

Public Health Surveillance of Air Pollution Related Morbidity and Mortality

A State Health Department's Perspective

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Definition of Public Health Surveillance:

World Health Organization, 1968

- 1) the ongoing systematic collection of relevant data
- 2) the orderly consolidation and evaluation of these data
- 3) the prompt dissemination of the results to those who need to know

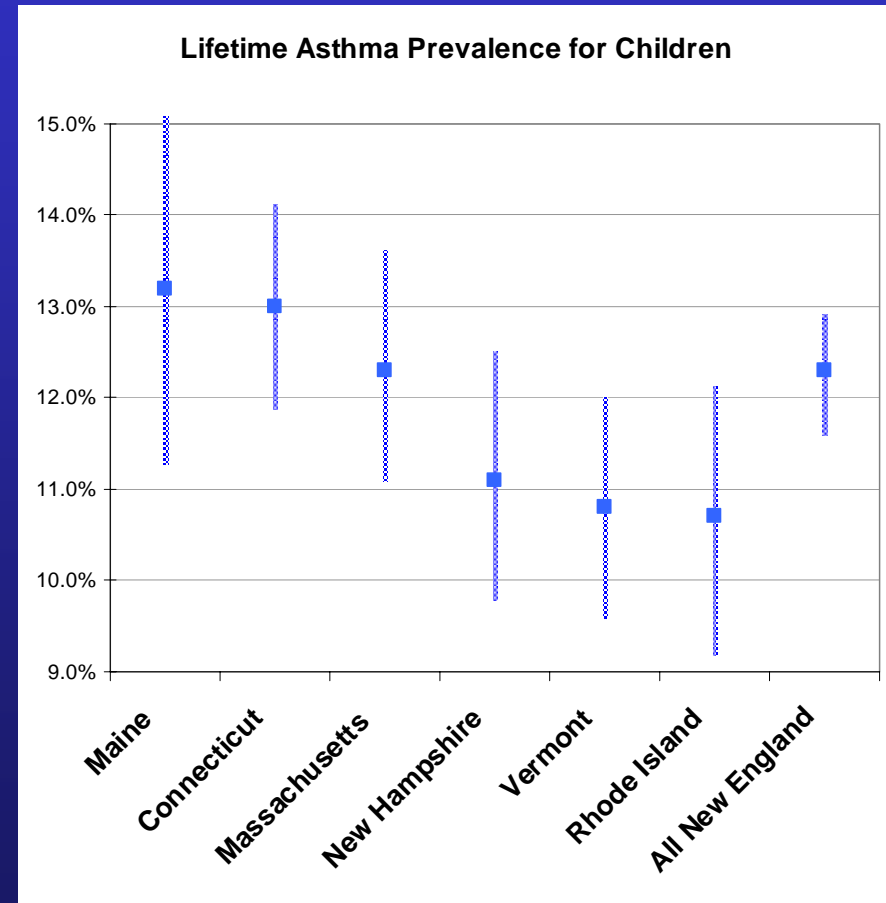
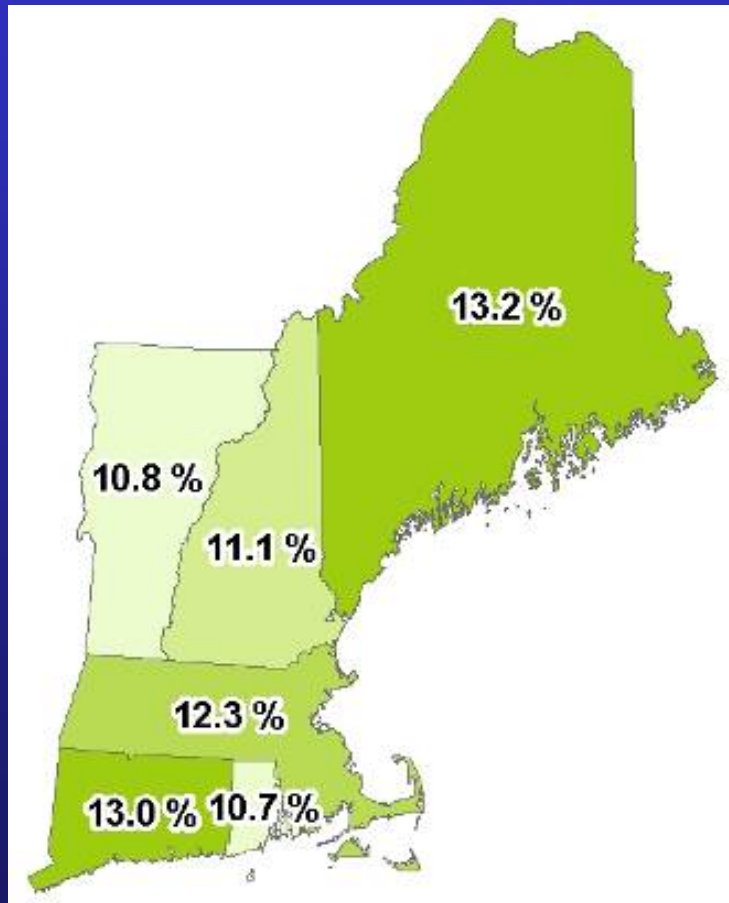
CDC addition, 1986:

- 4) application of these data for prevention and control

Public Health Surveillance is:

Ongoing systematic collection of data...

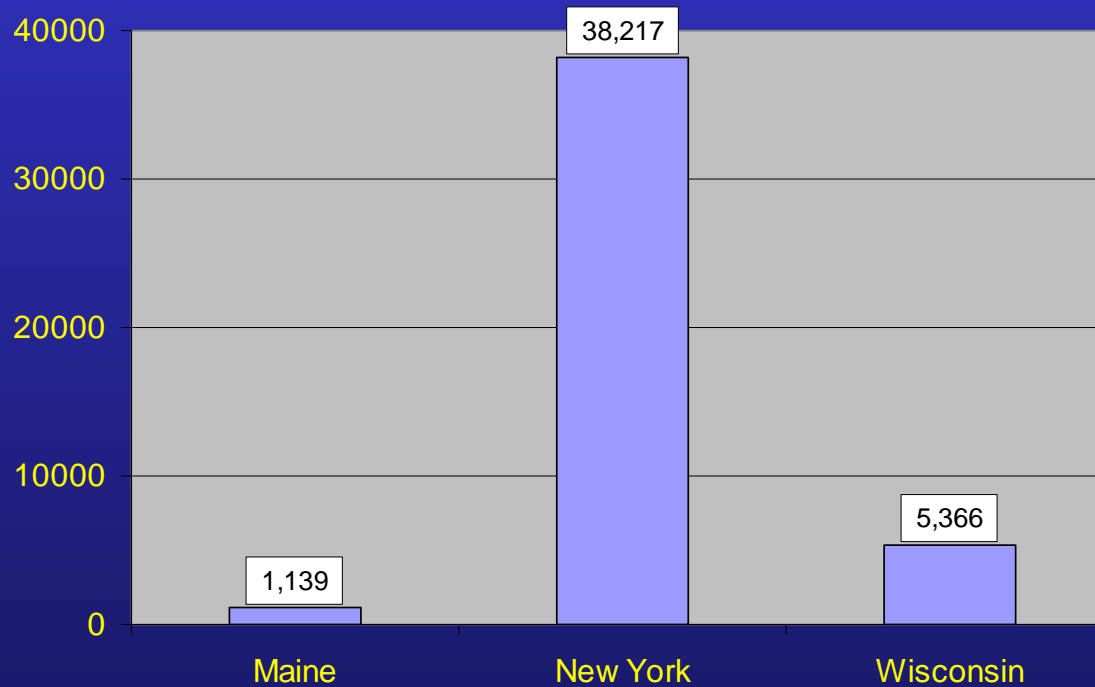
Maine Asthma Prevalence



Source: New England Asthma Regional Council, 2004/ Behavioral Risk Factor Surveillance System, 2001

