Utilizing partnerships between state departments of health, universities and the National Weather Service to improve public preparation and response to extreme heat

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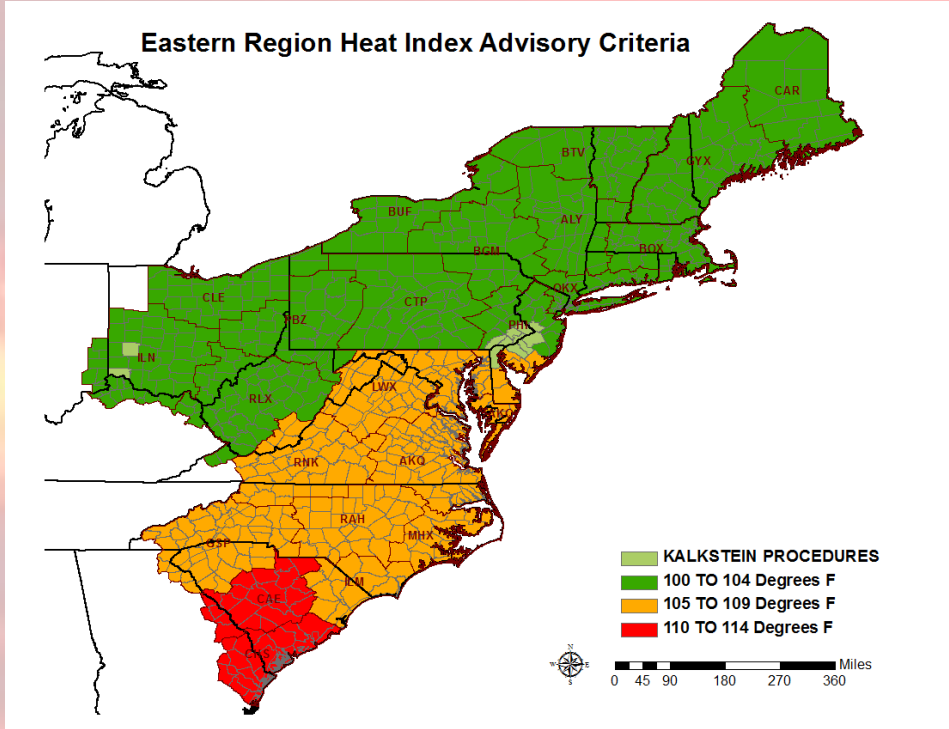
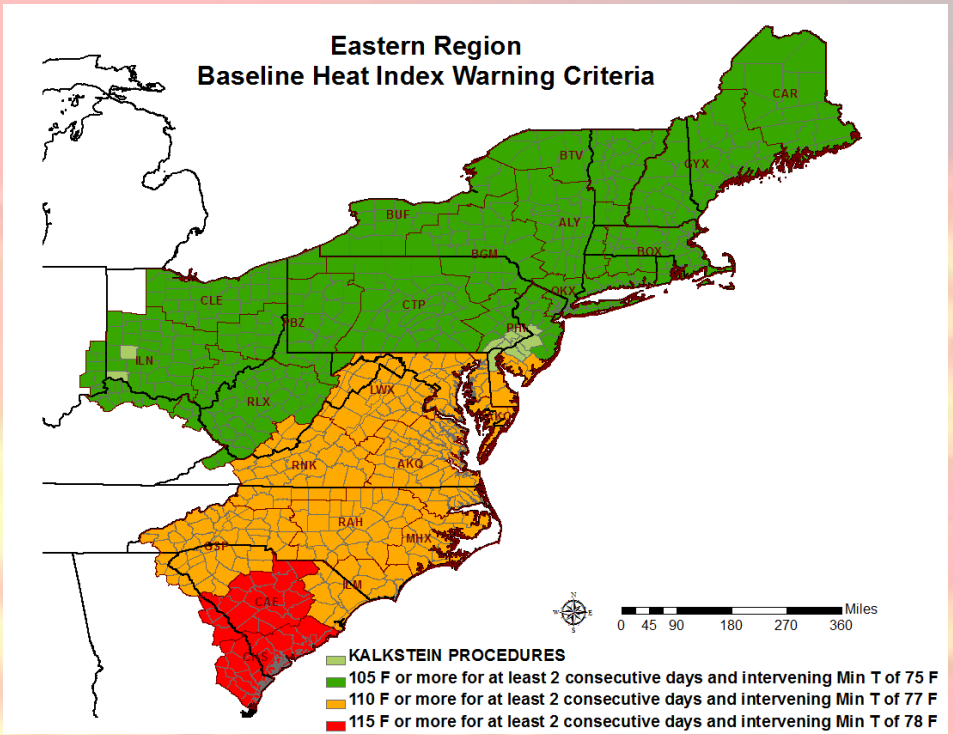
Current Thresholds for Advisories and Warnings

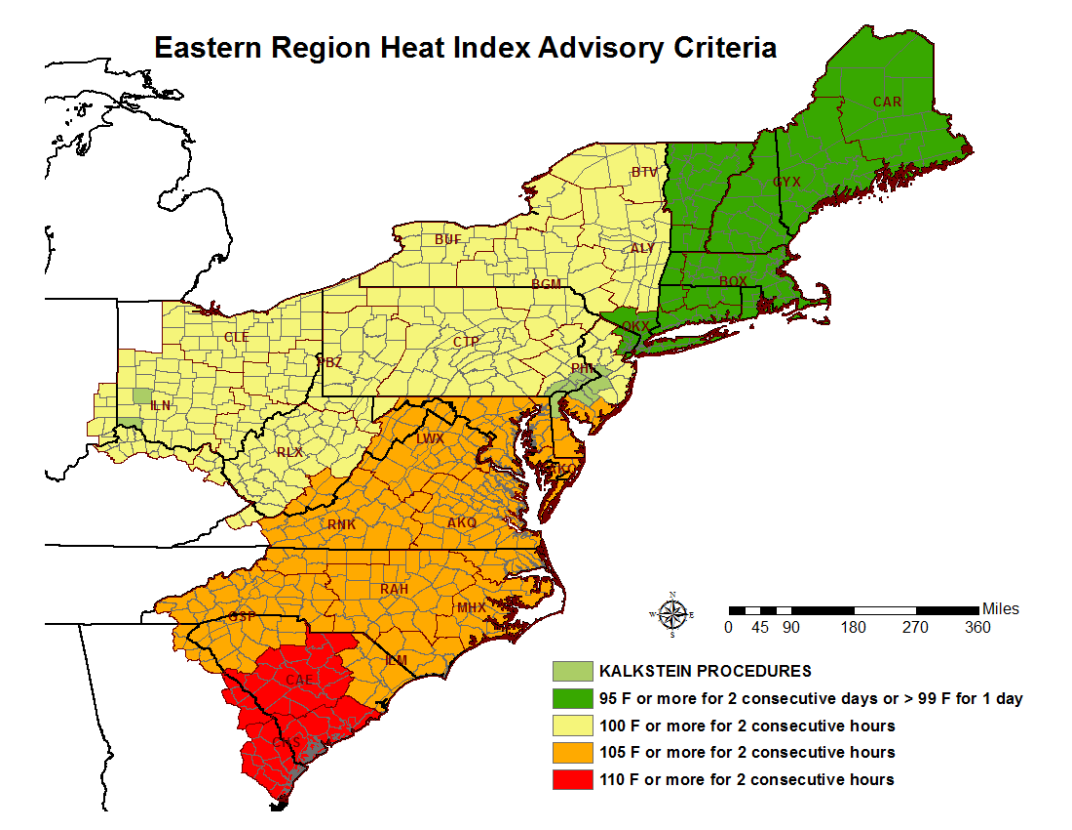
- Current thresholds established years ago based on coordination with partners and frequency of heat events
- NWS PHI used morbidity studies by Lawrence Kalkstein (University of Delaware) to lower thresholds (BAMS 1996)
- The thresholds were also lowered for New York City





