Assessing the relationship of ambient temperature and heat related illness in Florida: implications for setting heat advisories and warnings

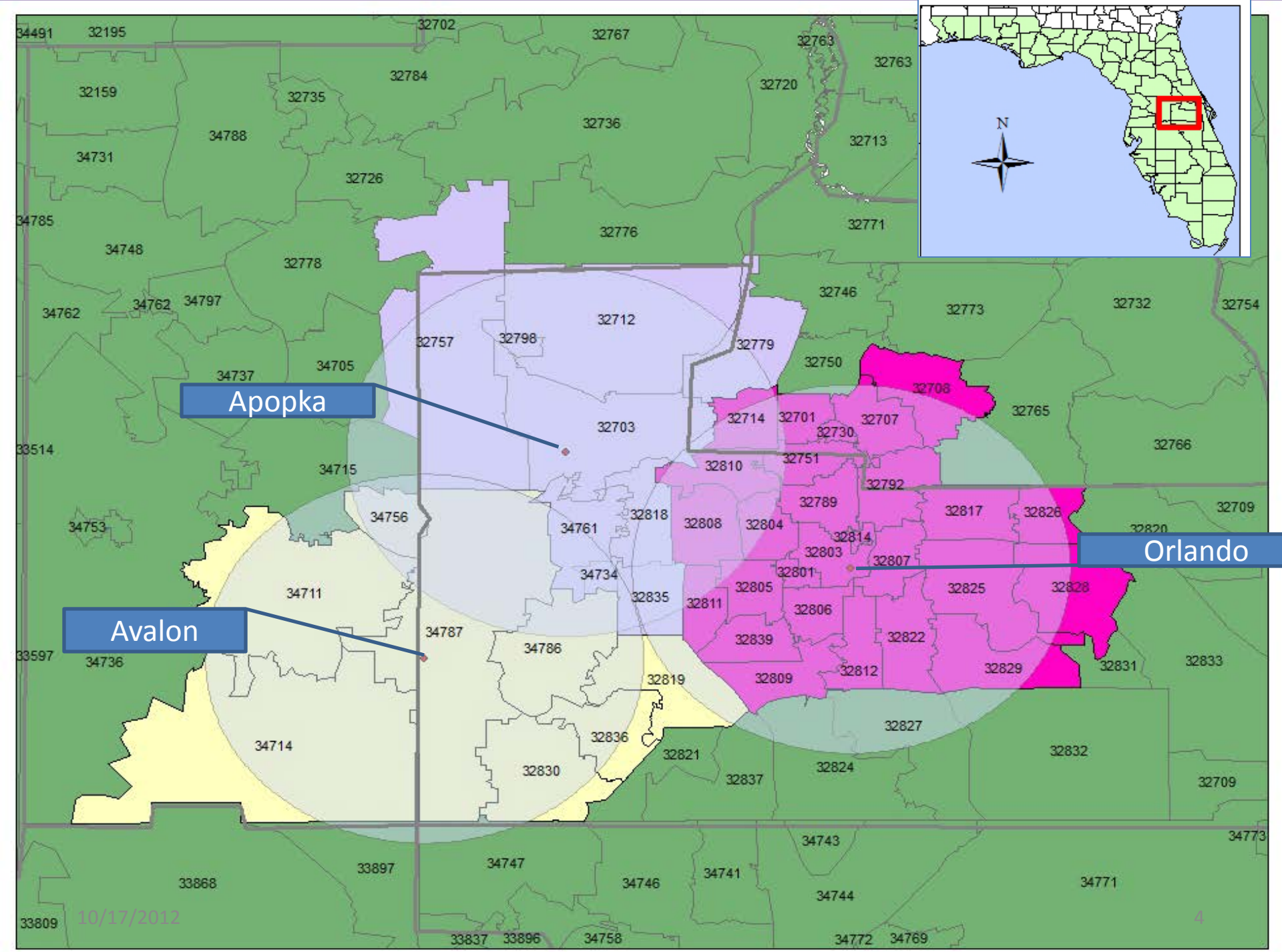
Pilot study of Orlando and the surrounding area

Purpose

- Examine the relationship, in Florida, between ambient outdoor temperature and heat-related illness
  - Non-occupational
  - Occupational
- To assess the criteria for heat advisories and warnings
  - Make recommendations based on heat-health relationship
- Assess datasets and methodology before analyzing the whole state

