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Background

Patterns of birth seasonality in some neuropsychiatric conditions, such as schizophrenia and autism, were indicated in previous research. The objective of this study was to determine if the birth date distribution for individuals with autism spectrum disorders (ASDs), including single births and concordant multiplex births, differs from that for the general population. This information might help to determine if there is a relationship between infectious or environmental exposures and ASDs.

Methods

Participants

- ASD case group I: 907 single-birth cases ascertained at Kennedy Krieger Institute (KKI) (birth year 1983-2002)
- ASD case group II: 161 concordant cases from multiplex births ascertained by Autism Genetic Resource Exchange (birth year 1983-2002)
- Control group: Expected birth date distributions came from Maryland vital statistics for 1983-2002

Statistical Analysis

- The Rayleigh test was used to examine distribution uniformity of birth date by gender and ASD subtype
- Poisson regression was performed to estimate relative risk of ASD births observed in a given month after adjusting for birth cohort effect

Results

- Birth distributions of multiplex births with autism are not evenly distributed throughout the year ($p < .05$ from Rayleigh test)
- Non-parametric time-series analyses suggest multiple peaks and troughs whose borders are not clearly bounded by month
- After adjusting for cohort effect, relative risk for multiplex males with ASDs was 87% less in December than in January with 95%CI from 2% to 100%
- After adjusting for cohort effect, relative risk for multiplex births with autism was 82% less in December than in January with 95%CI from 4% to 82%.

Figure 1. Distribution of births by day

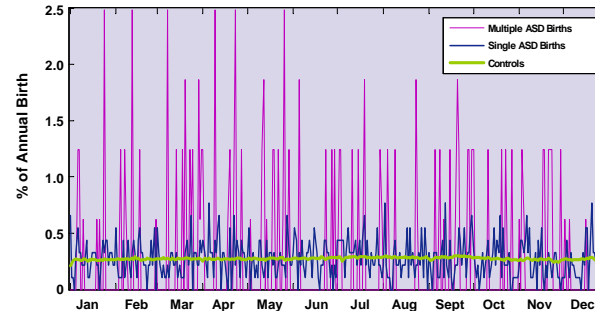
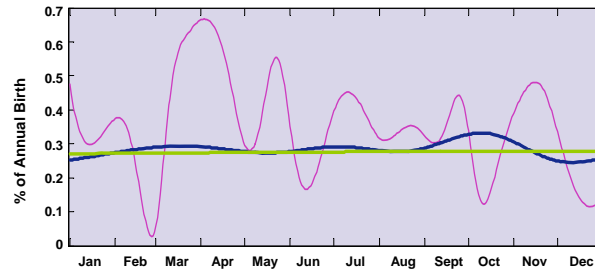


Figure 2. Trends in birth distribution - Empirical Mode Decomposition



Footnote: Empirical Mode Decomposition (EMD) is a non-parametric method for extracting low-frequency (long-term) patterns from time series data. While analogous to Fourier methods, EMD makes no assumptions about the underlying model of the data.

Discussion

- Consider categorizing seasonal trends based on EMD pattern, rather than the conventional "monthly" categories, which can be arbitrary and artificially dilute risk effects.
- Birth date patterns that differ from population expectation were observed in multiplex males with ASDs and multiplex births with autism but not single births with ASDs, suggesting the risk for these individuals varies by their birth month.
- Findings from this analysis suggest a role of nonheritable factors (e.g., prenatal infections or other environmental exposures) on these multiplex births. The fact that these patterns appear to differ by gender and singleton vs. multiplex-birth pregnancy may also be etiologically significant.

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Figure 3. Relative risk of ASD in males by month

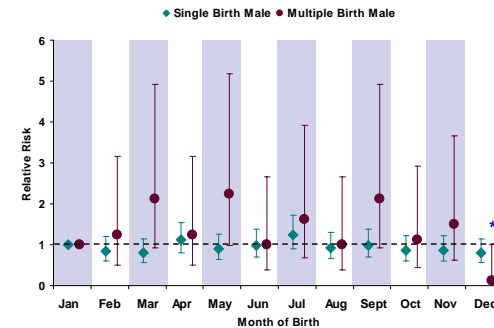


Figure 4. Relative risk of ASD in females by month

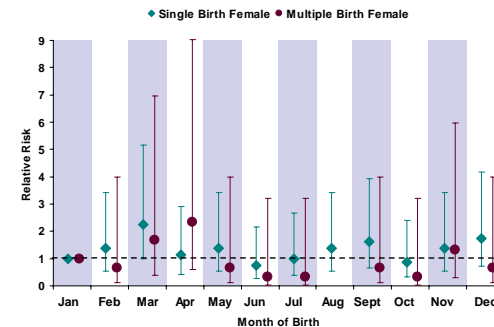


Figure 5. Relative risk of autism by month

