Modeling Committee Update

OTC Stakeholder Meeting

April 12, 2016

Washington, DC

Overview

1. Ozone NAAQS
2. Emission Inventory
   a) Beta Inventory
   b) Small EGU Temporalization
3. Modeling Update
   a) Emission Inventory
   b) High Electricity Demand Day (HEDD)
   c) Episodic Modeling
4. Background Ozone
5. Health Benefits

New Ozone NAAQS!

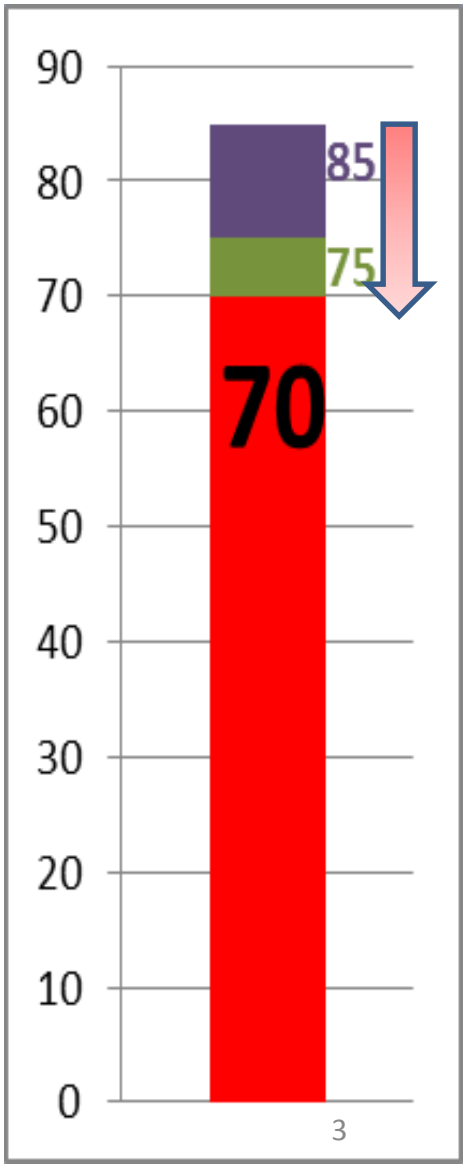
October 1, 2015

70 ppb!

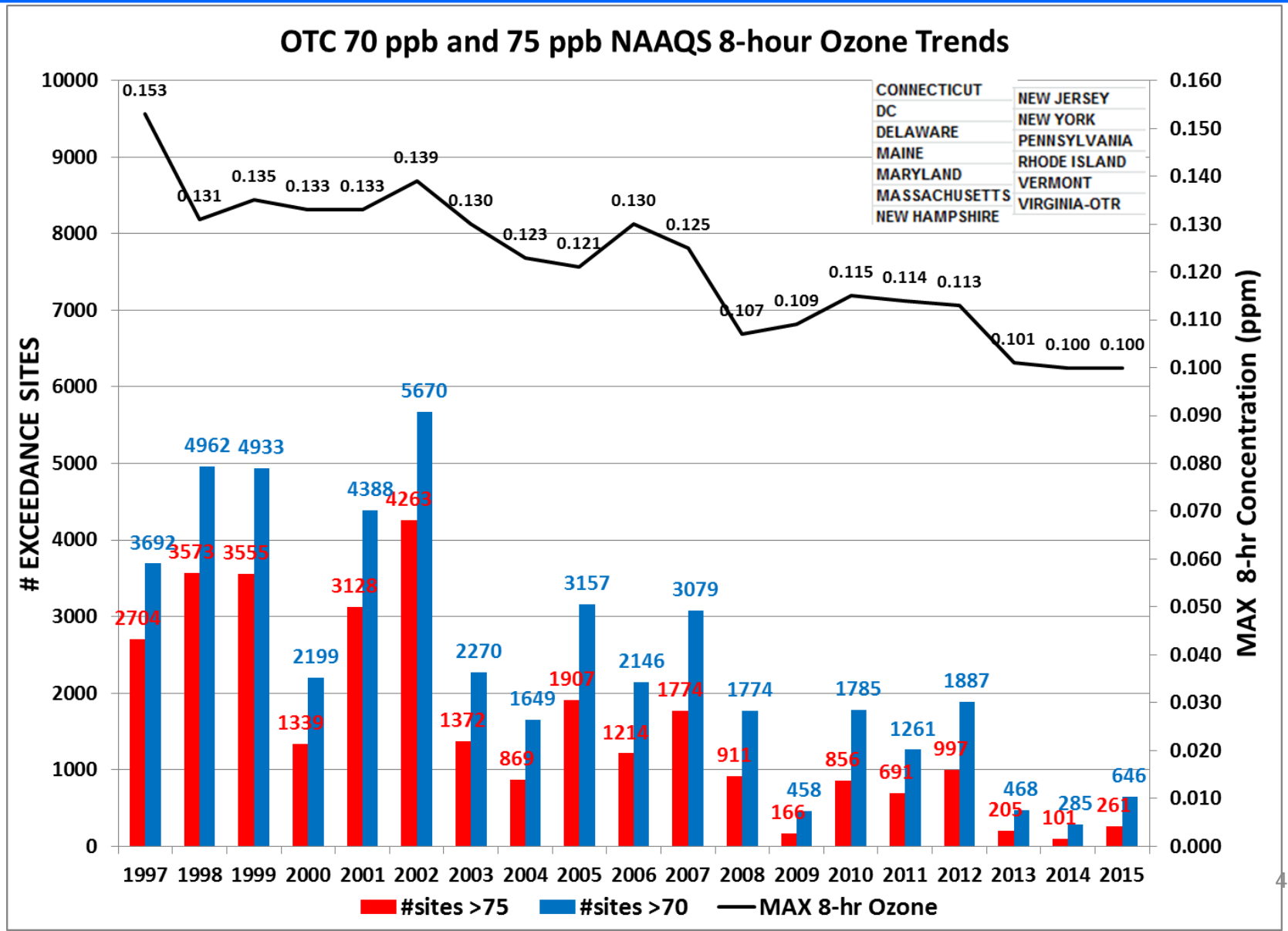
- 8-hour averaging period
- 3-year average of the 4th 8-hour maximum by monitor