Methods Summary

- Daily Hospital discharge data/ED data (Florida residents only)
- Three temperature zones defined by zip codes surrounding one of three weather stations
- Analysis stratified by occupational/non-occupational and temperature/heat index
- Regression analysis (effect = incidence rates)
  - Controlled for temporal trends
  - Examined lagged effects


Apopka
Orlando
Avalon
N
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RESULTS

Results Summary: Descriptive

- Orlando = highest number of heat-related cases
- Apopka = highest rate of heat-related cases
- Majority of heat-related cases seen in July and August
- Average summer temperature = 89°F; Heat index = 95°F
  - Greater variability for the maximum heat index than for the maximum temperature.
- The majority of heat advisories/warnings were seen in Apopka and Avalon

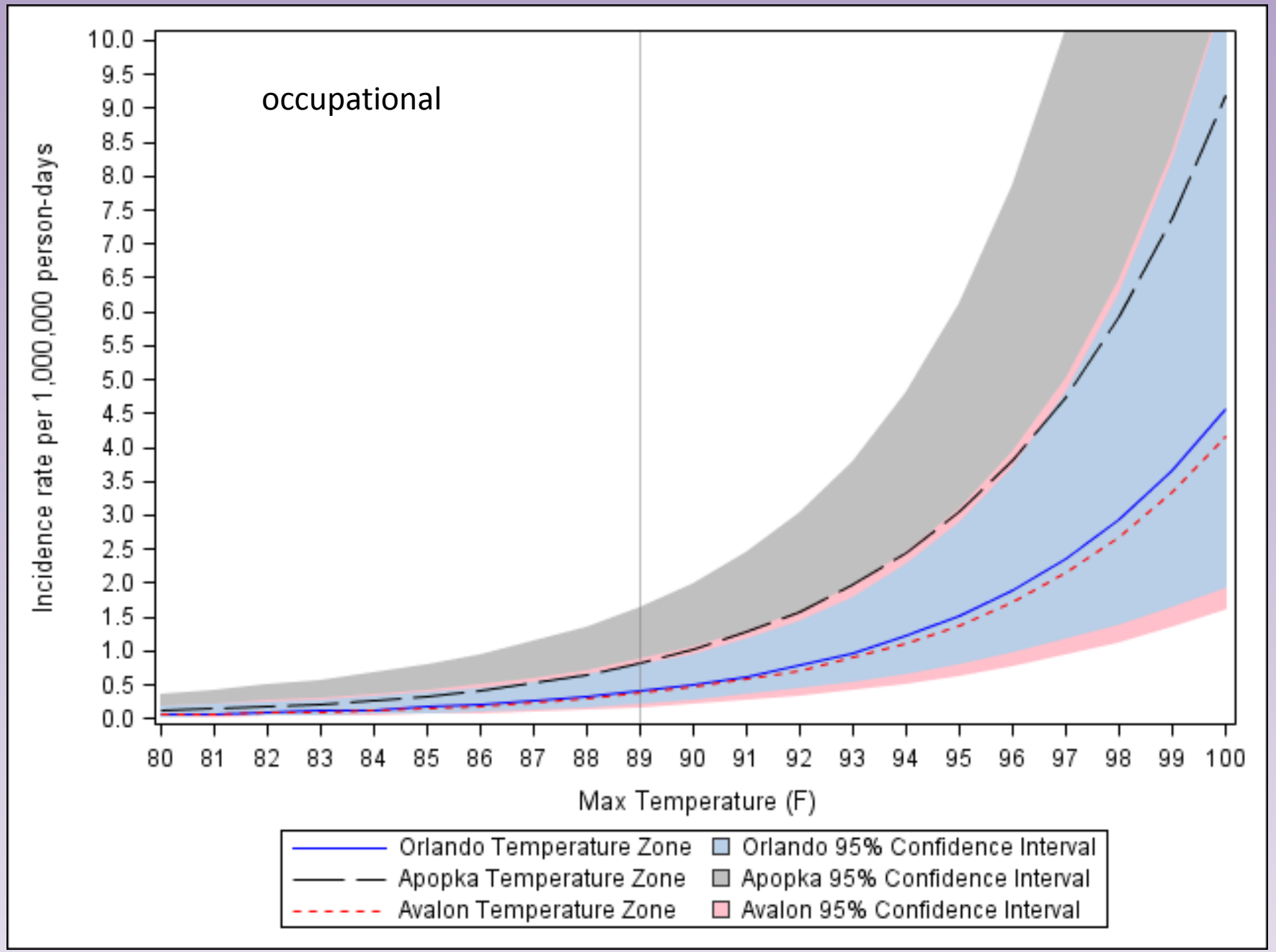
For every 5°F increase in temperature (total study area)

