

Olive Oil During Pregnancy Is Associated With Reduced Wheezing During the First Year of Life of the Offspring

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Summary. Objective: To test the hypothesis that consuming Mediterranean diet and using olive oil for cooking/dressing salads during pregnancy might be associated with less wheezing during the first year of the offspring's life. Methods: A study was conducted in 1,409 infants (mean age, 16.6 ± 2.5 months) attending healthy infant clinics in Spain. Dietary data of mothers' intake during pregnancy was collected by means of a parental food frequency questionnaire. Demographic information and data on wheezing during the first year of the offspring's life were also recorded. Infants were stratified according to any wheezing (42.2%) during the first year of life. Results: In the univariate analysis, adherence to a Mediterranean diet and using olive oil for cooking/dressing salads during pregnancy were both significantly associated with less wheezing during the first year of life. However, after multivariate analysis, only olive oil consumption during pregnancy remained associated with less wheezing in the studied period (aOR = 0.57 [95% CI = 0.4–0.9]); whereas male gender (1.8 [1.4–2.3]), day care attendance (2.15 [1.5–3.1]), maternal asthma (2.16 [1.3–3.6]), maternal smoking during pregnancy (1.83 [1.3–2.2]), infant eczema (1.95 [1.3–2.9]), and mould stains on the household walls (1.72 [1.2–2.5]) remained associated with wheezing. Conclusion: Our findings suggest a protective effect (primary prevention) of olive oil use during pregnancy on wheezing during the first year of the offspring's life. **Pediatr Pulmonol.** 2010; 45:395–402. © 2010 Wiley-Liss, Inc.

Key words: infant wheezing; maternal food in pregnancy; olive oil; Mediterranean diet; primary prevention; risk factors.

INTRODUCTION

During the past years, the interest in studying the relationship between diet and asthma has increased not only due to possible connections between diet, obesity, and asthma¹ but also for the potential primary or secondary preventive role that diet could have on asthma and/or wheezing.² In fact, several studies have reported a beneficial effect of single foods on asthma/wheezing (e.g., citrus/kiwi fruit;³ whole milk, apples, and pears;⁴ vegetables, tomatoes, and fruit;^{5,6} nuts;⁷ and oily fish⁸), whereas other foods were deleterious (e.g., margarine and butter intake^{5,9}).

Our group has been focused on the effect of the Mediterranean diet on asthma/wheezing. The Mediterranean diet is characterized by elevated intake of plant foods (fruits and vegetables), bread and whole grain cereals, legumes and nuts; low-to-moderate intake of dairy products and eggs; and limited amounts of meat and poultry. This dietary pattern is low in saturated fatty acids; rich in carbohydrates, fiber, and antioxidants; and has a high content of monounsaturated fatty acids and n-3 polyunsaturated fatty acids (PUFA), which are primarily derived from olive oil, and in some areas from fish intake.¹⁰

In cross-sectional studies we reported that Mediterranean diet is associated with less clinically significant

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asthma in school children aged 6–7 years¹¹ and with less wheezing in preschool children in Spain.¹² Similarly, other cross-sectional studies reported that Mediterranean diet is associated with less asthma and rhinitis in children aged 7–18 years in Greece,⁷ and in children aged 6–7 years in Mexico.¹³ Also, a longitudinal cohort study from Menorca (Spain) showed that the intake of Mediterranean diet during pregnancy reduced asthma-like symptoms and atopy of the offspring assessed at 6.5 years of age.¹⁴ An Australian study reported that maternal supplementation with fish oil during pregnancy resulted in a significant increased in n-3 PUFA levels in neonatal erythrocyte membranes and lower plasma interleukin-13.¹⁵ Conversely, another cohort study from the U.K. reported that other dietary patterns in pregnancy do not predict asthma/wheezing in the offspring assessed at school age.¹⁶

Since nearly 30% of children will have at least one episode of wheezing prior to their third birthday,¹⁷ it seems important to explore if Mediterranean diet consumption during pregnancy could decrease the risk of wheezing during the first year of the offspring's life. Our hypothesis is that consuming Mediterranean diet and using olive oil for cooking/dressing salads during pregnancy by the mothers could be associated with less infant wheezing up to their first birthday.

