# Factors associated with the increase in child development delay post-covid: cross-sectional population-based series between 2017 and 2022 in Brazil analysis using non-linear multivariate decomposition

Presenter Hermano Lima Rocha

*Federal University of Ceará, Brazil*

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# Background

- Children and adolescents worldwide have experienced more mental health problems due to the COVID-19 pandemic.
- The brains of teenagers - especially girls - have been aging much faster than expected.
- The prevalence of common mental disorders in pregnant women was high during the period of social distancing and was aggravated by negative feelings towards COVID-19.

WOLF, Kristin; SCHMITZ, Julian. Scoping review: longitudinal effects of the COVID-19 pandemic on child and adolescent mental health. European child & adolescent psychiatry, v. 33, n. 5, p. 1257-1312, 2024.
CORRIGAN, Neva M.; ROKEM, Ariel; KUHL, Patricia K. COVID-19 lockdown effects on adolescent brain structure suggest accelerated maturation that is more pronounced in females than in males. Proceedings of the National Academy of Sciences, v. 121, n. 38, p. e2403200121, 2024.
MACHADO, Márcia Maria Tavares et al. COVID-19 and mental health of pregnant women in Ceará, Brazil. Revista de Saúde Pública, v. 55, p. 37, 2021.

# Motivation

- Despite findings suggesting an impact on child development, very little research has assessed child development itself, with most focusing on scales of mental disorders.
- Considering this, we carried out a study in 2022 that used validated child development analysis scales to compare with a study using the same method carried out previously, to verify whether there was a change and the possible causes of the change.

PENNA, Ana Luiza et al. Impact of the COVID-19 pandemic on maternal mental health, early childhood development, and parental practices: a global scoping review. BMC public health, v. 23, n. 1, p. 388, 2023.

# Methods

- We used data from the Ceará Maternal and Child Health Survey, which has been conducted since 1987.
- The state of Ceará was the second most affected by COVID first wave in Brazil, has around nine million inhabitants and a monthly percapita income of US$ 347.2.
- PESMIC is representative of the state, sampling participants randomly using clusters.
- A total weighted sample of 3,566 and 3,222 children in 2017 and 2022 respectively were included.

