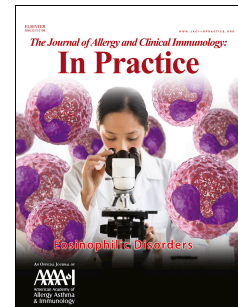


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Predictors of Food Sensitization in Children and Adults across Europe

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Predictors of Food Sensitization in Children and Adults across Europe

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ABSTRACT

BACKGROUND The geographical variation and temporal increase in prevalence of food sensitization (FS), suggest environmental influences.

OBJECTIVE To investigate how demographics, environment, and infant diet are associated with FS in children and adults, focusing on early-life exposures.

METHODS Data on demographics, childhood and adult environmental exposures (including, amongst others, sibship size, day care, pets, farm environment, and smoking), and infant diet (including breastfeeding, and timing of introduction to infant formula and solids), were collected from 2196 school-age children and 2185 adults completing an extensive questionnaire and blood sampling in the cross-sectional pan-European EuroPrevall project. Multivariable logistic regression was applied to determine associations between the exposure variables and sensitization to foods commonly implicated in food allergy ($sIgE \geq 0.35$ kU/L). Secondary outcomes were inhalant sensitization and primary (non-cross-reactive) FS.

RESULTS Dog ownership in early childhood was inversely associated with childhood FS (OR 0.65 [95%-CI 0.48-0.90]), as was higher gestational age at delivery (OR 0.93 [95%-CI 0.87-0.99] per week increase in age). Lower age and male sex were associated with higher prevalence of adult FS (OR 0.97 [95%-CI 0.96-0.98] per year increase in age, and 1.39 [95%-CI 1.12-1.71] for male sex). No statistically significant associations were found between other evaluated environmental determinants and childhood or adult FS, nor between infant diet and childhood FS, although early introduction of solids did show a trend towards prevention of FS.

84 **CONCLUSION** Dog ownership seems to protect against childhood FS, but independent effects
85 of other currently conceived environmental and infant dietary determinants on FS in childhood
86 or adulthood, could not be confirmed.

87 **Word count abstract:** 249

HIGHLIGHTS BOX**1. What is already known about this topic?**

Prevalence of food sensitization (FS) varies considerably across Europe, and is reported to be on the rise. Environmental influences are likely, but studies investigating currently conceived environmental predictors for FS are lacking.

2. What does this article add to our knowledge?

This is the first study evaluating the main postulated environmental risk factors for FS, using a standardized approach in both children and adults across Europe. Mutually adjusted associations between primarily early-life exposures and FS are revealed.

3. How does this study impact current management guidelines?

Dog ownership appears to protect against childhood FS, but other environmental factors appear to have (more) limited impact on prevalence of FS in European children and adults.

KEY WORDS

Food sensitization, food allergy, inhalant sensitization, predictors, risk factors, early life exposures, environment, infant diet, dog, Europe

106 **ABBREVIATIONS**

107 CI - confidence interval

108 DBPCFC - double-blind placebo-controlled food challenge

109 FA - food allergy

110 FS - food sensitization

111 HDM - house dust mite

112 IS - inhalant sensitization

113 OR - Odds ratio

114

INTRODUCTION

Prevalence estimates of IgE-sensitization to foods in 6- to 10-year-old children in Europe are reported to vary from 4.1 to 52.0%¹. In adults, prevalence of food sensitization (FS) ranges from 6.5 to 23.6% across various European countries². Several studies indicate that prevalence of FS is rising in children and adults³⁻⁷. The geographical variation in prevalence of FS in children and adults of comparable genetic background, and the proposed increase in FS prevalence over time, suggest an effect of environmental factors⁸.

Although FS does not invariably lead to food allergy (FA), it is a prerequisite, and an objective endpoint that can feasibly be obtained for various foods in a large group of participants. Studies investigating environmental predictors for FS are scarce. Some previous studies report a protective effect of certain environmental determinants on FS in children, such as younger maternal age at delivery⁹, higher number of previous pregnancies¹⁰, exposure to a farm environment^{10, 11}, or having childhood pets (dogs or cats)¹¹. Determinants related to infant diet also may be relevant. Vitamin D insufficiency and late introduction of solid foods, for example, have been associated with an increased likelihood of FS¹²⁻¹⁴. In adults, a link between use of antacids and increased FS has been proposed¹⁵. Most studies in adults, however, tend to focus on inhalant sensitization (IS) or other atopic diseases as outcomes^{16, 17}. As part of the European Community Respiratory Health Survey, Svanes et al. performed extensive analyses on the effect of a multitude of childhood environmental determinants on adult sensitization to inhalant allergens, and found a protective effect of increasing family size, bedroom sharing and the presence of a dog in the childhood home¹⁷. Studies on this scale, which include multiple suggested risk factors and allow for mutual adjustment, are not yet available for the outcome FS

or FA. Such studies are key to helping us understand differences in prevalence and time trends between and within populations⁸.

This gap in knowledge led to the current study, in which the primary aim was to investigate how demographic, environmental and dietary determinants are associated with sensitization to foods that are commonly consumed across Europe and frequently implicated in FA. The focus was on early life events and exposures, and the outcome was assessed in both children and adults, using data collected from all across Europe in a standardized manner during the EU-funded EuroPrevall project. Secondary outcomes included IS and primary (non-cross-reactive) FS, in order to determine whether there are differences between predictors for FS and IS, the latter of which was the focus of previous studies in adult populations¹⁷.

METHODS

Study design, setting and subjects

A full description of the methodology of the EuroPrevall study, a cross-sectional cohort study with a case-control design nested within, is available elsewhere¹⁸. In the current study, we included randomly sampled children (7-10 years) and adults (20-54 years) from the general population of Athens (Greece), Lodz (Poland), Madrid (Spain), Reykjavik (Iceland), Utrecht (The Netherlands), Zurich (Switzerland), and Vilnius (Lithuania), who completed phase I (a short screening questionnaire) and phase II (a detailed questionnaire, and blood sampling for detection of IgE against 24 common food allergens [termed *priority foods*] and 6 common inhalant allergens [as summarized in this article's online repository]). All phase I participants who reported symptoms to one or more of the 24 priority foods (cases) and a random sample of phase I participants who reported no symptoms to these foods (controls), were invited for phase II. All data were collected between 2007 and 2009 for children, with a median time interval of 5 months between phase I and II; and between 2006 and 2009 for adults, with a median time interval of 8 months. The local ethical committees of all participating centres gave approval for this study, and informed consent was obtained from all participants.

Data collection

The primary outcome, FS, was defined as positive serology ($sIgE \geq 0.35$ kUA/l) to at least one of the 24 selected foods. IS was considered present if a subject was sensitized to at least one of the 6 selected inhalant allergens. Primary FS, defined as sensitization occurring through true plant or animal-derived food allergens, rather than through pollen inhalant allergens cross-reacting with plant food allergens, was determined using an allergen microarray assay (figure E1). The overlap between the various outcome variables is depicted in figure E2.

Information on determinants was extracted from answers to the EuroPrevall phase II questionnaire (figure E3 and E4). In addition to the childhood environmental factors that were investigated for both adults and children, infant dietary factors were taken into account for children, and adult environmental factors for adults. Childhood environmental determinants were investigated for exposure before the age of two years for children and before the age of five years for adults. To give a complete overview, demographic factors were also assessed. More details on data collection are available in this article's online repository.

Data analysis

As an initial exploration, differences between subjects with and without FS were examined using the chi-square test for categorical variables and two-sample t-test for continuous variables. Univariable logistic regression was performed to assess crude associations between each individual determinant and FS. Multivariable logistic regression including all determinants was then applied to obtain the independent contribution of the determinants to FS (adjusted odds ratios [OR]). Details on missing data are available from table E1. To ensure optimal power in the multivariable analysis and potentially reduce bias, multiple imputation was performed using fully conditional specification (20 imputations, 20 iterations), for which all variables in table E1 were included as covariates. As it is known that the prevalence of FS is variable between countries², all analyses were controlled for centre by adding centre as a categorical covariate in the model. In order to better understand the independent contribution of the various determinants, a stepwise approach to model building was chosen. In model I, multivariable analysis was performed with only demographic factors. In model II, childhood environmental determinants were added. Model III consisted of adding infant dietary determinants for children, and adult environmental determinants for adults.

To observe how the association between the determinants and FS changed upon adding comorbidity with overlapping pathophysiological mechanisms, we performed additional analyses. First comorbid atopy (asthma, allergic rhinitis or atopic dermatitis comorbidity, or at least one of these three diseases in first-degree relatives, or parental FA in the children), and then co-existing IgE-sensitization to inhalant allergens, was incorporated into model III.

To evaluate whether predictors for FS differ from predictors for IS and primary FS, and enable comparison with earlier studies regarding factors associated with sensitization, we also fitted model III for these outcomes.

Analyses were conducted with SPSS version 25 (IBM Corporation, Armonk, NY). P-values <0.05 were considered statistically significant.

RESULTS

Of the 2326 children and 2256 adults completing the phase II questionnaire, the 2196 children and 2185 adults with available food serology were evaluated in this study. There were no differences in age or sex between those subjects who did and who did not complete phase II. In subjects who did complete phase II, subjects with available serology appeared somewhat more likely to report symptoms to (priority foods) and were more likely to be male, than subjects with missing serology results, but no other remarkable differences were observed in demographics or allergic comorbidities (table E2).

Respectively 494 children and 441 adults were sensitized to at least one of the priority foods. The median age of the children was 8.9 years in both those with and without FS, and respectively 50.8% and 49.6% were males (table 1). The food-sensitized adults had a median age of 35.3 years and 49.0% were males, whereas the non-sensitized adults had a median age of 39.2 years and 41.1% were males (table 2). Data on all determinants were complete in 76.5% of the children and 82.2% of the adults; in the rest, missing values on one or more of the determinants were estimated by multiple imputation.

Children: crude associations between demographic, childhood environmental, and infant dietary determinants, and food sensitization

Table 1 shows the results of univariable analyses in children. No significant associations between demographic factors age, sex and parental level of education with FS in childhood were found. Lower gestational age, lower birth weight and shorter length at birth, tended to increase the likelihood of FS (table 1). Comorbid atopy, parental FA and IS also showed strong positive associations with FS.

Many childhood environmental factors demonstrated significant inverse associations with FS, specifically having more siblings, having older siblings, day care attendance before the age of two years, and having a pet dog before the age of two years.

Regarding dietary determinants, breastfeeding for longer than six months was inversely associated with FS, compared to breastfeeding for less than six months. Breastfeeding was not necessarily exclusive. Use of infant formula, which could be either a replacement of or complementary to breastfeeding, was positively associated with FS; especially hypo-allergenic infant formula. In subjects who received infant formula, a trend was suggested where the younger infant formula was introduced, the less likely FS became. A similar trend was observed for solid food introduction.

Independent predictors of food sensitization in children

In multivariable analyses, gestational age was the only demographic determinant that remained significantly associated with FS in childhood (table 3). The longer the pregnancy, the lower the chance of FS in the child (OR 0.93 [95%-CI 0.87-0.99] per week of pregnancy duration). Of the childhood environmental determinants, having a pet dog before the age of two years was still significantly inversely associated after multivariable adjustment (OR 0.65 [95%-CI 0.48-0.90]). Of the infant dietary determinants, use of hypo-allergenic infant formula maintained a positive association with childhood FS (OR 1.51 [1.06-2.15]).

Adjustment for comorbid atopy did not result in relevant changes to the associations obtained in model III (table E3). Subsequent correction for co-existing IS resulted in male sex becoming significantly inversely associated with FS (OR 0.64 [0.49-0.84]) and attenuated the associations between having a pet dog under the age of two years and use of hypo-allergenic infant formula

and FS in childhood, suggesting that reverse causality explains part of the observed associations (table E3). The association between pet dog and FS remained significant.

