Department of Health

Communicable Disease and Climate Change

New York State Department of Health
Bryon Backenson

What's That Crawling on My House?

All are harmless!

(images from Penn State Entomology)

Western Conifer Seed Bug

Multicolored Asian Lady Beetle

Boxelder Bug

Brown Marmorated Stink Bug

Ways That Climate Change Can Impact Infectious Diseases

- Obvious
  - Temperature: Vector-Borne Diseases
  - Temperature: Vibriosis
- Less Obvious
  - Temperature: Legionellosis
  - Precipitation/Drought: Vector-Borne Diseases
  - Precipitation: Enteric Diseases
- Less Known
  - Temperature: Fungal disease
- Is it really this easy and direct?

Lyme and Babesiosis and Anaplasmosis and Powassan and Rocky Mountain Spotted Fever

(aka, ticks and risk)

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Tick-borne Disease Transmission

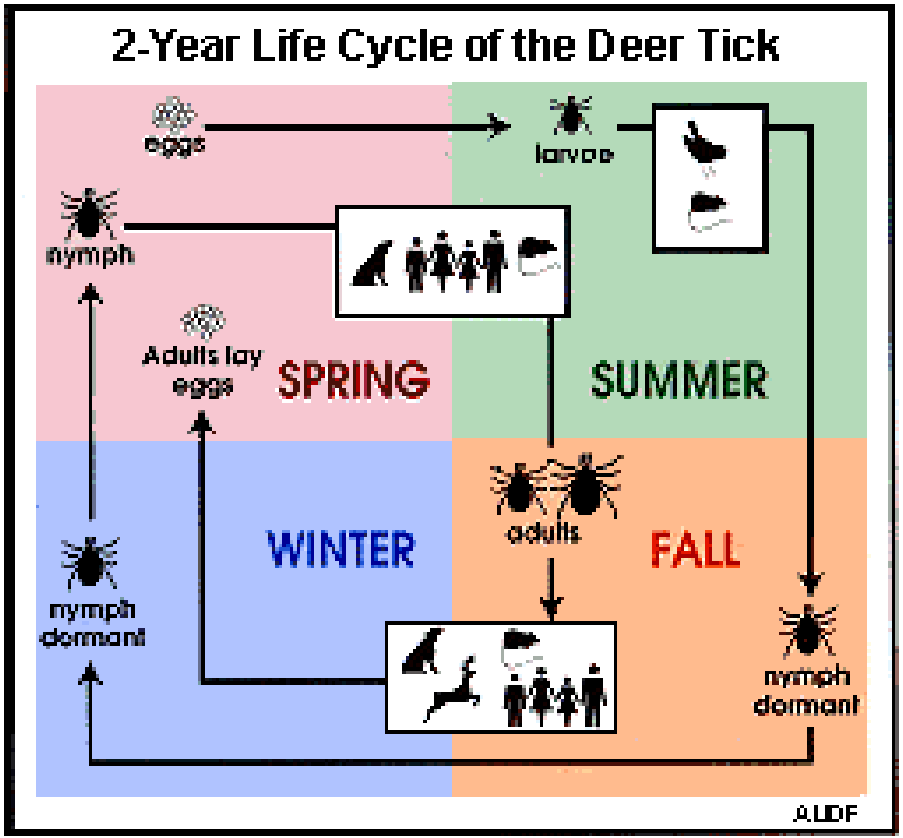
American Dog tick: → Rocky Mountain spotted fever & Human Monocytic Ehrlichiosis (HME)

Lone Star tick: → Human Monocytic Ehrlichiosis (HME)

Deer (black-legged) tick: → Lyme disease & Babesiosis, Human Granulocytic Anaplasmosis (HGA), Deer Tick Virus (Powassan)

Woodchuck tick: (Groundhog tick) → Powassan (Encephalitis) Virus

Two Year Life Cycle of the Deer Tick



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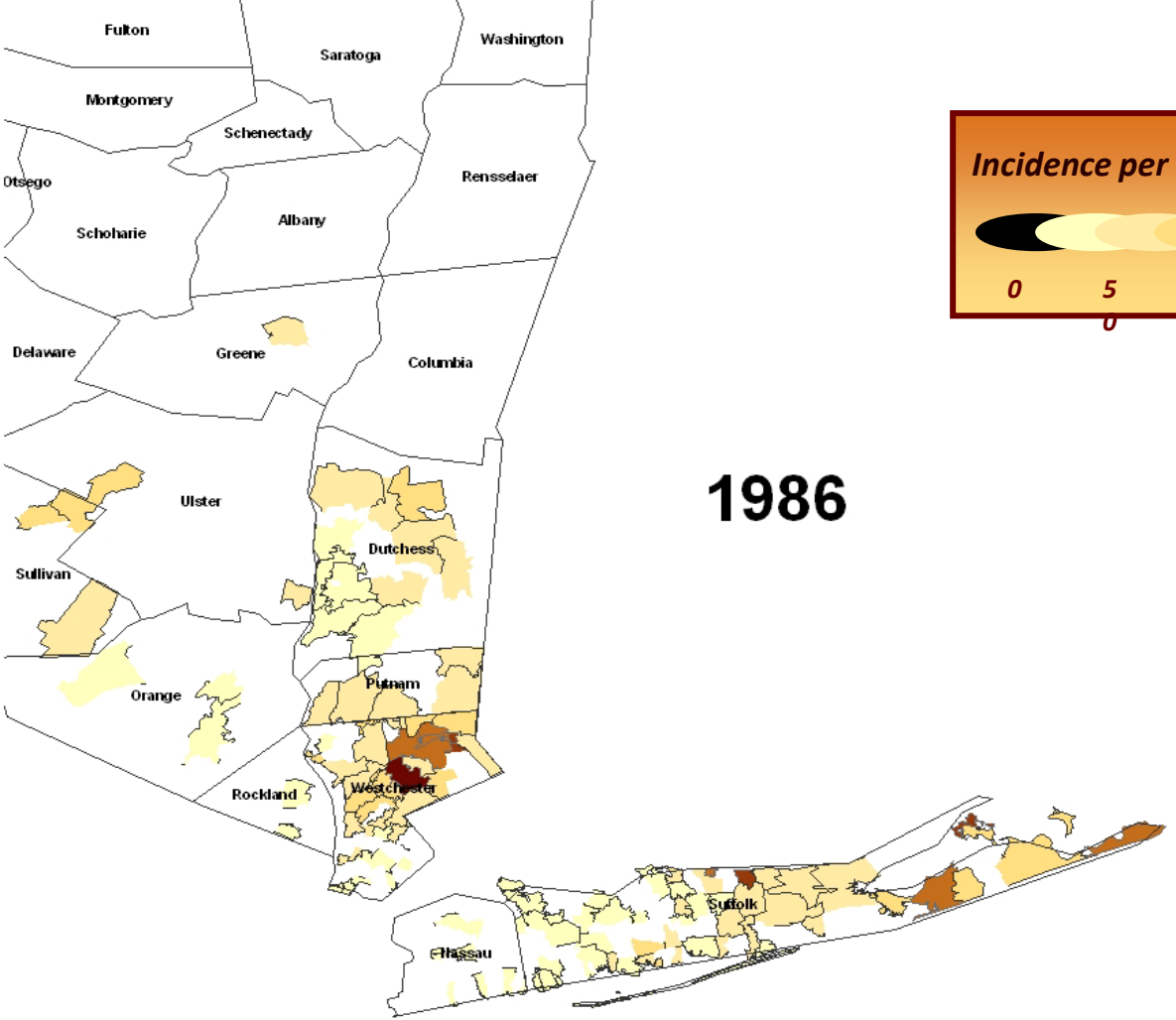
Lyme disease incidence per 100,000 population by year of onset by zip code in southeast New York State by year 1986 - 2005



Incidence per 100,000 population

0 5 100 500 1000+

0

1986

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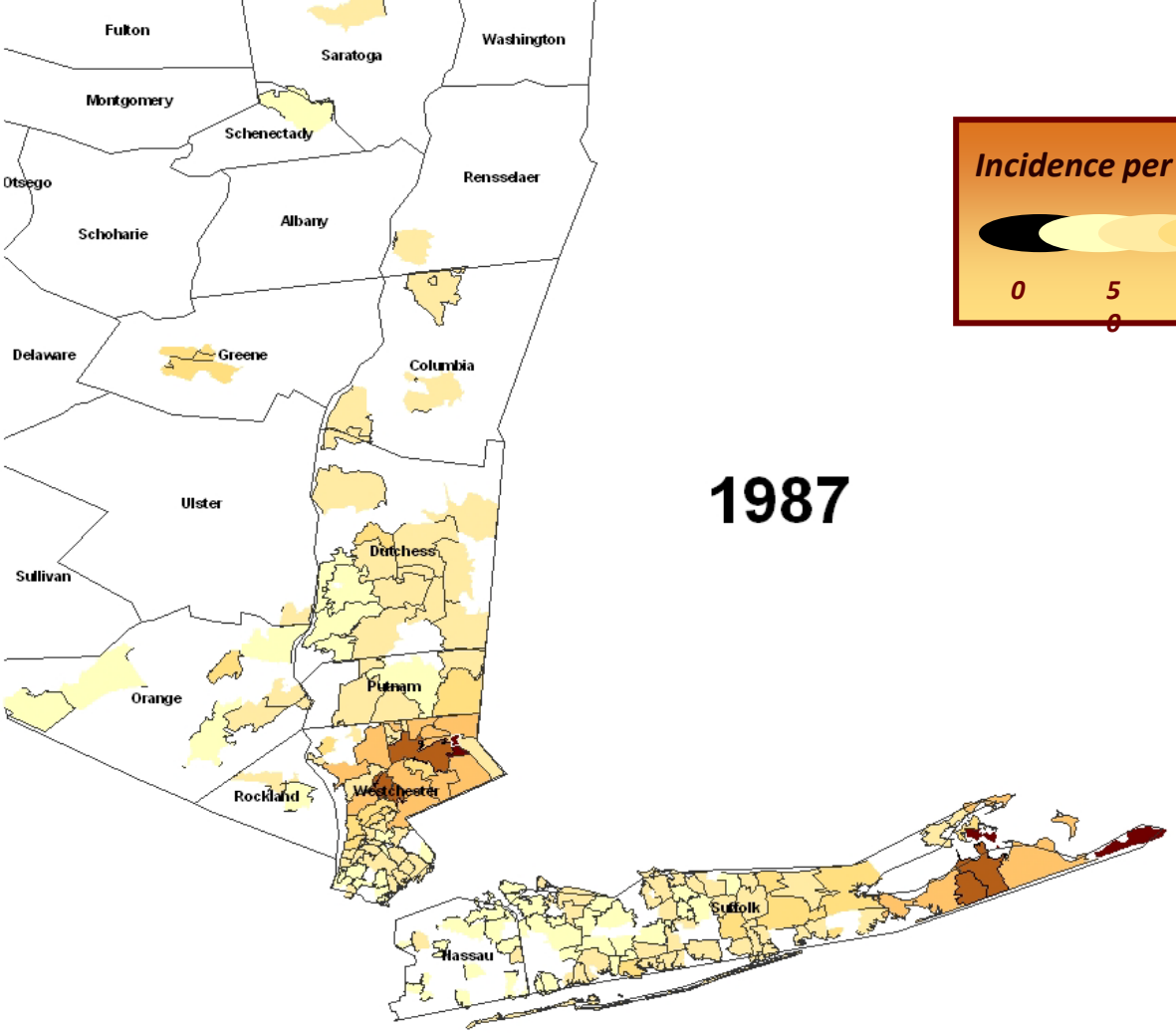

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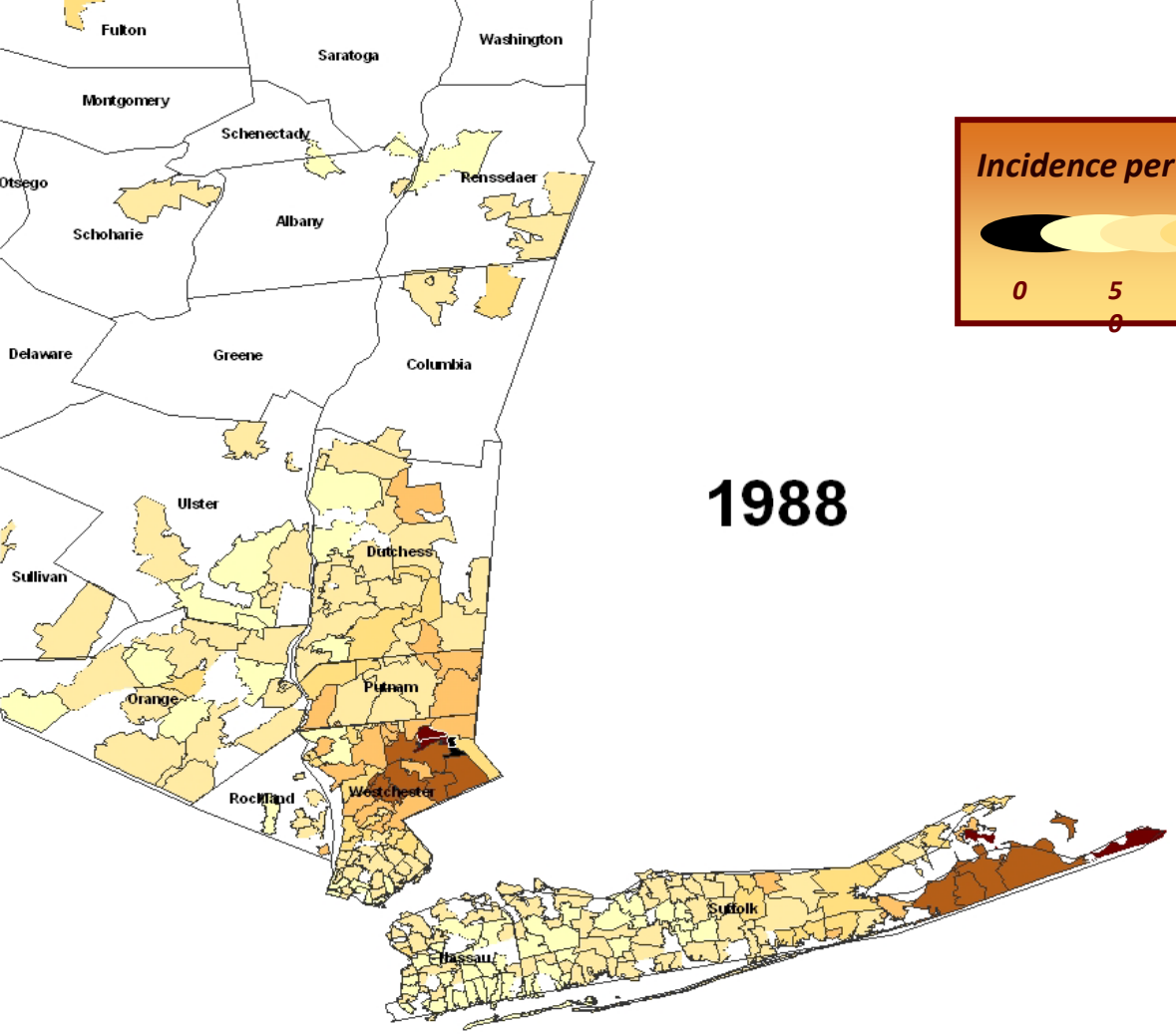

