucasian; 25% overweight or obese	BW (kg)	Mean Na 3281 (1150) mg/d	Adjusted for age, sex, race, Tanner stage, birth weight, PA, energy intake, potassium intake, SSB intake	**Difference in BW (kg) associated with sodium intake (mg/d)** BW: β (standardised)=0.23, P=0.01 * Adjusted for age, sex, race, Tanner stage, birth weight, physical activity, energy intake, potassium intake, SSB intake	+ BW (adjusted, including energy intake)	N

Abbreviations: BW body weight; Na sodium; USA United States of America; SSB sugar sweetened beverage; PA physical activity
Red text is used to highlight those studies which have considered adjustment with energy or SSB intake
[a] Measures of variance represent (SD) or ±SE unless otherwise specified
[b] *r* correlation coefficient, *β* represents unstandardized regression beta-coefficient unless otherwise stated
[c] Where possible summary based on most adjusted model

Supplemental Table 17. Summary of findings from cross-sectional studies among children, outcome: waist circumference or abdominal obesity

Study	Country	N, sample characteristics	Adiposity outcome	Sodium/salt intake[a]	Covariates, stratification	Findings[b]	Summary[c]	Included in meta-analyses related to this outcome
Gilardini et al 2015[116]	Italy	360 Boys 36%	WtHR	Mean Na boys: 1420 (490) mg/d; girls: 1780 (740) mg/d	Age, sex, energy intake	Significant positive partial correlation between sodium intake (mg/d) and waist-to-height ratio (*r*=0.15, P <0.05) *Adjusted age, sex, energy intake *Excludes n=88 low energy intake reporters (EI:estBMR as <0.93 for age 6-10 y and <1.1 for >10 y)	+ WtHR among obese children (adjusted, including energy intake)	N
Zhu et al. 2014	USA	766 Boys 50%; mean age 16 y; 49% African American, 51% Caucasian; 25% overweight or obese	WC (cm)	Mean Na 3281 (1150) mg/d	Adjusted for age, sex, race, Tanner stage, birth weight, PA, energy intake, potassium intake, SSB intake	**Difference in waist circumference associated with sodium intake (mg/d) (indep variable)** β (standardised)=0.23, P=0.01 *Adjusted for age, sex, race, Tanner stage, birth weight, PA, energy intake, potassium intake, SSB intake	+ WC (adjusted, including energy intake)	N
Rafie et al. 2017[123]	Iran	374 41% boys; mean age 14 (2) y; 18% overweight, 9% obese; 27%	Abdominal obesity defined as WtHR ≥0.5	Not reported	Adjusted for age, sex, parents' education level, household income, PA + SSB intake or	**Odds (OR 95% CI) of abdominal obesity by tertile of sodium intake (mg/d)** T1 Na intake <1750 mg/d: reference category T2 Na intake 1750, 3420 mg/d: OR 2.33 (95%CI 1.13, 4.78) T3 Na intake >3420 mg/d: OR 9.75 (95%CI 4.88, 19.5) P-value <0.001	+ abdominal obesity (adjusted, including energy intake)	N

		centrally obese			energy intake	*base model adjusted for age, sex, parents education level, household income, PA ***Additional adjustment with energy intake*** T1 Na intake <1750 mg/d: reference category T2 Na intake 1750, 3420 mg/d: OR 2.00 (95%CI 0.96, 4.20) T3 Na intake >3420 mg/d: OR 6.65 (95%CI 3.24, 13.7) P-value <0.010 * adjusted for base model + energy intake (kcal/d) ***Additional adjustment with SSB intake*** T1 Na intake <1750 mg/d: reference category T2 Na intake 1750, 3420 mg/d: OR 2.30 (95%CI 11.11, 4.75) T3 Na intake >3420 mg/d: OR 9.75 (95%CI 4.88, 19.5) P-value <0.001 * adjusted for base model + SSB (g/d)		
[8]Ma et al. 2015[(9)]	UK	458 Boys 52%; mean age 10 y	WC (cm)	Mean salt 5.5 (2.7) g/d	Adjusted for age sex, ethnic group, household income, physical activity, energy intake and energy misreporting	**Mean±SE WC (cm) by tertile of salt intake (g/d)** T1 mean salt 3.1 (0.8) g/d n=152: 69.6±2.5 cm T2 mean salt 5.1 (0.6) g/d n=155: 70.6±2.2 cm T3 mean salt intake 8.5 (2.2) g/d n=151: 75.7±2.0 cm P-value for trend <0.001 *adjusted for age sex, ethnic group, household income, physical activity, energy intake and energy misreporting	+ WC (adjusted, including energy intake)	N
Grimes et al. 2016[(5)]	Australi a	666 Boys 55%; mean age	Abdominal obesity as	Mean salt intake 6.1 g/d	Adjusted for age, sex, SES, and BMI z-	**Odds (O 95%CI) of abdominal obesity (WHtR ≥0.5) associated with 1 g/d of salt** **All children 4-12 years n=665**	+ abdominal adiposity (adjusted,	N

		9.3 (1.8) y; 14% overweight, 3% obese	defined by a WtHR ≥0.5		score. Additional models in 8-12 y with 1x24-hr dietary recall data used to adjust for energy and SSB intake	Not centrally obese: reference group Centrally obese: OR 1.15 (95%CI 1.09, 1.23), P<0.001 *adjusted for age, sex, SES **All children 4-12 years n=665** Not centrally obese: reference group Centrally obese: OR 1.00 (95%CI 0.90, 1.10), P=0.93 *adjusted for age, sex, SES ***+ BMI z-score*** ***Additional adjustment with energy intake*** **8-12 years n=497** Not centrally obese: reference group Centrally obese: OR 1.11 (95%CI 1.02, 1.20), P=0.011 *adjusted for age, sex, SES + energy intake (kg/d) ***Additional adjustment with SSB intake*** **8-12 years n=497** Not centrally obese: reference group Centrally obese: OR 1.11 (95%CI 1.03, 1.96), P=0.010 *adjusted for age, sex, SES + SSB intake (g/d)	including energy intake) but not independent of BMI z-score	
Lee et al. 2016[119]	Korea	1467 Boys 64%; mean age 13 y; 7% overweight, 12% obese	WC (cm), abdominal obesity defined as WC ≥90th p for age and sex	Mean Na intake 4305 mg/d	Adjusted for age, sex, household income, PA, energy intake or SSB intake	**Odds (OR 95% CI) of abdominal obesity by tertile of sodium density (mg/1000 kcal/d)** T1 154, 1589 mg/1000 kcal: reference category T2 1446, 2304 mg/1000 kcal: OR 1.04 (95%CI 0.58, 1.86) T3 2046, 12039 mg/1000 kcal: OR 1.95 (95%CI 1.17, 3.26) P for trend=0.0086 * adjusted for age, sex, household income, PA, energy intake (kcal/d) ***Additional adjustment with SSB intake***	+ WC (adjusted, including energy intake)	N

						T1 154, 1589 mg/1000 kcal: reference category T2 1446, 2304 mg/1000 kcal: OR 1.12 (95%CI 0.62, 2.03) T3 2046, 12039 mg/1000 kcal: OR 2.14 (95%CI 1.25, 3.67) P for trend=0.0044 *adjusted for base model above + SSB intake (g/d)		
Yoon et al. 2013[12]	South Korea	5025 Boys 53%; 4.5% obese	WC (cm), abdominal obesity defined as WC ≥90th p for age and sex	Mean Na 3880 mg/d	Adjusted for age, sex, household income, total weekly PA (MET/week) and energy intake	**Odds (OR 95% CI) of abdominal obesity by quintile of sodium density (mg/g/d)** Q1 sodium density 0.1, 2.0 mg/g/d: reference category Q2 sodium density 2.0, 2.7 mg/g/d: OR 1.21 (95%CI 0.68, 2.15) Q3 sodium density 2.7, 3.3 mg/g/d: OR 1.64 (95%CI 0.84, 3.20) Q4 sodium density 3.3, 4.4 mg/g/d: OR 2.45 (95%CI 1.24, 4.86) Q5 sodium density 4.4, 22.6 mg/g/d: OR 2.13 (95%CI 1.16, 3.91) P-value for trend <0.001 * Adjusted for age, sex, household income, total weekly PA (MET/week) and energy intake	+ abdominal obesity (adjusted, including energy intake)	N

Abbreviations: BMI body mass index; BW body weight; WC waist circumference; WtHR waist-to-height ratio; Na sodium; SES socio-economic status; UK United Kingdom; USA United States of America; SSB sugar sweetened beverage; PA physical activity

Red text is used to highlight those studies which have considered adjustment with energy or SSB intake

[a] Measures of variance represent (SD) or ±SE unless otherwise specified

[b] *r* correlation coefficient, *β* represents unstandardized regression beta-coefficient unless otherwise stated

[c] Where possible summary based on most adjusted model

Supplemental Table 18. Summary of findings from cross-sectional studies among children, outcome: body composition

Study	Country	N, sample characteristics	Adiposity outcome	Sodium/salt intake[a]	Covariates, stratification	Findings[b]	Summary[c]	Included in meta-analyses related to this outcome
Ellison et al. 1980[115]	USA	248 Boys 52%	Body fat % (calculated from predictive equations)	Boys overnight mean Na 43 mmol; Girls overnight mean Na 31 mmol	None	No correlation between overnight sodium (mmol) and body fat % (*r*=0.14, P=0.10)	Null % body fat (unadjusted)	N
Zhu et al. 2014[7]	USA	766 Boys 50%; mean age 16 y; 49% African American, 51% Caucasian; 25% overweight or obese	5 x skinfolds (biceps, triceps, sub-scapular, medial calf), body fat % and fat mass (DXA), subcutaneous abdominal adipose tissue (SAAT) and visceral adipose tissue (VAT) (measured using magnetic resonance imaging)	Mean Na 3281 (1150) mg/d	Adjusted for age, sex, race, Tanner stage, birth weight, physical activity, energy intake, potassium intake, SSB intake	**Difference in body composition outcomes associated with sodium intake (mg/d)** Sum of skinfolds: β (standardised)=0.12, P=0.08 Body fat %: β (standardised)=0.31, P=0.03 Fat mass: β (standardised)=0.23, P=0.01 SAAT: β (standardised)=0.25, P=0.02 VAT: β (standardised)=0.16, P=0.12 *adjusted for age, sex, race, Tanner stage, birth weight, physical activity, energy intake, potassium intake, SSB intake	+ % body fat (adjusted, including energy intake)	N

Ma et al. 2015[9]	UK	458 Boys 52%; mean age 10 y	Body composition (fat mass kg & lean mass kg) derived from doubly labelled water study in representative sub-sample n=67	Mean salt 5.5 (2.7) g/d	Adjusted for age sex, ethnic group, household income, physical activity, energy intake and energy misreporting	**Sub-sample n=67 with body composition data** **Difference in body fat mass (kg) associated with salt intake (g/d)** β= 0.73 kg, P-value=0.001 *adjusted for age, sex, ethnic group, energy intake **Difference in body lean mass (kg) associated with salt intake (g/d)** β=0.44 kg, P-value=0.033 *adjusted for age, sex, ethnic group, energy intake **Difference in lean fat mass (kg) associated with salt intake (g/d)** β=0.0.44 kg, P-value=0.003 *adjusted for age, sex, ethnic group, energy intake **Difference in body fat mass (kg) associated with salt density (g/2000kcal)** β=0.09, P-value=0.767 *adjusted for age, sex, ethnic group	+ fat mass (adjusted, including energy intake) Mixed findings lean mass	N
Lee et al. 2016[119]	Korea	1467 Boys 64%; mean age 13 y; 7% overweight, 12% obese	Total body per cent fat (TBPF) via DXA (adiposity defined as TPBF >25% for boys, >30% for girls <11 y and >25% for girls ≥11 y	Mean Na intake 4305 mg/d	Adjusted for age, sex, household income, PA, energy and SSB intake	**Odds (OR 95% CI) of TBPF by tertile of sodium density (mg/1000 kcal/d)** T1 154, 1589 mg/1000 kcal: reference category T2 1446, 2304 mg/1000 kcal: OR 1.04 (95%CI 0.70, 1.56) T3 2046, 12039 mg/1000 kcal: OR 1.31 (95%CI 0.89, 1.92) P for trend=0.1735 * adjusted for age, sex, household income, PA, energy intake (kcal/d)	Null % body fat (adjusted, including energy intake)	N

Additional adjustment with SSB intake
T1 154, 1589 mg/1000 kcal: reference category
T2 1446, 2304 mg/1000 kcal: OR 1.06 (0.70, 1.61)
T3 2046, 12039 mg/1000 kcal: OR 1.33 (0.89, 1.99)
P for trend=0.1577
*adjusted for base model above + SSB intake (g/d)

Abbreviations: BMI body mass index; BW body weight; WC waist circumference; WtHR waist-to-height ratio; Total body per cent fat (TBPF); DXA Dual energy x-ray absorptiometry; Na sodium; SES socio-economic status; UK United Kingdom; USA United States of America; SSB sugar sweetened beverage; PA physical activity
Red text is used to highlight those studies which have considered adjustment with energy or SSB intake
[a] Measures of variance represent (SD) or ±SE unless otherwise specified
[b] *r* correlation coefficient, *β* represents unstandardized regression beta-coefficient unless otherwise stated
[c] Where possible summary based on most adjusted model

Supplemental Table 19. Characteristics of observational studies examining the association between sodium intake and sugar-sweetened beverage (SSB) consumption among children

