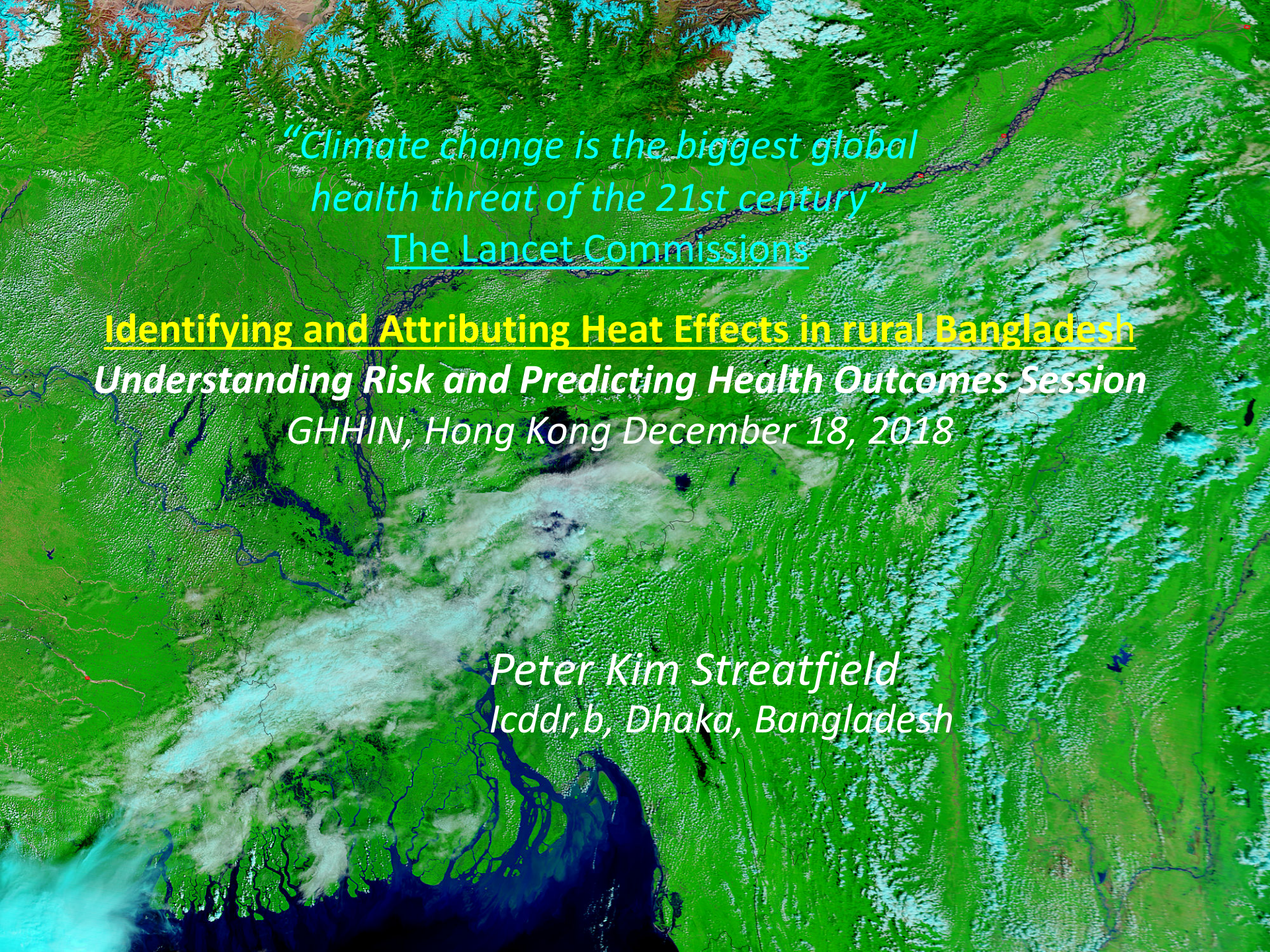


"Climate change is the biggest global health threat of the 21st century"
The Lancet Commissions