Data on Asthma Morbidity

Hospitalizations with primary diagnosis of asthma (2001)



Data on Asthma Morbidity

- Emergency department (ED) visits for asthma: Statewide

Female 60%

Year	Female	%	Male	%	Total
2000	4,848	61%	3,136	39%	7,984
2001	5,151	60%	3,455	40%	8,606
2002	4,858	60%	3,220	40%	8,078
2003	5,107	59%	3,481	41%	8,588
	19,964	60%	13,292	40%	33,256

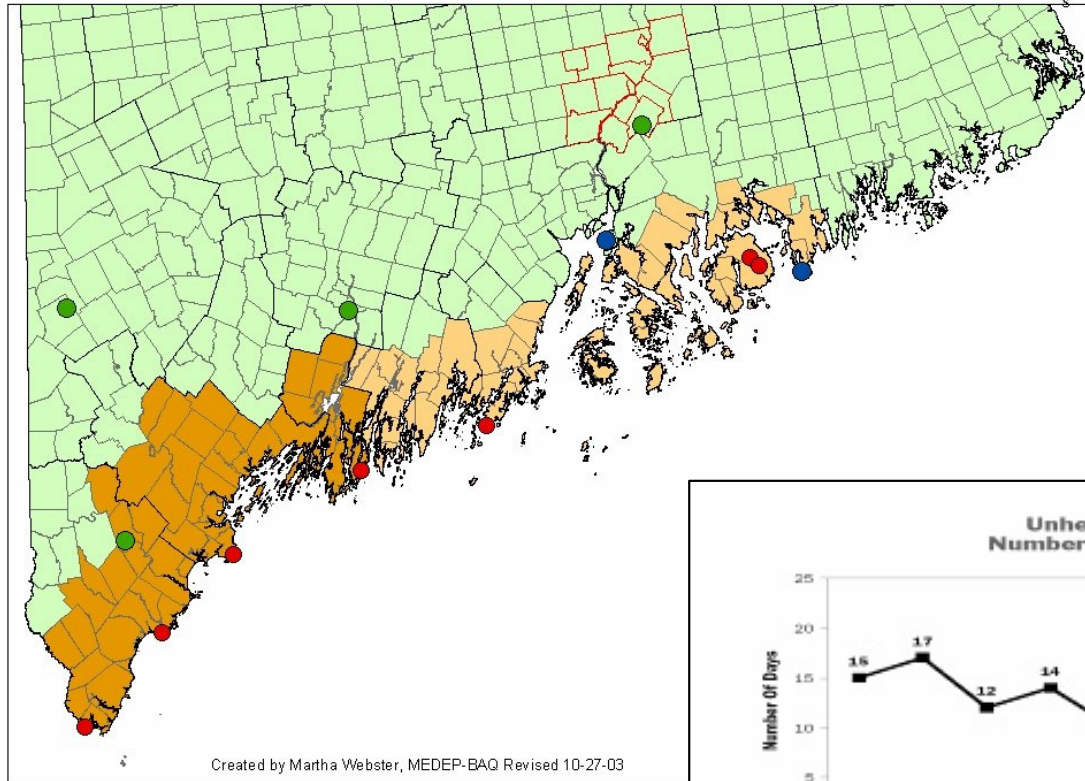
Year	2-17	%	18-34	%	35-64	%	65+	%
2000	1,916	24%	2,627	33%	2,829	35%	612	8%
2001	2,102	24%	2,824	33%	2,993	35%	687	8%
2002	2,052	25%	2,644	33%	2,783	34%	599	7%
2003	2,041	24%	2,918	34%	2,975	35%	655	8%
	8,111	24%	11,013	33%	11,580	35%	2,553	8%

