Table 2. Associations between children's diet quality and watching television during meals or snacks

Authors, year, country (reference number)	Population size Age group of study population	Type of study	Method of determining amount of TV viewing during meals	Method of determining dietary intake/patterns	Outcomes reported	Adjustment for confounding variables	Key findings
Carson and Janssen, 2012. Canada (11)	N = 15,973 Canadian children in grades 6-10 (12.8-15.3 years, mean age 14.4 years) who participated in the Health Behaviour in School-Aged Children Survey. (N = 8242 females and 7731 males)	Analysis of Canadian only data collected from WHO-sponsored HSBC cross-sectional survey conducted in over 40 countries in 2009/2010.	Classroom based questionnaire	Classroom based questionnaire	Whether TV snacking and junk food consumption mediate the relationship between TV viewing and BMI.	Gender, age, race, family structure, SES, whether currently dieting, and whether dieting in the last 12 months.	Snacking and junk food consumption increased with increasing time spent viewing. By comparison with TV viewing quartile 1, frequency of TV snacking was 0.65 (95% CI 0.57, 0.74) units higher in quartile 2, 0.92 (0.84, 1.01) units higher in quartile 3 and 1.35 (1.26, 1.45) units higher in quartile 4. Frequency of junk food consumption was higher in quartile 2 (0.19: 0.13, 0.24), quartile 3 (0.37: 0.31, 0.42) and quartile 4 (0.61: 0.55, 0.67). BMI increased with increased time spent watching TV ($p \leq 0.05$). For every 1 unit increase in the 7 point TV snacking scale, the BMI z-scores decreased by 0.03 ($p < 0.05$))
Coon et al, 2001 USA (26)	N=91 parent-child pairs, with children in the 4th, 5th or 6th grade. (9-12yrs). Mean age was 10 years. (N = 53 females and 38 males)	Data collected from Maryland suburbs from1993-1995 as part of a study on family behaviours and children's diets	Face-to-face interview, structured survey in family home. Qu re; whether TV on or off during each meal	3 non-consecutive 24 hr. recalls; school days	Energy intake %energy CHO % energy total fat snacking	Parents' nutritional knowledge, attitudes and norms, mother's education (years in school), hours per week mother works for pay, number of meals per day TV is on,	TV is more likely to be on during meals in families with lower incomes ($p \leq 0.01$) and less educated mothers ($p \leq 0.05$). Compared to children from families in which the TV is on for <2 meals per day, children from families where the TV is on for >2 meals per day consumed: 1. 16% fewer vegetables per day ($p \leq 0.01$)

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						number of nights per week parents prepare quick suppers, parent's attitude toward meat.	2. 15% more portions of soda per day ($p \leq 0.05$) 3. 2% more of their total daily energy from meat ($p \leq 0.05$), with 14% more red meat per day ($p \leq 0.01$) 4. 3% more of their total daily energy from pizza, salty snacks and sodas combined ($p \leq 0.001$) 5. 2% less of their total daily energy intake from fruits, vegetables and juices combined ($p \leq 0.001$). 6. Twice as much caffeine ($p \leq 0.05$).
Cox et al, 2012. Australia (23)	N = 135 Preschool children aged 2-6 years (mean age: 4.5 years) from Melbourne (N = 81 females and 54 males)	Data collected form cross-sectional survey between Jun - Sep 2010.	3 day TV diary completed by mothers of pre-schoolers. Information collected on viewing time, content and food consumed while watching TV.	3 day TV diary completed by mothers of pre-schoolers. Information collected on viewing time, content and food consumed while watching TV.	Association between BMI and TV viewing time, TV content, energy intake while viewing and daily physical activity.		Moderate positive association between TV viewing and energy intake while viewing TV on weekdays and weekends (r=0.61 and 0.50, p = 0.001)). Weak positive associations were found between TV viewing and consumption of obesogenic foods (r = 0.23, p = 0.001)) and frequency of consuming fast foods (r = 0.27, p = 0.001). Daily serves of vegetables was moderately negatively associated with TV viewing (r = -0.31, p = 0.001). Weak association between weekday and weekend TV viewing and number of minutes in sedentary activities (r = 0.20 and 0.22 respectively p = 0.05).
Del Mar Bibiloni et al, 2009, Spain.	N = 1,231. 12-17 year old children living in	Population-based cross-sectional	General questionnaire with question	Two non-consecutive	Prevalence of overweight, differences	Socio-demographic and lifestyle variables.	Positive correlation between watching TV and SSB consumption (r = 0.123, P <0.001).