Identifying and Attributing Heat Effects in rural Bangladesh

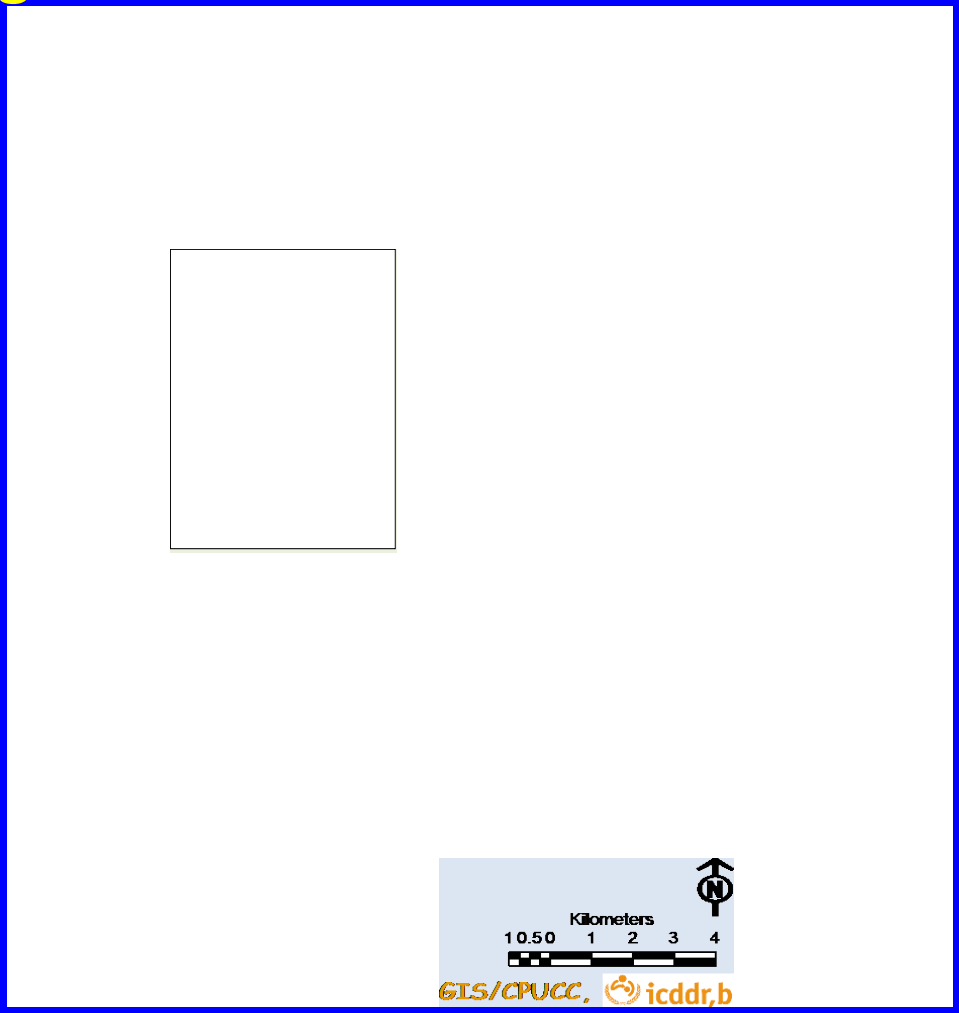
Understanding Risk and Predicting Health Outcomes Session

GHHIN, Hong Kong December 18, 2018

Peter Kim Streatfield
Icddr,b, Dhaka, Bangladesh

Matlab Health and Demographic Surveillance System, Bangladesh

- Matlab HDSS is the longest running HDSS in the developing world (1966- present), and model for 50+ In-Depth Network sites.
- Fieldworkers visit all households every 2 months. Many demographic and socio-economic variables monitored.
- Current pop 235,000, with all deaths (~1,500 annually) assigned a COD, so 75,000 in the database.
- Morbidity is limited to children, mostly diarrhoea and ARI, so less useful for study of heat effects.