Study	Design	Country	Study population / Study Name	N, sample characteristics	Exposure	Outcome	Sodium /salt intake[a]	Covariates, stratification	Findings[b]	Summary	Included in meta-analysis related to this outcome
He et al. 2008 [16]	Cross-sectional	UK	Nationally representative sample of children and adolescents aged 4-18 y 1997 National Diet and Nutrition Survey	1688 Boys 50%	7-day weighed diet record (average salt g/d)	7-day weighed diet record SSB (g/d): all types of non-low calorie concentrated, carbonated and ready to drink soft drinks	Salt 4 y: 4.6 (1.5) g/d; 18 y: 6.8 (2.1) g/d	Adjusted for age, sex, BW and in ≥7 y hours spent on moderate and vigorous PA	**Difference in SSB intake (g/d) associated with 1 g/d salt (n=1688)** Partial *r*=0.12, β=27±5 g/d, P<0.001 *adjusted for age, sex, BW **Additional adjustment PA, sub-sample ≥7 y** Partial *r*=0.13, β=29±6 g/d, P<0.001	+ SSB consumption	Y
Grimes et al. 2013 [15]	Cross-sectional	USA	Nationally representative sample of children and adolescents aged 2-18 y 2005-2008 National Health and Nutrition	6400 Boys 50% *salt intake & SSB analysis restricted to consumers of SSB n=4443	1 x 24-hr diet recall (salt g/d)	1 x 24-hr diet recall. SSB (g/d): sugar-sweetened soda, vitamin waters, fruit ades, fruit drinks, flavoured mineral	Overall salt 7.8±0.1 g/d	Adjusted for age, sex, race-ethnic group, SES, energy intake derived from sources other than SSB	**Difference in SSB intake (g/d) associated with 1 g/d salt (n=4443)** β=32, 95% CI 13, 50 g/d, P<0.001 *adjusted for age, sex, race-ethnic group, SES and energy (kJ/d) derived from sources other than SSB **Stratified by sex & age group**	+ SSB consumption (overall) + SSB consumption all groups, except null 12-18 y girls	Y

			Examination Survey			waters, and sports and energy drinks that contained ≥20kcal/100mL		Stratified by sex and age group (2-5 y, 6-11 y, 12-18 y)	Positive association between salt intake (g/d) and SSB consumption (g/d) remained significant in all age and sex groups, except in 12-18-y-old girls. *adjusted for race-ethnic group, SES and energy (kJ/d) derived from sources other than SSB		
Grimes et al. 2013 (14)	Cross-sectional	Australia	Nationally representative sample of children and adolescents aged 2-16 y 2007 Children's National Nutrition and Physical Activity Survey	4282 Boys 52% *salt intake & SSB analysis restricted to consumers of SSB n=2571	2 x 24-hr diet recall (average salt g/d)	2 x 24-hr diet recall Sugar-sweetened beverage (SSB): sweetened soda, vitamin waters, fruit ades, fruit drinks, flavoured mineral waters, and sports and energy drinks that contained ≥20kcal/100mL	Overall salt among SSB consumers 6.5 (2.6) g/d	Adjusted for age, sex, SES and energy derived from sources other than SSB, additional adjustment for PA in subsample of 5-16 y with available data	**Difference in SSB intake (g/d) associated with 1 g/d salt (n=2571)** β=17.4, 95% CI 9.8, 25.0, P<0.001 *adjusted for age, sex, SES and energy derived from sources other than SSB **Additional adjustment physical activity in 5-16 y (n=1511)** β=21.1, 95%CI 10.8, 31.5, P<0.001	+ SSB consumption	Y

Marventano et al. 2017[128]	Cross-sectional	Italy	Adolescents attending final year of school recruited from 15 secondary schools across 10 districts of Catania, Southern Italy	1643 Male 54%, mean age 12 y	1 x 62-item FFQ	FFQ SSB: drinks with added sugar including: non-diet soft drinks/sodas, flavoured juice drinks, sweetened tea, sports drinks, and energy drinks.	Salt intake 5.1 – 6.4 g/d across quartiles of SSB intake.	Adjusted for energy intake and PA, sex stratified	**Difference in SSB intake (g/d) associated with 1 g/d salt** **Boys** n=875, β=18 g/d, P-value<0.05 **Girls** n=751, β=16 g/d, P-value <0.05 *adjusted for energy intake and PA	+ SSB boys and girls	Y
Libuda et al. 2010[6]	Longitudinal, 5-y follow-up	Germany	Children aged 3-18 years, a sub-sample of participants from the Dortmund Nutritional and Anthropometric Longitudinally Designed (DONALD) Study	364	At least 2 x 24-hr urine (range 2, 7)	2 x 3-day weighed dietary records SSB (g/d): soft drinks and fruit juice containing sugar	Median salt intake 7-10 y 5.3 g/d	Adjusted for baseline Na excretion, baseline Na excretion X time interaction, time, age X age interaction, maternal BMI, maternal education	Change in salt intake (g/d) was significantly associated with a concurrent change in SSB (β=12.0, P=0.027)	+ SSB	N

Abbreviations: NOS Newcastle-Ottawa Scale Score; SES Socio-economic status; FFQ Food Frequency Questionnaire; BMI Body Mass Index; PA Physical Activity; Na sodium; SSB sugar sweetened beverage; USA United States of America, UK United Kingdom

[a] Measures of variance represent (SD) or ±SE unless otherwise specified
[b] r correlation coefficient, β unstandardized regression beta-coefficient

Supplemental Table 20. Newcastle Ottawa Scale quality assessment of observational studies examining the association between sodium intake and sugar-sweetened beverage (SSB) consumption among children

Cross-sectional studies	**Country**	**Selection** ***(0-3*)***		**Comparability** ***(0-1*)***	**Outcome** ***(0-2*)***		**Total NOS Score** ***(0-6*)***[1]
		Representativeness of cohort ***(0-1*)***	**Assessment of the exposure (sodium/salt intake)** ***(0-2*)***	**Methods to control confounding** ***(0-1*)***	**Assessment of outcome** ***(0-1*)***	**Non-response rate** ***(0-1*)***	
		a) truly representative of the source population ***(1*)*** b) somewhat representative of the source population ***(1*)*** c) selected group of users e.g. nurses, volunteers ***(0)*** d) no description of the derivation of the cohort ***(0)***	a) 24-hr urine collection (1 or more) ***(2*)*** b) 24-hr dietary recall method ***(1*)*** c) Weighed dietary record (1 or more days) ***(1*)*** d) Urine sample: spot, timed or overnight ***(0)*** e) Food frequency questionnaire ***(0)***	a) study controls for age and sex ***(1)***	a) validated dietary assessment tool to quantify SSB intake ***(1*)*** b) unvalidated dietary assessment tool to quantify SSB intake ***(0)*** c) no description ***(0)***	a) Non-response rate =<20% ***(1*)*** b) Non-response rate >20% ***(0)*** c) no description ***(0)***	
He et al. 2008[16]	UK	1	1	1	1	0	4
Grimes et al. 2013[15]	USA	1	1	1	1	0	4
Grimes et al. 2013[14]	Australia	1	1	1	1	0	4
Marventano et al. 2017[128]	Italy	1	0	1	1	1	4

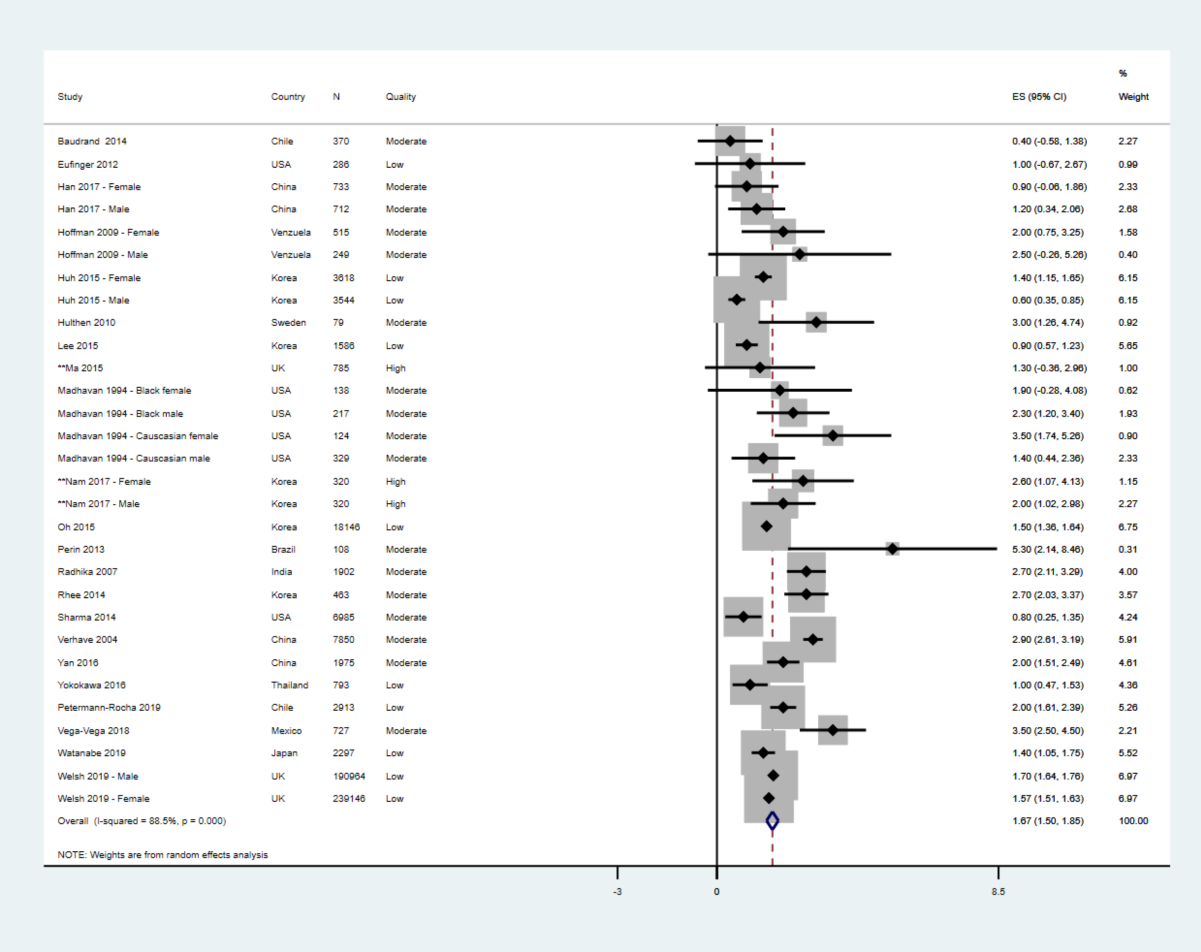
Longitudinal studies		**Selection** ***(0-3*)***		**Comparability** ***(0-1*)***	**Outcome** ***(0-2*)***		**Total NOS Score** ***(0-6*)***[1]
		Representativeness of cohort ***(0-1*)***	**Assessment of the exposure (sodium/salt intake)** ***(0-2*)***	**Methods to control confounding** ***(0-1*)***	**Assessment of outcome** ***(0-1*)***	**Non-response Adequacy of follow up of**	

						cohorts *(0-1*)*	
		a) truly representative of the source population ***(1*)*** b) somewhat representative of the source population ***(1*)*** c) selected group of users e.g. nurses, volunteers ***(0)*** d) no description of the derivation of the cohort ***(0)***	a) 24-hr urine collection (1 or more) ***(2*)*** b) 24-hr dietary recall method ***(1*)*** c) Weighed dietary record (1 or more days) ***(1*)*** d) Urine sample: spot, timed or overnight ***(0)*** e) Food frequency questionnaire ***(0)***	a) study controls for age and sex ***(1)***	a) validated dietary assessment tool to quantify SSB intake ***(1*)*** b) unvalidated dietary assessment tool to quantify SSB intake ***(0)*** c) no description ***(0)***	a) Complete follow up – all subjects accounted for ***(1*)*** b) Subjects lost to follow up unlikely to introduce bias (>75% follow up, or description provided of those lost) ***(1*)*** c) follow up rate <75% and no description of those lost ***(0)*** d) no statement ***(0)***	
Libuda et al. 2010[(6)]	Germany	1	2	0	1	0	4

Abbreviations: NOS Newcastle-Ottawa Scale Score; USA United States of America; UK United Kingdom

[1] Studies with total scores of ≥5*, 3-4* and ≤2* were assessed as high, moderate and low-quality studies, respectively.