Incidence per 100,000 population

0 50 100 500 1000+

1988

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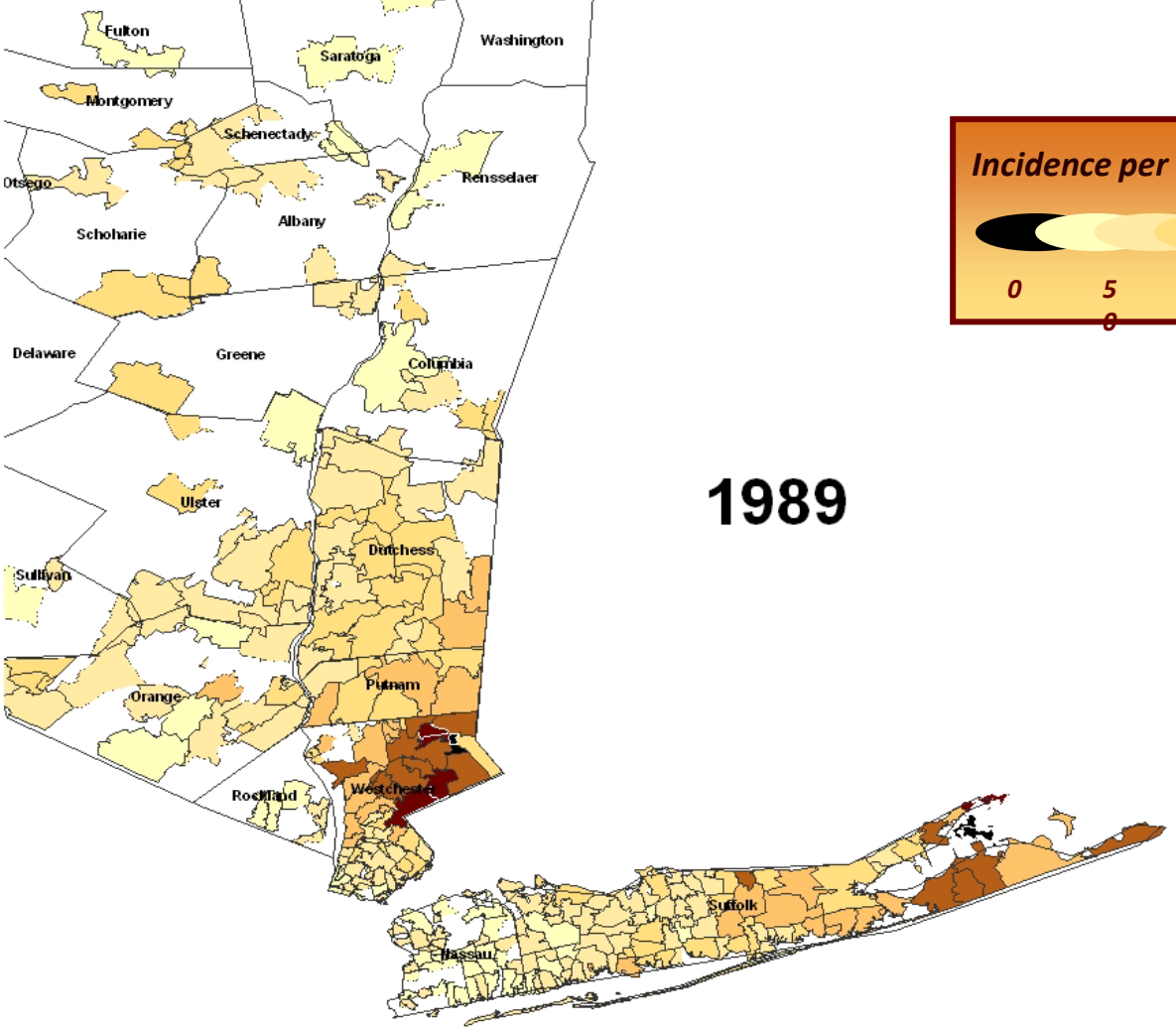

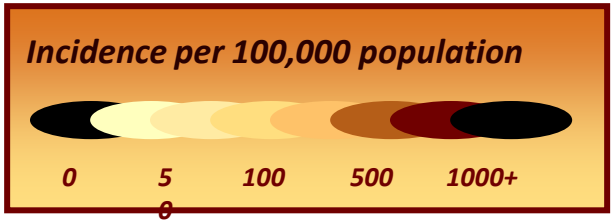

1989

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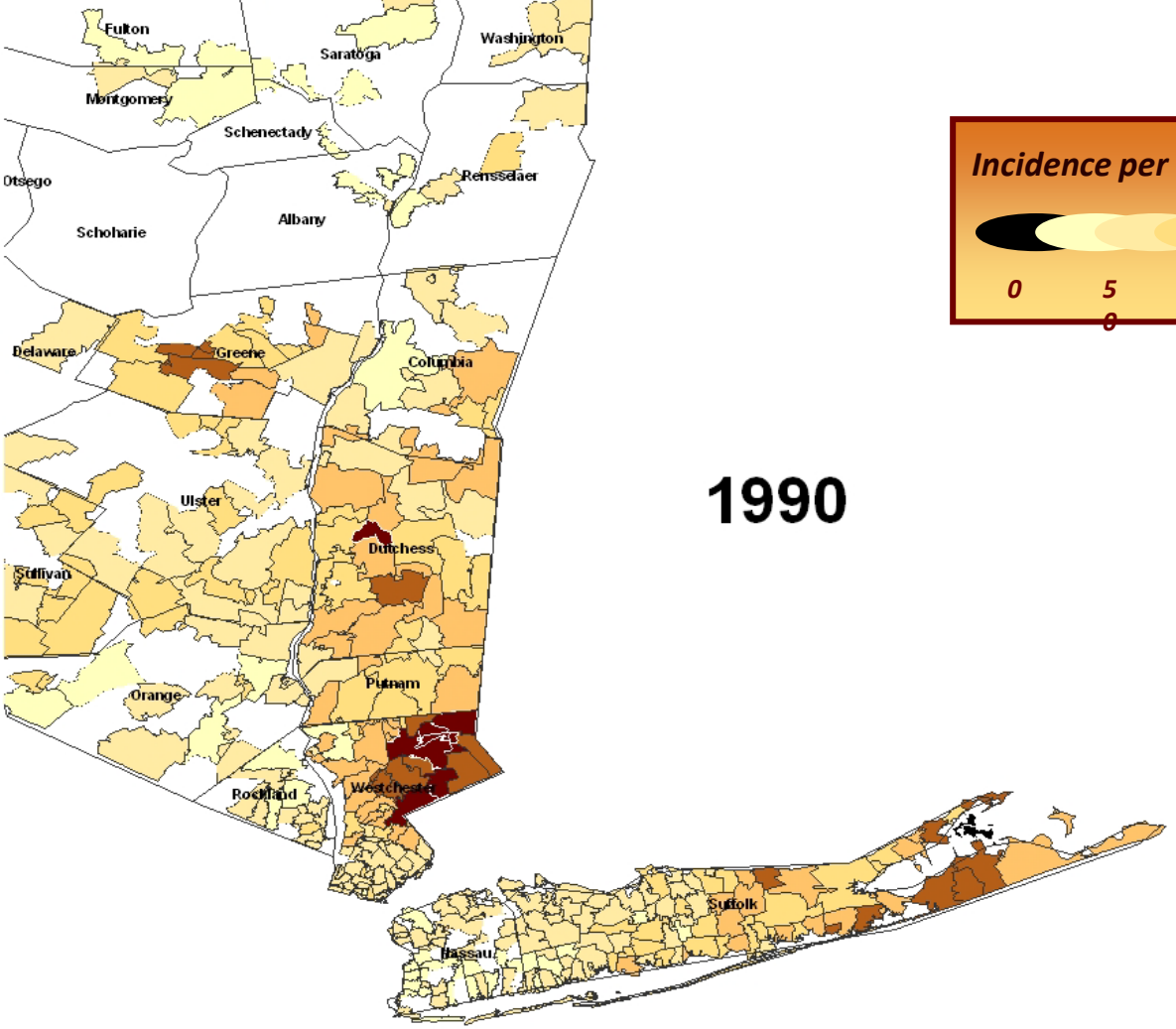
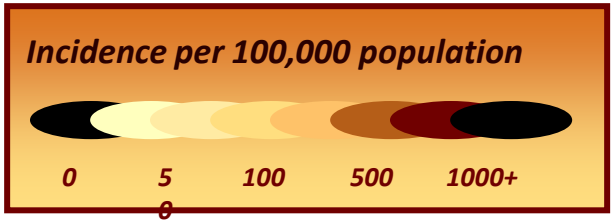


1990



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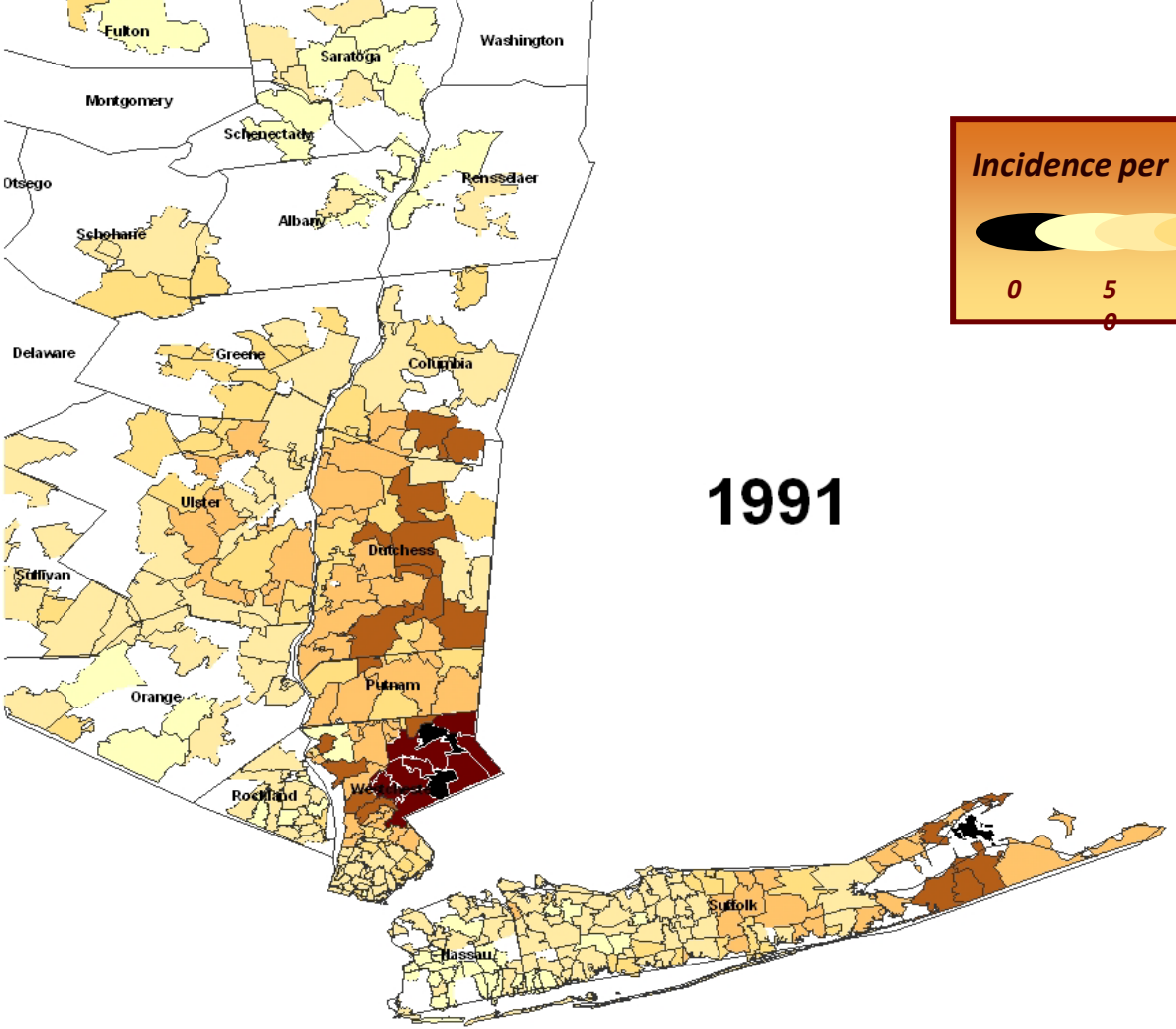

Incidence per 100,000 population

0 50 100 500 1000+

1991

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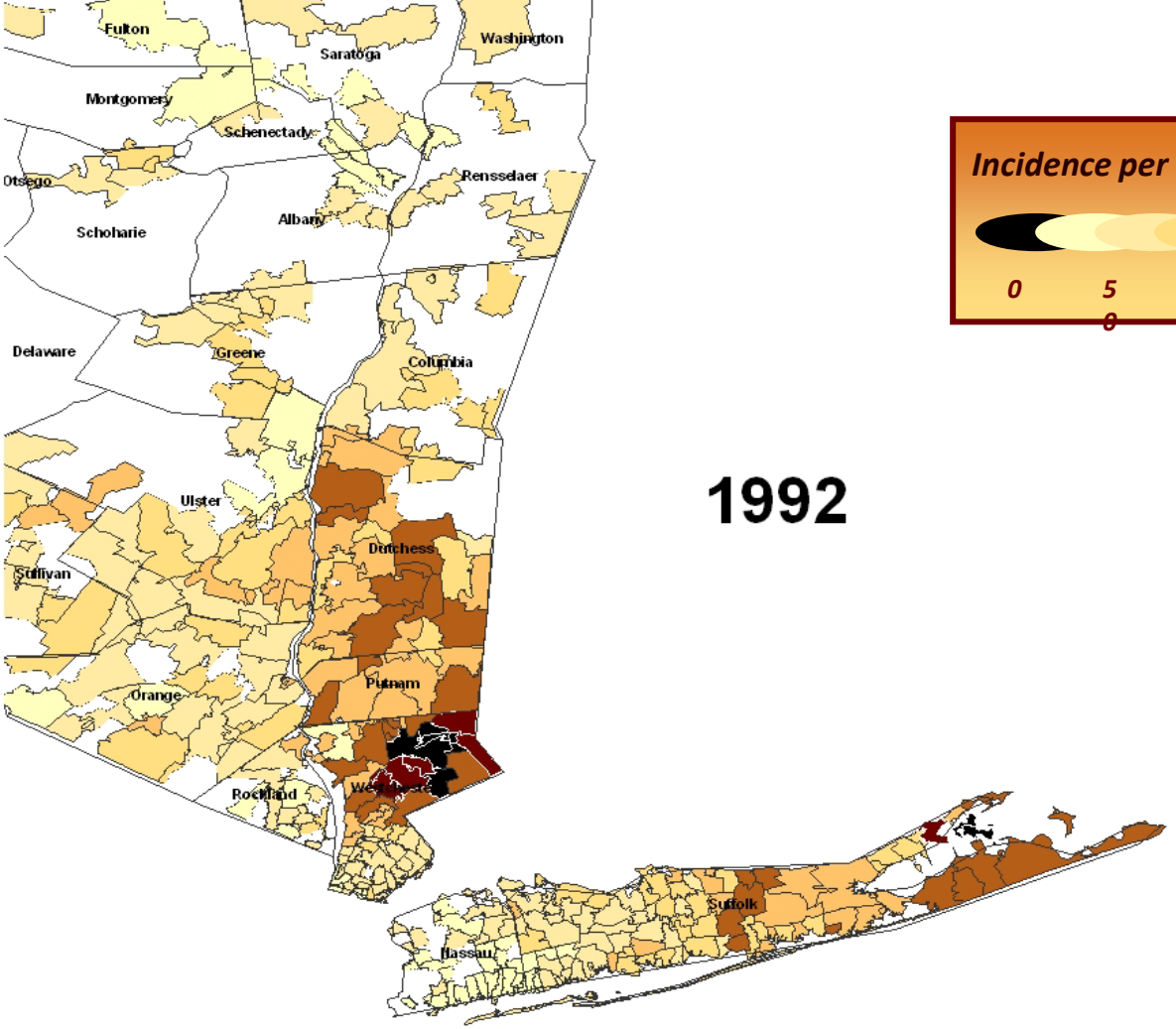