icddr,b

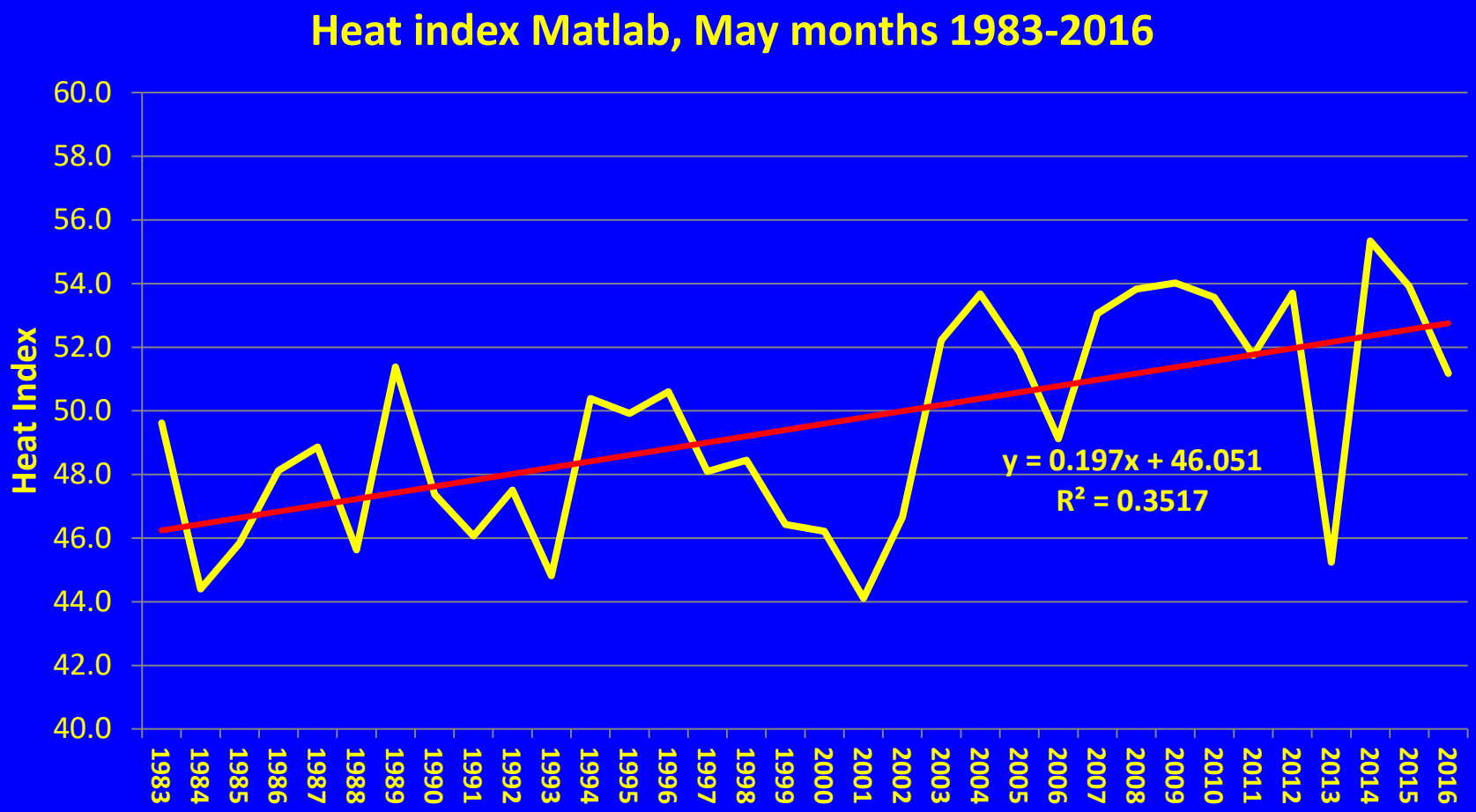
Heat Index, Matlab 1981-2016 (Monsoon June-Sept)