Thresholds for Advisories – changes beginning summer 2017

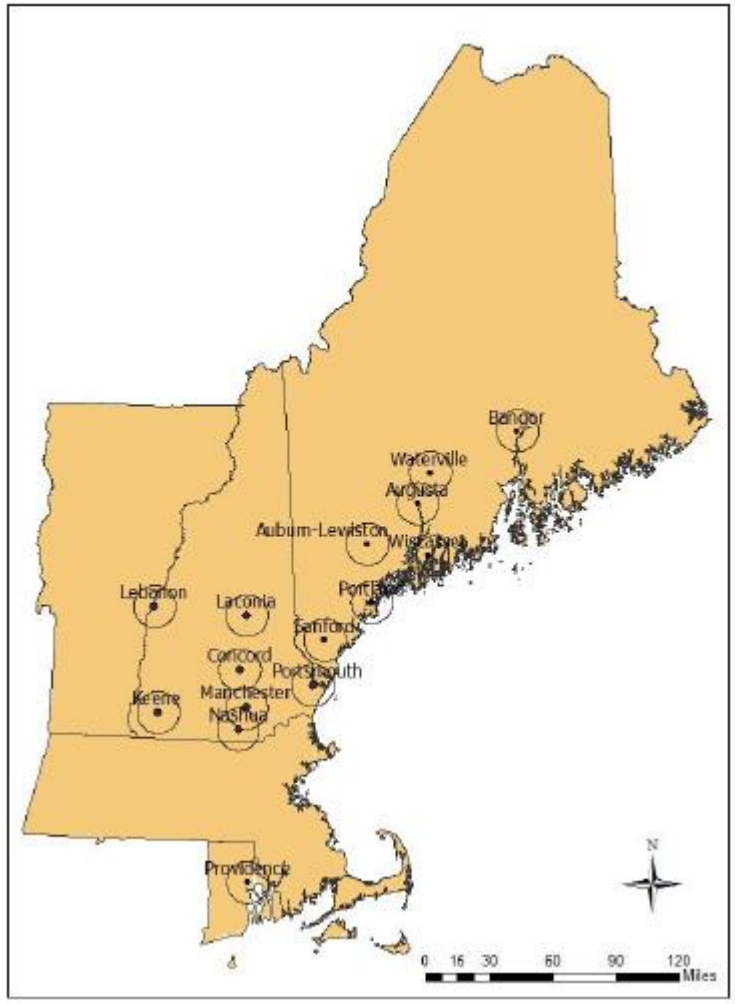
- **Collaborative study on morbidity and chronic health conditions by New England departments of health, Brown University and NWS offices - Lowered to New York City criteria**
- **No changes to Excessive Heat Criteria**



Northeast Regional Heat Collaborative - 2016

Partners

- Rhode Island Department of Health
- New Hampshire Department of Health and Human Services
- Maine Department of Health and Human Services
- Vermont Department of Health
- Brown University: School of Public Health
- The Centers for Disease Control and Prevention



Background

NATIONAL WEATHER SERVICE THRESHOLDS FOR NORTHEAST

HEAT ADVISORY	HEAT WARNING	HEAT WAVE
100° - 104°F (daytime heat indices for 2 or more hours)	105°F and above	3 consecutive days 90°F or higher

New York City Heat Advisory

Heat index of at least 100°F but less than 105°F for any length of time *or*
Heat index of at least 95°F but less than 100°F for two consecutive days

The threshold was modified for New York City, where historically the Northeast standards were used.

Data

Study Period

- May 1-September 30
- RI (2005-2012); ME (2001-2010); & NH (2000-2009)

Study Area

- Towns within 10 miles of a NOAA weather station (ME, NH), and all of RI
- Population included 60% of ME, 66% of NH, and 100% of RI
  (an estimated 2.7 million people)

Exposure

- Daily maximum heat index

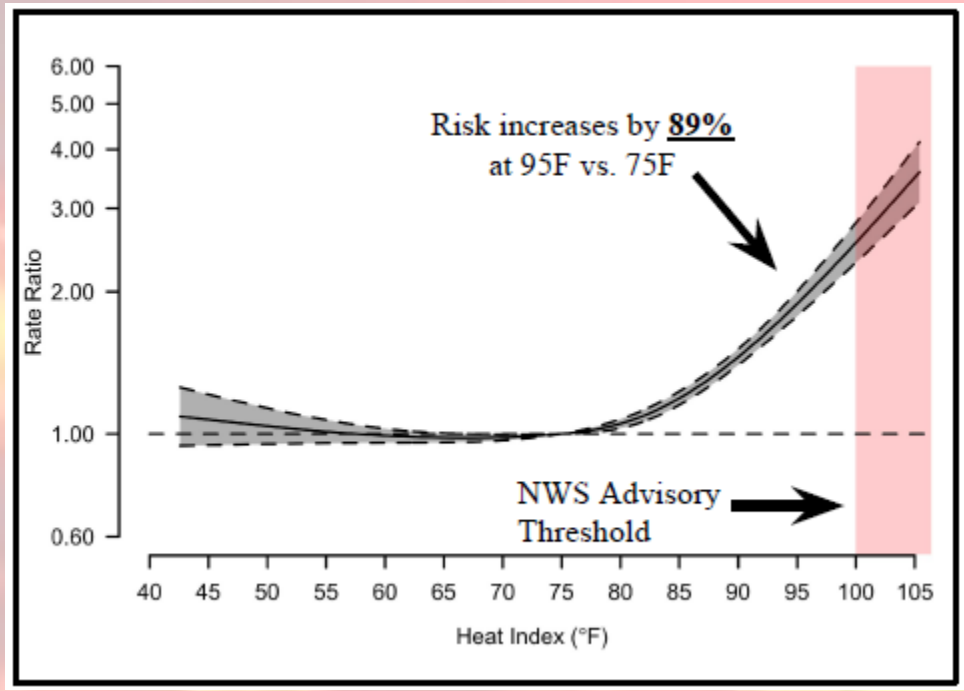
Outcome

- Counts of daily all-cause and heat-specific emergency department (ED) visits
- Counts of daily all-cause deaths

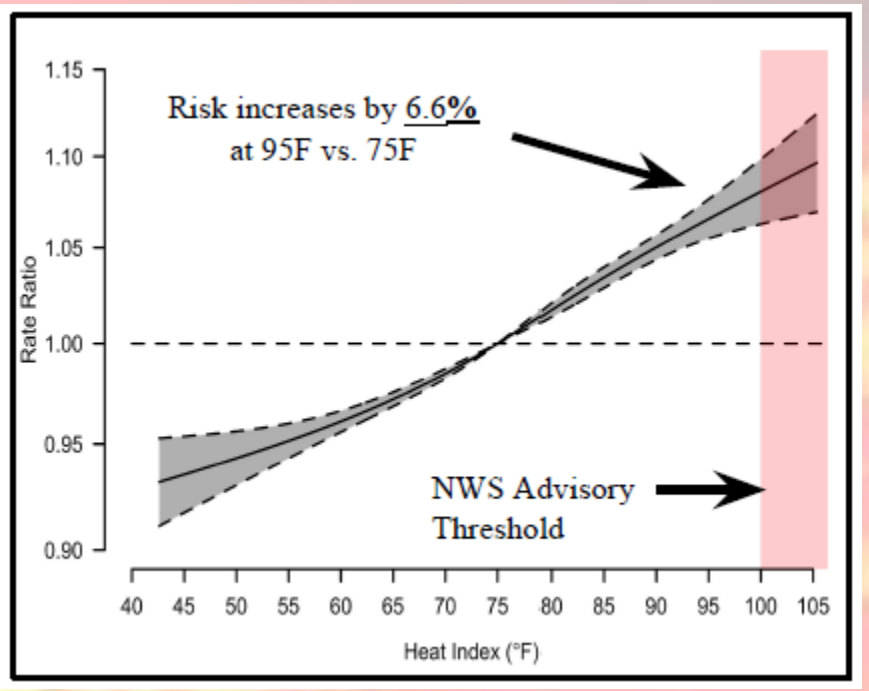
Methods and Results

- Time series analysis
  - Over-dispersed Poisson Regression
  - Distributed Lag Non-Linear Model
  - Day of (Lag 0) and cumulative (Lags 0-7)
  - Controlled for long-term time trends, day of week and federal holidays
- Estimated heat attributed risks of hospital ED visits and deaths at various cities
- Allowed for non-linear relationships over time
- Considered impact of a single hot day over the next 0-7 days
- Heat related ED visits up 6.6% over the next 7 days
- All cause ED visits up 89% over the next 7 days

59 excess heat specific ED visits



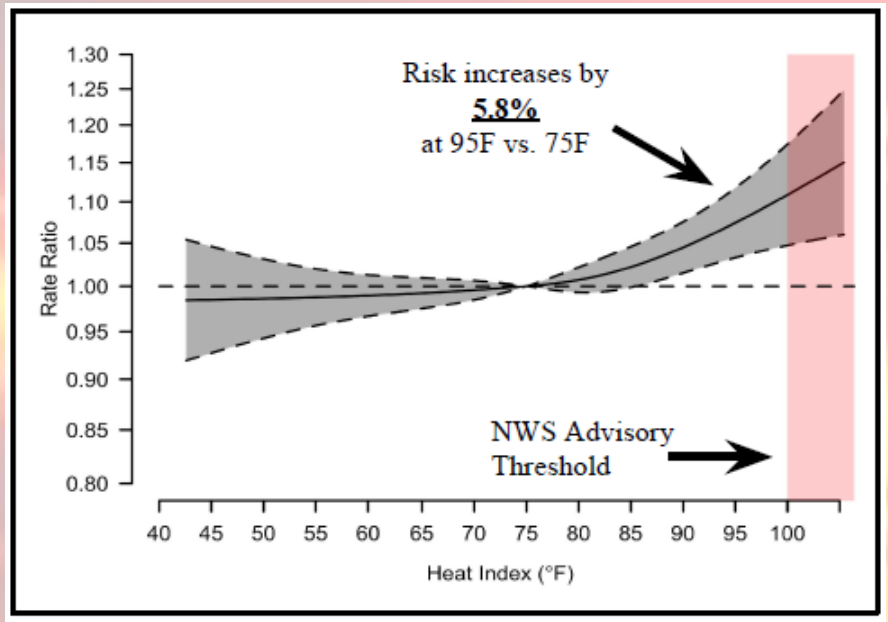
224 excess all cause ED visits



More Results

- Deaths up 5.8% the next day
- Annual excess of all causes for ED visits
  - Heat Index between 90°F-95°F – 1425/year
  - Heat Index between 95°F-100°F – 618/year
  - Heat Index ≥ 100°F – 240/year

3.4 excess deaths



Warning fatigue?