METHODS

Population

The present study is part of the “Estudio Internacional de Sibilancias en Lactantes” (EISL) (International Study of Wheezing in Infants) in which Cartagena, Spain, is one of the centers involved.¹⁸ All primary care health centers monitoring children for nutrition, growth, and development, and/or for vaccine administration—according to the pediatric health programme in the Region of Murcia, belonging to the Cartagena health district—were included as recruiting centers. All the mothers of the children who were born from January 2006 to April 2007 were asked to participate in this birth cohort study. When the child came to receive vaccination at 15 or 18 months of age, parents or guardians were asked to complete the questionnaire, emphasizing on symptoms related only to events occurred during the first 12 months of their child's life. In accordance with the EISL study strategy,¹⁸ the sample size for Cartagena was to complete at least 1,000 questionnaires.

Questionnaire

The standardized and validated questionnaire,^{18,19} based on the International Study of Asthma and Allergies in Childhood (ISAAC) Phase III,²⁰ included questions on wheezing during the first year of life and also

on epidemiological and risk/protective factors. Demographic data include: age; gender; race; type of delivery; birth weight and height (as reported by parents); premature birth; duration of exclusive breastfeeding (without any formula feeding or infant food); parental asthma, rhinitis, or eczema; maternal age; maternal education level; and parent-reported current weight and height of the infant. The infants' nutritional status was calculated using the WHO software Antro, version 2, 2007 (<http://www.who.int/childgrowth/software/en/>), and children were classified according to the z-score for weight/length as normal (>-1 SD to $<+1$ SD), overweight ($\geq+1$ SD to $<+2$ SD) and obese ($\geq+2$ SD).

Environmental data collected included: number of siblings and other persons in the home; day care attendance; immunization schedule; common colds during the first year of the child's life; parental current tobacco smoking and maternal tobacco smoking during pregnancy; presence of dogs and cats at home during pregnancy and during the first year of the child's life; existence of mould stains on the household walls; industries and truck traffic in front of the house; and type of fuel used in heating and cooking systems.

For the purpose of the present study wheezing was defined as any wheeze (a positive answer to the question: “Has your child had wheezing or whistling in the chest during the first 12 months of life?”). Eczema was defined as a positive answer to the following question: “During the first 12 months of his/her life, has your child had an itchy rash which was coming and going in any part of his/her body except around the mouth and nose, and on the nappy area?”

The environmental questionnaire also included questions on the consumption of certain foods during pregnancy (never or occasionally, one or two times per week and three or more times per week). The Mediterranean diet score employed in the present study was previously developed by our group^{11,12} and is based on the score by Psaltopoulou et al.:²¹ fruit, fish, vegetables, legumes, cereals, pasta, rice, and potatoes are considered “pro-Mediterranean” foods and rated according to the frequency of their intake (0 points = never or occasionally, 1 point = 1 or 2 times/week, or 2 points = ≥ 3 times/week). Meat, milk, and fast foods are considered “anti-Mediterranean” foods and are rated inversely (0 points = ≥ 3 times/week of intake, 1 point = 1 or 2 times/week, or 2 points = never or occasionally). Industrial pastry, precooked pizzas, and fried food, together with hamburgers taken in fast food restaurants were considered generically as fast food (Table 1). In contrast with our two previous reports,^{11,12} in which olive oil was not included as part of the Mediterranean diet score because it was difficult to ask a frequency question about olive oil consumption; in the present study we wanted to know the antioxidants

TABLE 1—Mediterranean Diet Score¹

Food	Never or occasionally (points)	1 or 2 times per week (points)	≥3 times per week (points)
Fruit	0	1	2
Fish (oily and white)	0	1	2
Vegetables (including salads)	0	1	2
Legumes	0	1	2
Cereals	0	1	2
Pasta	0	1	2
Rice	0	1	2
Potatoes	0	1	2
Meat	2	1	0
Milk	2	1	0
Fast food ²	2	1	0

¹ After adding all points, higher scores mean more adhesion to Mediterranean diet and lower scores mean less adhesion.