Pre-monsoon months hottest with rising humidity

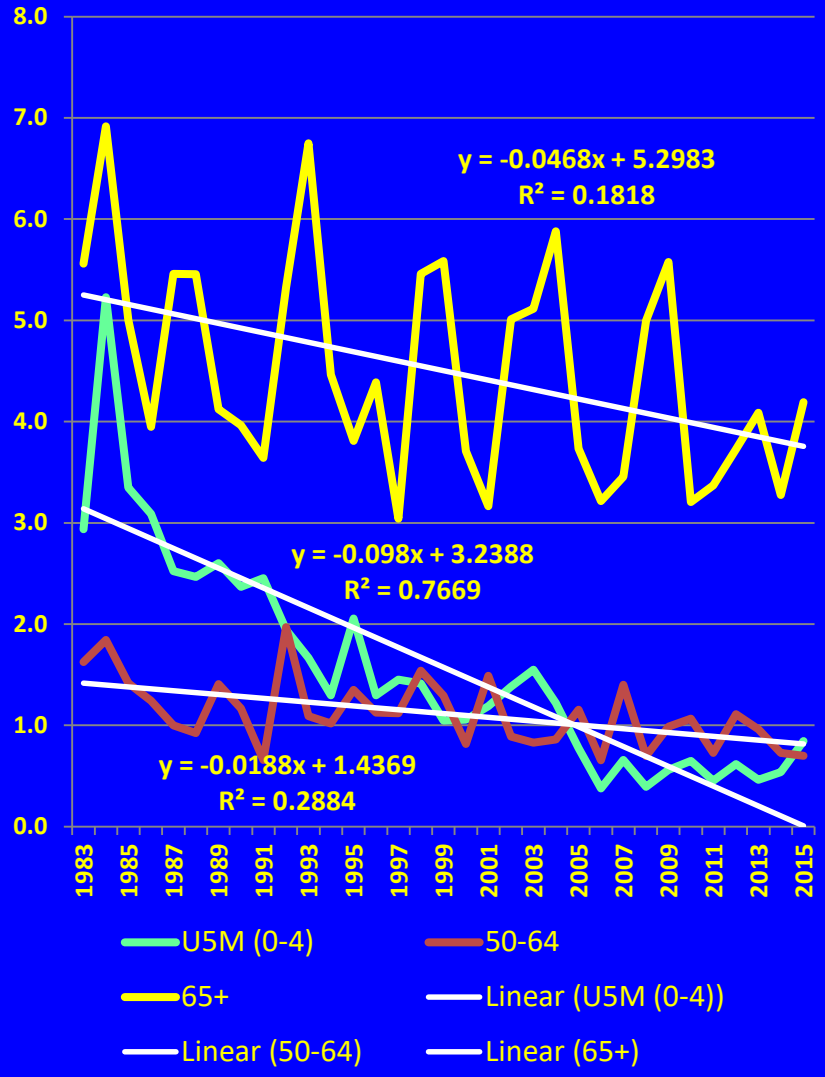
	January	February	March	April	May	June	July	August	September	October	November	December
1981	25.4	29.4	37.3	40.6	45.0	45.9	31.4	44.9	44.9	44.3	35.7	26.0
1982	27.1	29.3	35.9	46.4	52.9	44.5	46.2	43.6	46.5	45.5	32.6	27.2
1983	25.4	29.3	39.9	46.4	49.6	48.7	46.2	44.4	45.2	42.3	36.7	28.7
1984	25.2	28.0	42.1	46.0	44.4	31.0	42.9	42.9	42.8	45.0	33.9	27.3
1985	26.5	30.7	44.3	46.9	45.8	44.5	30.7	44.8	43.7	44.6	35.3	29.7
1986	26.5	32.0	44.2	45.4	48.1	48.1	44.0	47.8	43.8	42.3	34.8	27.8
1987	26.8	33.0	40.3	44.8	48.9	48.8	42.9	42.8	45.4	43.0	34.7	28.2
1988	27.3	32.6	40.1	47.4	45.6	42.8	44.5	42.6	44.9	42.7	35.8	28.8
1989	24.7	30.3	40.3	47.6	51.4	46.7	44.6	45.9	45.4	40.3	34.7	26.8
1990	26.1	32.1	33.7	43.1	47.4	46.9	42.9	46.7	46.6	38.2	36.5	27.2
1991	24.6	32.4	42.4	47.0	46.1	44.7	46.1	45.2	44.3	42.4	31.5	26.0
1992	24.2	27.4	41.6	49.7	47.5	48.3	44.9	45.9	44.8	43.4	34.5	26.5
1993	24.8	31.7	36.5	46.0	44.8	45.6	44.8	44.2	43.9	44.5	35.5	28.8
1994	26.5	27.7	40.2	45.3	50.4	45.5	46.5	45.1	46.8	44.1	35.4	28.9
1995	25.0	29.5	40.2	51.3	49.9	46.7	43.1	46.1	45.5	44.5	33.7	27.9
1996	25.7	31.3	44.5	47.4	50.6	46.9	45.7	42.9	47.5	42.5	35.6	28.4
1997	25.4	28.7	41.0	38.7	48.1	49.5	44.9	47.6	45.0	42.0	36.8	24.8
