

# Early childhood allergy prevention behaviours: trends in Germany from 2015 to 2020

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## Key words

allergy prevention; early childhood; pregnancy; trend analyses

To the Editor,

Early childhood allergy prevention (ECAP) behaviours encompass a wide range of parental behaviours with regard to children’s exposure to or avoidance of allergens, including maternal and child nutrition or modification of the living environment. The paradigm shift in allergy prevention from avoidance to exposure has questioned many measures formerly presumed efficacious and resulted in a revised guideline on childhood allergy prevention in Germany in 2014. This guideline specifies not only the behaviours recommended for allergy prevention (e.g. breastfeeding and early introduction of solid food), but also discourages most measures promoting avoidance of allergens. A new revision has been currently published. We are not aware of studies investigating whether and to what extent families in Germany engage in ECAP behaviours and if there are secular trends. Therefore, we observed prevalences and trends in ECAP behaviours of mothers in Germany over a period of five years (2015 to 2020).

We used data from a prospective birth cohort in Regensburg (Germany), the KUNO Kids health study<sup>4</sup>. All mothers who gave consent and participated with their newborn child in the study for at least one year (recruited until March 2020, with data collection until March 2021) were included. Sociodemographic and ECAP data were collected directly after birth of the child, at the age of four weeks, 6 months and 1 year, respectively, using standardized computer-assisted personal interviews (CAPI) and paper-based self-report questionnaires. The study has been approved by the Ethics Committee of the University of Regensburg (reference number: 14-101-0347 and 19-1646-101).

ECAP behaviours considered in our analyses were: fish in mothers’ diet during pregnancy, during feeding with breast milk, as part of solid food during the child’s first year of life ([?]1 /<1 per week); smoking during pregnancy (yes/no); allergy prevention related avoidance of specific foods in mother’s diet during feeding with breast milk, in the child’s diet during first year of life (fish, meat, dairies, wheat, hen egg, nuts (incl. peanuts), soy, citruses, other fruit or vegetable, other foods: yes (any)/no); duration of predominant breastfeeding (no breastfeeding/<4 / [?]4 months); regular feeding of hypoallergenic (HA) infant milk; age of introduction of solid foods (<4 /4-6 />6 months); feeding of farm milk (yes (cow milk not boiled/boiled/goat milk)/no); allergy prevention related measures for reducing house dust mites (removal of carpets, frequent cleaning, use of specific vacuum cleaners, mattress encasing, allergy mattress, allergy pillow/blanket: yes (any)/no); exposure to tobacco smoke by smoking of parents or in the child’s home (yes/no); removal of pets (any furry pets, cats: yes/no); avoidance of pets (yes/no); regular ([?]1 per week) contact with hay (yes/no). Children whose mother, father or sibling had an allergic disease (self-reported diagnosis of food allergy, allergic rhinitis, allergic conjunctivitis, bronchial asthma or atopic dermatitis) were defined as at-risk for allergy.

Crude prevalence estimates and 95% confidence intervals (CIs) were calculated for ECAP behaviours, in the total sample and stratified for allergy risk status. Multivariate imputation by chained equations (MICE) was applied to handle missing data. In order to analyse trends over time, two independent cross-sectional data sets were prepared (cohort 1: born 2015 to mid-2017; cohort 2: born mid-2017 to 2020). Adjusted logistic regression modelling was used for estimating change in ECAP behaviours over time, for the total sample and stratified for allergy risk status. Results were adjusted for multiple testing using the Hommel method. All analyses were performed according to an a priori specified analysis plan, using SPSS and R.

Baseline characteristics of N=1662 mothers included in our analyses are shown in table 1. N=1442 mothers dropped out before the 1-year assessment.