24% under18
 ~34% 18-34; 35-64
 8% - 65+

Ambient Air Ozone in Maine

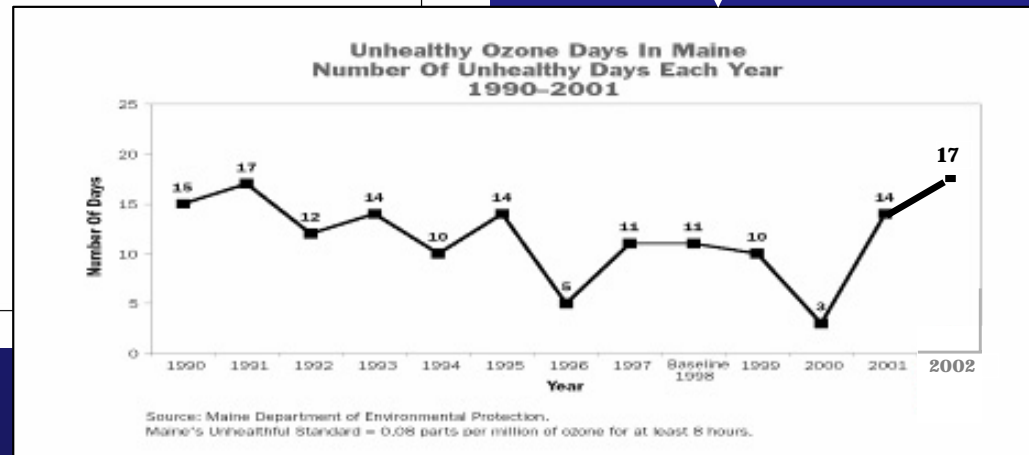


Figure A-23 Recommended 8-hr Ozone Nonattainment Areas



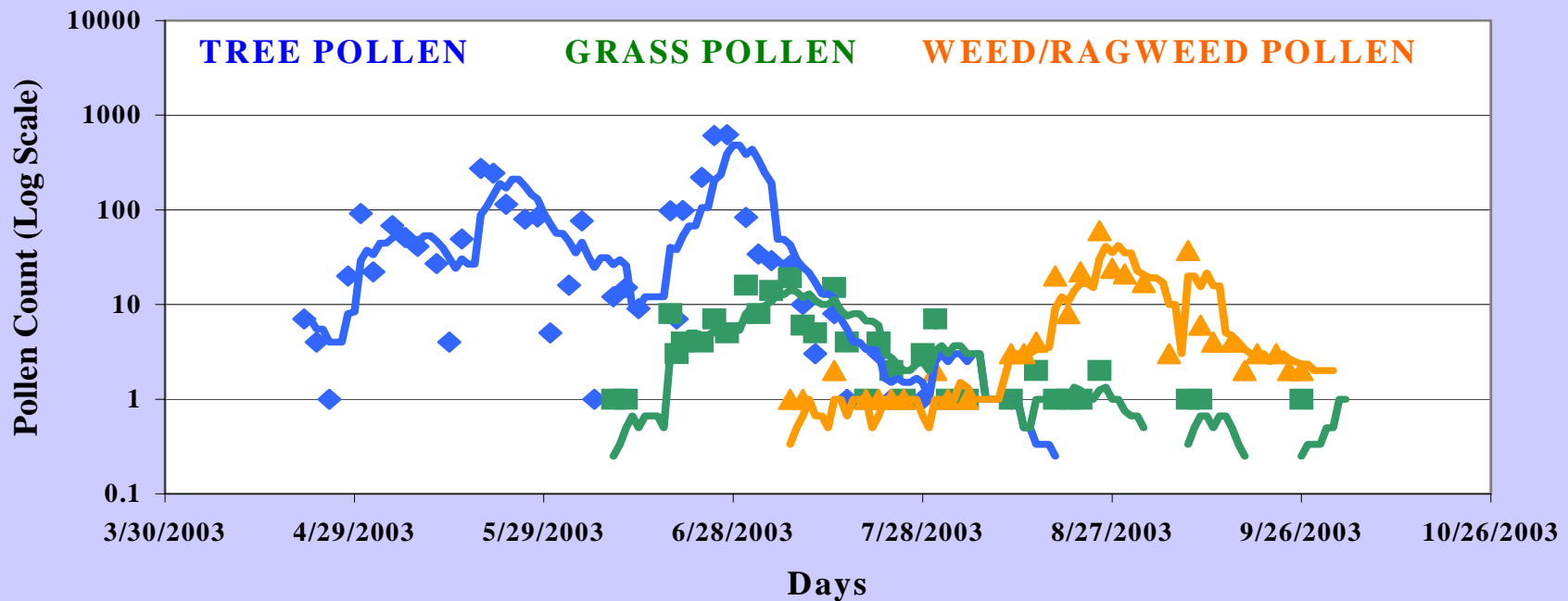
43% of Maine population lives in revised non-attainment areas.

There are ~12 days per year with ozone above unhealthy standard.



Surveillance of Pollen-Related Asthma Morbidity?

2003 Bangor ME Pollen Season

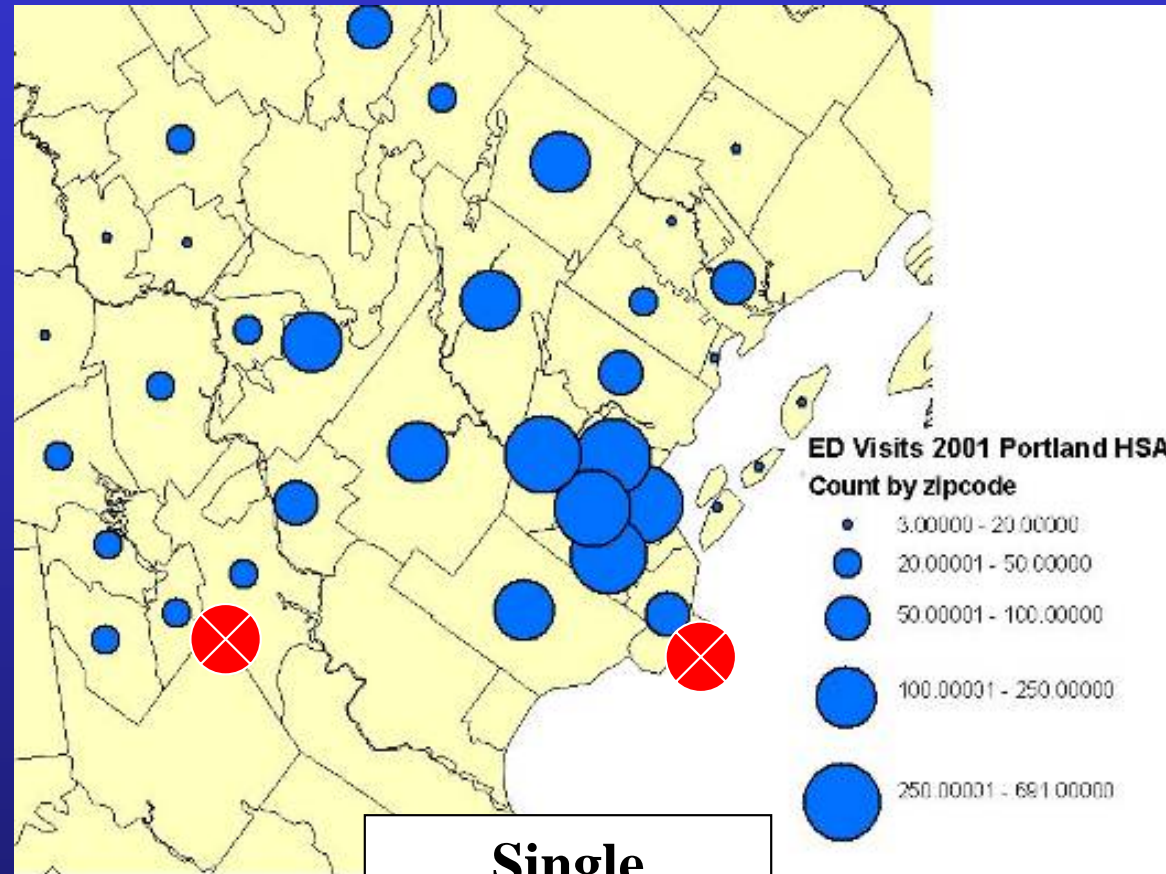
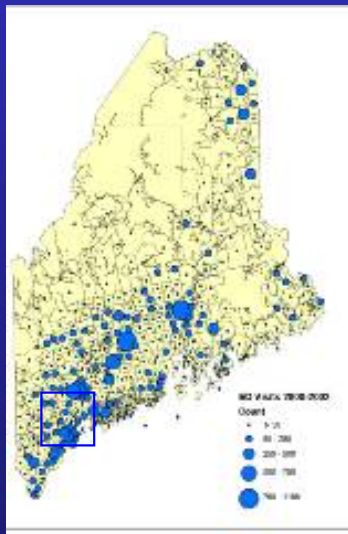



Public Health Surveillance is:

The orderly consolidation and evaluation of these data ...

- can we track asthma morbidity attributable to ozone?

