Maternal diet in pregnancy and child's respiratory outcomes: an individual participant data meta-analysis of 18,000 children

SUPPORTING INFORMATION

Figure S3 Associations of maternal DASH score with child's respiratory outcomes assessed by a two-stage IPD meta-analysis

SUPPLEMENTAL METHODS

This meta-analysis was performed among seven European prospective birth cohorts participating in the ALPHABET consortium, which aims to examine the early-life nutritional programming of non-communicable diseases [S1, S2]. The birth cohorts were the Avon Longitudinal Study of Parents and Children (ALSPAC) from the United Kingdom [S3, S4], the study on the pre- and early postnatal determinants of child health and development (EDEN) from France [S5], the Generation R Study (Generation R) from The Netherlands [S6], the Lifeways Cross-Generation Cohort Study (Lifeways) from Ireland [S7], the Polish Mother and Child Cohort (REPRO_PL) [S8] from Poland and the Southampton Women's Survey (SWS) from the United Kingdom [S9], which were observational birth cohorts, and the Randomised cOntrol trial of LOw glycaemic index diet versus no dietary intervention to prevent recurrence of fetal macrosomia study (ROLO) from Ireland [S10], which was originally a randomized controlled trial. Participants from both the intervention and non-intervention arm of this study were included for the main analyses. All participating cohorts obtained ethical approval from their local institutional review boards.

We included 23,466 singleton children with information on maternal dietary scores. To avoid extreme misreporting, participants with a likely implausible maternal energy intake (<500 or >3,500 kcal per day) (n=353), were excluded based on the availability of data in the ALPHABET consortium and according to a commonly used cut-off [S2, S11]. Furthermore, children with missing information on respiratory outcomes (n=4,787) were excluded, resulting in 18,326 mother-child pairs for the current analyses.

Maternal diet Information on maternal dietary intake was obtained from food frequency questionnaires (FFQs) (Table S1). All FFQs were adapted to the country-specific diet and validated, except for the ALSPAC cohort that uses a FFQ which covers all the main foods consumed in Britain but has not formally been validated [S12-S18]. To control for the effect of the total energy intake the E-DII, calculated per 1,000 kilocalories (kcal) of food consumed, was used instead of the standard DII (Dietary Inflammatory Index) score. Briefly, for the E-DII score, the food parameters for each cohort were linked to a regionally representative world database. This database was constructed based on eleven datasets from populations from different regions of the world and provides a global mean and standard deviation for each food parameter per 1000 kcal included in the E-DII score [S19]. A z-score was created by subtracting the “energy-adjusted standard global mean” from the amount reported and by dividing this value by the standard deviation. To calculate a food parameter-specific E-DII score, the obtained z-score for each food parameter was converted to a proportion and centered on zero by doubling and subtracting 1, then multiplied by its respective parameter-specific inflammatory effect score based on literature. These scores were summed up to create the overall E-DII score for each participant. When a parameter was not available, this parameter was imputed as missing. Based on the availability of the dietary parameters in each cohort, the E-DII was generated from 20-28 dietary parameters, out of 44 possible parameters (Table S2). Energy was not included in the score since the E-DII was adjusted for it. A higher E-DII score characterizes a more pro-inflammatory diet [S19, S20]. For the seven cohorts in the ALPHABET project, a DASH score was generated in a harmonized way and adapted to the length and content of the FFQs used in the different cohorts (Table S2) [S2]. This score was composed of eight food components, based mainly on the Fung method with a scoring system based on quintile rankings in each cohort [S2, S21]. An item not filled in was imputed with zero. For intakes of total grains, vegetables, fruits, non-full-fat dairy products, and nuts/seeds/legumes, women received a score from 1 (lowest quintile) to 5 (highest quintile). At the opposite, for intakes of red and processed meats, sugar-sweetened beverages/sweets/added sugars, and sodium, women were scored on a reverse scale. The food component scores were summed to calculate an overall DASH score for each participant. A lower DASH score characterizes a lower dietary quality.

Respiratory health The ALSPAC study collected lung function data at multiple time points, and we used the measurement closest to the mean age at lung function measurement of the children of other cohorts for this meta-analysis. Five cohorts (ALSPAC, EDEN, Generation R, REPRO_PL and SWS) had information on preschool wheezing and school-age lung function. All cohorts had information on school-age asthma.

Covariates Information on lifestyle and sociodemographic related confounders, intermediates and effect modifiers was mainly obtained by questionnaires or clinical examinations at the research center (Table S1), and included maternal energy intake (kcal), pre-pregnancy or early-pregnancy body mass index (BMI) according to World Health Organization cut-offs (underweight, normal weight, overweight, obesity), educational level (low, medium, high), birthplace/ethnic background (European, non-European), smoking during pregnancy (no, yes), parity (nulliparous, multiparous), history of asthma (no, yes), and child’s sex (boy, girl), gestational age at birth (weeks), birthweight (grams), whether the child was ever breastfed (no, yes), attended daycare (no, yes), was exposed to pets (no, yes), or to dampness in the house (no, yes), had lower respiratory tract infections at the age of 2 years (no, yes), and about child's inhalant allergic sensitization obtained by skin prick tests (no, yes) and BMI in childhood. All cohorts, except for the EDEN cohort, had information available on child's dietary intake. This information was collected by using parental-reported questionnaires developed to capture foods eaten by children, and child's E-DII score was calculated according to a validated method (Table S2) [S22].

Statistical analyses Model 1 (basic model) was adjusted for maternal energy intake (only with DASH as the exposure) and child's sex. Model 2 (confounder model) was additionally adjusted for lifestyle-related confounders including maternal BMI, smoking during pregnancy, whether the child was ever breastfed, and socio-demographic factors including maternal educational level, birthplace/ethnic background and parity. Confounders were selected based on previous knowledge and visualised in a directed acyclic graph (DAG) by using DAGitty version 2.3 (Figure S1). We included variables in our models that were identified by the DAG. Consequently, child's daycare attendance, pet keeping and dampness in the house were not included in our models. To prevent exclusion of non-complete cases, we categorized all covariates and defined the missing values as an additional category.

We considered the linear confounder models as the main models and applied several additional analyses to these models. First, for the consistent associations, we additionally adjusted for potential intermediates gestational age at birth and birthweight, lower respiratory tract infections, child's BMI and, only for the models with maternal E-DII as exposure, for child's E-DII score. The percentage of the total effect that was explained by intermediates with the corresponding 95% confidence interval (CI) was calculated by using causal mediation analysis implemented in R [S23]. Second, to examine effect modification due to atopic predisposition factors (maternal history of asthma or child's inhalant allergic sensitisation) or child's sex, we added the product term of the potential effect modifier and E-DII or DASH score to the model, one at a time. Third, we performed two-stage random effect meta-analyses to study the associations of maternal diet with respiratory outcomes in each cohort and to test for heterogeneity between cohorts [S24]. Fourth, we performed several restrictive analyses. Because of the potential effect of the timing in pregnancy of an adverse maternal diet on child's respiratory outcomes and of the age of the children when adequate lung function measures on a population-based level could be performed, we repeated the analyses in groups of different time periods in pregnancy (early, mid, late) and ages of the children (<8 and ≥8 years). We repeated our analyses restricted to complete cases to explore differences between complete and non-complete cases. Also, we repeated our models restricted to mothers with a European birthplace/ethnic background, since the FFQs were mainly developed for a European population. Last, to determine the influence of any particular population, we left one cohort out at a time.

REFERENCES

1. Phillips CM, Chen LW, Heude B, et al. Dietary Inflammatory Index and Non-Communicable Disease Risk: A Narrative Review. *Nutrients* 2019: 11(8).

2. Aubert AM, Forhan A, de Lauzon-Guillain B, et al. Deriving the Dietary Approaches to Stop Hypertension (DASH) Score in Women from Seven Pregnancy Cohorts from the European ALPHABET Consortium. *Nutrients* 2019: 11(11).

3. Fraser A, Macdonald-Wallis C, Tilling K, et al. Cohort Profile: the Avon Longitudinal Study of Parents and Children: ALSPAC mothers cohort. *Int J Epidemiol* 2013: 42(1): 97-110.

4. Boyd A, Golding J, Macleod J, et al. Cohort Profile: the 'children of the 90s'--the index offspring of the Avon Longitudinal Study of Parents and Children. *Int J Epidemiol* 2013: 42(1): 111-127.

5. Heude B, Forhan A, Slama R, et al. Cohort Profile: The EDEN mother-child cohort on the prenatal and early postnatal determinants of child health and development. *Int J Epidemiol* 2016: 45(2): 353-363.

6. Kooijman MN, Kruithof CJ, van Duijn CM, et al. The Generation R Study: design and cohort update 2017. *Eur J Epidemiol* 2016: 31(12): 1243-1264.

7. O'Mahony D, Fallon UB, Hannon F, et al. The Lifeways Cross-Generation Study: design, recruitment and data management considerations. *Ir Med J* 2007: 100(8): suppl 3-6.

8. Polanska K, Hanke W, Krol A, et al. Polish Mother and Child Cohort Study (REPRO_PL) - Methodology of the follow-up of the children at the age of 7. *Int J Occup Med Environ Health* 2016: 29(6): 883-893.

9. Inskip HM, Godfrey KM, Robinson SM, et al. Cohort profile: The Southampton Women's Survey. *Int J Epidemiol* 2006: 35(1): 42-48.

10. Walsh JM, McGowan CA, Mahony R, et al. Low glycaemic index diet in pregnancy to prevent macrosomia (ROLO study): randomised control trial. *Bmj* 2012: 345: e5605.

11. Rhee JJ, Sampson L, Cho E, et al. Comparison of methods to account for implausible reporting of energy intake in epidemiologic studies. *Am J Epidemiol* 2015: 181(4): 225-233.