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(30)	the Balearic Islands (N = 657 females and 574 males)	nutritional survey carried out in the Balearic Islands between 2007 and 2008.	about distraction during meals – one option being watching TV, as well as questions regarding hours per day of TV viewing.	24h diet recalls General questionnaire with questions about frequency of eating specific foods and number of daily meals.	between genders, waist hip ratio & body fat measurements. Link between obesity, parental education & meals per day. Link between TV and SSB		Positive association between BMI and distraction at mealtimes (OR 1.52, 95% CI 0.81, 2.84) but not significant. Inverse relationship between parental education and BMI (OR: 3.47 in boys, 95% CI 1.58, 7.62 & 3.29 in girls, 95% CI 1.38, 7.89, p <0.01). Increasing risk of obesity with decreasing number of meals per day (adjusted OR: 2.60 in boys who ate 4 meals per day, 95% CI 1.13, 5.98 p <0.05 and 4.99 in boys and 2.20 in girls who ate 1-3 meals per day, 95% CI 2.1, 11.54 and 0.99, 4.89 respectively, p <0.01) Risk of obesity linked to parental education (adjusted OR: 2.35 boys & 1.89 girls with parents of medium education level, 95% CI 1.04, 5.34 and 0.73, 4.94 respectively p <0.05 and 3.47 boys and 3.29 girls from parents with low educational level, 95% CI 1.58, 7.62 and 1.38, 7.89 respectively, p <0.01).
Dubois et al, 2008. Canada. (12)	N = 1,540 representative sample of children born in 1998 (aged 4-5 years) in Quebec, Canada. (N =	Analysis of baseline data from Longitudinal Study of Child Development in Quebec (1998-2002.	TV viewing questionnaire	24 hour recall, eating behaviour questionnaire	Association between eating meals and snacks in front of the TV and: • BMI • Energy intake • macronutrient intake	Maternal characteristics (age, immigrant status, education, working status and self-perceived health). Mother and	Children who ate snacks while watching TV every day consumed more CHO and less energy from proteins compared with children who never ate snacks in front of the TV (p ≤0.05). Eating meals during TV viewing once daily or more was associated with lower consumption of energy from protein (p ≤0.05).

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	750 females and 790 males)				• Consumption of fruit/veg • Consumption of soft drinks • Hours of viewing	father's smoking status and derived number of smoking parents in the household, family type, household annual income, SE status. Variables 9pertaining to the child including day-care attendance and sex of the child.	Eating dinner or snacks daily while watching TV was associated with fewer servings of fruits & vegetables ($p \leq 0.05$). Eating meals while watching TV increased odds of drinking soft drinks daily (OR: 2.316, $p < 0.0001$). Having snacks whilst watching TV increased the odds of drinking soft drinks (OR: 2.294, $p < 0.0001$) & increased further for children who ate snacks while watching TV daily (OR: 3.568, $p < 0.0001$). Children who ate in front of the TV once daily had 70% increased odds of drinking soft drinks daily, which increased to 80% in children who ate in front of the TV twice daily. Children who ate snacks or dinner while watching TV once daily or more had higher BMI compared to those who did so less than once daily ($p \leq 0.05$). Children from younger mothers, immigrants, smoking parents and mothers whose self-perceived health was poor were more likely to eat meals and snacks in front of the TV, as well as those from low SE families and mothers with no high school diploma ($p \leq 0.05$). Watching TV for >3 h/day was associated with meals/snacks in front of the TV ($p \leq 0.05$)