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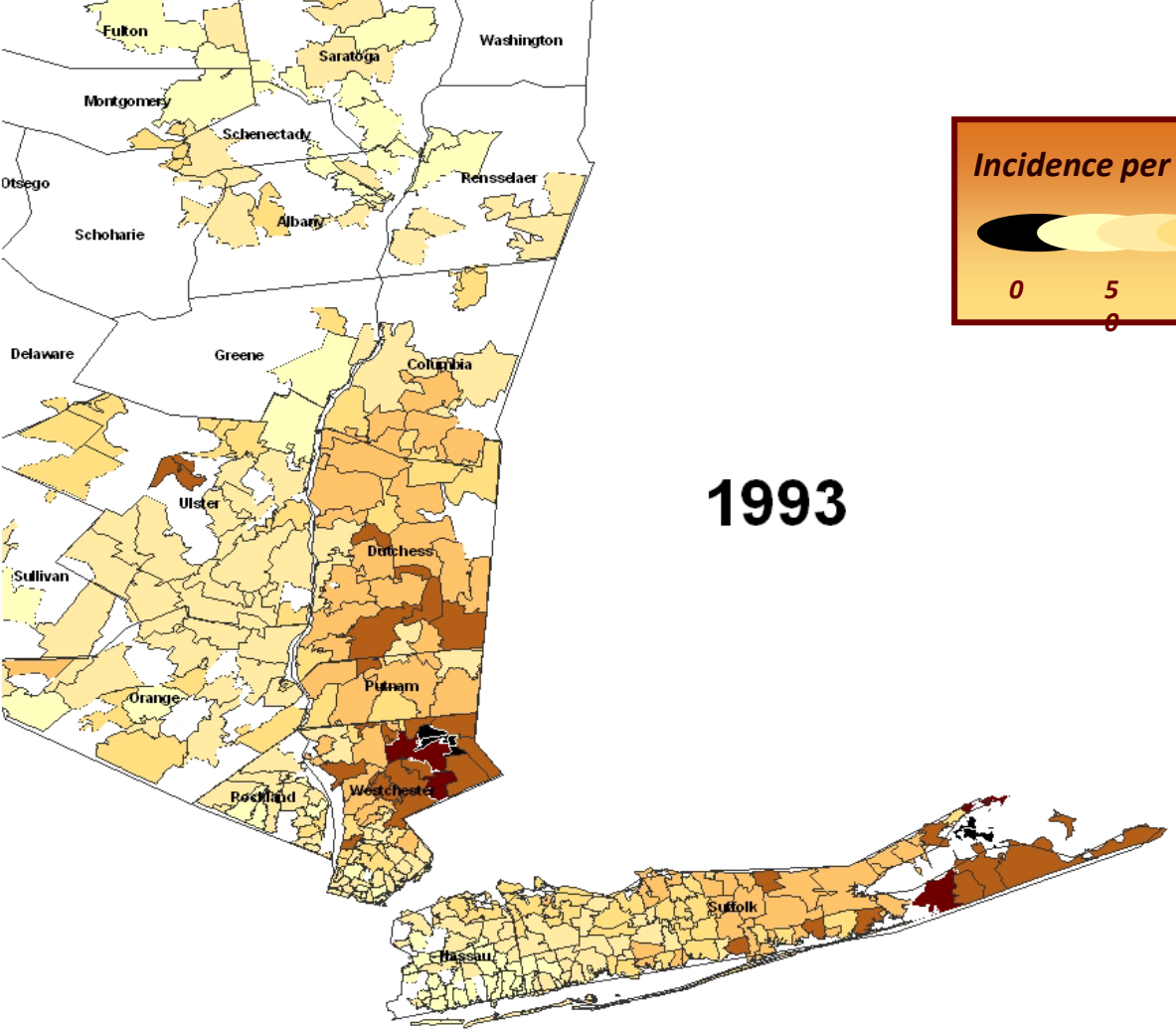

Incidence per 100,000 population

0 50 100 500 1000+

1993

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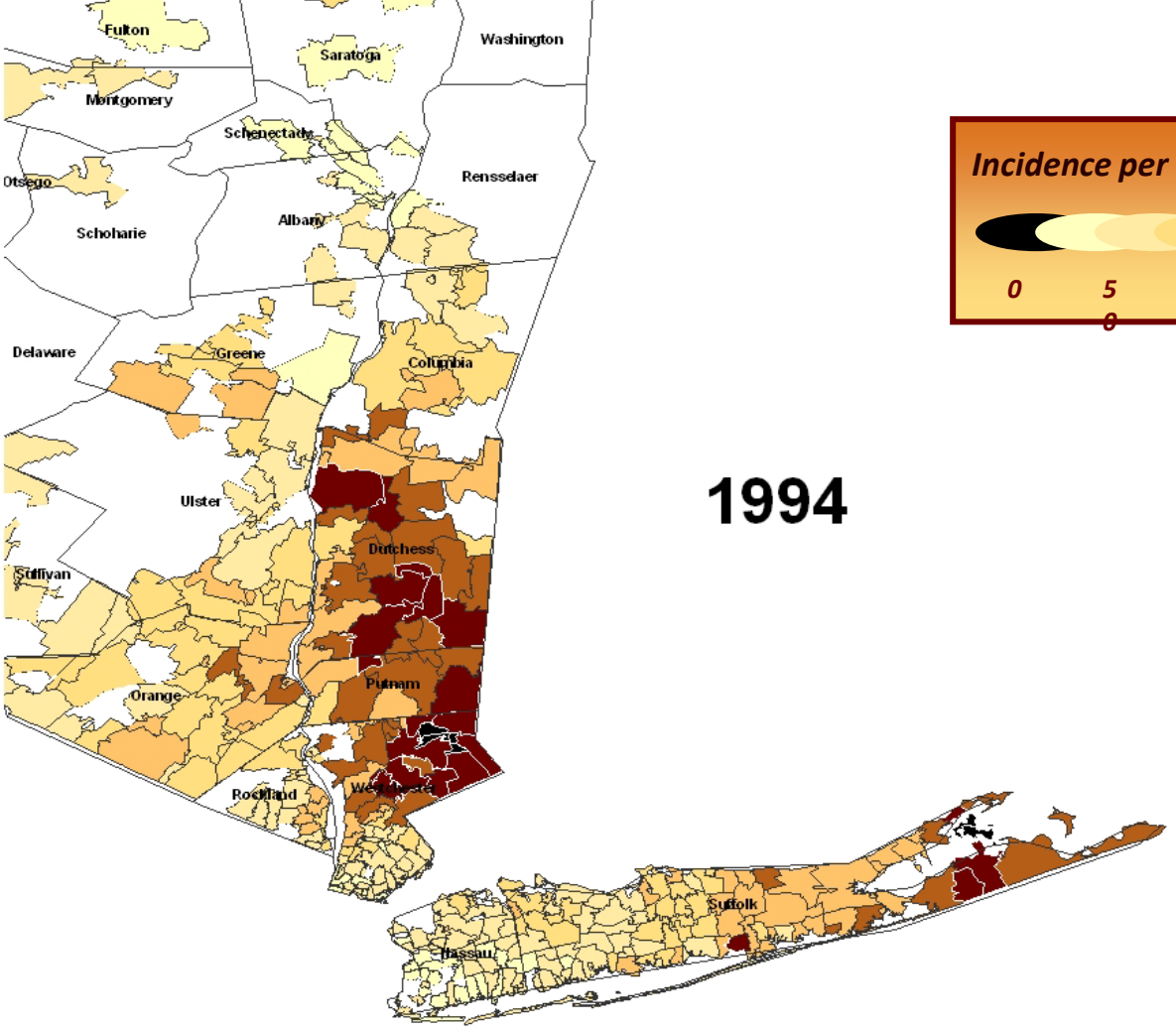

Incidence per 100,000 population

0 50 100 500 1000+

1994

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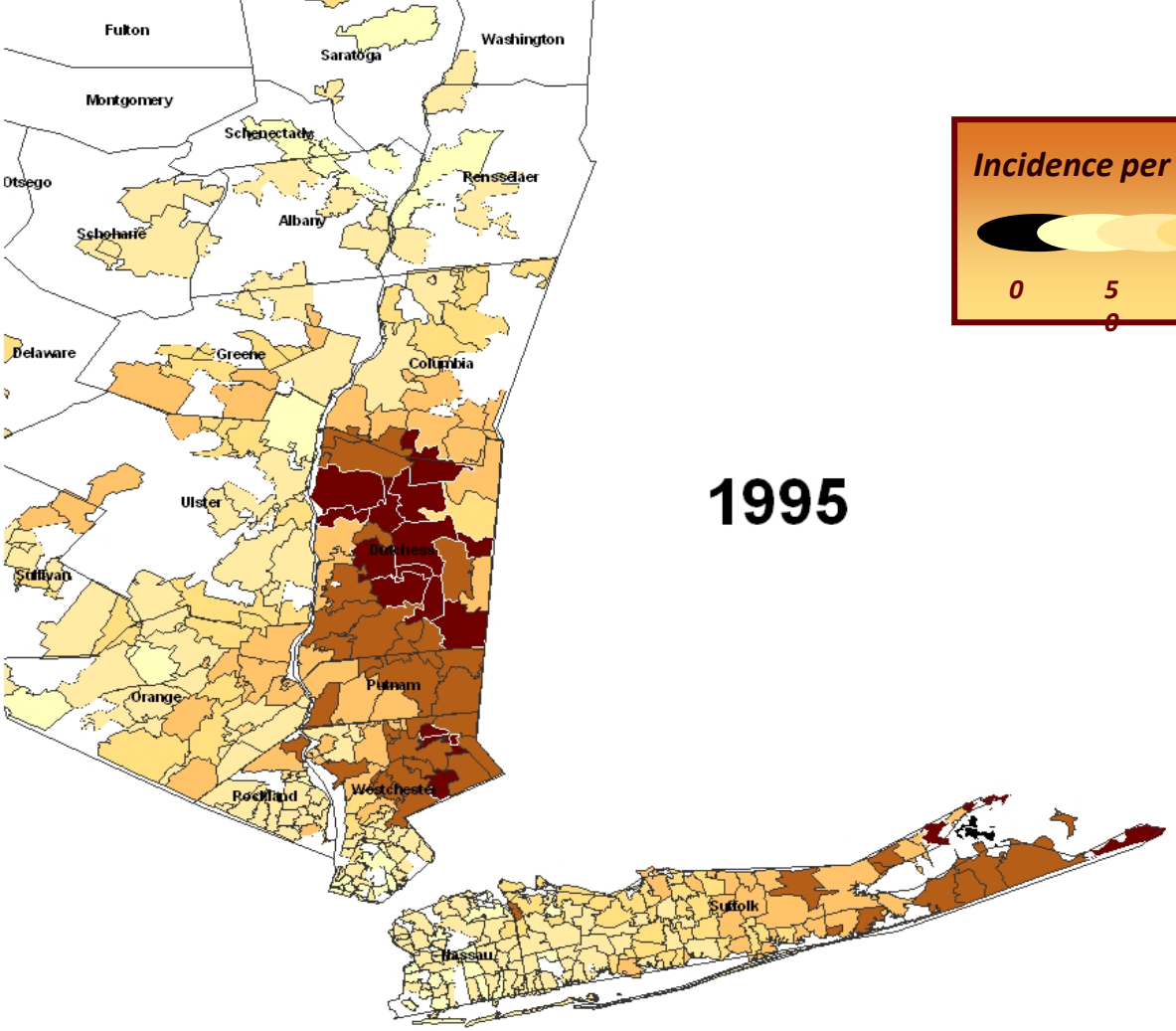

1995

Incidence per 100,000 population

0 50 100 500 1000+

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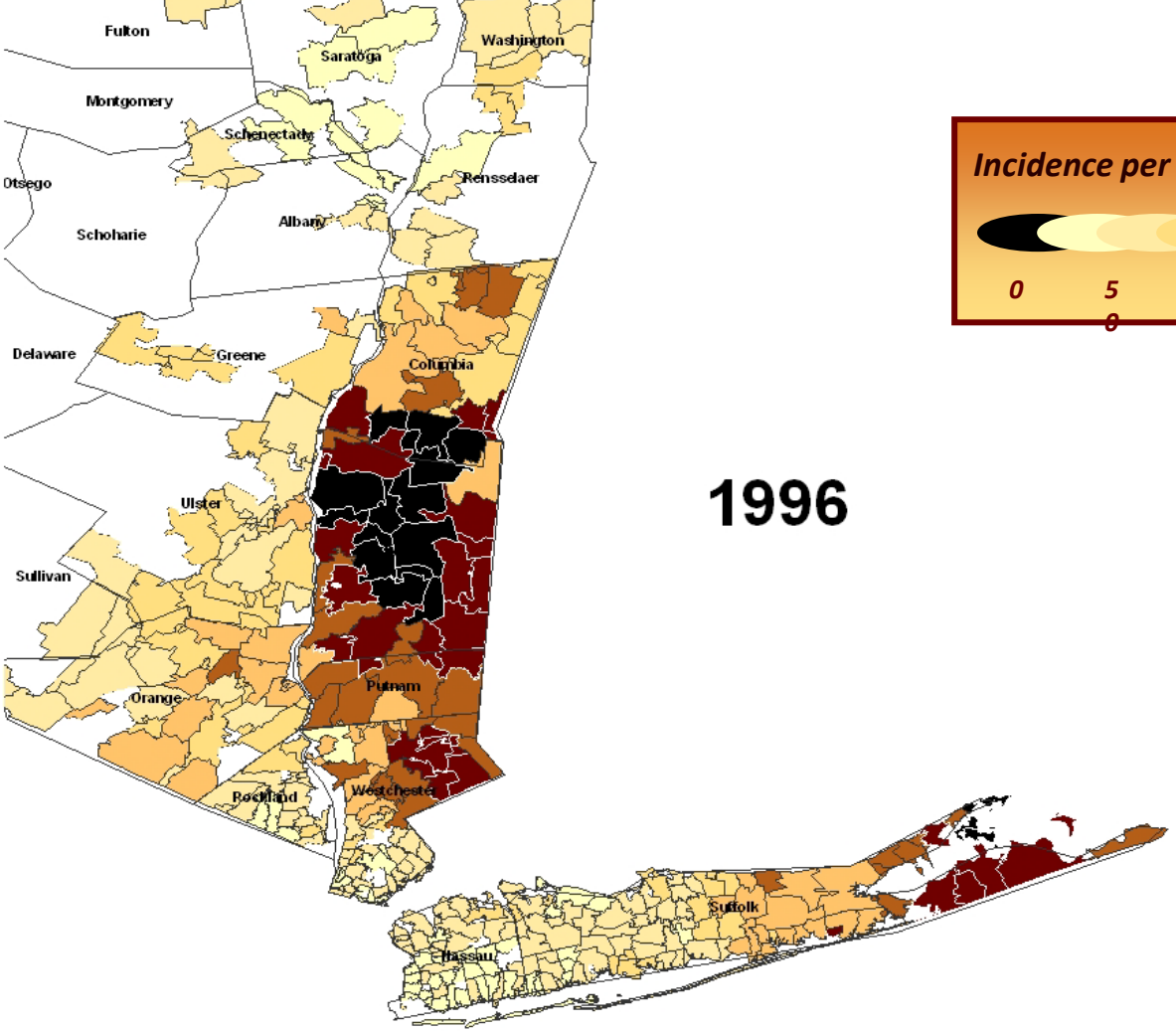

