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Effect of Air Pollution on Lung Function in Schoolchildren in Alta Floresta, Mato Grosso, Brazil

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Objective:

The aim of this study is to evaluate the effect of air pollution (biomass burn) on lung function in schoolchildren (6–15 years old) who live in the county of Alta Floresta, Mato Grosso, Brazil.

Methods:

This was a panel study that collected during 112 days (08/14/2006 a 12/03/2006) daily measurements of levels of PM_{2.5}, temperature (°C), humidity (%), peak expiratory flow (PEF) and respiratory symptoms of 309 children from the public school Rui Barbosa who were random selected for the study. These children had been submitted to the PEF exams daily, except on weekends and holidays, at the time they were studying. Each child had their own portable device and daily, three measures were collected sequentially but just the maximums were considered for the present study. To complement the PEF, children weekly took home a card for daily evaluation of respiratory symptoms like cough, itch in the ear and throat, nose draining, tearing and visit to the hospital. In this card, the child or its responsible party were to mark an "X" in the corresponding cell for the day of the week and respiratory symptom presented. Individual characteristics such as weight, height, gender and age were collected using a questionnaire that also included questions to identify the asthmatic child based on the "International Study of Asthma and Allergies in Childhood" (ISAAC) instrument. The data analysis was based on a multilevel model where the exposure variable (PM_{2.5}) and the meteorological variables (humidity and temperature) were considered first level units and the individual characteristics as second level units. The final basic model considered the temporal trend of the PEF measures, temperature and humidity with 2-days lags, adjusted for quadratic parametric spline with random effect in the model's parameters. Beyond the basic model three other models had been structuralized. Model 1 incorporates the basic model and individual characteristics of the child. Model 2 includes the basic model and symptoms respiratory variables with random effect in the model's parameters. Model 3 includes the basic model, Model 2, age of the child and asthma (asthmatic and non-asthmatic). The air pollution effect was evaluated in the four models estimated and it used the current day, 1-day, 2-day and 3-day lags and accumulates effect of 2-days and 3-days of air pollution levels. Moreover, these models were adjusted in three different moments: 1) for all 309 schoolchildren; 2) only for asthmatics children according ISAAC; 3) and only for non-asthmatics children according ISAAC.

Results:

The models adjusted for all children showed a significant effect between the exposure variable and the lung function of the schoolchildren. Every 10 µg/m³ increase of PM_{2.5} the PEF average decrease. Between the four adjusted models the decrease varied from 0.31 to 0.34 l/min for current day level of PM_{2.5} and from 0.18 to 0.21 l/min for the 2-days accumulates levels. Among the asthmatic children, for every 10 µg/m³ increase of PM_{2.5} the PEF average also increase. On the other hand, among non-asthmatic children, for every 10 µg/m³

increase of $PM_{2.5}$ the PEF average decreased.

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