Life Before PHASE

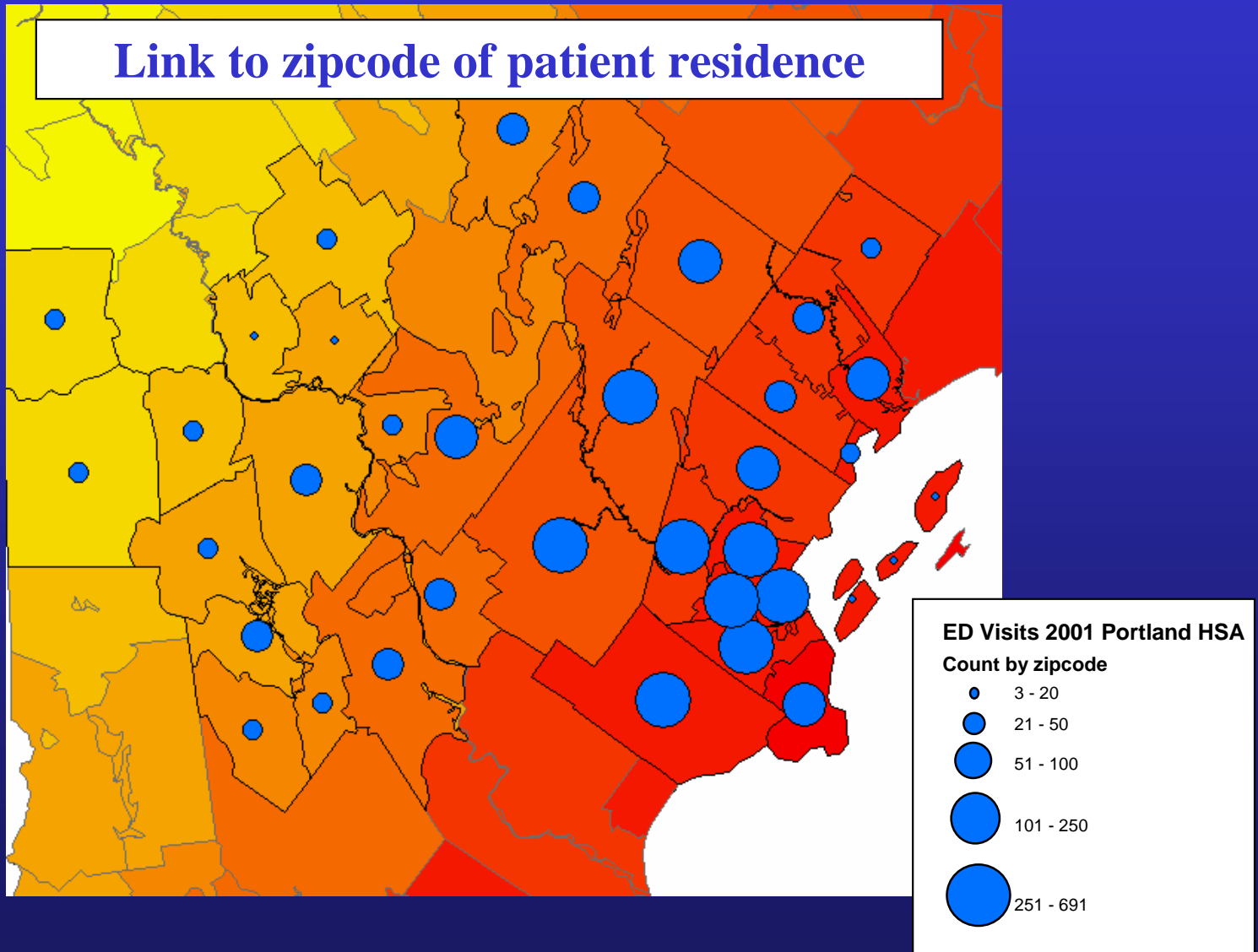
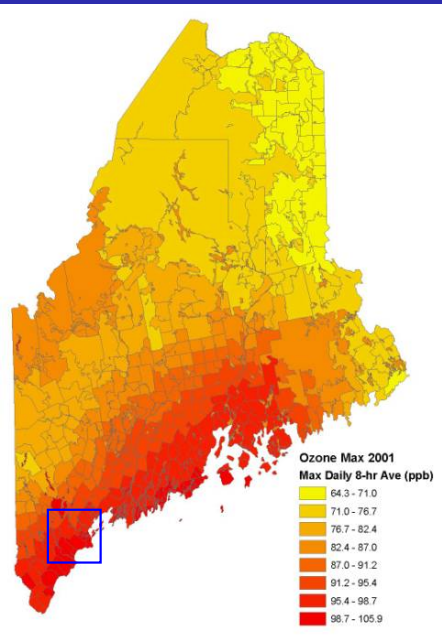


Single
monitoring
site 

... treats population as all having the same ozone exposure

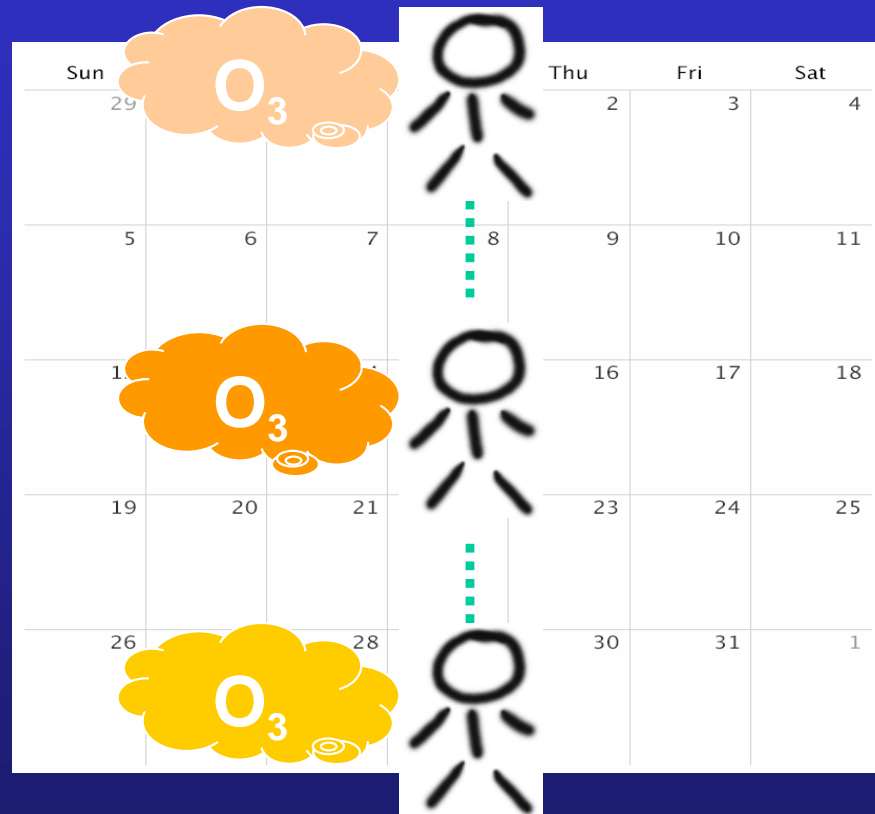
Life After PHASE

Link to zipcode of patient residence



Case-Crossover Methods Used to Evaluate Contribution of Ozone to Asthma Morbidity