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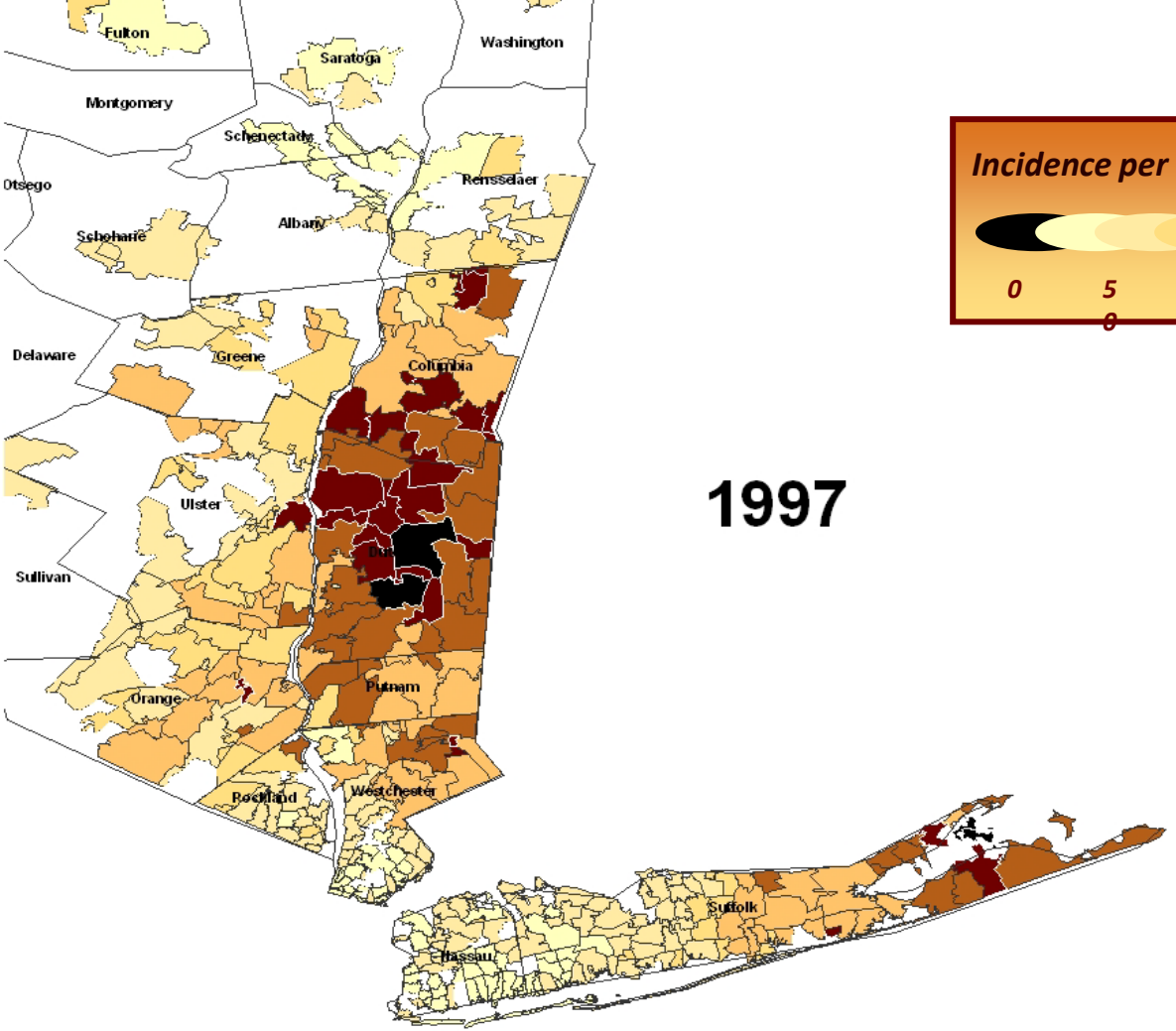

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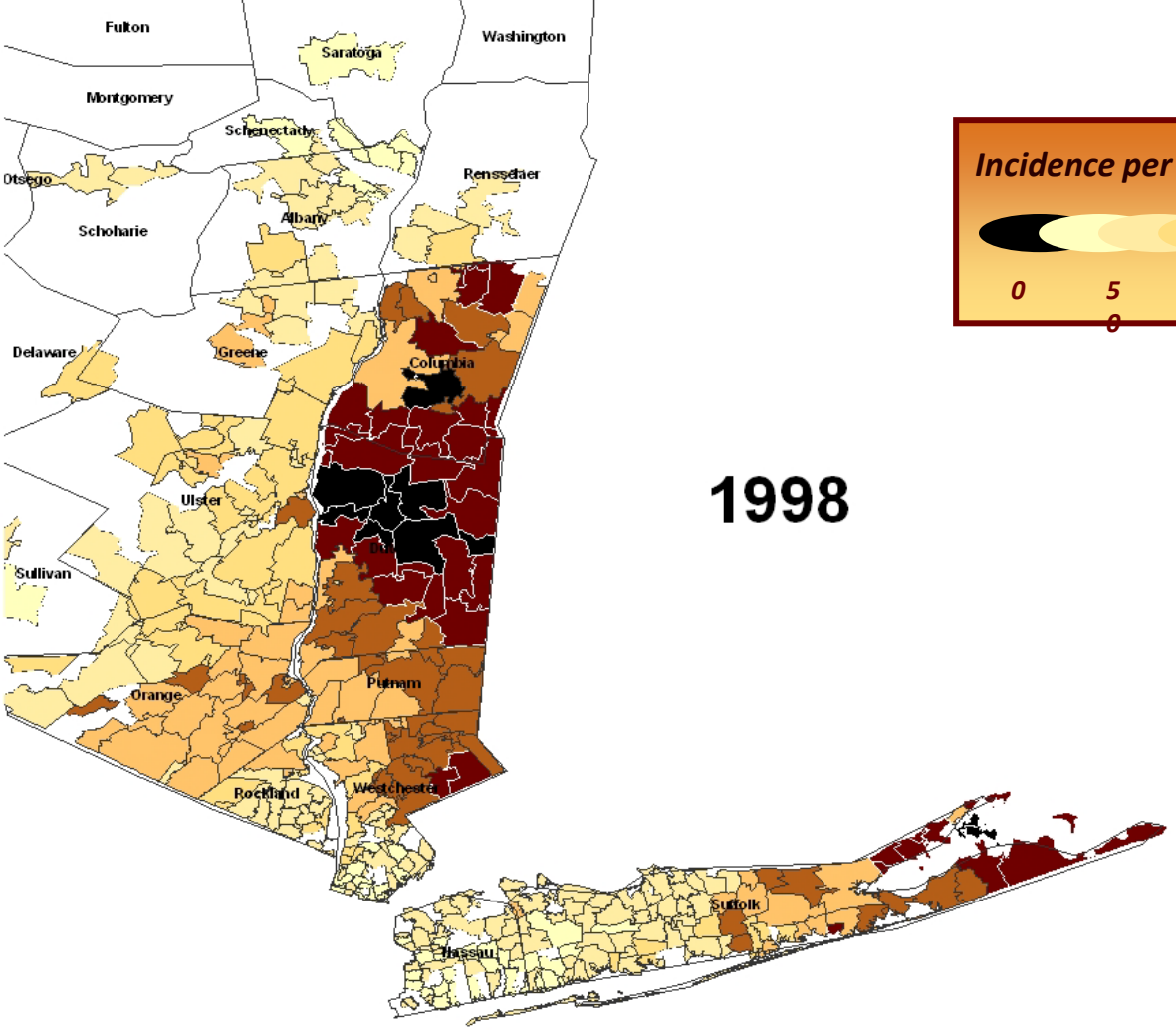

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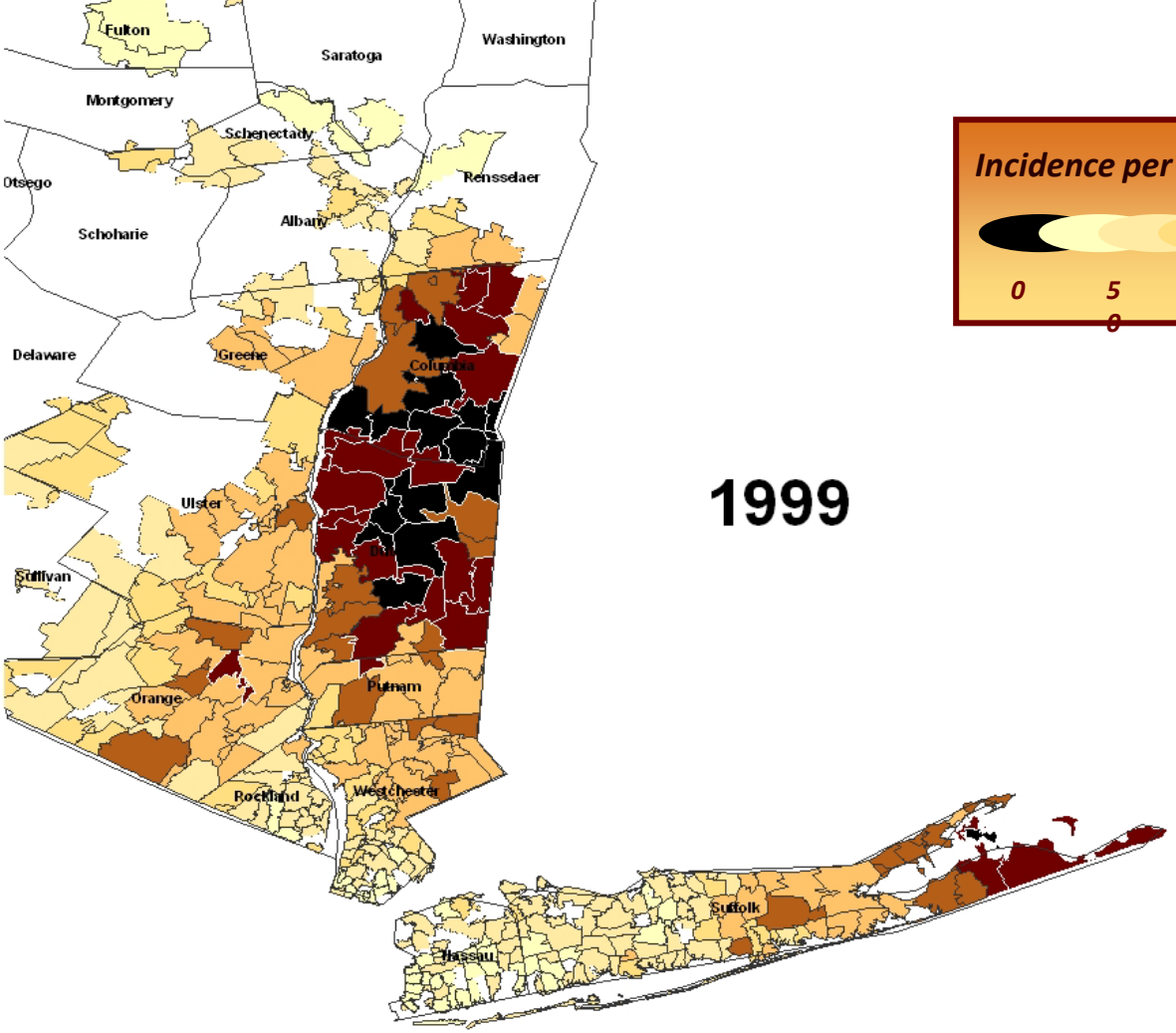

Incidence per 100,000 population

0 50 100 500 1000+

1999

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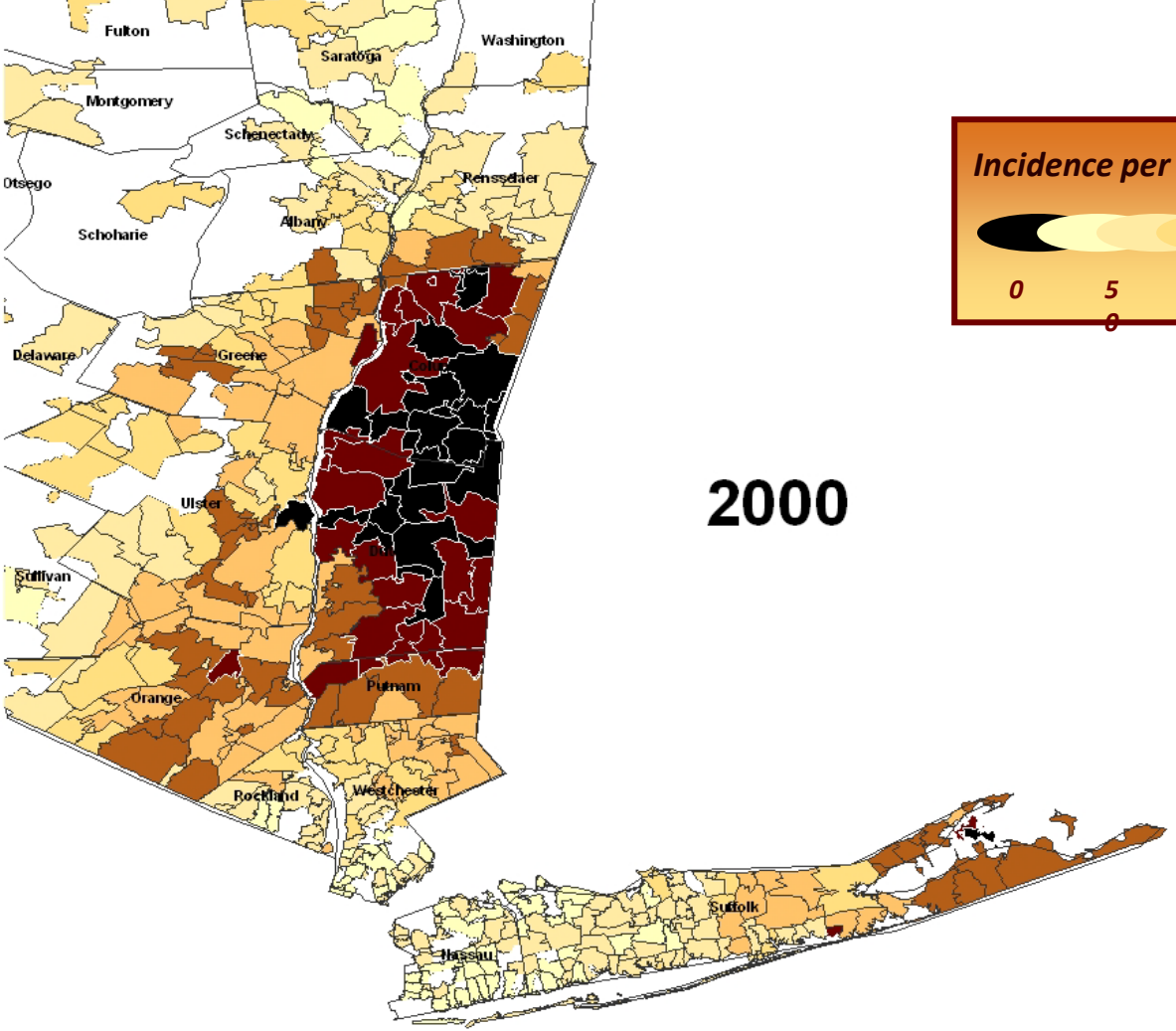

