Meteorological influences on the interannual variability of meningitis incidence in northwest Nigeria.

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Northwest Nigeria is a region with high risk of bacterial meningitis. Since the first documented epidemic of meningitis in Nigeria in 1905, the disease has been endemic in the northern part of the country, with epidemics occurring regularly. In this study we examine the influence of climate on the interannual variability of meningitis incidence and epidemics. Monthly aggregate counts of clinically confirmed hospital-reported cases of meningitis were collected in northwest Nigeria for the 22-year period spanning 1990-2011. Several generalized linear statistical models were fit to the monthly meningitis counts, including generalized additive models. Explanatory variables included monthly records of temperatures, humidity, rainfall, wind speed, sunshine and dustiness from weather stations nearest to the hospitals, and a time series of polysaccharide vaccination efficacy. The effects of other confounding factors – i.e. mainly non-climatic factors for which records were not available – were estimated as a smooth, monthly-varying function of time in the generalized additive models. Results reveal that the most important explanatory climatic variables are mean maximum monthly temperature, relative humidity and dustiness. Accounting for confounding factors (e.g., social processes) in the generalized additive models explains more of the year-to-year variation of meningococcal disease compared to those generalized linear models that do not account for such factors. Promising results from several models that included only explanatory variables that preceded the meningitis case data by 1-month suggest there may be potential for prediction of meningitis in northwest Nigeria to aid decision makers on this time scale.