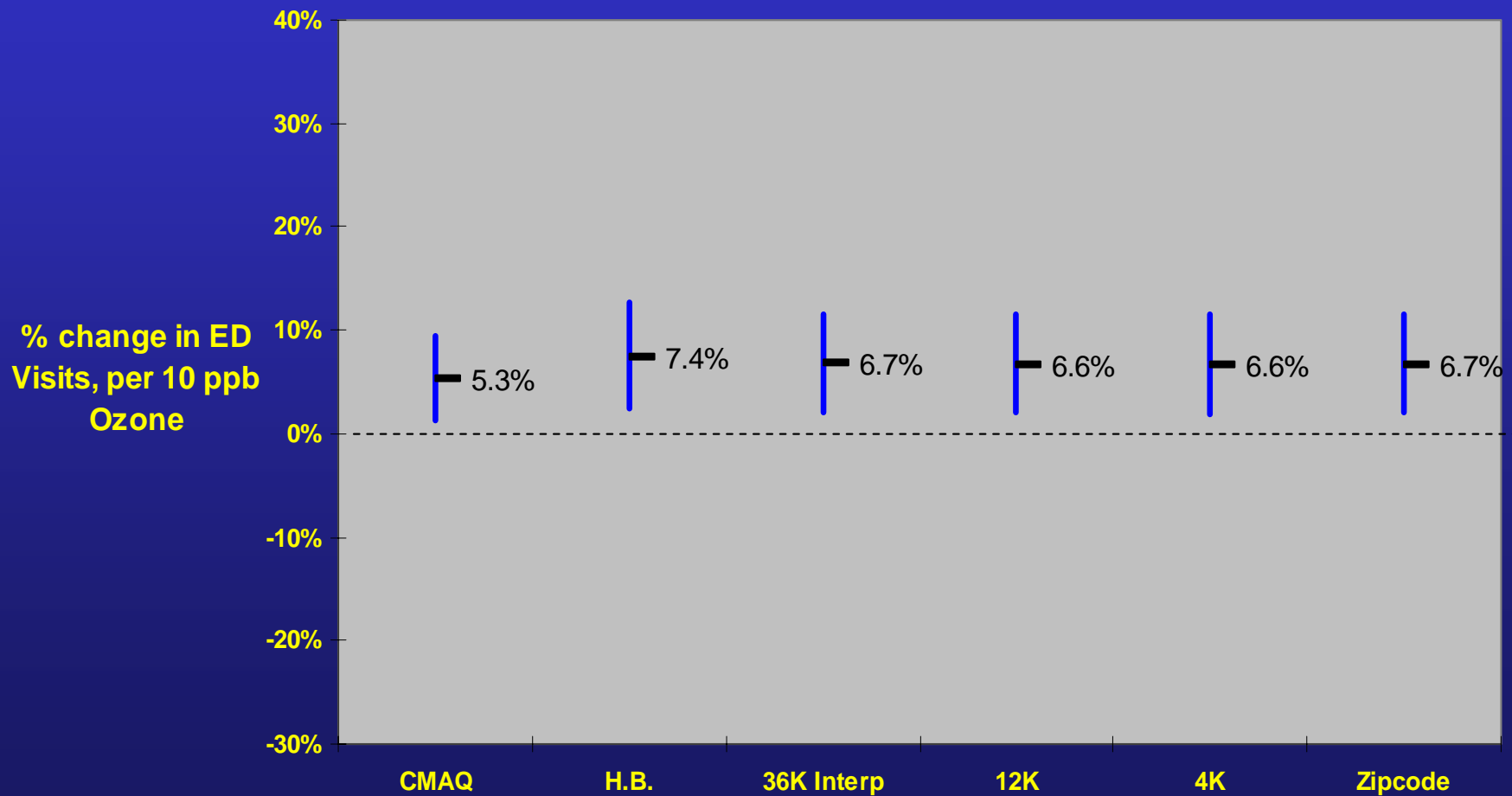
Case-crossover analysis compares exposure before case event to exposure at referent times, in the same individuals.



Why? To use individual-level info.