Supplemental Figure 1. Pooled mean difference in BMI (kg/m^2) between the highest and lowest ntile of salt intake in cross-sectional studies of adults [a, b, c]



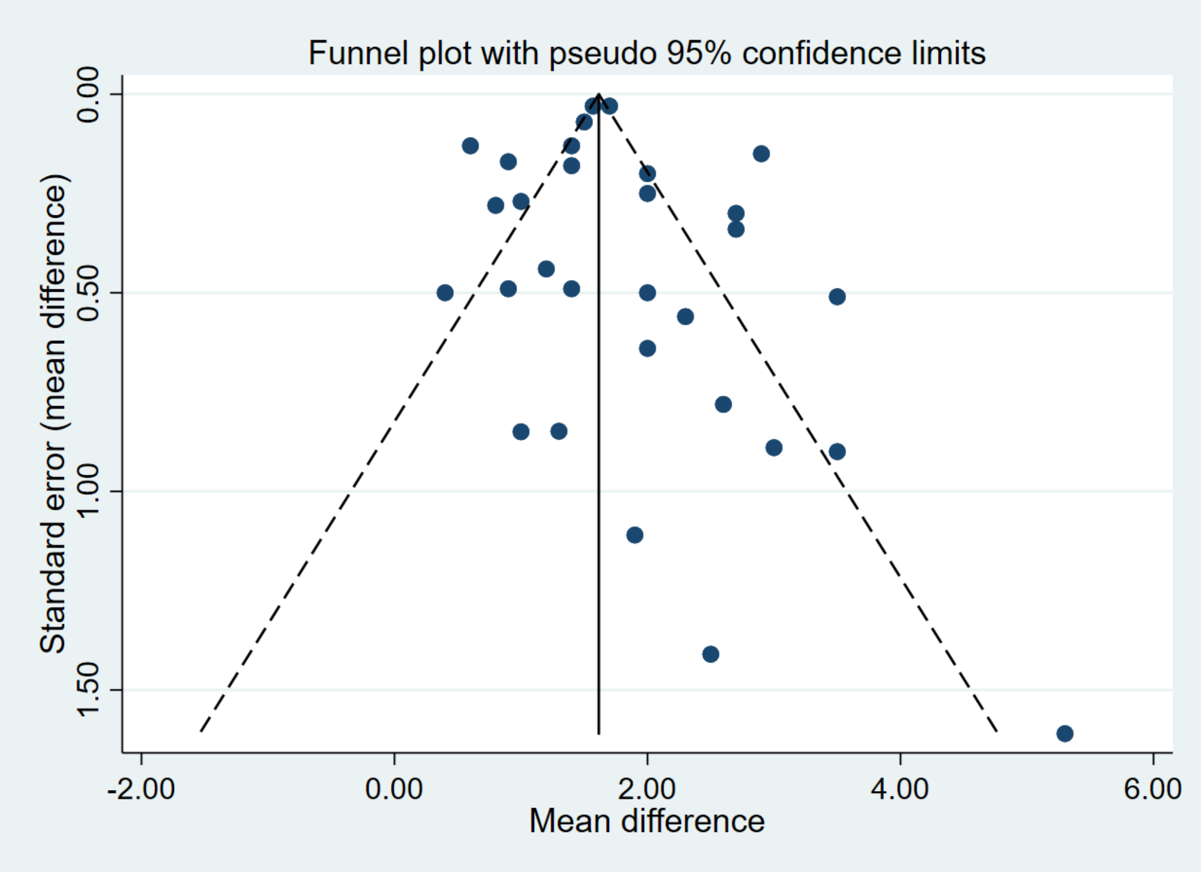
[a] Inverse-variance weighted random effects model. Heterogeneity: τ^2=0.12, χ^2 =252.2, df=29, P<0.001. Test for overall effect size=0: z=18.31, P<0.001. I^2 = 88% (95% CI: 85, 91%)

[b] Black dots with horizontal lines represent individual study effect estimates and corresponding 95% CI. Grey box areas surrounding individual study effect estimates are proportional to the weight for the individual study. The diamond and broken vertical line represent the overall pooled estimate, the width of the diamond indicates its corresponding 95% CI. The unbroken vertical line represents the null value.

[c] Quality refers to assessment made using Newcastle-Ottawa Scale Score. Studies with total scores of ≥5*, 3-4* and ≤2* were assessed as high, moderate and low-quality studies, respectively.

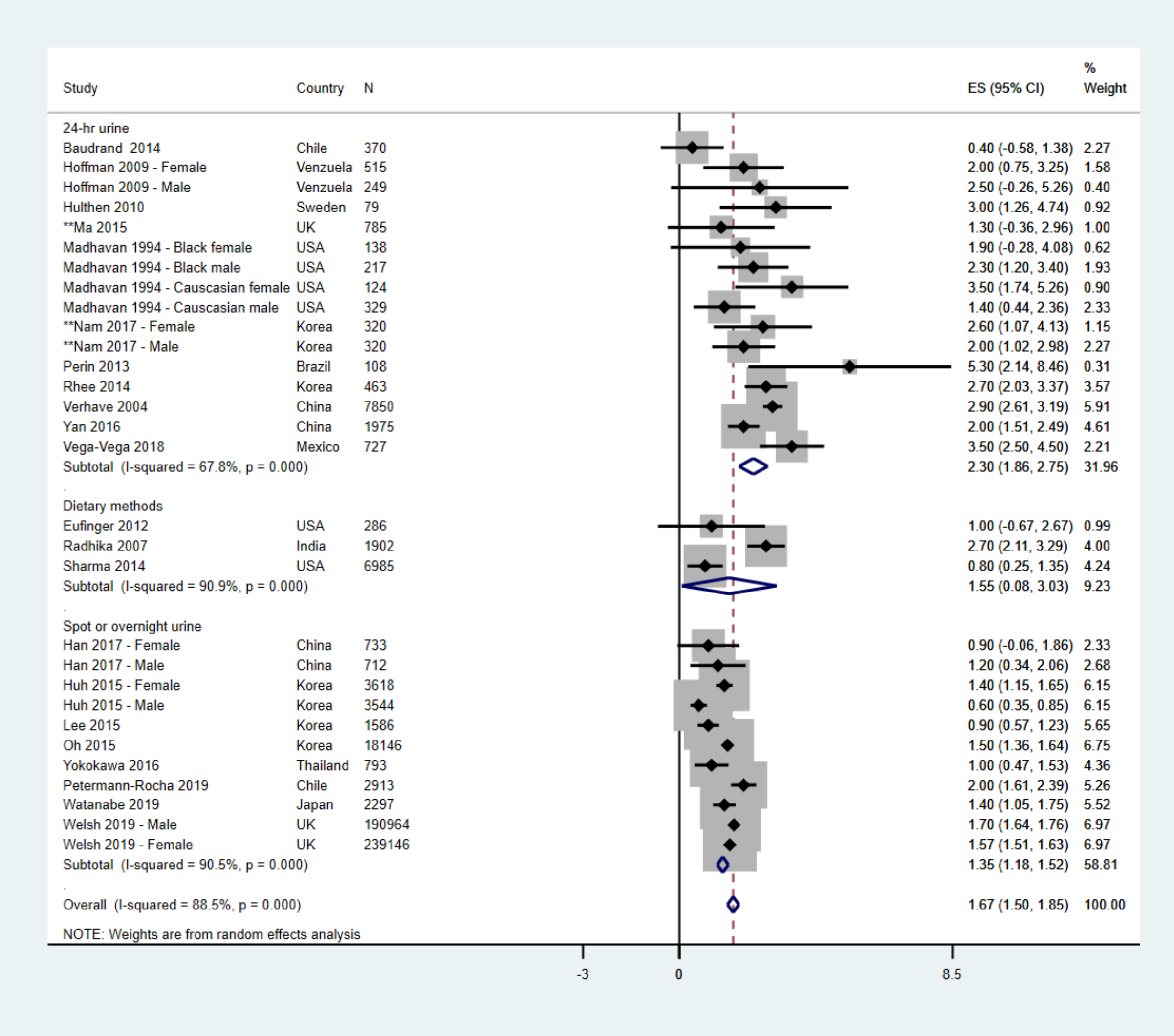
** adjusted for covariates, including energy intake

Supplemental Figure 2. Funnel plots with pseudo 95% confidence limits for meta-analyses: cross-sectional studies in adults assessing mean difference in BMI between lowest and highest ntile of salt intake[a]



[a] Egger's regression asymmetry test P=0.637 indicates no publication bias.

Supplemental Figure 3. Sub-group analysis by salt intake assessment method: pooled mean difference in BMI (kg/m²) between the highest and lowest ntile of salt intake in cross-sectional studies of adults [a, b, c]



[a] All models are inverse-variance weighted random effects

[b] **24-hour urine:** Heterogeneity: τ^2=0.43, χ^2 =46.6, df=15, P<0.001. Test for overall effect size=0: z=10.11, P<0.001. I^2 =68% (95% CI: 46, 81%)

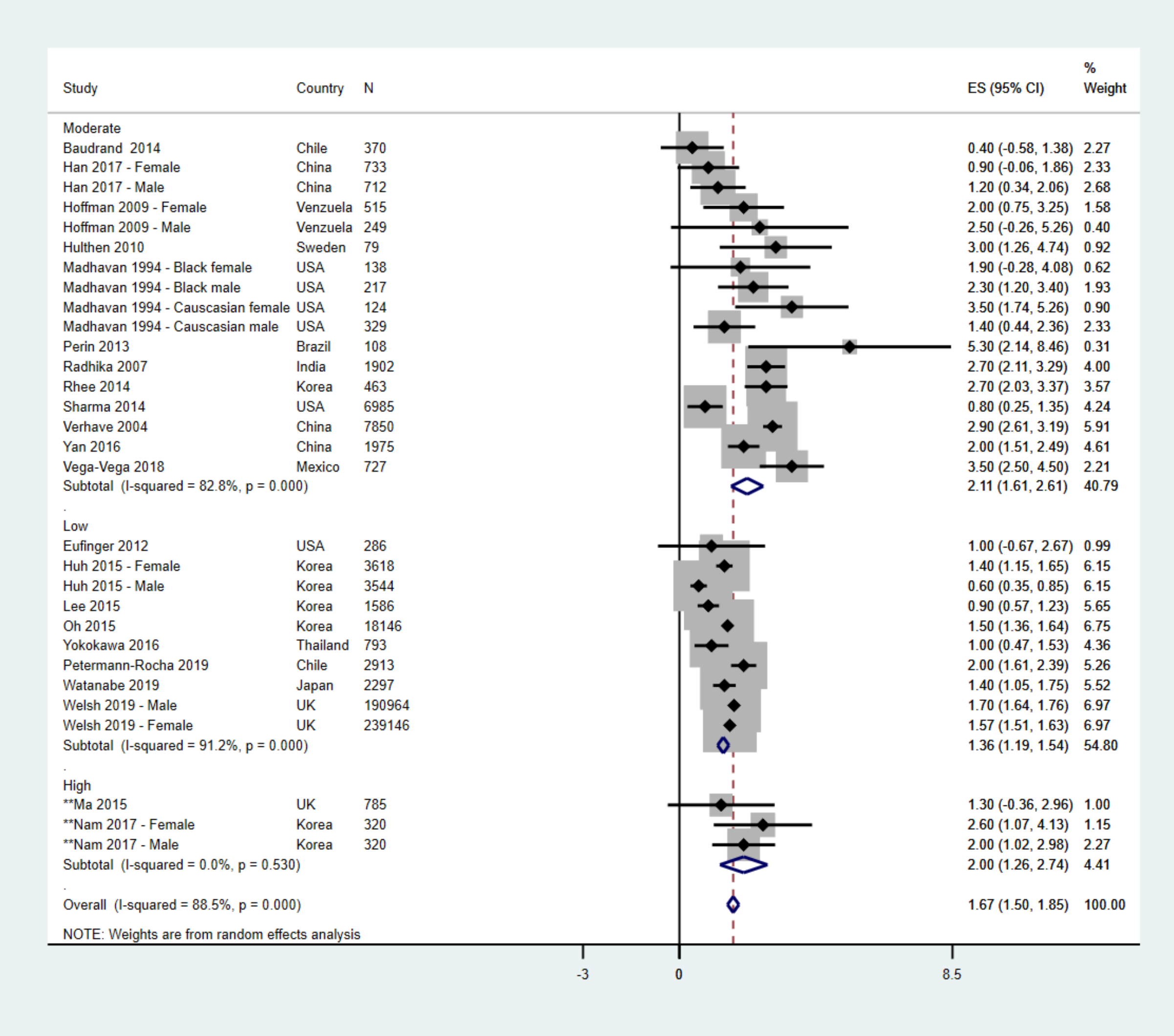
Spot/overnight urine: Heterogeneity: τ^2=0.06, χ^2 =104.9, df=10, P<0.001. Test for overall effect size=0: z=15.32, P<0.001. I^2 =90% (95% CI: 85, 94%)

Dietary methods: Heterogeneity: τ^2=1.45, χ^2 =22.05, df=2, P<0.001. Test for overall effect size=0: z=2.06, P=0.039. I^2 =91% (95% CI: 76, 97%)

[c] Black dots with horizontal lines represent individual study effect estimates and corresponding 95% CI. Grey box areas surrounding individual study effect estimates are proportional to the weight for the individual study. The diamond and broken vertical line represent the overall pooled estimate, the width of the diamond indicates its corresponding 95% CI. The unbroken vertical line represents the null value.

** adjusted for covariates, including energy intake

Supplemental Figure 4. Sub-group analysis by study quality: pooled mean difference in BMI (kg/m^2) between the highest and lowest ntile of salt intake in cross-sectional studies of adults [a, b, c]



[a] All models are inverse-variance weighted random effects

[b] **Low quality NOS ≤2:** Heterogeneity: τ^2=0.06, χ^2 =102.62, df=9, P<0.001. Test for overall effect size=0: z=15.14, P<0.001. I^2 =91% (95% CI: 86, 95%)

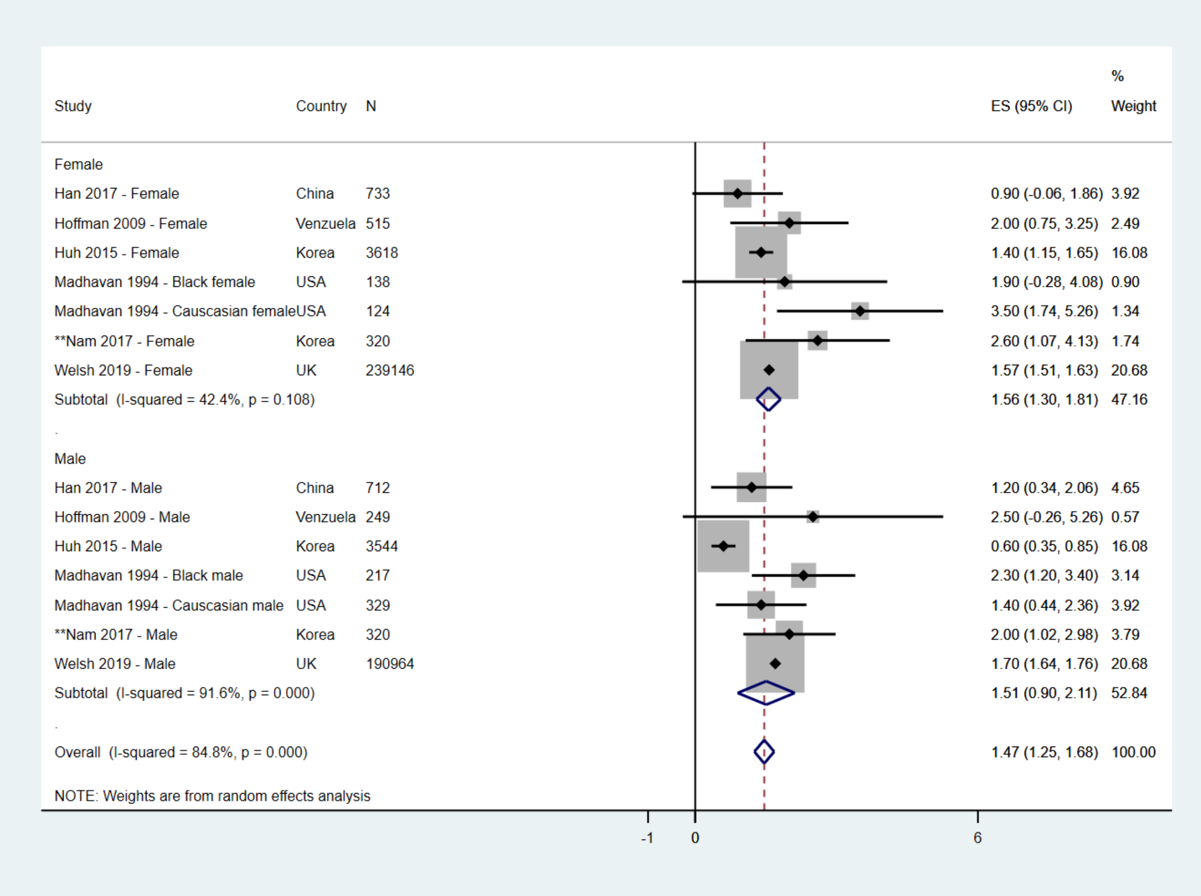
Moderate quality NOS 3-4: Heterogeneity: τ^2=0.75, χ^2 =93.10, df=16, P<0.001. Test for overall effect size=0: z=8.27, P<0.001. I^2 =83% (95% CI: 74, 89%)