Incidence per 100,000 population

0 50 100 500 1000+

2000

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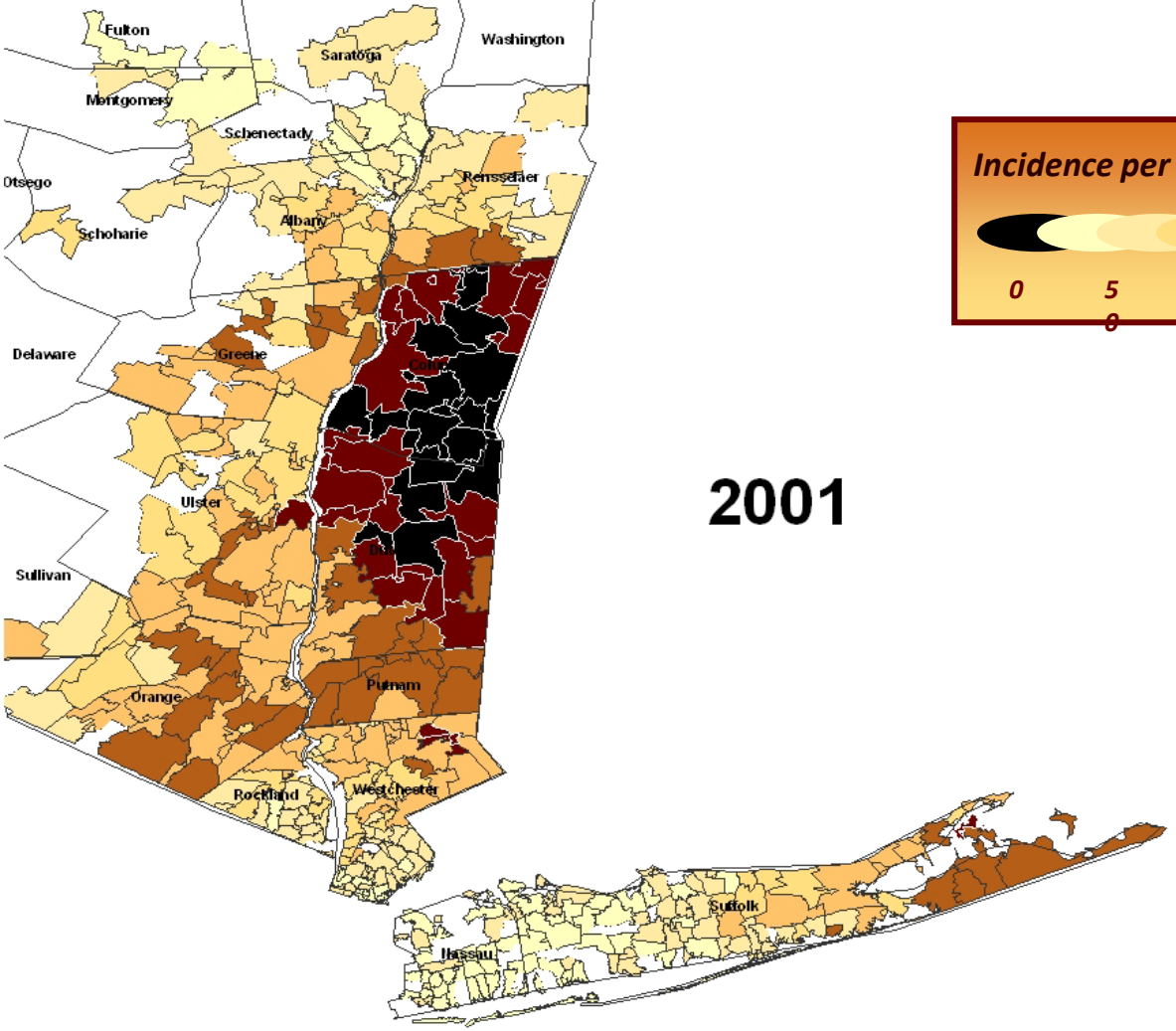

Incidence per 100,000 population

0 50 100 500 1000+

2001

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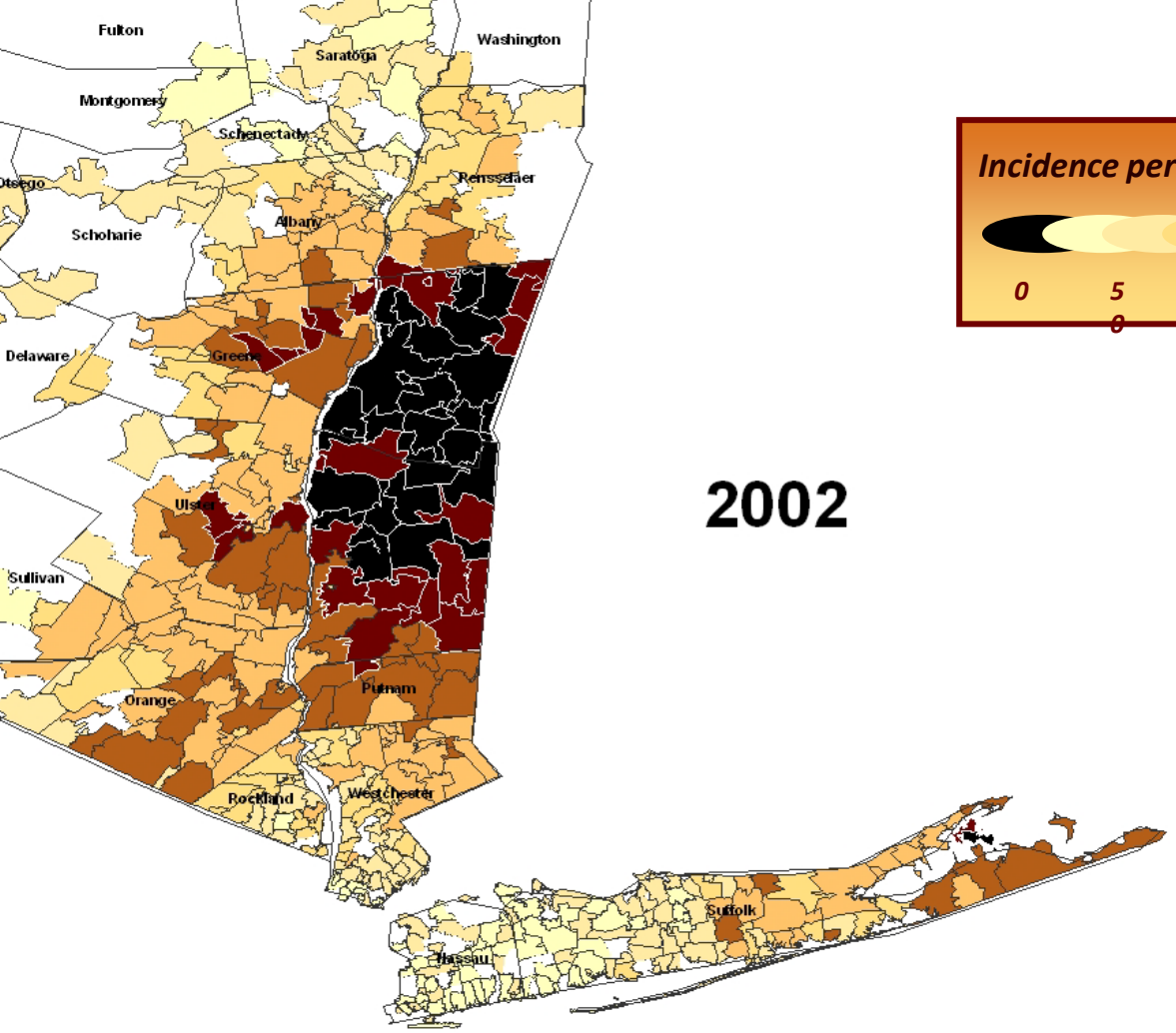

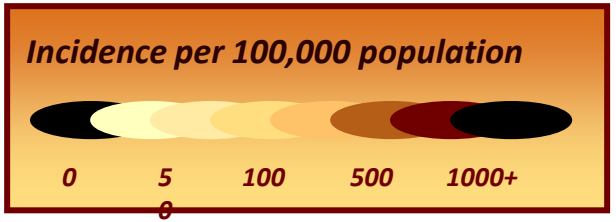

2002

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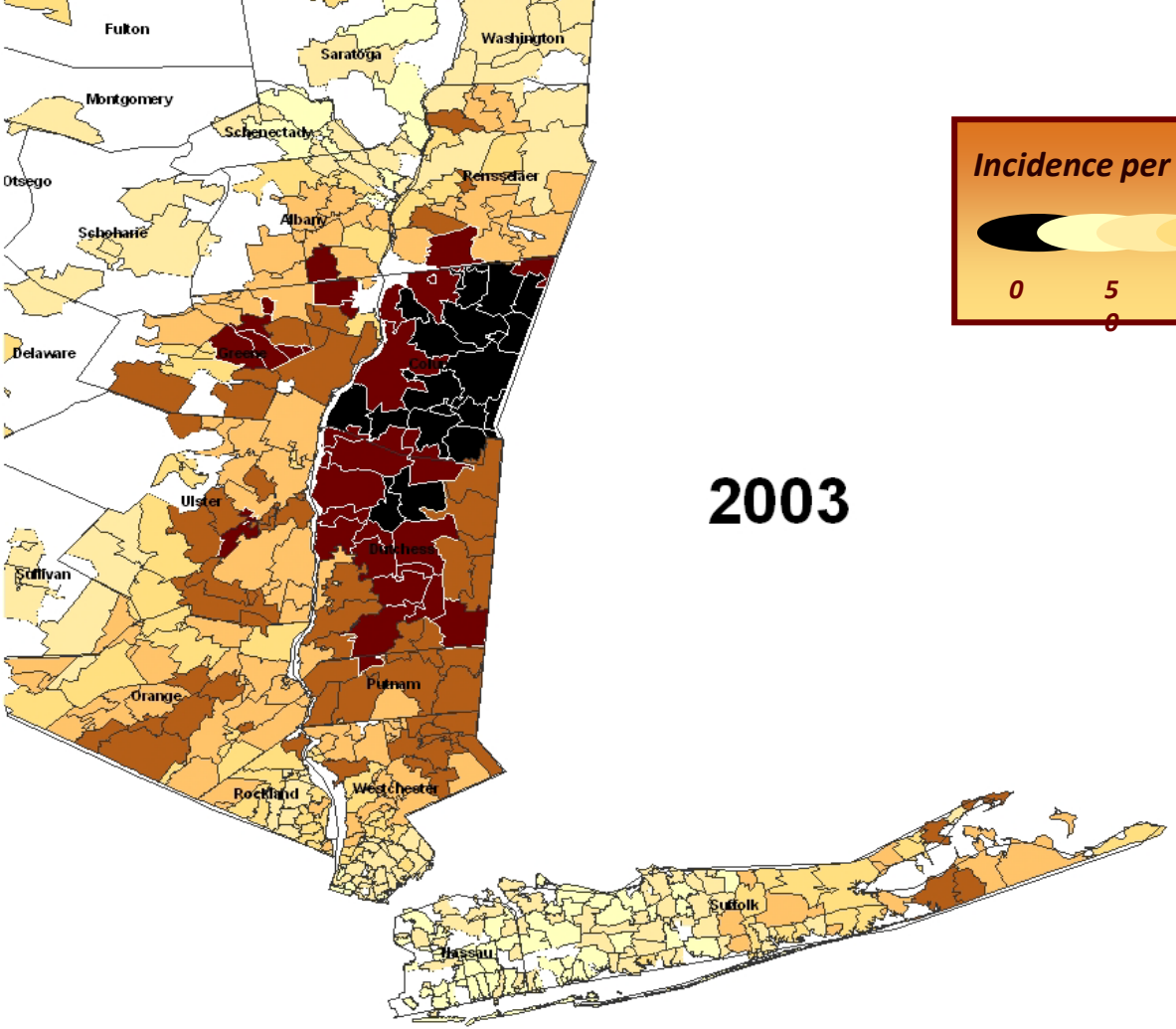

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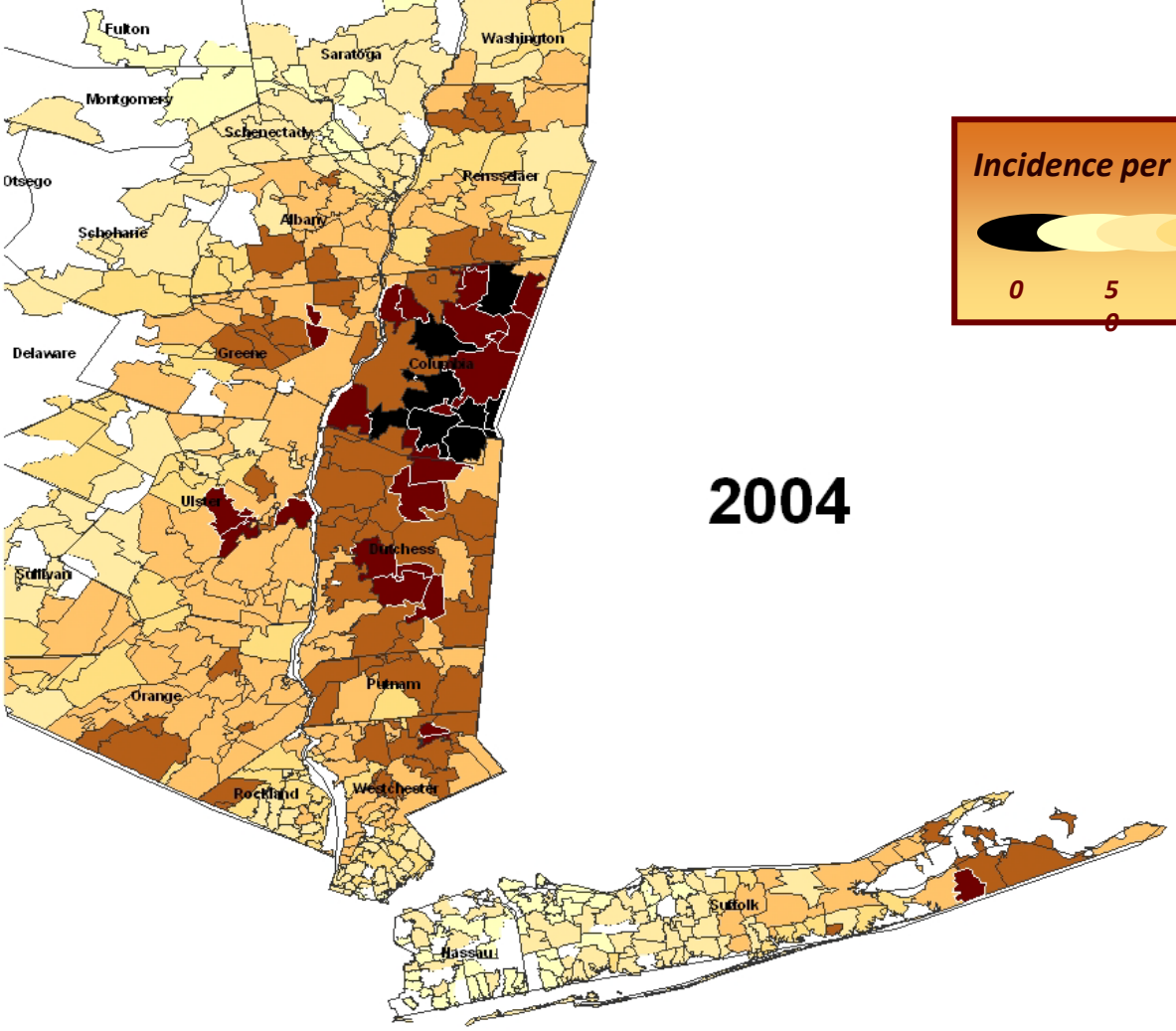

