

Epidemiology of Top 10 Infectious Agents in the US

Jaidev Menon

Objective

Track the transmission of the top 10 non-COVID infectious agents throughout the US to better understand how to reduce rates of infection

Dataset

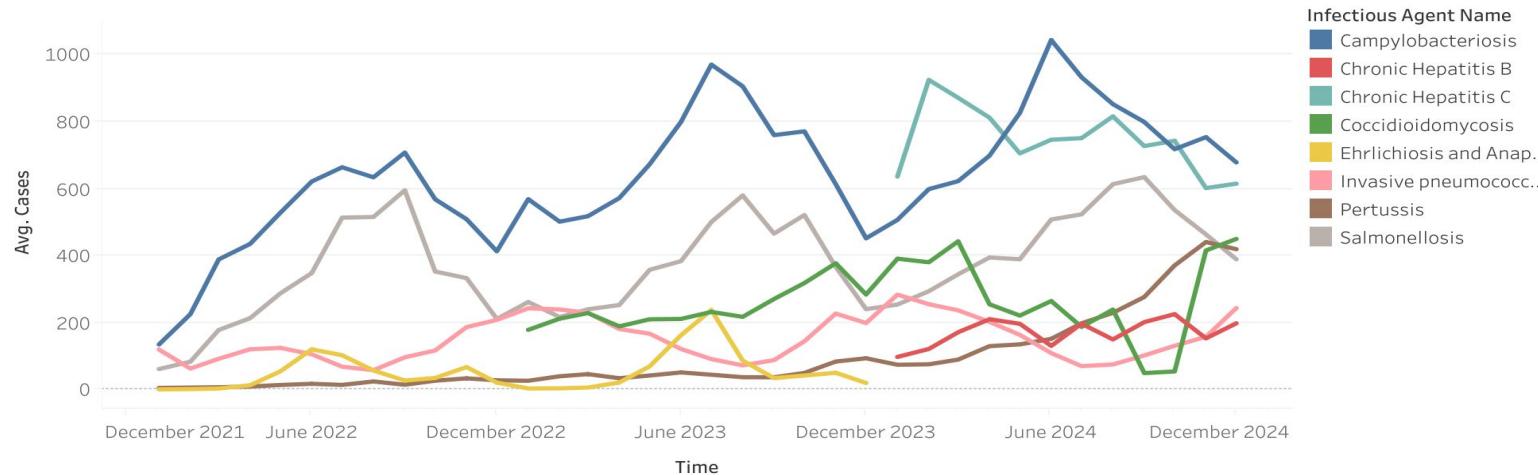
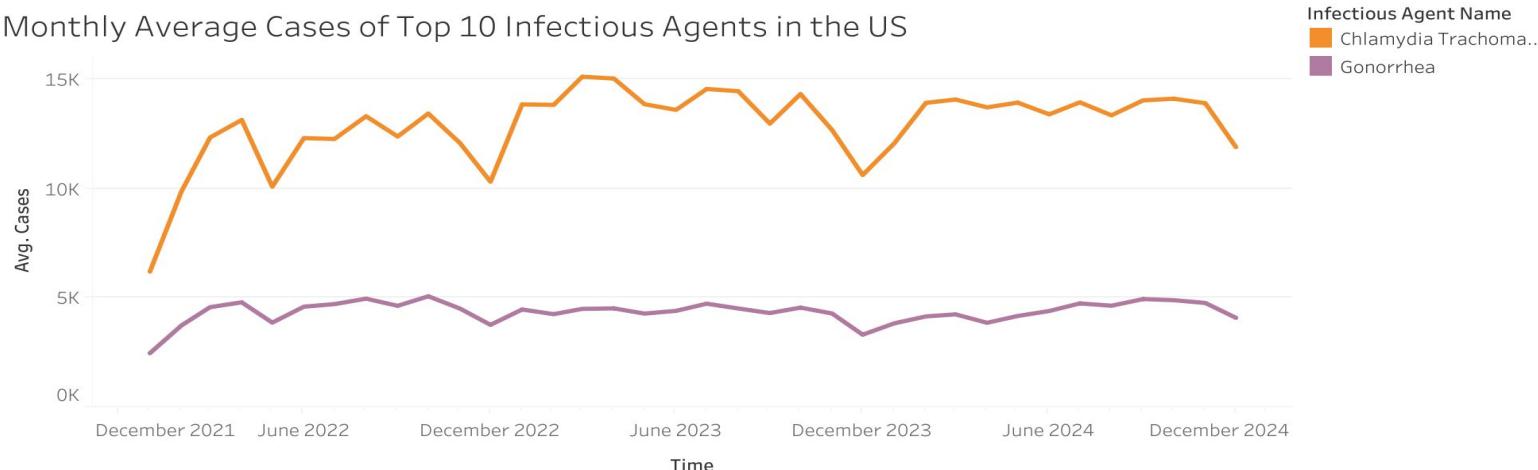
- Table taken from National Notifiable Diseases Surveillance System (NNDSS) Weekly Dataset constructed by the Office of Public Health Data, Surveillance and Technology in the CDC
- Contains the weekly cases of infectious agents divided by all US states and territories from 2022 to the present
- New York City cases not included because they were separate from New York state cases
- Top 10 Infectious Agents were chosen by picking the agents that had a maximum weekly case of at least 250

Reporting Area	Current MMWR Year	Infectious_Agent_Name	avg_cases	max_cases
ARIZONA	2022	Campylobacteriosis	21.21	50
CALIFORNIA	2022	Campylobacteriosis	104.67	175
FLORIDA	2022	Campylobacteriosis	22.85	98
MISSOURI	2022	Campylobacteriosis	8.33	24
OREGON	2022	Campylobacteriosis	10.46	25
TENNESSEE	2022	Campylobacteriosis	3.85	24
TEXAS	2022	Campylobacteriosis	26.63	65
WASHINGTON	2022	Campylobacteriosis	16.35	39
ALABAMA	2022	Chlamydia Trachomatis	474.37	641
ALASKA	2022	Chlamydia Trachomatis	18.81	111
ARIZONA	2022	Chlamydia Trachomatis	432.17	758
ARKANSAS	2022	Chlamydia Trachomatis	146.67	255
CALIFORNIA	2022	Chlamydia Trachomatis	1546.29	2391
COLORADO	2022	Chlamydia Trachomatis	259.69	592
DELAWARE	2022	Chlamydia Trachomatis	37.35	216
FLORIDA	2022	Chlamydia Trachomatis	1293.02	1931
GEORGIA	2022	Chlamydia Trachomatis	493.96	846
IDAHO	2022	Chlamydia Trachomatis	60.48	168
ILLINOIS	2022	Chlamydia Trachomatis	54.08	284
INDIANA	2022	Chlamydia Trachomatis	23.58	517
IOWA	2022	Chlamydia Trachomatis	41.58	131
KANSAS	2022	Chlamydia Trachomatis	75.02	212
KENTUCKY	2022	Chlamydia Trachomatis	296.98	480
LOUISIANA	2022	Chlamydia Trachomatis	271.02	677
MAINE	2022	Chlamydia Trachomatis	41.33	77
MASSACHUSETTS	2022	Chlamydia Trachomatis	79.63	476
MICHIGAN	2022	Chlamydia Trachomatis	169.87	278
MINNESOTA	2022	Chlamydia Trachomatis	88.23	393