12. Rogers I, Emmett P. Diet during pregnancy in a population of pregnant women in South West England. ALSPAC Study Team. Avon Longitudinal Study of Pregnancy and Childhood. *Eur J Clin Nutr* 1998: 52(4): 246-250.

13. Deschamps V, de Lauzon-Guillain B, Lafay L, et al. Reproducibility and relative validity of a food-frequency questionnaire among French adults and adolescents. *Eur J Clin Nutr* 2009: 63(2): 282-291.

14. Voortman T, Steegers-Theunissen RPM, Bergen NE, et al. Validation of a Semi-Quantitative Food-Frequency Questionnaire for Dutch Pregnant Women from the General Population Using the Method or Triads. *Nutrients* 2020: 12(5).

15. Murrin C, Shrivastava A, Kelleher CC, et al. Maternal macronutrient intake during pregnancy and 5 years postpartum and associations with child weight status aged five. *Eur J Clin Nutr* 2013: 67(6): 670-679.

16. Wesołowska E, Jankowska A, Trafalska E, et al. Sociodemographic, Lifestyle, Environmental and Pregnancy-Related Determinants of Dietary Patterns during Pregnancy. *Int J Environ Res Public Health* 2019: 16(5).

17. Horan MK, McGowan CA, Doyle O, et al. Well-being in pregnancy: an examination of the effect of socioeconomic, dietary and lifestyle factors including impact of a low glycaemic index dietary intervention. *Eur J Clin Nutr* 2014: 68(1): 19-24.

18. Robinson S, Godfrey K, Osmond C, et al. Evaluation of a food frequency questionnaire used to assess nutrient intakes in pregnant women. *Eur J Clin Nutr* 1996: 50(5): 302-308.

19. Shivappa N, Steck SE, Hurley TG, et al. Designing and developing a literature-derived, population-based dietary inflammatory index. *Public Health Nutr* 2014: 17(8): 1689-1696.

20. Shivappa N, Steck SE, Hurley TG, et al. A population-based dietary inflammatory index predicts levels of C-reactive protein in the Seasonal Variation of Blood Cholesterol Study (SEASONS). *Public Health Nutr* 2014: 17(8): 1825-1833.

21. Fung TT, Rimm EB, Spiegelman D, et al. Association between dietary patterns and plasma biomarkers of obesity and cardiovascular disease risk. *Am J Clin Nutr* 2001: 73(1): 61-67.

22. Khan S, Wirth MD, Ortaglia A, et al. Design, Development and Construct Validation of the Children's Dietary Inflammatory Index. *Nutrients* 2018: 10(8).

23. Imai K, Keele L, Tingley D. A general approach to causal mediation analysis. *Psychol Methods* 2010: 15(4): 309-334.

24. Debray TP, Moons KG, Abo-Zaid GM, et al. Individual participant data meta-analysis for a binary outcome: one-stage or two-stage? *PLoS One* 2013: 8(4): e60650.

Table S1. Data collection on maternal diet and child's respiratory outcomes per cohort.

	Maternal E-DII and DASH			Child's respiratory outcomes			Covariates
Cohort name (country)	**Method**	**Total of food items in FFQ**	**Assessed period**	**Preschool wheezing**	**Spirometry**	**School-age asthma**	
ALSPAC (United Kingdom)	Non-quantitative FFQ	43	Preceding 3 months	Annual questionnaires to mother from 6 months to 42 months	Vitalograph 2120 hand-held spirometer (Spirotrac IV, Vitalograph, UK), according to ATS/ERS protocol	Questionnaire, parental report of doctor diagnosis at age 8 years	Questionnaires at 18 and 32 weeks gestation and annually from 6 months of age. At age 7 years, BMI was measured and skin prick tests were used to measure inhalant allergic sensitization.
EDEN (France)	Semi-quantitative FFQ	137	Preceding year	ISAAC based questionnaire at 4, 8, 12 months, 2 years, 3 years, 4years	Spirobank G (Medical International Research, Rome, Italy), according to ATS/ERS protocol	Parent reported questionnaire at 5 and 8 years on ever doctor-diagnosed asthma	Questionnaires and clinical exams during pregnancy and at 1, 3 and 5 years of age

Generation R (The Netherlands)	Semi-quantitative FFQ	293	Preceding 3 months	ISAAC based questionnaire, age 1, 2, 3 and 4 years: Has your child ever suffered from a whistling noise in the chest?	MS-Pneumo, (Vyaire, Würzburg, Germany), according to ATS/ERS protocol	ISAAC based questionnaire, physician diagnosed asthma ever, age 9 years	Questionnaires 1st - 3rd trimester of pregnancy, and at age 1-4, 6 and 9 years. At age 9 years, BMI was measured and skin prick tests were used to measure inhalant allergic sensitization.
Lifeways (Ireland)	Semi-quantitative FFQ	158	First 12-16 weeks of pregnancy	NA	NA	Asthma diagnosed between age 5 and age 9 years was reported by the general practitioner	Baseline questionnaire at ante-natal stage, mother and baby hospital records, questionnaires age 5 and 10 years, and measurements age 10 years.
REPRO_PL (Poland)	Non-quantitative FFQ	66	Preceding 3 months	ISAAC based questionnaire, age 1 and at 2 years: Has you	Jaeger MasterScreen Body/Diffusion (Viasys,	ISAAC based questionnaire at age 7-8 years, parental report	Questionnaires 1st, 2nd and 3rd trimester of pregnancy, age 1

				child ever suffered from a whistling noise in the chest?	Hoechberg, Germany). According to ATS/ERS protocol.	of ever doctor-diagnosed asthma	year, age 2 years and age 7-8 years. At age 7 years, BMI was measured and skin prick tests were used to measure inhalant allergic sensitization.
ROLO (Ireland)	Semi-quantitative FFQ	158	Preceding 3 months	NA	NA	Maternal reported doctor-diagnosed asthma at age 5 years	Baseline questionnaire at ante-natal stage, mother and baby hospital records, questionnaires and measurements at age 5 years

SWS (United Kingdom)	Non-quantitative FFQ	104	Preceding 3 months	ISAAC-based questionnaire at 6, 12 and 36 months of life: Has your child had any episodes of chestiness associated with wheezing or whistling in his/her chest? (includes wheezy bronchitis, asthma)	Koko spirometer and incentive software (KoKo version 4; PDS Instrumentation ; Louisville, CO, USA) . According to ATS/ERS protocol but without noseclips.	ISAAC based questionnaire, physician diagnosed asthma ever, age 5 years. ICPC codes reported by the GP	Questionnaires at 11 and 34 weeks gestation and at 6, 12 and 36 months of life. At age 6-7 years, BMI was measured and skin prick tests were used to measure inhalant allergic sensitization.

Food frequency questionnaire (FFQ); International Study on Asthma and Allergy in Childhood (ISAAC); American Thoracic Society/ European Respiratory Society (ATS/ERS); not available (NA)

Table S2. Cohort specific information on the food items included in the dietary scores

	ALSPAC (United Kingdom)	EDEN (France)	Generation R (The Netherlands)	Lifeways (Ireland)	REPRO_PL (Poland)	ROLO (Ireland)	SWS (United Kingdom)
Maternal E-DII score							
Total parameters	28	25	20	28	28	28	24
Food parameters	Beta Carotene, Folic Acid, Vitamin A, Alcohol, Carbohydrate, Cholesterol, Fat, Fiber, Iron, Magnesium, Monounsaturated fatty acids, Niacin, Protein, Polyunsaturated fatty acids, Riboflavin, Saturated fat, Selenium, Thiamin, Vitamin B12, Vitamin B6, Vitamin C, Vitamin D, Vitamin E, Zinc, Tea, Caffeine, Omega 3, Trans Fat	Beta Carotene, Folic Acid, Vitamin A, Alcohol, Carbohydrate, Cholesterol, Fat, Fiber, Iron, Magnesium, Monounsaturated fatty acids, Niacin, Protein, Polyunsaturated fatty acids, Riboflavin, Saturated fat, Thiamin, Vitamin B12, Vitamin B6, Vitamin C, Vitamin D, Vitamin E, Tea, Omega 3, Omega 6	Alcohol, Carbohydrate, Cholesterol, Fat, Fiber, Iron, Magnesium, Monounsaturated fatty acids, Protein, Polyunsaturated fatty acids, Riboflavin, Saturated fat, Vitamin B6, Vitamin C, Zinc, Garlic, Onion, Tea, Caffeine, Omega 6	Beta Carotene, Folic Acid, Vitamin A, Alcohol, Carbohydrate, Cholesterol, Fat, Fiber, Iron, Magnesium, Monounsaturated fatty acids, Niacin, Protein, Polyunsaturated fatty acids, Riboflavin, Saturated fat, Selenium, Thiamin, Vitamin B12, Vitamin B6, Vitamin C, Vitamin D, Vitamin E, Zinc, Garlic, Onion, Tea, Caffeine	Beta Carotene, Folic Acid, Vitamin A, Alcohol, Carbohydrate, Cholesterol, Fat, Fiber, Iron, Magnesium, Monounsaturated fatty acids, Niacin, Protein, Polyunsaturated fatty acids, Riboflavin, Saturated fat, Selenium, Thiamin, Vitamin B12, Vitamin B6, Vitamin C, Vitamin D, Vitamin E, Zinc, Tea, Caffeine, Omega 3, Omega 6	Beta Carotene, Folic Acid, Vitamin A, Alcohol, Carbohydrate, Cholesterol, Fat, Fiber, Iron, Magnesium, Monounsaturated fatty acids, Niacin, Protein, Polyunsaturated fatty acids, Riboflavin, Saturated fat, Selenium, Thiamin, Vitamin B12, Vitamin B6, Vitamin C, Vitamin D, Vitamin E, Zinc, Garlic, Onion, Tea, Caffeine	Beta Carotene, Folic Acid, Vitamin A, Alcohol, Carbohydrate, Cholesterol, Fat, Fiber, Iron, Magnesium, Monounsaturated fatty acids, Niacin, Protein, Polyunsaturated fatty acids, Riboflavin, Saturated fat, Vitamin B12, Vitamin B6, Vitamin C, Vitamin D, Vitamin E, Zinc, Onion, Tea
Child's E-DII score							