1998	21.8	30.2	34.8	45.2	48.5	51.3	43.6	42.7	47.5	47.1	39.1	30.2
1999	27.0	34.6	44.9	51.7	46.4	46.3	44.4	43.4	43.2	43.4	36.5	29.5
2000	25.6	27.1	38.6	46.0	46.2	46.0	44.7	45.3	45.6	42.9	36.5	28.1
2001	25.2	32.7	39.9	48.1	44.1	43.2	45.4	47.1	45.9	45.4	35.3	26.9
2002	26.1	31.0	40.0	42.8	46.7	46.0	46.7	45.2	47.0	42.7	34.9	28.2
2003	22.3	31.2	36.1	50.2	52.2	44.8	49.1	47.4	45.1	44.2	35.5	27.3
2004	23.3	31.2	43.5	47.0	53.7	47.0	45.3	46.9	31.7	40.9	34.9	29.2
2005	25.0	33.2	41.9	52.2	51.9	52.5	43.9	45.1	48.8	42.9	35.5	29.4
2006	26.0	38.8	41.4	48.3	49.1	50.8	47.1	48.6	47.6	47.3	36.8	29.6
2007	25.0	31.1	39.9	49.5	53.1	48.6	44.8	48.0	45.7	44.7	36.8	27.7
2008	26.1	28.1	42.0	50.6	53.8	46.9	45.2	46.6	48.3	43.2	37.4	28.3
2009	28.1	34.9	42.9	52.4	54.0	54.6	46.8	48.7	49.2	46.4	38.8	28.3
2010	23.8	34.0	47.6	54.6	53.6	50.6	47.8	51.2	49.2	47.9	38.6	28.1
2011	24.5	33.2	41.7	46.8	51.7	49.4	47.7	45.6	48.5	50.0	38.5	27.6
2012	25.1	33.1	44.6	49.9	53.7	52.1	49.4	50.7	50.4	46.7	35.6	25.2
2013	25.1	33.1	44.5	49.2	45.2	51.5	47.8	47.1	50.3	44.8	37.6	29.4
2014	24.5	30.1	42.3	55.8	55.3	52.6	49.0	48.2	48.7	47.7	38.8	26.1
2015	25.7	33.7	40.5	47.2	53.9	50.1	46.0	49.4	50.8	49.3	39.9	28.4
2016	26.5	35.8	44.5	51.8	51.2	49.5	46.7	48.9	50.8	49.2	37.1	32.0