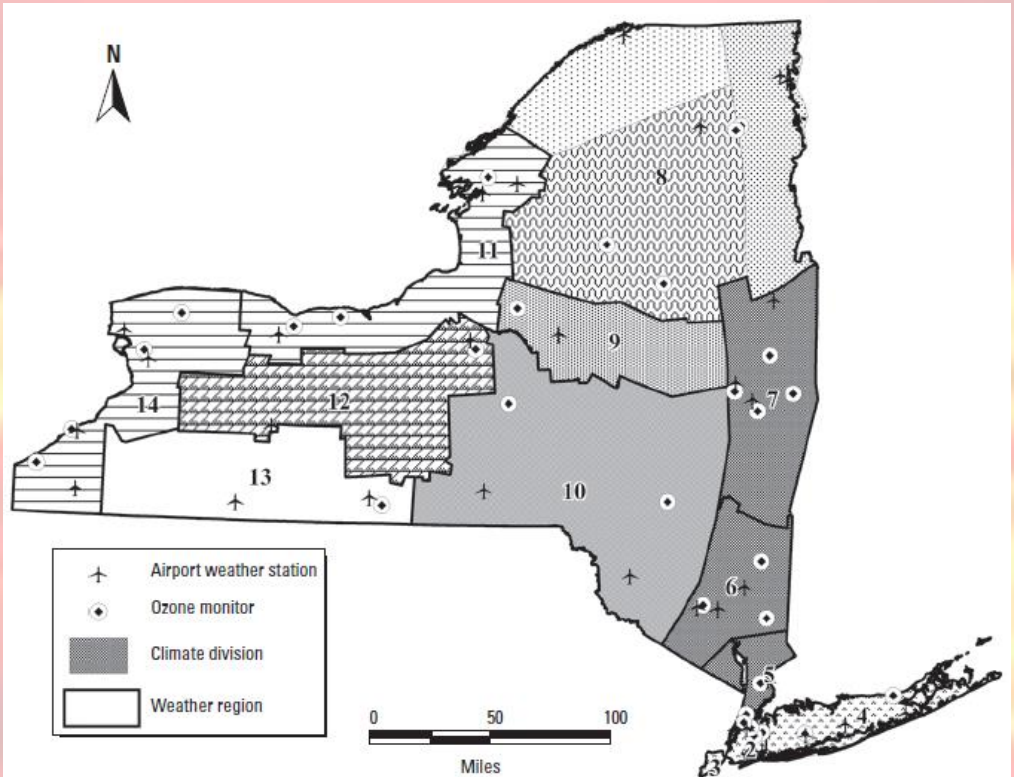
Annual average # of days in RI, NH, and ME reaching:

Heat Index 95-99°F- 3.5 days/year*
Heat Index 100-104°F- 1 day/year*
Heat Index 105°F- less than 1 day/year*

*Annually, during warm season (May-Sept)

Research on effects of heat in Upstate New York – Data studied 1992-2006

- Initial studies by NY State Department of Health published in 2009-2012
  - NY State divided into 14 study zones
  - First order airport observations used to represent verification for each zone
  - Limited account for variability of apparent temperature within each zone due to sparsity of verifying observations
  - Data analysis showed little temperature variation across zones in rural upstate NY regions



Research on effects of heat - birth defects in Upstate New York – Data studied 1991-2006

- Universal apparent temperature data used in this study

	Daily minimum UAT			Daily mean UAT			Daily maximum UAT		
Weather region	Mean ± SD	Minimum	Maximum	Mean ± SD	Minimum	Maximum	Mean ± SD	Minimum	Maximum
4. Long Island	66.1 ± 8.6	40.8	91.4	75.0 ± 8.3	52.9	99.9	83.4 ± 8.9	57.0	111.1
5. Westchester/Rockland	63.9 ± 7.7	41.2	90.5	73.6 ± 8.1	53.1	99.4	83.1 ± 9.2	55.0	111.3
6. Hudson Valley–South	61.5 ± 7.9	34.8	88.4	73.0 ± 7.9	52.2	97.9	84.0 ± 9.3	53.5	109.4
7. Hudson Valley–North	59.2 ± 7.6	36.2	84.4	70.6 ± 7.4	49.7	94.8	81.5 ± 8.9	53.5	106.6
8. Adirondack and North	57.9 ± 8.0	29.8	86.2	69.2 ± 7.8	45.0	94.5	80.1 ± 9.2	52.0	106.6
9. Mohawk Valley	59.1 ± 7.9	12.0	86.9	69.6 ± 7.7	46.4	95.4	80.1 ± 9.2	52.0	108.0
10. Binghamton	58.5 ± 7.2	31.5	81.2	67.7 ± 7.3	43.5	90.4	77.0 ± 8.6	51.0	102.9
11. Great Lakes–Rochester	58.3 ± 8.1	33.8	85.2	69.3 ± 7.8	45.2	95.1	79.5 ± 8.7	55.3	104.3
12. Central Lakes	60.5 ± 7.8	31.6	87.9	71.3 ± 8.0	47.2	95.7	81.5 ± 9.3	53.0	108.1
13. Western Plateau	56.6 ± 7.8	30.0	83.2	69.2 ± 7.4	45.5	93.8	81.6 ± 9.0	54.0	109.1
14. Great Lakes–Buffalo	61.1 ± 8.0	36.2	88.4	71.1 ± 7.9	43.0	93.4	80.5 ± 8.8	50.0	105.5
Overall: upstate New York	60.2 ± 8.3	12.0	91.4	70.9 ± 8.1	43.0	99.9	81.1 ± 9.2	50.0	111.3

Research on effects of heat - birth defects in Upstate New York – Data studied 1991-2006