Assessment method	FFQ	NA	FFQ	FFQ	24-hour dietary recall	FFQ	FFQ
Assessment age	8.5 years	NA	8 years	5 years	7 years	5 years	3 years
Total parameters	23	NA	15	23	23	23	19
Food parameters	Beta Carotene, Folic Acid, Vitamin A, Alcohol, Carbohydrate, Cholesterol, Fat, Fiber, Iron, Magnesium, Monounsaturated fatty acids, Niacin, Protein, Polyunsaturated fatty acids, Riboflavin, Saturated fat, Selenium, Thiamin, Vitamin B12, Vitamin B6, Vitamin C, Vitamin E, Zinc		Cholesterol, Fat, Fiber, Iron, Magnesium, Niacin, Protein, Riboflavin, Saturated fat, Selenium, Vitamin B12, Vitamin B6, Vitamin C, Vitamin D, Zinc	Beta Carotene, Folic Acid, Vitamin A, Alcohol, Carbohydrate, Cholesterol, Fat, Fiber, Iron, Magnesium, Monounsaturated fatty acids, Niacin, Protein, Polyunsaturated fatty acids, Riboflavin, Saturated fat, Selenium, Thiamin, Vitamin B12, Vitamin B6, Vitamin C, Vitamin E, Zinc	Beta Carotene, Folic Acid, Vitamin A, Alcohol, Carbohydrate, Cholesterol, Fat, Fiber, Iron, Magnesium, Monounsaturated fatty acids, Niacin, Protein, Polyunsaturated fatty acids, Riboflavin, Saturated fat, Selenium, Thiamin, Vitamin B12, Vitamin B6, Vitamin C, Vitamin E, Zinc	Beta Carotene, Folic Acid, Vitamin A, Alcohol, Carbohydrate, Cholesterol, Fat, Fiber, Iron, Magnesium, Monounsaturated fatty acids, Niacin, Protein, Polyunsaturated fatty acids, Riboflavin, Saturated fat, Selenium, Thiamin, Vitamin B12, Vitamin B6, Vitamin C, Vitamin E, Zinc	Folic Acid, Vitamin A, Carbohydrate, Cholesterol, Fat, Fiber, Iron, Magnesium, Monounsaturated fatty acids, Niacin, Protein, Riboflavin, Saturated fat, Thiamin, Vitamin B12, Vitamin B6, Vitamin C, Vitamin E, Zinc
Maternal DASH score							
Total grains	7 Rice; Pasta; Oat cereals; Wholegrain or bran cereals; Other cereals; Crispbreads; Bread or rolls or chappatis	7 Bread; Whole bread or special bread; Rusk or equal; Cereals; Pasta; Rice; Semolina or Wheat	20 White pasta; Whole grain pasta; Cereal products; White rice; Brown rice; Seitan; White bread; Wholegrain bread; Multigrain bread; Muesli bread; White baguette; Wholegrain baguette; Dutch cake; Rye bread; Muesli; Cornflakes;	14 White bread; Brown bread; Wholemeal bread; Crisp bread; Brown soda; All bran; Branflakes; Cornflakes; Muesli; Sugar coated cereals; White rice; Brown rice; White green pasta; Wholemeal pasta	5 White bread; Whole bread; Groats; Rice or pasta; Cereal	14 White bread; Brown bread; Wholemeal bread; Crisp bread; Brown soda; All bran; Branflakes; Cornflakes; Muesli; Sugar coated cereals; White rice; Brown rice; White green pasta; Wholemeal pasta	8 White bread; Brown or wholemeal bread; Wholemeal or rye crackers; 'Bran' breakfast cereals; Other breakfast cereals; Added bran to foods; Brown or white rice; Pasta or dumplings

			Oatmeal; Whole cereal; Bran; Wheat germ				
Vegetables (excluding potatoes and condiments)	5	16	33	24	12	24	16
	Cabbage or brussels sprouts or kale or other green leafy vegetables; Other green vegetables (cauliflower, runner beans, leeks, etc.); Carrots; Other root vegetables (turnip, swede, parsnip, etc.); Salad (lettuce, tomato, cucumber, etc.)	Raw vegetables: Salad or endive or cress or spinach; Grated carrot; Other raw vegetables (celery, tomato, beet, cabbage, cucumber, radish, etc.); Avocado; Raw soybeans Cooked vegetables: Green beans; Endive or spinach or watercress; Leeks or cabbage (green cabbage, cauliflower, brussels sprouts, etc.); Broccoli; Cooked carrots; Courgette or eggplant (ratatouille, etc.); green peas; Other cooked vegetables (turnip, chards, etc.); Vegetable soup; Sweetcorn; Pumpkins or sweet potato	Raw vegetables: Kool; Endive salad; Winter carrot; Root or carrot; Endive or spinach; Lettuce; Cucumber; Celery. Cooked vegetables: Cauliflower; Broccoli; Brussels sprouts or cabbage; Beetroot; Chard; Green beans or snow peas; Garden peas or broad beans; Sweetcorn; Endive chicory; Leek; Endive or spinach; Mixed stir-fry vegetables; Carrots or stew; Kale; Sauerkraut. Vegetables for family/household: Onion; Tomato; Zucchini; Mushrooms; Bean sprouts; Paprika; Eggplant.	Carrots; Spinach; Broccoli; Brussel sprouts; Cabbage; Peas; Green beans; Marrow; Cauliflower; Parsnips; Leeks; Onions; Mushrooms; Sweet peppers; Bean sprouts; Green salad; Cucumber or celery; Watercress; Tomatoes; Beetroot; Coleslaw; Avocado; Vegetable soup; Sweetcorn	Carrot or root parsley; Beetroot; Lettuce; Tomato; Cucumber; Pepper; Radish; Onions or garlic; Cauliflower or broccoli or cabbage; Mushrooms; Other vegetables; Vegetable juice.	Carrots; Spinach; Broccoli; Brussel sprouts; Cabbage; Peas; Green beans; Marrow; Cauliflower; Parsnips; Leeks; Onions; Mushrooms; Sweet peppers; Bean sprouts; Green salad; Cucumber or celery; Watercress; Tomatoes; Beetroot; Coleslaw; Avocado; Vegetable soup; Sweetcorn.	Tinned vegetables; Peas or green beans; Carrots; Parsnips or swede or turnip; Sweetcorn or mixed vegetables; Tomatoes; Spinach; Broccoli or brussels sprouts or spring greens; Cabbage or cauliflower; Peppers or watercress; Onion; Green salad; Side salads in dressing; Courgettes or marrow or leeks; Mushrooms; Vegetable dishes

			Other parts: Avocado; Side dish vegetables; Tomato juice or vegetable juice.				
Fruits	3 Fresh fruit (apple, pear, banana, orange, bunch of grapes, etc.); Tinned juice; Pure juice not in tin	12 Apricot or melon or mango; Peach or plum or cherry; Banana; Kiwi; Citrus (orange, mandarin, grapefruit, etc.); Apple or pear; Grape; Other fresh fruits (pineapple); Dried apricot or peach; Other dried fruits; Fruit juice (orange, grapefruit, pineapple, apple, grape)	20 Mandarin; Orange or grapefruit; Lemon or lime; Banana; Kiwi; Apple; Pear; Mango; Peaches or nectarines; Apricots; Plums; Strawberries or raspberries; Grapes or cherries; Pineapple or melon; Canned fruit; Orange juice or grapefruit juice from the pack; Other fruit juices from the pack; Fruit juices prepared yourself; Dried fruits; Dried plums	13 Apples; Pears; Oranges; Grapefruit; Bananas; Grapes; Melon; Peaches; Strawberries; Tinned fruit; Pure juice; Dried fruit; Fruit squash	10 Apples; Pears; Plums; Strawberries or raspberries; Cherries; Mandarins or oranges or grapefruit or kiwi; Peaches or apricots; Bananas; Other fruits; Fruit juice	13 Apples; Pears; Oranges; Grapefruit; Bananas; Grapes; Melon; Peaches; Strawberries; Tinned fruit; Pure juice; Dried fruit; Fruit squash	12 Tinned fruit; Cooked fruit; Dried fruit; Apples or pears; Oranges or orange juice; Grapefruit or grapefruit juice; Blackcurrants or ribena or hi-juice blackcurrant drinks; Other fruit juices (not squashes); Bananas; Peaches or plums or cherries or grapes; Strawberries or raspberries; Pineapple or melon or kiwi fruit or other tropical fruit
Non-full-fat dairy products	3 Semi-skimmed milk; Skimmed milk; Dried milk	6 Semi-skimmed milk; skimmed milk; Sour cream or yoghurt 0% fat; Sour cream or yoghurt 20%, 30%, 40% fat;	18 Semi-skimmed milk. Skimmed milk; Buttermilk; Drink yoghurt (natural/ without detail/ with sweeteners/ light);	7 Low-fat yoghurt; Low-fat cheddar; Low-fat milk; Skimmed milk; High low milk; Buttermilk; Dried milk	2 Milk; Yoghurt or kefir or buttermilk	7 Low-fat yoghurt; Low-fat cheddar; Low-fat milk; Skimmed milk; High low milk; Buttermilk; Dried milk	5 Yoghurt or fruit fools; Semi-skimmed pasteurised milk; Skimmed pasteurised milk; Semi-skimmed UHT; Skimmed UHT

