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Neonates in Ahmedabad, India, during the 2010 Heat Wave: A Climate Change Adaptation Study



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Research Article

Neonates in Ahmedabad, India, during the 2010 Heat Wave: A Climate Change Adaptation Study

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Ahmedabad Heat and Climate Study Group



Project Team at Ahmedabad Met Centre, March 2012

- Natural Resources Defense Council (NRDC)
- Public Health Foundation of India
- Indian Institute of Public Health
- Ahmedabad Municipal Corporation
- Emory University
- Icahn School of Medicine at Mount Sinai
- Georgia Tech
- Ramachandra University

March 2011 Indo-US Scientific Kick-Off Workshop Ahmedabad

- 40 experts discuss heat-adaptation strategies
- 2010 Heat Wave focus



Background on extreme heat and health

- In northern US cities, 40% increased summer mortality over baseline averages (Curriero et al. *AJE*, 2002)
- 2003 heat wave in France related to excess mortality among male infants less than 1 year (Fouillet et al. *Intnl Arch of Occ Env Hlth,* 2006)
- Birth outcomes such as preterm birth worsen (Basu et al. *AJE*, 2010)
- Low and middle income countries and nonclimate controlled settings understudied

Climate Adaptations

Based on 2011 Heat workshop discussions, Shardaben General Hospital maternity ward moved from top to ground floor to reduce exposure to high temperatures for vulnerable newborns.



Study questions

- Was there a relationship between high outdoor temperatures and the rate of neonatal intensive care unit (NICU) admissions during the May 2010 heat wave in Ahmedabad?
- 2. Did the relocation of the maternity ward from top to ground floor have an effect on subsequent NICU admission rates?

Heatwave in 2010



Maternity ward location during study period: April–June, 2009–2011



Methods

- Setting: SCL General Hospital, serving a primarily low income population, in Ahmedabad, Gujarat, India
- Data: hospital records and India Meteorological Department



Methods (continued)

- Generalized Linear Models
- Outcome: daily # heat-related NICU admissions
- Co-variates
 - maximum daily temperature,
 - number of deliveries over the past three days,
 - ICU location (top floor (in 2009 and 2010) or lower floor)
- Analyses in SAS
- Secondary analysis of all NICU admissions, and total births with births term removed.

Results

- The temperature of the "best fit," evaluated based on the log likelihood, was 42°C.
- Each increase in degree, Celsius over 42°C associated with a 43% increase in heat-related admissions, 95% CI [9.2%, 88%].
- At 42°C, moving the maternity ward to a lower floor was associated with a predicted 64% reduction in heat-related admissions, 95% CI [3%, 89%].

Heatwave in 2010



Conclusions

- High outdoor temperatures were associated with NICU admissions during May 2010 heat wave <u>and</u> other non-heat wave warm periods.
- 2. The relocation of the maternity ward from top to ground floor appears to have had a protective effect on NICU admission rates related to heat.

Additional Climate Adaptations

Shardaben General Hospital replaced black tar roof to cooler, white reflective, china mosaic.



Shardaben Hospital (Government)



Roof replacement with china mosaic

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