- Secondary standard = Primary standard

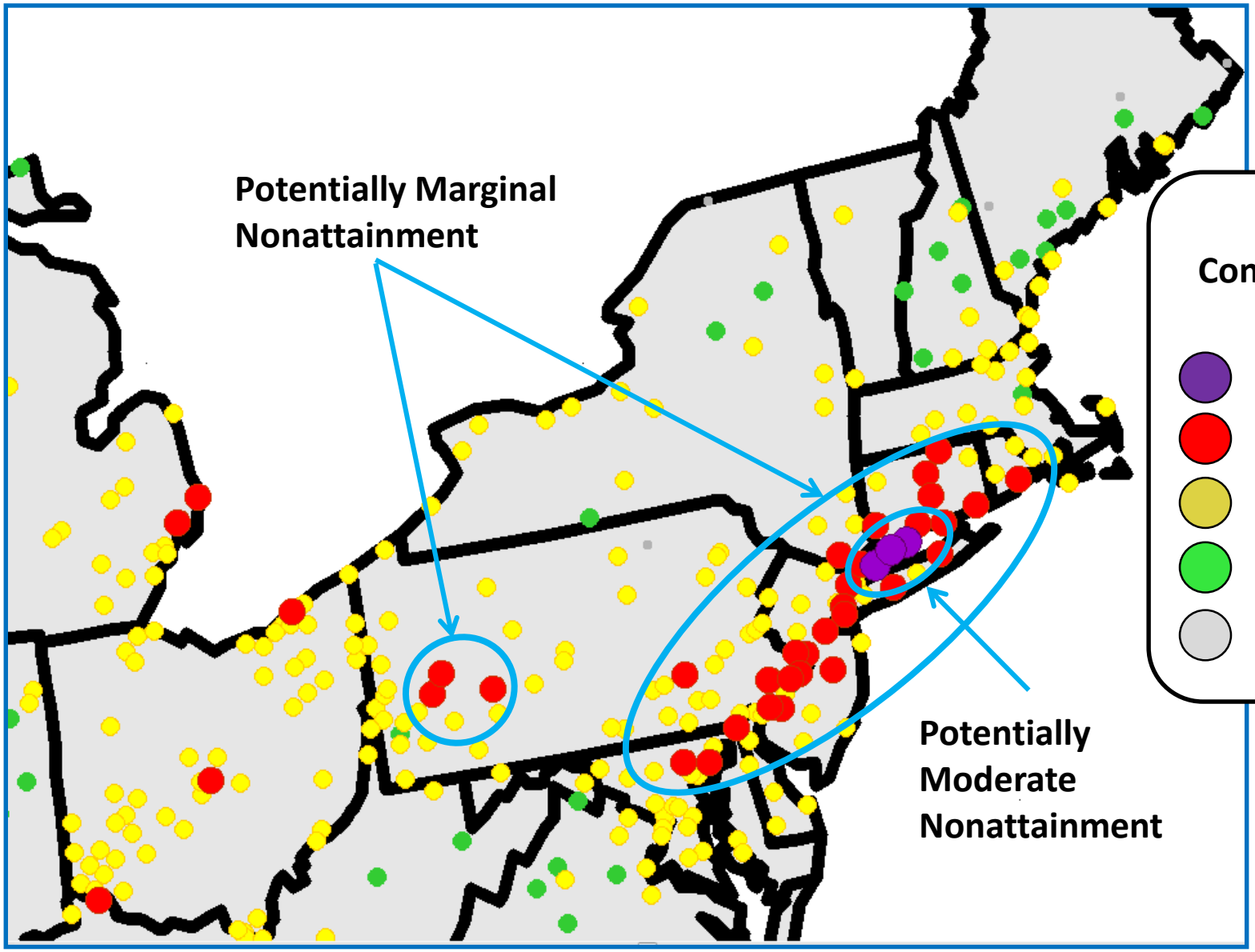
- Estimated annual benefits and costs
  - $2.9 to $5.9 billion in health benefits
  - $1.4 billion in control costs



Trends in the OTR



Preliminary 2013-15 Design Values (DV)



2016 Thresholds by State

State	Preliminary 2013-15 DV ppb	2016 4th Max to Exceed 75 ppb	2016 4th Max to Exceed 70 ppb
Connecticut	84	60	45
Delaware	68	90	75
District of Columbia	68	88	73
Maine	67	94	79
Maryland	73	80	65
Massachusetts	69	89	74
New Hampshire	67	92	77
New Jersey	74	79	64
New York	74	77	62
Pennsylvania	75	75	60
Rhode Island	73	88	73
Vermont	62	103	88
Virginia	70	84	69

2016 Thresholds by Monitor

State	Monitor	Preliminary 2013-15 DV ppb	2016 4th Max to Exceed 75 ppb	2016 4th Max to Exceed 70 ppb
MD	Fair Hill	73	80	65
MD	Padonia	71	83	68
MD	Aldino	70	85	70
NJ	Leonia	74	79	64
NJ	Bayonne	71	79	64
NJ	Rutgers U	72	80	65
NJ	Camden-Spruce St	70	81	66
NJ	Colliers Mills	72	81	66
NJ	Clarksboro	73	82	67
NJ	Wash Crossing	71	82	67
NJ	Rider U	71	84	69
NY	NYC-Susan Wagner	74	77	62
NY	White Plains	73	81	66
NY	Rockland County	71	83	68
NY	Babylon	72	84	69
PA	Bristol	75	75	60
PA	NEA	73	77	62
PA	Chester	72	81	66
PA	Harrison Township	73	83	68
PA	Norristown	71	83	68