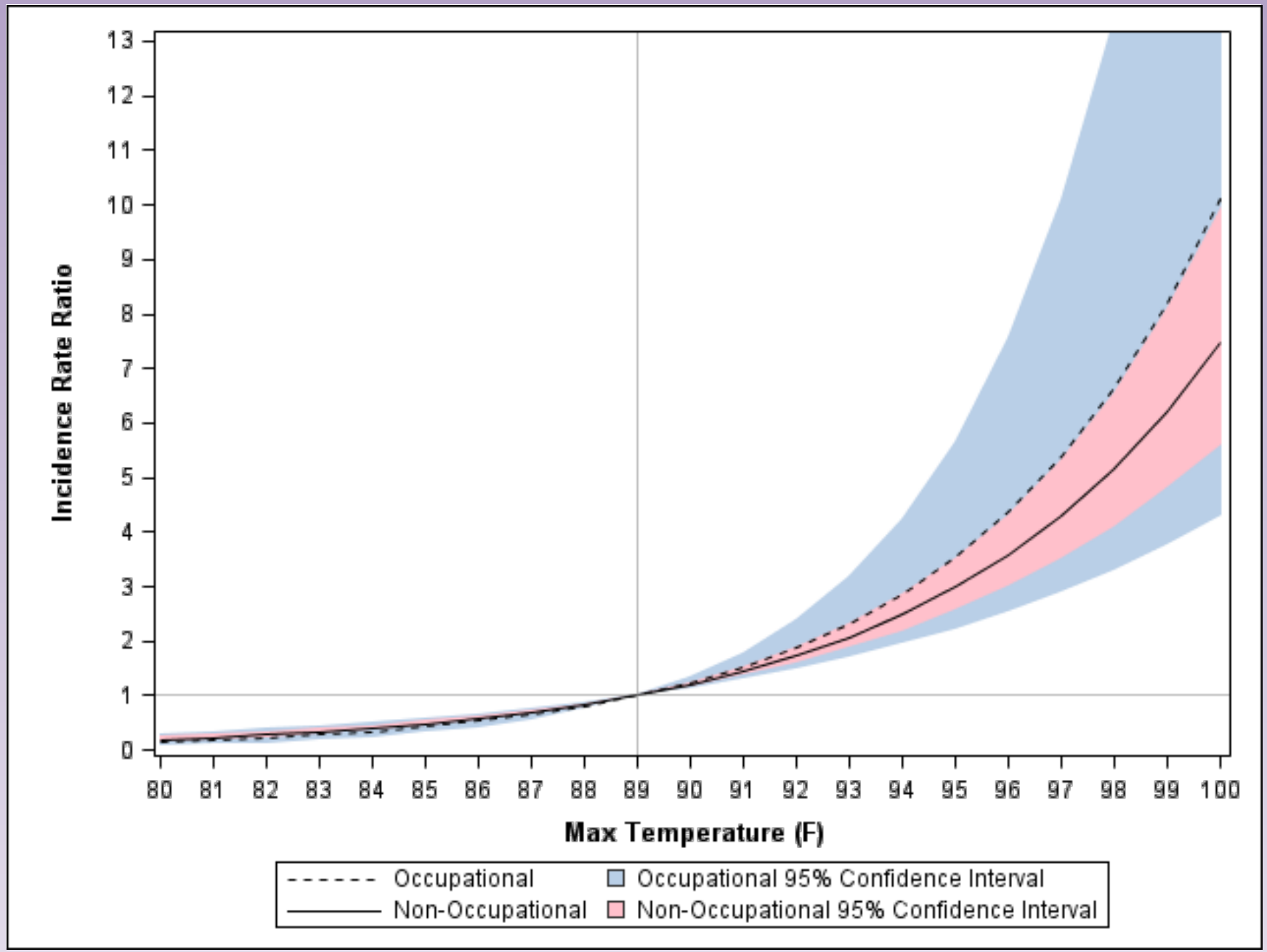
- Occupational
  - Lag 0: IRR = 1.74 (95% CI = 1.15-2.64)
  - Lag 1: IRR = 1.65 (95% CI = 1.08-2.50)