Top 10 Infectious Agents in the US

1. Chlamydia Trachomatis
2. Gonorrhea
3. Campylobacteriosis
4. Chronic Hepatitis C
5. Salmonellosis
6. Pertussis
7. Coccidioidomycosis
8. Invasive pneumococcal disease
9. Chronic Hepatitis B
10. Ehrlichiosis and Anaplasmosis

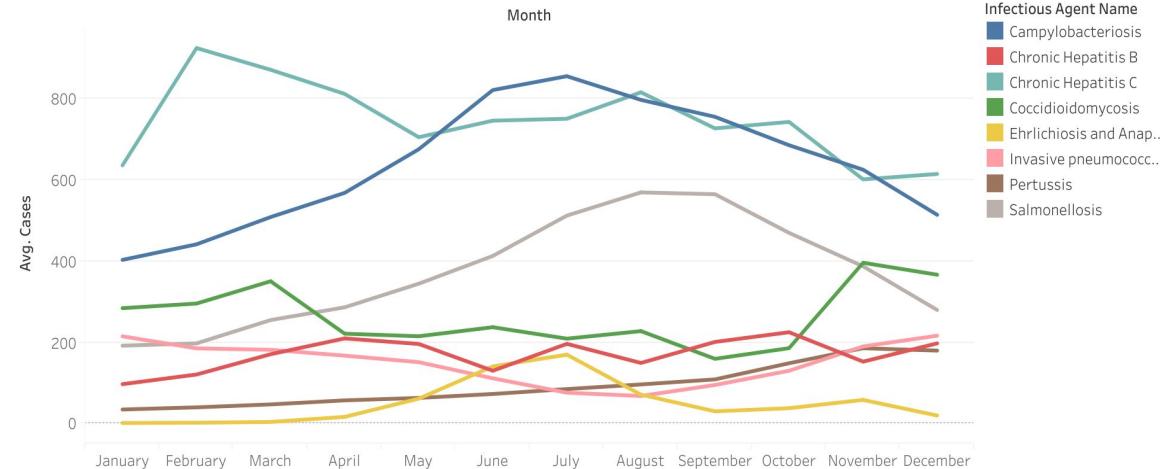
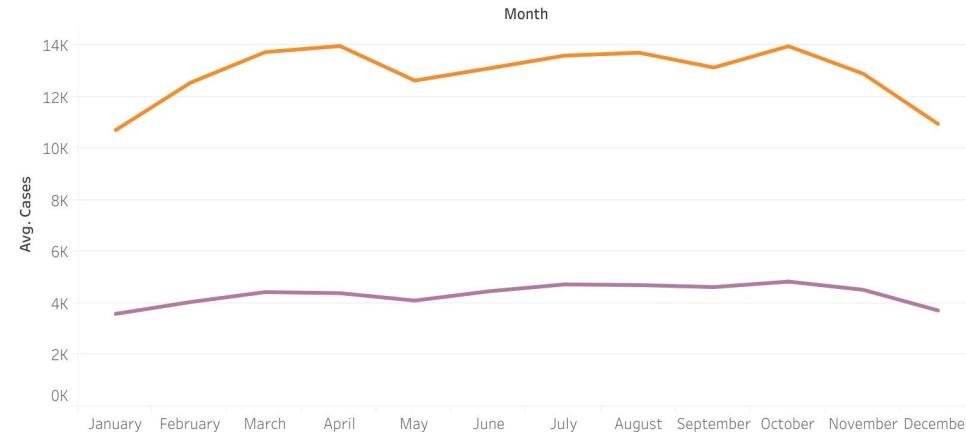
Monthly Average Cases of Top 10 Infectious Agents in the US



Seasonal Preferences

- Campylobacteriosis, Ehrlichiosis and Anaplasmosis common in summer months
- Salmonellosis common in Fall
- Coccidiomycosis and Invasive pneumococcal disease common in winter months
- Pertussis common in December
- Gonorrhea rates consistent throughout the year

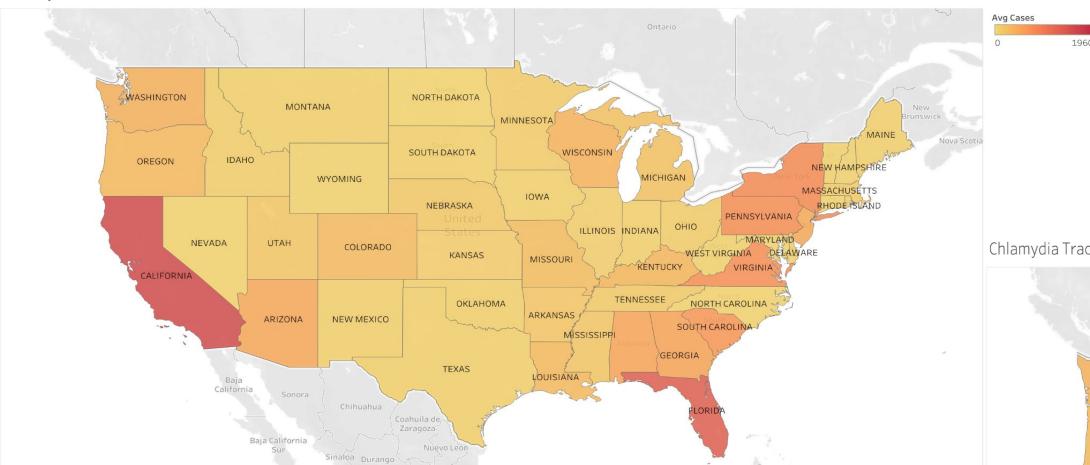
Seasonal Cases of Top 10 Infectious Agents in the US