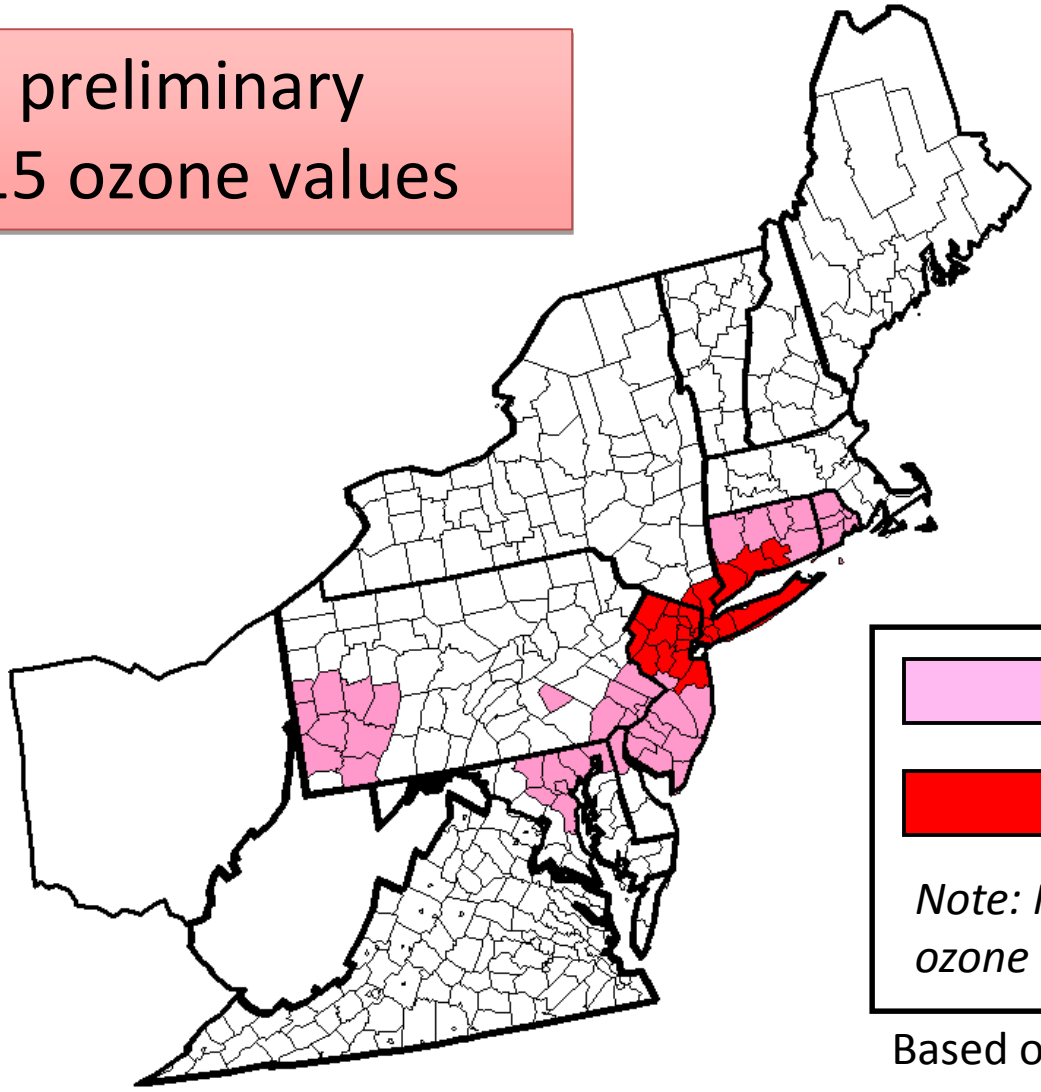
2016 Thresholds by Monitor

Connecticut Edition

State	Monitor	Preliminary 2013-15 DV ppb	2016 4th Max to Exceed 75 ppb	2016 4th Max to Exceed 70 ppb
CT	Westport	84	60	45
CT	Greenwich	81	66	51
CT	Stratford	83	68	53
CT	Middletown	80	70	55
CT	Danbury	76	75	60
CT	New Haven-B	76	75	60
CT	East Hartford	76	76	61
CT	Madison	78	78	63
CT	Stafford	76	79	64
CT	Cornwall (Mohawk Mt)	70	84	69

Potential Nonattainment – 2015 70ppb NAAQS

Based on preliminary 2013-2015 ozone values



Marginal

Moderate

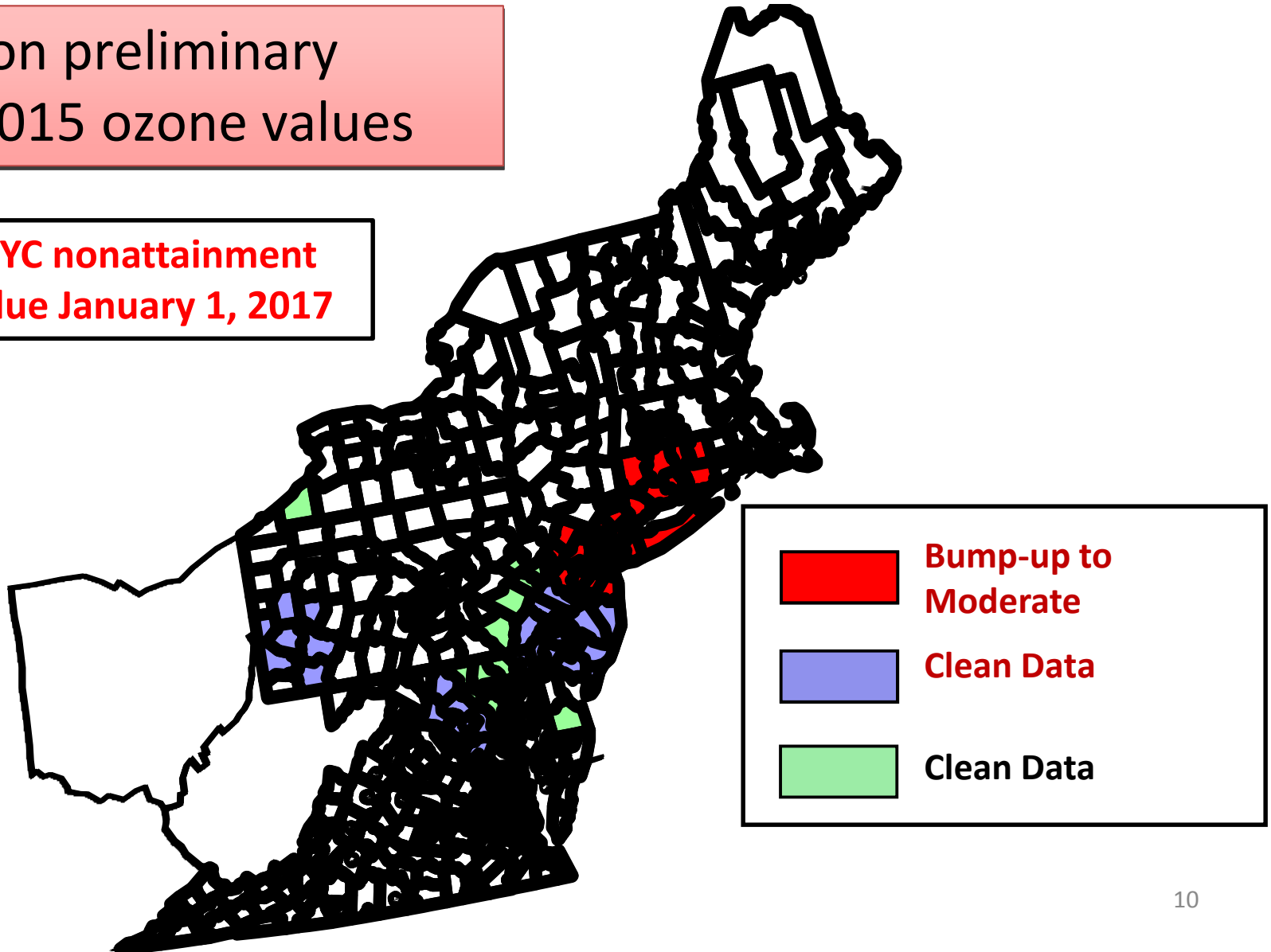
Note: Not all counties have ozone monitoring