		Yoghurt; Low-fat fresh cream	Yoghurt (semi-skimmed natural/ semi-skimmed with fruits/ skimmed natural/ skimmed with fruits/ skimmed with fruits and sweeteners); Cottage cheese (semi-skimmed natural/ semi-skimmed with fruits/ skimmed natural/ skimmed with fruits/ skimmed with fruits and sweeteners/ light); Low-fat cheese				
Nuts, seeds, legumes	7 Baked beans; Peas or sweetcorn or broad beans; Pulses or dried peas or beans or lentils or chick peas; Nuts or nut roast; Bean curd; Tahini; Soya 'meat' or TVP or vegaburgers	4 Nuts, hazelnut, almonds; Legumes (lentils, white bean, chickpea, beans, etc.); Cooked soy; Peanut	14 Legumes; Lentil soup; Lentils; Cooked soy; Tofu or tahoe; Tempeh; Nuts; Peanut butter or nut paste; Tahin (sesame paste); Sunflower seed; Pine nut; Linseed; Peanuts or nuts cocktail; Other nuts	5 Baked beans; Dried lentils; Tofu; Peanuts; Peanut butter	2 Legumes (soybeans, beans, peas, etc.); Seeds or nuts	5 Baked beans; Dried lentils; Tofu; Peanuts; Peanut butter	2 Beans or pulses; Nuts
Red and Processed meat	4	12	20	17	4	17	10

	Sausages or burgers; Pies or pasties (pork pie, steak/meat pie, etc.); Meat (beef, lamb, pork, ham, bacon, etc.); Liver or liver pate or kidney or heart	Beef (except chopped steak); Chopped steak; Pork; Veal; Lamb or ship; Liver (heifer, poultry, etc.); Beef tongue or black pudding, etc.; Dry sausage; Cervelas or mortadella; Pate or rillettes; Ham or bacon; Sausage	Meat: Beef or calf's liver; Veal; Steak or roast beef or tartar; Beef rump or ground beef; Smoked sausage; Half-to-half minced; Pork liver; Cop or pork; Bacon; Sausage or hamburger or minced pork; Pork; Mutton: Horse meat; Lamb; Shoarma meat; Frikandel or croquette. Salty snacks: Frikandel or croquette; Crunchy sausage; Satay or bitterballen or meatball; Slice of sausage meat	Beef roast; Beef steak; Beef mince; Beef stew; Beef burgers; Pork roast; Pork chops; Pork slices; Lamb roast; Lamb chops; Lamb stew; Bacon; Ham; Corned beef; Sausages; Liver; Pate.	Meat (beef, pork, veal); Liver; Other offal; Cooked meats	Beef roast; Beef steak; Beef mince; Beef stew; Beef burgers; Pork roast; Pork chops; Pork slices; Lamb roast; Lamb chops; Lamb stew; Bacon; Ham; Corned beef; Sausages; Liver; Pate	Bacon or gammon; Pork; Lamb; Beef; Minced meat dishes; Liver or kidney; Pate or liver sausage; Faggots or black pudding; Sausages; Ham or luncheon meat
Sugar-sweetened beverages, sweets, and added sugars	5	8	11	5	1	5	5
	Sweets; Soft drink; Cola; Spoons of sugar in tea; Spoons of sugar in coffee	Honey or jam or marmalade; Sugar (in coffee, yoghurt, etc.); Candies; Drink syrup; Cola "non-light"; Lemonade or soft drinks "non-	Honey or sugar or jam; Apple syrup; Ice cream or milkshake; Soft drink (not light); Lemonade syrup; Liquorice; Candy;	Sweets; Sugar; Soft drinks; Ice cream; Jam or marmalade	Candy or cake or biscuits.	Sweets; Sugar; Soft drinks; Ice cream; Jam or marmalade	Coke or Pepsi; Soft drinks not including diet drinks (low calorie or low sugar); Other sweets; Ice cream or chocolate

		light"; Ice cream; Ice sorbet.	Rosehip syrup; Added sugar in dairy products; Added sugar in coffee; Added sugar in tea.				desserts; Teaspoons of sugar added
Sodium	Available in grams/day	Available in grams/day	Available in grams/day	Available in grams/day	Available in grams/day	Available in grams/day	Available in grams/day

Food frequency questionnaire (FFQ), Not available (NA).

Table S3. Maternal related baseline characteristics of cohorts

	ALSPAC (United Kingdom)	EDEN (France)	Generation R (The Netherlands)	Lifeways (Ireland)	REPRO_PL (Poland)	ROLO (Ireland)	SWS (United Kingdom)
Maternal BMI							
Underweight	0.2 (15)	7.0 (59)	3.3 (141)	2.5 (5)	8.5 (44)	0.7 (2)	1.3 (27)
Normal weight	38.5 (3,500)	65.4 (547)	69.4 (2,955)	69.5 (141)	73.0 (376)	48.0 (144)	56.4 (1,144)
Overweight	44.6 (4,047)	18.0 (151)	19.2 (816)	21.7 (44)	14.0 (72)	34.3 (103)	28.1 (570)
Obesity	16.8 (1,522)	9.6 (80)	8.1 (343)	6.4 (13)	4.5 (23)	17.0 (51)	14.2 (287)
Missing	*10.3 (1,046)*	*0.7 (6)*	*0.2 (8)*	*9.4 (21)*	*1.5 (8)*	*0.3 (1)*	*0.7 (14)*
Educational level							
Low	17.4 (1,759)	3.7 (31)	5.3 (218)	0.4 (1)	2.7 (14)	0.0 (0)	39.0 (794)
Middle	68.6 (6,920)	18.3 (154)	40.1 (1,664)	35.0 (78)	27.9 (146)	18.1 (54)	37.5 (763)
High	13.9 (1,403)	78.0 (657)	54.6 (2,267)	64.6 (144)	69.4 (363)	81.9 (245)	23.5 (479)
Missing	*0.5 (48)*	*0.1 (1)*	*2.7 (114)*	*0.4 (1)*	*0.0 (0)*	*0.7 (2)*	*0.3 (6)*

Birthplace/ethnic background, European	98.0 (9,932)	98.1 (783)*	72.2 (3,060)	100 (224)	100 (523)	99 (298)	96.8 (1,977)
Missing	*0.0 (0)*	*5.3 (45)*	*0.6 (24)*	*0.0 (0)*	*0.0 (0)*	*1.0 (3)*	*0.0 (0)*
Smoking, yes	24.9 (2,358)	21.1 (177)	23.3 (911)	41.6 (92)	9.9 (52)	6.4 (19)	13.8 (278)
Missing	*6.4 (649)*	*0.4 (3)*	*8.1 (347)*	*1.3 (3)*	*0.2 (1)*	*1.0 (3)*	*1.3 (26)*
Parity, nulliparous	55.9 (4,441)	42.8 (360)	59.4 (2,524)	39.8 (88)	64.2 (315)	0.0 (0)**	52.4 (1,068)
Missing	*21.5 (2,181)*	*0.2 (2)*	*0.3 (14)*	*1.3 (3)*	*6.1 (32)*	*0.0 (0)*	*0.1 (2)*
Asthma, yes	11.5 (1,134)	10.6 (89)	6.8 (261)	10.8 (24)	3.8 (10)	NA	21.8 (444)
Missing	*2.5 (256)*	*0.0 (0)*	*9.9 (424)*	*1.3 (3)*	*49.9 (261)*		*0.0 (1)*

Values are valid percentages (absolute numbers). Not available (NA). *For EDEN, maternal ethnicity was proxied by birthplace because a specific question on ethnicity is not allowed in France. **It was a recruitment criterion in ROLO that mothers were not nulliparous.

Table S4. Child related baseline characteristics of cohorts

	ALSPAC (United Kingdom)	EDEN (France)	Generation R (The Netherlands)	Lifeways (Ireland)	REPRO_PL (Poland)	ROLO (Ireland)	SWS (United Kingdom)
Early life							
Sex, female	48.3 (4,892)	47.2 (398)	50.5 (2,154)	46.9 (105)	50.7 (265)	50.2 (151)	48.0 (981)
Missing	*0.0 (0)*	*0.0 (0)*	*0.0 (0)*	*0.0 (0)*	*0.0 (0)*	*0.0 (0)*	*0.0 (0)*
Gestational age** (weeks)	40.0 (36.0 - 42.0)	40.0 (35.0 - 41.0)	40.1 (36.0 - 42.4)	39.9 (34.2 - 42.0)	39.0 (36.0 - 41.0)	40.0 (37.0 - 42.0)	40.1 (34.9 - 42.1)
Missing	*0.0 (0)*	*0.0 (0)*	*0.0 (0)*	*8.0 (18)*	*0.2 (1)*	*0.0 (0)*	*0.0 (0)*
Birthweight (grams)*	3,444 (520)	3,287 (504)	3,454 (544)	3,548 (593)	3393 (472)	4,042 (435)	3,451 (559)
Missing	*1.2 (122)*	*0.0 (0)*	*0.1 (5)*	*0.0 (0)*	*4.0 (21)*	*0.0 (0)*	*0.8 (16)*
Ever breastfed	79.1 (7,545)	74.6 (628)	92.5 (3,303)	65.4 (140)	91.7 (343)	67.1 (202)	83.2 (1,641)
Missing	*5.8 (587)*	*0.1 (1)*	*16.3 (694)*	*4.5 (10)*	*28.5 (149)*	*0.0 (0)*	*3.4 (70)*
LRTI age 2 years	NA	39.7 (296)	11.2 (349)	22.5 (16)	30.5 (67)	NA	20.8 (402)
Missing		*11.6 (98)*	*27.2 (1,160)*	*68.3 (153)*	*57.9 (303)*		*5.3 (109)*
Childhood							

Allergy, yes	33.7 (788)	NA	32.0 (887)	NA	53.8 (86)	NA	19.9 (317)
Missing	*76.9 (7,795)*		*34.9 (1,487)*		*69.4 (363)*		*22.1 (452)*
E-DII score*	0.35 (1.00)	NA	-0.36 (0.77)	0.50 (1.10)	-0.10 (1.35)	-0.46 (1.36)	-0.04 (1.07)
Missing	*30.3 (3,070)*		*25.2 (1,073)*	*10.3 (23)*	*55.3 (289)*	*0.3 (1)*	*10.3 (211)*
School-age BMI*	16.2 (2.0)	15.4 (1.3)	17.5 (2.7)	17.9 (3.1)	16.4 (2.5)	16.2 (1.3)	16.1 (1.8)
Missing	*31.9 (3,229)*	*0.1 (1)*	*7.9 (338)*	*0.0 (0)*	*47.6 (249)*	*5.0 (15)*	*31.3 (639)*

Values are valid percentages (absolute numbers), *means (SD) or **medians (95% range), and percentages (absolute numbers) for the amount of missing data. Lower respiratory tract infections (LRTI), not available (NA).