- Non-Occupational
  - Lag 0: IRR = 1.93 (95% CI = 1.67, 2.23)
  - Lag 1: IRR = 1.29 (95% CI = 1.13, 1.49)

For every 5°F increase in temperature (by temperature zone)

Group	Temperature Zone	Temperature: IRR (95% CI) Lag 0	Lag 1
Occupational	Orlando	1.78 (1.17, 2.70)	1.69 (1.11, 2.58)
	Apopka	3.58 (1.96, 6.54)	3.40 (1.86, 6.25)
	Avalon	1.62 (0.78, 3.37)	1.54 (0.74, 3.22)
Non-Occupational	Orlando	1.96 (1.70, 2.27)	1.31 (1.14, 1.51)
	Apopka	2.81 (2.26, 3.48)	1.88 (1.52, 2.32)
	Avalon	1.69 (1.31, 2.16)	1.13 (0.88, 1.45)


occupational
Incidence rate per 1,000,000 person-days
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100
Max Temperature (F)
Orlando Temperature Zone
Apopka Temperature Zone
Avalon Temperature Zone
Orlando 95% Confidence Interval
Apopka 95% Confidence Interval
Avalon 95% Confidence Interval


Incidence Rate Ratio
0
1
2
3
4
5
6
7
8
9
10
11
12
13
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
Max Temperature (F)
Occupational
Non-Occupational
Occupational 95% Confidence Interval
Non-Occupational 95% Confidence Interval