High quality NOS ≥5: Heterogeneity: τ^2=0.00, χ^2 =1.27, df=2, P=0.530. Test for overall effect size=0: z=5.31, P<0.001. I^2 =0% (95% CI: 0, 90%)

[c] Black dots with horizontal lines represent individual study effect estimates and corresponding 95% CI. Grey box areas surrounding individual study effect estimates are proportional to the weight for the individual study. The diamond and broken vertical line represent the overall pooled estimate, the width of the diamond indicates its corresponding 95% CI. The unbroken vertical line represents the null value.

** adjusted for covariates, including energy intake

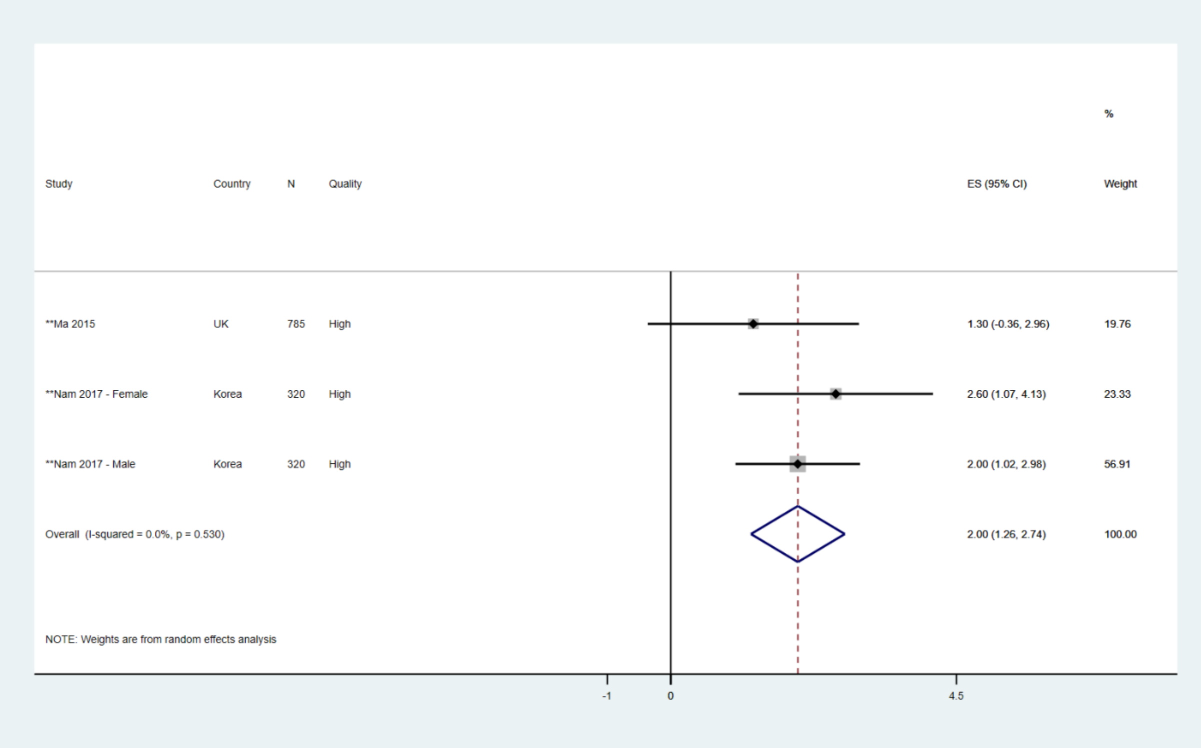
Supplemental Figure 5. Sub-group analysis by sex: pooled mean difference in BMI (kg/m^2) between the highest and lowest ntile of salt intake in cross-sectional studies of adults [a, b, c]



[a] All models are inverse-variance weighted random effects
[b] **Female:** Heterogeneity: τ^2=0.03, χ^2 =10.41, df=6, P=0.108. Test for overall effect size=0: z=11.91, P<0.001. I^2 =42% (95% CI: 0, 76%)
Male: Heterogeneity: τ^2=0.45, χ^2 =71.49, df=6, P<0.001. Test for overall effect size=0: z=4.87, P<0.001. I^2 =92% (95% CI: 85, 95%)
Overall: Heterogeneity: τ^2=0.06, χ^2 =85.81, df=13, P<0.001. Test for overall effect size=0: z=13.62, P<0.001. I^2 =85% (95% CI: 76, 90%)

[c] Black dots with horizontal lines represent individual study effect estimates and corresponding 95% CI. Grey box areas surrounding individual study effect estimates are proportional to the weight for the individual study. The diamond and broken vertical line represent the overall pooled estimate, the width of the diamond indicates its corresponding 95% CI. The unbroken vertical line represents the null value.
** adjusted for covariates, including energy intake

Supplemental Figure 6. Sensitivity analysis adjustment with energy intake: Pooled mean difference in BMI (kg/m^2) between the highest and lowest ntile of salt intake in cross-sectional studies with adjustment for energy intake among adults[a, b, c]



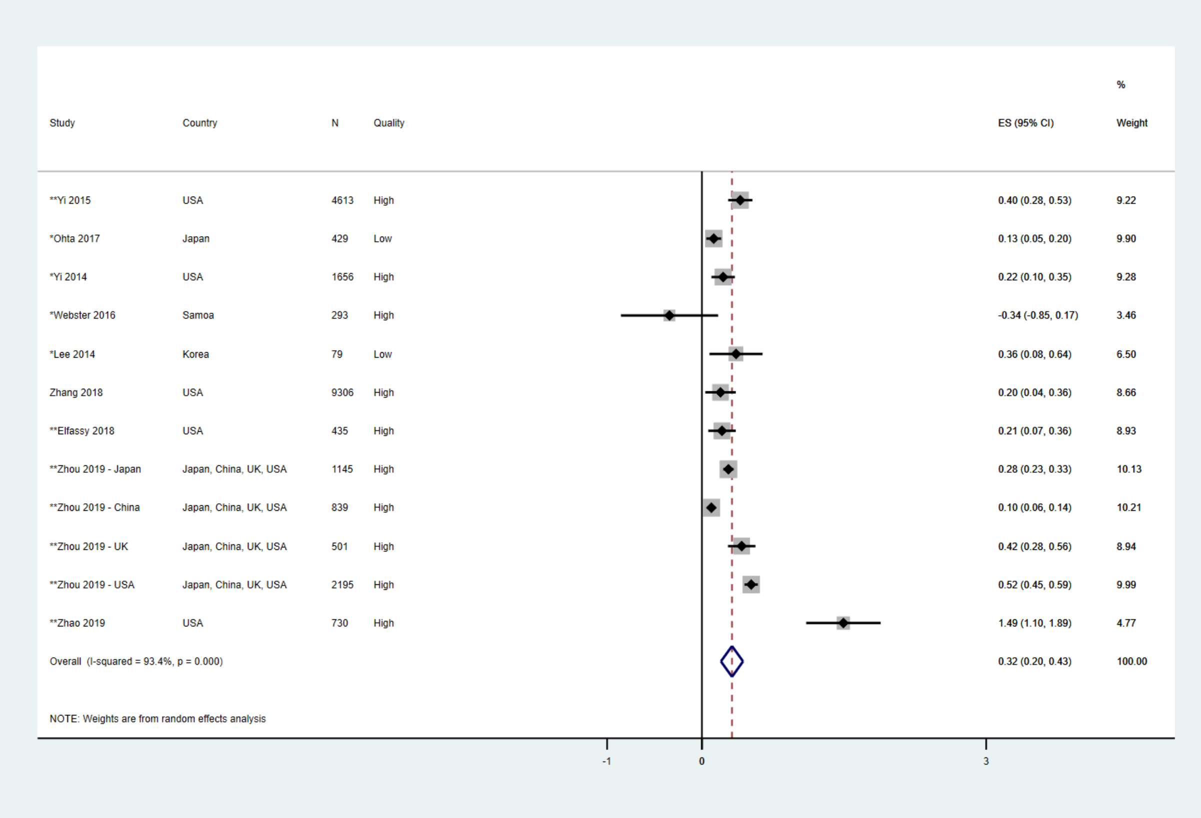
[a] Inverse-variance weighted random effects model. Heterogeneity: τ^2=0.00, χ^2 =1.27, df=2, P<0.001. Test for overall effect size=0: z=5.31, P<0.001. I^2 = 0% (95% CI: 0, 90%)

[b] Black dots with horizontal lines represent individual study effect estimates and corresponding 95% CI. Grey box areas surrounding individual study effect estimates are proportional to the weight for the individual study. The diamond and broken vertical line represent the overall pooled estimate, the width of the diamond indicates its corresponding 95% CI. The unbroken vertical line represents the null value.

[c] Quality refers to assessment made using Newcastle-Ottawa Scale Score. Studies with total scores of ≥5*, 3-4* and ≤2* were assessed as high, moderate and low-quality studies, respectively.

** adjusted for covariates, including energy intake

Supplemental Figure 7. Pooled difference in BMI (kg/m^2) associated with sodium intake (393 mg/d) in cross-sectional studies of adults[a, b, c, d]



[a] Inverse-variance weighted random effects model. Heterogeneity: τ^2=0.03, χ^2 =166.42, df=11, P=0.001. Test for overall effect size=0: z=5.32, P<0.001. I^2 =93% (95% CI: 90, 96%)

[b] Black dots with horizontal lines represent individual study effect estimates and corresponding 95% CI. Grey box areas surrounding individual study effect estimates are proportional to the weight for the individual study. The diamond and broken vertical line represent the overall pooled estimate, the width of the diamond indicates its corresponding 95% CI. The unbroken vertical line represents the null value.

[c] Quality refers to assessment made using Newcastle-Ottawa Scale Score. Studies with total scores of ≥5*, 3-4* and ≤2* were assessed as high, moderate and low-quality studies, respectively.

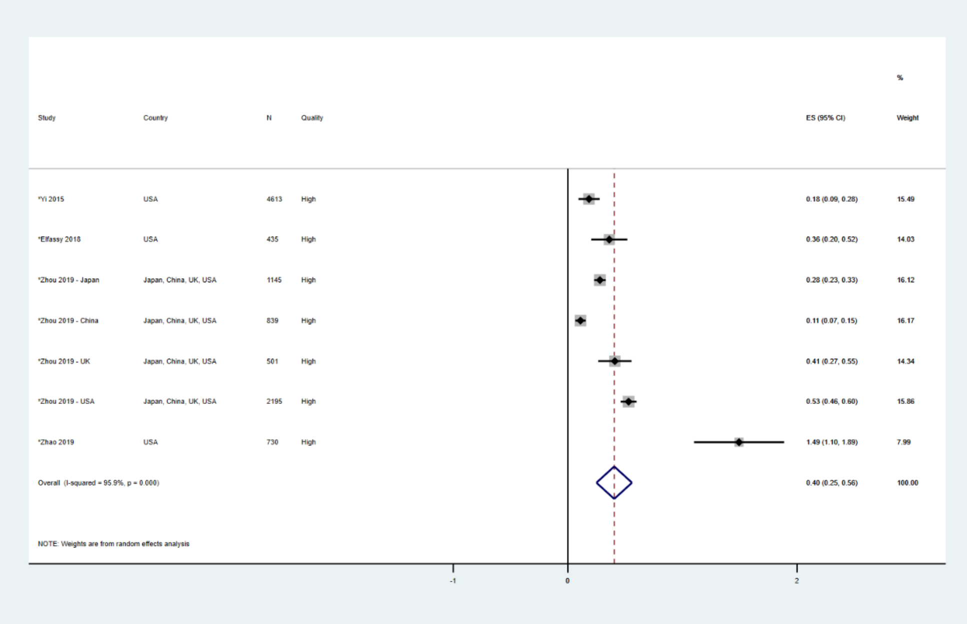
[d] Lee 2014 estimates are based on calculations for daily salt intake from spot urine using Kawasaki equation