Adults: crude associations between demographic, childhood and adult environmental determinants, and food sensitization

Table 2 shows the results of univariable analyses in adults. Of the demographic factors, younger age and male sex were significantly positively associated with FS, as were comorbid atopy and IS.

Analyses of childhood environmental determinants in adults showed a significant inverse association between having more siblings, sharing a bedroom with other or older children before the age of five years, and growing up on a farm before the age of five years, and FS in adulthood (table 2). In contrast to the findings in children, day care attendance before the age of five was shown to significantly increase the likelihood of adult FS.

Of the adult environmental determinants, ever having had a food-related occupation was associated with a lower risk of FS.

Independent predictors of food sensitization in adults

Only the demographic factors age and sex remained significantly associated with adult FS after multivariable adjustment (table 3), yielding OR 0.97 [95%-CI 0.96-0.98] per year increase in age, and OR 1.39 [95%-CI 1.12-1.71] for male sex. Multivariable analyses revealed no significant associations between childhood or adult environmental determinants and FS in adults.

Addition of comorbid atopy and subsequently IS to the model, did not notably change any of the observed associations (table E3).

Secondary outcomes: Independent predictors of sensitization to inhalant allergens and primary food allergens

Table E4 facilitates comparison of predictors for FS, as discussed above, with predictors of the secondary outcomes, IS and primary FS.

In children, the results pertaining to IS were generally similar to those related to FS. Noticeable exceptions were that bedroom sharing with other children before the age of two years and growing up in a farm environment showed stronger inverse associations with IS, the former of which reached statistical significance. Also, whereas sex was not associated with FS, male sex was significantly positively associated with IS. Regarding primary FS, no particular differences in predictors were found compared to overall FS.

In adults, it was noteworthy that, where there were no significant associations between the childhood environmental determinants and FS in adulthood, there was a significant inverse association between growing up in a farm environment or with a pet cat before the age of five years, and IS. Furthermore, increasing maternal age was significantly associated with higher risk of IS. Adjustment for comorbid atopy attenuated the protective effect of cat ownership, but not that of farm or maternal age, which suggests some reverse causality in the association between cat ownership and IS.

Regarding the outcome primary FS, bedroom sharing with older children before the age of five years was found to be inversely associated, and smoking in adulthood significantly increased the likelihood of primary FS in adults.

DISCUSSION

Summary of findings

Until now, no study existed in which the main postulated environmental and infant dietary risk factors for FA were evaluated collectively in multivariable analysis, especially not all over Europe for both children and adults. The data from the EuroPrevall project made this possible. In our study, having a pet dog before the age of two years was the only statistically significantly predictive early-life exposure, and it was found to be strongly associated with a decreased risk of FS in childhood. Higher gestational age at birth was also significantly inversely associated with childhood FS. No childhood or adult environmental determinants were significantly associated with FS in adulthood, but demographics lower age and male sex did make adult FS more likely.

Early-life exposures: environmental determinants

The finding that having a pet dog in early childhood was inversely associated with FS, consolidates existing evidence that dog ownership protects against childhood FA¹⁹⁻²¹. The protective effect is thought to be the result of exposure to diverse environmental microbiota²¹. Similarly to the adjusted OR of 0.65 (95%-CI 0.48-0.90) in the current study, Koplin et al. reported an adjusted OR of 0.6 (95% CI 0.3-0.8) for the association between dog ownership and challenge-proven egg, peanut and sesame allergy in Australian infants participating in the HealthNuts study²²; and Von Hertzen et al. found an adjusted OR of 0.57 (95% CI 0.35-0.95) for the association between having a dog before the age of one year and food and inhalant sensitization in Finnish schoolchildren aged 7 to 16 years¹¹. More recent findings from Europe by Marrs et al. demonstrate an even stronger relationship, with an adjusted OR of 0.1 (95% CI 0.01-0.71) between dog ownership before 3 months and challenge-confirmed FA to cow's milk,

egg white, cod, peanut, sesame and wheat in infants aged 1 to 3 years from the UK and Wales²¹. Perhaps the association is stronger depending on how young the subject is at exposure, or depending on how old the subject is when the outcome is measured. The result from our study that having a pet dog in childhood was not as strongly inversely associated with FS in adulthood, might be explained by the fact that the exposure to dog before the age of five years instead of two years was examined. Or maybe the protective effect does not last until adulthood. Alternatively, one should consider the fact that the adults stemmed from an environmentally different childhood era than the children in this study, which could mean that predictors for the current adults differ from those for the current children when reaching adulthood.

Previous literature suggests that environmental factors other than having a pet dog in childhood, also influence the likelihood of FA²³⁻²⁶. Two environmental determinants that are relatively consistently suggested to protect against FA in children, are an increasing number of siblings, especially older siblings²³⁻²⁶, and rural or farm lifestyle^{23, 27, 28}. In our study, these determinants also exhibited an inverse association with FS in univariable analysis, both for children and adults. However, the suggested protective effects were attenuated and lost statistical significance in multivariable analysis. Although the current study was not specifically powered to detect associations (of minimal relevant size) for all predictors studied, nor was it designed to assess causal associations, our study is unique in that it included both childhood environmental exposures and infant diet determinants in multivariable analysis for prediction of childhood FS, which may influence the associations found in comparison with earlier studies where a more limited set of predictive factors was evaluated. Furthermore, as the outcome FA is often (partly) defined by a measure of subjective interpretation, subjects self-reporting symptoms may be more

likely to report risk factors associated with FA than subjects without symptoms, thus possibly inflating associations. Our objective outcome, FS, may have mitigated these associations.

Nonetheless, several studies also report a significant protective effect of early-life farm exposure on IgE-sensitization, in both children^{11, 29} and adults^{17, 30}. All these studies, however, focused on IS. In our study, early-life farm exposure, but also bedroom sharing in childhood for example, were more strongly inversely associated with IS than with FS in both children and adults, to the point of reaching statistical significance. Even larger differences were observed when comparing IS to primary FS. It is possible that predictors for food and inhalant sensitization differ, at least in effect size, despite shared pathophysiological mechanisms.

Early-life exposures: infant diet

Regarding infant diet, none of the dietary determinants evaluated in our study significantly predicted FS in childhood, except for use of hypo-allergenic infant formula. Findings from models with further adjustment for comorbid atopy and IS, where the association between use of hypo-allergenic infant formula and FS lost statistical significance, suggest that reverse causality may play a role here. In other words, food sensitized infants may be more likely to receive hypo-allergenic infant formula rather than the other way around.

Literature is inconsistent on whether breastfeeding is protective against allergy, neutral or allergy-promoting³¹. In accordance with our findings, most systematic reviews of literature conclude that there appears to be no significant association between breastfeeding ever vs. never, or breastfeeding duration, and FA^{23, 32, 33}. Interestingly, Hong et al. found that breastfeeding significantly increased or decreased the odds of FS in childhood depending on genotype,

implying that individual genes may decide whether breastfeeding promotes or protects against FS³¹.

No significant trend was found for timing of introduction of infant formula or solid foods and likelihood of FS in childhood in multivariable analyses, but effect direction did suggest that earlier introduction of solid foods may protect against FS. Introduction before 4 months would appear to be associated with the least likely FS, as was also concluded in a recent systematic review and meta-analyses by Burgess et al³⁴.

Demographics

Demographic factors were taken into account for complete adjustment, and as expected, some were relevant predictors of FS in our data. Interestingly, higher gestational age at delivery was found to be inversely related to FS in childhood. Available literature on the relationship between gestational age and the outcome FS is scarce, and previously showed no significant relationship³⁵. For the outcome FA, some results are contradictory in that they reveal a positive association between preterm birth and FA^{19, 36}, whereas others again report no significant relationship^{37, 38}. Several studies suggest that immune system homeostasis, gut barrier function and diversity in gut microbiota are essential for normal tolerance development^{39, 40}. As these features are underdeveloped in preterm infants, this may make FS more likely. Another possibility is that there is confounding through caesarean section, on which we had no data. Systematic reviews have concluded that c-section, which is more common in preterm births, is positively associated with both FS and FA, mostly based on the theory that babies born through c-section are deprived of first colonisation of the gut with maternal vaginal bacteria^{39, 41}.

In adults, FS significantly decreased with age in our study. Our data on primary FS in children suggest the same effect direction for children, but probably did not reach statistical significance due to the small age range in included children (7-10 years). Similar trends were found in cross-sectional studies in American, Italian and German children and adults⁴²⁻⁴⁴. These trends may be the result of increasing prevalence of FS over time, as suggested by some studies^{3, 6, 7}, which would lead to higher prevalence of sensitization in the younger age groups.

Male sex was positively associated with FS in adults. The latter finding appears to contradict the predominating thought that women are at a higher risk of FA than men^{1, 23, 26, 32}. However, with regard to FS, available studies also found that adult males are more likely to be food sensitized than adult females^{42, 44}. As many studies investigate the outcome FA rather than FS, outcome measures are mainly based on patient history. Since women are more likely to report symptoms to foods than men⁴⁴⁻⁴⁶, this may explain the discrepancy.

Strengths and limitations

Overall, this study is unique in that data on determinants were analyzed for the outcomes FS, IS and primary FS, in both children and adults, after assessing IgE-sensitization to 24 foods. A limitation is the retrospective data collection on childhood determinants, which means that some recall bias is likely, especially in adults. Also, causal inference was limited, because we had no information on when sensitization developed in relation to the exposure variables. We did attempt to take the possibility of reverse causality into account, assessing the change in associations after adding comorbid atopy to the model. The standardized approach of this multicentre study all across Europe is a major strength, allowing valid comparisons. The broad inclusion from the general population and the use of multiple imputation for sporadically missing

data on determinants, yielded a large study population in which we could evaluate most postulated environmental, infant dietary and demographic risk factors.

Conclusions

To conclude, our findings consolidate existing evidence that dog ownership in early childhood protects against FS in later childhood. Other postulated environmental and infant dietary risk factors for FA appear to have (more) limited impact on childhood or adult FS after mutual adjustment, though preventative tendencies were observed for certain early-life exposures, including early introduction of solid foods. Demographic factors also appear relevant, in that gestational age affects the likelihood of childhood FS, and age and sex the likelihood of adult FS.

