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The Cancer Control Challenge:
Better Understanding It to Better Face It

EPIDEMIOLOGY OF LUNG CANCER IN URBAN AND RURAL AREAS OF THE BRAZILIAN LEGAL AMAZON: IMPACTS OF THE COVID-19 PANDEMIC (2010–2024)

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Introduction: Lung cancer remains one of the leading causes of cancer-related mortality in Brazil. In the Brazilian Legal Amazon, a region characterized by territorial and socioeconomic inequalities, differences in the occurrence and outcomes of the disease between urban and rural settings remain underexplored. The COVID-19 pandemic, which directly affected the respiratory system and health service delivery, may have influenced the diagnosis and treatment of this neoplasm, particularly in vulnerable populations. **Objectives**: To analyze the temporal and spatial distribution of lung cancer in urban versus rural municipalities of the Legal Amazon from 2010 to 2024, assessing the impact of the COVID-19 pandemic on hospitalization and mortality rates. **Methods**: This ecological study utilized secondary data from official Brazilian health databases. A total of 771 municipalities from the states of Acre, Amapá, Amazonas, Maranhão, Mato Grosso, Pará, Rondônia, Roraima, and Tocantins were included. Hospital admissions due to lung cancer (ICD-10: C33–C34) were extracted from SIH-SUS and mortality data from SIM. Population estimates were sourced from the Brazilian Institute of Geography and Statistics (IBGE). Municipalities were classified as urban or rural based on IBGE typology. Age-standardized rates per 100,000 inhabitants were calculated, and percent variation was assessed across three periods: pre-pandemic (2010–2019), pandemic (2020–2021), and post-pandemic (2022–2024). Spatial analysis (Anselin Local Moran's I) and multivariate linear regression were applied to explore associations with contextual factors including urbanization, hospital bed density, Municipal Human Development Index (IDHM), and COVID-19 mortality. **Results:** From 2010 to 2024, the average lung cancer mortality rate was 12.3 per 100,000 inhabitants in urban municipalities and 8.1 in rural areas. During the pandemic (2020–2021), hospital admissions decreased by 18.4% in urban areas and 34.7% in rural ones. In contrast, in-hospital mortality increased by 9.6%, particularly in municipalities with low bed density ($p < 0.01$) and high COVID-19 burden ($p = 0.02$). Spatial analysis revealed significant high-mortality clusters in southern Maranhão, northern Mato Grosso, and the area surrounding Manaus. Multivariate regression identified low urbanization and limited access to early diagnosis as independent predictors of poorer outcomes ($p < 0.05$). **Conclusion:** Inequities between urban and rural areas of the Legal Amazon significantly affect the epidemiological profile of lung cancer. The COVID-19 pandemic

further exacerbated these disparities, especially in municipalities with limited healthcare infrastructure. Targeted cancer surveillance, early detection strategies, and expanded oncology services are urgently needed in rural and remote regions of the Amazon.

Keywords: Lung cancer; Rural health; Legal Amazon; COVID-19