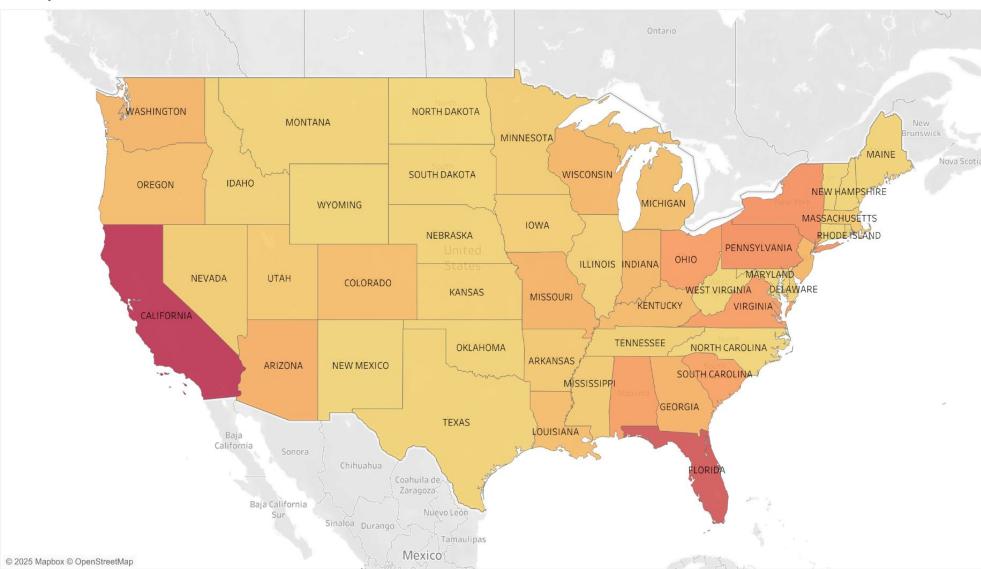
Infectious Agent Name
■ Chlamydia Trachoma..
■ Gonorrhea

Infectious Agent Name
■ Campylobacteriosis
■ Chronic Hepatitis B
■ Chronic Hepatitis C
■ Coccidioidomycosis
■ Ehrlichiosis and Anap..
■ Invasive pneumococc..
■ Pertussis
■ Salmonellosis

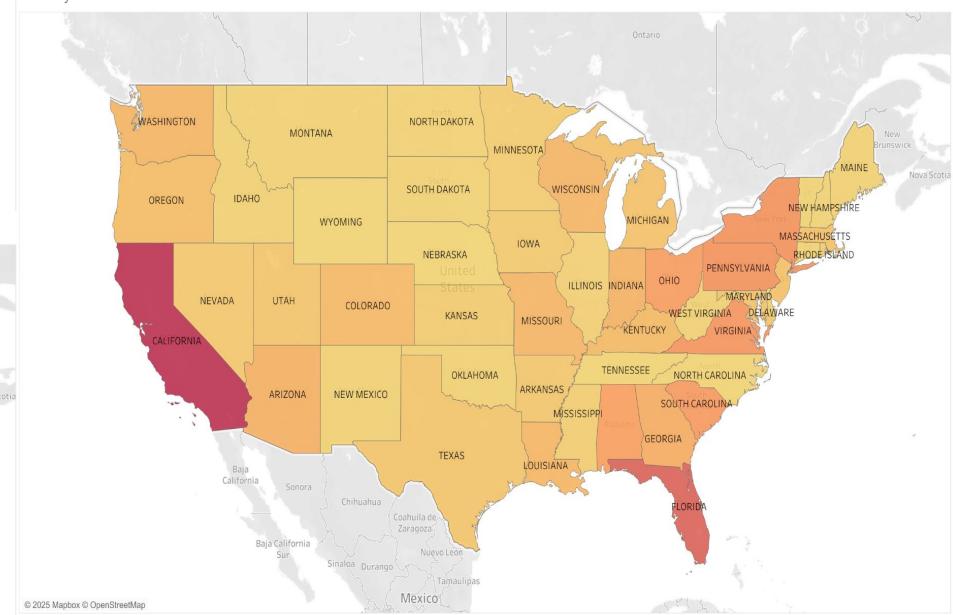
Chlamydia Trachomatis - 2022



Chlamydia Trachomatis - 2023

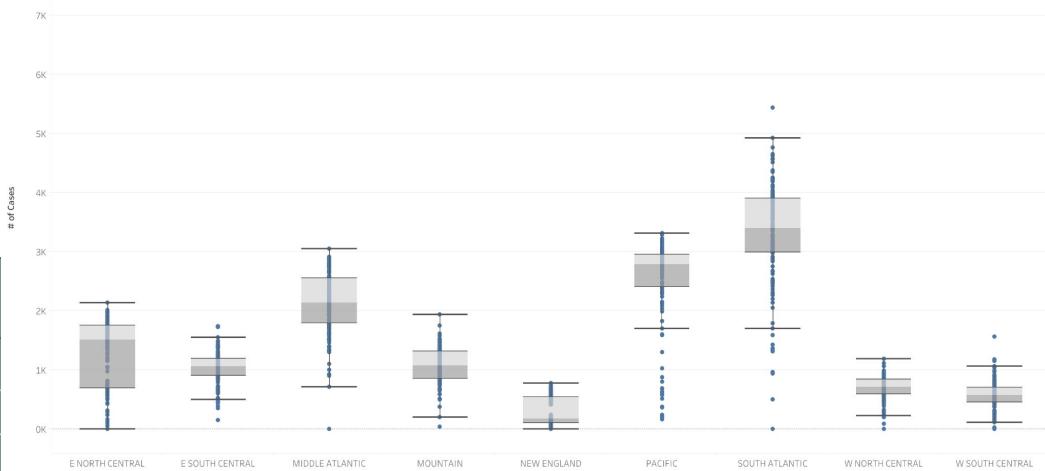
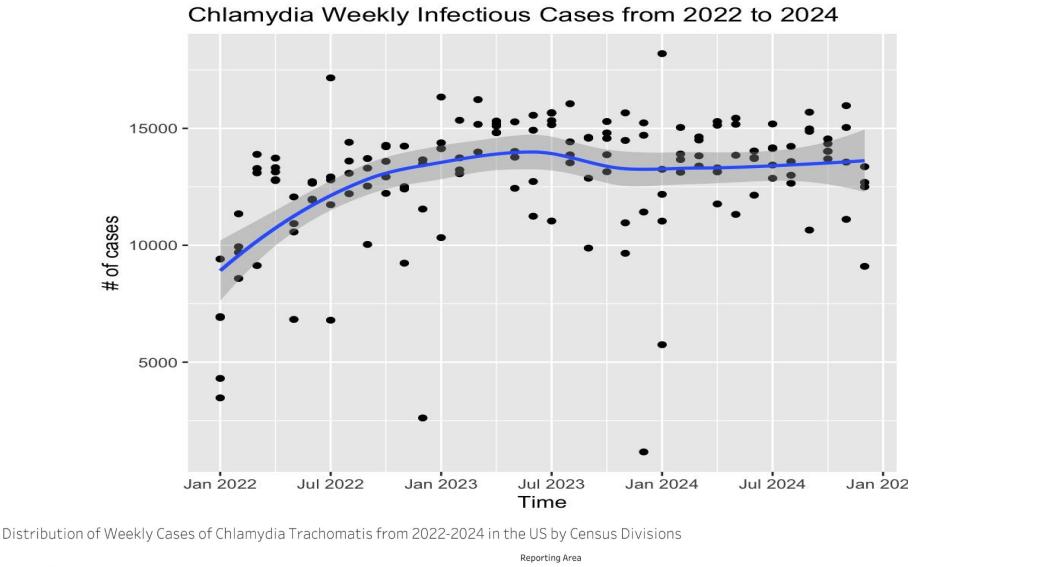