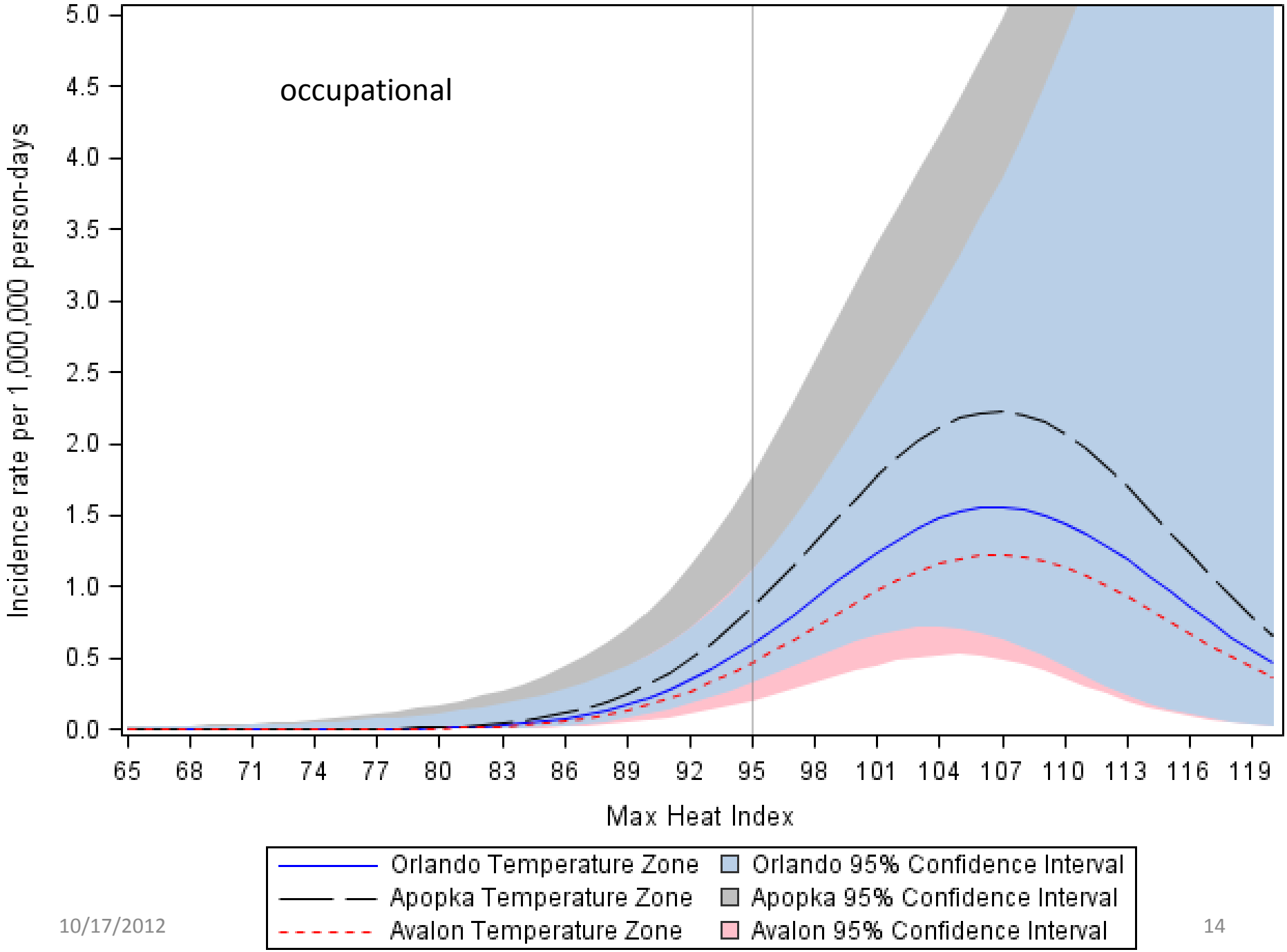
For every 5˚F increase in Heat Index

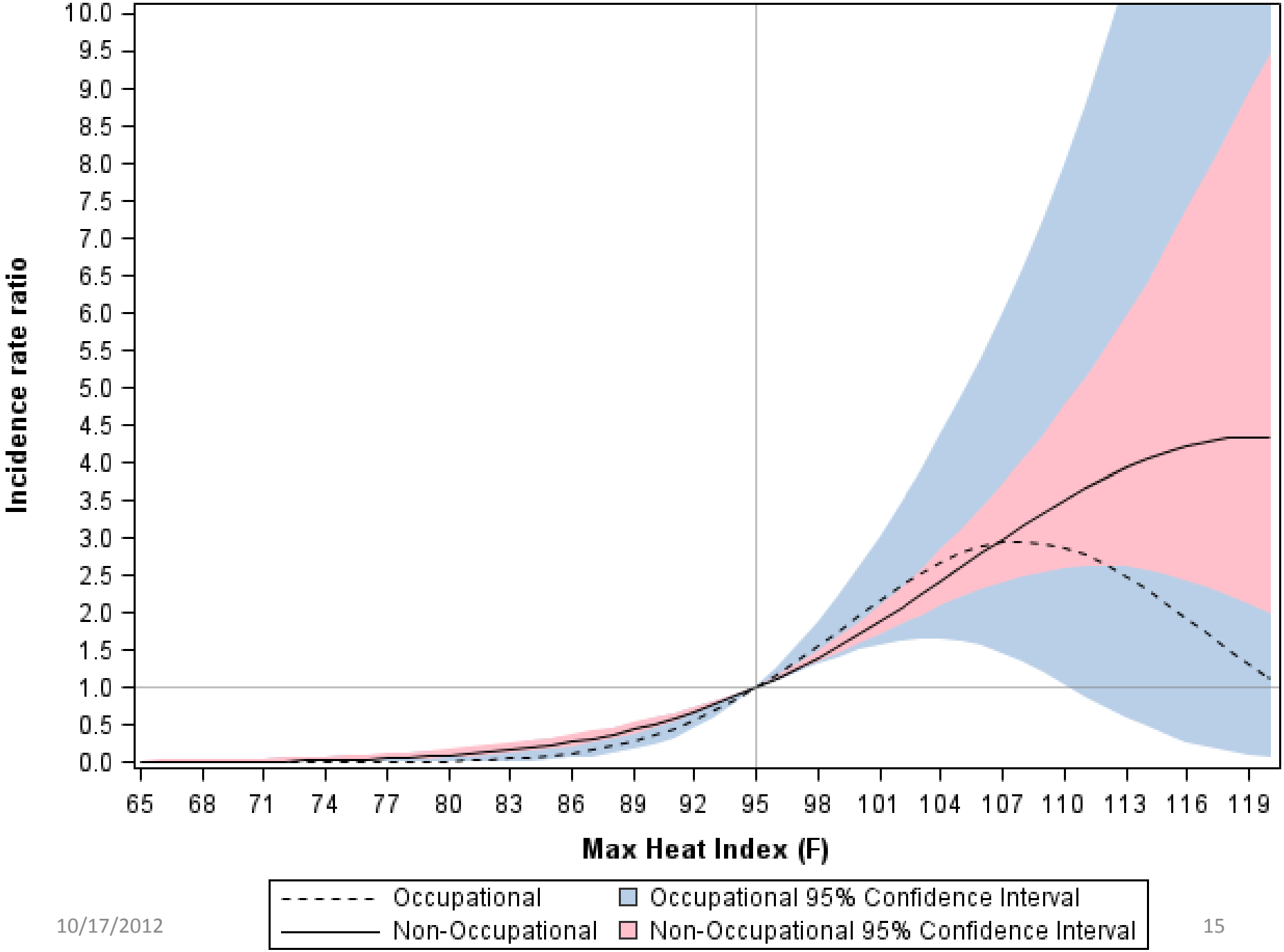
- Occupational
  - Lag 0: IRR = 1.51 (95% CI = 1.11, 2.07)
  - Lag 1: IRR = 1.30 (95% CI = 0.99, 1.72)