- **Some of the health affects that were determined**

Birth outcome group	*n*	Daily minimum UAT		Daily mean UAT		Daily maximum UAT	
			5°F increase		5°F increase		5°F increase
		Mean ± SD	OR[a] (95% CI)	Mean ± SD	OR[a] (95% CI)	Mean ± SD	OR[a] (95% CI)
Controls	59,328	59.1 ± 6.2	—	69.4 ± 5.9	—	79.2 ± 5.7	—
Central nervous system							
Anencephalus	21	56.9 ± 3.6	0.94 (0.63, 1.42)	67.4 ± 3.8	0.93 (0.61, 1.43)	77.6 ± 4.0	0.95 (0.62, 1.46)
Spina bifida without anencephalus	114	58.6 ± 5.8	1.12 (0.92, 1.35)	68.9 ± 5.4	1.10 (0.90, 1.34)	78.8 ± 5.2	1.08 (0.89, 1.32)
Hydrocephalus without spina bifida	311	59.3 ± 6.2	1.06 (0.95, 1.18)	69.6 ± 5.7	1.07 (0.95, 1.20)	79.4 ± 5.4	1.07 (0.95, 1.19)
Encephalocele	25	58.0 ± 6.1	0.92 (0.64, 1.32)	68.3 ± 5.9	0.92 (0.63, 1.33)	78.2 ± 5.9	0.93 (0.64, 1.35)
Microcephalus	199	58.5 ± 6.9	0.93 (0.82, 1.06)	68.7 ± 6.5	0.93 (0.81, 1.06)	78.4 ± 6.3	0.92 (0.80, 1.05)
Eye							
Anophthalmia/microphthalmia	34	58.2 ± 6.2	0.71 (0.54, 0.94)*	68.2 ± 6.2	0.70 (0.53, 0.93)*	77.8 ± 6.4	0.70 (0.52, 0.93)*
Congenital cataract	75	60.5 ± 5.1	1.51 (1.14, 1.99)*	71.0 ± 4.9	1.47 (1.11, 1.94)*	81.0 ± 4.9	1.45 (1.10, 1.90)*
Cardiovascular							
Common truncus	9	57.2 ± 8.2	0.99 (0.53, 1.86)	67.7 ± 7.7	1.02 (0.52, 1.98)	77.7 ± 7.2	1.07 (0.54, 2.11)
Transposition of great arteries	68	58.7 ± 5.7	1.04 (0.82, 1.33)	69.4 ± 5.4	1.07 (0.84, 1.37)	79.6 ± 5.3	1.08 (0.84, 1.37)
Tetralogy of Fallot	106	59.3 ± 6.1	0.99 (0.83, 1.19)	69.5 ± 5.8	0.98 (0.82, 1.18)	79.2 ± 5.5	0.98 (0.82, 1.18)
Ventricular septal defect	1,579	59.0 ± 6.2	1.00 (0.96, 1.05)	69.5 ± 5.8	1.01 (0.96, 1.06)	79.2 ± 5.6	1.00 (0.95, 1.05)
Atrial septal defect	822	59.9 ± 6.4	0.96 (0.90, 1.02)	69.8 ± 6.1	0.96 (0.90, 1.02)	79.4 ± 6.0	0.97 (0.90, 1.03)
Endocardial cushion defect	43	58.2 ± 5.3	0.97 (0.73, 1.29)	68.7 ± 5.4	0.97 (0.72, 1.30)	78.7 ± 5.6	0.98 (0.73, 1.32)
Pulmonary valve atresia/stenosis	457	59.3 ± 6.2	1.07 (0.97, 1.17)	69.5 ± 5.8	1.07 (0.98, 1.17)	79.2 ± 5.6	1.07 (0.97, 1.17)
Tricuspid atresia/stenosis	44	58.7 ± 7.1	0.99 (0.75, 1.32)	68.8 ± 6.9	0.97 (0.73, 1.29)	78.4 ± 6.7	0.95 (0.71, 1.27)
Ebstein's anomaly	23	59.5 ± 4.7	1.06 (0.70, 1.59)	69.9 ± 4.3	1.12 (0.73, 1.71)	79.8 ± 4.3	1.18 (0.76, 1.83)
Aortic valve stenosis	102	59.5 ± 5.8	1.08 (0.89, 1.31)	69.8 ± 5.6	1.08 (0.89, 1.31)	79.6 ± 5.6	1.08 (0.89, 1.31)
Hypoplastic left heart syndrome	96	58.9 ± 6.3	0.99 (0.82, 1.20)	69.3 ± 6.1	0.98 (0.81, 1.19)	79.2 ± 6.0	0.98 (0.81, 1.19)
Patent ductus arteriosus (≥ 2,500 g)	566	59.7 ± 6.1	0.96 (0.89, 1.03)	69.6 ± 5.8	0.95 (0.88, 1.03)	79.0 ± 5.6	0.95 (0.88, 1.03)
Coarctation of aorta	235	59.0 ± 5.9	1.05 (0.92, 1.19)	69.3 ± 5.7	1.06 (0.93, 1.21)	79.2 ± 5.6	1.08 (0.95, 1.24)
Craniofacial							
Choanal atresia	99	58.3 ± 6.6	0.90 (0.75, 1.08)	68.7 ± 6.2	0.90 (0.75, 1.08)	78.7 ± 6.0	0.91 (0.76, 1.09)
Cleft palate without cleft lip	340	58.4 ± 6.1	0.99 (0.89, 1.10)	68.8 ± 5.7	0.99 (0.89, 1.10)	78.7 ± 5.6	0.97 (0.87, 1.08)
Cleft lip ± cleft palate	501	58.6 ± 6.4	0.98 (0.90, 1.07)	69.1 ± 6.0	0.98 (0.90, 1.07)	79.1 ± 5.9	0.99 (0.91, 1.07)
Genitourinary							
Renal agenesis/hypoplasia	174	59.8 ± 5.8	1.17 (1.00, 1.37)*	70.1 ± 5.5	1.15 (0.99, 1.35)	79.8 ± 5.3	1.13 (0.97, 1.32)
Musculoskeletal							
Upper limb reduction	105	58.7 ± 5.6	1.09 (0.89, 1.33)	69.2 ± 5.3	1.11 (0.90, 1.36)	79.3 ± 5.4	1.12 (0.91, 1.38)
Lower limb reduction	85	59.1 ± 6.4	1.10 (0.88, 1.37)	69.4 ± 6.0	1.10 (0.88, 1.38)	79.2 ± 5.7	1.09 (0.87, 1.36)
Gastroschisis	108	58.3 ± 5.6	1.00 (0.83, 1.21)	68.6 ± 5.7	0.98 (0.82, 1.19)	78.5 ± 5.8	0.99 (0.82, 1.19)
Omphalocele	81	59.0 ± 5.7	1.12 (0.89, 1.42)	69.3 ± 5.3	1.12 (0.89, 1.42)	79.1 ± 5.3	1.12 (0.88, 1.41)

[a]ORs were adjusted for maternal age, race, ethnicity, adequacy of prenatal care, smoking, weather region, and year. *Statistically significant ($p \leq 0.05$).

Research on effects of heat - birth defects in Upstate New York – Data studied 1992-2006

- **Heat Waves – 3 or more days UAT > 90th percentile**

Birth outcome group	*n*	Embryo-days in summer[a]	Heat wave[a] *n* (%)	Heat wave[a] OR[b] (95% CI)	No. of heat waves Mean ± SD	No. of heat waves OR[b] (95% CI)	No. of days > 90th percentile Mean ± SD	No. of days > 90th percentile OR[b] (95% CI)
Controls	59,328		18,629 (31.4)	—	0.4 ± 0.7	—	3.1 ± 3.8	—
Central nervous system								
Anencephalus	21		2 (9.5)	0.21 (0.04, 1.03)	0.1 ± 0.3	0.25 (0.06, 1.03)	1.7 ± 2.8	0.89 (0.74, 1.05)
Spina bifida without anencephalus	114		38 (33.3)	1.30 (0.82, 2.05)	0.4 ± 0.7	1.12 (0.83, 1.52)	3.2 ± 3.6	1.03 (0.97, 1.09)
Hydrocephalus without spina bifida	311		94 (30.2)	0.95 (0.72, 1.25)	0.4 ± 0.7	0.99 (0.82, 1.20)	3.2 ± 3.8	1.01 (0.97, 1.04)
Encephalocele	25		6 (24.0)	0.57 (0.21, 1.57)	0.4 ± 0.9	1.00 (0.53, 1.86)	3.0 ± 4.8	0.97 (0.86, 1.10)
Microcephalus	199		60 (30.2)	1.10 (0.77, 1.58)	0.4 ± 0.6	0.99 (0.77, 1.28)	3.0 ± 4.0	0.99 (0.95, 1.04)
Eye								
Anophthalmia/microphthalmia	34		10 (29.4)	0.65 (0.29, 1.44)	0.4 ± 0.7	0.75 (0.42, 1.33)	3.3 ± 4.1	0.98 (0.89, 1.09)
Congenital cataract	75		35 (46.7)	1.97 (1.17, 3.32)*	0.6 ± 0.7	1.45 (1.04, 2.02)*	4.0 ± 3.9	1.09 (1.02, 1.17)*
Cardiovascular								
Common truncus	9		5 (55.6)	3.47 (0.78, 15.40)	0.6 ± 0.5	2.31 (0.68, 7.81)	3.2 ± 3.0	1.10 (0.85, 1.44)
Transposition of great arteries	68		21 (30.9)	0.81 (0.46, 1.45)	0.4 ± 0.6	0.86 (0.56, 1.30)	3.2 ± 3.7	0.99 (0.92, 1.07)
Tetralogy of Fallot	106		39 (36.8)	1.15 (0.73, 1.81)	0.4 ± 0.6	0.91 (0.67, 1.25)	3.2 ± 3.6	0.98 (0.92, 1.04)
Ventricular septal defect	1,579		489 (31.0)	0.98 (0.87, 1.11)	0.4 ± 0.7	0.97 (0.89, 1.05)	3.1 ± 3.7	0.99 (0.98, 1.01)
Atrial septal defect	822		258 (31.4)	0.91 (0.77, 1.08)	0.4 ± 0.7	0.93 (0.83, 1.03)	3.3 ± 4.0	0.99 (0.97, 1.01)
Endocardial cushion defect	43		14 (32.6)	1.18 (0.57, 2.43)	0.4 ± 0.7	1.13 (0.71, 1.80)	3.2 ± 3.9	1.01 (0.92, 1.11)
Pulmonary valve atresia/stenosis	457		145 (31.7)	1.04 (0.83, 1.30)	0.4 ± 0.7	1.07 (0.92, 1.24)	3.3 ± 4.0	1.01 (0.99, 1.04)
Tricuspid atresia/stenosis	44		17 (38.6)	1.78 (0.83, 3.81)	0.5 ± 0.8	1.40 (0.87, 2.24)	3.6 ± 4.8	1.05 (0.96, 1.14)
Ebstein's anomaly	23		7 (30.4)	1.24 (0.41, 3.71)	0.4 ± 0.7	0.96 (0.46, 2.01)	2.7 ± 3.2	0.96 (0.82, 1.11)
Aortic valve stenosis	102		40 (39.2)	1.22 (0.78, 1.92)	0.5 ± 0.6	1.04 (0.76, 1.41)	3.4 ± 3.7	1.00 (0.94, 1.06)
Hypoplastic left heart syndrome	96		36 (37.5)	1.05 (0.65, 1.70)	0.5 ± 0.8	1.07 (0.79, 1.46)	3.8 ± 4.4	1.03 (0.97, 1.09)
Patent ductus arteriosus (≥ 2,500 g)	566		180 (31.8)	0.96 (0.78, 1.19)	0.4 ± 0.7	0.95 (0.83, 1.09)	3.2 ± 4.0	0.98 (0.96, 1.00)
Coarctation of aorta	235		65 (27.7)	0.94 (0.67, 1.30)	0.4 ± 0.7	1.04 (0.83, 1.29)	3.0 ± 3.8	1.01 (0.97, 1.05)
Craniofacial								
Choanal atresia	99		28 (28.3)	0.77 (0.48, 1.26)	0.4 ± 0.7	0.93 (0.66, 1.31)	2.7 ± 3.7	0.96 (0.90, 1.03)
Cleft palate without cleft lip	340		110 (32.4)	1.14 (0.88, 1.48)	0.4 ± 0.6	0.99 (0.82, 1.19)	3.1 ± 3.6	1.01 (0.97, 1.04)
Cleft lip ± cleft palate	501		163 (32.5)	0.94 (0.76, 1.17)	0.4 ± 0.7	0.98 (0.85, 1.13)	3.4 ± 4.1	1.00 (0.97, 1.02)
Genitourinary								
Renal agenesis/hypoplasia	174		61 (35.1)	1.13 (0.79, 1.62)	0.4 ± 0.6	1.02 (0.79, 1.30)	3.2 ± 3.6	1.00 (0.95, 1.04)
Musculoskeletal								
Upper limb reduction	105	3,412	29 (27.6)	0.90 (0.56, 1.45)	0.4 ± 0.7	1.02 (0.73, 1.42)	3.0 ± 3.7	1.01 (0.95, 1.08)
Lower limb reduction	85	2,754	31 (36.5)	1.36 (0.82, 2.25)	0.5 ± 0.7	1.23 (0.87, 1.75)	3.5 ± 4.1	1.05 (0.98, 1.12)
Gastroschisis	108	3,527	23 (21.3)	0.48 (0.28, 0.81)*	0.3 ± 0.6	0.63 (0.43, 0.92)*	2.8 ± 3.9	0.95 (0.90, 1.01)
Omphalocele	81	2,559	23 (28.4)	0.93 (0.54, 1.61)	0.3 ± 0.5	0.83 (0.55, 1.25)	2.8 ± 3.3	0.98 (0.91, 1.05)