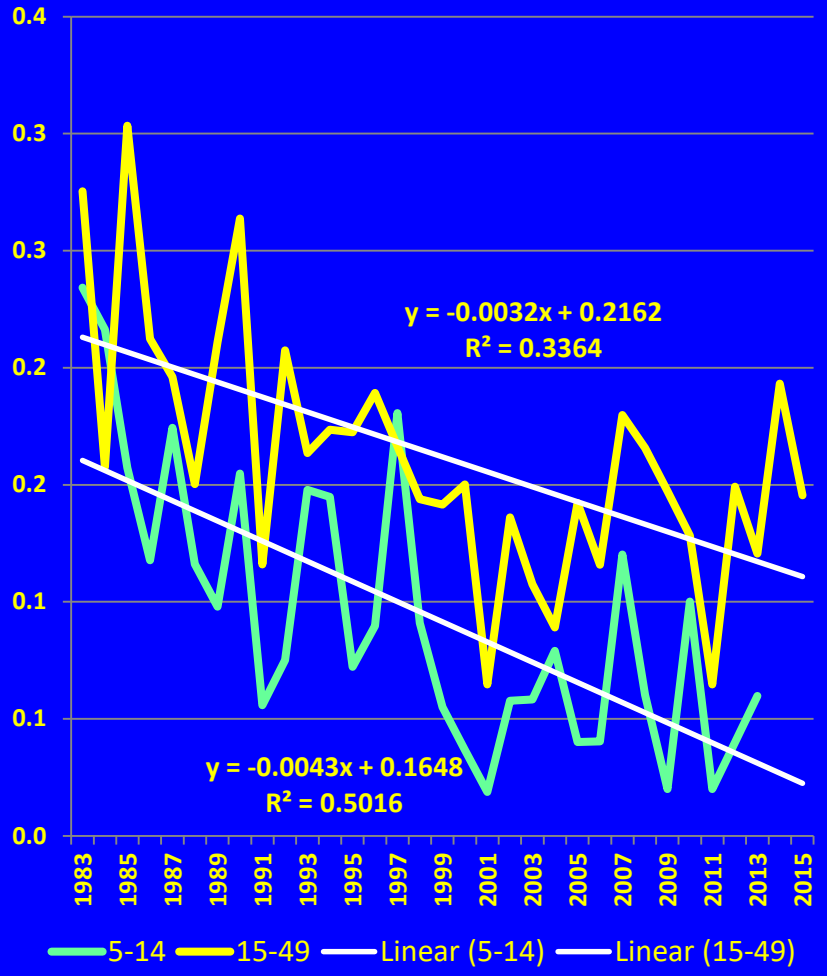
May is usually the highest Heat Index Month – pre-monsoon, based on average maximum temperature and humidity. HI above 35 is hazardous. Erratic pattern, but steady rise.

Rothfusz 1990 formula for HI (US NWS)

