Patterns of eczema disease activity from birth through mid-adulthood in two British birth cohorts

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Methods:
Eczema (aka atopic dermatitis) is among the most common chronic childhood conditions, but there are limited data on longitudinal patterns of disease activity past childhood. The objective of this study was to identify possible subtypes of eczema based on patterns of disease activity into mid-adulthood and to examine whether early and mid-life characteristics are associated with these subtypes.

We used data from the 1958 and 1970 British birth cohort studies, which are ongoing, multidisciplinary studies that include 17,196 and 17,415 babies born in Great Britain during one week in March 1958 and March 1970, respectively. There have been 8-9 waves of follow up in each cohort at approximately 5-10 year intervals through age 46-50.

The primary outcome was self-reported eczema period prevalence at 5-8 time points, a measure that has been shown to accurately reflect rates of physician-diagnosed disease and mirrors prevalence rates from childhood physical exams in the 1958 cohort.

We performed multiple imputation to address missing covariate and outcome data, then performed a latent class analysis to identify eczema subtypes based on the course of self-reported symptoms of eczema. We included age at survey as a predictor of the outcome, and we included early life covariates previously shown to be associated with eczema prevalence including: sex, ethnicity, region of early childhood residence, social class in childhood, household size in early childhood, in utero smoke exposure, childhood smoke exposure, birth weight, and breastfeeding. We fit latent class models with 2 to 5 classes and assigned individuals to the class for which they had the highest probability. To determine the optimal number of classes, we examined model fit statistics and considered the homogeneity, separation, and size of classes. After checking for consistency between the individual cohort results we combined the cohorts to simplify reporting.

Finally, we used logistic regression models to examine the association between the eczema subtypes identified in the latent class analysis and mid-life outcomes, including asthma, hay fever, and subject-reported general health and mental health. These models controlled for childhood social class, sex, ethnicity, and cohort.

Results:
The period prevalence of eczema ranged from 5-14% across ages, and there was no clear trend in prevalence by age in either cohort. Latent class analysis (LCA) identified
four similar subtypes based on disease trajectory in both cohorts: transient/no eczema (85-89%) early onset/resolving eczema (4-5%), early onset/persistent eczema (2%) and increasing/late onset eczema (5-8%), see Figure below. Of multiple early life factors previously associated with eczema, only female sex (Odds Ratio 1.74, 95%CI 1.38-2.18) and lower social class in childhood (Odds Ratio 0.54 for low vs high social class 95%CI 0.30-0.95) predicted the pattern of persistent eczema as compared to resolving eczema.

When we examined associations between the eczema subtypes identified in the latent class analysis and health measures in mid-life, we found that compared to the transient/no eczema subtype, all other subtypes had higher odds of asthma and hay fever in adulthood (see Table below). The increasing/late onset eczema subtype also had higher odds of poor self-reported general and mental health (Odds Ratio 1.25, 95%CI 1.08-1.44) and mental health (Odds Ratio 1.33, 95%CI 1.16-1.53).

**Conclusions:** We identified four possible distinct eczema trajectory subtypes into middle adulthood in two large longitudinal population-based birth cohorts. Early life exposures were not highly predictive of eczema subtypes, and late-onset/increasing eczema was common and associated with poor health in adulthood. These results offer important prognostic information for patients on long-term disease course and establish baseline trajectories for future studies of whether newly approved biologic treatments can help to modify the course of disease. Additional research is needed to understand the reasons for poor systemic health among the newly identified subgroup with late onset disease.

**Figure.** Estimated probabilities of eczema symptoms by age and latent class analysis subtype from 4-class models
**Table.** Associations between eczema activity subtypes from the latent class analysis and measures of mid-life health

<table>
<thead>
<tr>
<th>Measures of mid-life health</th>
<th>Persistent vs transient/no eczema</th>
<th>Resolving vs transient/no eczema</th>
<th>Increasing vs transient/no eczema</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asthma</td>
<td>4.01 (3.18, 5.06)</td>
<td>1.64 (1.30, 2.08)</td>
<td>1.70 (1.42, 2.04)</td>
</tr>
<tr>
<td>Hay fever</td>
<td>2.89 (2.34, 3.56)</td>
<td>1.43 (1.19, 1.72)</td>
<td>1.56 (1.35, 1.80)</td>
</tr>
<tr>
<td>Poor vs good general health</td>
<td>1.25 (0.97, 1.61)</td>
<td>0.92 (0.75, 1.14)</td>
<td><strong>1.25 (1.08, 1.44)</strong></td>
</tr>
<tr>
<td>Poor vs good mental health</td>
<td>0.98 (0.76, 1.28)</td>
<td>0.99 (0.81, 1.21)</td>
<td><strong>1.33 (1.16, 1.53)</strong></td>
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</tbody>
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