* adjusted for covariates

** adjusted for covariates, including energy intake

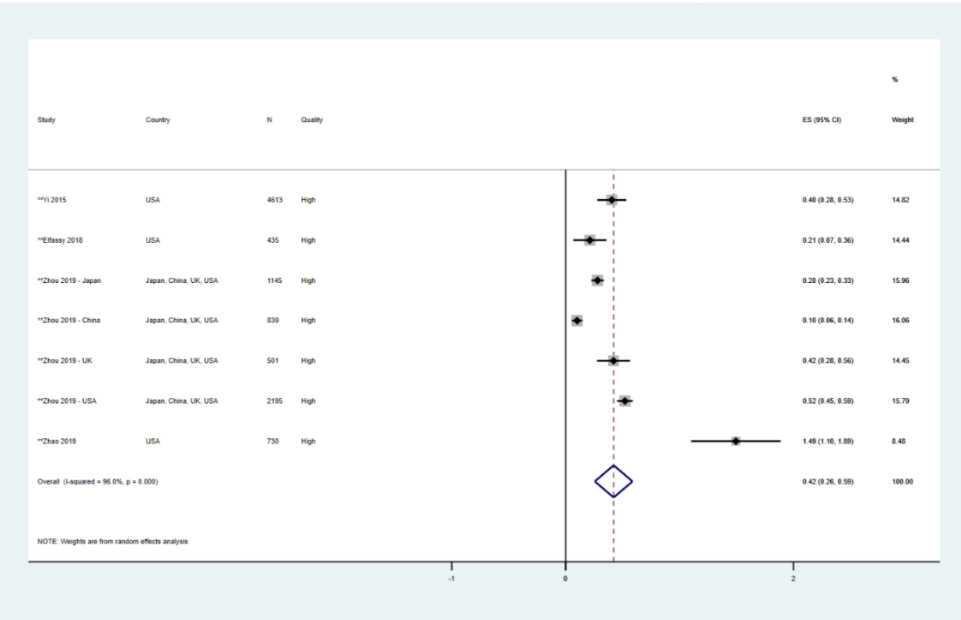
Supplemental Figure 8. Sensitivity analysis adjustment with energy intake: Pooled difference in BMI (kg/m^2) associated with sodium intake (393 mg/d) in cross-sectional studies of adults[a, b]

8 a) Fully adjusted models without the inclusion of energy intake[c]



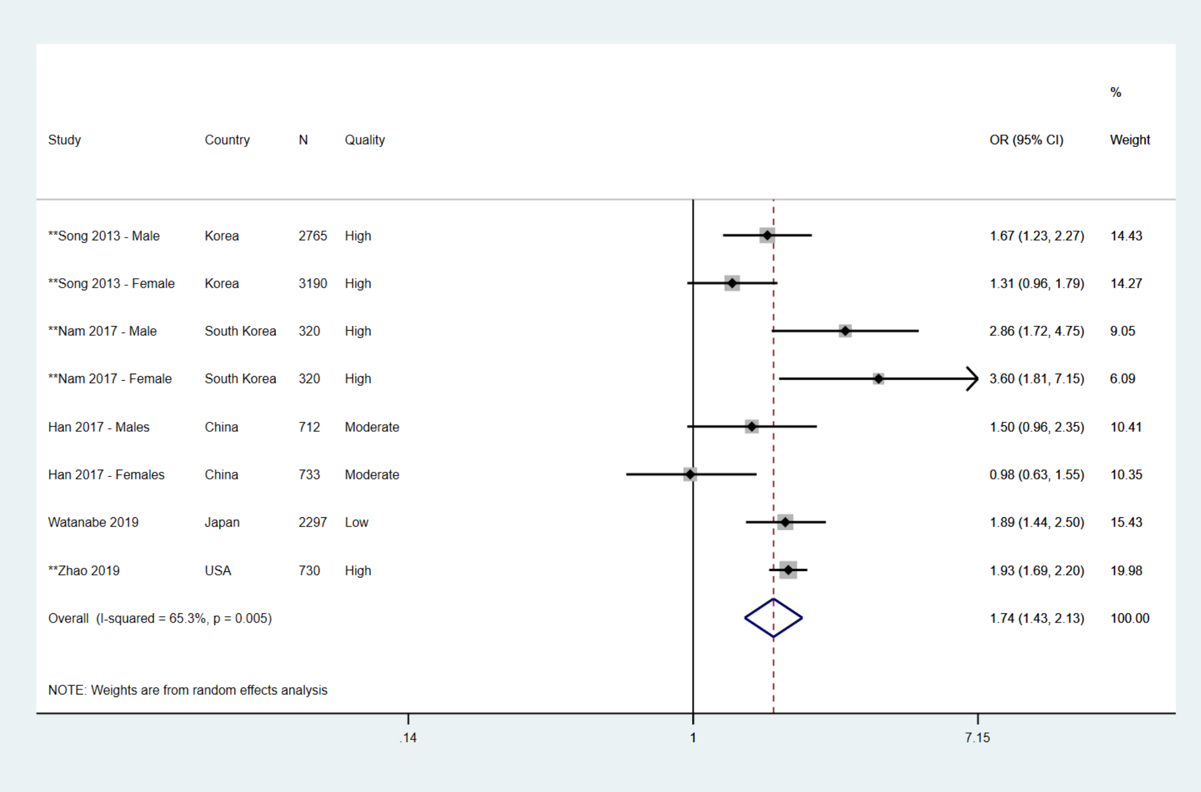
[a] Inverse-variance weighted random effects model. Heterogeneity: τ^2=0.04, χ^2 =146.56, df=6, P<0.001. Test for overall effect size=0: z=5.11, P<0.001. I^2 =96% (95% CI: 94, 97%)
[b] Black dots with horizontal lines represent individual study effect estimates and corresponding 95% CI. Grey box areas surrounding individual study effect estimates are proportional to the weight for the individual study. The diamond and broken vertical line represent the overall pooled estimate, the width of the diamond indicates its corresponding 95% CI. The unbroken vertical line represents the null value.
[c] Quality refers to assessment made using Newcastle-Ottawa Scale Score. Studies with total scores of ≥5*, 3-4* and ≤2* were assessed as high, moderate and low-quality studies, respectively.
* adjusted for covariates

8 b) Fully adjusted models with the inclusion of energy intake[a,b,c]



[a] Inverse-variance weighted random effects model. Heterogeneity: τ^2=0.04, χ^2 =149.91, df=6, P<0.001. Test for overall effect size=0: z=4.98, P<0.001. I^2 =96% (95% CI: 94, 97%)
[b] Black dots with horizontal lines represent individual study effect estimates and corresponding 95% CI. Grey box areas surrounding individual study effect estimates are proportional to the weight for the individual study. The diamond and broken vertical line represent the overall pooled estimate, the width of the diamond indicates its corresponding 95% CI. The unbroken vertical line represents the null value.
[c] Quality refers to assessment made using Newcastle-Ottawa Scale Score. Studies with total scores of ≥5*, 3-4* and ≤2* were assessed as high, moderate and low-quality studies, respectively.
** adjusted for covariates, including energy intake

Supplemental Figure 9. Risk of overweight/obesity between the highest and lowest ntile of salt intake in cross-sectional studies of adults[a, b, c]



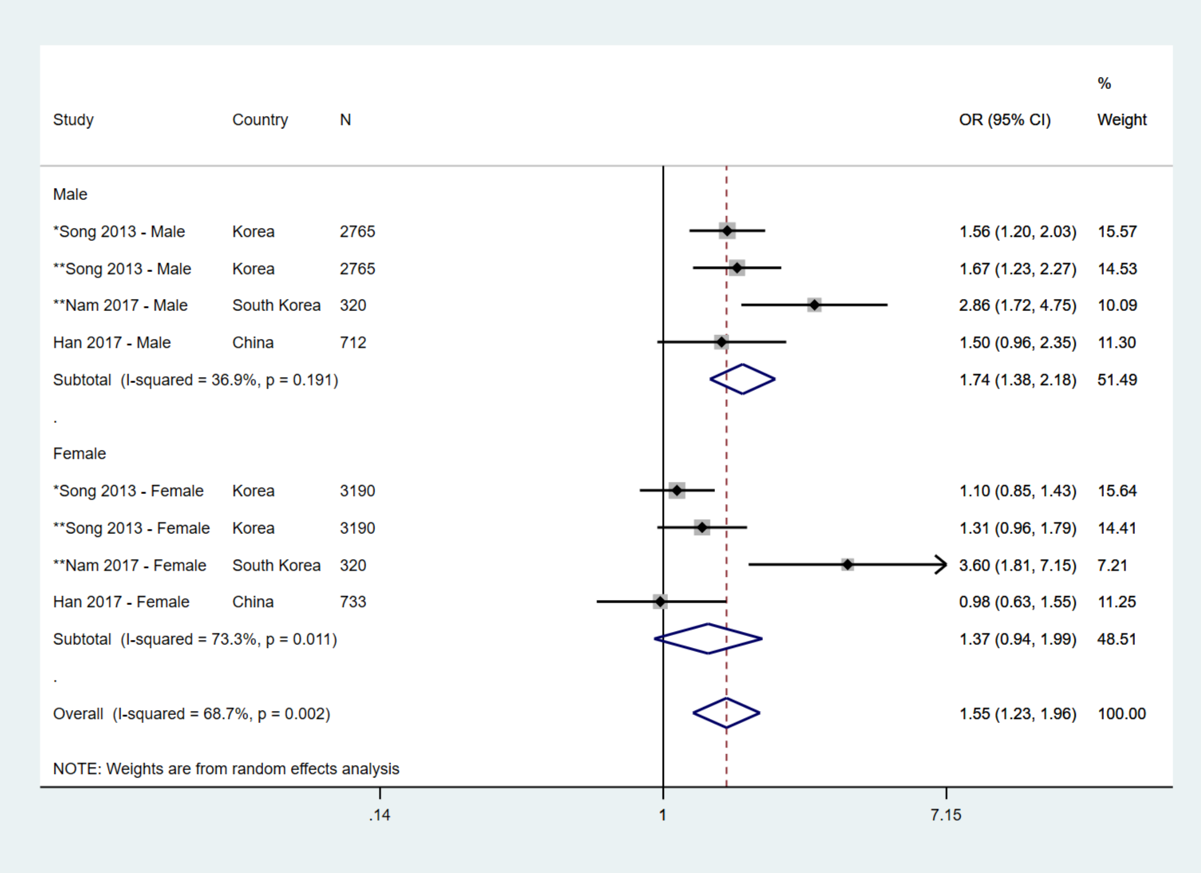
[a] Inverse-variance weighted random effects model. Heterogeneity: τ^2=0.05 χ^2 =20.17, df=7, P=0.005. Test for overall effect size=0: z=5.46, P<0.001. I^2 =65% (95% CI: 26, 84%)

[b] Black dots with horizontal lines represent individual study effect estimates and corresponding 95% CI. Grey box areas surrounding individual study effect estimates are proportional to the weight for the individual study. The diamond and broken vertical line represent the overall pooled estimate, the width of the diamond indicates its corresponding 95% CI. The unbroken vertical line represents the null value.

[c] Quality refers to assessment made using Newcastle-Ottawa Scale Score. Studies with total scores of ≥5*, 3-4* and ≤2* were assessed as high, moderate and low-quality studies, respectively.

** adjusted for covariates, including energy intake

Supplemental Figure 10. Sub-group analysis by sex: Risk of overweight/obesity between the highest and lowest ntile of salt intake in cross-sectional studies of adults[a, b, c]



[a] All models are inverse-variance weighted random effects

[b] **Female:** Heterogeneity: τ^2=0.10, χ^2 =11.23, df=3, P=0.011. Test for overall effect size=0: z=1.63, P=0.103. I^2 =73% (95% CI: 25, 90%)

Male: Heterogeneity: τ^2=0.02, χ^2 =4.75, df=3, P=0.191. Test for overall effect size=0: z=4.77, P<0.001. I^2 =37% (95% CI: 0, 80%)

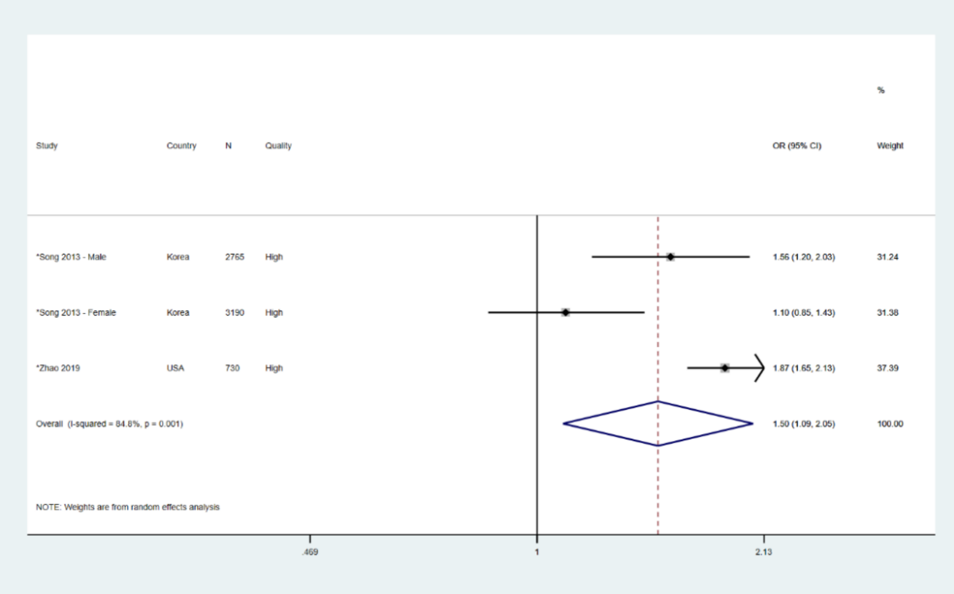
Overall: Heterogeneity: τ^2=0.07, χ^2 =22.39, df=7, P=0.002. Test for overall effect size=0: z=3.70, P<0.001. I^2 =69% (95% CI: 35, 85%)

[c] Black dots with horizontal lines represent individual study effect estimates and corresponding 95% CI. Grey box areas surrounding individual study effect estimates are proportional to the weight for the individual study. The diamond and broken vertical line represent the overall pooled estimate, the width of the diamond indicates its corresponding 95% CI. The unbroken vertical line represents the null value.