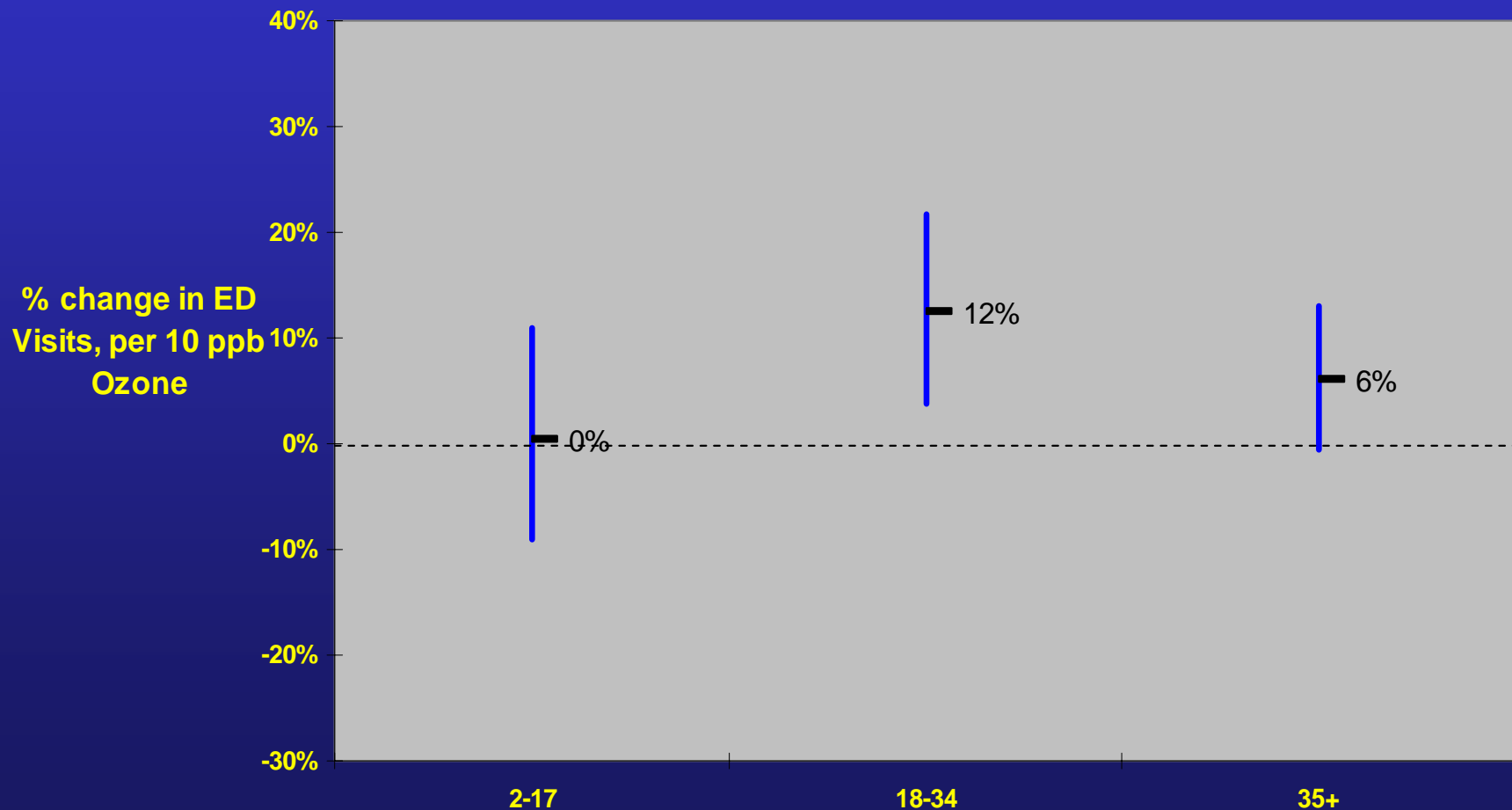
Statewide Estimates

Maine Asthma ED visits 2001: daily percent change associated with ozone lag1, adjusted model



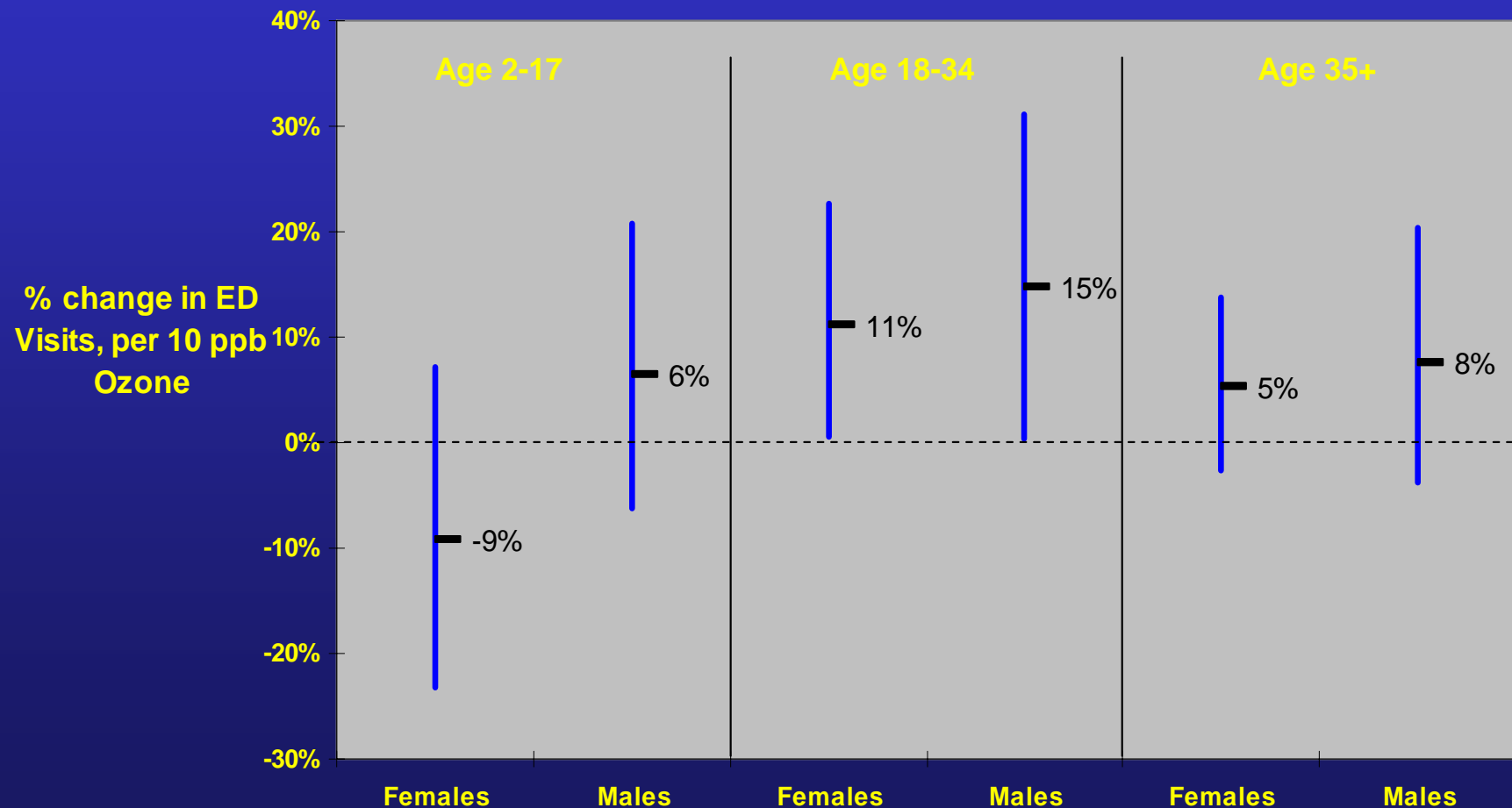
Age-Specific Estimates

Maine Asthma ED visits 2001: daily percent change associated with ozone lag1, by age group, adjusted model