Based on CBSA Boundaries in most cases

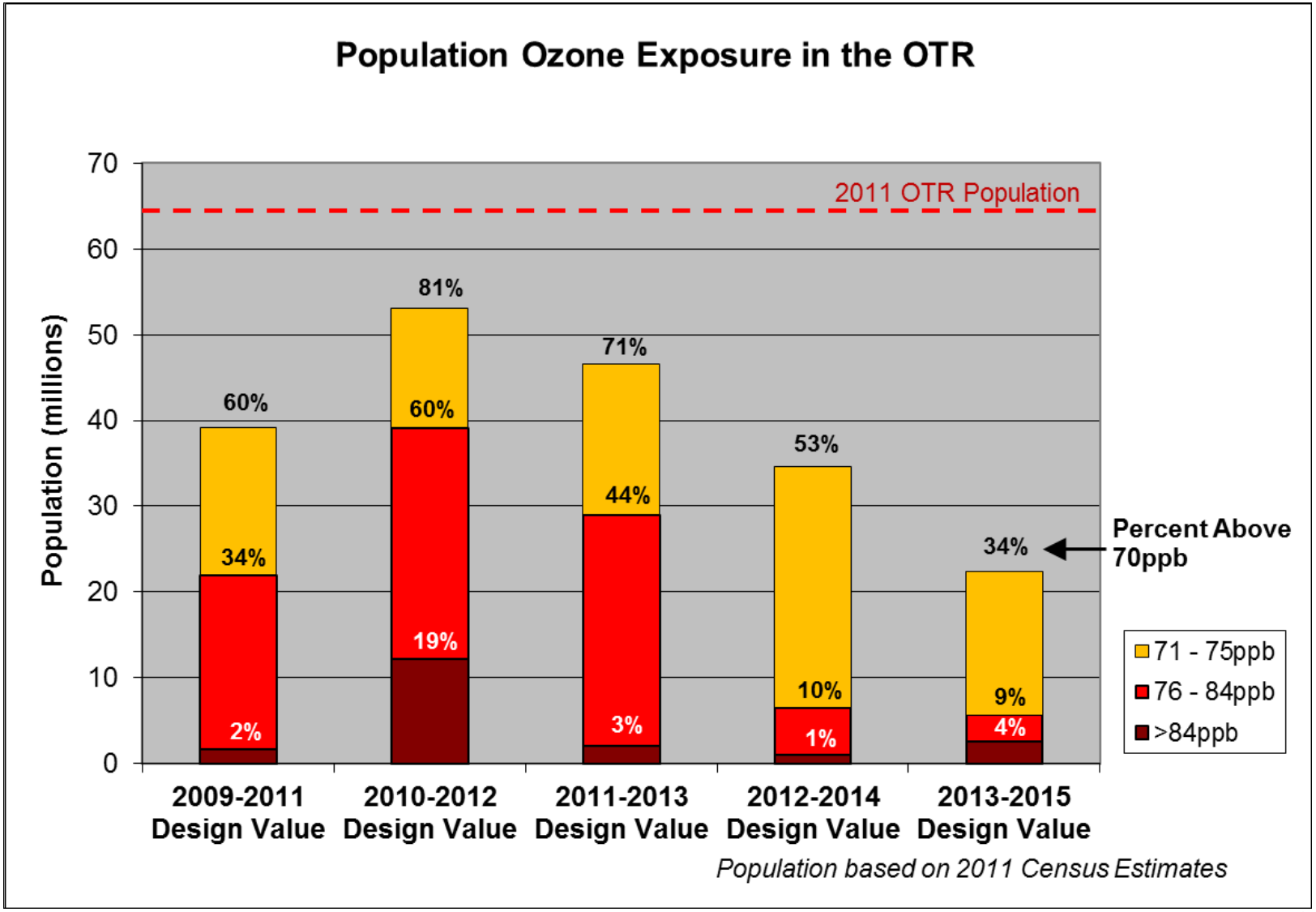
Meeting the 2008 75ppb Ozone NAAQS

Based on preliminary 2013-2015 ozone values

SIPS for NYC nonattainment area are due January 1, 2017



Population Exposed to Unhealthy Ozone Air Quality



2015 Ozone NAAQS Timeline

October 2015

Final Rule

December 2015

Effective Date for NAAQS

October 2016

Submit Nonattainment Designation Recommendations (2013-15)

October 2017

EPA Nonattainment Area Designations

October 2018

Infrastructure/Transport SIP Due

Attainment by (October):

2020 - Marginal	**2023** - Moderate	**2026** - Serious

Good Neighbor SIPs - 2015 70ppb NAAQS

- Addresses contribution to nonattainment
- Considering modeling options to perform this work
- Due October 2018
- Some states need 1-2 years to adopt rules for SIPs
  - This does not leave much time to develop new modeling tools
- Developing a new modeling platform takes years and requires a huge amount of resources

Emission Inventory Update

- Current modeling still focused on the 2011-based Alpha2 Emission Inventories
- Next round of full season ozone modeling will use incrementally improved Beta emission inventories
  - Target completion is Summer 2016
- A public outreach process will occur in Mid-May through MARAMA

Emission Inventories

Alpha

- 2011

Alpha 2

- 2011
- 2018
- 2028

Beta

- 2011
- 2017

- Beta Improvements
  - Upgrade to **ERTAC v2.5**
    - Include state banked emissions
  - State Adjustments/Updates
  - Project future year to **2017**
  - BEIS 3.6.1 (from BEIS 3.6)
  - MOVES 2014a
  - Small EGU temporalization
  - EMF Growth
    - Evaluate USEPA v2 growth factors and adopt as appropriate
    - Include new rules (e.g. residential wood NSPS)
    - State updates and corrections

Modeling Planning

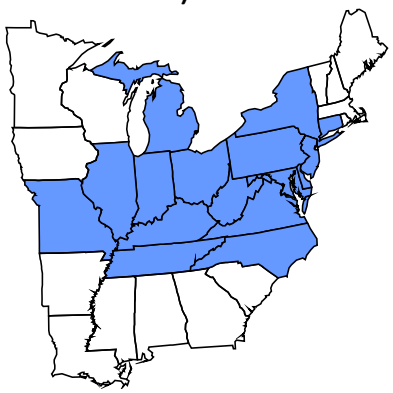
- 2011 Base Case – Beta Emissions
- 2017 Base Case – Beta Emissions
- 2028 Base Case – Alpha2 Emissions
- Sensitivity Modeling
  - 2011 Base Case Contribution
  - 2011 Base Case Nested Grid
  - 2018 Episodic Scenarios

Episodic Sensitivity Runs

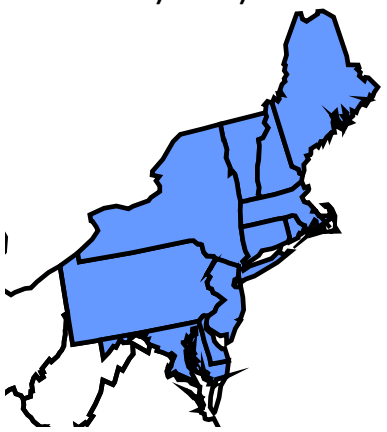
Reductions for Sensitivity Runs

	NOx	VOC	Geography
i)	35%		OTR
ii)	35%		Non-OTR (EGUs only)
a)	35%		Domain-Wide
b)	35%	35%	Domain-Wide
c)	35%	35%	1% Contributing States
d)	35%	35%	OTR
e)	35%	35%	Inner Corridor
f)	50%	35%	Inner Corridor
g)	35%	35%	NYC Nonattainment Area
h)	50%	35%	NYC Nonattainment Area