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Feldman et al, 2007. USA (27)	N = 4064 ethnically and socioeconomically diverse adolescents from 31 public middle and high schools in Minneapolis-St. Paul metropolitan area. Mean age 14.9 years (range 11 to 18) (N = 2022 females and 2042 males)	Cross sectional study – data from Project EAT, collected in 1998-1999.	Project EAT survey	149-item Youth/Adolescent Questionnaire	Intake of fruits, total vegetables, dark green/yellow vegetables, calcium-rich food, grains, soft drinks, fried food, snack food, calories, family meal frequency and watching TV during meals.	Socio-demographics, weekly hours spent watching TV, caloric intake	Boys and girls who ate family meals whilst watching TV ate fewer vegetables, including dark green/yellow vegetables, and calcium rich foods and more soft drinks than those who ate family meals without TV ($p < 0.001$) Fewer grains were consumed by children who ate family meals whilst watching TV compared to those who ate family meals without watching TV ($p < 0.001$ in boys and 0.020 in girls) Girls who ate family meals whilst watching TV ate more fried foods than girls who ate family meals without TV ($p < 0.001$). Not so significant effect for boys.
Fitzpatrick et al, 2007. USA (22)	N = 1,336 parent-child pairs from low-income households. Children's ages ranged from 1.0 to 4.9 years; mean age was 2.8 years. Sample was evenly divided between males and females.	Cross sectional study of care-givers participating in WIC in New York state between May - Dec 2000.	Self-administered survey (available in English or Spanish)	Self-administered survey (available in English or Spanish)	Frequencies of serving fruits, vegetables and milk	Race/ethnicity and parental education attainment	Number of days the TV was on during dinner was inversely associated with serving fruits (OR: 0.95, $p < 0.05$) and serving vegetables (OR: 0.94, $p < 0.01$). Number of days/week eating dinner as a family was positively associated with servings of fruit (OR: 1.14, $p < 0.001$) and vegetables (OR: 1.15, $p < 0.001$). However, having dinner as a family does not overcome the adverse effects of having the TV on during mealtimes.
Hare-Bruun et	N = 697 8-10 year old (382	Prospective cohort study	Computer based	Computer based	Effect of TV viewing on healthy food	Survey year, BMI z score, physical	More TV viewing was associated with lower healthy food preferences in all 8-

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al, 2011, Denmark (25)	female and 315 male) and; N = 495 14-16 year old (275 female and 220 male) school children in Odense, Denmark.	with cross-sectional analysis (Data from Danish part of European Youth Heart Study 1997-98 and 2003-04)	questionnaire developed for the EYHS	questionnaire developed for the EYHS and 24 hour recall with qualitative food record completed at home, face-to-face.	preferences and healthy food habits.	activity, maternal BMI, paternal BMI, SES.	10 year old girls (OR: -0.61 for 1-2 h/day and -1.06 for >2h/day, p ≤0.05), and boys (OR -1.12 for 1-2 h/day and -1.36 for >2h/day, p ≤0.001) and in 14-16 year old girls who watched >2h/day(OR: -0.94, p ≤0.05) Boys aged 8-10 years who watched TV during meals every day or most days had less healthy food preferences than those who rarely watched TV during meals (Or: -0.83, p ≤0.05). 8-10 year old girls who watched TV during meals 1-2 times per week had higher healthy food preferences than those who rarely watched TV during meals (OR: .068, p ≤0.05). Watching TV during meals most days or every day was associated with less healthy food habits in 8-10 year old girls (OR: -1.56, p ≤0.001), 14-16 year old girls (OR -1.24, p ≤0.001), and boys age 14-16 years (OR -2.04, p ≤0.0001)
Liang, Kuhle and Veugelers, 2009. Canada. (21)	N = 4,966 Grade 5 students (predominantly 10-11 years old). (No detail on gender)	Data taken from 2003 Children's Lifestyle and School Performance Study, a population-based study of	Questionnaire completed at home by parents, which collected information on socio-demographic	Slightly modified version of the Harvard Youth/Adolescent Food Frequency Questionnaire.	Effect of watching TV and of watching TV while eating supper on percentage of students concerning two or more servings of	Energy intake, child's gender, household income	Eating supper while watching TV is negatively associated with diet quality (OR: -3.46 in those who watched TV during supper ≥5 times/wk, 95% CI -4.32, -2.60) and positively associated with overweight (OR: 1.43 in highest quartile, 95% CI 1.14, 1.78).