² Candies, industrial pastry, precooked pizzas, and fried food, together with hamburgers taken in fast food restaurants were considered generically as “fast food.”

properties of this oil on asthma compared to other types of lipids (e.g., butter or margarine) as described in cardiovascular diseases.²² Therefore, a question about the type of oil used for cooking and dressing salads and vegetables was included as a dichotomy variable: olive oil versus others (margarine, butter, or other oils). Also, the frequency of industrial foods (e.g., yogurt, puddings, petit suisse, commercial chips, jelly, chocolate, soft drinks, and bottled/packed juices) consumed by the infants during their first year of life was recorded (as never, once per month, once per week, and every day).

The Ethics Committee of the University of Murcia approved the study, and full informed and signed consent was obtained from parents before completing the questionnaire.

Statistical Analysis

The analysis of the differences between the wheezing and non-wheezing children was performed by means of the chi-square test for categorical variables, the Student's *t*-test for continuous variables, and the Mann–Whitney *U*-test for ordinal variables. Odds ratios (OR) and 95% confidence intervals (95% CI) were also calculated. A multivariate logistic regression analysis model was built using the presence of wheezing as the dependent variable and those factors which were statistically significant ($P \leq 0.05$) in the univariate analysis as independent variables. Adjusted OR (aOR) and 95% CI were calculated from the logistic regression model. A second logistic regression was similarly performed, but excluding olive oil consumption from the list of variables. All analyses were performed by means of the STATA 7.0 statistical software (Stata Corp., College Station, TX).

RESULTS

During the study period 3,564 children were registered born in the health district of Cartagena. After discarding those who were not of Spanish origin and those without correct contact data, 2,396 families were invited to participate in the study and 1,694 of them completed the questionnaire (70.7% participation rate). Of those, 285 had to be eliminated from the analysis due to one or various of the following reasons: blank questionnaire ($n = 6$); blank answer to the question related to wheezing during the first year of life ($n = 169$); first wheezing episode reported after the age of 12 months ($n = 93$); and infant younger than 12 months ($n = 3$) or older than 24 months ($n = 14$) when the questionnaire was completed. Thus, in this birth cohort study the final number of children with usable data was 1,409. The mean age was 16.6 ± 2.5 months and 53% were males. The prevalence of any wheeze during their first year of life was 42.2% ($n = 594$). The proportion of Caucasians was similar between infants in the wheezing and non-wheezing groups (91.4% vs. 91.5%, $P = 0.93$, respectively). There were no differences with respect to age, but there were significantly more males in the wheezing group (Table 2).

A similar proportion of infants from the wheezing and from the non-wheezing groups were born by cesarean section (26.9% vs. 24.5%, $P = 0.32$, respectively). The proportion of children with birth weight $>2,500$ g was similar (87.5% vs. 89%, $P = 0.5$, respectively); and there was no difference in length at birth between groups (49.7 ± 3 cm vs. 49.7 ± 2.8 cm, $P = 0.75$, respectively). The proportion of infants with complete immunization schedule at their first year was similar between groups (97.9% vs. 98.9%, $P = 0.16$, respectively). However, infants in the wheezing group had a significantly shorter period of exclusive breastfeeding (Table 2).