2004

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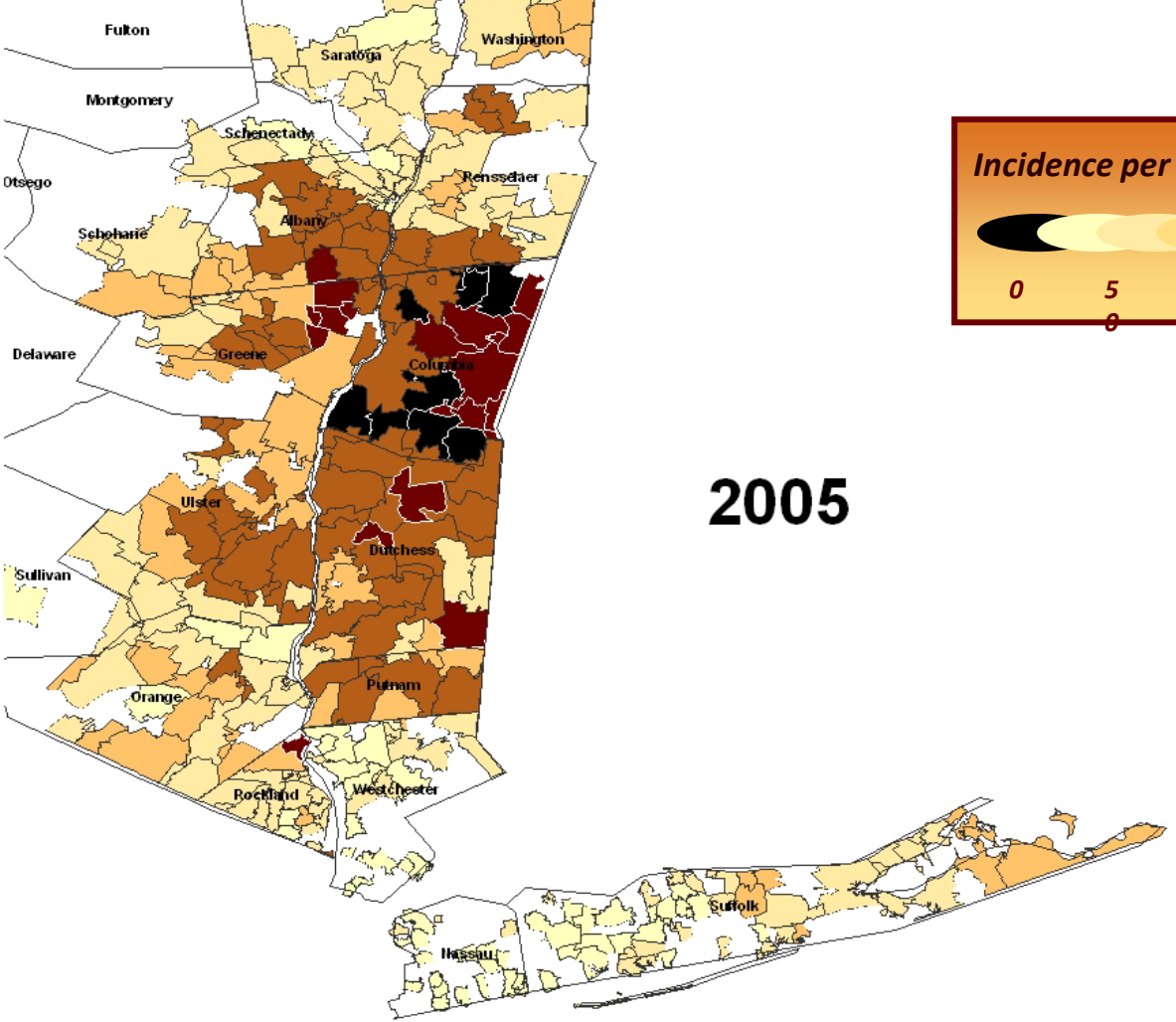

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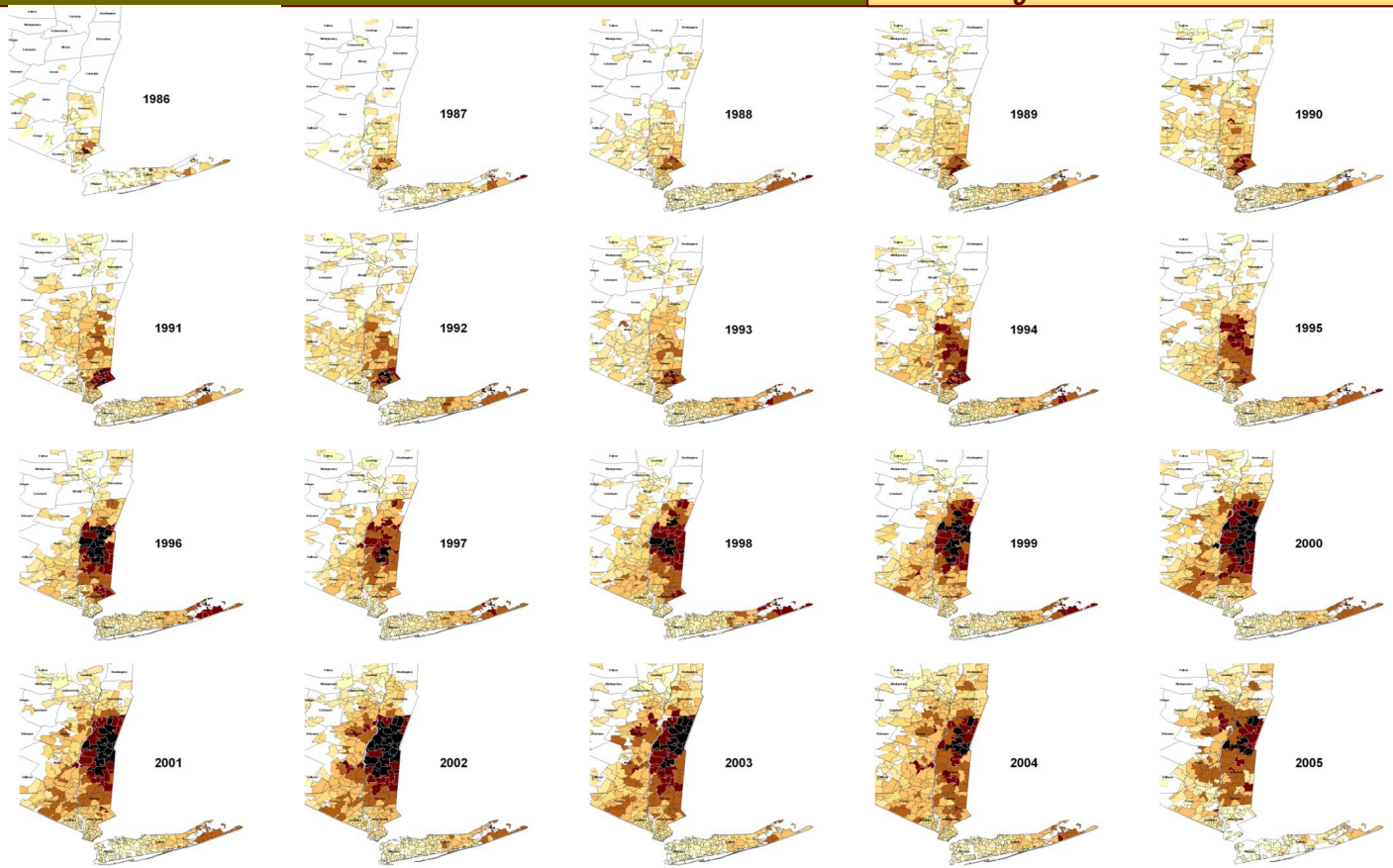
Lyme disease in New York State
1986 – 2005 by zip code



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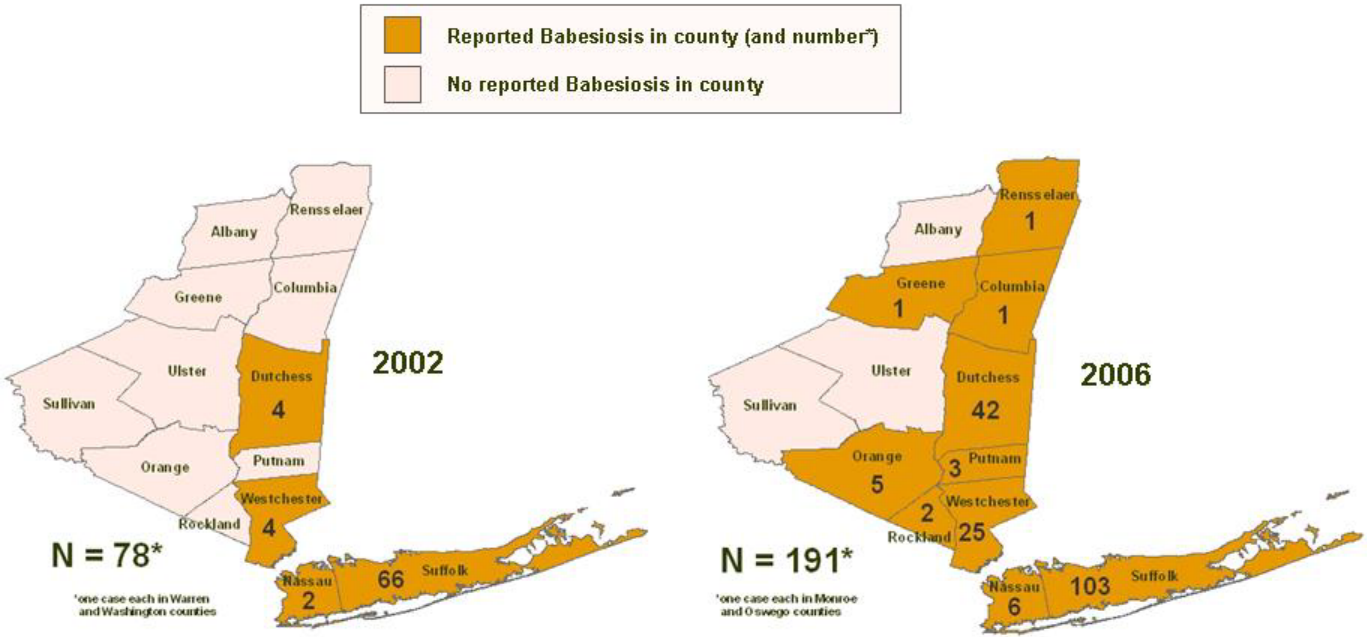
Babesiosis in New York State, 2002 vs. 2006



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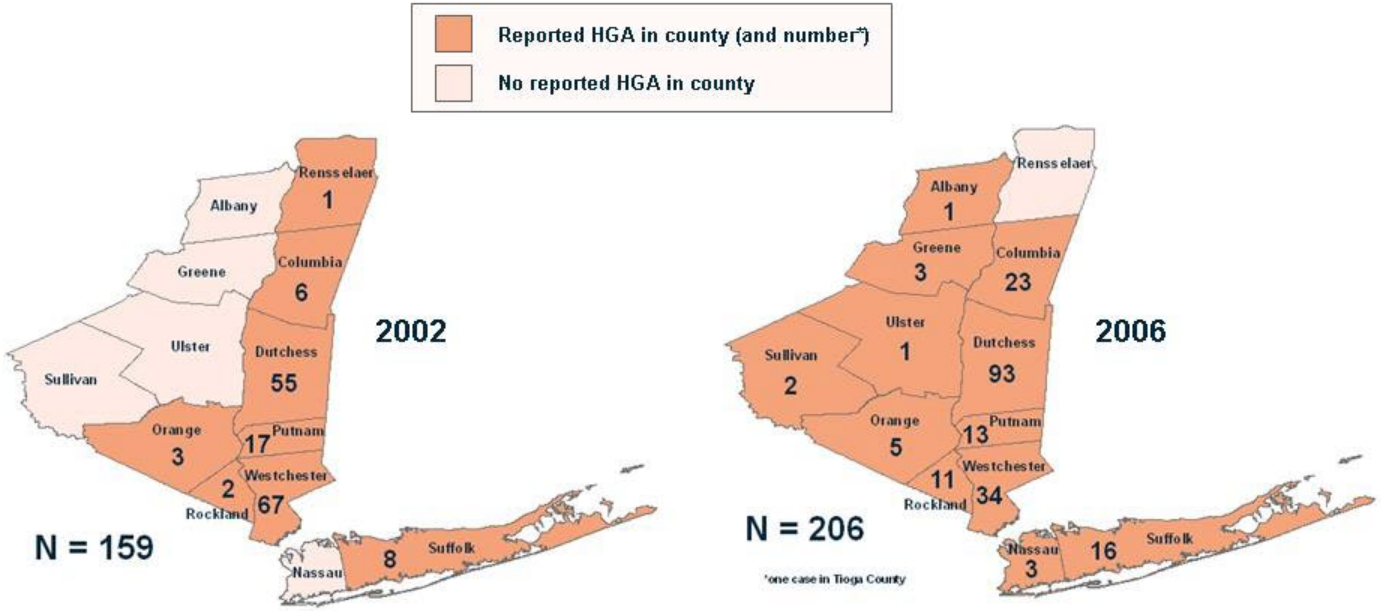
HGA in New York State, 2002 vs. 2006