- Non-Occupational
  - Lag 0: IRR = 1.48 (95% CI = 1.34, 1.64).
  - Lag 1: IRR = 1.16 (95% CI = 1.06, 1.27).

For every 5°F increase in Heat Index (by temperature zone)

Group	Temperature Zone	Heat Index: IRR (95% CI)	
		Lag 0	Lag 1
Occupational	Orlando	1.48 (1.08, 2.03)	1.28 (0.97, 1.70)
	Apopka	2.11 (1.26, 3.54)	1.83 (1.11, 3.02)
	Avalon	1.16 (0.58, 2.32)	1.01 (0.51, 1.97)
Non-Occupational	Orlando	1.53 (1.38, 1.69)	1.19 (1.08, 1.31)
	Apopka	1.45 (1.21, 1.75)	1.13 (0.94, 1.36)
	Avalon	1.01 (0.80, 1.28)	0.79 (0.62, 0.99)


occupational
Incidence rate per 1,000,000 person-days
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
65
68
71
74
77
80
83
86
89
92
95
98
101
104
107
110
113
116
119
Max Heat Index
Orlando Temperature Zone
Apopka Temperature Zone
Avalon Temperature Zone
Orlando 95% Confidence Interval
Apopka 95% Confidence Interval
Avalon 95% Confidence Interval


Incidence rate ratio
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
65
68
71
74
77
80
83
86
89
92
95
98
101
104
107
110
113
116
119
Max Heat Index (F)
Occupational
Non-Occupational
Occupational 95% Confidence Interval
Non-Occupational 95% Confidence Interval

CONCLUSIONS

Conclusions

- Heat index was higher in the suburban and rural areas of Avalon and Apopka
- Heat index models fit data better than temperature models
- Delayed effect of exposure
- Apopka had highest rate heat-related illness as temperature increased

Conclusions continued

- There seems to be a rural/urban difference
- Occupational heat-related cases have a different relationship with heat-index than non-occupational heat-related cases
- Recommend advisory set at 96°F for 48hrs instead of 98°F for 48hrs
  - Limited analysis – a larger sample is required

Limitations

- Small sample size
- Incidence rates of occupational heat-related illness underestimate
- Exposure misclassification
- Only used codes for heat-related illness

Next Steps

- Conduct the analysis for the seven Florida weather forecasting areas
- Heat advisory/warning criteria have changed – assess new criteria in a larger area
- Include mortality in the future analysis
- Further explore the occupational/non-occupational and the urban/rural heat-health differences
- Explore the relationship between heat and health by using other codes for heat-related illness (e.g. heart disease, kidney, respiratory)

Partners

- Environmental Public Health Tracking (EPHT), Florida Department of Health
- Agency for Health Care Administration
- National Weather Service, National Oceanic and Atmospheric Administration (NOAA)
  - Kelly Godsey (contact)
- Florida Climate Center, Center for Ocean-Atmospheric Prediction Studies
  - Melissa Griffin (contact)

Occupational Safety and Health Program

Laurel Harduar Morano, MPH

Analytical Epidemiologist (data consultant)

Onarom.lh@gmail.com

Sharon Watkins, PhD

Environmental Epidemiology Surveillance and Response Administrator

Juanita Chalmers, MPH

Occupational Epidemiologist

Occupational Safety and Health Program

Bureau of Epidemiology

Division of Disease Control and Health Protection

Florida Department of Health