[a]Heat wave (≥ 3 consecutive days with daily mean UAT above the 90th percentile). [b]ORs were adjusted for maternal age, race, ethnicity, adequacy of prenatal care, smoking, weather region, and year. *Statistically significant ($p \leq 0.05$).

Research on effects of heat - respiratory and cardiovascular diseases in New York City – Data studied 1992-2004

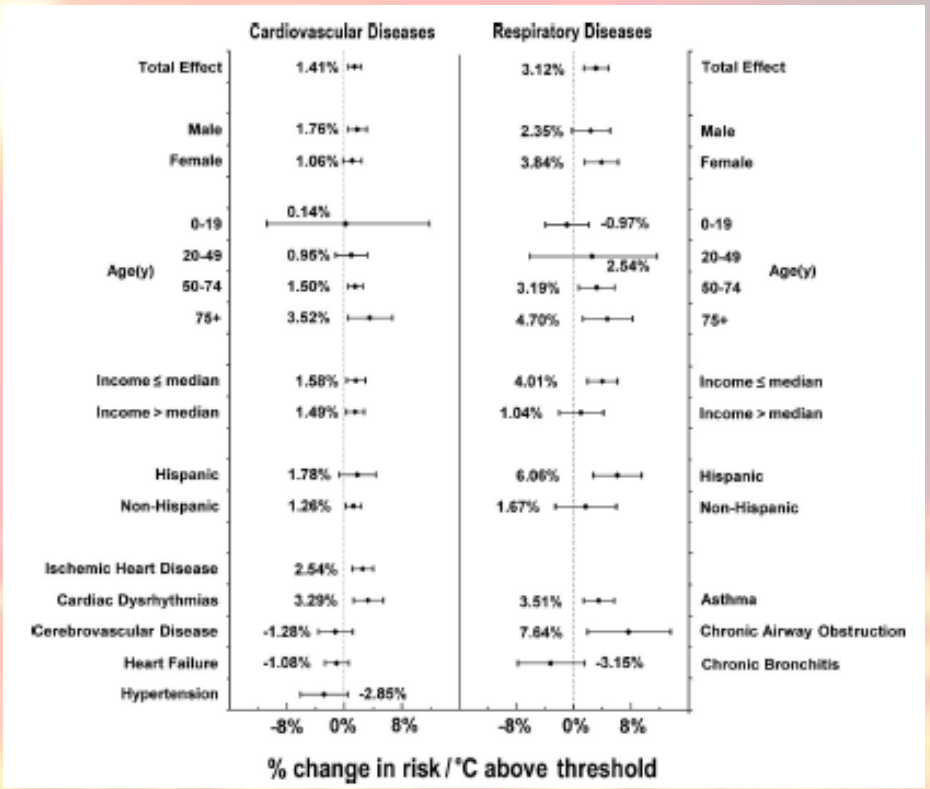
- **Some of the health effects that were determined**

	Mean (SD)	Minimum	25th Percentile	Median	75th Percentile	Maximum
Daily mean temperature (°C)						
Staten Island, LGA	24.0 (3.4)	12.9	22.0	24.1	26.2	34.2
JFK	22.8 (3.1)	12.6	21.0	23.0	24.8	33.2
Daily mean apparent temperature (°C)						
Staten Island, LGA	25.6 (4.7)	12.1	22.6	25.8	29.0	40.3
JFK	24.7 (4.5)	10.6	21.9	24.9	27.9	38.7
Daily mean relative humidity (%)						
Staten Island, LGA	64.5 (14)	33.0	53.9	63.6	74.8	99.3
JFK	71.6 (14)	31.3	61.9	72.8	82.8	99.7
Daily ozone 8 hours max (ppb)[b]						
JFK, LGA	57.4 (24.6)	2.0	39.6	54.5	72.0	155.0
Staten Island[c]	66.0 (25.4)	5.0	46.6	62.5	80.2	178.0
Daily admission rate for respiratory diseases (per 1,000,000)						
LGA	10.2 (3.3)	2.5	8.3	10.2	12.1	20.8
JFK	12.4 (8.0)	2.2	7.8	10.0	13.9	98.2
Staten Island	9.0 (5.1)	0.0	4.6	9.1	11.4	34.2
Daily admission rate for cardiovascular diseases (per 1,000,000)						
LGA	36.5 (8.0)	19.0	28.3	38.2	42.7	53.1
JFK	43.4 (10.8)	17.8	34.4	43.8	51.6	71.0
Staten Island	44.0 (13.9)	11.4	34.2	43.3	54.7	88.8

[a]Time period for this table is June–August, 1991–2004 (1288 days).
[b]Maximum value in 8-hour period (10:00 AM–6:00 PM observations).
[c]Calculated from 1130 days which had ≥75% available hourly observations.

Disease	ICD-9 Codes	No. Cases	Percent Distribution
Cardiovascular diseases	393–438	392,734	100
Chronic rheumatic heart disease	393–398	2334	0.6
Hypertensive disease	401–405	33,557	8.5
Ischemic heart disease	410–414	160,751	40.9
Cardiac dysrhythmias	427	51,567	13.1
Heart failure	428	87,058	22.2
Cerebrovascular disease	430–434, 436–438	57,467	14.6
Respiratory diseases	491–493, 496, 490[a], 466[a]	108,445	100
Acute bronchitis and bronchiolitis	466[a]	7710	7.0
Bronchitis, not specified as acute or chronic	490[a]	693	0.6
Chronic bronchitis	491	17,366	16.0
Emphysema	492	3259	3.0
Asthma	493	70,727	65.2
Chronic airway obstruction, not elsewhere classified	496	8690	8.0

[a]For age <5 years.



3-day moving average Apparent Temperature 90°F, CD 1-3 day lag, RD 0-2 day lag

Research on effects of heat – renal disease in New York – Data studied 1991-2004

- **Some of the health effects that were determined**

Region	Hospital Admissions During July and August, 1991–2004									
	Acute Renal Failure, no.	Chronic Kidney Disease, no.	Urinary Tract Infection, no.	Nephritis and Nephrosis, no.	Renal Calculi, no.	Lower Urinary Calculi, no.	Lower Urinary Tract Disorders, no.	Other Kidney Disorders, no.	Total Renal, no.	All Renal/10,000 Population/Month
1 (New York City-LaGuardia Airport)[a]	4,100	1,965	20,024	8,279	9,580	831	4,664	2,038	51,481	3.0
2 (New York City-John F. Kennedy International Airport)	1,170	561	6,179	1,919	3,095	332	1,623	626	15,505	3.0
4 (Long Island)	1,996	739	7,280	2,949	5,864	364	2,368	962	22,522	2.9
5 (Westchester)	735	292	2,730	1,110	2,702	137	1,131	480	9,317	2.7
6 (Hudson Valley-South)	382	111	1,392	538	1,382	56	501	265	4,627	2.1
7 (Hudson Valle-North)	487	158	2,132	924	1,411	69	478	306	5,965	2.2
8 (Adirondacks and North)	222	71	880	463	802	35	335	117	2,925	2.9
9 (Mohawk Valley)	243	54	1,050	477	891	31	278	155	3,179	2.8
10 (Binghamton)	456	133	1,850	819	1,482	69	570	301	5,680	2.6
11 (Rochester)	691	163	2,360	1,247	1,863	78	452	277	7,131	2.4
12 (Central Lakes)	492	142	2,006	894	1,279	72	462	281	5,628	2.2
13 (Western Plateau)	212	78	888	381	863	34	233	139	2,828	3.1
14 (Buffalo)	1,184	269	3,972	1,287	2,873	97	852	563	11,097	2.8
Statewide	12,370	4,736	52,743	21,287	34,087	2,205	13,947	6,510	147,885	2.8

[a] Includes Staten Island.