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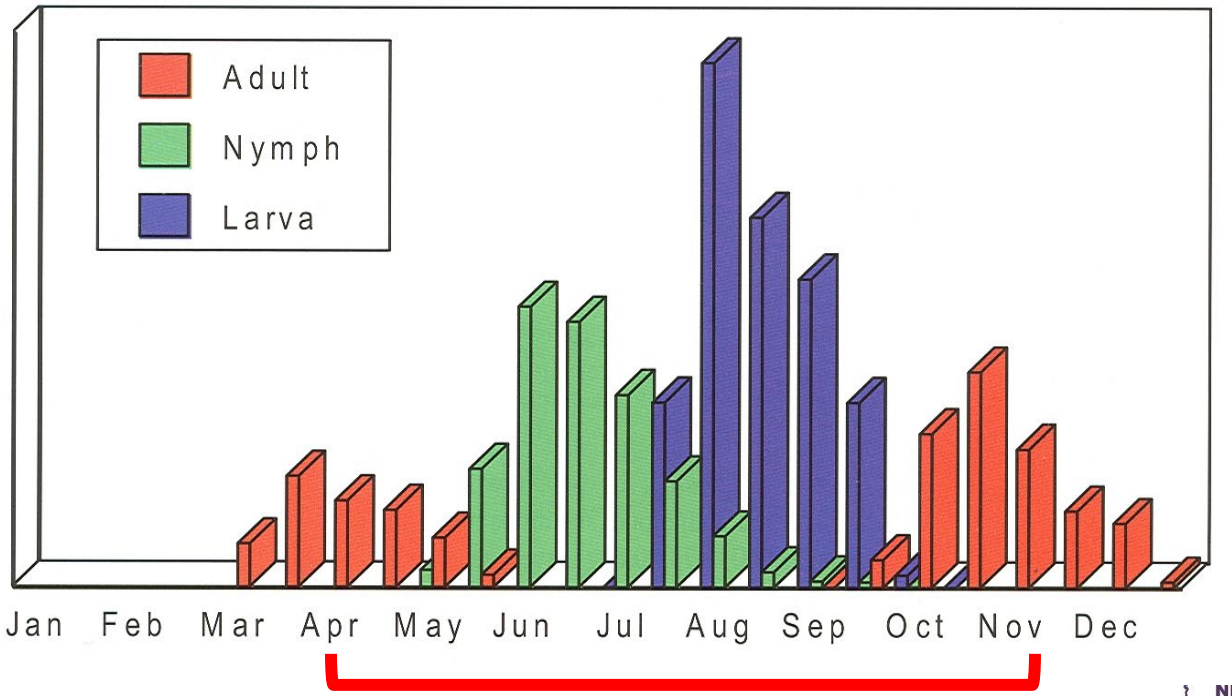
The Seasonal Life Cycle of the Deer Tick



Source: CT Agricultural Experimental Field Station

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Zika and Dengue and Chikungunya and Oropouche and Yellow Fever and Malaria

(aka, mosquito movement and risk)

Aedes albopictus
Asian tiger mosquito

Aedes aegypti
Yellow fever mosquito

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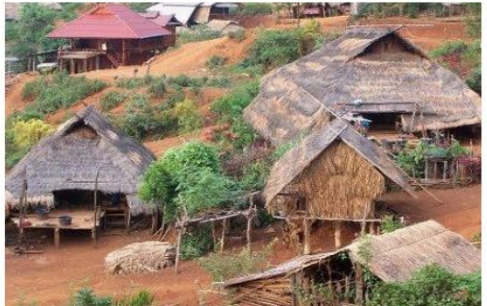
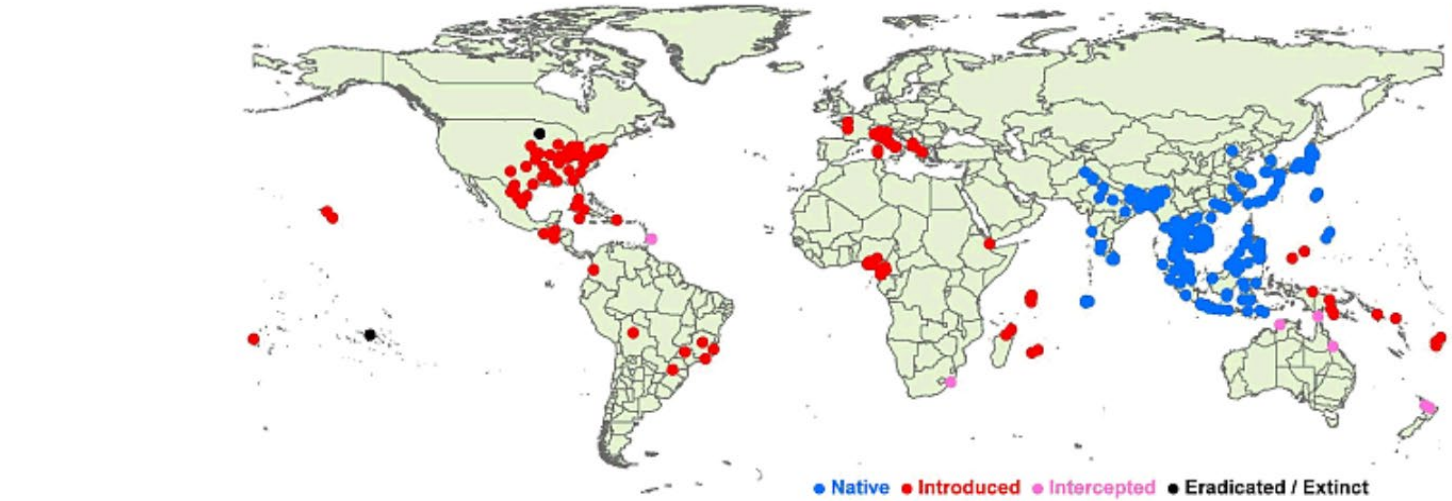
Aedes aegypti

What makes it such a good vector?

- Closely associated with humans
  - Eggs & larvae in containers
  - Adults rest inside houses
  - Feed frequently and (almost) exclusively on human blood
- Originally native to forests in West Africa
- Transported in water storage containers on slave ships around the world
- Now – in tropical and subtropical climates worldwide



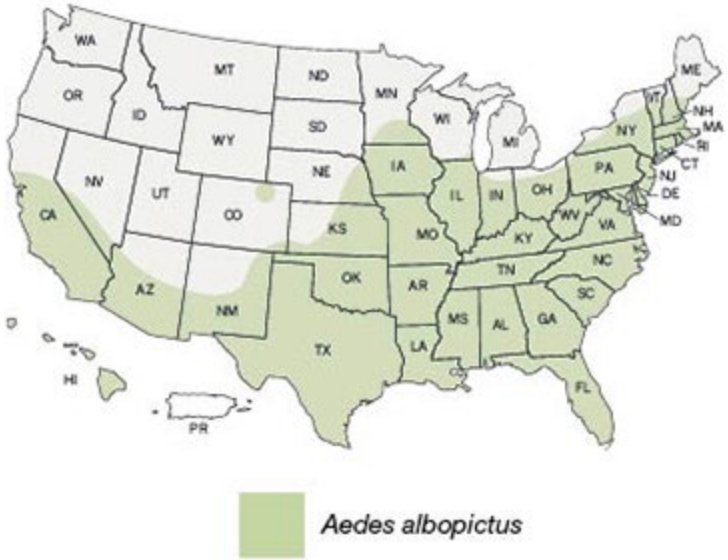
Aedes albopictus (Asian Tiger Mosquito)



- Native to forests in Southeast Asia; gradually ‘domesticated’
- Shipped around the world in used tires, ‘lucky bamboo’
- Tolerates colder temps compared to *Ae. aegypti*
- Diverse habitats – urban, suburban
- Larval breeding sites – natural to artificial
- Prefers mammal blood but also reptiles, birds, amphibians
- Introduced to Texas in 1985

CDC-published Distribution Maps

Aedes aegypti



Aedes albopictus

Aedes transmit Zika, Dengue, Chikungunya, Yellow Fever, Oropouche, etc.

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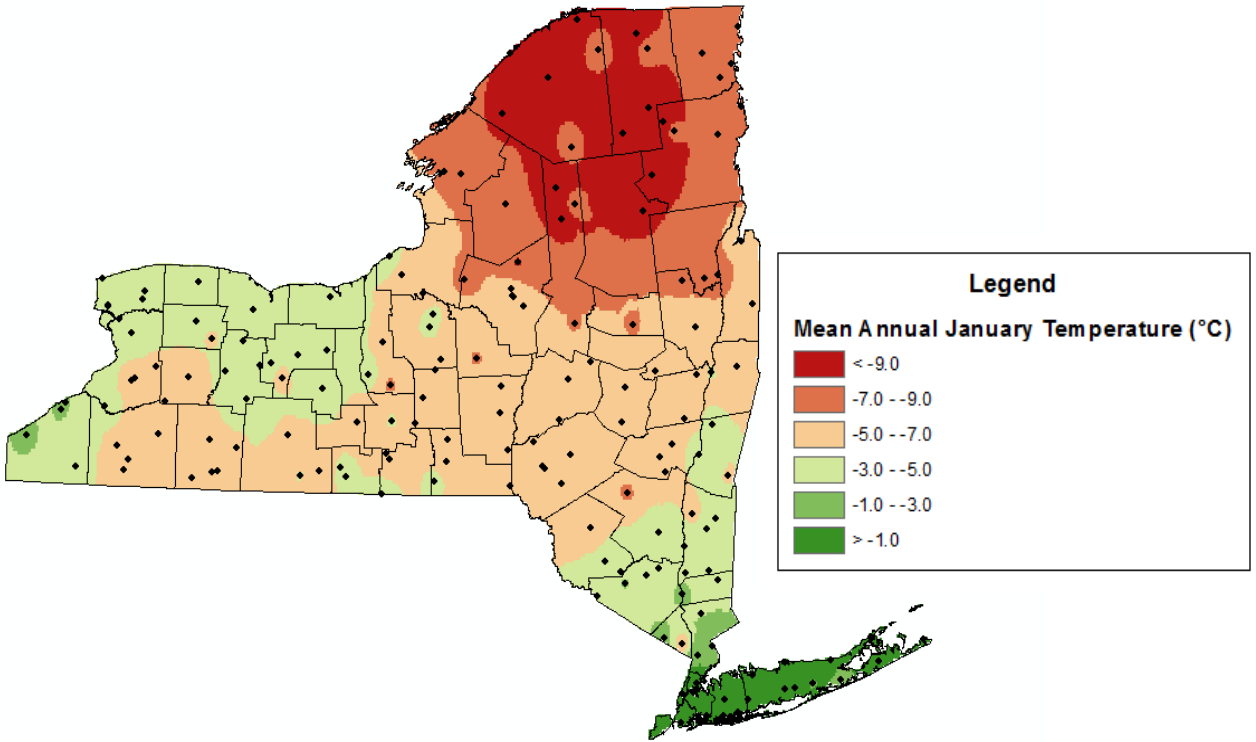
NYS January Temperature



Source: D. Lopez

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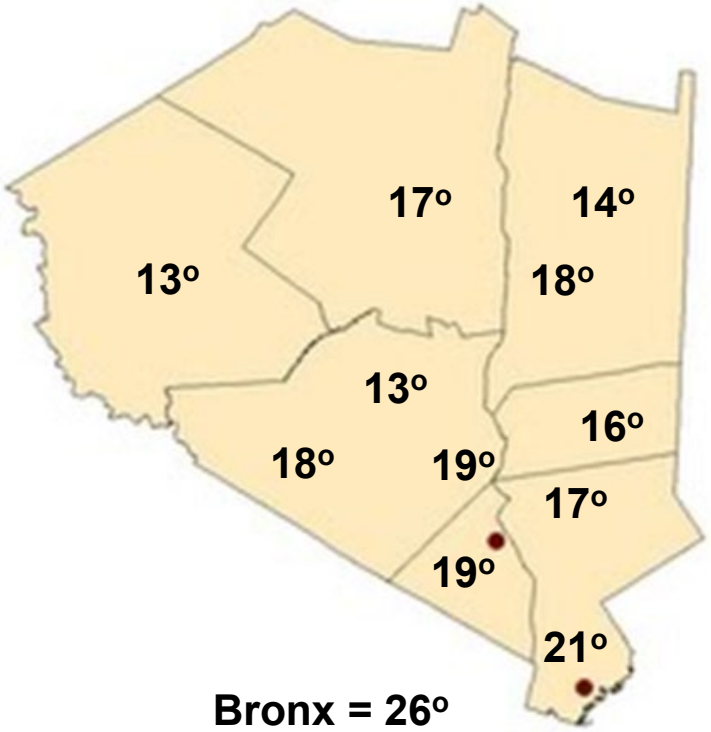
AVG. JAN. LOW TEMPERATURES (ºF)



Bronx = 26º

Larval Mosquito Abundance Summer 2015

North

South

	Total Collected			Relative Abundance (%)		
	Tri	Jap	Alb	Tri	Jap	Alb
Yorktown Heights	104	73	0	45.61	32.02	0
Armonk	1090	49	0	84.82	3.81	0
Yonkers	1176	167	42	83.29	11.83	2.98
Bronx	9	12	602	1.24	1.65	82.81

Risk for these diseases now?

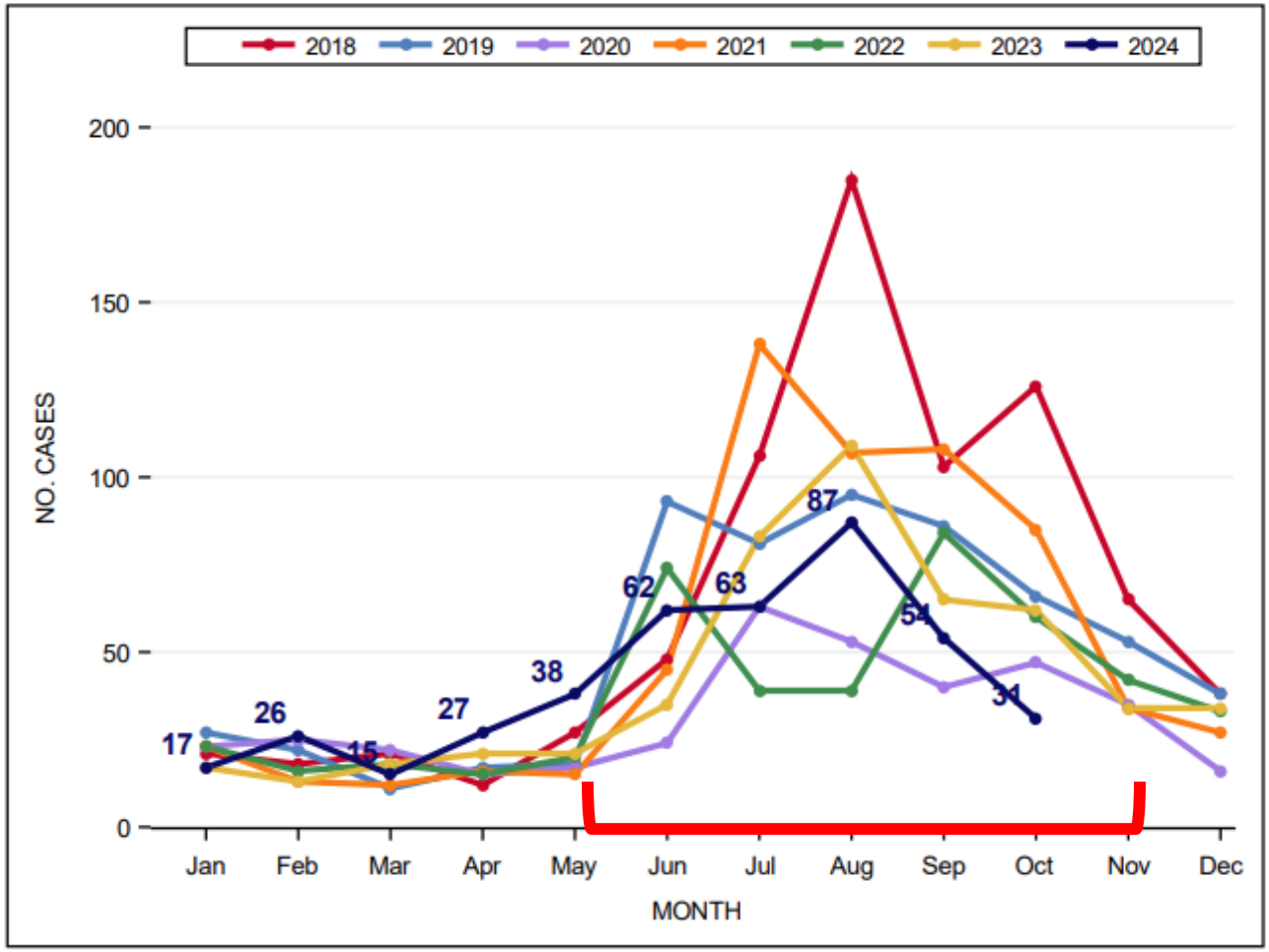
Not yet, but probably coming…

Source: M. Katz

Vibriosis (aka, hotter salt water)