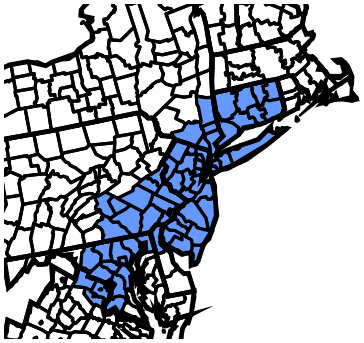
c)



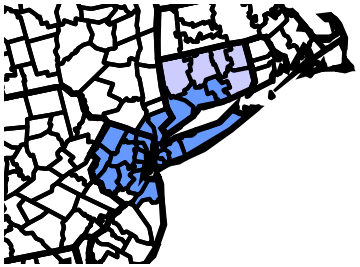
i) & d)



e) & f)



g) & h)



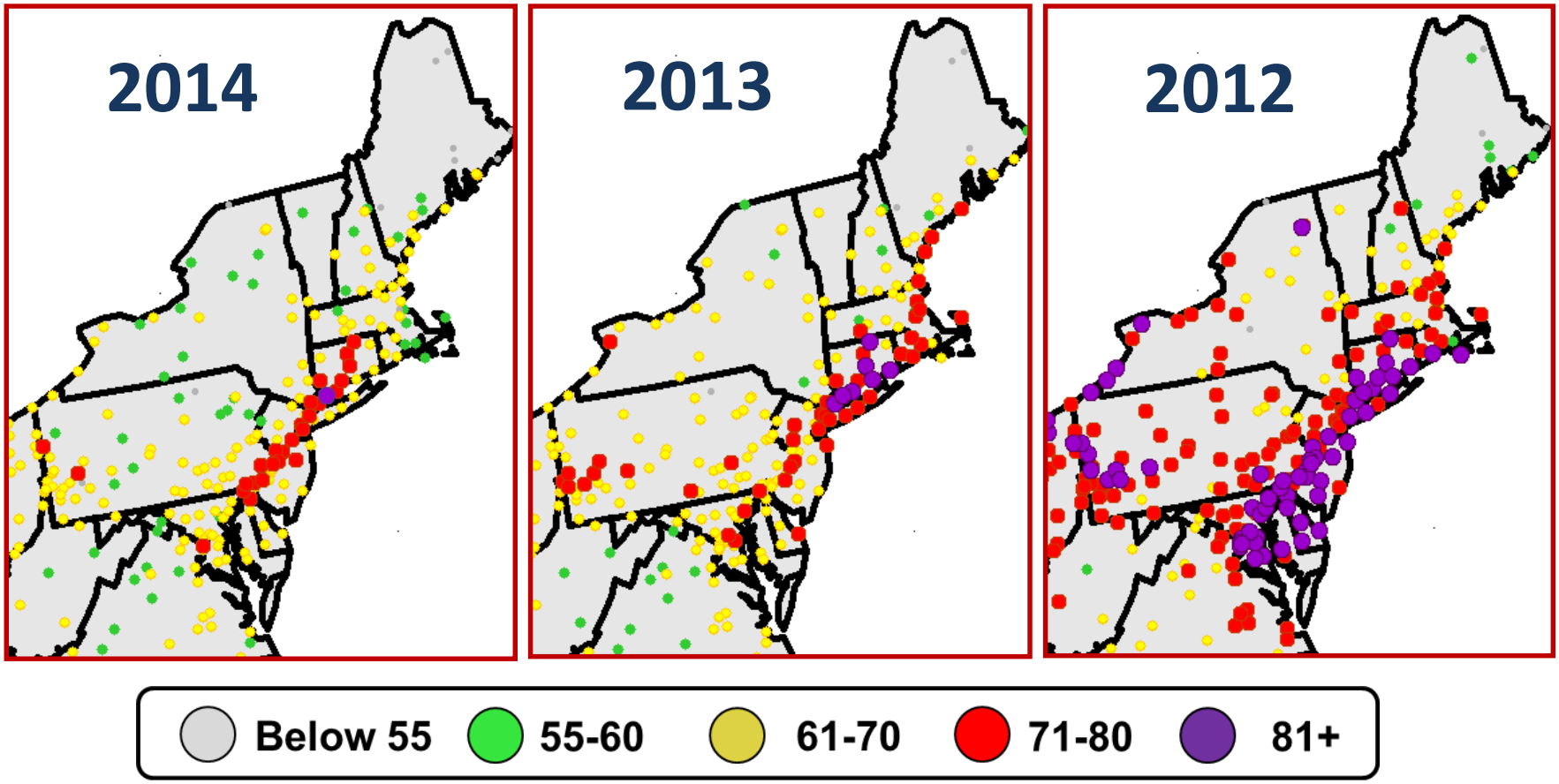
- All reductions will be applied to anthropogenic sectors only
- All runs will use Alpha 2 inventory
- Runs in red are complete

