A descriptive analysis of the geographic and temporal distribution of microcephaly-associated children mortality in Brazil before Zika epidemics

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This study aims to describe the spatial and temporal distribution of microcephaly-associated deaths in Brazil in the pre-Zika era, generating a scenario that may serve as a parameter in the epidemics of Zika Congenital Syndrome. We reviewed all 13,696,828 deaths in Brazil between 2000-2012 in the Mortality Information System; 132,554 had as the underlying cause congenital malformations (ICD-10 Q00-Q99). Among 24,513 deaths associated with abnormalities of the central nervous system (ICD-10 Q00-Q07 as the underlying cause of death or present in any of the lines "a", "b", "c" and "d" of death certificates), 1,473 had as cause microcephaly (ICD-10 Q02). Among these deaths, 870 occurred in children aged less than 1 year: 430 early neonatal deaths (0-6 days), 104 late neonatal deaths (7-27 days) and 336 not neonatal deaths (28 days-11 months). The average annual rates of specific infant mortality by microcephaly (per million births), in the pre-Zika times, in the midwest, north, northeast, south and southeast were 27/10\textsuperscript{6}, 23/10\textsuperscript{6}, 20/10\textsuperscript{6}, 27/10\textsuperscript{6} and 23/10\textsuperscript{6}, respectively. The average annual absolute number of deaths due to microcephaly, by region was 6.7±3.6 in midwest, 7.5±3 in north, 19.4±5.4 in northeast, 11.4±3.1 in south and 21.9±6.3 in southeast. Regarding the average annual rates of infant mortality for any CNS malformation in the regions midwest, north, northeast, south and southeast, the values were 600/10\textsuperscript{6}, 617/10\textsuperscript{6}, 530/10\textsuperscript{6}, 542/10\textsuperscript{6} and 520/10\textsuperscript{6} births, respectively. Before Zika epidemics, microcephaly-associated deaths were geographically and temporally homogeneous in Brazil. From 2015 to the 24\textsuperscript{th} week of 2016, 86 microcephaly deaths were confirmed, of which 66 (75.9\%) occurred in the Northeast. Assuming that 2/3 of these deaths occurred in 2015, the rate of microcephaly-associated children mortality in the northeast, this year, would be 76/10\textsuperscript{6} births, three times higher than those observed in the pre-Zika era, and superior to the other Brazilian regions.

\textbf{Key-words}: Children mortality. Microcephaly. Zika Congenital Syndrome