Table S5. Associations of maternal E-DII and DASH score with preschool wheezing and school-age asthma and lung function, stratified by child's sex

	Preschool wheezing OR (95% CI)	**School-age asthma OR (95% CI)**	**FEV_1 Z-score change (95% CI)**	**FVC Z-score change (95% CI)**	**FEV_1/FVC Z-score change (95% CI)**
E-DII score, per IQR increase					
Boys	n = 7,987	n = 7,141	n = 5,631	n = 5,631	n = 5,631
	1.03 (0.96, 1.11)	1.03 (0.94, 1.14)	-0.04 (-0.08, 0.00)	**-0.06 (-0.10, -0.02)****	0.03 (-0.01, 0.07)
Girls	n = 7,449	n = 6,938	n = 5,618	n = 5,618	n = 5,618
	1.00 (0.93, 1.08)	0.95 (0.85, 1.06)	-0.02 (-0.06, 0.02)	-0.03 (-0.07, 0.01)	0.03 (-0.01, 0.07)
DASH score, per IQR decrease					
Boys	n = 7,987	n = 7,141	n = 5,631	n = 5,631	n = 5,631
	1.03 (0.96, 1.11)	1.08 (0.99, 1.19)	0.01 (-0.04, 0.05)	0.00 (-0.04, 0.05)	-0.01 (-0.06, 0.03)
Girls	n = 7,449	n = 6,938	n = 5,618	n = 5,618	n = 5,618
	1.04 (0.97, 1.12)	1.03 (0.92, 1.15)	-0.04 (-0.08, 0.00)	-0.02 (-0.06, 0.02)	-0.03 (-0.07, 0.01)

Values are derived from multilevel logistic or linear regression models and reflect Odds ratios or changes in Z-scores with their corresponding 95% confidence interval (95% CI) per inter quartile range (IQR) increase in the E-DII score or per IQR decrease in the DASH score. Forced

Expiratory Flow in 1 second (FEV_1), and Forced Vital Capacity (FVC). The models are adjusted for maternal BMI, education, birthplace/ethnic background, smoking during pregnancy and parity, and child's breastfeeding, and the models with DASH as exposure are additionally adjusted for maternal energy intake. *P-value <0.05. **P-value<0.01.

Table S6. Associations of maternal E-DII and DASH score with preschool wheezing and school-age asthma and lung function, per time period in pregnancy of maternal diet assessment

	Preschool wheezing OR (95% CI)	**School-age asthma OR (95% CI)**	**FEV_1 Z-score change (95% CI)**	**FVC Z-score change (95% CI)**	**FEV_1/FVC Z-score change (95% CI)**
E-DII score, per IQR increase					
Pre-pregnancy‡	n = 2,854	n = 2,240	n = 1,546	n = 1,546	n = 1,546
	1.01 (0.90, 1.14)	0.85 (0.71, 1.02)	-0.00 (-0.10, 0.09)	-0.01(-0.10, 0.09)	-0.02 (-0.10, 0.06)
Early pregnancy§	n = 5,283	n = 5,731	n = 4,645	n = 4,645	n = 4,645
	0.97 (0.89, 1.05)	1.04 (0.91, 1.18)	-0.02 (-0.06, 0.03)	-0.03 (-0.08, 0.01)	0.02 (-0.02, 0.06)
Late pregnancy‖	n = 11,983	n = 9,616	n = 7,292	n = 7,292	n = 7,292
	1.04 (0.98, 1.10)	0.95 (0.88, 1.03)	-0.03 (-0.07, 0.01)	**-0.05 (-0.09, -0.01)***	0.04 (-0.00, 0.08)
DASH score, per IQR decrease					
Pre-pregnancy‡	n = 2,854	n = 2,240	n = 1,546	n = 1,546	n = 1,546
	1.06 (0.95, 1.18)	0.96 (0.82, 1.13)	-0.01 (-0.10, 0.07)	0.01 (-0.08, 0.10)	-0.07 (-0.14, 0.00)
Early pregnancy§	n = 5,283	n = 5,731	n = 4,645	n = 4,645	n = 4,645

	1.04 (0.95, 1.13)	1.08 (0.94, 1.24)	-0.03 (-0.08, 0.01)	-0.03 (-0.08, 0.02)	-0.02 (-0.07, 0.03)
Late pregnancy[‖]	n = 11,983	n = 9,616	n = 7,292	n = 7,292	n = 7,292
	1.03 (0.98, 1.09)	1.03 (0.95, 1.11)	-0.02 (-0.05, 0.02)	-0.00 (-0.04, 0.03)	-0.03 (-0.07, 0.01)

Values are derived from multilevel logistic or linear regression models and reflect Odds ratios or changes in Z-scores with their corresponding 95% confidence interval (95% CI) per inter quartile range (IQR) increase in the E-DII score or per IQR decrease in the DASH score. Forced Expiratory Flow in 1 second (FEV_1), and Forced Vital Capacity (FVC). The models are adjusted for maternal BMI, education, birthplace/ethnic background, smoking during pregnancy and parity, and child's sex and breastfeeding, and the models with DASH as exposure are additionally adjusted for maternal energy intake. *P-value <0.05. **P-value<0.01.

‡ Pre-pregnancy includes data from EDEN and SWS

§ Early pregnancy (first and second trimester) includes data from Generation R, Lifeways, REPRO_PL, ROLO and SWS

‖ Late pregnancy (third trimester) includes data from ALSPAC, EDEN and SWS

Table S7. Associations of maternal E-DII and DASH score with preschool wheezing and school-age asthma and lung function in complete cases, mothers with a European birthplace/ethnic background, and children aged < 8 years and ≥ 8 years, respectively

	Complete cases	**European mothers**	**Age <8 years**	**Age ≥ 8 years**
		Preschool wheezing		
N	11,676	14,566	NA	NA
E-DII score	0.98 (0.93, 1.04)	1.02 (0.97, 1.08)	NA	NA
DASH score	1.04 (0.98, 1.10)	1.03 (0.98, 1.09)	NA	NA
		School-age asthma		
N	10,408	12,978	NA	NA
E-DII score	0.97 (0.89, 1.05)	0.96 (0.89, 1.04)	NA	NA
DASH score	1.05 (0.96, 1.14)	1.06 (0.98, 1.14)	NA	NA
		FEV_1		
N	8,126	9,992	1,803	9,446
E-DII score	-0.03 (-0.06, 0.01)	-0.03 (-0.06, 0.00)	0.02 (-0.07, 0.12)	**-0.04 (-0.07, -0.01)***
DASH score	-0.03 (-0.06, 0.01)	-0.02 (-0.06, 0.01)	0.07 (-0.02, 0.15)	**-0.04 (-0.07, -0.01)***
		FVC		
N	8,126	9,992	1,803	9,446

E-DII score	**-0.04 (-0.08, -0.01)***	**-0.05 (-0.08, -0.02)**	-0.02 (-0.11, 0.08)	**-0.05 (-0.08, -0.02)****
DASH score	-0.01 (-0.04, 0.03)	-0.02 (-0.05, 0.01)	0.08 (-0.01, 0.17)	-0.03 (-0.06, 0.00)
		FEV_1/FVC		
N	8,126	9,992	1,803	9,446
E-DII score	0.02 (-0.01, 0.06)	**0.04 (0.01, 0.07)***	0.07 (-0.01, 0.14)	0.02 (-0.01, 0.05)
DASH score	**-0.04 (-0.07, -0.00)***	-0.02 (-0.05, 0.01)	-0.06 (-0.13, 0.01)	-0.01 (-0.05, 0.02)

Values are derived from multilevel logistic or linear regression models and reflect Odds ratios or changes in Z-scores with their corresponding 95% confidence interval (95% CI) per inter quartile range (IQR) increase in the E-DII score or per IQR decrease in the DASH score. Forced Expiratory Flow in 1 second (FEV_1), and Forced Vital Capacity (FVC). The models are adjusted for maternal BMI, education, birthplace/ethnic background (except for the models restricted to mothers with a European birthplace/ethnic background), smoking during pregnancy and parity, and child's sex and breastfeeding, and the models with DASH as exposure are additionally adjusted for maternal energy intake. *P-value <0.05. **P-value<0.01.