Health Benefits

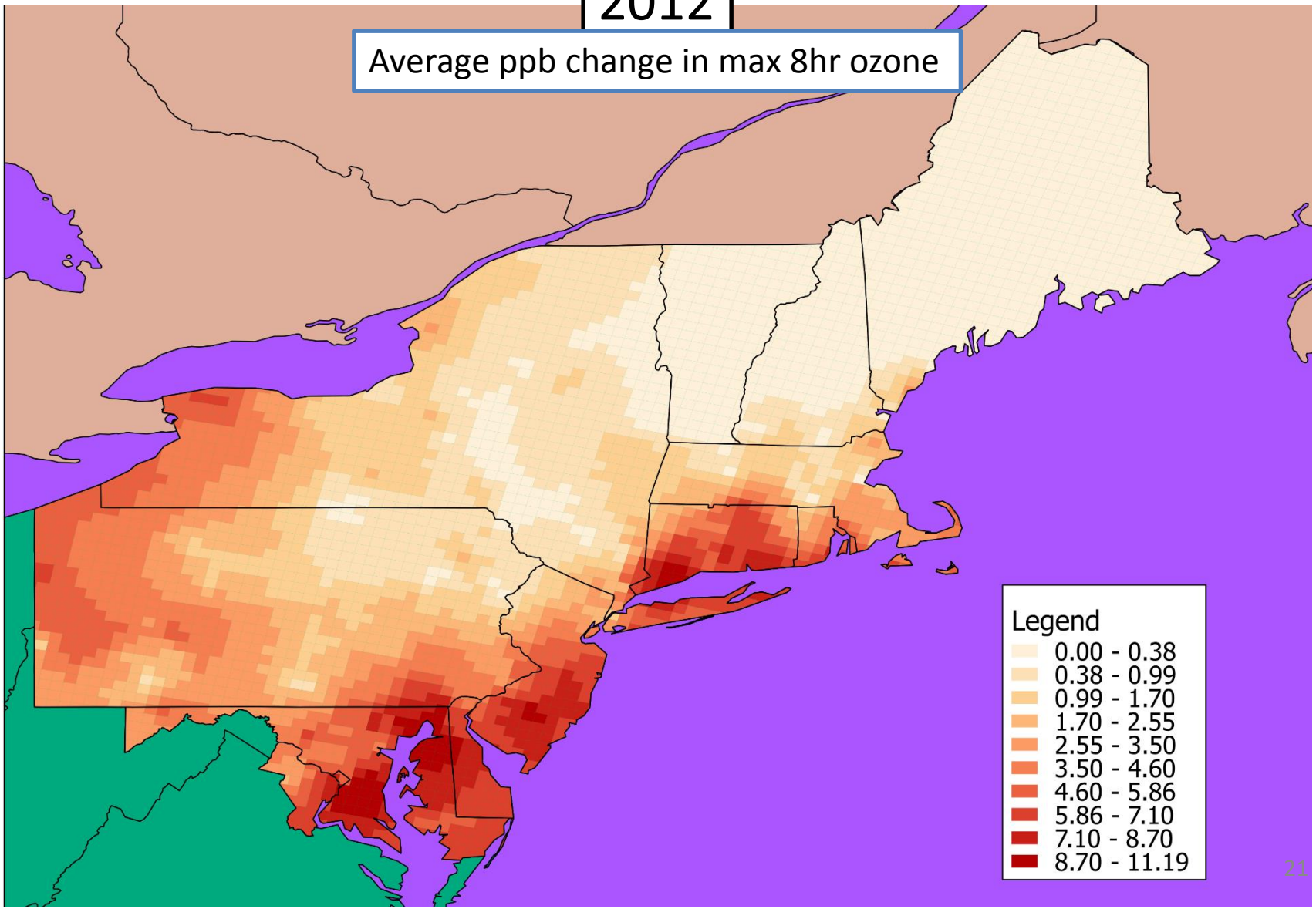
Project Overview

- 2012-14 hourly monitored Ozone data
- "Rolled back" the monitor data
  - Monitors with a 4th high >70ppb had ozone reductions applied to meet the NAAQS using peak shaving technique
- Employed health functions and economic valuations that are used by EPA to produce Regulatory Impact Assessments

4TH High 8-hour Ozone



Changes in O_3 Concentration after Rollback



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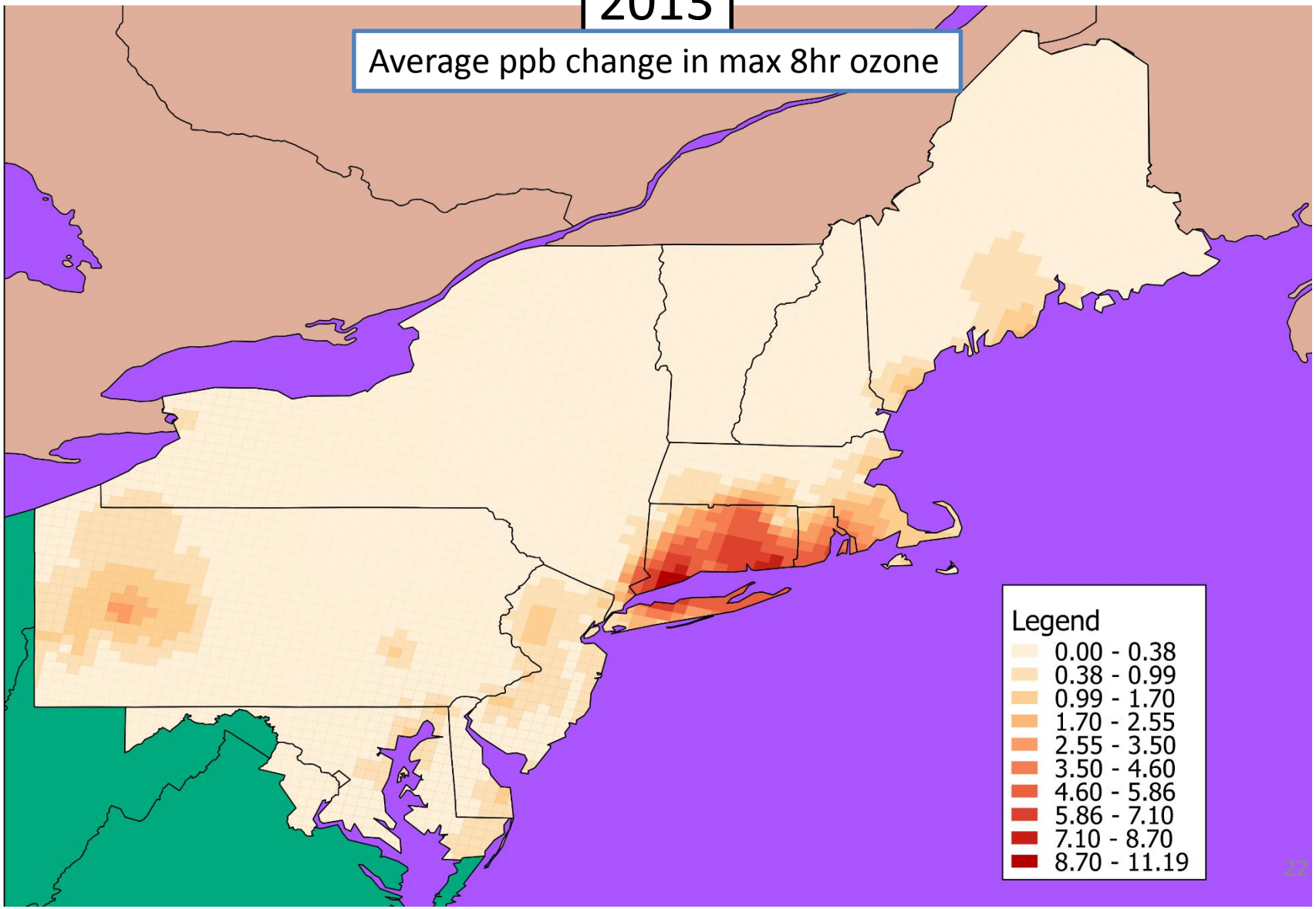