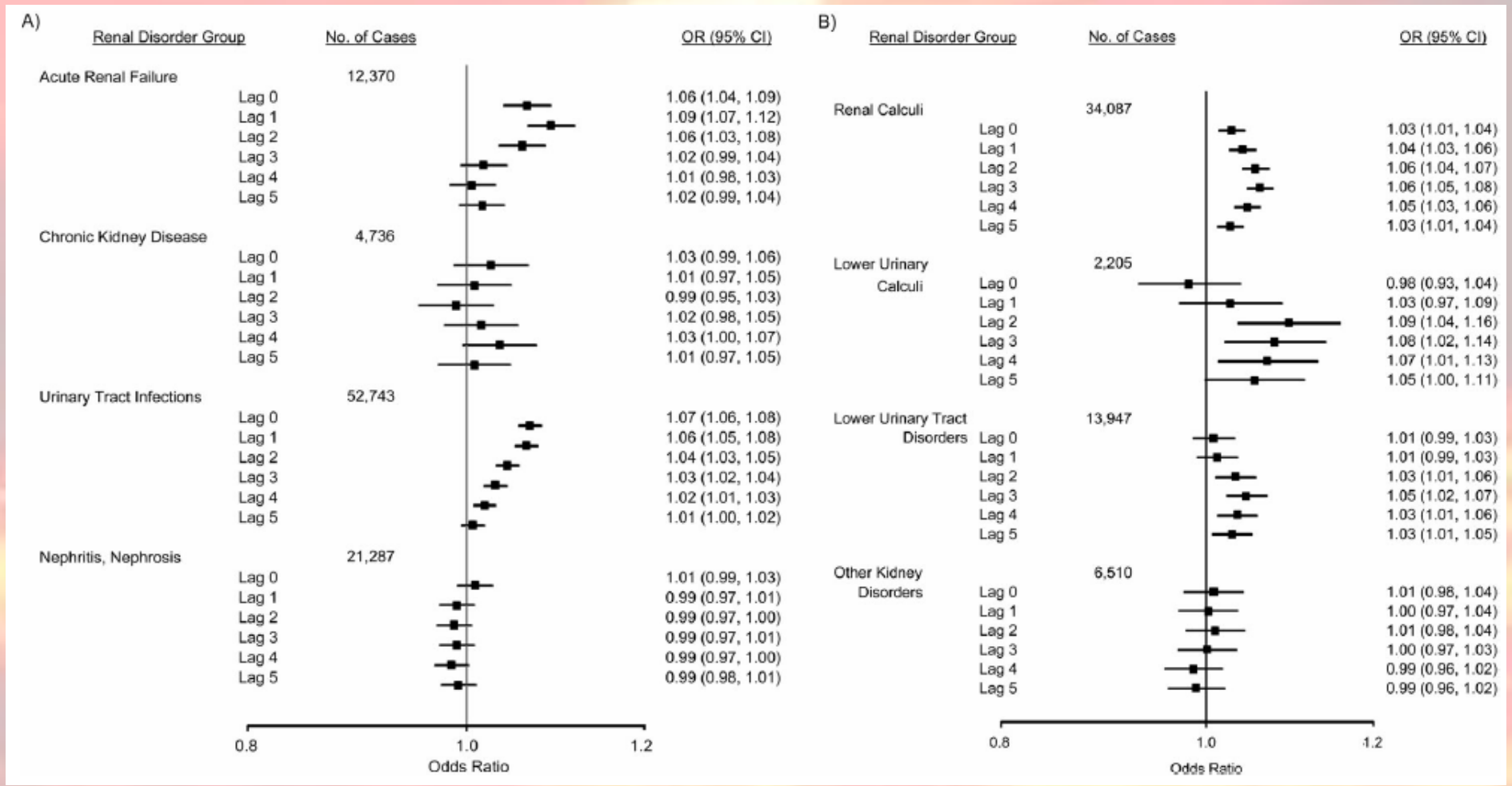
Lag, days	Actual Temperature[a]						Apparent Temperature[b]					
	Mean		Minimum		Maximum		Mean		Minimum		Maximum	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
0	1.064	1.040, 1.089	1.062	1.039, 1.085	1.043	1.024, 1.063	1.044	1.025, 1.063	1.035	1.018, 1.053	1.035	1.020, 1.053
1	1.090	1.065, 1.116	1.082	1.059, 1.105	1.065	1.045, 1.086	1.060	1.041, 1.080	1.051	1.033, 1.068	1.048	1.032, 1.066
2	1.059	1.034, 1.083	1.045	1.023, 1.068	1.042	1.023, 1.062	1.042	1.023, 1.062	1.035	1.018, 1.052	1.035	1.018, 1.052
3	1.018	0.995, 1.042	1.018	0.996, 1.039	1.011	0.992, 1.030	1.012	0.993, 1.031	1.012	0.996, 1.029	1.006	0.990, 1.022
4	1.006	0.984, 1.030	1.008	0.986, 1.029	1.005	0.986, 1.024	0.995	0.977, 1.013	0.996	0.980, 1.013	0.995	0.979, 1.012
5	1.016	0.993, 1.040	1.009	0.988, 1.030	1.016	0.997, 1.035	1.005	0.987, 1.012	1.000	0.984, 1.017	1.008	0.992, 1.025

Abbreviations: CI, confidence interval; OR, odds ratio.
[a] Actual temperature is adjusted for relative humidity and barometric pressure.
[b] Apparent temperature is adjusted for barometric pressure only.

Note the ORs >1 and the lag days for temperature and apparent temperature

Research on effects of heat – renal disease in New York – Data studied 1991-2004

- **Some of the health effects that were determined**



Note the ORs > 1 and the lag days

www.health.ny.gov/environmental/weather/cooling/

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Cooling Centers

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- Data
- Publications
- Tracking Program
- Glossary
- Frequently Asked Questions

Interactive Tool

Environmental Public Health Tracker
Use this tool to view maps, graphs and tables of select environmental health data.

You are Here: Home Page > Climate, Weather & Health > Cooling Centers

Cooling Centers

Cooling centers are facilities where you can go to cool off during extreme heat. The New York State Department of Health collected information about seasonal cooling centers from local health departments and emergency management offices.

To view the address and phone number of a cooling center in your area, select your county on the map below or visit county cooling centers. Some counties (gray) do not have cooling centers listed. If a cooling center is not available, libraries, supermarkets, malls, and community swimming pools are great places to stay cool.

Call before you go! Cooling centers may be closed at certain times or only available during extreme heat events.

Questions or comments: epht@health.ny.gov Revised: August 2016

Department of Health

www.health.ny.gov/environmental/weather/cooling/countycenters.htm#schenectady

Apps History IEM :: ADM from NW https://sites.google.c Briefing Image Gener http://www.weather.g http://www.image.uca Other bookmarks

- Palisades Center Mall Community room, 4th floor by the ice skating rink (as needed), 1000 Palisades Center Dr., West Nyack, 10994, (Mall Security 845-348-1010)

Saratoga County

- Clifton Park Community Center, 6 Clifton Commons Blvd, Clifton Park, 12065, 518-383-1343
- Corinth Fire Dept, 16 Saratoga Ave, Corinth, 12822, 518-654-6789
- Galway EMS, 2175 Galway Rd, Galway, 12074, 518-882-1234
- Gansevoort Fire Dept, 1870 Rt 32 North, Gansevoort, 12831 , 518-792-4396
- Northumberland Town Hall, 17 Catherine St, Gansevoort, 12831, 518-792-9179
- Shelly Park Community Center, 19 Elm Lane, Gansevoort, 12831
- Greenfield Community Center, 7 Wilton Rd, Greenfield Center, 12833, 518-893-7432
- Hadley Senior Center, 23 Maple St, Hadley, 12835, 518-696-2280
- Saratoga Springs Indoor Rec Center, 15 Vanderbilt Ave, Saratoga Springs, 12866, 518-587-3550
- Saratoga Springs Senior Center, 5 Williams St, Saratoga Springs, 12866, 518-584-1621

