Climatic Variability of the West African Monsoon and its Influence on Meningococcal Meningitis Susceptibility

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Abstract. The large-scale annual weather pattern in sub-Saharan West Africa is linked to the West African Monsoon (WAM). The monsoon is defined as a shift in the predominant wind direction blowing from the northeast off the Sahara Desert during the winter dry season to southwest off the Gulf of Guinea during the summer wet season. This leads to a marked transition in local conditions, including an increase in humidity and an increase or start of regional rainfall. The annual latitudinal migration of the Intertropical Convergence Zone (ITCZ) drives monsoon onset and retreat, however ancillary factors such as sea-surface temperatures can have a large influence on monsoon timing and strength. This onset and retrieval of monsoon plays an important role in the occurrence of Meningococcal Meningitis (MM) in the region. Thus, understanding the physical mechanism of WAM variability is important for public health management in terms of planning resources to mitigate the impact of MM in the population. To this end, daily precipitation, relative humidity and temperature data from 32 ground stations throughout the region spanning the period 1973 – 2012 is used to identify, monsoon onset, peak season, and retreat, with particular focus on the humidity profile. These attributes are systematically related to large scale climate and circulation variables using NCEP/NCAR reanalysis data. The results indicate that the precipitation and relative humidity during onset, peak season and retreat exhibit distinct relationship with large scale sea surface temperatures and regional circulation forcings, such as pressure and winds. Furthermore, these relationships are persistent in time, offering prospects for skillful predictions of precipitation attributes that are of importance for public health planners. Relationships between these attributes and incidence of MM will also be investigated with an aim towards potential predictions.

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