** adjusted for covariates, including energy intake

Supplemental Figure 11. Sensitivity analysis adjustment with energy intake: Risk of overweight/obesity between the highest and lowest ntile of salt intake in cross-sectional studies of adults

11 a) Fully adjusted models without the inclusion of energy intake[a, b, c]



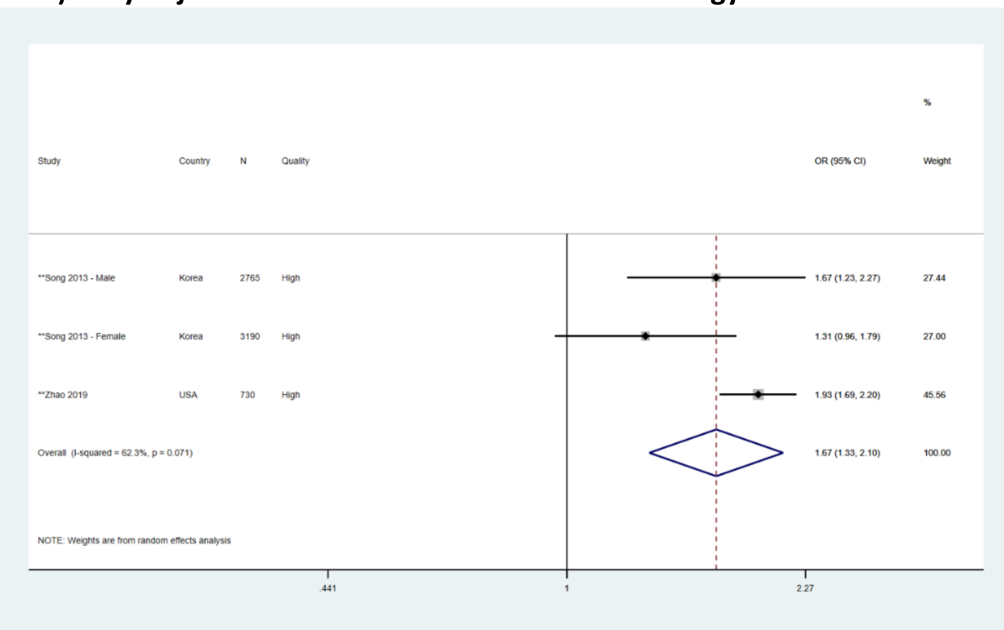
[a] Inverse-variance weighted random effects model. Heterogeneity: τ^2=0.07, χ^2 =13.17, df=2, P=0.001. Test for overall effect size=0: z=2.49, P=0.013. I^2 =85% (95% CI: 55, 95%)

[b] Black dots with horizontal lines represent individual study effect estimates and corresponding 95% CI. Grey box areas surrounding individual study effect estimates are proportional to the weight for the individual study. The diamond and broken vertical line represent the overall pooled estimate, the width of the diamond indicates its corresponding 95% CI. The unbroken vertical line represents the null value.

[c] Quality refers to assessment made using Newcastle-Ottawa Scale Score. Studies with total scores of ≥5*, 3-4* and ≤2* were assessed as high, moderate and low-quality studies, respectively.

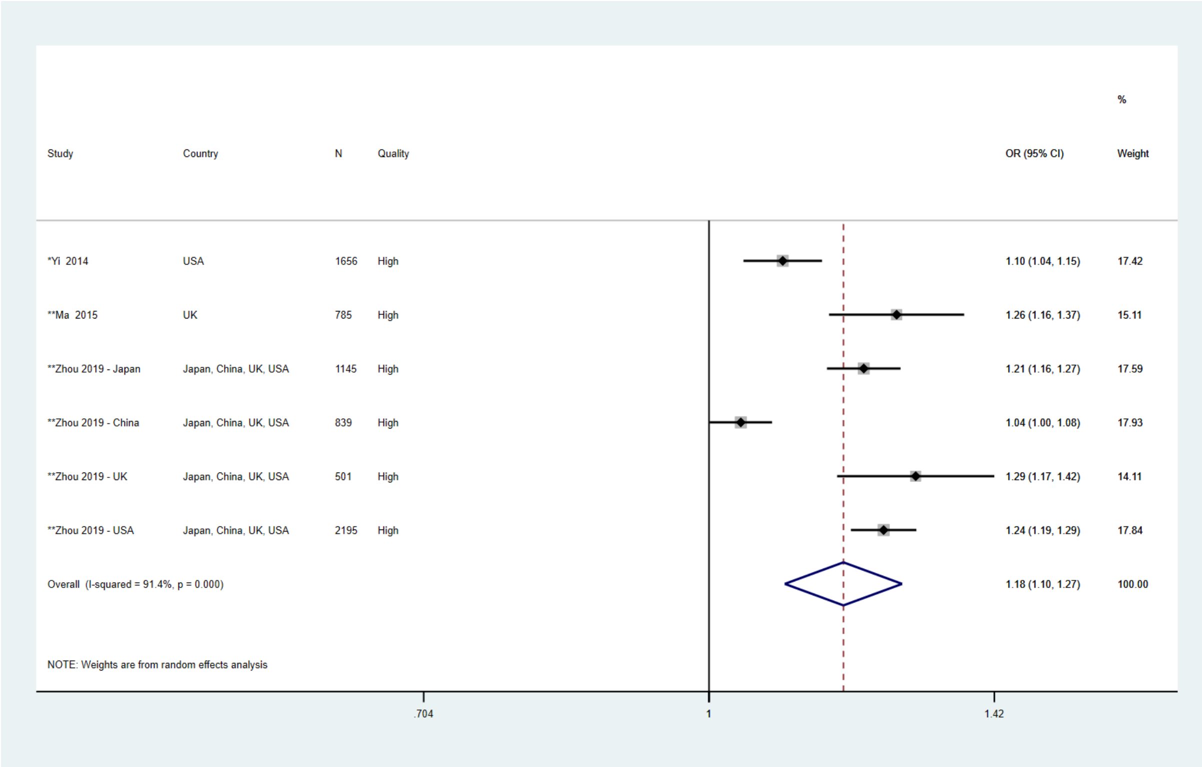
** adjusted for covariates

11 b) Fully adjusted models with the inclusion of energy intake[a,b, c]



[a] Inverse-variance weighted random effects model. Heterogeneity: τ^2=0.03, χ^2 =5.30, df=2, P=0.071. Test for overall effect size=0: z=4.38, P<0.001. I^2 =62% (95% CI: 0, 89%)
[b] Black dots with horizontal lines represent individual study effect estimates and corresponding 95% CI. Grey box areas surrounding individual study effect estimates are proportional to the weight for the individual study. The diamond and broken vertical line represent the overall pooled estimate, the width of the diamond indicates its corresponding 95% CI. The unbroken vertical line represents the null value.
[c] Quality refers to assessment made using Newcastle-Ottawa Scale Score. Studies with total scores of ≥5*, 3-4* and ≤2* were assessed as high, moderate and low-quality studies, respectively.
** adjusted for covariates, including energy intake

Supplemental Figure 12. Risk of overweight/obesity associated with sodium intake (393 mg/d) in cross-sectional studies of adults[a, b, c]



[a] Inverse-variance weighted random effects model. Heterogeneity: τ^2=0.007, χ^2 =58.34, df=5, P<0.001. Test for overall effect size=0: z=4.49, P<0.001. I^2 =91% (95% CI: 84, 95%)

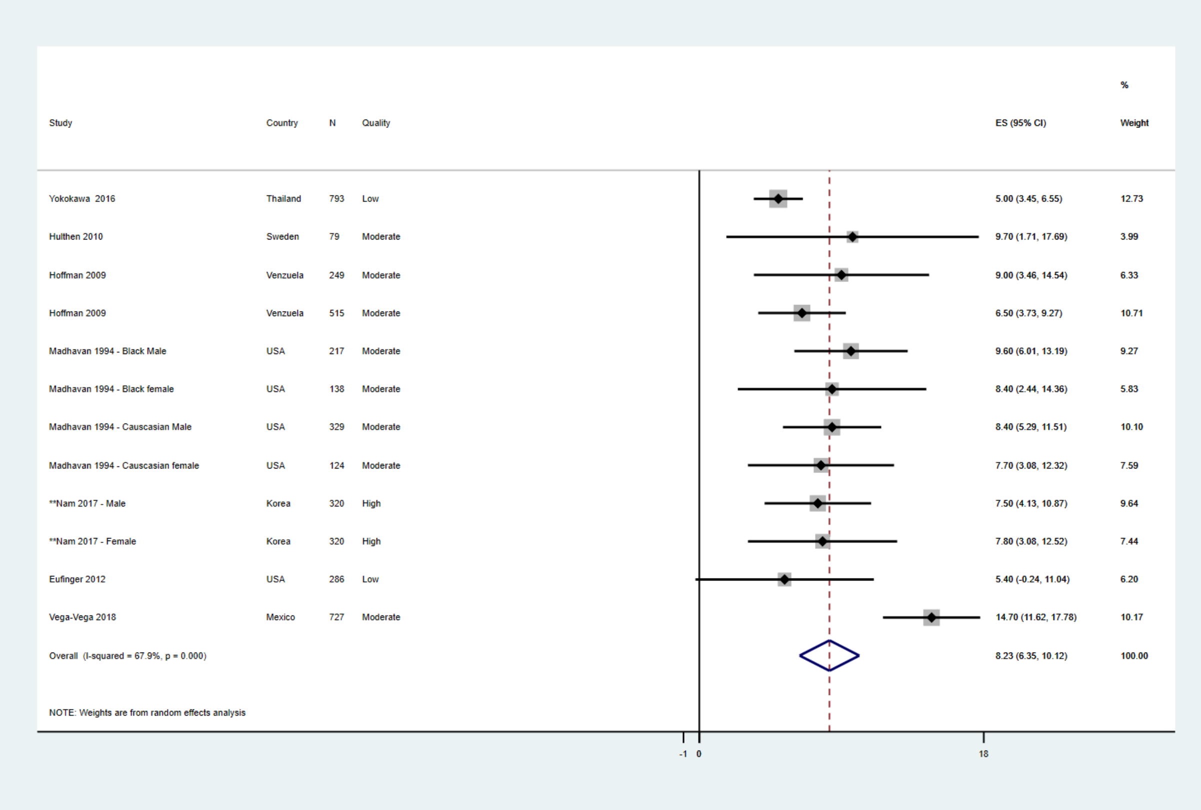
[b] Black dots with horizontal lines represent individual study effect estimates and corresponding 95% CI. Grey box areas surrounding individual study effect estimates are proportional to the weight for the individual study. The diamond and broken vertical line represent the overall pooled estimate, the width of the diamond indicates its corresponding 95% CI. The unbroken vertical line represents the null value.

[c] Quality refers to assessment made using Newcastle-Ottawa Scale Score. Studies with total scores of ≥5*, 3-4* and ≤2* were assessed as high, moderate and low-quality studies, respectively.

* adjusted for covariates

** adjusted for covariates, including energy intake

Supplemental Figure 13. Pooled mean difference in BW (kg) between the highest and lowest ntile of salt intake in cross-sectional studies of adults[a, b, c]



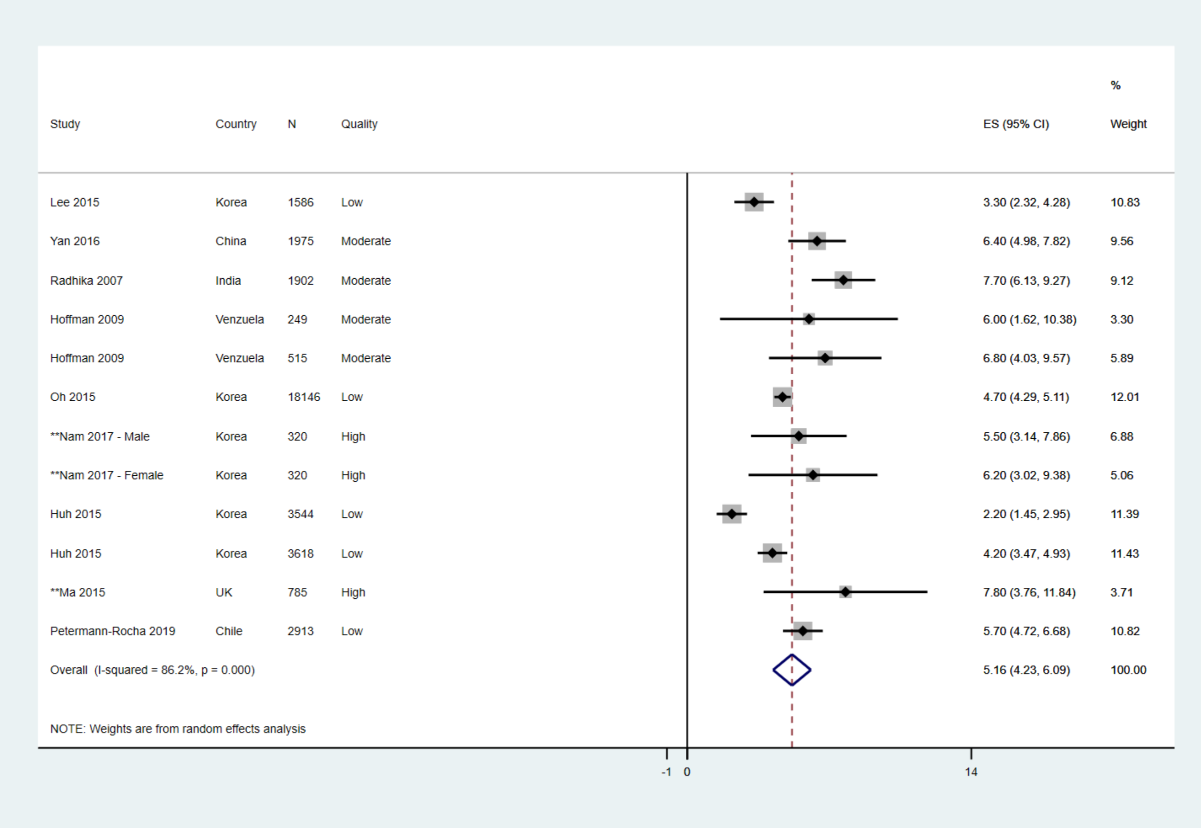
[a] Inverse-variance weighted random effects model. Heterogeneity: τ^2=6.66, χ^2 =34.32, df=11, P<0.001. Test for overall effect size=0: z=8.55, P<0.001. I^2 = 68% (95% CI: 41, 82%)

[b] Black dots with horizontal lines represent individual study effect estimates and corresponding 95% CI. Grey box areas surrounding individual study effect estimates are proportional to the weight for the individual study. The diamond and broken vertical line represent the overall pooled estimate, the width of the diamond indicates its corresponding 95% CI. The unbroken vertical line represents the null value.