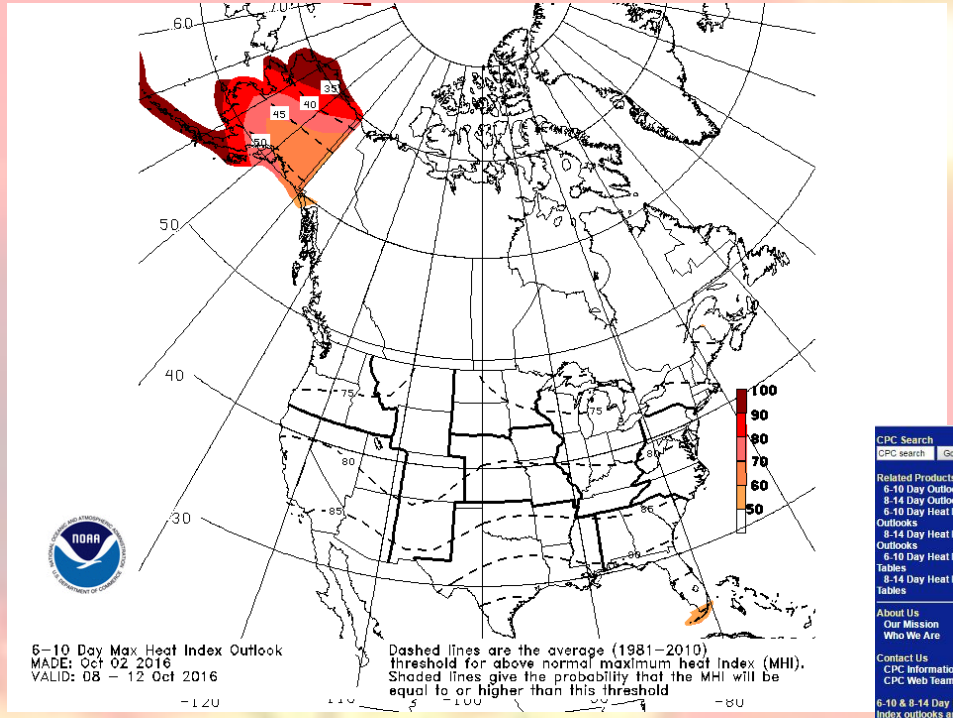
Schenectady County

- Quaker Street Branch Library, 133 Bull St, Delanson, 12053, 518-895-2719
- Duanesburg Area Community Center, 221 Victoria Drive, Delanson, 12053, 518-895-9500
- Glenville Branch Library, 20 Glenridge Rd, Glenville, 12302, 518-386-2243
- Glenville Senior Center, 32 Worden Rd, Glenville, 12302, 518-374-0734
- Niskayuna Branch Library, 2400 Nott St E, Niskayuna, 12309, 518-386-2249
- Niskayuna Community Center, 2682 Aqueduct Rd, Niskayuna, 12309, 518-372-2519
- Rotterdam Branch Library, 1100 N Westcott Rd, Schenectady, 12306, 518-356-3440
- Rotterdam Town Senior Citizen's Center, 2639 Hamburg St, Schenectady, 12303, 518-356-1561
- Duane Branch Library, 1331 State St, Schenectady, 12304, 518-386-2242
- Woodlawn Branch Library, 2 Sanford St, Schenectady, 12304, 518-386-2248
- Schenectady County Public Library, 99 Clinton St, Schenectady, 12305, 518-388-4500
- Scotia Branch Library, 14 Mohawk Ave, Scotia, 12302, 518-386-2247
- Schenectady County Recreational Facility, 5 Tower Rd Scotia, 12302, 518-384-2445

Steuben County

- Public Libraries
- Local and State Parks
- Shopping Malls

Heat Index Outlook from the Climate Prediction Center (Days 6-10)



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6-10 & 8-14 Day Heat Index outlooks are issued daily between 3pm & 4pm Eastern Time. All forecasts of heat index are completely automated.

Please refer to the U.S. Prognostic Discussion for an explanation of terms and symbols used on these maps.

USA.gov

D+8 Heat Index Forecasts
Made 10/02/2016

Valid: 10/08/2016 - 10/12/2016

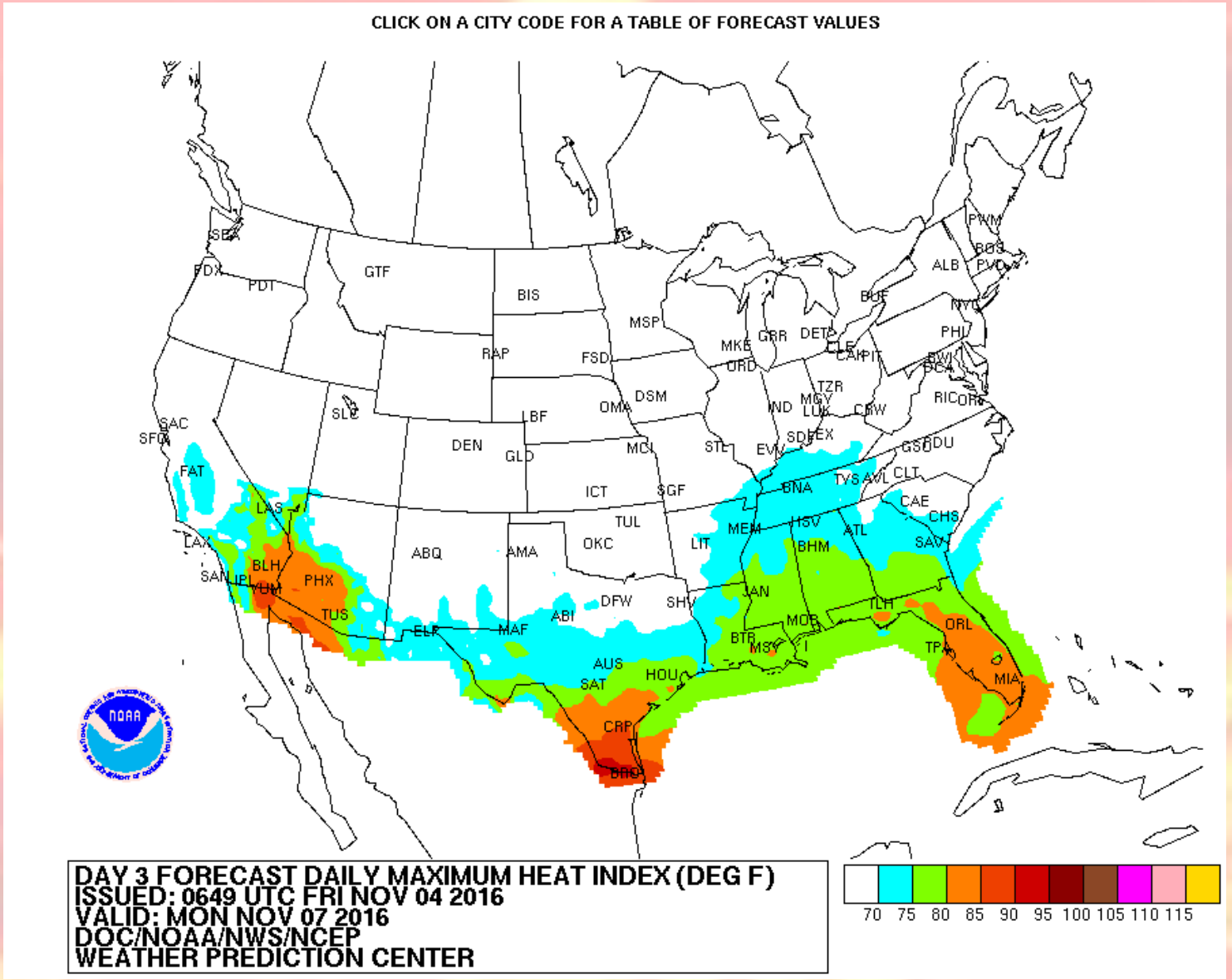
Northeast

City	State	Max HI	% Bel Nor	% Nr Nor	% Abv Nor	% >90	% > 95	% > 100	% > 105	% > 110	% > 115	% > 120	% 3 days > 85	% 2 days > 90	% 1 day > 95
HARTFORD BRADLEY INTL AP	CT	69.85	47.62	52.38	0	0	0	0	0	0	0	0	0	0	0
BOSTON LOGAN INTL ARPT	MA	68.36	33.33	66.67	0	0	0	0	0	0	0	0	0	0	0
WORCHESTER REGIONAL ARPT	MA	63.29	57.14	42.86	0	0	0	0	0	0	0	0	0	0	0
PORTLAND INTL JETPORT	ME	68.8	0	78.57	21.43	0	0	0	0	0	0	0	0	0	0
CARIBOU MUNICIPAL AR	ME	66.88	2.38	9.52	88.1	0	0	0	0	0	0	0	0	0	0
AUGUSTA AIRPORT	ME	67.12	2.38	78.57	19.05	0	0	0	0	0	0	0	0	0	0
CONCORD MUNICIPAL ARPT	NH	67.95	35.71	64.29	0	0	0	0	0	0	0	0	0	0	0
PEASE INTL TRADEPOR	NH	67.64	23.81	76.19	0	0	0	0	0	0	0	0	0	0	0
NEW YORK LAGUARDIA ARPT	NY	75.13	40.48	45.24	14.29	0	0	0	0	0	0	0	0	0	0
BINGHAMTON EDWIN A LINK FI	NY	63.1	61.9	38.1	0	0	0	0	0	0	0	0	0	0	0
ALBANY COUNTY AP	NY	67.6	33.33	66.67	0	0	0	0	0	0	0	0	0	0	0
SYRACUSE HANCOCK INTL ARPT	NY	68.09	50	45.24	4.76	0	0	0	0	0	0	0	0	0	0
BUFFALO NIAGARA INTL AP	NY	65.43	59.52	38.1	2.38	0	0	0	0	0	0	0	0	0	0
ROCHESTER GREATER ROCHESTER I	NY	69.6	38.1	47.62	14.29	0	0	0	0	0	0	0	0	0	0
ISLIP LONG ISL MACARTHUR AP	NY	74.13	0	92.86	7.14	0	0	0	0	0	0	0	0	0	0
WHITE PLAINS WESTCHESTER CO A	NY	70.78	23.81	71.43	4.76	0	0	0	0	0	0	0	0	0	0
ELMIRA CORNING REGIONAL AP	NY	68.84	47.62	47.62	4.76	0	0	0	0	0	0	0	0	0	0
WATERTOWN AP	NY	67.11	38.1	30.95	30.95	0	0	0	0	0	0	0	0	0	0
PROVIDENCE T F GREEN STATE AR	RI	72.79	7.14	90.48	2.38	0	0	0	0	0	0	0	0	0	0
BURLINGTON INTERNATIONAL AP	VT	68.33	16.67	50	33.33	0	0	0	0	0	0	0	0	0	0
MONTPELIER AP	VT	62.79	47.62	45.24	7.14	0	0	0	0	0	0	0	0	0	0