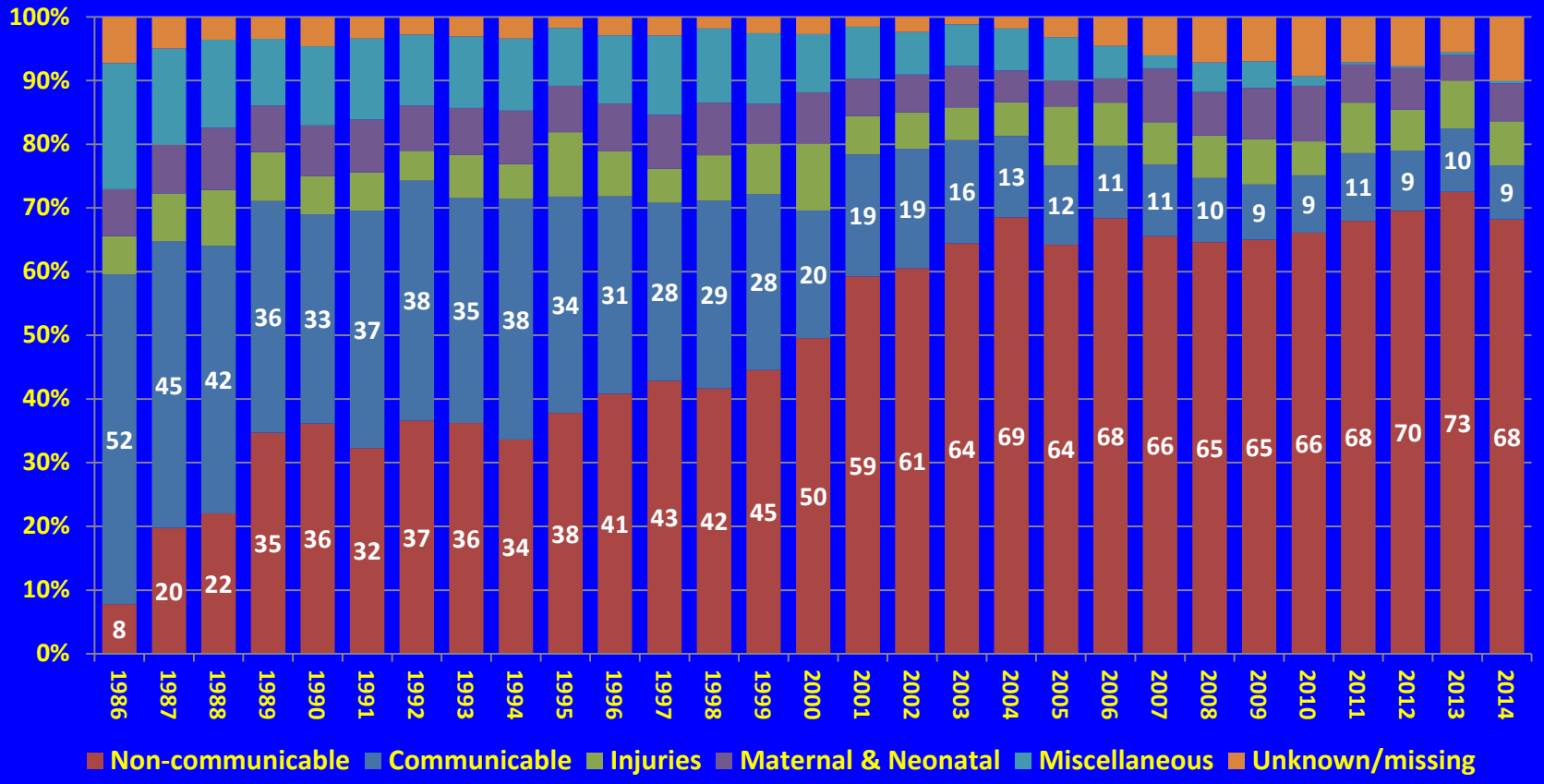


Age Specific Mortality Rates, Matlab, May month, 1983-2015





Health Transition Graph (Causes of Death, M+F, All Ages), Matlab 1986-2014.
Massive increase in Non-communicable Disease deaths over decades.
Partly balanced by decline in communicable diseases.



Discussion Questions

- If overall trend in mortality is decline due to biomedical interventions, even while temperatures and heat indices are rising, how do we attribute impacts of heat stress on health?
- Referring to mortality (cause of death) data, what are the specific causes where we might expect to see impacts of rising temperatures on health? Dehydration, kidney failure, CVD, strokes, etc.? How does this vary by age, gender, occupation?
- Which morbidity causes should we be examining?
- How do we deal with 'indirect' effects, such as cholera outbreaks becoming more common as sea surface temperatures rise? Likewise increasing Dengue and/or Chikungunya. Malaria in some areas.