Table S8a. Associations of maternal E-DII score with preschool wheezing and school-age asthma and lung function, after excluding one cohort at a time

E-DII score, per IQR increase	**Preschool wheezing OR (95% CI)**	**School-age asthma OR (95% CI)**	**FEV_1 Z-score change (95% CI)**	**FVC Z-score change (95% CI)**	**FEV_1/FVC Z-score change (95% CI)**
All cohorts	n = 15,436	n = 14,079	n = 11,249	n = 11,249	n = 11,249
	1.02 (0.97, 1.07)	1.00 (0.93, 1.07)	-0.03 (-0.06, 0.00)	**-0.05 (-0.08, -0.02)****	0.03 (-0.00, 0.06)
Excluded cohort					
ALSPAC	n = 6,123	n = 6,573	n = 5,483	n = 5,483	n = 5,483
	0.97 (0.90, 1.05)	1.04 (0.93, 1.18)	-0.01 (-0.05, 0.04)	-0.02 (-0.06, 0.02)	0.02 (-0.01, 0.06)
EDEN	n = 14,596	n = 13,237	n = 10,411	n = 10,411	n = 10,411
	1.02 (0.97, 1.07)	0.99 (0.92, 1.07)	**-0.04 (-0.07, -0.01)***	**-0.05 (-0.08, -0.02)****	0.03 (-0.00, 0.06)
Generation R	n = 12,560	n = 10,569	n = 7,598	n = 7,598	n = 7,598
	1.03 (0.98, 1.09)	0.96 (0.89, 1.04)	-0.04 (-0.08, 0.00)	**-0.06 (-0.10, -0.02)****	**0.04 (0.00, 0.08)***
Lifeways	n = 15,436	n = 13,855	n = 11,249	n = 11,249	n = 11,249
	NA	1.00 (0.93, 1.08)	NA	NA	NA

REPRO_PL	n = 15,066	n = 13,804	n = 10,985	n = 10,985	n = 10,985
	1.01 (0.96, 1.07)	0.99 (0.93, 1.07)	**-0.03 (-0.06, -0.00)***	**-0.05 (-0.08, -0.02)****	**0.03 (0.00, 0.06)***
ROLO	n = 15,436	n = 13,778	n = 11,249	n = 11,249	n = 11,249
	NA	0.99 (0.92, 1.06)	NA	NA	NA
SWS	n = 13,399	n = 12,658	n = 10,519	n = 10,519	n = 10,519
	1.03 (0.97, 1.09)	1.01 (0.94, 1.09)	-0.03 (-0.06, 0.00)	**-0.04 (-0.07, -0.01)***	0.03 (-0.00, 0.06)

Values are derived from multilevel logistic or linear regression models and reflect Odds ratios or changes in Z-scores with their corresponding 95% confidence interval (95% CI) per inter quartile range (IQR) increase in the E-DII score. Forced Expiratory Flow in 1 second (FEV_1), and Forced Vital Capacity (FVC). 'NA' measure is not available in the omitted cohort. The models are adjusted for maternal BMI, education, birthplace/ethnic background, smoking during pregnancy and parity, and child's sex and breastfeeding. *P-value <0.05. **P-value<0.01.

Table S8b. Associations of maternal DASH score with preschool wheezing and school-age asthma and lung function, after excluding one cohort at a time

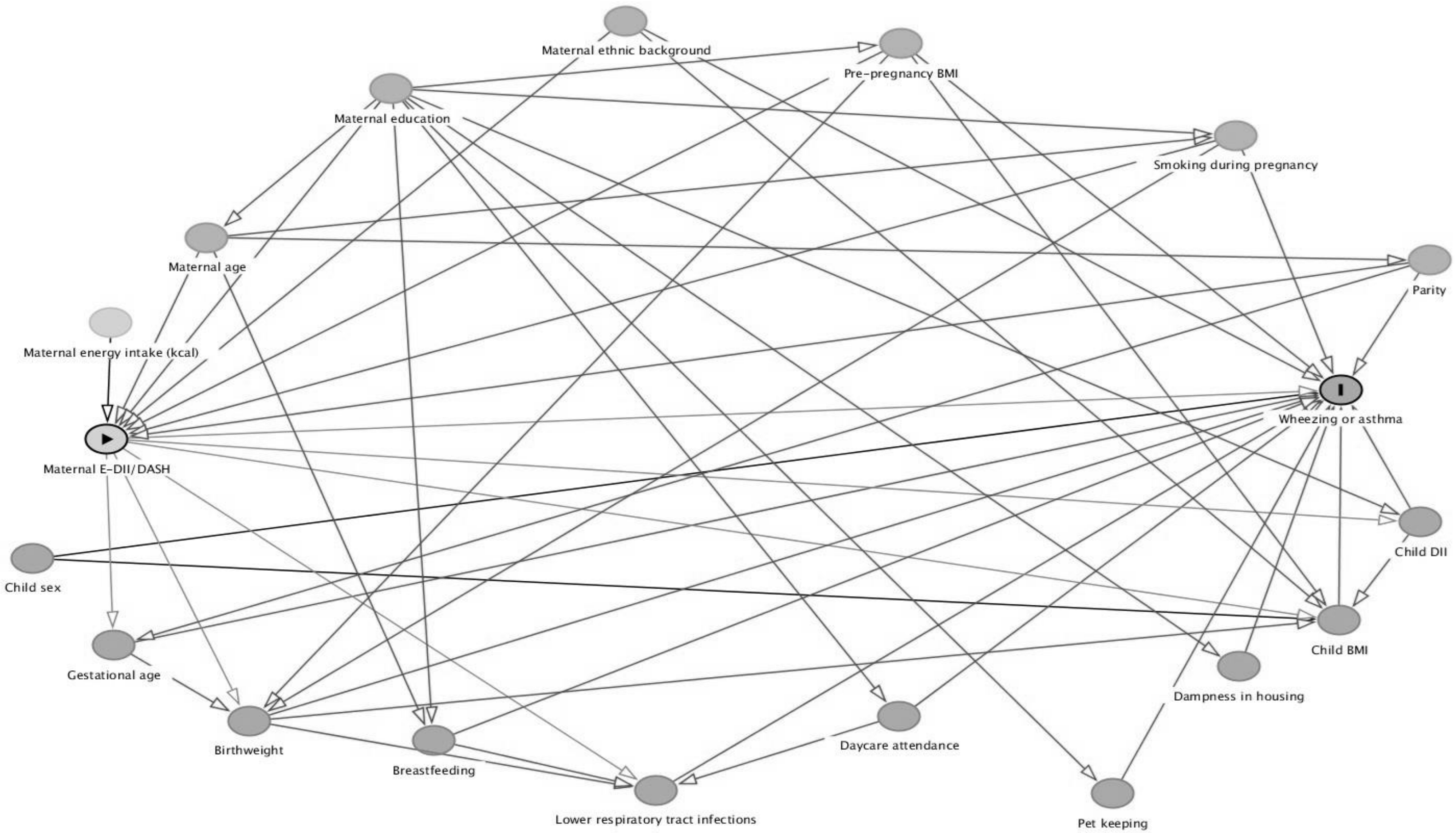
DASH score, per IQR decrease	Preschool wheezing OR (95% CI)	School-age asthma OR (95% CI)	FEV_1 Z-score change (95% CI)	FVC Z-score change (95% CI)	FEV_1/FVC Z-score change (95% CI)
All cohorts	n = 15,436	n = 14,079	n = 11,249	n = 11,249	n = 11,249
	1.04 (0.98, 1.09)	1.06 (0.99, 1.14)	-0.02 (-0.05, 0.01)	-0.01 (-0.04, 0.02)	-0.02 (-0.05, 0.01)
Omitted cohort					
ALSPAC	n = 6,123	n = 6,573	n = 5,483	n = 5,483	n = 5,483
	1.07 (0.99, 1.16)	1.11 (0.99, 1.26)	-0.00 (-0.05, 0.05)	0.00 (-0.04, 0.05)	-0.02 (-0.06, 0.02)
EDEN	n = 14,596	n = 13,237	n = 10,411	n = 10,411	n = 10,411
	1.02 (0.97, 1.08)	1.05 (0.97, 1.13)	**-0.04 (-0.07, -0.00)***	-0.03 (-0.06, 0.01)	-0.02 (-0.05, 0.01)
Generation R	n = 12,560	n = 10,569	n = 7,598	n = 7,598	n = 7,598
	1.03 (0.97, 1.09)	1.04 (0.96, 1.12)	-0.01 (-0.05, 0.02)	0.00 (-0.04, 0.04)	-0.03 (-0.07, 0.00)
Lifeways	n = 15,436	n = 13,855	n = 11,249	n = 11,249	n = 11,249
	NA	1.06 (0.99, 1.14)	NA	NA	NA
REPRO_PL	n = 15,066	n = 13,804	n = 10,985	n = 10,985	n = 10,985

	1.04 (0.98, 1.09)	1.06 (0.99, 1.14)	-0.02 (-0.05, 0.01)	-0.17 (-0.05, 0.01)	-0.02 (-0.05, 0.01)
ROLO	n = 15,436	n = 13,778	n = 11,249	n = 11,249	n = 11,249
	NA	1.06 (0.98, 1.14)	NA	NA	NA
SWS	n = 13,399	n = 12,658	n = 10,519	n = 10,519	n = 10,519
	1.04 (0.99, 1.10)	1.07 (1.00, 1.16)	-0.01 (-0.04, 0.02)	-0.01 (-0.04, 0.03)	-0.02 (-0.05, 0.02)

Values are derived from multilevel logistic or linear regression models and reflect Odds ratios or changes in Z-scores with their corresponding 95% confidence interval (95% CI) per inter quartile range (IQR) decrease in the DASH score. Forced Expiratory Flow in 1 second (FEV_1), and Forced Vital Capacity (FVC). 'NA' measure is not available in the omitted cohort. The models are adjusted for maternal energy intake, BMI, education, birthplace/ethnic background, smoking during pregnancy and parity, and child's sex and breastfeeding. *P-value <0.05. **P-value<0.01.