Table 1. Characteristics of children and crude associations with food sensitization

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Variable		Sensitized (N=494)	Not sensitized (N=1702)	P	Crude OR [95%-CI]
Demographics					
Age (years); mean (SD)		8,97 (0,98)	8,88 (0,96)	0,16	1,09 [0,98-1,21]
Sex	Male	251 (50,8)	845 (49,6)	0,65	1,05 [0,86-1,28]
	Female	243 (49,2)	857 (50,4)		
Highest level of education parents	High	206 (41,7)	732 (43,0)	0,60	0,95 [0,77- 1,16]
	Low	288 (58,3)	969 (57,0)		
Gestational age (weeks); mean (SD)		39,16 (2,30)	39,48 (1,93)	<0,001	0,93 [0,89- 0,97]
Birth weight (grams); mean (SD)		3344,27 (561,28)	3398,98 (600,48)	0,07	0,98 [0,97-1,00] per 100g
Birth length (cm); mean (SD)		51,11 (3,27)	51,57 (3,38)	0,01	0,96 [0,93- 0,99]
Childhood environment					
Maternal age (years); mean (SD)		29,75 (5,19)	29,67 (5,54)	0,78	1,00 [0,98-1,02]
Number of siblings	0	97 (19,7)	302 (17,8)	0,05	Reference
	1	247 (50,2)	859 (50,6)		0,90 [0,69-1,18]
	2	118 (24,0)	368 (21,7)		1,00 [0,73-1,36]
	3 or more	30 (6,1)	169 (10,0)		0,55 [0,35-0,86]
Number of older siblings	0	277 (56,3)	857 (50,5)	0,02	Reference
	1	154 (31,3)	591 (34,8)		0,81 [0,64-1,01]
	2	51 (10,4)	175 (10,4)		0,90 [0,64-1,26]
	3 or more	10 (2,0)	10 (2,0)		0,41 [0,20 -0,77]
Bedroom sharing with other children*		135 (27,3)	493 (29,1)	0,45	0,92 [0,73-1,15]
Bedroom sharing with older children*		118 (23,9)	428 (25,2)	0,56	0,93 [0,74-1,18]
Day care attendance*		175 (35,4)	698 (41,1)	0,02	0,79 [0,64-0,97]
Farm environment*		2 (0,4)	8 (0,5)	1,00	0,86 [0,13-3,45]
Inner city environment*		212 (42,9)	741 (43,5)	0,81	0,97 [0,80-1,19]
Pet dog*		65 (13,2)	429 (86,8)	0,01	0,67 [0,50-0,89]
Pet cat*		79 (16,0)	280 (16,5)	0,80	0,97 [0,73-1,26]
Serious respiratory infection*		133 (26,9)	424 (24,9)	0,37	1,11 [0,88-1,39]
Use of antibiotics*		296 (59,9)	1025 (60,3)	0,88	0,98 [0,80-1,21]
Maternal smoking during pregnancy		63 (12,8)	253 (14,9)	0,23	0,84 [0,62-1,12]
Maternal smoking since birth		149 (30,2)	528 (31,1)	0,70	0,96 [0,77-1,19]
Paternal smoking since birth		201 (40,7)	710 (41,8)	0,67	0,96 [0,78-1,17]
Reflux medication in last 6 months		3 (0,6)	17 (1,0)	0,42	0,61 [0,14-1,81]
Infant diet					
Vitamin D supplementation*		374 (80,4)	1324 (82,3)	0,35	0,88 [0,68-1,15]
Breastfeeding duration	Never	51 (10,4)	173 (10,3)	0,07	Reference
	≤4 months	173 (35,3)	521 (31,1)		1,13 [0,79-1,62]
	4-6 months	80 (16,3)	237 (14,1)		1,15 [0,77-1,72]
	>6 months	186 (38,0)	745 (44,5)		0,85 [0,60-1,21]
Cow's milk infant formula		282 (57,9)	982 (58,2)	0,90	0,99 [0,81-1,21]
Soy milk infant formula		38 (7,8)	110 (6,5)	0,31	1,22 [0,82-1,77]
Hypo-allergenic infant formula		126 (25,9)	286 (17,0)	<0,001	1,71 [1,34-2,17]
Age start infant formula	Never	91 (18,7)	430 (25,6)	0,02	Reference
	0-4 months	225 (46,3)	742 (44,2)		1,43 [1,10-1,89]
	4-6 months	61 (12,6)	188 (11,2)		1,53 [1,06-2,21]
	6-11 months	81 (16,7)	253 (15,1)		1,51 [1,08-2,12]
	≥11 months	28 (5,8)	66 (3,9)		2,00 [1,21-3,27]
Age introduction solid foods	0-4 months	76 (15,7)	342 (20,6)	0,04	Reference
	4-6 months	226 (46,8)	738 (44,4)		1,38 [1,04-1,85]
	6-11 months	133 (27,5)	463 (27,8)		1,29 [0,95-1,78]
	≥11 months	48 (9,9)	120 (7,2)		1,80 [1,18-2,73]
Comorbid atopy		26 (5,3)	189 (11,3)	<0,001	2,28 [1,52-3,55]
Parental food allergy		128 (29,0)	377 (24,8)	0,07	1,24 [0,98-1,57]
Pollen sensitization†		325 (66,7)	178 (10,6)	<0,001	16,89 [13,26-21,62]
Inhalant sensitization overall‡		368 (75,6)	335 (20,0)	<0,001	12,39 [9,78-15,78]
Centre	Zurich	93 (18,8)	211 (12,4)	<0,001	2,71 [1,89-3,89]
	Madrid	82 (16,6)	196 (11,5)		2,57 [1,78-3,73]
	Athens	40 (8,1)	115 (6,8)		2,14 [1,36-3,33]
	Utrecht	102 (20,6)	296 (17,4)		2,12 [1,50-3,00]
	Lodz	83 (16,8)	370 (21,7)		1,38 [0,97-1,97]
	Vilnius	30 (6,1)	121 (7,1)		1,52 [0,93-2,44]
	Reykjavik	64 (13,0)	393 (23,1)		Reference

Legend Table 1

Results presented in N (%) unless otherwise specified. *Before the age of 2 years; [†]IgE-sensitization to birch, grass, mugwort, parietaria; [‡]IgE-sensitization to pollen, cat or house dust mite; OR = Odds ratio, CI = Confidence interval, **bold** = p<0,05.

Table 2. Characteristics of adults and crude associations with food sensitization

Variable		Sensitized (N=441)	Not sensitized (N=1744)	P	Crude [95%-CI]	OR
Demographics						
Age (years); mean (SD)		36,10 (9,35)	38,89 (9,52)	<0,001	0,97 [0,96-0,98]	
Sex	Male	216 (49,0)	716 (41,1)	<0,001	1,38 [1,12-1,70]	
	Female	225 (51,0)	1028 (58,9)			
Level of education	High	285 (64,6)	1151 (66,0)	0,59	0,94 [0,76-1,17]	
	Low	156 (35,4)	593 (34,0)			
Childhood environment						
Maternal age (years); mean (SD)		28,60 (5,59)	28,03 (5,90)	0,07	1,02 [1,00-1,03]	
Number of siblings	0	32 (7,3)	128 (7,4)	0,01	Reference	
	1	169 (38,7)	582 (33,5)		1,16 [0,77-1,80]	
	2	122 (27,9)	428 (24,6)		1,14 [0,74-1,79]	
	3 or more	114 (26,1)	601 (34,6)		0,76 [0,50-1,19]	
Number of older siblings	0	182 (41,6)	697 (40,1)	0,39	Reference	
	1	141 (32,3)	536 (30,8)		1,01 [0,79-1,29]	
	2	70 (16,0)	269 (15,5)		1,00 [0,73-1,35]	
	3 or more	44 (10,1)	237 (13,6)		0,71 [0,49-1,01]	
Bedroom sharing with other children*		236 (53,5)	1058 (60,7)	0,01	0,74 [0,60-0,92]	
Bedroom sharing with older children*		134 (30,6)	650 (37,4)	0,01	0,74 [0,59-0,92]	
Day care attendance*		251 (58,8)	906 (53,3)	0,04	1,25 [1,01-1,55]	
Farm environment*		14 (3,2)	105 (6,0)	0,02	0,51 [0,28-0,87]	
Inner city environment*		147 (33,3)	535 (30,7)	0,28	1,13 [0,90-1,41]	
Pet dog*		165 (37,4)	692 (39,7)	0,38	0,91 [0,73-1,13]	
Pet cat*		163 (37,0)	696 (39,9)	0,26	0,88 [0,71-1,09]	
Serious respiratory infection*		46 (11,3)	211 (13,2)	0,30	0,84 [0,59-1,16]	
Adult environment						
Smoking		224 (50,8)	928 (53,2)	0,36	0,91 [0,74-1,12]	
Food-related occupation		109 (24,7)	540 (31,0)	0,01	0,73[0,57-0,93]	
Indigestion medication currently	No or <1x/year	386 (87,5)	1513 (86,8)	0,15	Reference	
	Yes, <1x/month	35 (7,9)	110 (6,3)		1,25 [0,83-1,84]	
	Yes, <1x/week	7 (1,6)	30 (1,7)		0,91 [0,37-1,98]	
	Yes, ≥ 1x/week	13 (2,9)	91 (5,2)		0,56 [0,30-0,98]	
Comorbid atopy		28 (6,3)	371 (21,3)	<0,001	3,99 [2,72-6,07]	
Pollen sensitization [†]		340 (80,8)	287 (16,7)	<0,001	20,96 [16,02-17,70]	
Inhalant sensitization overall [‡]		37 (8,8)	437 (25,4)	<0,001	30,47 [21,66-44,10]	
Centre	Zurich	147 (33,3)	335 (19,2)	<0,001	4,88 [3,37-7,23]	
	Madrid	63 (14,3)	246 (14,1)		2,85 [1,86-4,41]	
	Athens	15 (3,4)	52 (3,0)		3,21 [1,62-6,12]	
	Utrecht	112 (25,4)	364 (20,9)		3,42 [2,34-5,11]	
	Lodz	65 (14,7)	313 (17,9)		2,31 [1,52-3,55]	
	Reykjavik	39 (8,8)	434 (24,9)		Reference	

Legend Table 2

Results presented in N (%) unless otherwise specified. *Before the age of 5 years; [†]IgE-sensitization to birch, grass, mugwort, parietaria; [‡]IgE-sensitization to pollen, cat or house dust mite; OR = Odds ratio, CI = Confidence interval, **bold** = $p < 0,05$.

Table 3. Independent predictors of food sensitization

Variable	Children		Adults	
	Adjusted OR [95%-CI]	P-value	Adjusted OR [95%-CI]	P-value
Demographics				
Age (years)	1,01 [0,91-1,13]	0,85	0,97 [0,96-0,98]	<0,001
Male sex	1,01 [0,82-1,25]	0,92	1,39 [1,12-1,73]	<0,001
High level of education*	1,02 [0,80-1,29]	0,88	0,86 [0,67-1,09]	0,21
Gestational age (weeks)	0,93 [0,87-0,99]	0,01	NA	NA
Birth weight (grams)	1,00 [1,00-1,00]	0,97	NA	NA
Birth length (cm)	1,01 [0,97-1,06]	0,65	NA	NA
Childhood environment				
Maternal age (years)	0,99 [0,97-1,01]	0,33	1,01 [0,99-1,03]	0,45
Number of siblings	1	0,86 [0,63-1,18]	1,22 [0,75-1,97]	0,74
	2	1,09 [0,73-1,64]	1,34 [0,78-2,29]	
	3 or more	0,76 [0,40-1,44]	1,35 [0,75-2,42]	
Number of older siblings	1	0,85 [0,63-1,15]	1,17 [0,85-1,62]	0,74
	2	1,02 [0,63-1,18]	1,21 [0,78-1,88]	
	3 or more	0,77 [0,31-1,95]	1,22 [0,69-2,14]	
Bedroom sharing with other children	0,77 [0,53-1,13] [†]	0,18	0,84 [0,62-1,14] [‡]	0,26
Bedroom sharing with older children	1,19 [0,79-1,80] [†]	0,40	0,75 [0,52-1,06] [‡]	0,11
Day care attendance	0,82 [0,64-1,05] [†]	0,12	1,02 [0,80-1,30] [‡]	0,89
Farm environment	1,06 [0,21-5,36] [†]	0,95	0,73 [0,40-1,35] [‡]	0,32
Inner city environment	0,94 [0,76-1,17] [†]	0,60	1,01 [0,79-1,29] [‡]	0,93
Pet dog	0,65 [0,48-0,90][†]	0,01	0,94 [0,70-1,27] [‡]	0,61
Pet cat	1,04 [0,77-1,40] [†]	0,79	0,87 [0,68-1,10] [‡]	0,24
Serious respiratory infection	1,11 [0,86-1,45] [†]	0,42	0,88 [0,62-1,25] [‡]	0,47
Use of antibiotics	1,14 [0,89-1,45] [†]	0,29	NA	NA
Maternal smoking during pregnancy	0,74 [0,51-1,08]	0,12	NA	NA
Maternal smoking since birth	1,12 [0,84-1,48]	0,45	NA	NA
Paternal smoking since birth	0,97 [0,77-1,22]	0,78	NA	NA
Reflux medication in last 6 months	0,61 [0,17-2,19]	0,45	NA	NA
Infant diet				
Vitamin D supplementation	1,05 [0,75-1,47] [†]	0,77	NA	NA
Breastfeeding duration	≤4 months	1,20 [0,82-1,75]	NA	NA
	4-6 months	1,20 [0,75-1,94]	NA	NA
	>6 months	0,91 [0,57-1,46]	NA	NA
Cow's milk infant formula	0,85 [0,58-1,24]	0,39	NA	NA
Soy milk infant formula	1,35 [0,89-2,05]	0,16	NA	NA
Hypo-allergenic infant formula	1,51 [1,06-2,15]	0,02	NA	NA
Age start infant formula	0-4 months	1,02 [0,60-1,72]	NA	NA
	4-6 months	1,04 [0,60-1,79]	NA	NA
	6-11 months	1,10 [0,66-1,82]	NA	NA
	≥11 months	1,79 [0,94-3,40]	NA	NA
Age introduction solid foods	4-6 months	1,37 [1,00-1,86]	NA	NA
	6-11 months	1,22 [0,86-1,71]	NA	NA
	≥11 months	1,45 [0,93-2,27]	NA	NA
Adult environment				
Smoking	NA	NA	0,99 [0,79-1,24]	0,94
Food-related occupation	NA	NA	0,83 [0,64-1,07]	0,15
Indigestion medication currently	<1x/month	NA	1,30 [0,85-1,97]	0,59
	<1x/week	NA	1,10 [0,46-2,60]	
	≥ 1x/week	NA	0,84 [0,46-1,54]	