Mid_Atlantic

City	State	Max HI	% Bel Nor	% Nr Nor	% Abv Nor	% >90	% > 95	% > 100	% > 105	% > 110	% > 115	% > 120	% 3 days > 85	% 2 days > 90	% 1 day > 95
DOVER AFB	DE	83.22	0	11.9	88.1	0	0	0	0	0	0	0	0	0	0
WILMINGTON NEW CASTLE CNTY AP	DE	75.54	64.29	16.67	19.05	0	0	0	0	0	0	0	0	0	0
PATUXENT RIVER NAS	MD	76.37	64.29	26.19	9.52	0	0	0	0	0	0	0	0	0	0
BALTIMORE BLT-WASHNGTN INTL	MD	75.77	66.67	21.43	11.9	0	0	0	0	0	0	0	0	0	0

Long Range (Day 3-7) Heat Index Forecasts from the Weather Prediction Center



The next steps – through Spring 2017

- Track ED visits for upstate NY on a 12 Km grid using census data, satellite data and 1st order observations
  - Caveat – Satellite data cannot be used in cloudy conditions
  - Caveat – Satellite data displays skin temperatures not the standard 2m temperatures or apparent temperatures
- Possible resolution of 1 Km in urban areas with high population density
  - Caveat – Lower resolution 12 Km data could be used with verification of temperature data using the few standard observations in each zone
  - Caveat – Temperature data found adequately homogeneous across larger zones in prior studies, especially in less urban upstate NY zones
- Use Mesonet data for temperature and apparent temperature data to strengthen study
- Plot data in GIS map format with different demographic layers
- Determine whether the apparent temperature thresholds need to be lowered for all of NY State

The next steps – Summer 2017 and beyond

- Create color coded interactive GIS maps with apparent temperature predictions – might be beyond summer 2017
- NWS offices relay graphical and text information to broader user community
- Expand to extreme cold studies while continuing to add to database to strengthen results of heat studies

Examples of GIS based maps with graphical threats and descriptions of threats

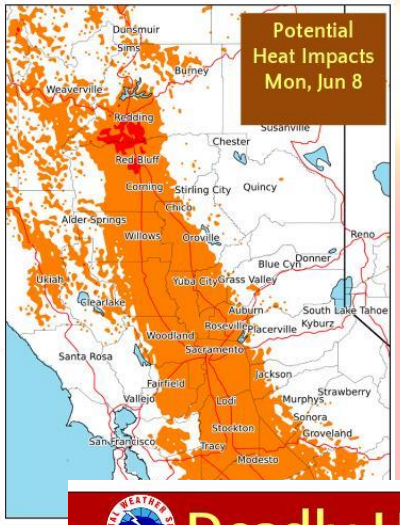
Prepare for Heat Now!

What Orange Means . . .

Heat like this happens many times a year. It will be relatively easy to take simple precautions to keep safe.

Advice . . .

- Drink water
- Dress for heat
- Stay in the shade
- Elderly, kids, and pets need more help staying cool



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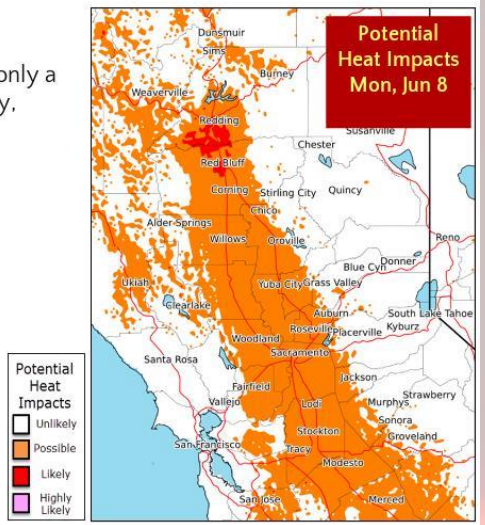
Prepare for Dangerous Heat!

What Red Means . . .

Dangerous heat like this happens only a few times a year. Impacts are likely, even for the general population, if precautions are not taken.

Advice . . .

- Drink water before you're thirsty
- Avoid strenuous activities
- Stay in air-conditioned areas
- Check on the heat-sensitive (e.g. elderly, infants, pets)



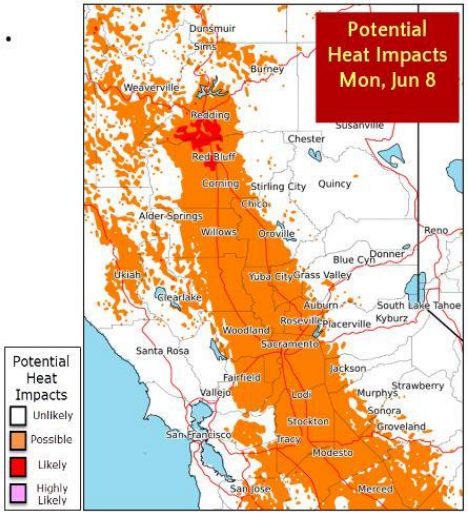
Deadly Heat!

What Magenta Means . . .

Heat events like this are rare and unusually dangerous, potentially deadly.

Advice . . .

- Prepare Now!
- Stay in air-conditioned areas
- Check on elderly often
- Protect livestock and pets
- Sensitive groups particularly vulnerable



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A model for enhanced web based and social media resources

Dangerous Heat Through Early Next Week!

What To Do

- Drink before you're thirsty
- If possible, cancel strenuous outdoor activity between 10 AM and 4 PM
- Seek air-conditioned buildings
- Help elderly, kids, & pets stay cool
- Take frequent breaks in the shade if outdoors in the sun

Experimental NWS Potential Heat Risks for Monday
Valid: 06/20/2016 08:00 AM - 06/20/2016 09:00 PM PDT

Red Means...

Heat of this magnitude happens a few times each year. Impacts are likely, even for the general population, if precautions are not taken.

Orange Means...

Heat like this happens many times a year. It will be relatively easy to take simple precautions to keep safe.

National Weather Service
Los Angeles/Oxnard California
06/18/2016 05:03 AM PDT

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Meteorological observations relevant to this study

- Surface observation data
  - Routinely calibrated Automated Surface Observation Systems
  - Routinely calibrated Automated Weather Observation Systems (FAA supported)
  - NY State Mesonet – long term funding
- Satellite data – Continued funding for all GOES series satellites and POES

Meteorological observations relevant to my discipline – operational forecasting

- Surface observation data
  - Routinely calibrated Automated Surface Observation Systems
  - Routinely calibrated Automated Weather Observation Systems (FAA supported)
  - NY State Mesonet – need long term funding for completion of network and long-term maintenance
  - Buoys and marine observations – expand network and fund long-term maintenance
- Radar data – Standard Doppler radar, Dual Polarization radar, in the future Phased Array radar data
- Satellite data – Continued funding for all GOES series satellites and POES
- Upper air RAOB data
- Co-operative observer data
- River gage data
- Atmospheric profiler data

Acknowledgments

- NWS Albany, NY colleagues Steve DiRienzo and Kevin Lipton
- NY State DOH – Dr. Seema Nayak and colleagues
- University at Albany School of Public Health – Dr. Shao Lin
- Northeastern Regional Heat Collaborative
  - RI Department of Health
  - VT Department of Health
  - NH Department of Health and Human Services
  - ME Department of Health and Human Services
  - Brown University
  - Centers for Disease Control
- NWS Eastern Region Headquarters Meteorological Services Division

- For more details about the NY State health studies in this presentation, please see:
  - Lin, Shao et al. 2009: Extreme High Temperatures and Hospital Admissions for Respiratory and Cardiovascular Diseases. *Epidemiology*, 20, 5, 738-746.
  - Van Zutphan, Allison R. et al., 2012: A Population-Based Case–Control Study of Extreme Summer Temperature and Birth Defects - *Environmental Health Perspectives*, 120, 10, 1443-1449.
  - Fletcher, Barbara A. et al., 2012: Association of Summer Temperatures With Hospital Admissions for Renal Diseases in New York State: A Case-Crossover Study - *American Journal of Epidemiology*, 175, 9, 907-916.

Questions?