[c] Quality refers to assessment made using Newcastle-Ottawa Scale Score. Studies with total scores of ≥5*, 3-4* and ≤2* were assessed as high, moderate and low-quality studies, respectively.

** adjusted for covariates, including energy intake

Supplemental Figure 14. Pooled mean difference in waist circumference (cm) between the highest and lowest ntile of sodium intake in cross-sectional studies of adults[a, b, c]



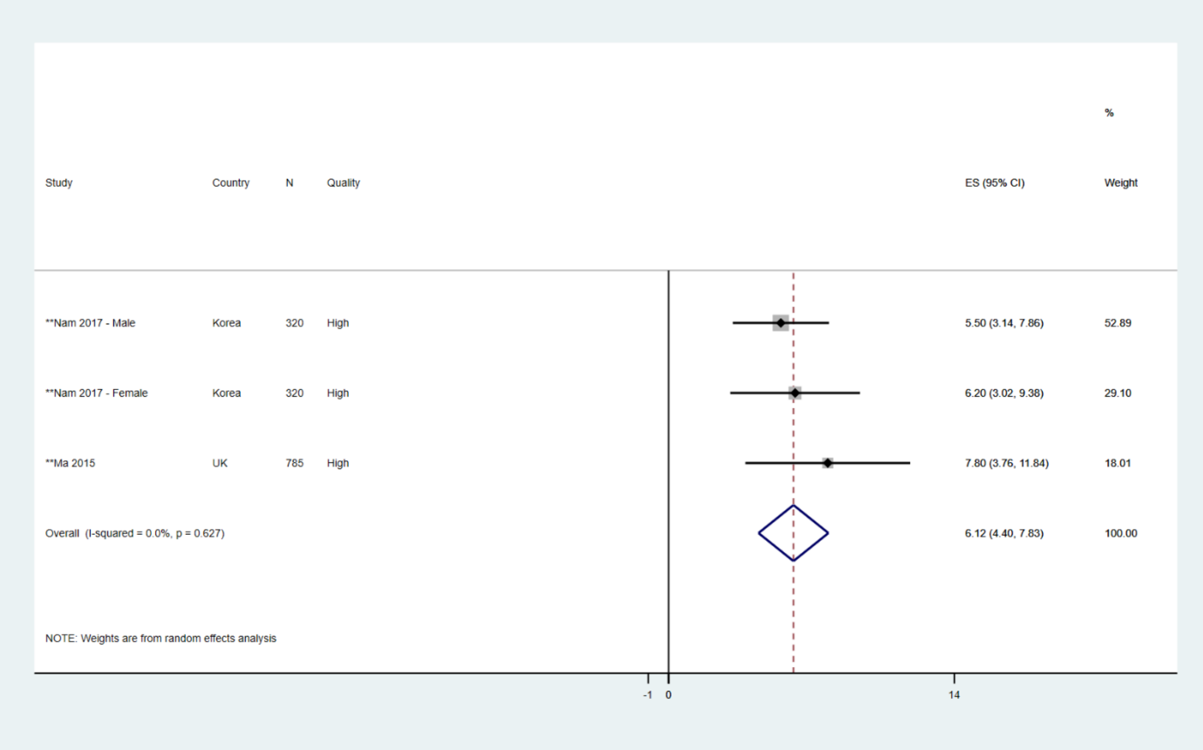
[a] Inverse-variance weighted random effects model. Heterogeneity: τ^2=1.84, χ^2 =79.72, df=11, P<0.001. Test for overall effect size=0: z=10.87, P<0.001. I^2 = 86% (95% CI: 78, 91%)

[b] Black dots with horizontal lines represent individual study effect estimates and corresponding 95% CI. Grey box areas surrounding individual study effect estimates are proportional to the weight for the individual study. The diamond and broken vertical line represent the overall pooled estimate, the width of the diamond indicates its corresponding 95% CI. The unbroken vertical line represents the null value.

[c] Quality refers to assessment made using Newcastle-Ottawa Scale Score. Studies with total scores of ≥5*, 3-4* and ≤2* were assessed as high, moderate and low-quality studies, respectively.

** adjusted for covariates, including energy intake

Supplemental Figure 15. Sensitivity analysis adjustment with energy intake: Pooled mean difference in waist circumference (cm) between the highest and lowest ntile of salt intake in cross-sectional studies with adjustment for energy intake among adults[a, b, c]



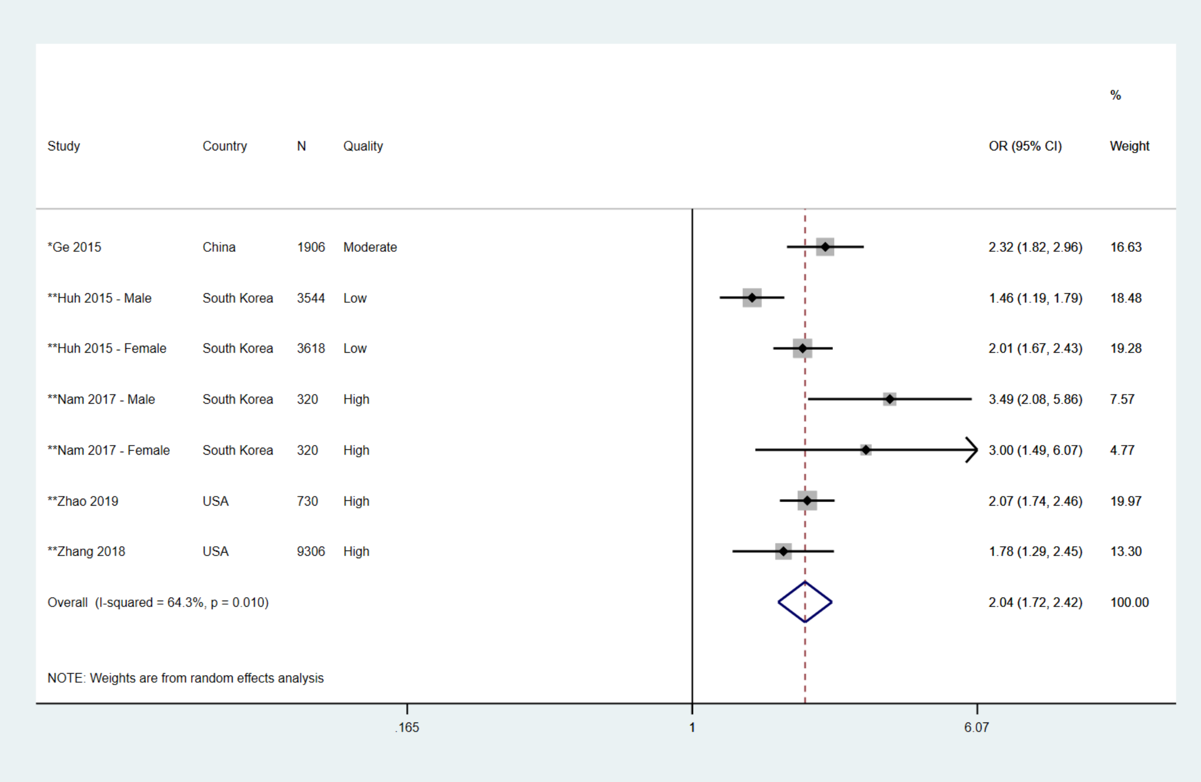
[a] Inverse-variance weighted random effects model. Heterogeneity: τ^2=0.00, χ^2 =0.93, df=2, P<0.001. Test for overall effect size=0: z=7.00, P<0.001. I^2 = 0% (95% CI: 0, 90%)

[b] Black dots with horizontal lines represent individual study effect estimates and corresponding 95% CI. Grey box areas surrounding individual study effect estimates are proportional to the weight for the individual study. The diamond and broken vertical line represent the overall pooled estimate, the width of the diamond indicates its corresponding 95% CI. The unbroken vertical line represents the null value.

[c] Quality refers to assessment made using Newcastle-Ottawa Scale Score. Studies with total scores of ≥5*, 3-4* and ≤2* were assessed as high, moderate and low-quality studies, respectively.

** adjusted for covariates, including energy intake

Supplemental Figure 16. Risk of abdominal obesity between the highest and lowest ntile of salt intake in cross-sectional studies of adults[a, b, c]



[a] Inverse-variance weighted random effects model. Heterogeneity: τ^2=0.03 χ^2 =16.81, df=6, P=0.010. Test for overall effect size=0: z=8.21, P<0.001. I^2 =64(95% CI: 19, 84%)

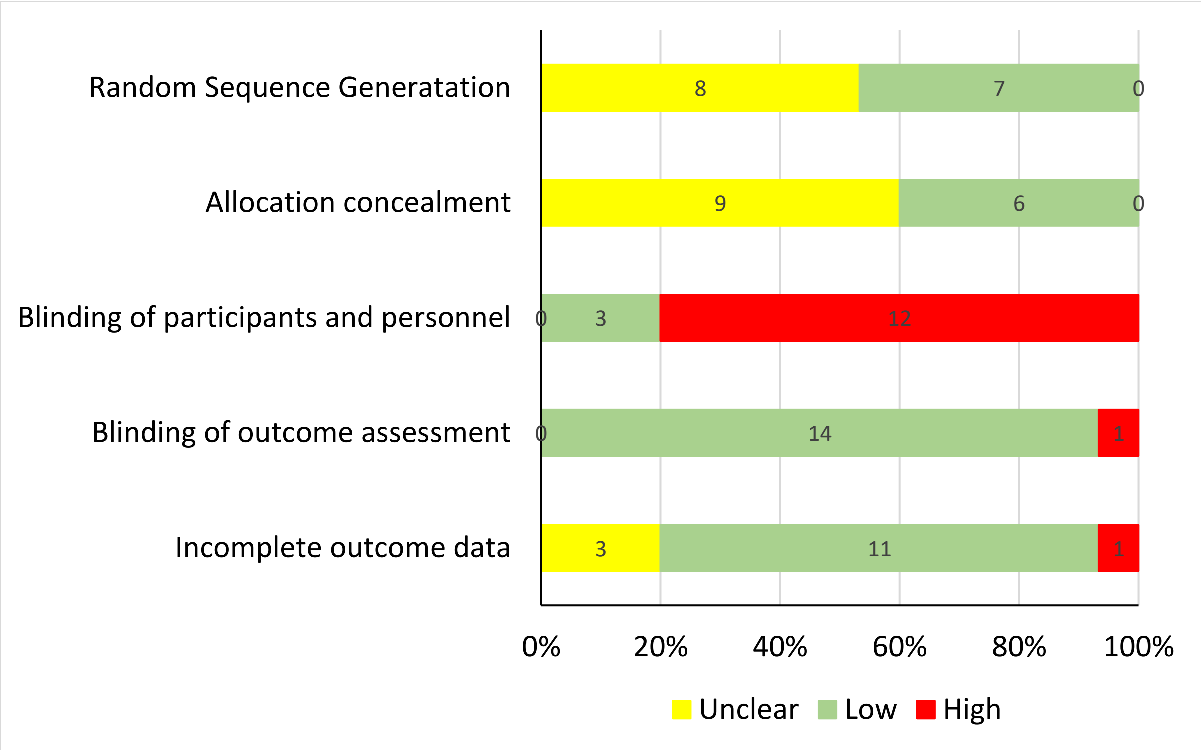
[b] Black dots with horizontal lines represent individual study effect estimates and corresponding 95% CI. Grey box areas surrounding individual study effect estimates are proportional to the weight for the individual study. The diamond and broken vertical line represent the overall pooled estimate, the width of the diamond indicates its corresponding 95% CI and the extended line on the diamond represents the prediction interval. The unbroken vertical line represents the null value.