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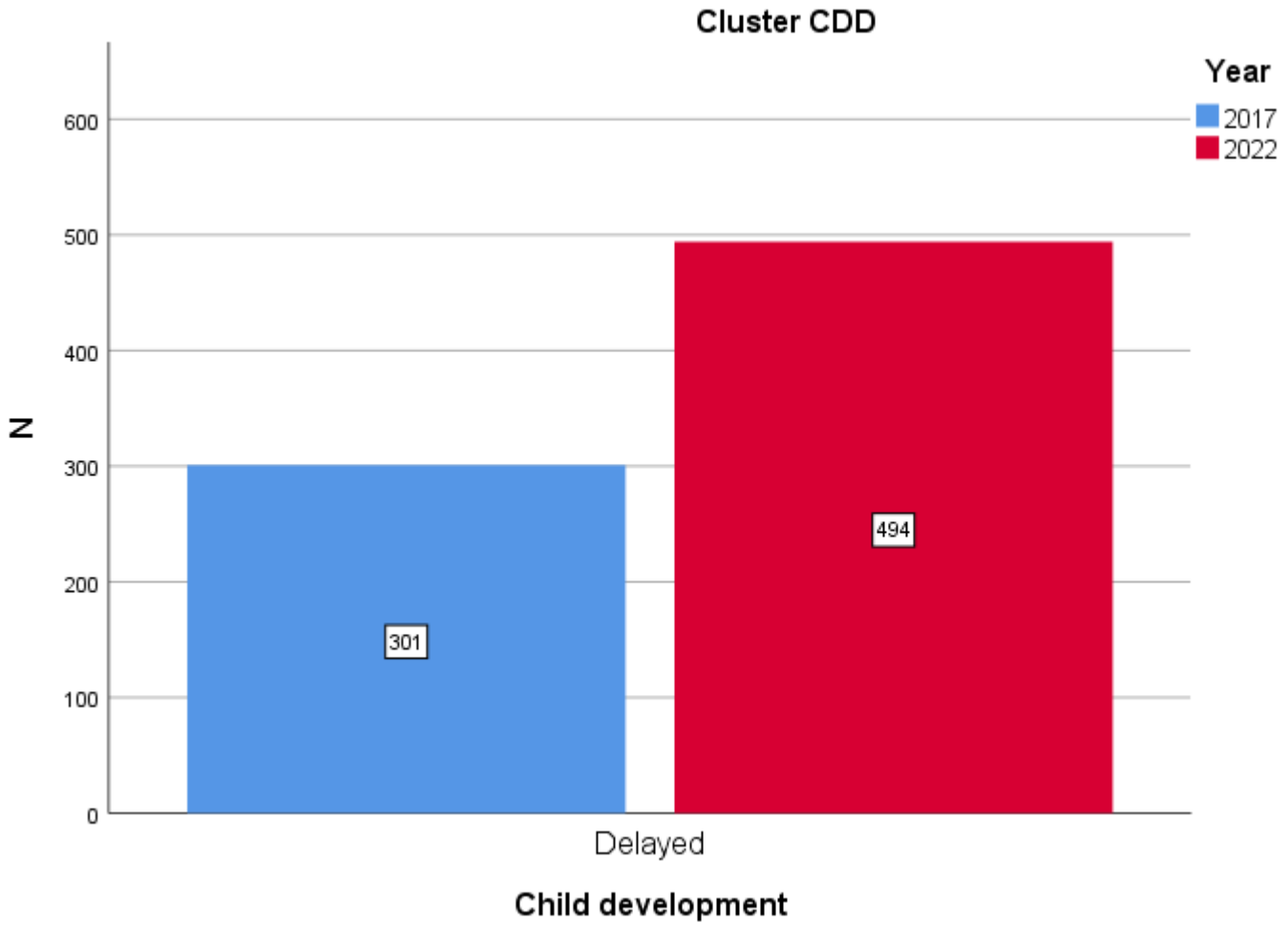
# Methods

- Descriptive analysis, trend and logistic models, and multivariate decomposition for nonlinear response techniques were used for analyzing the trends of child development delay (CDD) over time (measured with the ASQ-3 validated in portuguese instrument in both studies).
- Factors contributing to the associations and to the change (food insecurity, measured by the Brazilian Food Insecurity Scale and social classes according to Critério Brasil, maternal education, maternal mental disorder measured with SRQ20, children daily exposure time to screens, and children's weight-for-age Z-score(WAZ)).
- STATA17 was used for analyses, which were weighted for the sampling probabilities and non-response.

# Results

- 4.83 vs 7.92
- Pvalue<0.001

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# Results

| | | Year | | | |
|---|---|---|---|---|---|
| | | 2017 | | 2022 | |
| | | N | % | N | % |
| Maternal | Not depressed | 2820 | 82.5% | 2226 | 70.7% |
| depression | Depressed | **600** | **17.5%** | **924** | **29.3%** |
| Food insecurity | Food safety | 1329 | 41.9% | 658 | 20.9% |
| | Food unsafe | 1840 | 58.1% | 2489 | 79.1% |
| Social Class | Lower | 3283 | 93.8% | 2705 | 85.5% |
| | Higher | 217 | 6.2% | 458 | 14.5% |
| Screen | Up to two hours | 1101 | 31.0% | 1401 | 45.1% |
| Exposure | More than two hours | 2454 | 69.0% | 1707 | 54.9% |
| WAZ | Above -2 SD | 3303 | 96.9% | 2980 | 96.1% |
| | Under -2 SD | 107 | 3.1% | 122 | 3.9% |
| Maternal | More than 8 years | 1005 | 29.2% | 2417 | 76.7% |
| education | Up to 8 years | 2435 | 70.8% | 736 | 23.3% |