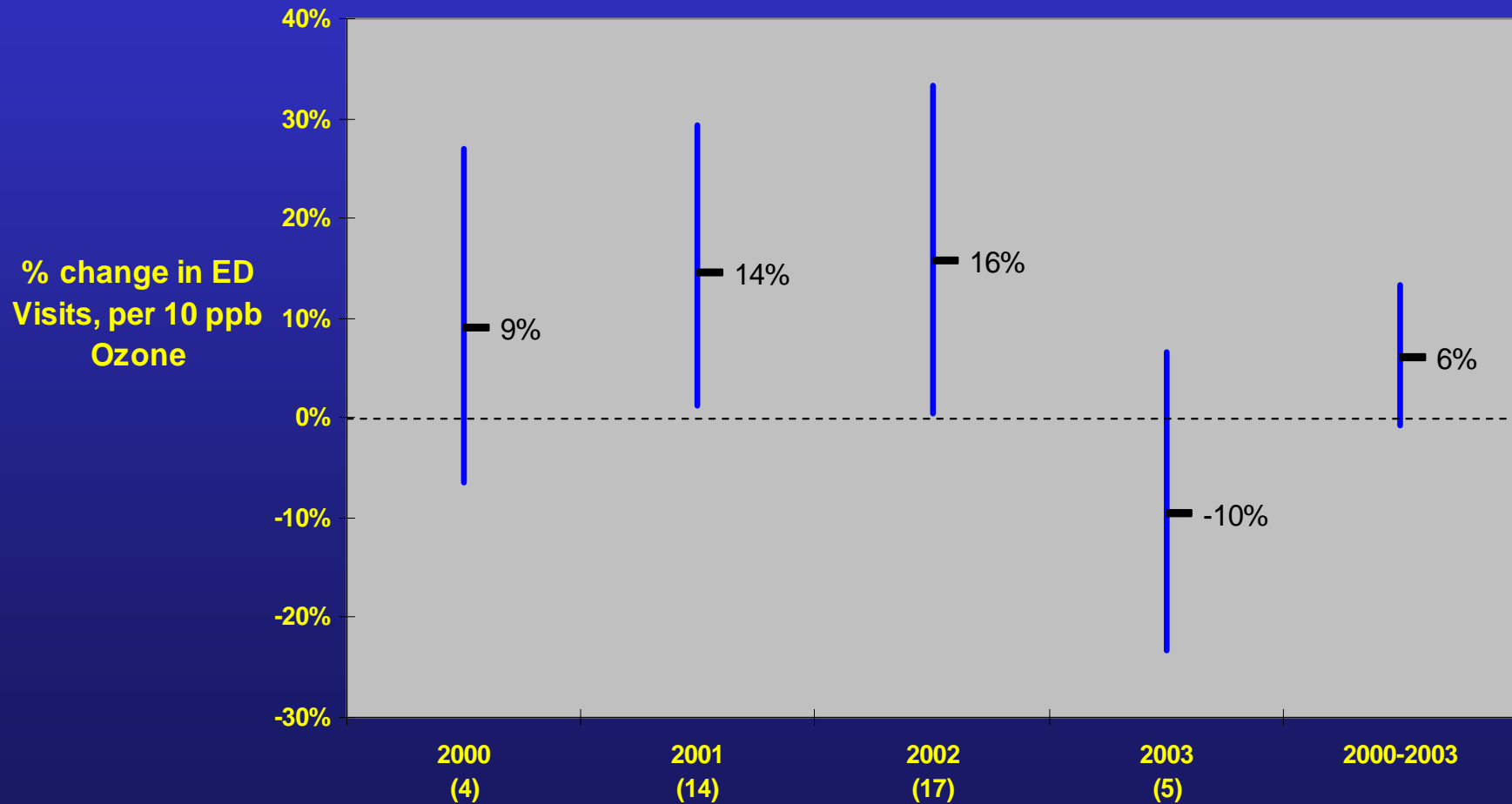
Age/Sex Specific Estimates

Maine Asthma ED visits 2001: daily percent change associated with ozone lag1, by age and sex groups, adjusted model



Estimates by Year

Portland, ME Asthma ED visits 2000-2003: daily percent change associated with ozone lag1, adjusted model



Public Health Surveillance is:

The prompt dissemination of the results to those who need to know ...

- Our Asthma Program
- Our DEP colleagues

OK, buthow many?

- Our Asthma Program wants :
 - How many people had ozone related ED visits for asthma in a given year
 - Who were these people (age, sex, race)
 - Track so they can evaluate education and outreach efforts aimed at improved management of asthma

...and how do we compute how many?

- Attributable Fraction:
 - “the fraction of all cases...that would not have occurred if exposure had not occurred.”
[Rothman & Greenland]
- Simple calculation when dichotomous exposure, no covariates
 - multivariate situation?
 - continuous/polytomous exposure?

Attributable Fraction

- An approach, case by case

$$AF_p = 1 - \frac{1}{\text{no. of cases}} \sum \frac{1}{RR_i},$$

100% - inverted, weighted sum of each case's would-be 'risk' at their own exposure level

* Hanley, 2001

Public Health Surveillance is:

The application of these data for prevention
and control ...

Use in Evaluating Intervention?

- Evaluate Effectiveness of AQI Alerts:
 - do people know about and understand the Alerts?
 - do Alerts prevent ED-visits / hospitalization?



Active children and adults, and people with lung disease, such as asthma, should avoid prolonged or heavy exertion outdoors. Everyone else, especially children, should reduce prolonged or heavy exertion outdoors.

AQI Alerts

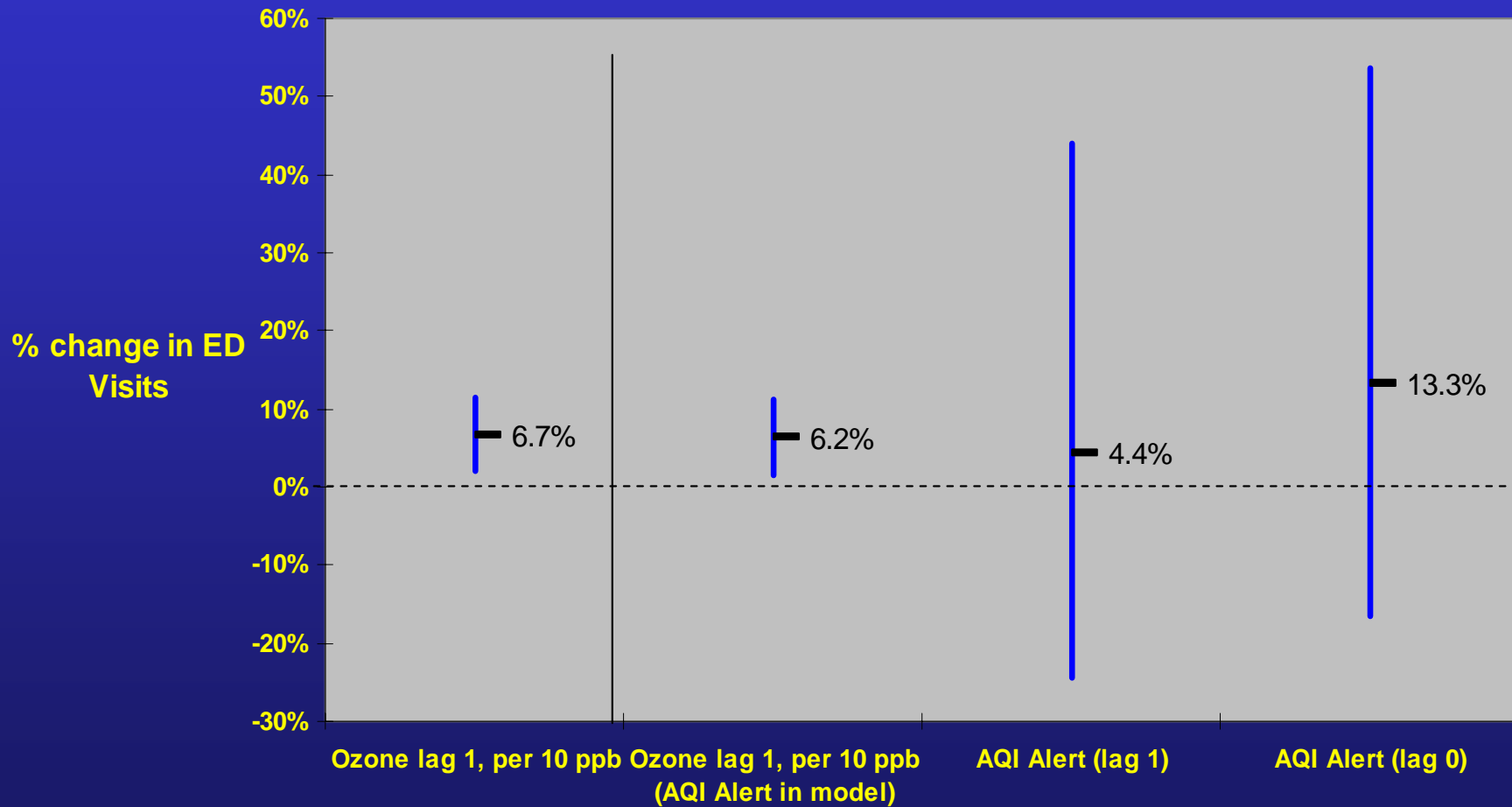
- imperfect forecasting is good for analysis!
(ref: Expert Panel)