Legend Table 3

Analyses were adjusted for centre. *For children: high level of education parents; [†]Before the age of 2 years; [‡]Before the age of 5 years; reference categories: “number of (older) siblings” = 0; “indigestion medication” = no or <1x/year; “breastfeeding duration” = never; “age start infant formula” = never; “age introduction solid food = 0-4 months; HDM= house dust mite, OR = Odds ratio; CI = confidence interval; NA = Not available; **bold** = $p < 0,05$

ACKNOWLEDGEMENTS

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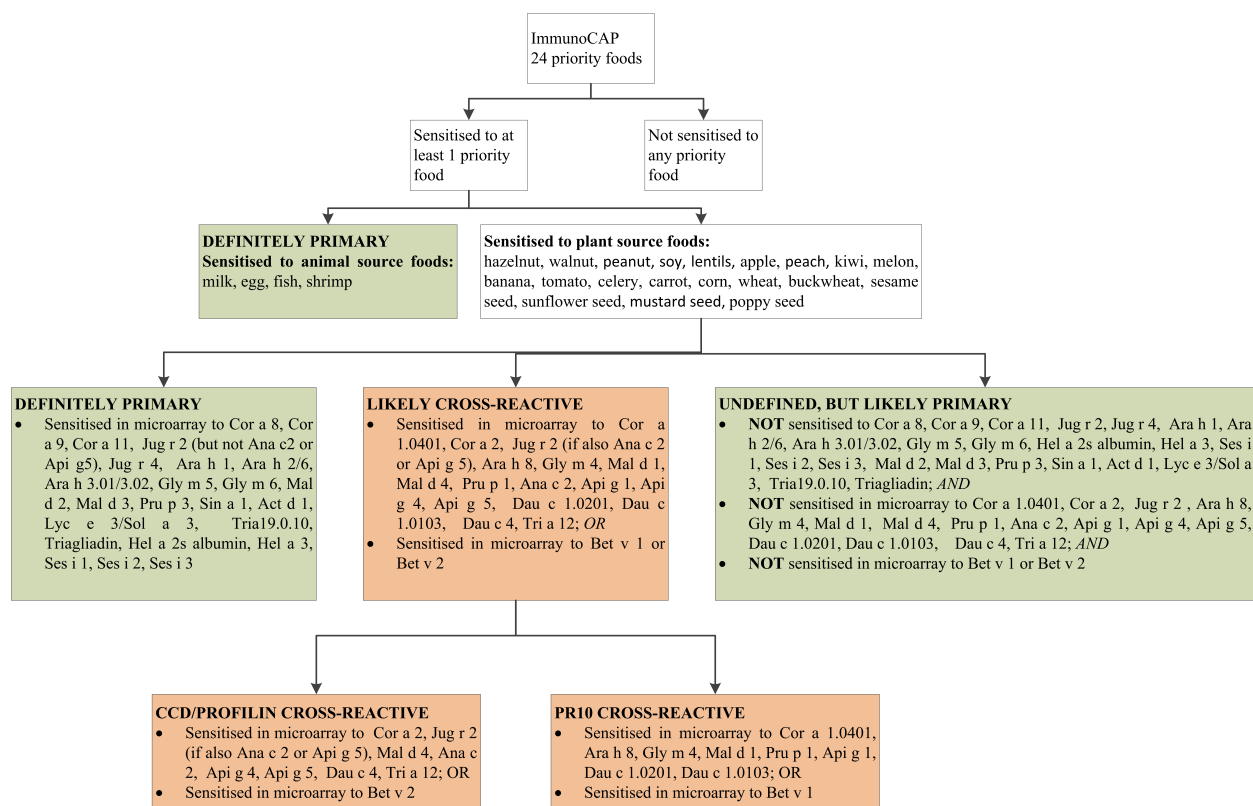
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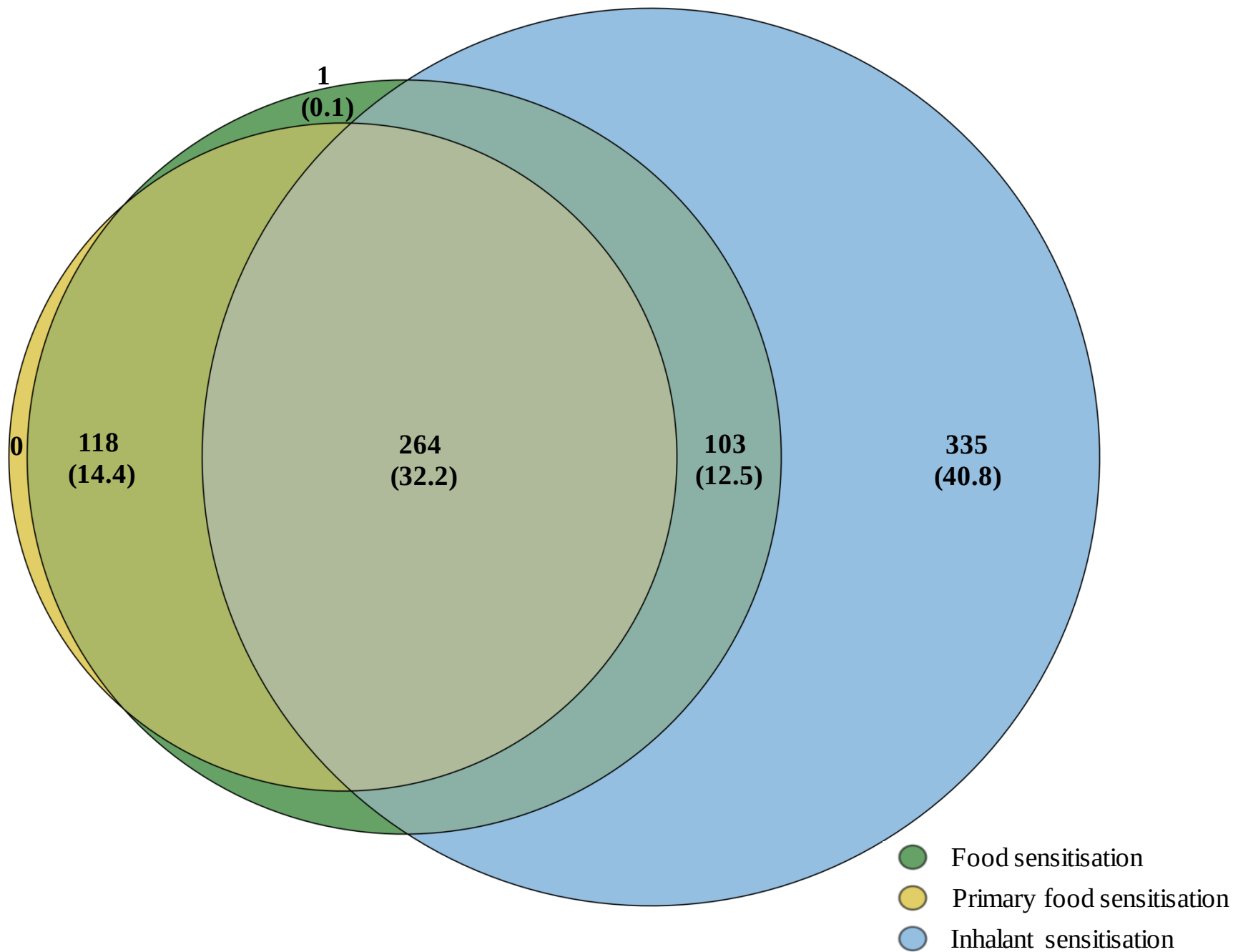
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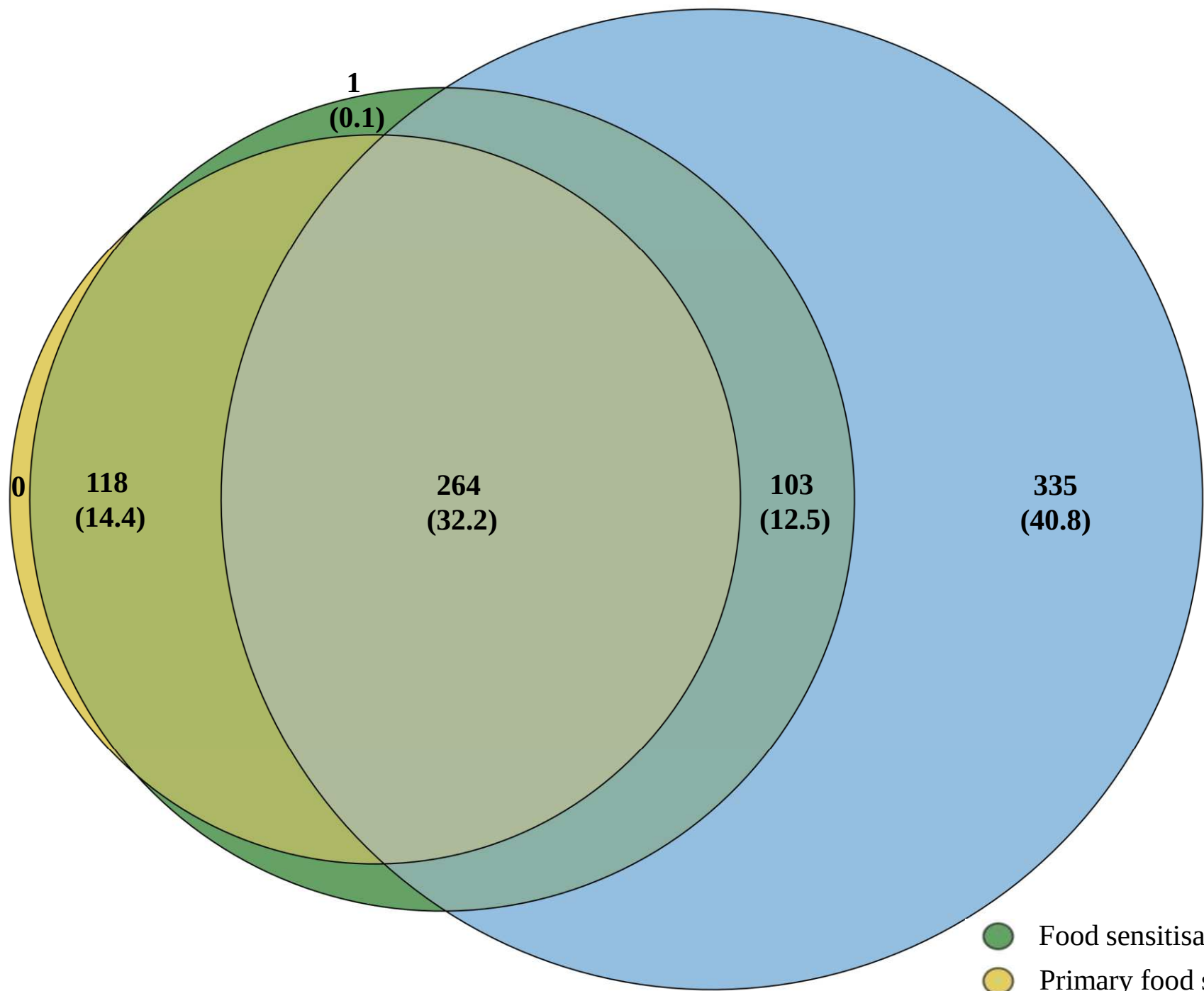
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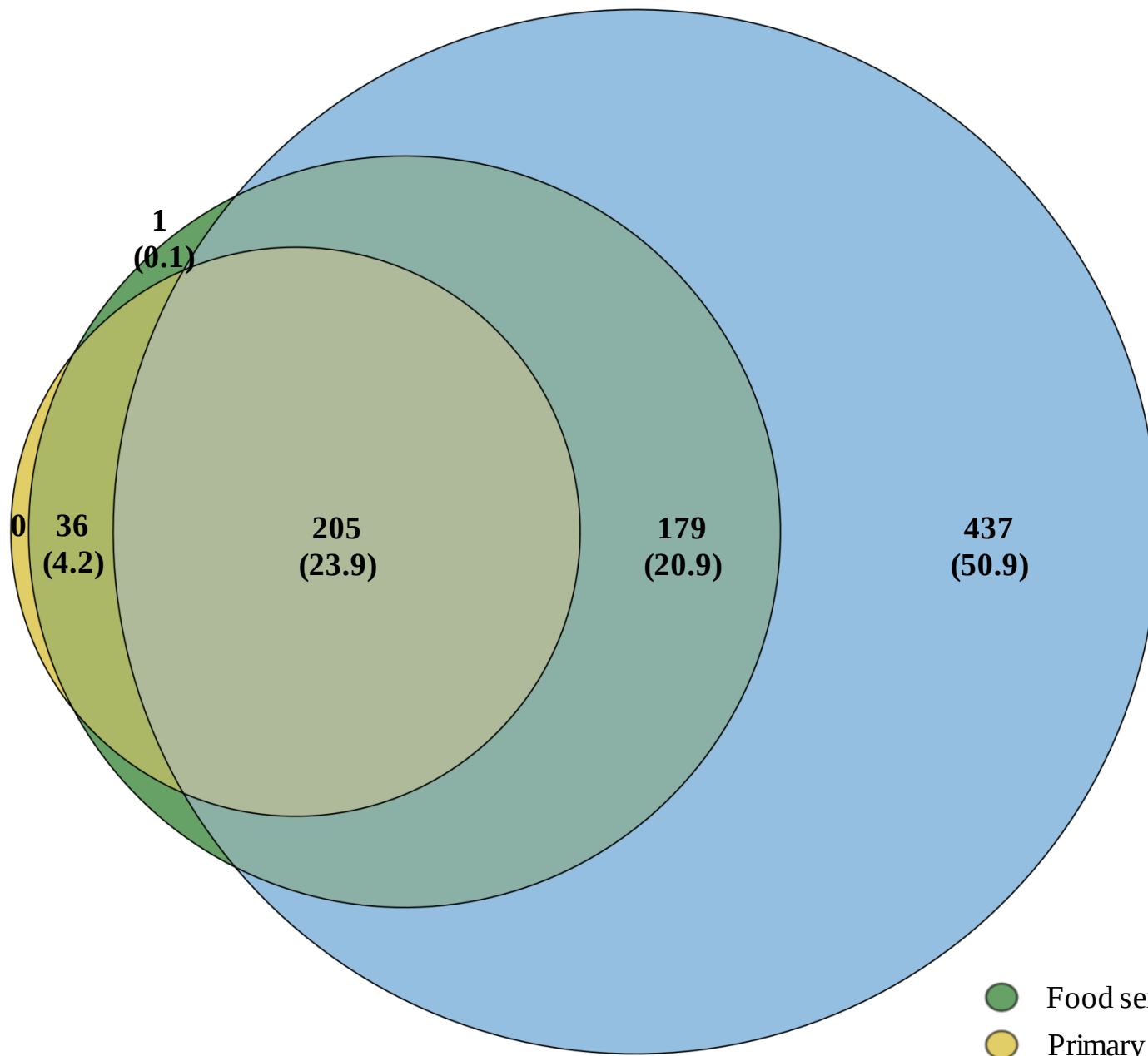
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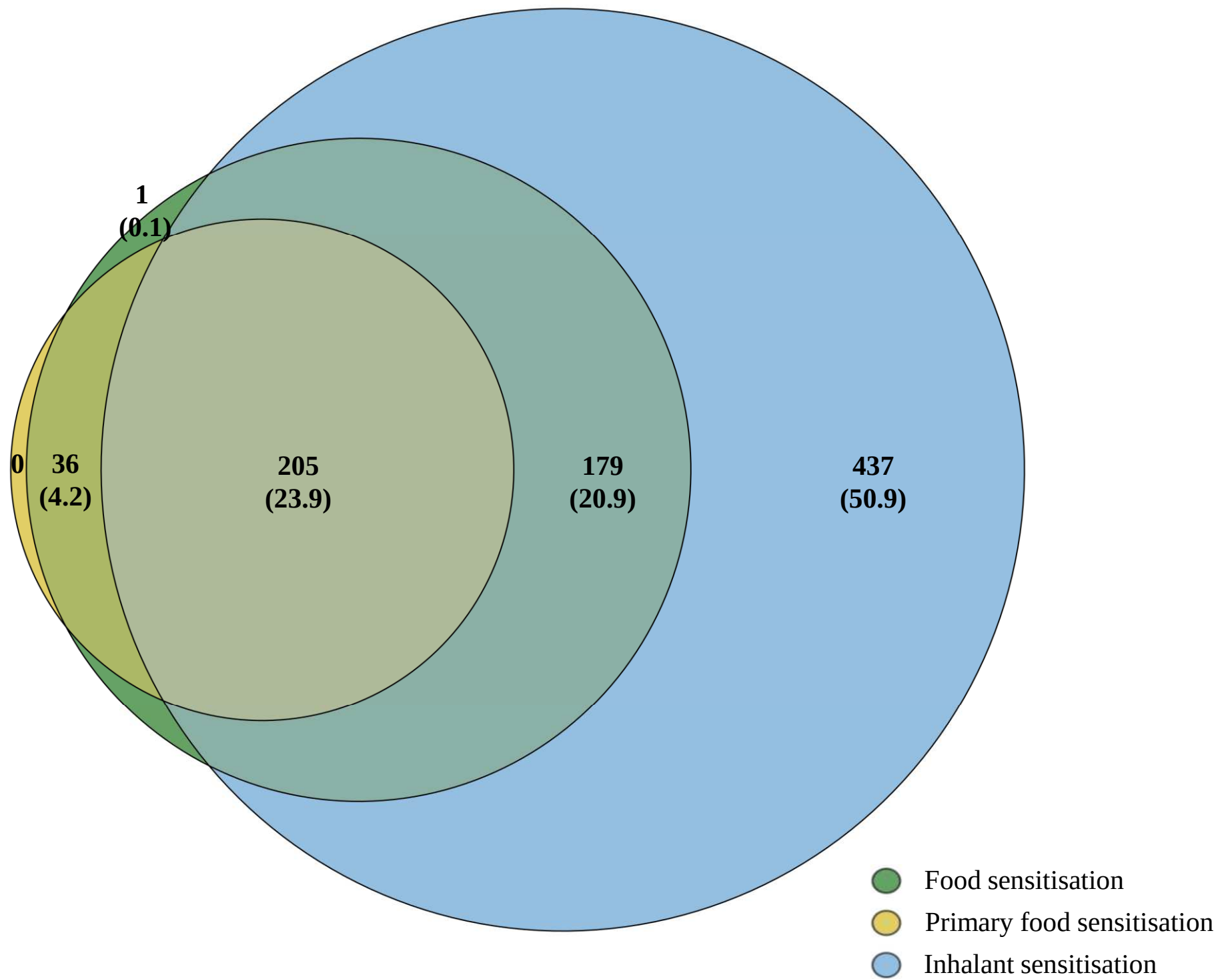