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		grade 5 students and their parents in Nova Scotia.	factors and contained validated questions on their child's activities.		soft drinks weekly, percentage of energy from sugar out of CHO energy, percentage of energy from dietary fat, percentage of energy from snack foods and prevalence of overweight.		TV watching showed positive associations with consumption of ≥2 weekly servings of soft drinks (OR: 2.46 in highest quartile, 95% CI 1.54, 3.93), percentage of energy from CHO sugar (OR 1.21 in highest quartile, 95% CI 0.52, 1.89), percentage of energy from snacks (OR: 2.20 in highest quartile, 95% CI: 0.29, 4.10) and percentage of overweight (OR: 2.42 in highest quartile, 95% CI 1.54, 3.79). TV watching showed negative associations with daily servings of fruits and vegetables (OR: -0.08 in highest quartile, 95% CI -0.19, 0.03) and diet quality index (OR: -1.73 in highest quartile, 95% CI -3.35, -0.10). Effects of watching TV on percentage of energy from fat (OR: 0.17) and on diet quality index (-1.73) were less pronounced than those of supper in front of the TV on these nutritional indices (OR: 0.97 & -3.46 respectively).
Lissner et al, 2011 Sweden (20) **(IDEFICS data collected from: Italy, Estonia,**	N = 15,144. IDEFICS data – children aged between 2 and 9, recruited via their daycare centres or schools. (N =	Baseline data collected between Sept 2007 and June 2008, taken from IDEFICS study (2-year intervention study)	Parent questionnaire about children's lifestyles, diets and family circumstances. Physical examination	Children's Eating Habits Questionnaire (CEHQ) comprising FFQ relating to previous 4 weeks	BMI, propensity to consume high fat/sugar foods, taste preference (sweet/fat)	Model 1: country, parental education (as a measure of SE status), age and sex Model 2: previous covariates, plus	Eating while watching TV was associated with more high fat items (OR: 1.49 in highest quartile, CI: 1.34-1.65) and more high sugar items (OR: 1.93 in highest quartile, CI: 1.72-2.16) in proportion to total number of foods consumed.

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Cyprus, Belgium, Sweden, Germany, Hungary and Spain)	7436 females and 7708 males)		to characterise weight status and cardiometabolic health.			fat & sugar propensity ratios.	Eating while watching TV was significantly associated with overweight, with prevalence odds ratios of 1.20 for boys and 1.35 for girls (CI: 1.04-1.40 and 1.17-1.55 respectively). Watching 60 mins or more of TV per day was associated with overweight with OR of 1.20 in boy (CI: 1.05-1.38)s and 1.21 in girls (CI: 1.06-1.38).
Matheson et al, 2004. USA (24)	N = 90 third grade children aged 7.8-9.6 years (mean: 8.6 years) (N = 51 females and 39 males) and; N = 142 children aged 9.0 to 11.5 years (mean: 9.6 years) (N = 66 females and 76 males).	Baseline cross-sectional data collected in 1999-2000 from: Sample one: recruited from a school-based trial on reducing TV viewing. Sample two: drawn from a study of factors affecting children's dietary intake.	For each meal or snack children were asked whether they participated in any of the following activities while eating: watching TV, videotape, movie, played video games or on a computer, watched a movie at the theatre, did homework or reading or played inside/outside, were riding in	Three non-consecutive dietary recalls, including two weekdays and one weekend day. The first recall was conducted face-to-face and the remaining two recalls were collected over the telephone.	Description of the amounts and types of foods that children consume while watching TV, compare those times with the types consumed at other times of the day, and examine association between BMI and amounts and types of foods consumed during TV viewing.	Two samples were analysed separately. Weekend and week day data calculated separately.	Amongst 3rd grade children who ate whilst watching TV on weekdays, 0.07 servings of soda were consumed with the TV on compared to 0.36 with the TV off, 0.05 servings of fast food were consumed with the TV on compared to 0.35 with the TV off and 0.09 servings of veg were consumed with the TV on compared to 0.73 with the TV off. Amongst 5th grade children who ate whilst watching TV on weekdays, 0.39 servings of veg were consumed with the TV on compared to 2.07 with the TV off and 0.15 servings of sweets and snacks were consumed with the TV on compared to 0.58 with the TV off. In the weekday 3rd grade data, the correlation between children's BMI and % energy from fat consumed during TV viewing was significant (r = .025, p = 0.04).