[c] All studies defined abdominal obesity as waist circumference ≥90 cm males and ≥80 cm females

** adjusted for covariates

** adjusted for covariates, including energy intake

Supplemental Figure 17. Overview of risk of bias assessment of n=15 randomised controlled trials conducted in adults[a]



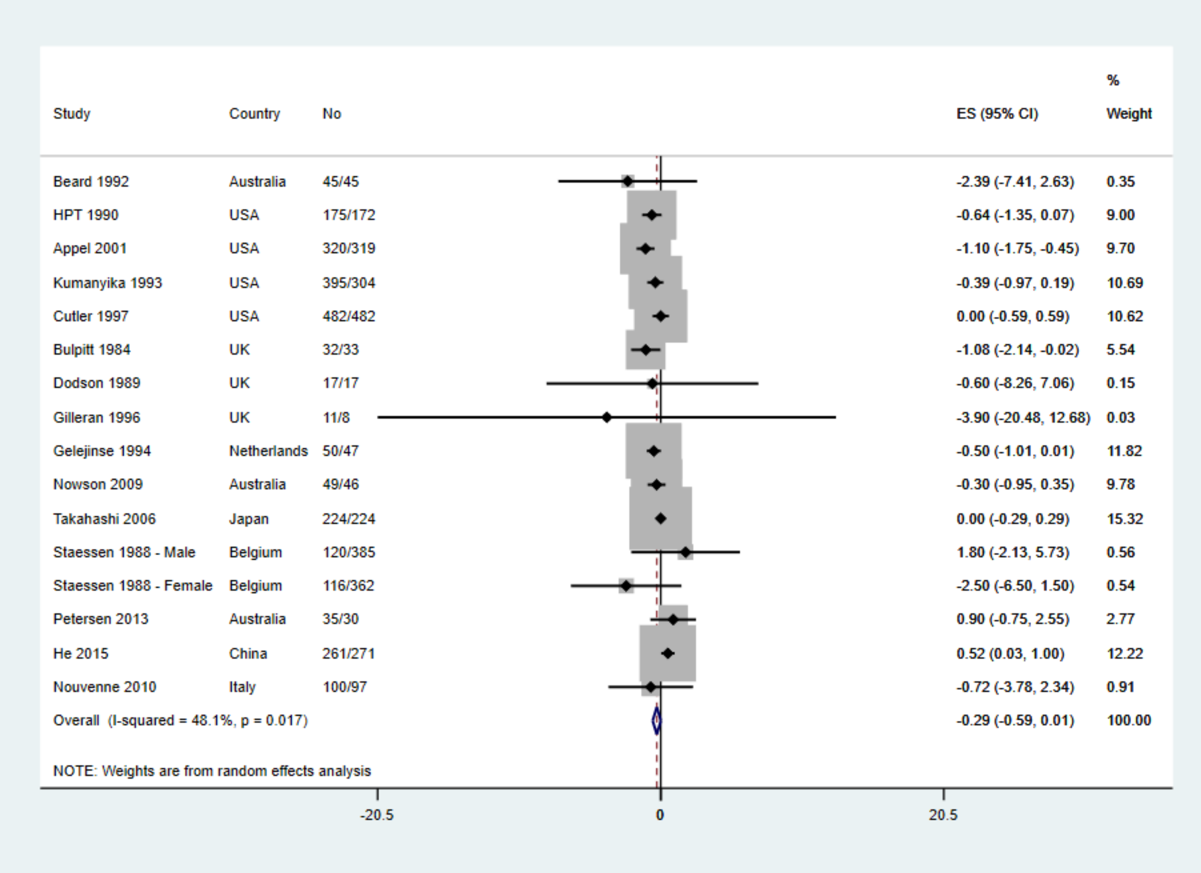
Unclear

Low

High

[a] Selective outcome reporting was not assessed as it was deemed inapplicable for this review i.e. the primary outcome of this review was change in BW and this was not listed as an outcome in any of the assessed trials.

Supplemental Figure 18. Pooled net change (kg) in BW associated with a reduced salt diet in randomised controlled trials of adults [a, b, c]

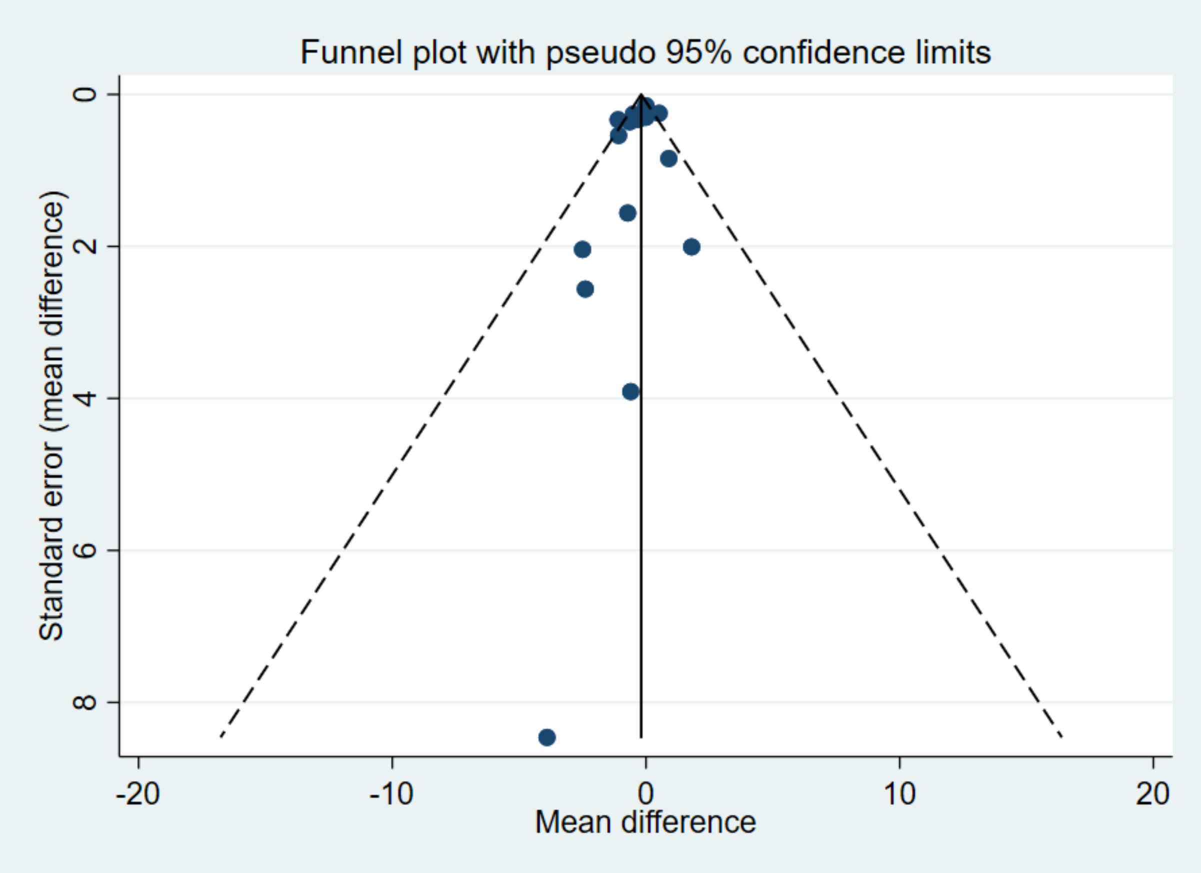


[a] Inverse-variance weighted random effects model. Heterogeneity: τ^2=0.13 χ^2 =28.91, df=15, P=0.017. Test for overall effect size=0: z=1.88, P=0.06. I^2 =48% (95% CI: 7, 71%)

[b] Black dots with horizontal lines represent individual study effect estimates and corresponding 95% CI. Grey box areas surrounding individual study effect estimates are proportional to the weight for the individual study. The diamond and broken vertical line represent the overall pooled estimate, the width of the diamond indicates its corresponding 95% CI and the extended line on the diamond represents the prediction interval. The unbroken vertical line represents the null value.

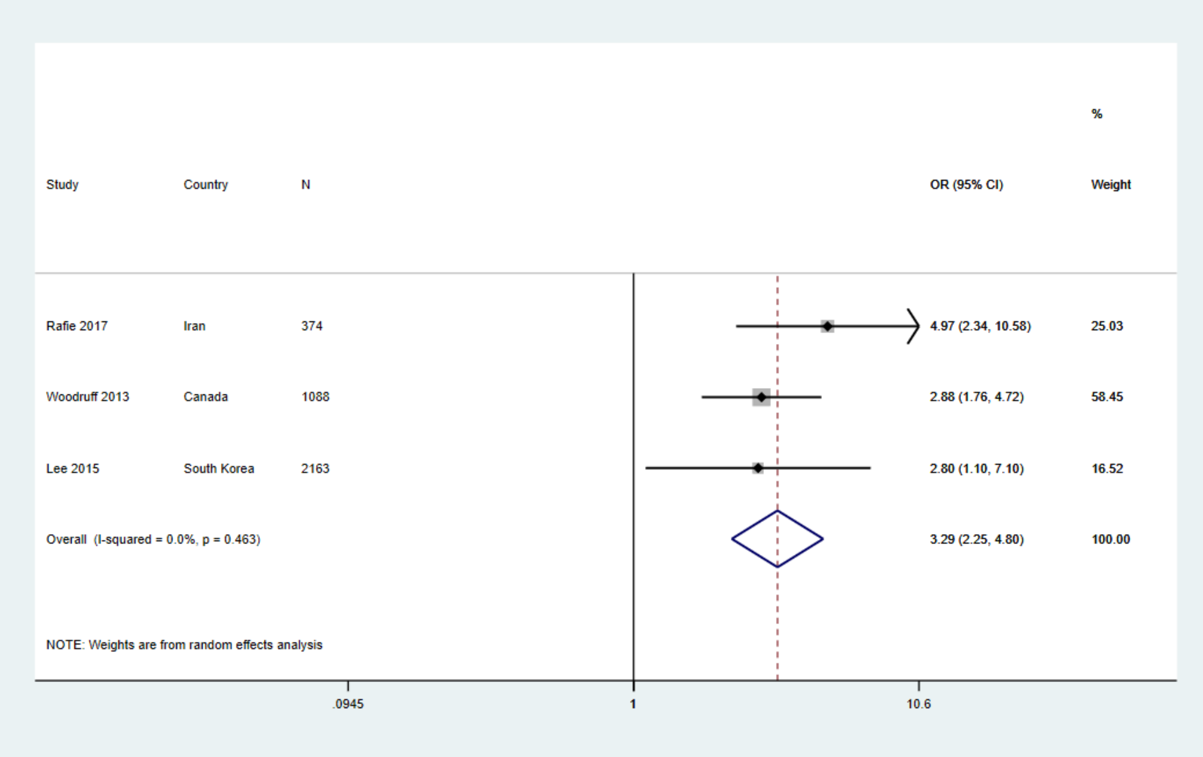
[c] No represents number of participants at end of trial in control/reduced sodium group. Of note Staessen et al. 1988 used different population samples at baseline and follow-up.

Supplemental Figure 19. Funnel plots with pseudo 95% confidence limits for meta-analyses: Randomised controlled trials of reduced sodium vs. control diet on BW [a]



[a] Egger's regression asymmetry test P=0.30 indicates no publication bias.

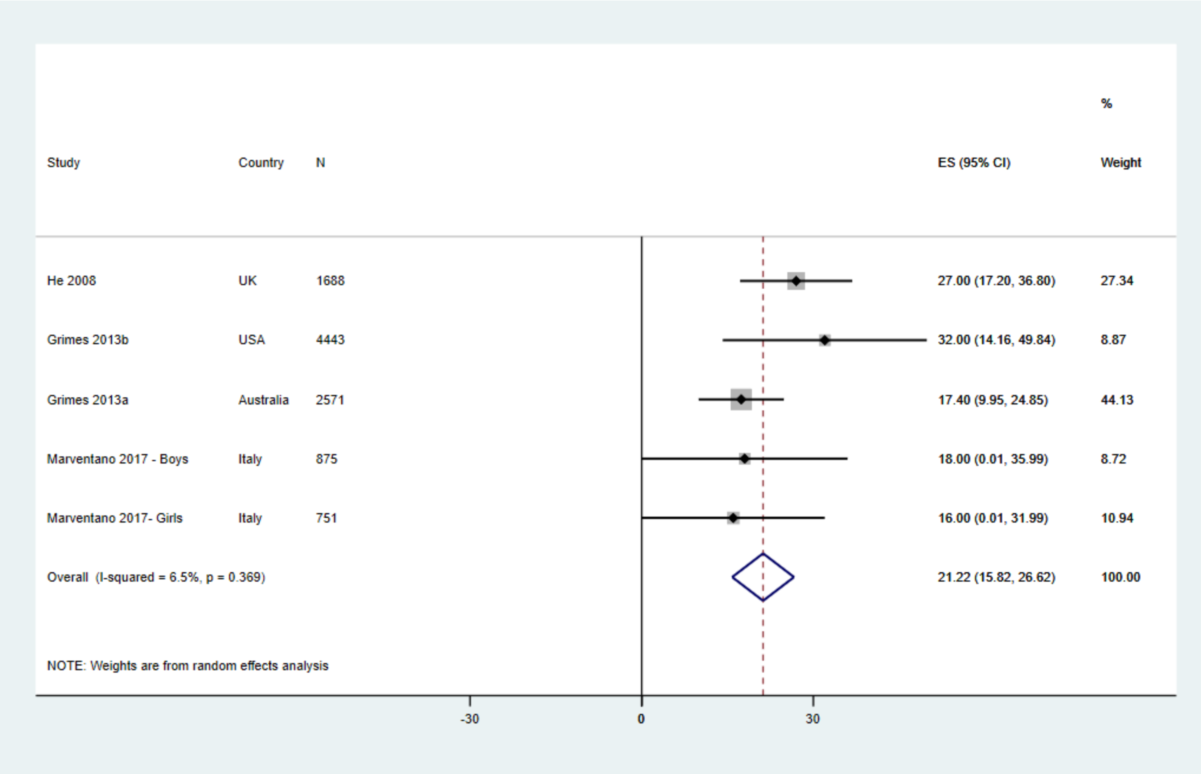
Supplemental Figure 20. Risk of overweight/obesity between the highest and lowest ntile of salt intake in cross-sectional studies of children[a, b]



[a] Inverse-variance weighted random effects model. Heterogeneity: τ^2=0.0 χ^2 =1.54, df=2, P=0.463. Test for overall effect size=0: z=6.17, P<0.001. I^2 =0% (95% CI: 0, 90%)

[b] Black dots with horizontal lines represent individual study effect estimates and corresponding 95% CI. Grey box areas surrounding individual study effect estimates are proportional to the weight for the individual study. The diamond and broken vertical line represent the overall pooled estimate, the width of the diamond indicates its corresponding 95% CI. The unbroken vertical line represents the null value. The unbroken vertical line represents the null value.

Supplemental Figure 21. Pooled association between salt intake (g/d) and sugar-sweetened beverage consumption (SSB) (g/d) in cross-sectional studies of children [a, b]



[a] Inverse-variance weighted fixed effects model. Heterogeneity: χ^2 =4.28, df=4, P=0.369. Test for overall effect size=0: z=8.12, P<0.001. I^2 =6.5% (95% CI: 0, 81%)

[b] Black dots with horizontal lines represent individual study effect estimates and corresponding 95% CI. Grey box areas surrounding individual study effect estimates are proportional to the weight for the individual study. The diamond and broken vertical line represent the overall pooled estimate, the width of the diamond indicates its corresponding 95% CI. The unbroken vertical line represents the null value.

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