- Food sensitisation
- Primary food sensitisation
- Inhalant sensitisation



- Food sensitisation
- Primary food sensitisation
- Inhalant sensitisation



Child Case-Control Questionnaire

ID Number

DAY MONTH YEAR
Today's date

DAY MONTH YEAR

1. What is this child's date of birth?

2. Sex of child

male female
☐ ☐

FOOD ALLERGY

3. Has this child ever had an illness or problem caused by eating any of the following foods? Say whether or not this child avoids them because they make him/her ill, and approximately how often this child eats the following foods:

FOOD	Has this child ever had an illness or problem caused by eating any of the following foods? Tick as many as apply		Does this child avoid this food because it makes him/her ill?		How often does this child eat this food (in season) Tick one column only				
	No	Yes	No	Yes	Most Days	Most weeks	Most months	< Most months	Never
3.1 Cows' milk*									
3.2 Hen's eggs									
3.3 Fish									
3.4 Shrimp/Lobster									
3.5 Other shellfish									
3.6 Peanut									
3.7 Hazelnut									
3.8 Walnut									
3.9 Chocolate									
3.10 Peach									
3.11 Apple									
3.12 Kiwi fruit									
3.13 Bananas									
3.14 Melon									
3.15 Strawberry									
3.16 Orange									
3.17 Tomato									
3.18 Avocado									
3.19 Celery									
3.20 Carrot									
3.21 Soybean									
3.22 Chick pea									
3.23 Lentils									
3.24 Wheat**									
3.25 Buckwheat									
3.26 Corn									
3.27 Rice									
3.28 Sesame seed									
3.29 Mustard seed									
3.30 Sunflower seed									
3.31 Poppy seed									

* Other cow's milk products including butter, cheese, yoghurt, crème fraîche, fromage frais....

** Including wheat products such as bread and breakfast cereals

4. Has this child had any problems eating any **other** food or foods? NO ☐ YES ☐

If yes please list the foods:

4.1 Food _____

CODE

4.2 Food _____

CODE

4.3 Food _____

CODE

**If you have answered 'NO' to questions 3 AND 4 please go to question 5.
If 'YES':**

4.4 Which of all these foods mentioned above gave this child the worst problems? _____

CODE

4.5 How old was this child when he/she had his/her first problem eating this food?

YEARS

4.6 How old was this child when he/she had his/her most recent problem eating this food?

YEARS

4.7 How often has this child had this illness or problem after eating this food?

please tick
one only

Only once

☐

2-4 times

☐

More than 4 times

☐

4.8 Has this child avoided eating this food since his/her illness or problem?

NO

☐

YES

☐

4.9 Did this illness or problem include:

4.9.1 Itching, tingling or swelling in the mouth, lips or throat?

NO

☐

YES

☐

4.9.2 A rash, nettle sting like rash or itchy skin?

☐
☐

4.9.3 Diarrhoea or vomiting (other than food poisoning)?

☐
☐

4.9.4 Runny or stuffy nose?

☐
☐

4.9.5 Red, sore or running eyes?

☐
☐

4.9.6 Difficulty swallowing?

☐
☐

4.9.7 Breathlessness?

☐
☐

4.9.8 Stiffness in his/her joints?

☐
☐

4.9.9 Fainting or dizziness?

☐
☐

4.9.10 Headaches?

☐
☐

4.10 Has this child had any other symptoms when eating this food?

NO

☐

YES

☐

If yes, please describe _____

4.11 How long after eating the food did this child start with the first symptom?

Minutes:

Hours:

Days:

4.12 How long did it last?

Minutes:

Hours:

Days:

4.13 Did this child receive any treatment?

NO

☐

YES

☐

If yes, could you tell us the name of any medicine used

4.13.1 Medicine

CODE

4.13.2 Medicine

CODE

4.13.3 Medicine

CODE

5. Have you ever been told by a doctor that this child has a food allergy?

NO

☐

YES

☐
6. Has this child received vitamin D **as a supplement** in the first two years of life?