Chlamydia Trachomatis - 2024



Chlamydia

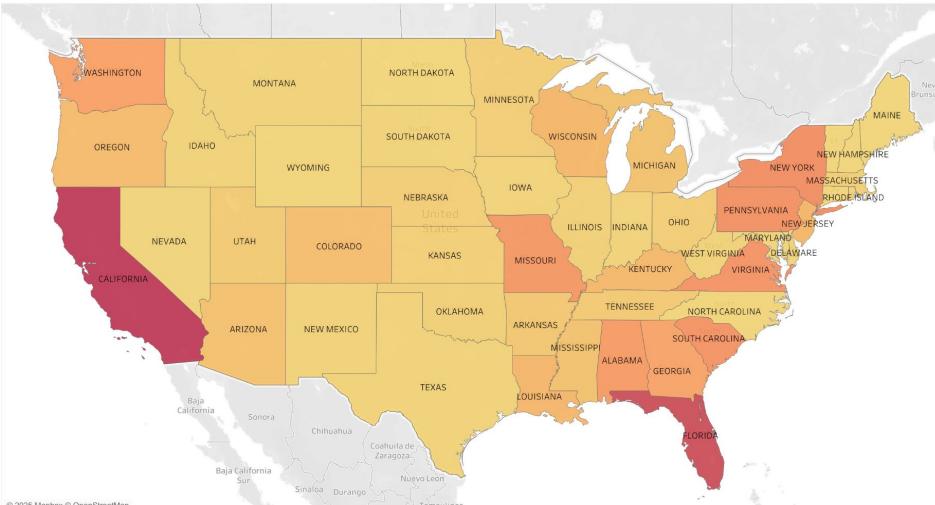
- Most prevalent in South Atlantic, Pacific and Middle Atlantic regions of US
- High number of cases in California and Florida
- Significant increase in cases from 2022-2023
- Not much geographical spread over time



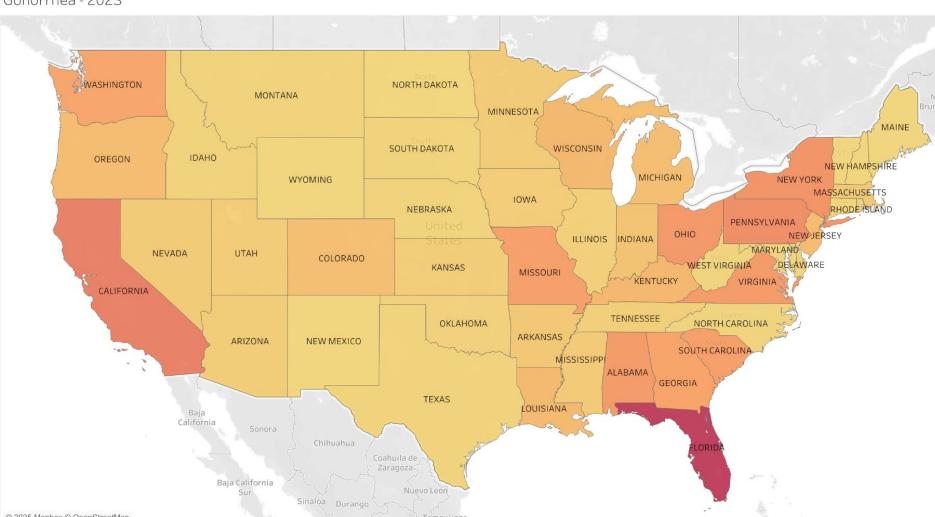
Background Info and Prevention Strategies

- *Chlamydia Trachomatis*: gram-negative obligate intracellular bacteria
- Sexually transmitted infection
- Causes conjunctivitis, urethritis, pelvic inflammatory disease (PID) and reactive arthritis
- Tx: antibiotics azithromycin and doxycycline
- Encourage safe sex practices and condom usage
- Raise awareness of chlamydia in the regions of California and Florida

