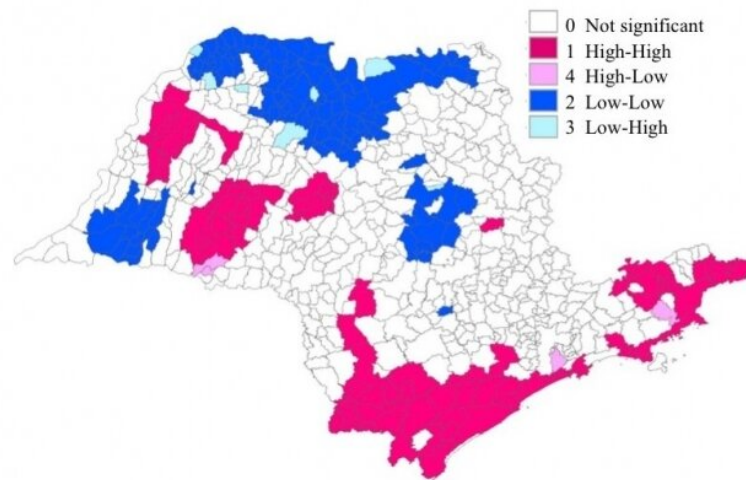


Asphyxia-associated neonatal mortality found to cluster in poorer parts of São Paulo state, Brazil

November 10 2021, by Luciana Constantino



The methodology used in the study, which is published in *PLOS ONE*, can help policymakers plan strategies for preventing deaths of babies under 28 days old. Credit: Daniela Testoni Costa-Nobre

Researchers who analyzed data for São Paulo state, Brazil, found the highest rates of newborn mortality from asphyxia in cities in the south, southeast and north of the state between 2004 and 2013. They cross-tabulated these results with economic data and detected a combination of high mortality with low per capita gross domestic product (GDP) in 31

of the cities. Neonatal asphyxia correlates highly with low-quality antenatal and postpartum care.

These are the main findings of a study reported in *PLOS ONE* by researchers at the Federal University of São Paulo (UNIFESP) and the São Paulo State Data Analysis System (SEADE).

The study showed that the methodology used, combining spatial analysis and secondary data, was effective to locate clusters of cases and can therefore contribute to public health planning and policy formulation.

Neonatal and [infant mortality](#) is a key indicator of the overall health of a society. Understanding its evolution by analyzing the main causes of death in this age group, as well as the associated geographic and demographic factors, helps policymakers plan action to achieve the Sustainable Development Goals (SDGs) agreed by the United Nations.

"It's important to analyze the data very closely in order to contribute to policymaking. One way to do this is to find out where phenomena occur. In our study, we applied the methodology to asphyxia-associated neonatal mortality, presenting a refinement that showed where the problem is most severe," said infectious disease specialist Carlos Roberto Veiga Kiffer, a professor at UNIFESP's Medical School and co-principal investigator alongside Ruth Guinsburg and Maria Fernanda Branco de Almeida.

According to the study, which was supported by FAPESP, the number of asphyxia-related neonatal deaths (of babies aged 28 days or less) reported in the state was 6,713, out of a total of 5,949,267 live births, corresponding to 1.13 per 1,000 live births in the period analyzed.

In the clusters identified, the rates ranged from 1.1-1.5 to 1.5-3.2 per 1,000 live births. "[L]ow per capita GDP correlated with high municipal

neonatal asphyxia-associated mortality rates, [...] suggesting that [their] [spatial distribution](#) [...] can be partially explained by this economic indicator," the authors write in the article.

The first author, Daniela Testoni Costa-Nobre, also affiliated with UNIFESP, told that other variables not analyzed in the study may correlate with this type of mortality, besides GDP. "We focused on identifying areas and their association with the economic indicator," she said. "The methodology can be used to analyze other factors that may also help explain neonatal mortality."

According to Costa-Nobre, the optimized, structured and hierarchical approach used in the study enabled the researchers to identify high-risk areas for asphyxia-associated neonatal mortality, showing that the methodology can help policymakers find ways of reducing avoidable deaths of newborn babies.

Neonatal asphyxia is caused by several factors and problems that cause lack of oxygen or impair organ perfusion during pregnancy, labor, and delivery. It correlates highly with low-quality antenatal and postpartum care and is considered one of the leading causes of preventable neonatal death, alongside infections and premature birth.

"Any maternal complication increases the risk of prepartum asphyxia, so proper care for pregnant women, especially those at risk, is a form of prevention. Hence the importance of good antenatal care throughout the pregnancy and having qualified professionals present during delivery," Costa-Nobre said.

Correlations

The researchers conducted a population-based study applying spatial analysis per area, including all [live births](#) from mothers living in São

Paulo state from 2004 to 2013, except infants with a birth weight of less than 500g and/or a gestational age of less than 22 weeks, infants with unknown birth weight and gestational age, and infants with congenital anomalies. The dataset was accessed between October 2018 and June 2021.

Asphyxia-associated neonatal mortality was defined as any death less than 28 days after birth, with hypoxia, asphyxia or meconium aspiration as cause of death in any line of the death certificate.

Geoprocessing included the detection of first-order effects through quintiles (datasets divided into five equal parts) and moving-average spatial maps, followed by detection of second-order effects based on global and local spatial autocorrelations using Moran's index and LISA respectively, before and after smoothing with Bayesian estimates.

Moran's index is a correlation coefficient that measures the overall spatial autocorrelation of a dataset. LISA stands for local indicator of spatial association, a statistical parameter that can be used to identify local clusters (neighboring features with similar values).

The group also applied Spearman's correlation analysis to determine the degree of association between asphyxia-associated neonatal mortality and per capita GDP for the municipalities with significant LISA values, identifying clusters of these deaths in the south, southeast and northwest of the state.

After local Bayesian estimates, the clusters were more pronounced and there was a partial overlap between areas with higher [mortality](#) and lower per capita GDP.

According to Kiffer, to the group's knowledge, this is the first study to show the spatial distribution of cause-specific [neonatal mortality](#) in

Brazil.

More information: Daniela Testoni Costa-Nobre et al, Clusters of cause specific neonatal mortality and its association with per capita gross domestic product: A structured spatial analytical approach, *PLOS ONE* (2021). [DOI: 10.1371/journal.pone.0255882](https://doi.org/10.1371/journal.pone.0255882)

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