NO

☐

YES

☐

DON'T

KNOW

☐

7. Does this child drink milk?

please tick
one only

Yes, mostly full fat milk

☐

Yes, mostly half fat milk

☐

Yes, mostly low fat milk

☐

No

☐

8. Does this child eat butter or margarine?

please tick
one only

Yes, mostly butter

☐

Yes, mostly margarine

☐

No

☐
ASTHMA AND ALLERGIES9. Has this child had wheezing or whistling in his/her chest at any time in the last **12 months?**

NO

☐

YES

☐
If 'NO' go to question 10.**If 'YES':**

9.1 Has this child been at all breathless when the wheezing noise was present?

NO

☐

YES

☐
9.2. Has this child had this wheezing or whistling when he/she did **not** have a cold?

NO

☐

YES

☐

10. Has this child ever had asthma?

NO

☐

YES

☐
If 'NO' go to question 11.

If 'YES':

10.1 How old was this child when he/she had his/her first attack of asthma?

YEARS

--	--

10.2 Has this child had an attack of asthma in the last **12 months**?

NO YES

--	--

If 'NO' go to question 11.

If 'YES':

10.3 How many times has this child been woken up because of his/her asthma in the last **12 months**?

please tick
one only

- Every night or almost every night
More than once a week, but not most nights
At least twice a month, but not more than once a week
Less than twice a month
Not at all

11. Does this child have any nasal allergies, including hay fever?

NO YES

--	--

If 'NO' go to question 11.2.

If 'YES':

11.1 How old was this child when he/she first had hay fever or nasal allergy?

YEARS

--	--

11.2. Has this child ever had a problem with sneezing, or a runny or a blocked nose when he/she did not have a cold or the flu?

NO YES

--	--

If 'NO' go to question 11.4, if 'YES':

11.3. Has this child had a problem with sneezing or a runny or blocked nose when he/she did not have a cold or the flu **in the last 12 months**?

NO YES

--	--

If 'NO' go to question 12.

If 'YES':

11.4 Has this nose problem been accompanied by itchy or watery eyes?

NO YES

--	--

12. Has this child **ever** had an itchy rash that was coming and going for at least **6 months**?

NO YES

--	--

If 'NO' go to question 12.2.

If 'YES':

12.1 How old was this child when he/she first had this itchy rash?

YEARS

--	--

12.2 Has this child had an itchy rash **at any time** that affected any of the following places:

- 12.2.1 the folds of the elbows
12.2.2 behind the knees
12.2.3 in front of the ankles
12.2.4 around the neck
12.2.5 around the ears
12.2.6 around the eyes

NO YES

If 'YES' to any of the above:12.3 Has this child had this itchy rash **at any time in the last 12 months?**

NO	YES
☐	☐

13. Has this child ever had eczema?

NO	YES
☐	☐

14. When this child is near animals, such as cat as a dog or a horse, does he/she **ever**

14.1 start to cough?

14.2 start to wheeze?

14.3 get a feeling of tightness in his/her chest?

14.4 start to feel short of breath?

14.5 get a runny or stuffy nose or start to sneeze?

14.6 get itchy or watering eyes?

NO	YES
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐

15. When this child is near trees, grass or flowers, or when there is a lot of pollen about, does he/she **ever**

15.1 start to cough?

15.2 start to wheeze?

15.3 get a feeling of tightness in his/her chest?

15.4 start to feel short of breath?

15.5 get a runny or stuffy nose or start to sneeze?

15.6 get itchy or watering eyes?

NO	YES
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐

16. Has this child ever had immunotherapy for allergy?

NO	YES	DON'T KNOW
☐	☐	☐

If 'NO' or 'DON'T KNOW' go to question 17.**If 'YES':**

16.1 What allergens was he/she desensitised for?

16.1.1 pollen counts

16.1.2 mites

16.1.3 latex

16.1.4 others

16.1.5 I don't know

NO	YES
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐

17. Within the last 6 months:

17.1 Has this child vomited when NOT having "winter vomiting disease" or food poisoning?

NO	YES
☐	☐

17.2 Has this child complained of feelings like vomiting or feeling nauseous when NOT having "winter vomiting disease" or food poisoning?

NO	YES
☐	☐

17.3 Has this child complained of having a burning or painful feeling in the middle of his/her chest?

NO	YES
☐	☐

17.4 Has this child, complained of having a sour taste, like the taste of vomit in his/her mouth?

NO	YES
☐	☐

17.5. **Within the last 6 months**, has this child taken any medications for acid regurgitation /gastroesophageal reflux?

NO YES
☐ ☐

If yes, which medicine was/is it? (including antacids over-the-counter) :

17.5.1 Medicine _____

CODE

17.5.2 Medicine _____

CODE

17.5.3 Medicine _____

CODE

PREGNANCY AND BIRTH OF THIS CHILD

18. How old was the mother when she gave birth to **this child**?

YEARS

19. At how many weeks of pregnancy was **this child** born?

WEEKS

20. What was the length of this child when it was born?

CENTIMETERS

21. What was the weight of this child when it was born?

GRAM

22. How many times did this child move house during the **first two years** of his/her life?

None
 Once
 More than once

please tick
 one only
☐
☐
☐

23. What country was this child born in? _____

CODE

IF NOT THIS COUNTRY:

23.1 How old was this child when he/she left the country of his/her birth?

YEARS

24. Did the mother have an alcoholic drink during her pregnancy **of this child**?

NO YES
☐ ☐

If yes, **on average**, how often did the mother have an alcoholic drink during her pregnancy **of this child**?

Once every couple of months
 Once or twice a month
 Once or twice a week
 Three or four days a week
 Almost every day

please tick
 one only
☐
☐
☐
☐
☐

25. Did the mother smoke during her pregnancy **of this child**?

NO YES
☐ ☐

If yes, **on average** during the time of the pregnancy **of this child**, how much did the mother smoke?

25.1 number of cigarettes per day
25.2 other tobacco in grams / week

INFANT FEEDING

26. Was this child **ever** breastfed?

NO YES
☐ ☐

Breastfeeding also means expressed breast milk given in a bottle

If 'NO' go to question 27.

If 'YES':

26.1 How old was this child when the breastfeeding was stopped completely?

Days: Weeks: Months:

27. Has this child **ever** received any infant formula?

NO YES
☐ ☐

If 'NO' go to question 28.

If 'YES':

27.1 How old was this child when he/she received the formula for the first time?

Days: Weeks: Months:

27.2 How old was this child when feeding the formula was stopped?

Days: Weeks: Months:

27.3 Which of the following types of infant formula has this child received?

please tick

27.3.1 Normal cow's milk formula

27.3.2 Normal soy milk formula

27.3.3 Hypo-allergenic (modified) formula

27.3.4 Other (please specify).....

28. At what age were supplemental liquids other than milk and water started?

WEEKS

29. At what age were solid foods started?

WEEKS

OTHER ISSUES RELATED TO HEALTH AND DISEASE

30. Did this child have a serious respiratory infection before the age of two years?

NO YES
☐ ☐

31. Was this child hospitalised before the age of two years for lung disease?

NO YES
☐ ☐

32. Was this child ever given antibiotics in the first two years of life?

NO YES
☐ ☐

YOU AND YOUR HOUSEHOLD

33. How many brothers and sisters does this child have or did have?

NUMBER

--	--

If 'NONE' go to question 34.**If 'YES':**33.1 How many **older** brothers and sisters?33.2 How many **younger** brothers and sisters?

33.3 How many of the brothers and sisters ever had asthma?

33.4 How many of the brothers and sisters, who **did not** have asthma, ever had other allergies such as eczema or skin allergies, nasal allergy or hay fever?

NUMBER

--	--

34. How many **other** children regularly slept in this child's bedroom before he/she was **two years old**?

CHILDREN

--

35. Did this child regularly share his/her bedroom with any **older** children before the age of two years?

NO YES

--	--

36. Did this child go to a school, play-school or nursery with **older children** before the age of two years?

NO YES

--	--

If 'NO' go to question 37.**If 'YES':**

36.1 At what age did this child first attend a school, play school, day care or nursery?

MONTHS

--	--

37. What term best describes the place this child lived most of the time when he/she was under the age of two years?

Farm

Village in a rural area

Small town

Suburb of a city

Inner city

Combination of rural and town/city*

please tick
one only

***for example when staying regularly with family at the country site during weekends**38. Did anyone in your household keep any of the following pets **in the first two years of life of this child**?

NO YES

38.1 Cats

38.2 Dogs

38.3 Horses

38.4 Birds

38.5 Guinea pigs or other furry animals

38.6 Other: _____

39. Does anyone in your household keep any of the following pets **at this moment**?

39.1 Cats

39.2 Dogs

39.3 Horses

39.4 Birds

39.5 Rabbits

39.6 Mice

39.5 Guinea pigs or other furry animals

39.6 Other: _____

NO	YES
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐

40. How often is this child present in the kitchen when food is being prepared?

Most times

Sometimes

Rare

Never

please tick
one only

☐
☐
☐
☐

ABOUT THE MOTHER

41. What country was the mother born in? _____

CODE

----------------------	----------------------	----------------------

42. Did the mother ever have a food allergy?

NO	YES	DON'T KNOW
☐	☐	☐

43. Did the mother ever have asthma?

NO	YES	DON'T KNOW
☐	☐	☐

44. Did the mother ever have eczema or skin allergy?

NO	YES	DON'T KNOW
☐	☐	☐

45. Did the mother ever have nasal allergy or hay fever?

NO	YES	DON'T KNOW
☐	☐	☐

46. What level of education had the mother completed?

46.1 Has she completed primary education?

46.2 Has she completed her secondary education?

46.3 Has she been awarded a lower level vocational education diploma?

46.4 Has she been awarded a higher level vocational education diploma?

46.5 Has she been awarded a university degree?

NO	YES
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐

47. Is the mother currently employed (or self-employed)?

NO	YES
☐	☐

If 'NO' or 'DON'T KNOW' go to question 48.

If 'YES':

47.1 What is the mother's current or most recent job? [Be as precise as possible]

CODE

--	--	--	--

48. Has the mother ever worked in a job relating to the growing, production, processing or distribution of food?

NO	YES	DON'T KNOW
☐	☐	☐

If 'NO' or 'DON'T KNOW' go to question 49.

If 'YES':

48.1 What was or is this job? [Be as precise as possible]

CODE

--	--	--	--

DON'T KNOW

☐

49. Has the mother ever worked in a job in which she used latex gloves?

NO	YES	DON'T KNOW
☐	☐	☐

If 'NO' or 'DON'T KNOW' go to question 50.

If 'YES':

49.1. Were these ever powdered latex gloves?

NO	YES	DON'T KNOW
☐	☐	☐

50. Has the mother smoked since the birth of this child?

NO	YES
☐	☐

'YES' means at least one cigarette per day or one cigar or 360g of tobacco a week

If 'NO' go to question 51.

If 'YES':

50.1 Was the mother smoking when the child was born?

NO	YES
☐	☐

If 'NO' go to question 50.3.

If 'YES':

50.2. **On average** when the child was born **of this child**, how much did the mother smoke?

50.2.1 number of cigarettes per day

--	--

50.2.2 other tobacco in grams / week

--	--	--

Go to question 50.5

50.3 How old was this child when the mother started smoking (again)?

YEARS

--	--

50.4. **On average** at the time the mother started smoking (again), how much did the mother smoke?

