

STATE-OF-THE-ART REVIEW

A Systematic Review of Children's Environmental Health in Brazil



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Abstract

In the region of the Americas, approximately 100,000 children under the age of 5 years die each year due to environmental hazards. Brazil, due to its large size and wide range of environmental challenges, presents numerous hazards to children's health. The aim of this study was to systematically review the scientific literature that describes children's exposures to environmental pollutants in Brazil and their effects on Brazilian children's health. A systematic review of the scientific literature was performed without language restrictions and time of publication (years). The literature search was conducted in the following key resources: PubMed (MEDLINE), Scopus and Web of Science with the MeSH Terms: Environmental exposure AND Brazil (filters: Human, Child [birth to 18 years] and Affiliation Author). The Virtual Health Library was also employed to access the databases Scielo and Lilacs. The search strategy was [DeCS Terms]: Child OR adolescent AND Environmental exposure AND Brazil. Health effects in children associated with exposure to environmental pollutants in Brazil were reported in 74 studies, during the period between 1995 and 2015. The most frequently cited effect was hospital admission for respiratory causes including wheezing, asthma, and pneumonia among children living in areas with high concentrations of air pollutants. A broad spectrum of other health effects possibly linked to pollutants also was found such as prematurity, low birth weight, congenital abnormality (cryptorchidism, hypospadias, micropenis), poor performance in tests of psychomotor and mental development, and behavioral problems. Exposure to pesticides in utero and postnatally was associated with a high risk for leukemia in children <2 years old. These results show that there is a need in Brazil for stricter monitoring of pollutant emissions and for health surveillance programs especially among vulnerable populations such as pregnant women and young children.

KEY WORDS child, environmental exposure, environmental health, environmental pollutants, children's health

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INTRODUCTION

According to the World Health Organization (WHO), 25% of the burden of disease in Latin America and the Caribbean can be attributed to

poor environmental quality.¹ In the region of the Americas, nearly 100,000 children age <5 years die each year due to environmental hazards. The proportionate mortality of children, age <14 years,

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from diseases related to poor environmental conditions is 33% for respiratory diseases, 32% for diarrheal diseases, 26% for injuries, 7% for cancers, and 2% for vector-borne diseases.² These diseases impose substantial economic costs on the countries of Latin America.³

In a review of the influences of the environmental factors on children's health in Latin America, it was found that there are both traditional and newer environmental risks to children's health.⁴ The traditional risks include drinking water contamination and indoor air pollution. The newer hazards are urban air pollution; climate change; exposure to toxic chemicals like heavy metals, asbestos, and pesticides; and hazardous and electronic waste (e-waste). The authors noted that 2 important environmental conditions have had a special effect on the children's health: increasing urbanization in Latin America where "72% of the population lives in urban centers" and the huge rise in the use and consumption of chemical products.⁴

Brazil is the largest country in Latin America and encompasses a wide range of environmental risks that threaten children's health. The under-5 child mortality rate (per 1000 live births) is 15.9%, but due to strong intraregional developmental differences within the country, this rate is almost 20% in the lesser developed regions of the north and northeast,⁵ and much lower in the industrial south.

According to the Brazilian Institute of Geography and Statistics, the percentage of the population of Brazil living in an urban area increased from 31.24 in 1940 to 84.36 in 2010.⁶

Annual use of pesticides increased from around 3 kg/ha (kilogram of active compound per hectare of planted area) in 2000 to near 7 kg/ha in 2012. Of the pesticides used in Brazil, 60% are dangerous products (class III).⁶

Against this background, the objective of the current study was to review the scientific literature on the exposure of children in Brazil to environmental pollutants. The ultimate goal was to determine the effects environmental exposures on the health of Brazilian children. We anticipate that this analysis in Brazil will provide a guide to understanding the effects of environmental pollutants on children's health in other rapidly developing Latin America countries.

METHOD

A systematic review of the scientific literature was performed in international and national (Brazilian)

journals. Technical reports not published in peer-reviewed journals were not included. The eligibility criteria were:

1. The study population was comprised of Brazilian children, from birth to 18 years old, as well as in the intrauterine period (studies including total population were added when they provided individualized age-specific data); and
2. Studies examined exposure of children to environmental agents (only chemicals). Articles about biologic agents, associated with sewage and bad quality of drinking water or as indoor air pollutants (such as bacteria, mold, fungus, etc.) were excluded. There were no restrictions regarding design and outcomes of the studies.

Multiple computerized resources were searched without language restrictions. There was no limit to time of publication (years). The literature search was conducted in the following key resources: PubMed (MEDLINE), Scopus and Web of Science with the MeSH Terms: Environmental exposure AND Brazil (filters: Human, Child [birth to 18 years] and Affiliation Author). The Virtual Health Library was employed to access the databases Scielo and Lilacs, which include many Brazilian journals that are not incorporated into one another. The search strategy was (DeCS Terms): Child OR adolescent AND Environmental exposure AND Brazil.

Two examiners, working independently, evaluated each of the references identified in the literature search. Each examiner read the titles and abstracts based on the 2 eligibility criteria. A third examiner evaluated abstracts on which the first 2 examiners disagreed. The 2 initial examiners then read the full texts of the abstracts approved by both examiners to confirm the eligibility of the studies. In the 4 databases, 783 references were identified, of which 528 were identified in PubMed-Medline, 130 in Scopus, 4 in Web of Science, and 121 in Virtual Health Library. The 2 examiners selected 206 abstracts to read full texts and excluded 577 abstracts. They disagreed on 10 abstracts. The third examiner evaluated these 10 abstracts and excluded 9 of them. One abstract was included for reading in full text. Both examiners evaluated the full texts of studies selected according to the following categories: design of study, region of the study, age subgroup, environmental pollutants, and ascertainment of outcome.

The search of references added 6 more articles. These 213 articles were read in full, and 164 were selected for analysis. [Figure 1](#) presents a flowchart

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