Prevalences of ECAP behaviours: 23.7% (CI: 21.5-25.9) of mothers renounced specific foods in their diet during feeding with breast milk, 40.1% (CI: 37.7-42.4) in their child’s diet during the first year of life. 67.9% (CI: 65.6-70.1) of mothers were predominantly breastfeeding at least 4 months and 92% (CI: 91-94) introduced solid foods between the 4<sup>th</sup> and 6<sup>th</sup> month. 43.5% (CI: 40.3-46.7) of children who were not predominantly

breastfed were fed with hypoallergenic (HA) infant milk. Weekly fish consumption was 51.9% (CI: 49.5-54.3) during pregnancy, 57.7% (CI: 55.1-60.3) during feeding with breast milk, and 64.6% (CI: 62.3-66.9) for the child during the first year of life. There was no smoking in the home of 90% (CI: 88.5-91.4) of children; 1.4% [CI: 0.9-2] of mothers smoked during pregnancy. 16.7% (CI: 14.9-18.5) of families took any measure against dust mites, 2.1% (CI: 1.5-2.8) deliberately kept their children away from pets. 6.4% (CI: 5.3-7.6) of children had regular contact with hay, 12.3% (CI: 10.7-13.9) received cow/goat milk directly from the farm. 57.6% (CI: 55.3-60) of the children were at risk for allergy. Prevalences stratified for children at-risk and not at-risk for allergies are presented in Figure 1 (b and c).

Trends of ECAP behaviours: Baseline characteristics of cohort 1 (2015-2017, N=893) and cohort 2 (2017-2020; N=769) differed only regarding parity (see table 1). Accordingly, trend analyses were adjusted for parity. There was no statistically significant upward or downward trend from 2015-2017 to 2017-2020 in any ECAP behaviour, neither in the total sample nor in the stratified samples.

Although the sample is characterized by a high proportion of highly educated women without migration background from an affluent area, the study yields findings with relevance for child health and allergy prevention. More than half of the children were at risk for allergy, emphasizing the relevance of ECAP. We found that some recommended ECAP behaviours were practiced in most families, in particular the early introduction of solids. However, allergen avoidance measures were also implemented – in both children at-risk and not at-risk for allergies. Remarkably, the prevalences of specific ECAP behaviours practiced in families did not change significantly from 2015 to 2020. In Germany, the paradigm shift in allergy prevention may not (yet) be reflected in young families' lives. In contrast, a study from Australia comparing data from 2007-2011 with data from 2017-2019 showed an increase in adherence to recommended behaviours following guideline revision. This might be due to more specific recommendations in the Australian guideline, especially concerning infant feeding practices, or due to the longer time period considered in that study. There is a need for easy access to evidence-based allergy prevention information alongside specific education and counselling for families with and without risk of allergy. Paediatricians, gynaecologists and midwives could play a crucial role in communicating recommendations for allergy prevention to families.

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### Authors’ contributions

Maja Pawellek drafted the statistical analysis plan, performed data analysis, interpreted the study findings, drafted the manuscript, critically evaluated the manuscript, and approved the final manuscript as submitted. Angela Königer contributed to data collection, critically evaluated the manuscript, and approved the final manuscript as submitted. Michael Melter contributed to data collection, critically evaluated the manuscript, and approved the final manuscript as submitted. Michael Kabesch contributed to the design of the study and to data collection. He critically evaluated the manuscript and approved the final manuscript as submitted. Christian Apfelbacher contributed to the design of the study, critically evaluated the statistical analysis plan and the manuscript. He approved the final manuscript as submitted. Susanne Brandstetter designed the study, and contributed to the statistical analysis plan, data analysis, interpretation of study findings and manuscript writing. She critically evaluated the manuscript and approved the final manuscript as submitted.

### Tables and Figures

Table 1: Baseline characteristics of participating mothers

Characteristic	Total sample (N=1662) N	Total sample (N=1662) N (%)
Age (years), <i>Mean (SD)</i>	1647	32.61 (4.1)
Marital status, <i>N (%)</i>	1629	
Married, living together with husband		1333 (81.83%)
Unmarried, living together with partner		271 (16.64)
Living without partner/divorced/widowed		25 (1.53%)
Migration background (country of birth other than Germany), <i>N (%)</i>	1631	149 (9.14%)
Education, <i>N (%)</i>	1626	
No degree or less than 10 years of schooling		107 (6.58%)
Ten years of schooling		494 (30.38%)
University entrance level		1025 (63.04%)
Employment before birth, <i>N (%)</i>	1627	1481 (91.03%)
Primiparous, <i>N (%)</i>	1644	1048 (63.75%)

\* T-Test and Wilcoxon rank sum test (W) were used for comparing participant characteristics between the two cohorts:  $W = 362923$  ( $p = 0.016$ ) for number of children.