Legionellosis
(aka, heat and air conditioners)

Legionellosis Cases by Month, NYS, Excluding NYC, 2018 to 2024



Likelihood of more cases, longer season

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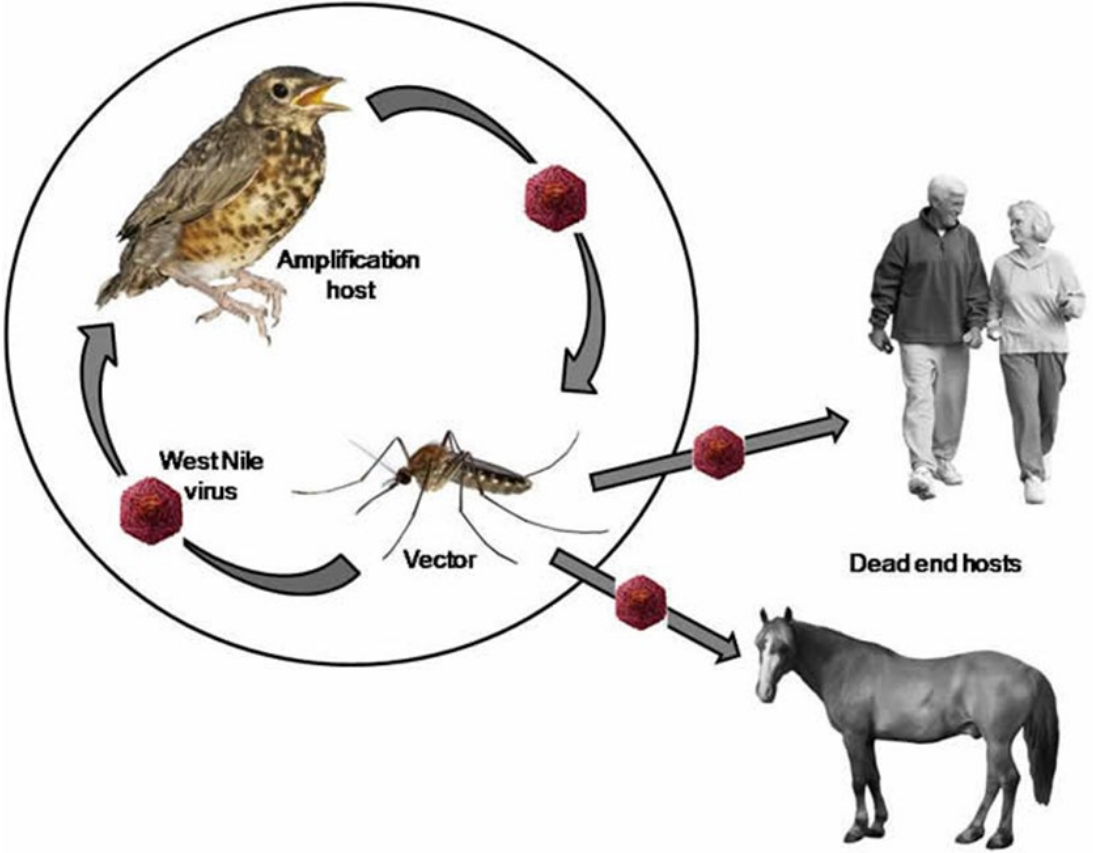
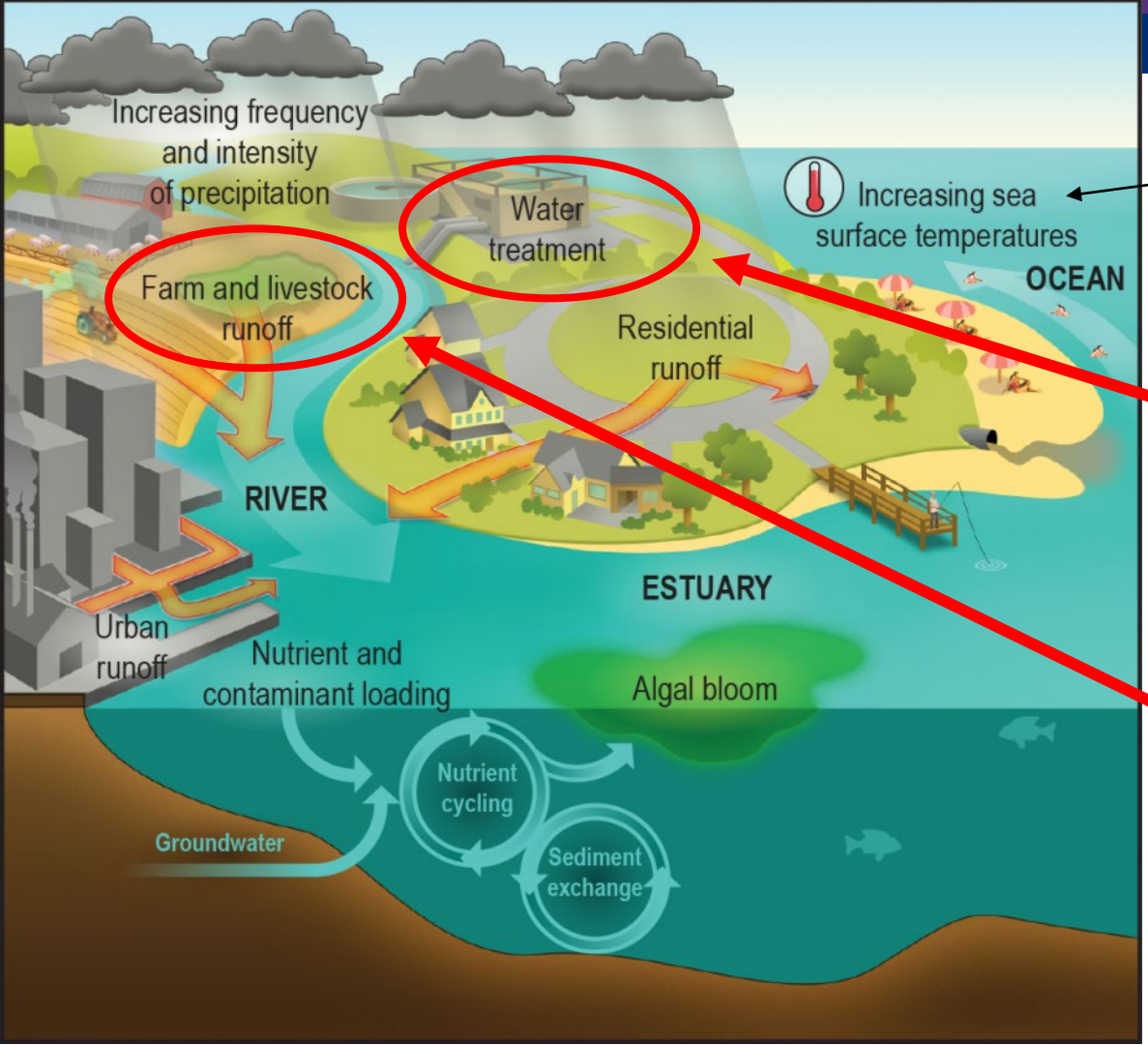
West Nile Virus, maybe Eastern Equine Encephalitis (aka, birds and mosquitoes during drought)



Food and Waterborne Diseases

(aka, flooding impacts)



See earlier slide on vibriosis!

Water treatment floods can put fecal pathogens into areas where they don't belong

Livestock runoff is one of the main drivers of many enteric diseases—salmonella, E. coli, etc.

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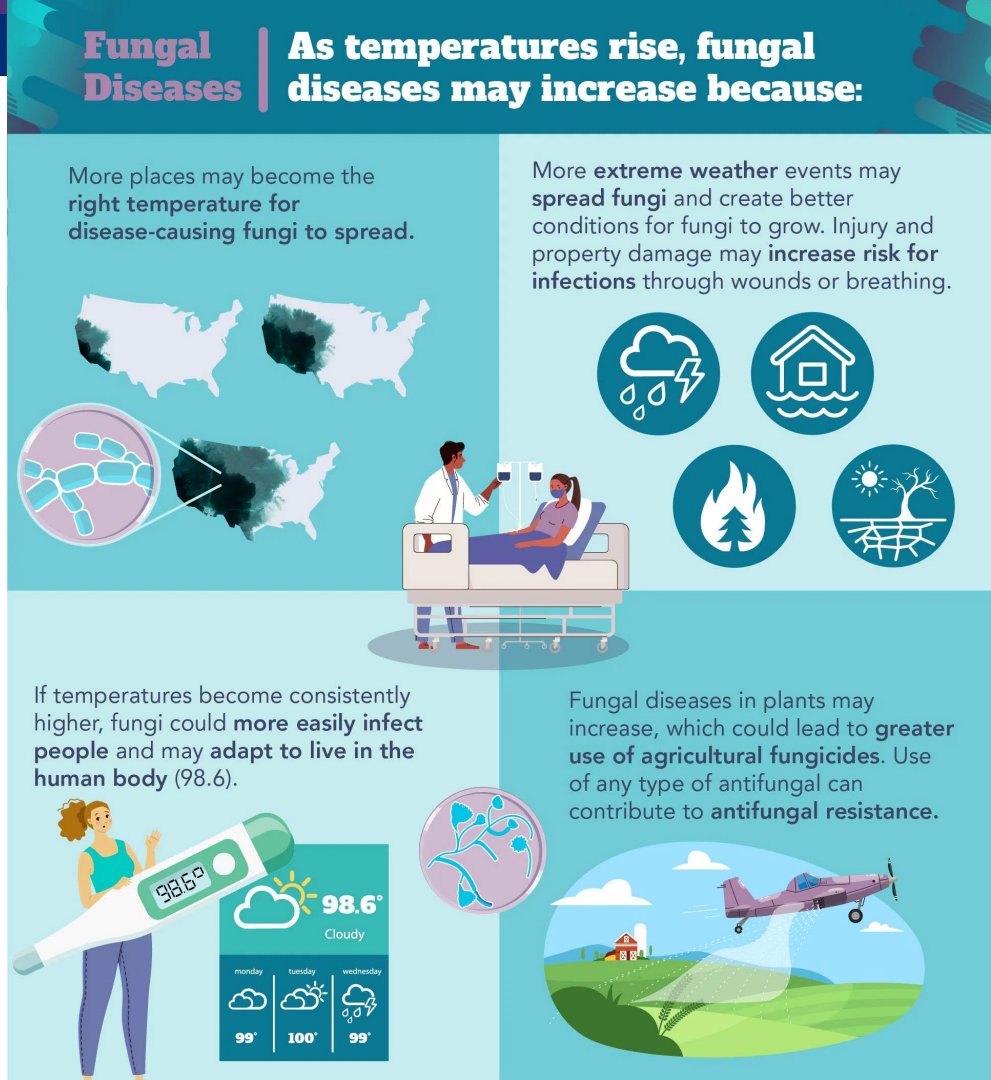
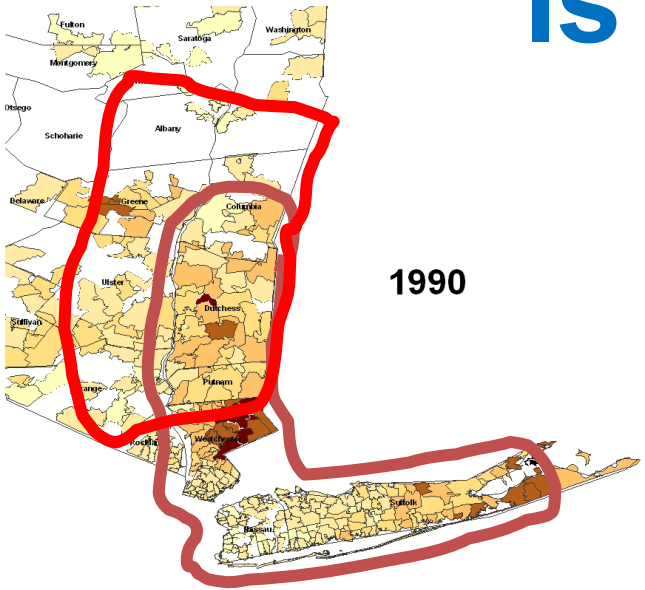
Fungal Diseases

(aka, adapting to conditions means adapting to the human body)

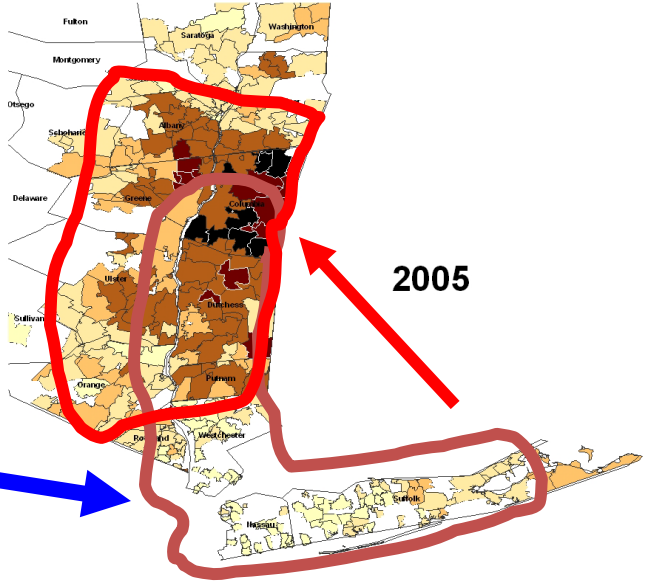
- Most fungi can’t survive human body temps
- With rising temps, fungi may be evolving to live in warmer conditions, which includes at human body temperatures
- No reportable fungal diseases yet
- Blastomycosis, histoplasmosis, Candida auris, aspergillosis, etc.



Is it this easy? Climate explains it all?



1990



2005

But what about this area?

Department of Health

Questions?

Contact

Bryon Backenson

Bureau of Communicable Disease Control

New York State Department of Health

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bryon.backenson@health.ny.gov

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