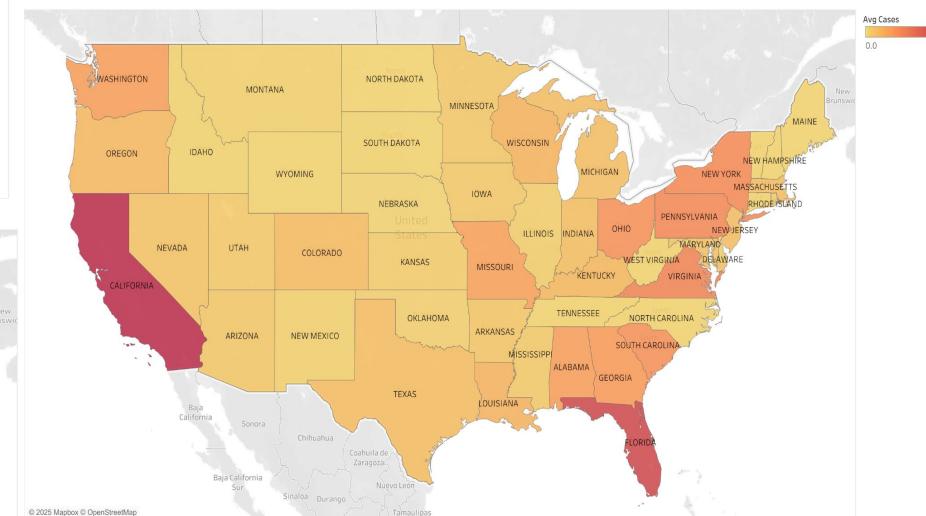
Gonorrhea - 2022



Geographia 2023



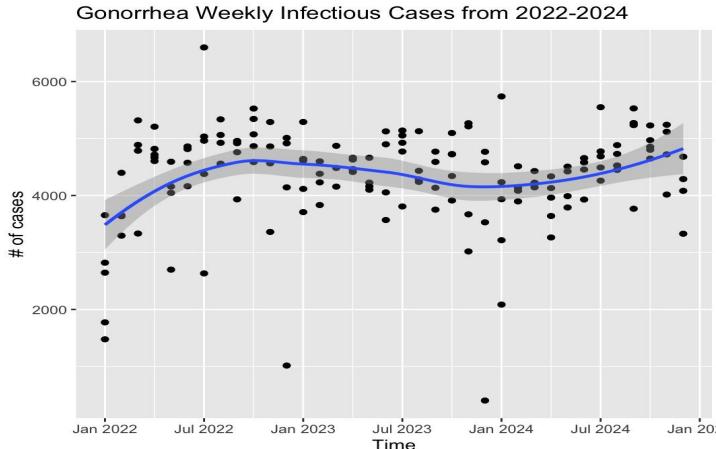
Gonorrhea - 2024



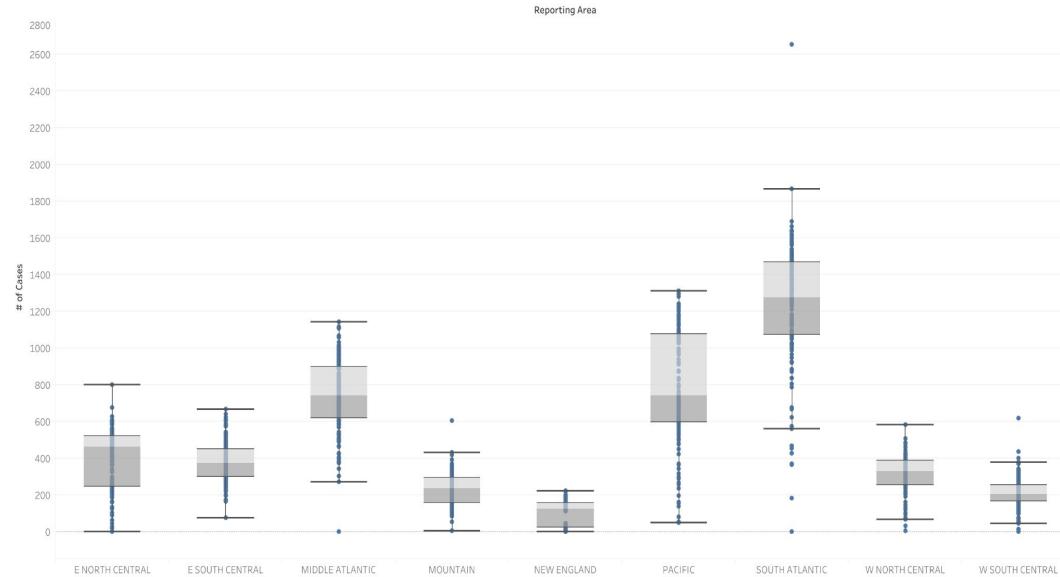
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Gonorrhea

- Most prevalent in South Atlantic, Pacific and Middle Atlantic regions of the US
- Nonsignificant change in cases from 2022-2024
- Not much geographical spread over time
- Transmission similar to chlamydia due to co-infection



Distribution of Weekly Cases of Gonorrhea from 2022-2024 in the US by Census Divisions

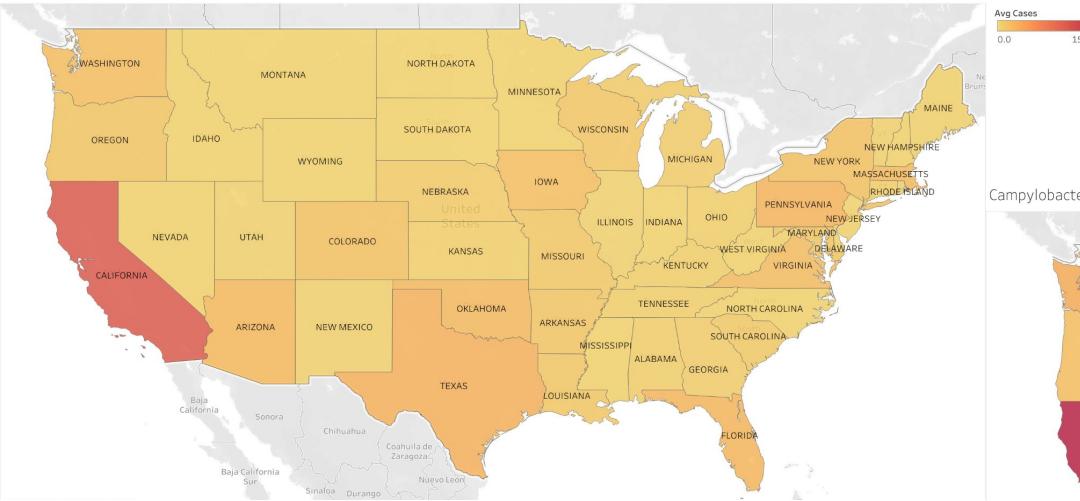


Year	Average Cases	Diff. in Cases	% change	p-value
2022	4,312.17			
2023	4,365.71	53.53	1.24	0.77
2024	4,397.40	31.7	0.73	0.82

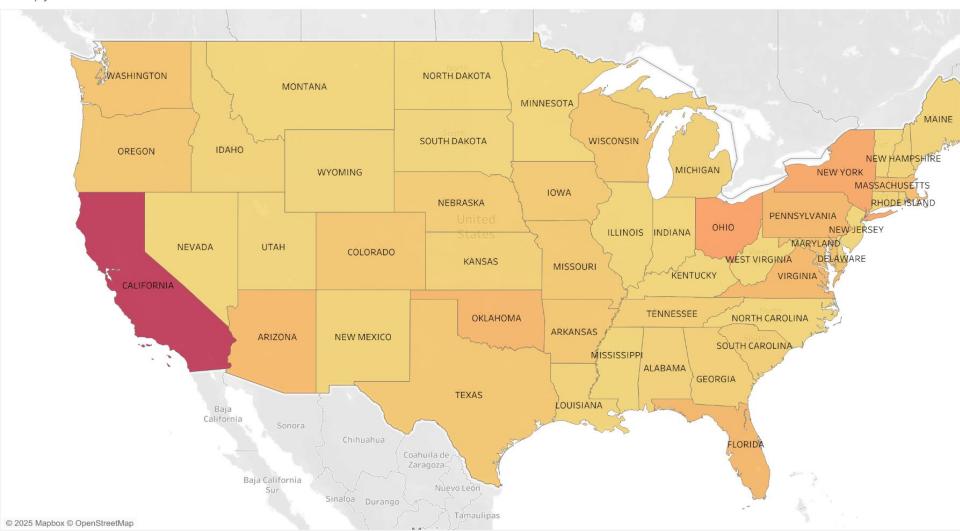
Background Info and Prevention Strategies

- *Neisseria Gonorrhoeae*: Gram-negative diplococci bacteria
- Sexually Transmitted Infection
- Causes gonorrhea, septic arthritis, neonatal conjunctivitis, pelvic inflammatory disease (PID) and Fitz-Hugh-Curtis Syndrome
- Tx: antibiotics ceftriaxone and azithromycin
- Recommend same prevention strategies as chlamydia in the same regions