50.4.1 number of cigarettes per day

--	--

50.4.2 other tobacco in grams / week

--	--	--

50.5 **On average** how much does the mother **now** smoke?

50.5.1 number of cigarettes per day

--	--

50.5.2 other tobacco in grams / week

--	--	--

50.5.3 stopped smoking

--	--

If the mother stopped smoking:

50.6 How old was this child when the mother stopped smoking?

YEARS	

51. How many people in your household smoked regularly in the house **in the first 2 years of life of this child?****'Regularly' means on most days**

NUMBER	

52. How many hours a day was this child exposed to tobacco smoking **in the first 2 years of life?**

HOURS	

53. How many people in your household smoke regularly in the house **now?**
'Regularly' means on most days

NUMBER	

54. How many hours a day is this child exposed to tobacco smoking?

HOURS	

ABOUT THE FATHER

55. What country was the father born in? _____

CODE		

56. Did the father ever have a food allergy?

NO	YES	DON'T KNOW

57. Did the father ever have asthma?

NO	YES	DON'T KNOW

58. Did the father ever have eczema or skin allergy?

NO	YES	DON'T KNOW

59. Did the father ever have nasal allergy or hay fever?

NO	YES	DON'T KNOW

60. What level of education had the father completed?

60.1 Has he completed primary education?

60.2 Has he completed his secondary education?

60.3 Has he been awarded a lower level vocational education diploma?

60.4 Has he been awarded a higher level vocational education diploma?

60.5 Has he been awarded a university degree?

NO	YES

61. Is the father currently employed (or self-employed)?

NO	YES

If 'NO' go to question 62**If 'YES':**

61.1 What is the father's current or most recent job? [Be as precise as possible]

CODE			

62. Has the father ever worked in a job relating to the growing, production, processing or distribution of food?

NO YES DON'T
KNOW
☐ ☐ ☐

If 'NO' or 'DON'T KNOW' go to question 63.

If 'YES':

62.1 What was or is this job? [Be as precise as possible]

CODE DON'T
KNOW
☐ ☐ ☐ ☐ ☐

63. Has the father ever worked in a job in which he used latex gloves?

NO YES DON'T
KNOW
☐ ☐ ☐

If 'NO' or 'DON'T KNOW' go to question 64.

If 'YES':

63.1. Were these ever powdered latex gloves?

NO YES DON'T
KNOW
☐ ☐ ☐

64. Has the father smoked since the child was born?

NO YES
☐ ☐

[YES' means at least one cigarette per day or one cigar or 360g of tobacco a week]

If 'NO' go to question 65, if 'YES':

64.1 Was the father smoking when the child was born?

NO YES
☐ ☐

If 'NO' go to question 64.3, if 'YES':

64.2. **On average** when the child was born, how much did the father smoke?

64.2.1 number of cigarettes per day

64.2.2 other tobacco in grams / week

Go to question 64.5

64.3 How old was this child when the father started smoking (again)?

YEARS

64.4. **On average** at the time the father started smoking (again), how much did he smoke?

64.4.1 number of cigarettes per day

64.4.2 other tobacco in grams / week

64.5 **On average** how much does the father smoke **now**?

64.5.1 number of cigarettes per day

64.5.2 other tobacco in grams / week

64.5.3 stopped smoking

If the father stopped smoking:

64.6 How old was this child when the father stopped smoking?

YEARS

65. Are you willing to be contacted again for further food allergy studies?

NO YES
☐ ☐

Thank you very much for completing this questionnaire

This questionnaire was administered to:

Mother

Father

Partner of mother/father

Guardian

Journal Pre-proof

ID Number					
-----------	--	--	--	--	--

Date DAY MONTH YEAR

DAY MONTH YEAR

2. Are you male or female?

MALE FEMALE

3. Have you ever had an illness or trouble caused by eating any of the following foods?

Tick as many as apply

- 3.1. Cow's milk*
- 3.2. Hen's eggs
- 3.3. Fish
- 3.4. Shrimp or Lobster
- 3.5. Other shellfish
- 3.6. Peanut
- 3.7. Hazelnut
- 3.8. Walnut
- 3.9. Chocolate
- 3.10. Peach
- 3.11. Apple
- 3.12. Kiwi fruit
- 3.13. Bananas
- 3.14. Melon
- 3.15. Strawberry
- 3.16. Orange
- 3.17. Tomato
- 3.18. Avocado
- 3.19. Celery
- 3.20. Carrot
- 3.21. Soybean
- 3.22. Chick pea
- 3.23. Lentils
- 3.24. Wheat**
- 3.25. Buckwheat
- 3.26. Corn
- 3.27. Rice
- 3.28. Sesame seed
- 3.29. Mustard seed
- 3.30. Sunflower seed
- 3.31. Poppy seed

** Including wheat products such as bread and breakfast cereals

4. Have you had any problems eating any other food or foods? If yes please list the foods:

4.1 Food _____

CODE

--	--

4.2 Food _____

CODE

--	--

4.3 Food _____

CODE

--	--

**If you have answered 'NO' to questions 3 AND 4 please go to question 5.
If 'YES':**

4.4 Which of all these foods gave you the worst problems? _____

CODE

--	--

4.5 How old were you when you had your first problem eating this food?

YEARS

--	--

4.6 How old were you when you had your most recent problem eating this food?

YEARS

--	--

4.7 How often have you had this illness or trouble after eating this food?

please tick

Only once

2-4 times

More than 4 times

--

--

--

4.8 Have you avoided eating this food since your illness or trouble?

NO

YES

--

--

4.9 Did this illness or trouble include:

NO

YES

4.9.1. Itching, tingling or swelling in the mouth, lips or throat?

--

--

4.9.2. A rash, nettle sting like rash or itchy skin?

--

--

4.9.3. Diarrhoea or vomiting (other than food poisoning)?

--

--

4.9.4. Runny or stuffy nose?

--

--

4.9.5. Red, sore or running eyes?

--

--

4.9.6. Difficulty swallowing?

--

--

4.9.7. Breathlessness?

--

--

4.9.8. Stiffness in your joints?

--

--

4.9.9. Fainting or dizziness?

--

--

4.9.10. Headaches?

--

--

4.10. Have you had any other symptoms?

NO

YES

--

--

If yes, please describe _____

4.11. How long after eating the food did you start with the first symptom?

Minutes:

--	--

Hours:

--	--

Days:

--

4.12. How long did it last?

Minutes:

--	--

Hours:

--	--

Days:

--

4.13. Did you receive any treatment? NO ☐ YES ☐

If yes, could you tell us the name of any medicine used

4.13.1 Medicine _____ CODE
 4.13.2 Medicine _____ CODE
 4.13.3 Medicine _____ CODE

4.14. Have you ever been told by a doctor that you have a food allergy? NO ☐ YES ☐

5. Say approximately how often you eat the following foods, and whether or not you avoid them because they make you ill:

FOOD	Do you avoid this food because it makes you ill?		How often do you eat this food (in season) Tick one column only				
	No	Yes	Most Days	Most weeks	Most months	< Most months	Never
1 Cow's milk*							
2 Hen's eggs							
3 Fish							
4 Shrimp/Lobster							
5 Other shellfish							
6 Peanut							
7 Hazelnut							
8 Walnut							
9 Chocolate							
10 Peach							
11 Apple							
12 Kiwi fruit							
13 Bananas							
14 Melon							
15 Strawberry							
16 Orange							
17 Tomato							
18 Avocado							
19 Celery							
20 Carrot							
21 Soybean							
22 Chick pea							
23 Lentils							
24 Wheat**							
25 Buckwheat							
26 Corn							
27 Rice							
28 Sesame seed							
29 Mustard seed							
30 Sunflower seed							
31 Poppy seed							

* Other cow's milk products including butter, cheese, yoghurt, crème fraîche, fromage frais....

** Including wheat products such as bread and breakfast cereals

ASTHMA AND ALLERGIES

6. Have you had wheezing or whistling in your chest at any time in the last **12 months**?

NO YES
☐ ☐

IF 'NO' GO TO QUESTION 7, IF 'YES':

6.1 Have you been at all breathless when the wheezing noise was present?

NO YES
☐ ☐

6.2. Have you had this wheezing or whistling when you did **not** have a cold?

NO YES
☐ ☐

7. Have you ever had asthma?

NO YES
☐ ☐

IF 'NO' GO TO QUESTION 8, IF 'YES':

7.1 Was this confirmed by a doctor?

NO YES
☐ ☐
 YEARS

7.2 How old were you when you had your first attack of asthma?

7.3 How old were you when you had your most recent attack of asthma?

YEARS

7.4. Which months of the year do you usually have attacks of asthma?

7.4.1 January / February

NO YES
☐ ☐

7.4.2 March / April

☐ ☐

7.4.3 May / June

☐ ☐

7.4.4 July / August

☐ ☐

7.4.5 September / October

☐ ☐

7.4.6 November / December

☐ ☐

7.5 Have you ever been admitted to hospital with an attack of asthma?

NO YES
☐ ☐

7.6 Have you had an attack of asthma in the last **12 months**?

NO YES
☐ ☐

IF NO GO TO Q8, IF YES

7.6.1 How many attacks of asthma have you had in the last **12 months**?

ATTACKS

7.6.2 How many attacks of asthma have you had in the last **3 months**?

ATTACKS

7.7 How many times have you been woken up because of your asthma in the last **3 months**?

TICK ONE BOX ONLY

Every night or almost every night

☐ 1

More than once a week, but not most nights

☐ 2

At least twice a month, but not more than once a week

☐ 3

Less than twice a month

☐ 4

Not at all

☐ 5

7.8 How often have you had trouble with your breathing because of your asthma in the last **3 months**?

TICK ONE BOX ONLY

Continuously

☐ 1

About once a day	☐	2
At least once a week, but less than once a day	☐	3
Less than once a week	☐	4
Not at all	☐	5

8. Do you have any nasal allergies, including hay fever?

NO YES

☐	☐
--------------------------	--------------------------

IF NO GO TO Q9, IF YES

YEARS

8.1 How old were you when you first had hay fever or nasal allergy?

----------------------	----------------------

9. Have you ever had a problem with sneezing, or a runny or a blocked nose when you did not have a cold or the flu?

NO YES

☐	☐
--------------------------	--------------------------

IF NO GO TO Q10, IF YES

9.1. Have you had a problem with sneezing or a runny or blocked nose when you did not have a cold or the flu **in the last 12 months?**

NO YES

☐	☐
--------------------------	--------------------------

IF NO GO TO Q10, IF YES

9.1.1. Has this nose problem been accompanied by itchy or watery eyes?

NO YES

☐	☐
--------------------------	--------------------------

9.1.2. In which months of the year did this nose problem occur?

NO YES

9.1.2.1 January/ February

☐	☐
--------------------------	--------------------------

9.1.2.2 March/ April

☐	☐
--------------------------	--------------------------

9.1.2.3 May/ June

☐	☐
--------------------------	--------------------------

9.1.2.4 July/ August

☐	☐
--------------------------	--------------------------

9.1.2.5 September/ October

☐	☐
--------------------------	--------------------------

9.1.2.6 November/ December

☐	☐
--------------------------	--------------------------

10. Have you **ever** had an itchy rash that was coming and going for at least **6 months?**

NO YES

☐	☐
--------------------------	--------------------------

IF NO GO TO Q11, IF YES

YEARS

10.1 How old were you when you first had this itchy rash?

----------------------	----------------------

10.2. Have you had this itchy rash **in the last 12 months?**

NO YES

☐	☐
--------------------------	--------------------------

11. Have you had an itchy rash **at any time** that affected any of the following places:

11.1.1 the folds of the elbows

NO YES

11.1.2 behind the knees

☐	☐
--------------------------	--------------------------

11.1.3 in front of the ankles

☐	☐
--------------------------	--------------------------

11.1.4 around the neck

☐	☐
--------------------------	--------------------------

11.1.5 around the ears

☐	☐
--------------------------	--------------------------

11.1.6 around the eyes

☐	☐
--------------------------	--------------------------

IF 'YES' TO ANY OF THE ABOVE:

11.2 Have you had this itchy rash **in the last 12 months?**

NO YES

☐	☐
--------------------------	--------------------------

12. When you are near animals, such as cats, dogs or horses, do you **ever**

12.1 start to cough?