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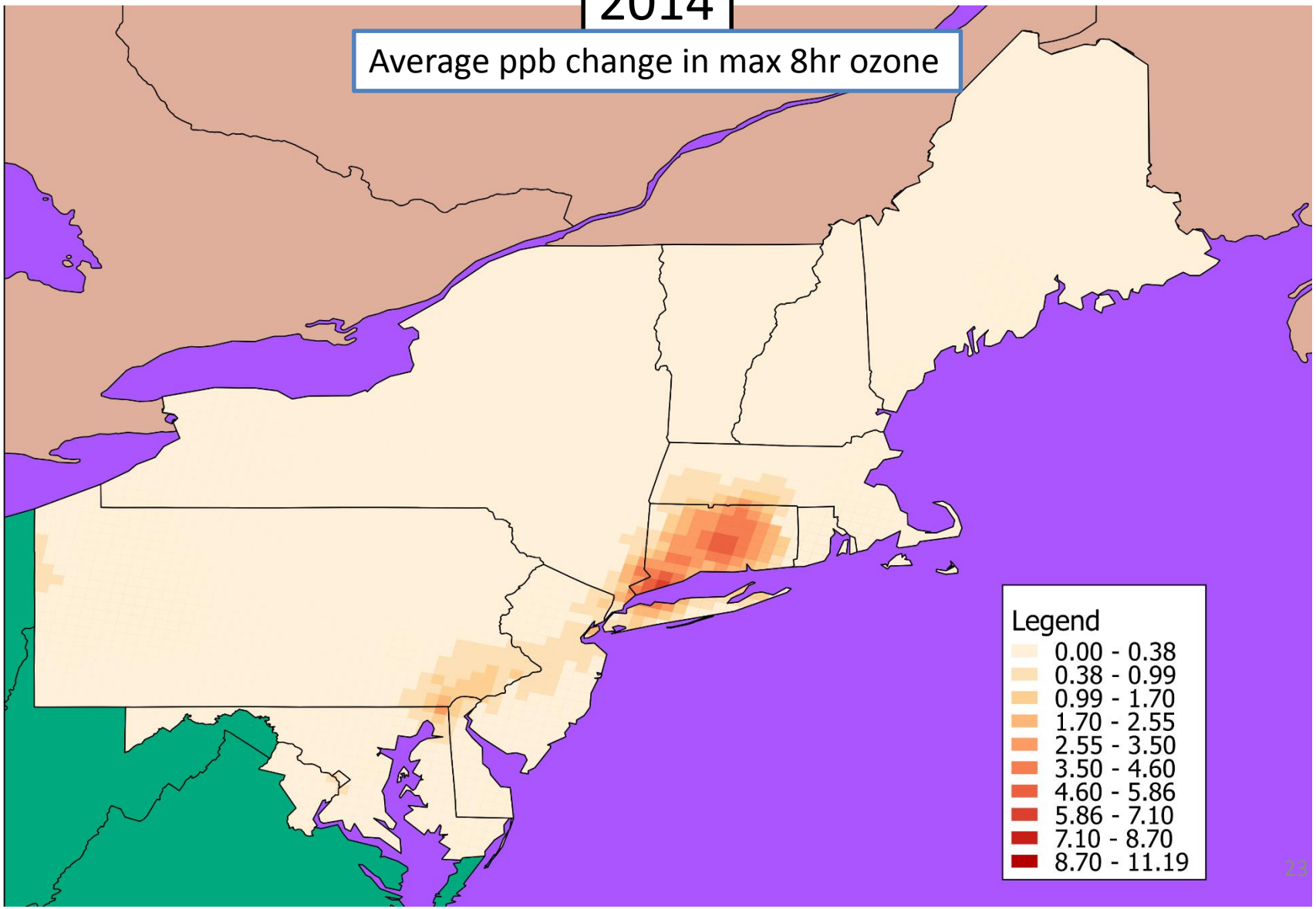


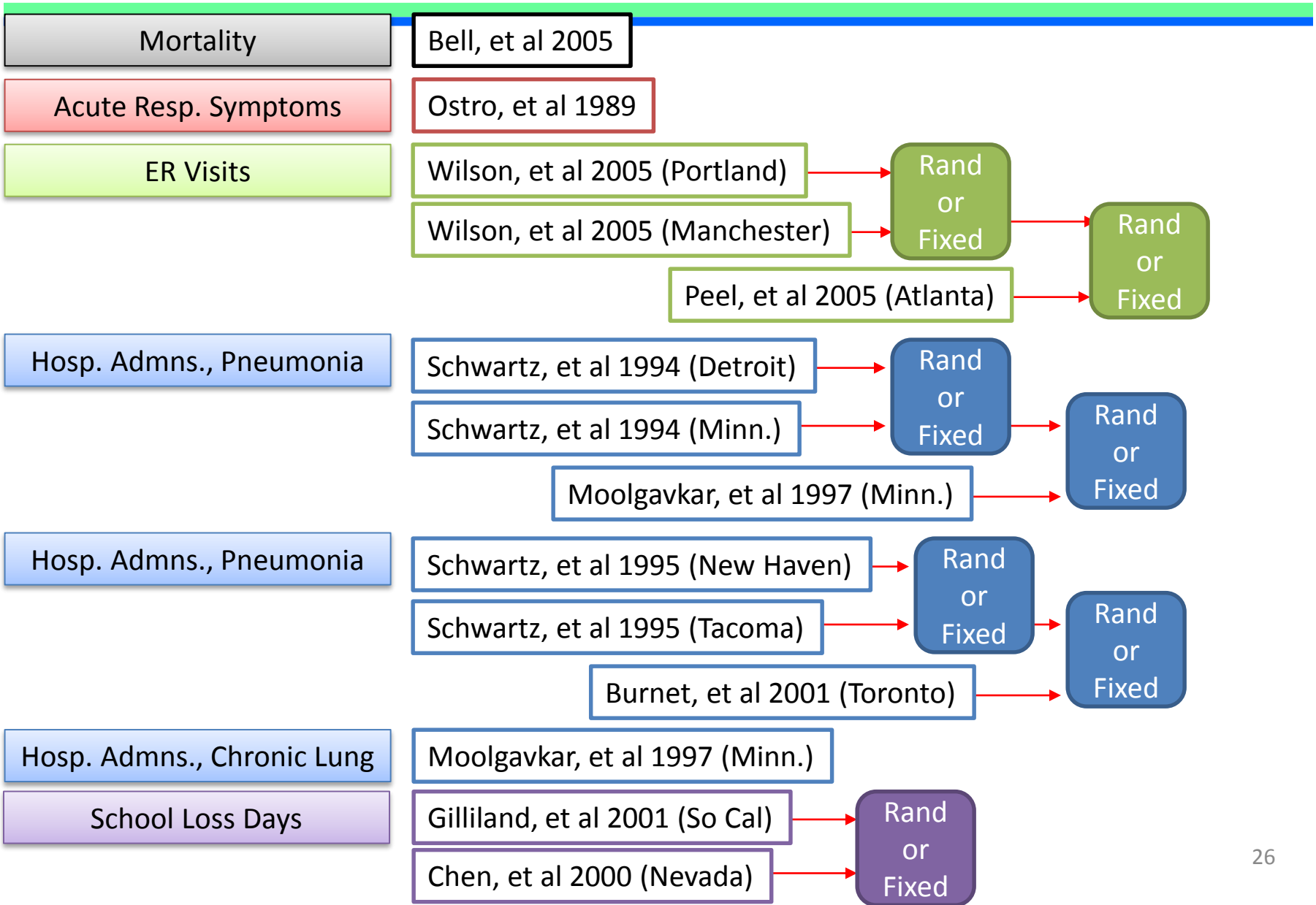
Changes in O_3 Concentration after Rollback