Figure S1. Directed acyclyc graph for confounder selection

A. Wheezing and asthma



B. Lung function

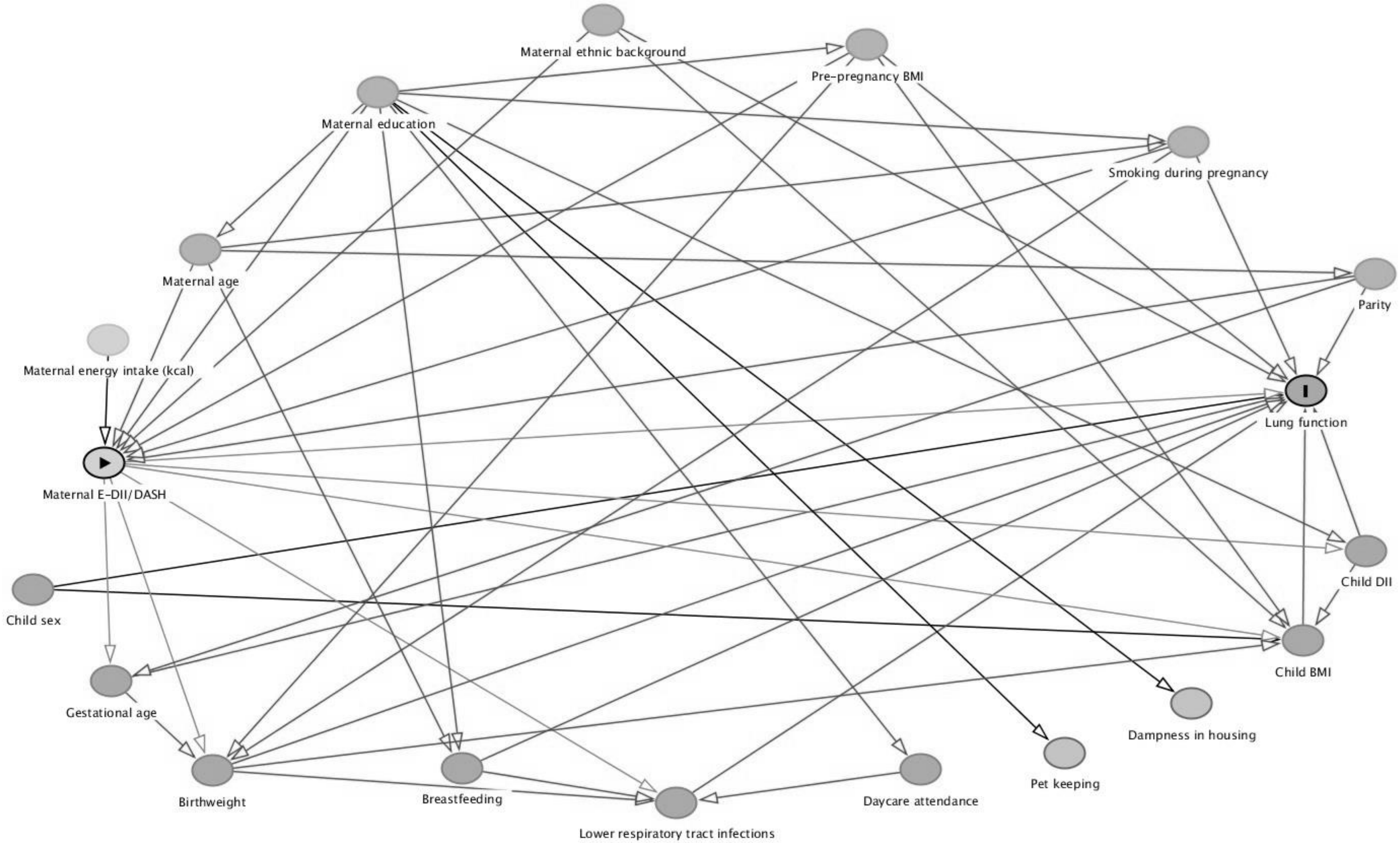
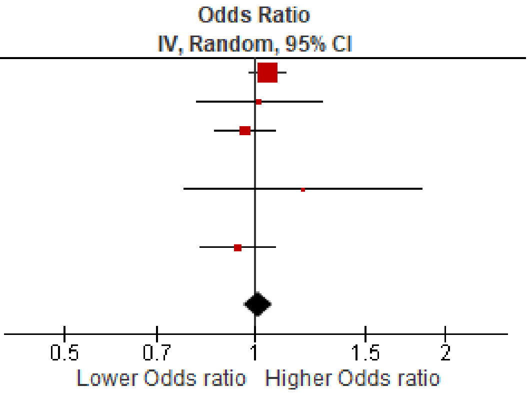


Figure S2. Associations of maternal E-DII score with preschool wheezing and school-age asthma and lung function, assessed by a two-stage individual participant data meta-analysis

A. Preschool wheezing

Study or Subgroup	Weight	Odds Ratio IV, Random, 95% CI
ALSPAC	58.2%	1.05 [0.98, 1.12]
EDEN	4.9%	1.02 [0.81, 1.28]
Generation R	21.4%	0.97 [0.87, 1.08]
Lifeways		Not estimable
Repro_PL	1.4%	1.19 [0.77, 1.84]
ROLO		Not estimable
SWS	14.1%	0.94 [0.82, 1.08]
Total (95% CI)	**100.0%**	**1.01 [0.96, 1.07]**

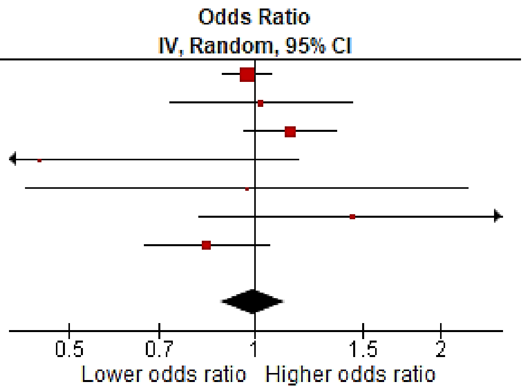
Heterogeneity: Tau² = 0.00; Chi² = 3.37, df = 4 (P = 0.50); I² = 0%
Test for overall effect: Z = 0.53 (P = 0.59)



B. School-age asthma

Study or Subgroup	Weight	Odds Ratio IV, Random, 95% CI
ALSPAC	38.4%	0.97 [0.89, 1.06]
EDEN	10.2%	1.02 [0.73, 1.44]
Generation R	25.4%	1.14 [0.96, 1.35]
Lifeways	1.6%	0.45 [0.17, 1.18]
Repro_PL	2.2%	0.97 [0.43, 2.20]
ROLO	4.2%	1.44 [0.81, 2.55]
SWS	18.0%	0.84 [0.67, 1.05]
Total (95% CI)	**100.0%**	**0.99 [0.88, 1.12]**

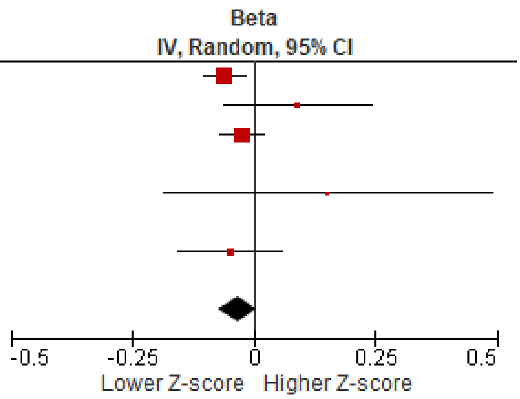
Heterogeneity: Tau² = 0.01; Chi² = 9.23, df = 6 (P = 0.16); I² = 35%
Test for overall effect: Z = 0.10 (P = 0.92)



C. FEV_1

Study or Subgroup	Weight	Beta IV, Random, 95% CI
ALSPAC	41.4%	-0.06 [-0.10, -0.02]
EDEN	6.2%	0.09 [-0.06, 0.24]
Generation R	39.6%	-0.02 [-0.07, 0.02]
Lifeways		Not estimable
Repro_PL	1.3%	0.15 [-0.19, 0.49]
ROLO		Not estimable
SWS	11.5%	-0.05 [-0.16, 0.06]
Total (95% CI)	**100.0%**	**-0.03 [-0.07, 0.01]**

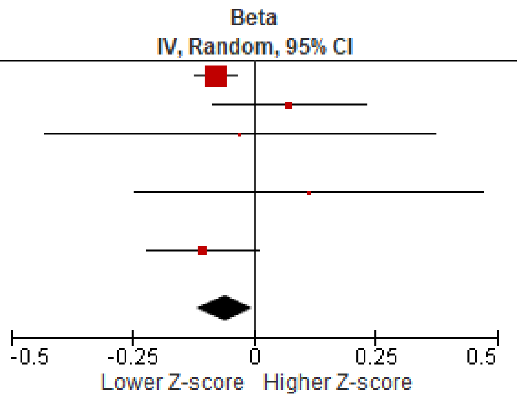
Heterogeneity: Tau² = 0.00; Chi² = 5.35, df = 4 (P = 0.25); I² = 25%
Test for overall effect: Z = 1.60 (P = 0.11)



D. FVC

Study or Subgroup	Weight	Beta IV, Random, 95% CI
ALSPAC	64.0%	-0.08 [-0.12, -0.03]
EDEN	11.8%	0.07 [-0.08, 0.23]
Generation R	2.0%	-0.03 [-0.43, 0.38]
Lifeways		Not estimable
Repro_PL	2.5%	0.11 [-0.24, 0.47]
ROLO		Not estimable
SWS	19.7%	-0.10 [-0.22, 0.01]
Total (95% CI)	**100.0%**	**-0.06 [-0.12, -0.00]**