	A	B	C	D	E	
1						
2	DATE	COASTAL	INTERIOR	NORTHERN	FORECASTER	COMMI
95	6/16/2001	moderate	moderate	moderate		still war
96	high 8-hr	moderate	moderate	good	mcf, hrb	temps +
97	6/17/2001	good	good	good		cold fro
98	high 8-hr	good	good	good		
99	6/18/2001	good	good	good		cooler,
100	high 8-hr	good	good	good		
101	6/19/2001	moderate	moderate	good		high ce
102	high 8-hr	unh sen	unh sen	moderate	major bust!	sw low
103	6/20/2001	unh sen	mod (hrb-uns)	good		the fron
104	high 8-hr	unh sen	mod (hrb-uns)	good	redemption!	and a v
105	6/21/2001	good	good	good		
106	high 8-hr	good	good	good		
107	6/22/2001	good	good	good		

Prediction

Actual

Maine Asthma ED visits: daily percent change associated with ozone lag1 (zipcode interpolation) and AQI Alerts, 2001, adjusted model

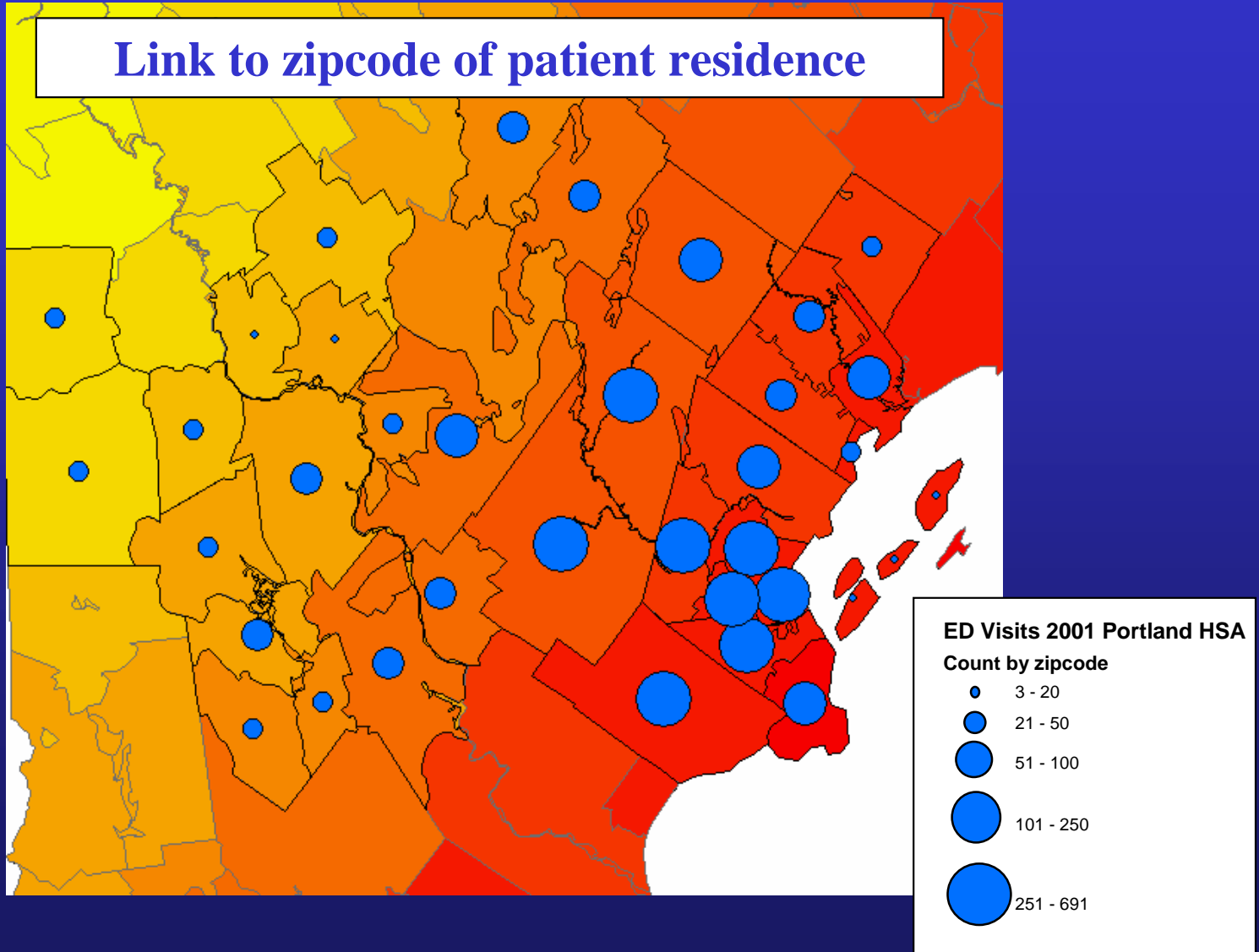
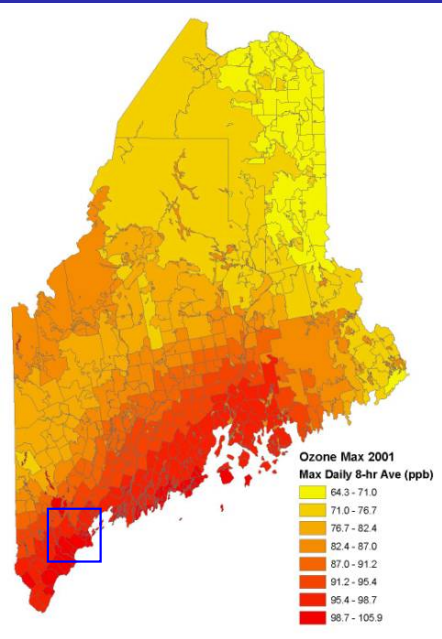


Environmental Public Health Tracking:

Making Data Available...

- If multiple states make standardized linkable hospitalization or ED visits data available, will the research community want it?

EPHT Data



SUMMARY

Issues, challenges, barriers

- Health data – ED data are missing important fields (e.g., address, race)
- Hazard data – placement of monitors not optimized for exposure assessment / Pollen?
- Evaluation – case-crossover analyses are more difficult to implement than we thought
- Dissemination – methods for attributable risk estimates
- Application – much more thought is needed on how these data can be used for PH action