NO YES

12.2 start to wheeze?

☐	☐
--------------------------	--------------------------

12.3 get a feeling of tightness in your chest?

☐	☐
--------------------------	--------------------------

12.4 start to feel short of breath?

☐	☐
--------------------------	--------------------------

12.5 get a runny or stuffy nose or start to sneeze?

☐	☐
--------------------------	--------------------------

12.6 get itchy or watering eyes?

☐ ☐

13. When you are near trees, grass or flowers, or when there is a lot of pollen about, do you **ever**

13.1 start to cough?

13.2 start to wheeze?

13.3 get a feeling of tightness in your chest?

13.4 start to feel short of breath?

13.5 get a runny or stuffy nose or start to sneeze?

13.6 get itchy or watering eyes?

NO YES

☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐

IF 'YES' TO ANY OF THE ABOVE:

13.7 Which time of year does this happen?

13.7.1 winter

13.7.2 spring

13.7.3 summer

13.7.4 autumn

NO YES

☐	☐
☐	☐
☐	☐
☐	☐

14. After taking any medicines (including antibiotics) have you ever had any of the following

14.1.1 Itching, tingling or swelling in the mouth, lips or throat?

14.1.2 A rash, nettle sting like rash or itchy skin?

14.1.3 Diarrhoea or vomiting ?

14.1.4 Runny or stuffy nose?

14.1.5 Red, sore or running eyes?

14.1.6 Difficulty swallowing?

14.1.7 Breathlessness?

14.1.8 Stiffness in your joints?

14.1.9 Fainting or dizziness?

14.1.10 Headaches?

NO

YES

☐
☐
☐
☐
☐
☐
☐
☐
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☐

☐
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☐
☐
☐
☐
☐
☐

NO

YES

☐
☐

- 14.2 Have you had any other symptoms after taking medicines?

14.2.1 If yes, please describe _____

- 14.3 Do you remember what medicine this was?

14.3.1 Medicine _____

CODE

☐ ☐

14.3.2 Medicine _____

CODE

☐ ☐

14.3.3 Medicine _____

CODE

☐ ☐

15. Have you ever had immunotherapy for allergy?

NO YES DON'T KNOW

☐ ☐
☐
IF 'NO' OR 'DON'T KNOW' GO TO QUESTION 16, IF 'YES':

15.1 If YES, what allergens were you immunised against?

15.1.1 Pollens

15.1.2 Mites

15.1.3 Latex

15.1.4 Other

Tick as many as apply

☐
☐
☐
☐

15.1.5 Unknown

☐

YEARS

15.2 How old were you when you first had immunotherapy?

YEARS

15.3 How old were you when you last had immunotherapy?

15.4 Was the immunotherapy

NO YES

a) By injection?

☐

b) Under your tongue?

☐

c) Other?

☐**INDIGESTION**

16. How often do you get any of the following symptoms?

	Never	<1/ year	<1/ month	<1/ week	1-2/ week	3-5/ week	every day
16.1 Regurgitating stomach contents	☐	☐	☐	☐	☐	☐	☐
16.2 Burning sensation behind the breastbone	☐	☐	☐	☐	☐	☐	☐
16.3 Acid taste in the mouth	☐	☐	☐	☐	☐	☐	☐
16.4 Have you woken with any of these symptoms?	☐	☐	☐	☐	☐	☐	☐

16.5 How often do you take medicine bought without prescription for indigestion?

Never	<1/ year	<1/ month	<1/ week	1-2/ week	3-5/ week	every day
-------	-------------	--------------	-------------	--------------	--------------	--------------

☐

16.6 How often do you take medicine prescribed by your doctor for indigestion?

☐**IF 'NEVER' GO TO QUESTION 17, otherwise**

16.7 Which medicine was/is this?

16.7.1 Medicine _____

CODE

16.7.2 Medicine _____

CODE

16.7.3 Medicine _____

CODE

16.8 How old were you when you first started taking any regular treatment for indigestion?

YEARS

16.9 Have you taken any medicine prescribed by your doctor for indigestion in the last 3 months?

NO YES

☐

16.10 Have you ever had an operation to cure or help your indigestion?

NO YES

☐**SMOKING**

17. Have you ever smoked for as long as a year?

NO YES

☐**[YES' means at least one cigarette per day or one cigar a week for one year or 360g of tobacco]**

IF 'NO' GO TO QUESTION 18, IF 'YES':

17.1 How old were you when you started smoking?

17.2 Do you **now** smoke, as of **one month ago**?

IF 'NO' GO TO QUESTION 17.3, IF 'YES':

How much do you **now** smoke on average?

17.2.1 number of cigarettes per day

17.2.2 number of cigarillos per day

17.2.3 number of cigars a week

17.2.4 pipe tobacco in grams / week

17.3 Have you stopped or cut down smoking?

IF 'NO' GO TO QUESTION 17.4 IF 'YES':

17.3.1 how old were you when you stopped or cut down smoking?

17.3.2 **on average** of the entire time you smoked, before you stopped or cut down, how much did you smoke?

17.3.2.1 number of cigarettes per day

17.3.2.2 number of cigarillos per day

17.3.2.3 number of cigars a week

17.3.2.4 pipe tobacco in grams / week

17.4 Do you or did you inhale the smoke?

ALCOHOL

18. Please read the following statements carefully and tick the box next to the one that best describes you:

18.1.1 I have never tasted an alcoholic drink

18.1.2 I have tasted alcohol once or twice, but never had a whole drink

18.1.3 I have had a proper alcoholic drink – a whole drink not just a taste

18.2 How old were you the first time you had a proper alcoholic drink?

18.3 How often do you usually have an alcoholic drink:

Less than once a year

Once or twice a year

Once every couple of months

Once or twice a month

Once or twice a week

Three or four days a week

Five or six days a week

Almost every day

18.4 How much of the following have you drunk in the last seven days:

- 18.4.1 Draught Beer, Lager or Cider
 18.4.2 Beer, Lager or Cider
 18.4.3 Beer, Lager or Cider
 18.4.4 Measures of spirits (doubles count as 2) e.g. gin, vodka, whisky, rum
 18.4.5 Fortified wine (e.g. sherry, martini, port, vermouth, cinzano, dubonnet)
 18.4.6 Wine (125ml glasses)
 18.4.7 Other (specify) _____

		Litres/Pints
		330ml cans/bottles
		660ml cans/bottles
		measures
		measures
		125 ml glasses

YOUR FAMILY

19.1 How many brothers and sisters do or did you have?

NUMBER	DON'T KNOW

IF 'NONE' GO TO QUESTION 20.1, IF 'YES':

- 19.2.1 How many **older** brothers and sisters?
 19.2.2 How many **younger** brothers and sisters?
 19.2.3 How many of your brothers and sisters ever had asthma?
 19.2.4 How many of your brothers and sisters, who **did not** have asthma, ever had other allergies such as eczema or skin allergies, nasal allergy or hay fever?

NUMBER	DON'T KNOW

19.3 Did your mother ever have asthma?

NO	YES	DON'T KNOW

19.4 Did your mother ever have eczema, skin or nasal allergy or hay fever?

NO	YES	DON'T KNOW

19.5 Did your father ever have asthma?

NO	YES	DON'T KNOW

19.6 Did your father ever have eczema, skin or nasal allergy or hay fever?

NO	YES	DON'T KNOW

EDUCATION AND WORK

20.1 Are you a full time student?

NO	YES

IF 'YES' GO TO QUESTION 20.3, IF 'NO':

20.2 At what age did you complete full time education?

YEARS

20.3 What level of education have you completed?

NO	YES

- 20.3.1 Have you completed primary education?
 20.3.2 Have you completed your secondary education?
 20.3.3 Have you been awarded a lower level vocational education diploma?
 20.3.4 Have you been awarded a higher level vocational education diploma?
 20.3.5 Have you been awarded a university degree

- 20.4 Are you currently employed (or self-employed)?

NO	YES
☐	☐

IF 'YES' GO TO QUESTION 20.5, IF 'NO':

- 20.4.1 Are you currently looking for a job?

NO	YES
☐	☐

- 20.5 What is your current or most recent job? [Be as precise as possible]

CODE			

- 20.6 Are you or were you

- a) a manager working for an employer?
 b) a foreman or supervisor working for an employer?
 c) working for an employer, but neither a manager, supervisor or foreman?
 d) self-employed?

TICK ONE BOX ONLY	
1	☐
2	☐
3	☐
4	☐

21. Have you ever worked in a job relating to the growing, production, processing or distribution of food?

NO	YES
☐	☐

IF 'NO' GO TO QUESTION 21.2 IF 'YES':

- 21.1 How old were you when you first did this type of job?

YEARS	

- 21.1.1 What was or is this job? [Be as precise as possible]

CODE			

- 21.1.2 Does/did this involve

- a) growing or production?
 b) processing?
 c) distribution?

NO	YES
☐	☐
☐	☐
☐	☐

- 21.1.3 What foods were involved?

CODE			

- 21.2 To what extent are you involved with food preparation at home?

- a) Have nothing to do with food preparation
 b) Sometimes present in the kitchen when food is being prepared
 c) Occasionally prepare and cook food in the kitchen
 d) Prepare and cook food in the kitchen at least once a week
 e) Prepare and cook food in the kitchen on most days

TICK ONE BOX ONLY	
1	☐
2	☐
3	☐
4	☐
5	☐

21.3 Have you ever worked in a job in which you used latex gloves?

IF NO, go to question 22; IF YES

21.12 How old were you when you first did this type of job?

21.12.1 Were these ever powdered latex gloves?

NO	YES
☐	☐
YEARS	
☐	☐
NO	YES
☐	☐

22. YOUR CHILDHOOD

22.1 How old was your mother when you were born?

YEARS	
☐	☐

22.2 What country were you born in? _____

CODE		
☐	☐	☐

IF NOT THIS COUNTRY:

22.2.1 How old were you when you left the country of your birth?

YEARS	
☐	☐

22.3. How many times did you move house during the first five years of your life?

- None
Once
more than once

TICK ONE BOX ONLY	
1	☐
2	☐
3	☐

22.4 What term best describes the place you lived most of the time when you were under the age of five years?

- a) farm
b) village in a rural area
c) small town
d) suburb of a city
e) inner city

TICK ONE BOX ONLY	
1	☐
2	☐
3	☐
4	☐
5	☐

22.5 When you were a child did anyone in your household keep any of the following pets?

- 22.5.1 cats
22.5.2 dogs
22.5.3 horses
22.5.4 birds
22.5.5 guinea pigs or other furry animals
22.5.6 other: _____

NO	YES
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐

22.6 How many **other** children regularly slept in your bedroom before you were **five years old**?

CHILDREN
☐
DON'T

22.7 Did you regularly share your bedroom with any **older** children before the age of five years?

NO	YES	KNOW
☐	☐	☐

22.8 Did you go to a school, play-school or nursery with **older** children before the age of five years?

NO	YES	KNOW
☐	☐	☐

22.9 At what age did you first attend a school, play school, day care or nursery?

YEARS
☐
DON'T

22.10 Did you have a serious respiratory infection before the age of five

NO	YES	KNOW
----	-----	------

years?

☐ ☐ ☐

22.11 Were you hospitalised before the age of two years for lung disease?

NO	YES
☐	☐

23. Are you willing to be contacted again for further food allergy studies?

NO	YES
☐	☐

Thank you very much for completing this questionnaire

Journal Pre-proof