TABLE 2—Sociodemographic and Anthropometric Characteristics of Infants With and Without Wheezing in the First Year of Life (% or Mean $\pm$ SD)

	Wheezing (n = 594)	Non-wheezing (n = 815)	OR (95%CI)	P-value
Male gender	60.9	47.1	1.8 (1.4–2.2)	<0.0001
Age (months)	16.6 $\pm$ 2.5	16.6 $\pm$ 2.5		0.93
Exclusive breastfeeding (months)	2.8 $\pm$ 2.6	3.1 $\pm$ 2.8		0.04
Eczema	19.4	10.2	2.1 (1.5–2.9)	<0.0001
Paternal asthma	5.8	3.8	1.5 (0.9–2.6)	0.09
Maternal asthma	8.8	4.4	2.1 (1.3–3.3)	0.001
Paternal eczema	6.6	4.4	1.6 (0.9–2.6)	0.06
Maternal eczema	7.8	7.4	1.1 (0.7–1.6)	0.79
Day care attendance	18.5	9.8	2.1 (1.5–2.9)	<0.0001
Number of people living at home	3.7 $\pm$ 1.3	3.5 $\pm$ 1.2		0.02
Number of siblings	0.8 $\pm$ 1	0.7 $\pm$ 0.8		0.001
Mould stains on household walls	17.7	10.3	1.7 (1.4–2.6)	<0.0001
Maternal smoking during pregnancy	25.6	17.0	1.7 (1.3–2.2)	<0.0001
Overweight/obese	29.7	24.5	0.8 (0.6–1.1)	0.139
Industrial infant food				
Never	16.4	20.6		0.09 for trend ¹
Once per month	7.1	6.7		
Once per week	23.0	22.1		
Every day	53.5	50.6		
Olive oil for cooking or dressing salads during pregnancy	78.8	85.2	0.65 (0.5–0.9)	0.002
Mediterranean diet score during pregnancy	13.1 $\pm$ 2.3	13.3 $\pm$ 1.9		0.036

¹Cuzick's chi-square for trend.

There was significantly more infant eczema, more maternal asthma, and slightly more paternal asthma and eczema in the wheezing group (Table 2). The proportion of paternal and maternal rhinitis was similar between groups (13.3% vs. 11.2%, $P=0.23$ and 16.3% vs. 13.3%, $P=0.12$, respectively, for wheezers and non-wheezers). The age of the mothers was similar in both groups (31.7 $\pm$ 5.2 years vs. 32 $\pm$ 5.1 years, $P=0.29$, respectively), and there was no difference in the maternal level of education (≥ 12 school years or university degree in 73.7% vs. 74.5%, $P=0.16$, respectively).

Paternal and maternal current smoking was similar in both groups (45.3% vs. 42.4%, $P=0.23$ and 33.5% vs. 29.6%, $P=0.13$, respectively). However, the proportion of maternal smoking during pregnancy, the number of persons living at home, and the number of siblings were significantly higher in the wheezing group compared to non-wheezing group (Table 2). The proportion of industries and truck traffic in front of the house, the type of fuel used for heating and cooking, and the proportion of families owning pets during the pregnancy and during the first year of the child's life was similar between groups (data not shown). Significantly more infants from the wheezing group attended a day care facility and had more mould stains on the household walls than infants from the non-wheezing group (Table 2).

The proportion of overweight/obese infants and the frequency of industrial infant food consumption by them were similar in both groups. However, Mediterranean diet score during pregnancy was statistically

significantly higher in the non-wheezing group (although the actual difference was very small); and significantly more mothers from the non-wheezing group used olive oil as the main source of oil for cooking or dressing salads (Table 2). The Mediterranean diet score was similar between those mothers who used or did not use olive oil during pregnancy (13.28 $\pm$ 2.0 vs. 13.31 $\pm$ 2.3, $P=0.84$, respectively). The frequency of intake of different foods during pregnancy between wheezing and non-wheezing infants was presented as an Electronic Supplemental Table (e1).