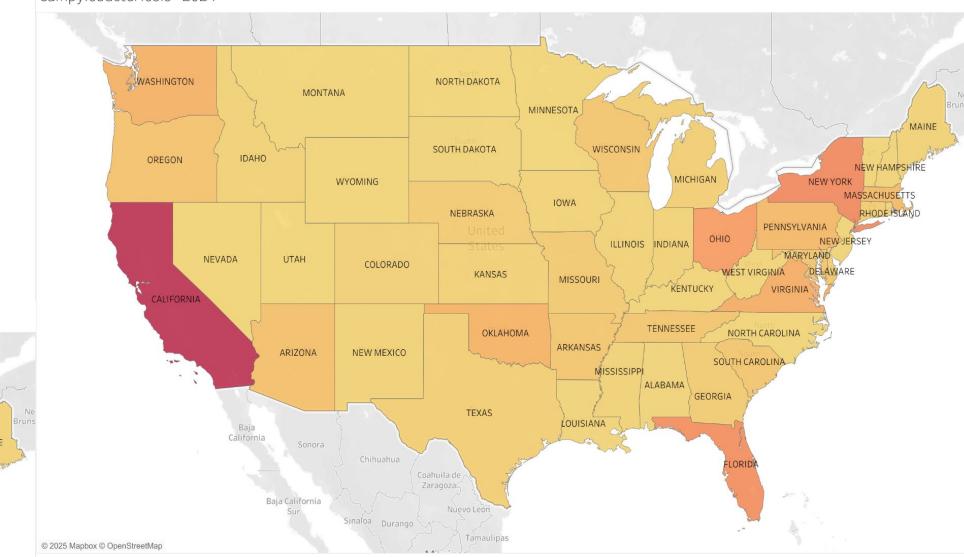
Campylobacteriosis - 2022



Campylobacteriosis - 2023



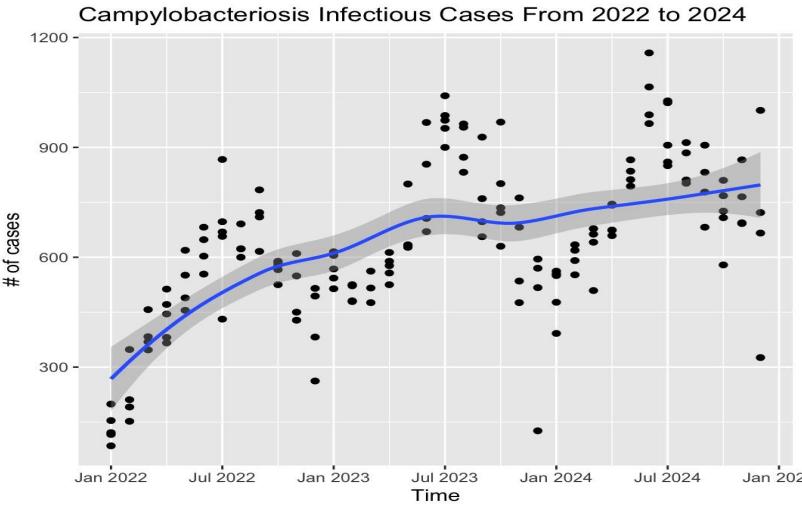
Campylobacteriosis - 20



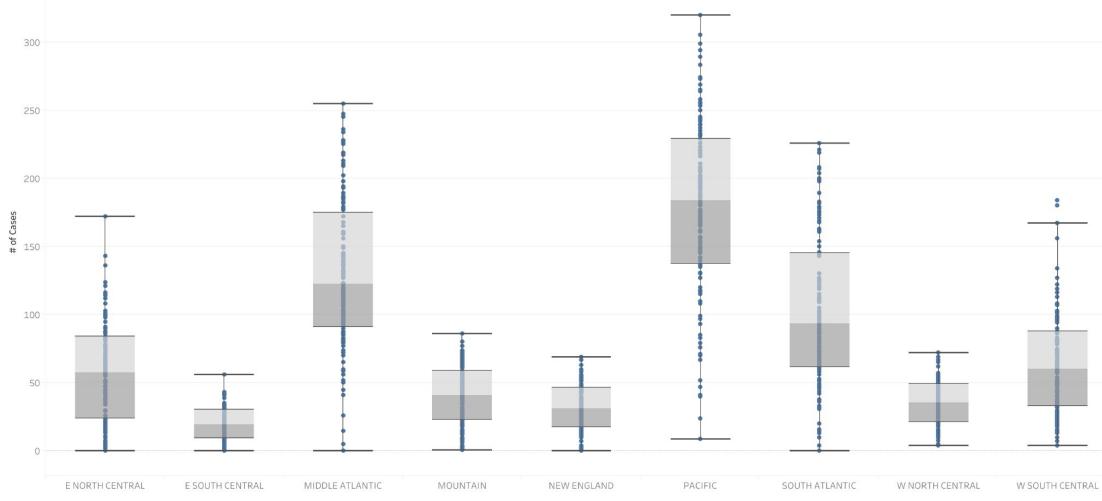
Campylobacteriosis

- Most prevalent in Pacific, South Atlantic and Middle Atlantic regions
- Increased spread to Middle Atlantic regions over time
- Significant increase in cases from 2022-2023
- Cases spike during the summer

Year	Average Cases	Diff. in Cases	% change	p-value
2022	483.33			
2023	682.27	198.95	41.16	<0.01
2024	749.96	67.69	9.92	0.058



