HEAT HEALTH IN BANGLADESH
DEFINING AND PREDICTING HEAT WAVES ACROSS TIMESCALES
Hannah Nissan¹, Katrin Burkart², Simon Mason³

Introduction
It is now well established that extreme heat poses a serious health risk, causing many excess deaths each year. Heat early warning systems are known to save lives by improving preparedness, and should form an important component of a climate change adaptation strategy. However, very little is known about heat waves in Bangladesh.

In Bangladesh, both hot and cold mortality effects are evident. A sharp increase in mortality at high temperatures shows that heat waves are a major public health concern.

Defining a heat wave
To prepare for a heat wave, decisions must be taken over when to issue a warning, and this requires a heat wave definition that is both
a) related to human health outcomes
b) forecastable using available weather & climate information.

We used regression modelling to test six possible heat wave definitions against mortality data from 2003-2007. The six definitions tested combined minimum (night) and maximum (day) temperature and heat index. High minimum and maximum temperatures (>95th percentile) for 3 consecutive days was the best predictor of mortality in Bangladesh.

Heat waves in Bangladesh occur during the pre-monsoon season, from April to June.

Predicting heat waves
During the heat wave season (April – June), a zone of discontinuity separates two air masses in Bangladesh: dry westerlies from India and moist southerlies from the Bay of Bengal, which bring early pre-monsoon rainfall to the country.

On heat wave days, the dry westerlies are stronger, and the moist southerlies are weaker, than normal for this time of year. This reduces rainfall below normal pre-monsoon levels. These warning signs can be seen 8-10 days before a heat wave begins.

Rainfall is highly variable, but detecting changes in soil moisture would indicate that predictability of heat waves beyond a few days may be possible. We found that heat waves are associated with unusually dry soil moisture during the whole heat wave season. This suggests that seasonal and sub-seasonal forecasts of heat wave risk may be possible by monitoring soil moisture conditions in Bangladesh.

Anomaly composite of 850hPa wind on heat wave days, 1989-2011.

Anomaly composite of total soil moisture in advance of heat waves in Bangladesh, 1989-2011.

Seasonal total number of heat waves (blue), precipitation (green) and soil moisture (orange), 1989-2011.

Correlations between number of heat wave days and total rain and soil moisture were -0.3 and -0.6, respectively.

¹ Mortality data from the Sample Vital Registration System, Bangladesh Bureau of Statistics
² Temperature data from the Bangladesh Meteorological Department
³ Mailman School for Public Health, Columbia University

Synoptic climate fields taken from the ECMWF ERA Interim Reanalysis from 1989-2011.

---

From: Hannah Nissan, Katrin Burkart, Simon Mason
Title: Heat Health in Bangladesh: Defining and Predicting Heat Waves Across Timescales
Source: International Research Institute for Climate and Society, Columbia University

---