In the multiple logistic regression analysis, after controlling for variables found significantly ($P \leq 0.05$) associated with wheezing in the univariate analysis, only the use of olive oil for cooking or dressing salads usually during pregnancy remained inversely associated with current wheezing in the first year of life (aOR = 0.57 [95% CI = 0.4–0.9], $P=0.002$). Conversely, male gender, day care attendance, smoking during pregnancy, maternal asthma, eczema, and mould stains on the household walls were still associated with wheezing (Table 3). In a second multiple logistic regression model, not including olive oil use, adherence to Mediterranean diet by the mother during pregnancy remained not associated with wheezing (aOR = 0.96 [95% CI = 0.8–1.1], $P=0.53$).

DISCUSSION

In the present study we report that olive oil, used as the main source of oil for cooking or dressing salads during

TABLE 3—Multivariate Analysis¹ for Factors Associated to Wheezing in the First Year of Life

	aOR ² (95% CI)	P-value
Male gender	1.81 (1.4–2.3)	0.0001
Exclusive breastfeeding (per additional month)	0.97 (0.9–1.0)	0.22
Day care attendance	2.16 (1.5–3.1)	0.0001
Eczema	1.95 (1.3–2.9)	0.001
Maternal asthma	2.16 (1.3–3.6)	0.003
Smoking during pregnancy	1.83 (1.3–2.5)	0.0001
Siblings (per additional sibling)	1.15 (1.0–1.3)	0.06
Mould stains on household wall	1.72 (1.2–2.5)	0.004
Preterm birth	1.17 (0.8–1.7)	0.44
Olive oil for cooking or dressing salads during pregnancy	0.57 (0.4–0.8)	0.002
Mediterranean diet score during pregnancy ³	0.96 (0.9–1.1)	0.56

¹This analysis only included factors which were significant ($P \leq 0.05$) in the univariate one.

²Odds ratio adjusted for all the variables in the table.

³Per unit increment.

pregnancy, is associated with less (nearly 40%) wheezing of the offspring during his/her first year of life.

It has been proposed that the development of asthma and allergies might be determined during fetal life, as there are potential mechanisms by which environmental factors, such as maternal diet and lifestyle, may influence the development of the airways and of the immune system of the child in utero.^{2,23,24} Regarding diet, Black and Sharpe²⁵ postulated that changes in dietary fat intake by increasing n-6 PUFA and decreasing n-3 PUFA had contributed to the increase of the prevalence of asthma worldwide: increasing the ratio of dietary n-6/n-3 PUFA might cause an increased level of prostaglandin (PG) E₂. PGE₂ suppresses T-helper (Th)1 differentiation (reduces IFN-gamma secretion) and promotes Th2 phenotype, which is associated with asthma and atopic diseases, by increasing IgE isotype switching. On the other hand, Seaton et al.²⁶ postulated that diets low in antioxidants may have increased the population susceptibility to develop asthma. The proposed mechanism involves the decline of lung antioxidant defences, resulting in increased oxidant-induced airway damage.

Some transport mechanisms for long chain PUFA and antioxidants (both components of Mediterranean diet) have been identified as being able to cross the placenta.²⁷ Furthermore, several birth cohort studies showed an association between maternal antioxidant status during pregnancy and prevalence of wheeze/asthma in children. For example, high intake of oily fish (rich in n-3 PUFA) during pregnancy reduced the risk of allergic diseases^{28,29} and persistent wheezing in non-breastfed children.³⁰ Low umbilical-cord selenium concentration was reported to be associated with an increased risk of persistent wheeze up to preschool age.³¹ Similarly, low maternal and neonatal plasma selenium levels have been associated with wheeze at the age of 2 years, but not at the age of 5.³² Low maternal intakes of vitamins E, D, and zinc during pregnancy were associated to an increased risk of wheezing at the ages of

2^{33–37} and 5,^{33–35} but not with eczema during the first 2 years of life.^{36–37}