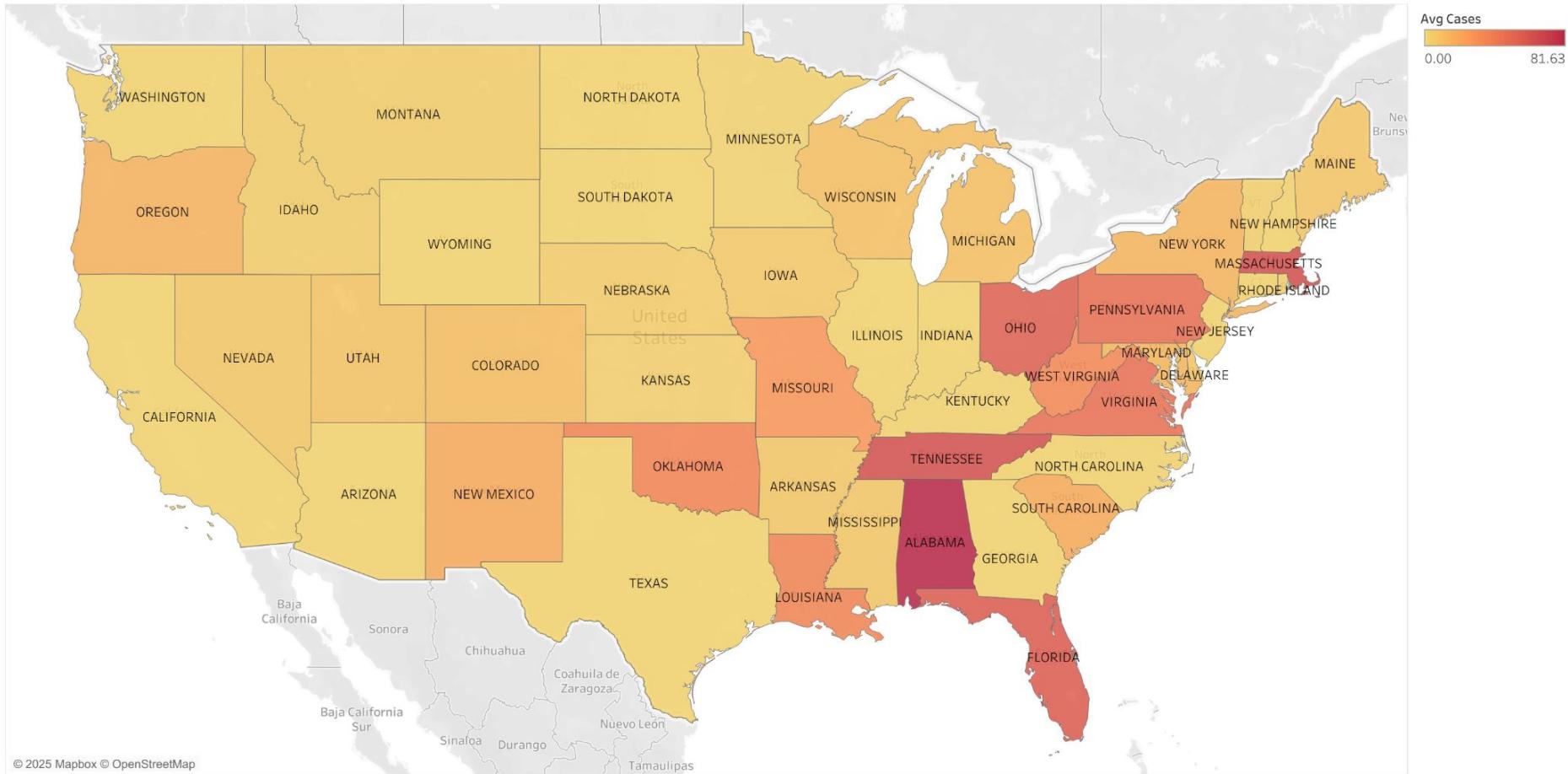
Distribution of Weekly Cases of Campylobacteriosis from 2022-2024 in the US by Census Divisions
Reporting Area



Background Info and Prevention Strategies

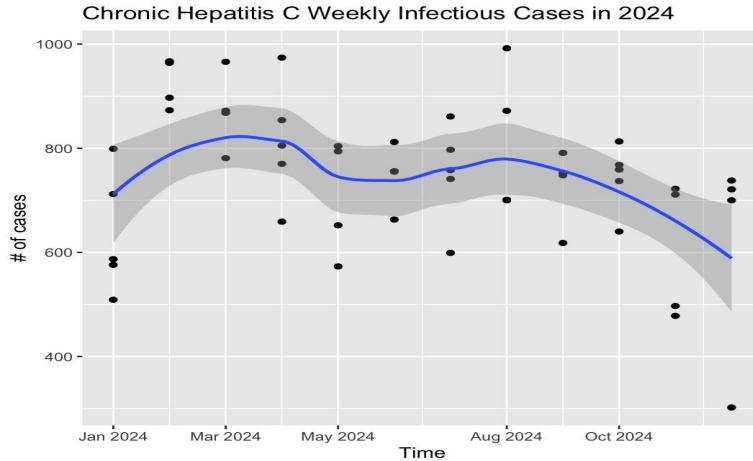
- *Campylobacter jejuni*: gram-negative curved rod bacteria
- Zoonotic infection transmitted by pet feces and contaminated meals
- Causes bloody diarrhea
- Tx: not indicated; if serious, give antibiotics azithromycin or erythromycin
- Recommend pet fecal testing for campylobacteriosis if they experience sx of diarrhea, especially in California and Middle Atlantic regions
- Regularly keep environment clean of pet feces
- Encourage proper food hygiene in the form of washing vegetables and not eating raw meat or milk

Chronic Hepatitis C 2024

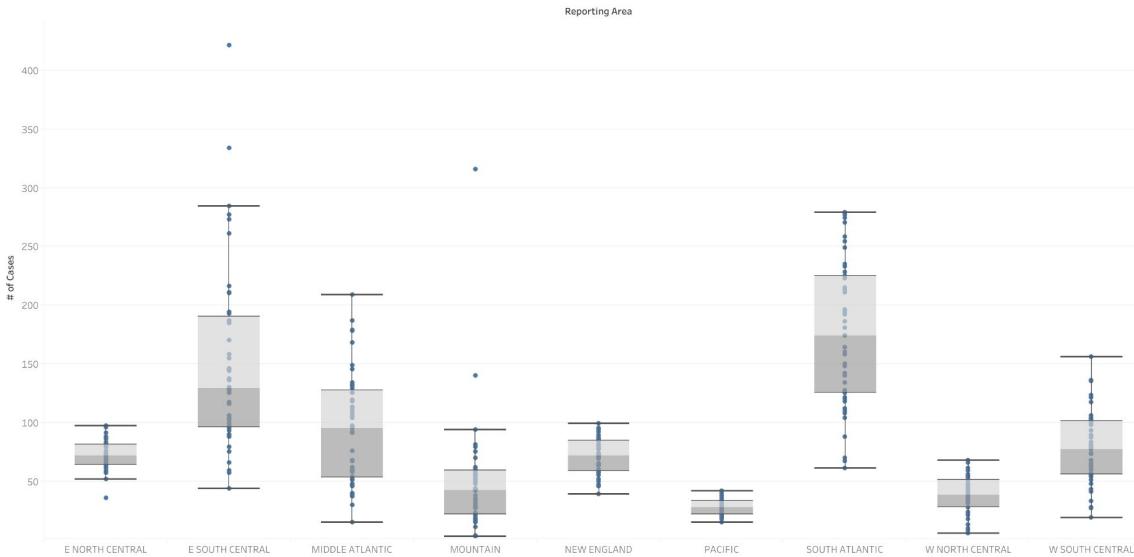


Chronic Hepatitis C

- Gradual decrease in cases throughout 2024
- Most prevalent in South Atlantic, East South Central and Middle Atlantic regions, especially in Alabama