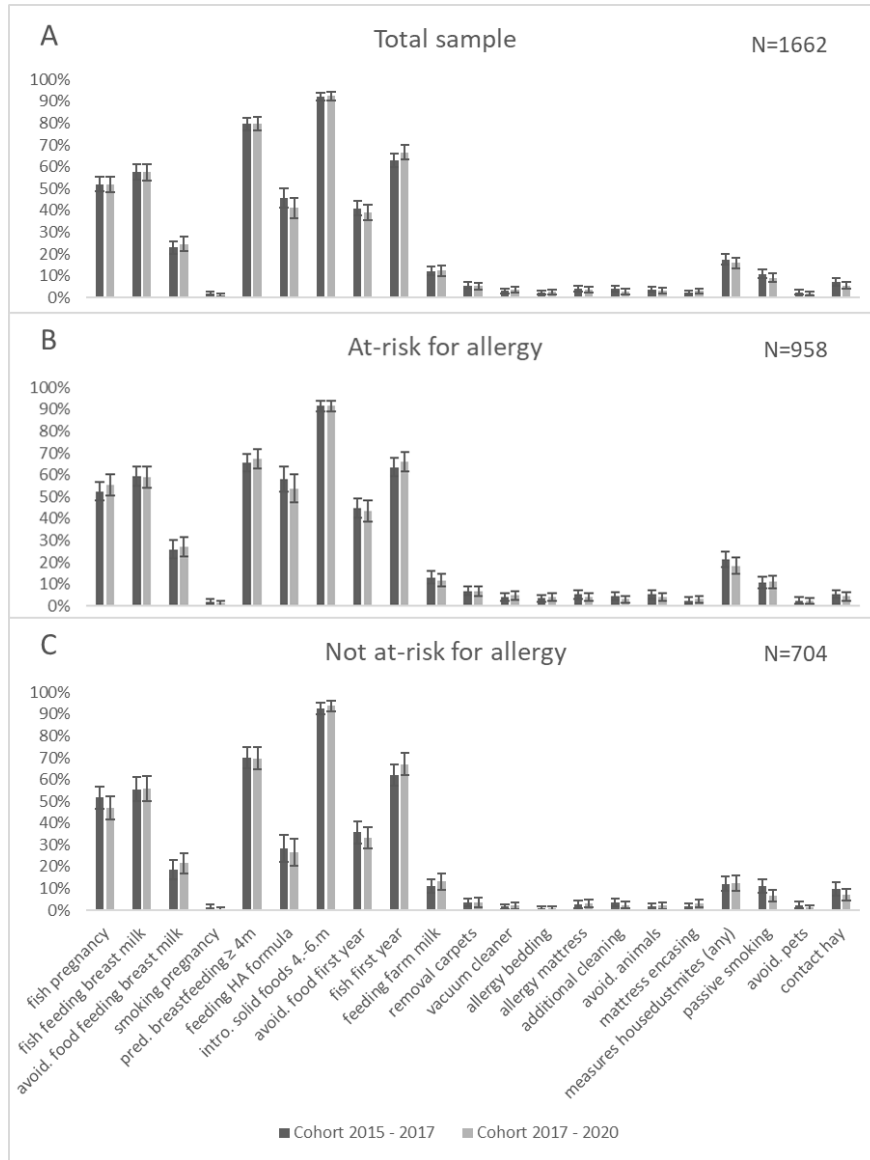


Figure 1: ECAP prevalences and 95% CIs in both cohorts (2015-2017, 2017-2020) for the total sample (A), children at-risk (B) and not at-risk (C) for allergies. Results from trend analyses (logistic regression): A:  $0.17 < OR < 1.31$  (adjusted  $p = 0.928$ ); B:  $0 < OR < 1.2$  (adjusted  $p = 0.994$ ); C:  $0.41 < OR < 1.52$  (adjusted  $p : 0.443 < p < 0.978$ )