- Greatest reductions in the I-95 corridor between DC and NYC
- Other noticeable reductions around Pittsburgh and western New York
- Caveats:
  - Analysis does not consider
    - Downwind benefits from upwind controls
    - Benefit of over control on borderline monitors

Evaluating Health Effects

- Health Impact Functions (HIFs) consist of:
  - Change in Air Quality
  - Affected Population
    - 2012-14 Population projected from 2010 Census Data
  - Baseline Incidence Rate
  - Effect Estimate from Epidemiological Literature
- HIFs are typically log-linear
- Only examined short term mortality impacts
  - Long term mortality impacts of ozone exposure are still debatable

Health Studies Used



Average Reduced Incidence from 2012-14

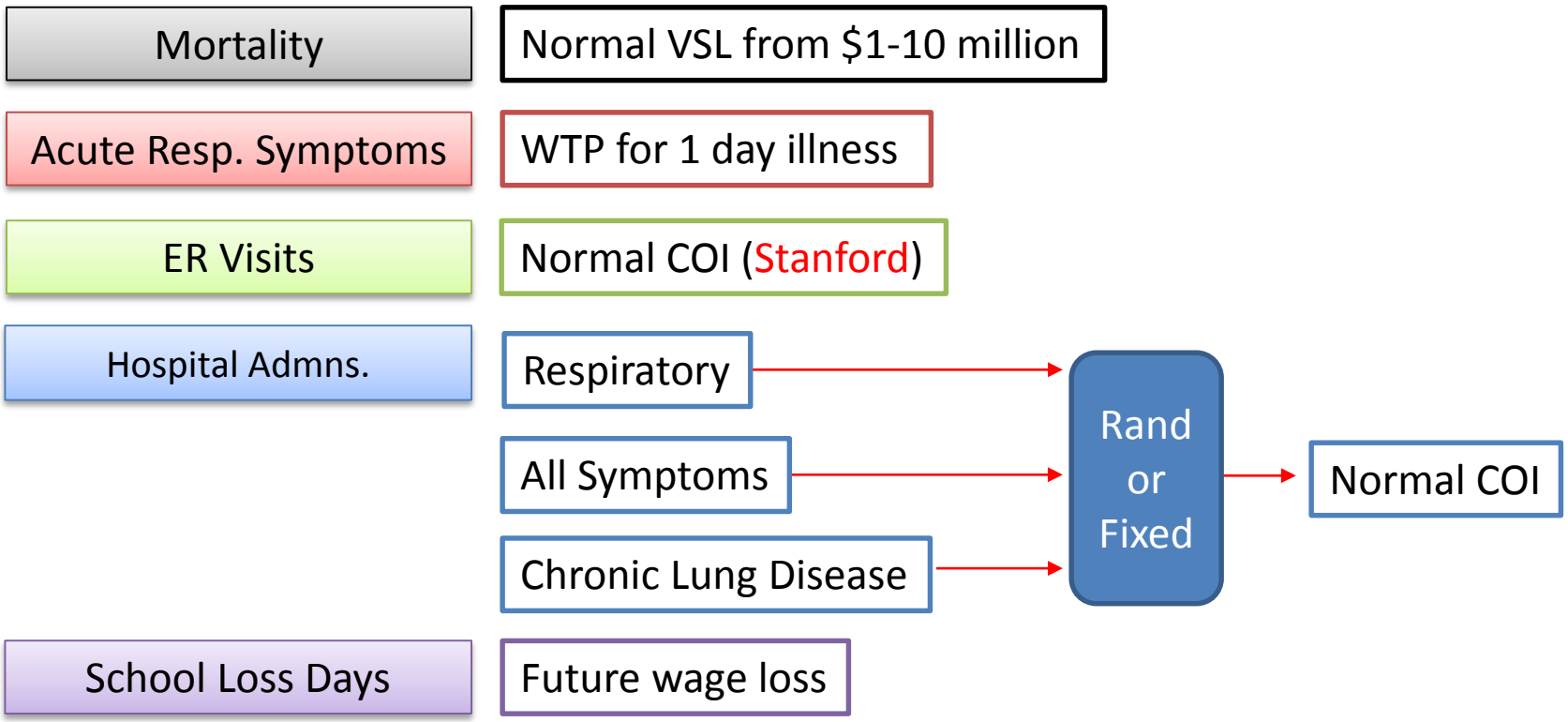
Health Effect Endpoint	Reduced Incidence at NAAQS Threshold (95% CI)		
	2012	2013	2014
Mortality, All Causes (all ages)	920 (460-1,400)	190 (97-290)	100 (50-150)
Acute Respiratory Symptoms (ages 18-64)	1,800k (780k-2,700k)	360k (160k-560k)	190k (85k-300k)
Emergency Room Visits, Respiratory (all ages)	840 (-120-1,800)	170 (-25-370)	100 (-14-220)
Hospital Admns., All Symptoms (age <2 and age >64)	4,200 (940-7,500)	2,300 (570-4,00)	280 (70-490)
Hospital Admns., Chronic Lung (age >64)	970 (-170-2,100)	500 (-90-5,400)	60 (-10-130)
Hospital Admns., Chronic Lung, Except Asthma (age >64)	1,300 (410-2,200)	690 (210-1,200)	20 (80-140)
Hospital Admns., Respiratory (age >64)	1,200 (500-1,800)	600 (260-960)	80 (40-130)
School Loss Days (ages 5-17)	510k (210k-820k)	100k (42k-170k)	56k (23k-89k)

Evaluating Economic Benefits

- Employed economic valuations used by EPA to produce RIAs
- To value the health benefit, the change in incidence is multiplied by a valuation
  - Mortality
    - Normally Distributed Value of Statistical Life (VSL)
  - Acute Respiratory Symptoms
    - Willingness to Pay (WTP)
  - Remainder
    - Cost of Illness (COI)

	Medicine, Hospital Stays, etc.	Pain and Suffering	Direct Economic Behavior
VSL	✓	✓	✓
WTP	✓	✓	
COI	✓		

Economic Valuations Used



Average Economic Impacts from 2012-14

Millions 2010$

Health Effect Endpoint	Economic Impacts at NAAQS Threshold (95% CI)		
	2012	2013	2014
Mortality, All Causes (all ages)	$7,900 ($990-$14,000)	$1,400 ($200-$2,800)	$800 ($100-$1,510)
Acute Respiratory Symptoms (ages 18-64)	$56 ($-18-$130)	$11 ($-3.7-$27)	$6.2 ($-2.0-$14)
Emergency Room Visits, Asthma (all ages)	$0.33 ($-0.05-$0.70)	$0.07 ($-0.01-$0.15)	$0.04 ($-0.01-$0.08)
Hospital Admissions, Respiratory (age <2 and age >64)	$34 ($8.1-$60)	$18 ($.0-$31)	$2.3 ($0.54-$4.0)
School Loss Days (ages 5-17)	$51 ($21-$81)	$10 ($4.2-$16)	$5.5 ($2.2-$8.8)

Questions

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