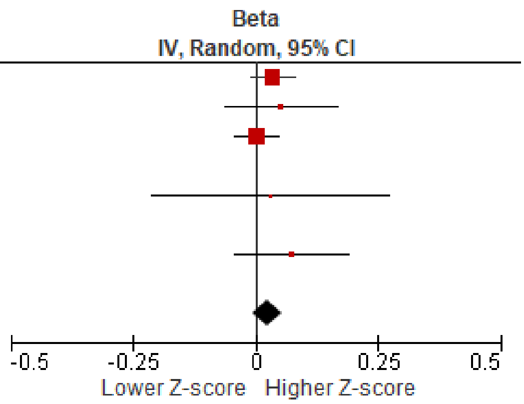
Heterogeneity: Tau² = 0.00; Chi² = 4.73, df = 4 (P = 0.32); I² = 15%
Test for overall effect: Z = 2.04 (P = 0.04)



E. FEV$_1$/FVC

Study or Subgroup	Weight	Beta IV, Random, 95% CI
ALSPAC	42.7%	0.04 [-0.01, 0.08]
EDEN	6.7%	0.05 [-0.06, 0.17]
Generation R	42.7%	0.00 [-0.04, 0.05]
Lifeways		Not estimable
Repro_PL	1.5%	0.03 [-0.21, 0.27]
ROLO		Not estimable
SWS	6.5%	0.07 [-0.04, 0.19]
Total (95% CI)	**100.0%**	**0.02 [-0.00, 0.05]**

Heterogeneity: Tau² = 0.00; Chi² = 2.01, df = 4 (P = 0.73); I² = 0%
Test for overall effect: Z = 1.66 (P = 0.10)



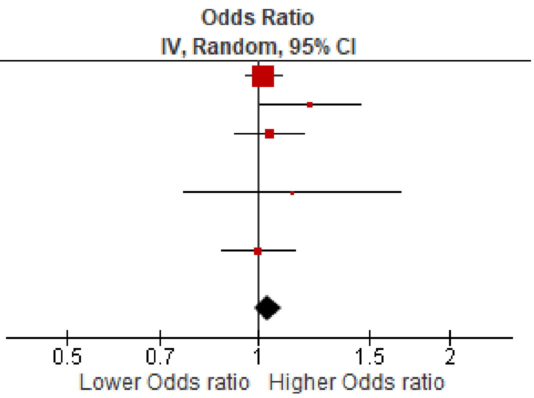
Values are derived from logistic or linear regression models and reflect Odds ratios or changes in Z-scores with their corresponding 95% confidence interval (95% CI) per inter quartile range (IQR) increase in the E-DII score. Forced Expiratory Flow in 1 second (FEV$_1$), and Forced Vital Capacity (FVC). The cohorts for which no estimate is provided had no data available on that specific outcome. The models are adjusted for maternal BMI, education, birthplace/ethnic background, smoking during pregnancy and parity, and child's sex and breastfeeding.

Figure SS3. Associations of maternal DASH score with child's respiratory outcomes assessed by a two-stage individual participant data meta-analysis

A. Preschool wheezing

Study or Subgroup	Weight	Odds Ratio IV, Random, 95% CI
ALSPAC	59.6%	1.02 [0.95, 1.09]
EDEN	8.0%	1.21 [1.01, 1.45]
Generation R	16.3%	1.04 [0.92, 1.18]
Lifeways		Not estimable
Repro_PL	1.7%	1.13 [0.76, 1.68]
ROLO		Not estimable
SWS	14.5%	1.00 [0.87, 1.14]
Total (95% CI)	**100.0%**	**1.04 [0.98, 1.09]**

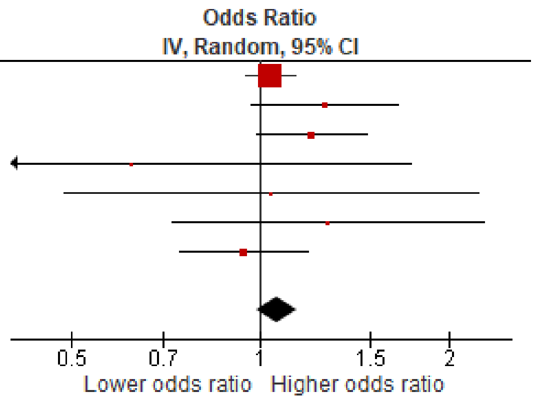
Heterogeneity: Tau² = 0.00; Chi² = 3.39, df = 4 (P = 0.50); I² = 0%
Test for overall effect: Z = 1.33 (P = 0.18)



B. School-age asthma

Study or Subgroup	Weight	Odds Ratio IV, Random, 95% CI
ALSPAC	66.2%	1.04 [0.95, 1.13]
EDEN	7.4%	1.26 [0.97, 1.66]
Generation R	13.5%	1.21 [0.99, 1.47]
Lifeways	0.5%	0.62 [0.22, 1.73]
Repro_PL	0.9%	1.04 [0.49, 2.22]
ROLO	1.7%	1.28 [0.72, 2.26]
SWS	9.9%	0.94 [0.74, 1.19]
Total (95% CI)	**100.0%**	**1.06 [0.99, 1.14]**

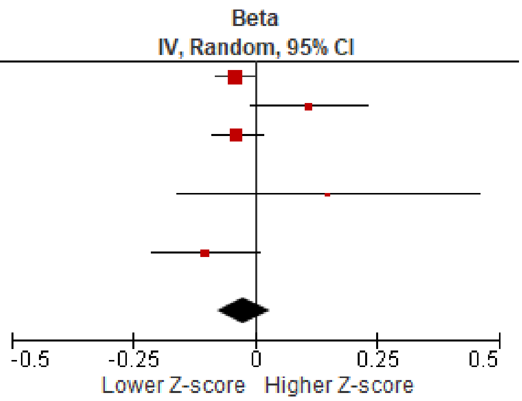
Heterogeneity: Tau² = 0.00; Chi² = 5.99, df = 6 (P = 0.42); I² = 0%
Test for overall effect: Z = 1.65 (P = 0.10)



C. FEV_1

Study or Subgroup	Weight	Beta IV, Random, 95% CI
ALSPAC	35.9%	-0.04 [-0.08, 0.00]
EDEN	13.9%	0.11 [-0.01, 0.23]
Generation R	31.7%	-0.04 [-0.09, 0.02]
Lifeways		Not estimable
Repro_PL	2.9%	0.15 [-0.16, 0.46]
ROLO		Not estimable
SWS	15.6%	-0.10 [-0.21, 0.01]
Total (95% CI)	**100.0%**	**-0.02 [-0.08, 0.03]**

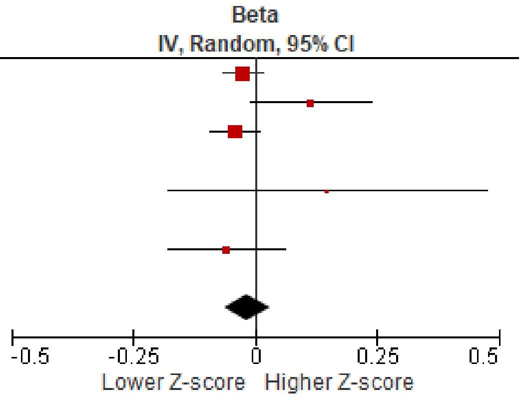
Heterogeneity: Tau² = 0.00; Chi² = 8.35, df = 4 (P = 0.08); I² = 52%
Test for overall effect: Z = 0.81 (P = 0.42)



D. FVC

Study or Subgroup	Weight	Beta IV, Random, 95% CI
ALSPAC	39.9%	-0.03 [-0.07, 0.02]
EDEN	11.6%	0.11 [-0.01, 0.24]
Generation R	34.3%	-0.04 [-0.09, 0.01]
Lifeways		Not estimable
Repro_PL	2.0%	0.15 [-0.18, 0.48]
ROLO		Not estimable
SWS	12.2%	-0.06 [-0.18, 0.06]
Total (95% CI)	**100.0%**	**-0.02 [-0.06, 0.03]**

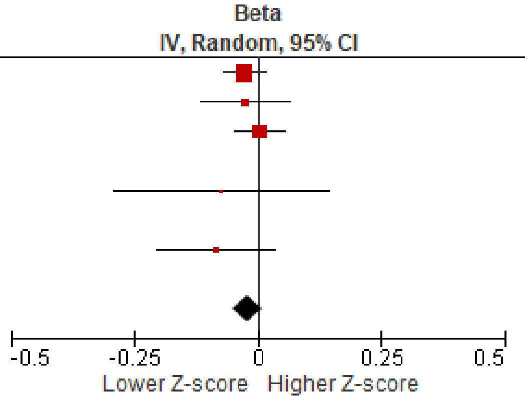
Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 6.57$, df = 4 (P = 0.16); $I^2 = 39\%$
Test for overall effect: Z = 0.63 (P = 0.53)



E. FEV_1/FVC

Study or Subgroup	Weight	Beta IV, Random, 95% CI
ALSPAC	47.3%	-0.03 [-0.07, 0.02]
EDEN	10.8%	-0.03 [-0.12, 0.06]
Generation R	33.9%	0.01 [-0.05, 0.06]
Lifeways		Not estimable
Repro_PL	1.8%	-0.07 [-0.29, 0.15]
ROLO		Not estimable
SWS	6.2%	-0.08 [-0.20, 0.04]
Total (95% CI)	**100.0%**	**-0.02 [-0.05, 0.01]**

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 2.40$, df = 4 (P = 0.66); $I^2 = 0\%$
Test for overall effect: Z = 1.38 (P = 0.17)



Values are derived from logistic or linear regression models and reflect Odds ratios or changes in Z-scores with their corresponding 95% confidence interval (95% CI) per inter quartile range (IQR) decrease in the DASH score. Forced Expiratory Flow in 1 second (FEV_1), and Forced Vital Capacity (FVC). The cohorts for which no estimate is provided had no data available on that specific outcome. The models are adjusted for maternal energy intake, BMI, education, birthplace/ethnic background, smoking during pregnancy and parity, and child's sex and breastfeeding.