Mediterranean diet is rich in both antioxidants and *cis*-monounsaturated fatty acids. Moreover, among its components, cereals (particularly wholegrain) are rich in vitamin D, phenolic acids, and phytic acid; and fruits, vegetables, and legumes are rich in vitamin C, E, carotenoids, selenium, and flavonoids. Additionally, olive oil for cooking and dressing salads constitutes a major component of the Mediterranean diet. The main active components of olive oil include oleic acid, phenolic derivatives (hydroxytyrosol, tyrosol, oleuropein, and ligstroside) and squalene; all of which have been found to exhibit a marked antioxidant activity, oleuropein and its hydrolysis product (hydroxytyrosol) being the most potent antioxidants.³⁸

High level of adherence to the Mediterranean diet early in life protects against the development of asthma and atopy in children.³⁹ Recently, Chatzi et al.¹⁴ in a birth cohort study in 460 children from Menorca, Spain, reported a protective effect of the Mediterranean diet during pregnancy against asthma-like symptoms and atopy in children at 6.5 years of age. The authors included olive oil among the Mediterranean diet score; and when they analyzed the individual components of the diet, they found that higher consumption of vegetables was inversely associated with persistent wheeze and atopy; similarly, higher consumption of legumes and fish were inversely associated with persistent wheeze. However, no analysis on olive oil as an individual component was reported. A cross-sectional study conducted in 1,467 children (6–7 years old) from the Mexicali region showed no association between maternal adherence to Mediterranean diet during pregnancy and asthma in children, but olive oil was not evaluated.¹³ Also, a recent ALPAC cohort study¹⁶ showed that other different dietary patterns in pregnancy (e.g., “health conscious,” “traditional,” “processed,” “vegetarian,” and “confectionery”) do not have a protective effect on asthma/

wheezing in the offspring during school age. This “health conscious” pattern of diet was similar to the Mediterranean diet but did not include olive oil. Thus, analyzing separately the effect of olive oil during pregnancy made it possible to reveal our finding.

In the present study, mothers of infants who did not wheeze during their first year of life have a significantly higher Mediterranean diet score (although the absolute difference was very small) and significantly higher use of olive oil for cooking/dressing salads during their pregnancy than those wheezing infants. After controlling for potential confounders the effect of Mediterranean diet disappeared, and only the use of olive oil remained as a protective factor for wheezing during the first year of life. A potential explanation of this finding might be that, as was explained above, olive oil contains the most potent antioxidant components of that diet.³⁸ Conversely, mothers in the wheezing group used more margarine/butter and other oils (rich in n-6 PUFA, as compared to olive oil), thus increasing the intake of pro-inflammatory substances.²⁵ Moreover, since our Mediterranean diet score was very similar between mothers with and without olive oil intake, the effect of olive oil could play an independent role: this was confirmed in the second multivariate model (excluding olive oil), where Mediterranean diet showed no effect on wheeze. Unfortunately, we did not have quantitative information on olive oil consumption. However, our results could suggest that the increase of olive oil consumption during pregnancy might be a primary prevention measure to reduce wheezing early in life. Prospective and long-term studies are needed to confirm this finding.

There are some important potential limitations in the present study. Firstly, as in all cross-sectional studies, a recall bias for food intake and wheezing could be present. Since this report was part of the EISL study (which was originally implemented to search for the prevalence of wheezing in infancy) it would be possible that those children who entered the study had been more prone to wheeze; however, the participation rate was quite reasonable, which makes a participation bias less likely. No corroboration of wheezing with clinical records was contemplated within the EISL protocol. Secondly, our food questionnaires did not allow for correcting for energy intake; nevertheless most studies on diet and asthma in children do not correct for this parameter.⁴⁰ Also, no data on non-industrial food consumption (e.g., fruit, vegetable, or olive oil) during infancy were recorded. Thirdly, a bias on reported height and weight could also be present; however, a prior study in the same area showed that height and weight reported by parents are reliable for epidemiological studies.⁴¹

In the present study, other factors related to nutrition, such as industrial infant food consumption or overweight/obesity were not associated to wheezing during the

first year of life. This might be due to industrial infant food being too widespread, and to the association between obesity and wheezing/asthma starting later in life. We recently showed that although Mediterranean diet is an independent protective factor for current wheezing among both preschoolers¹² and schoolchildren,¹¹ obesity was a risk factor only in schoolgirls but not in schoolboys or preschoolers. In addition, it was previously reported⁴² that girls becoming obese between 6 and 11 years of age have more risk of developing asthma, and this effect is highest in those with early menarche.