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			a car van, bus or truck.				In the 3rd grade sample, 59% of snacks, were consumed during TV viewing on weekdays and 45% on weekends. In the 5th grade sample, 67% of snacks were consumed during TV viewing on weekdays and 45% on weekends. This was more frequent than meal consumption in front of the TV. More than one third of the children's dinners were consumed in front of the TV.
Rey-Lopez et al, 2011. (28)	N = 1,336 aged 12½ to 17½ years old. (N = 699 females and 637 males)	Data from HELENA cross-sectional study, collected Oct 2006 - Dec 2007. Data selected that had valid information from the sedentary behaviour questionnaire and only data from Ghent, Heraklion, Pecs and Zaragoza was included, since other cities that took part in the HELENA CSS did not examine food	Self-reported sedentary behaviour questionnaire taken by the children at school, which included questions about habitual TV viewing time and concurrent food choices.	Self-reported sedentary behaviour questionnaire taken by the children at school, which included questions about habitual TV viewing time and concurrent food choices.		Family affluence, parental occupation, parental education	Energy dense dietary choices during TV viewing were more likely in boys who watched TV >2h/day (OR: 1.88, 95%CI 1.15, 3.08) and in girls who watched TV >2h/day (OR: 1.58, 95% CI 1.15, 2.17) Compared to boys who watched TV for ≤2h/day, boys who watched >2h/d had more frequent consumption of: • Soft drinks (p = 0.001) • Pastry (p = 0.004) • Sandwiches (p = 0.004) • Savoury (p = 0.006) • Sweets (p = 0.04) Compared to girls who watched TV for ≤2h/day, girls who watched >2h/d had more frequent consumption of: • Fruit juice (p = 0.02) • Soft drinks (p = <0.001) • Beer (p = 0.03) • Coffee (p = 0.03) • Pastry (p = 0.04) • Sweets (p = <.001)

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		consumption during sedentary behaviours.					• Sandwiches (p = 0.002) Girls whose mothers achieved a low educational level had an increased risk of consumption of energy-dense drinks during TV viewing (OR: 3.22, 95% CI 1.81, 5.72) compared with those whose mothers attained the highest education. Girls with low family affluence status were more likely to consume energy-dense drinks during TV viewing; this association was less when paternal occupation and education were tested (OR: 2.03, 95% CI 1.19, 3.47).
Verzeletti et al, 2009. Italy (29)	N = 14,407 adolescents between 11 and 16 years of age; N = 7904 from Belgium (N = 3991 females and 3913 males) and; N = 6503 from the Veneto region of Italy (N = 3253 females and 3250 males).	Cross sectional study on data from the 2005-2006 HBSC survey.	Questionnaire with questions on family food rules and food related family lifestyles.	Questionnaire with questions on family food rules and food related family lifestyles.	Daily fruit and vegetable intake	SES	After controlling for variables, there was no association between having a daily meal while watching TV and daily fruit and vegetable intake. Findings suggest that heavy TV viewing behaviours may be associated with lower fruit and vegetable intake among adolescents but also that the hours of TV viewing are more important than the habit of watching TV during meals for these outcome variables.