



CASE STUDY 4C

ANALYSIS OF THE HEALTH IMPACTS OF CLIMATE VARIABILITY IN FOUR MAJOR SOUTH AMERICAN CITIES

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CONTEXT

Communicable diseases, such as diarrhoea, hepatitis A, leptospirosis, dengue and respiratory infections, and non communicable diseases, such as hypertensive disorders, cerebrovascular and chronic respiratory diseases affect Argentina, Uruguay and Brazil and are sensitive to the influence of temperature, rainfall and extreme weather events. In order to increase evidence on the impact of climate on these diseases in Buenos Aires, Montevideo, Salto and Manaus, a project entitled 'Climate variability and its potential impacts on health' was elaborated and approved by the regional "Training Institute on Climate and Health"⁹ in Piriápolis (Uruguay).

NEW APPROACHES

Extreme meteorological events (such as heat and cold waves, floods and droughts) were analysed from 1981 to 2010 and, particularly, their relationship with impacts on public health between 2005 and 2010. The categorization of cold and heat waves was conducted by calculating the 10th and 90th percentiles for maximum and minimum temperatures. The events were classified as mild, moderate and severe. The average daily temperatures and relative humidity were used to calculate the bio-meteorological index of temperature and humidity (ITH), in order to characterize the thermic environment. For determination of extreme rainfall events, the 10th and 90th monthly percentiles were calculated and accumulated on a weekly basis.

Heatwaves were identified along the entire study period (1981–2010). The highest frequency of events was observed in summer in Salto, Aeroparque (Buenos Aires) and Carrasco (Montevideo). For the summer season, every city registered at least one heat wave event during the 30 years analysed. Cold events were registered in every city throughout the year, with maximum frequency in winter. The highest frequency of severe cold waves was registered in winter in Buenos Aires, Montevideo and Salto, while in Manaus the minimum temperature varied only slightly. Rainfall patterns were similar in Aeroparque and Carrasco.

In Uruguay, the disease data sources used for the study were from the Division of Epidemiology of the Ministry of Public Health (Montevideo) and the Medical and Surgical Society (Salto, Mutualista). Buenos Aires data were provided by the Direction of Statistics and Information in Health and by the Direction of Epidemiology, both part of the Argentina National Ministry of Health. For Manaus, data were extracted from the hospital's information system (HIS).

Data processing involved the application of a quantitative methodology to establish association between climate and health. This included the application of exploratory data analysis techniques to assess frequencies, measures of central tendency and dispersion. Furthermore, bivariate correlation was applied to assess statistical dependence and independence (8).

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Communicable pathologies such as diarrhoea, hepatitis A and dengue are sensitive to the influence of climate variables such as temperature and rainfall. Common diarrhoea was studied in Buenos Aires, Salto and Manaus. The relation of diarrhoea with extreme temperature was analysed in Buenos Aires, with both extreme temperature and rainfall in Salto, and with extreme rainfall events in Manaus. In Manaus, an increase in diarrhoea cases during lower rainfall months was observed.

Hepatitis A was studied in Buenos Aires, Manaus and Montevideo. In Manaus, a similar linkage with climate as for diarrhoea was observed. In Montevideo, Hepatitis A was studied in relation to heat waves. An increase in the number of cases during severe heat waves was observed. In Buenos Aires, no association between Hepatitis A and heat waves was observed.

Bronchiolitis (in children less than two years old) and pneumonia were studied in Buenos Aires and Salto, and influenza conditions were studied only in Buenos Aires. Acute respiratory infections were assessed in Salto. These pathologies were correlated with cold waves. In Salto, an increase in the number of cases coincided with increased cold waves severity. In Buenos Aires, the peak of bronchiolitis cases in children less than two years old and in influenza-like disease in the general population, was observed to coincide with a cold wave in 2007.

Dengue and leptospirosis were studied in Manaus, while in Buenos Aires only leptospirosis was studied. The number of dengue cases in Manaus increased in all age groups, especially among children less than 14 years of age, as the rainfall increased. Leptospirosis was analysed in relation to rainfall. Like dengue, the number of cases of leptospirosis increased to the greatest number during the highest rainfall months in Manaus. In Buenos Aires, no association between leptospirosis and extreme rainfall events was observed.

BENEFITS AND LESSONS

Weaknesses in health information systems were identified, particularly in relation to the availability and consistency of appropriate spatio-temporal data scales required to generate robust time series comparable with climate data. Although climate time series are available, this information is not easily accessible by health users for disease prevention and health adaptation purposes. Nevertheless, this problem could be solved by strengthening the collaboration between national meteorological services and the ministries of health of each country.

The findings presented here contribute to the strengthening of health systems preparedness and response capacities by means of the collection, systematization, processing and analysis of information.

It was possible to build a solid 50-year database of meteorological information for various cities. However, it was difficult to homogenize health data due to their different spatial (city, district, country) and temporal (weeks, month) scales. This fact hampered the establishment of the correlation with climate data. In addition, health data time series are very short in comparison to climate time series.