All p values lower than < 0.001

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# Results

| | | PR | 95% CI | |
|---|---|---|---|---|
| Maternal | 2017 | 1,087 | 1,017 | 1,163 |
| Depression | 2022 | 1,132 | 1,054 | 1,217 |
| Food | 2017 | 1,200 | 1,010 | 1,425 |
| Insecurity | 2022 | 1,144 | 0,933 | 1,401 |
| Social | 2017 | 1,77 | 0,975 | 3,212 |
| Class | 2022 | 1,179 | 0,915 | 1,518 |
| Screen | 2017 | **1,136** | 1,037 | 1,244 |
| Exposition | 2022 | **1,377** | 1,209 | 1,568 |
| Low | 2017 | 1,059 | 1,024 | 1,095 |
| WAZ | 2022 | 1,016 | 0,995 | 1,039 |
| Low Maternal | 2017 | **1,028** | 0,947 | 1,116 |
| Education | 2022 | **1,094** | 1,03 | 1,161 |

# Results

Decomposition Results ..... Number of obs = 6,785

Reference group (A): year==2017
Mean = 0.0844

Comparison group (B): year==2022
Mean = 0.1535

| DI | Coef. | Std.Err. | z | P>z | [95%Conf. | Interval] | Pct. |
|---|---|---|---|---|---|---|---|
| E | -0.011 | 0.006 | -1.760 | 0.078 | -0.023 | 0.001 | 13.990 |
| C | **-0.066** | 0.011 | -6.160 | **0.000** | **-0.087** | **-0.045** | **86.010** |
| R | -0.077 | 0.009 | -9.010 | 0.000 | -0.094 | -0.060 | |

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# Results

Due to Difference in Characteristics (E)

| DI | Coef. | Std.Err. | z | P>z | [95%Conf. | Interval] | Pct. |
|---|---|---|---|---|---|---|---|
| Screen time | 0.001 | 0.001 | 1.680 | 0.093 | -0.000 | 0.003 | -1.540 |
| M. depression | **-0.004** | 0.002 | -2.220 | **0.027** | **-0.008** | **-0.000** | **5.260** |
| F. insecurity | -0.003 | 0.003 | -0.890 | 0.374 | -0.009 | 0.003 | 3.480 |
| S. class | 0.004 | 0.002 | 1.870 | 0.062 | -0.000 | 0.009 | -5.490 |
| M. education | -0.009 | 0.005 | -1.900 | 0.057 | -0.019 | 0.000 | 12.270 |

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# Results

Due to Difference in Coefficients (C)

| DI | Coef. | Std.Err. | z | P>z | [95%Conf. | Interval] | Pct. |
|---|---|---|---|---|---|---|---|
| Screen time | **-0.027** | 0.009 | -3.050 | **0.002** | **-0.044** | **-0.010** | **34.720** |
| M. depression | 0.002 | 0.006 | 0.280 | 0.782 | -0.010 | 0.014 | -2.240 |
| F. insecurity | 0.007 | 0.016 | 0.440 | 0.658 | -0.025 | 0.040 | -9.470 |
| S. class | 0.052 | 0.031 | 1.690 | 0.091 | -0.008 | 0.112 | -67.590 |
| M. education | **-0.014** | 0.005 | -2.880 | **0.004** | **-0.024** | **-0.005** | **18.330** |
| _cons | -0.086 | 0.038 | -2.290 | 0.022 | -0.160 | -0.013 | 112.260 |

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# Conclusion

- We conclude that efforts to return maternal common mental disorders levels to pre-pandemic levels could help to reduce the prevalence of CDD and that the increase in the negative effect of exposure to screens and low maternal education account for most of the increase explained by the variables analyzed.

- Thank you

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