Finally, other factors which in our study remained significantly associated with wheezing (male gender, day care attendance, eczema, maternal asthma, smoking during pregnancy, and mould stains on the household walls) are well-known, and are accepted risk factors,^{17,43,44} thus adding some strength to the other findings of the present study. The proportion of wheezing children found in our study (42.2%) was higher than that reported in the Tucson cohort (30%),¹⁷ but smaller than the overall EISL study (45%) carried out more recently (data from the authors).

In conclusion, our results suggest a potential protective effect (primary prevention) of olive oil for cooking or dressing salads during pregnancy on wheezing during the first year of the offspring's life. Future prospective studies on olive oil consumption during pregnancy need to be carried out to confirm this finding.

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Electronic Supplemental Table (e1): Prevalence (%) of the intake of different foods during pregnancy and wheezing in the offspring during their first year of life.

	Wheezing			Non-wheezing			*p for trend
	N= 594			n= 815			
	Never or Occasionally	1 or 2 times/week	≥ 3 times/week	Never or occasionally	1 or 2 times/week	≥ 3 times/week	
Meat	1.6	36.0	62.4	2.9	33.6	63.5	0.22
Hamburgers home made	74.1	23.4	2.5	80.2	18.1	1.7	0.03
Fast food:							
Pizzas	63.3	33.6	3.1	63.6	33.6	2.8	0.95
Hamburgers/hotdogs	84.3	13.7	2.0	86.0	13.0	1.0	0.24
Precooked fried food	58.3	33.8	7.9	62.9	33.2	4.0	0.009
White fish	16.1	65.0	18.9	12.2	69.0	18.8	0.11
Oily fish	26.4	56.4	17.2	23.8	60.6	15.6	0.32
Fruit, natural juice	7.0	17.9	75.2	4.2	13.8	82.0	0.007
Fresh vegetables	10.9	25.9	63.1	7.0	23.9	69.2	0.015
Salads	7.2	21.4	71.4	4.5	17.7	77.9	0.013
Cooked vegetables	14.9	39.1	46.1	13.6	38.3	48.1	0.70
Legumes	6.2	55.2	38.5	6.1	56.1	37.9	0.96
Cereals (including bread)	6.2	21.4	72.4	5.6	18.3	76.1	0.31
Pasta	9.1	65.8	25.1	6.3	70.1	23.5	0.10
Rice	9.5	68.8	21.8	7.2	74.9	17.9	0.04
Butter	64.9	25.0	10.1	69.1	22.2	8.7	0.27
Margarine	71.4	20.0	8.5	70.2	21.9	7.9	0.70
Nuts, peanuts	60.3	30.0	9.7	57.2	33.2	9.6	0.47
Potatoes	11.7	50.0	38.3	12.6	50.4	37.0	0.83
Snacks	56.0	31.7	12.3	57.3	30.5	12.2	0.88
Milk	6.4	8.9	84.6	4.1	7.7	88.2	0.09
Yoghurt	10.4	26.5	63.2	11.0	22.7	66.4	0.28
Eggs	7.8	68.1	24.1	7.3	69.4	23.3	0.87
Industrial pastry	37.3	36.4	26.3	40.7	37.5	21.8	0.15
Alcohol beverages	95.3	4.3	0.4	97.3	1.7	1.0	0.006
Soft drinks	46.3	34.0	19.7	48.5	35.0	16.5	0.32

* Cuzick's chi-square for trend.