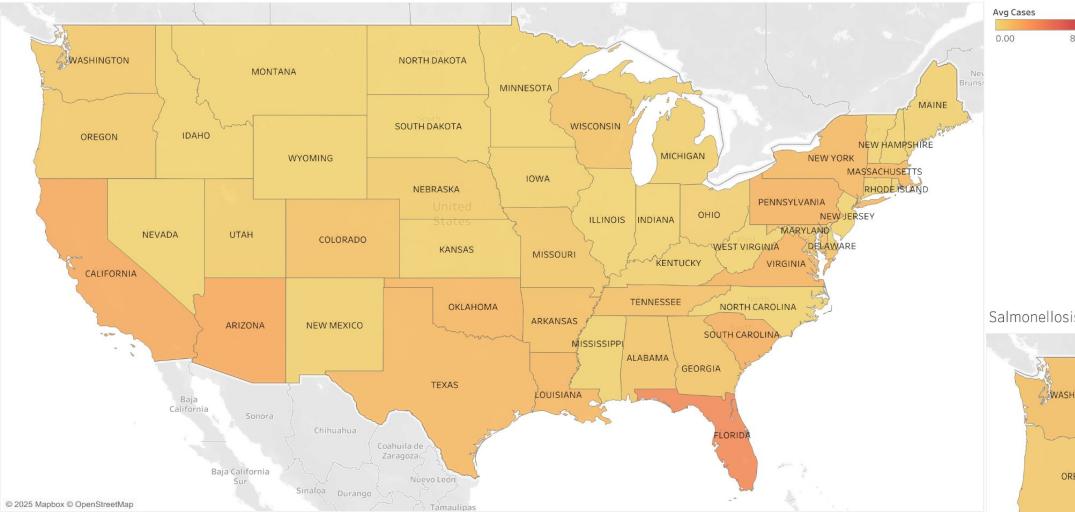
Distribution of 2024 Weekly Cases of Chronic Hepatitis C in the US by Census Divisions



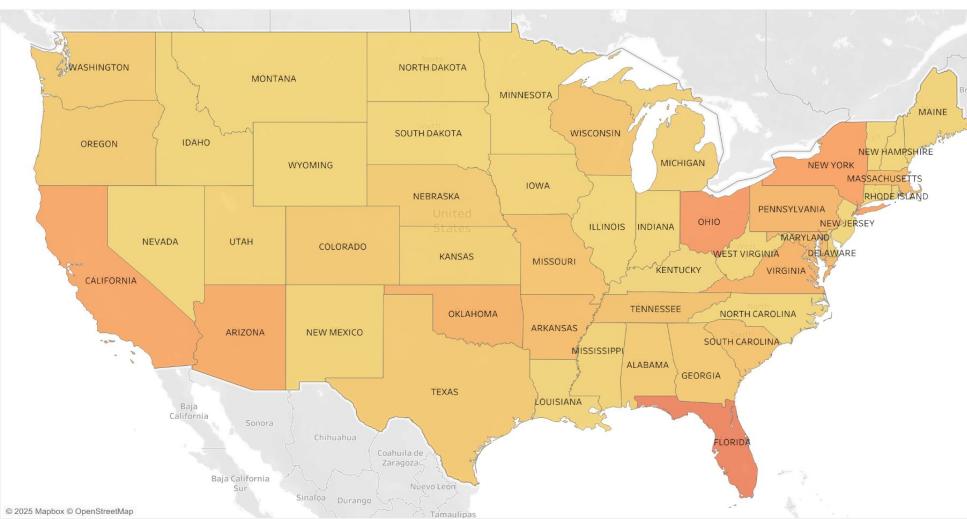
Background Info and Prevention Strategies

- Hepatitis C Virus: RNA flavivirus
- Transmitted by blood through IV drugs and transfusions
- May progress to cirrhosis or hepatocellular carcinoma
- Tx: antivirals such as sofosbuvir and daclatasvir and liver transplant if serious
- Recommend checking for sterility of hospital equipment, needles and tattoo equipment especially in Middle Atlantic and South Atlantic regions of the US

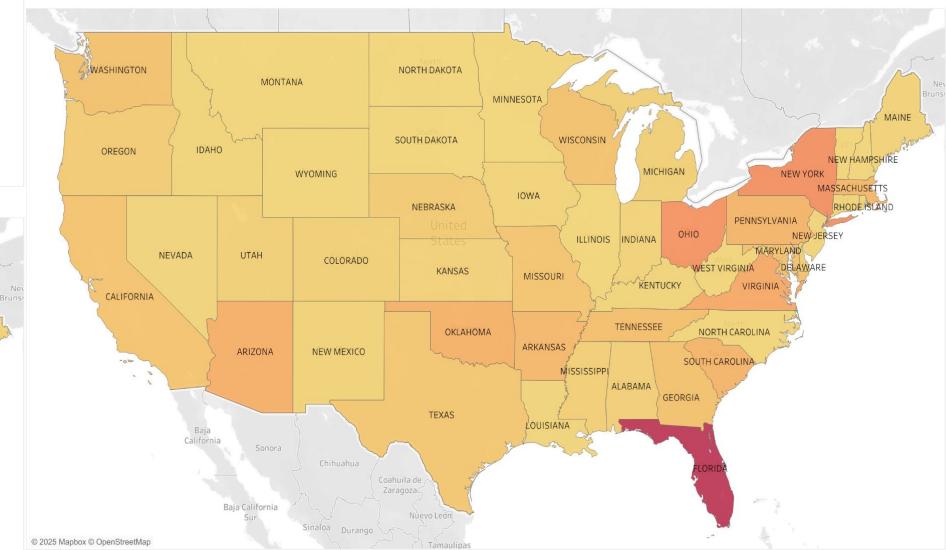
Salmonellosis - 2022



Salmonellosis - 2023

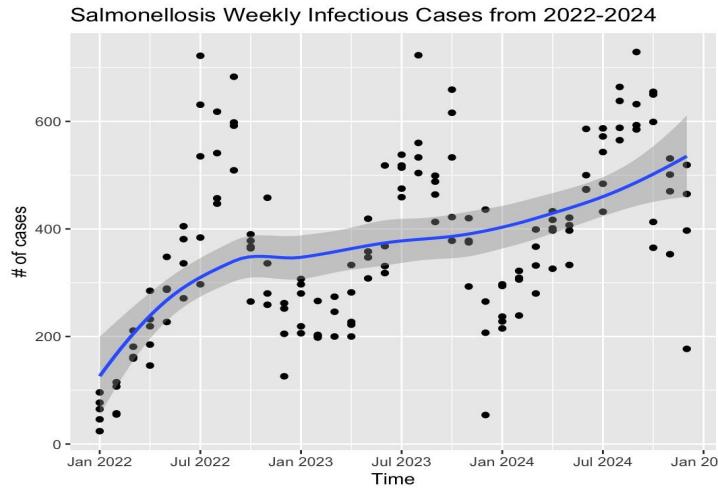


Salmonellosis - 2024

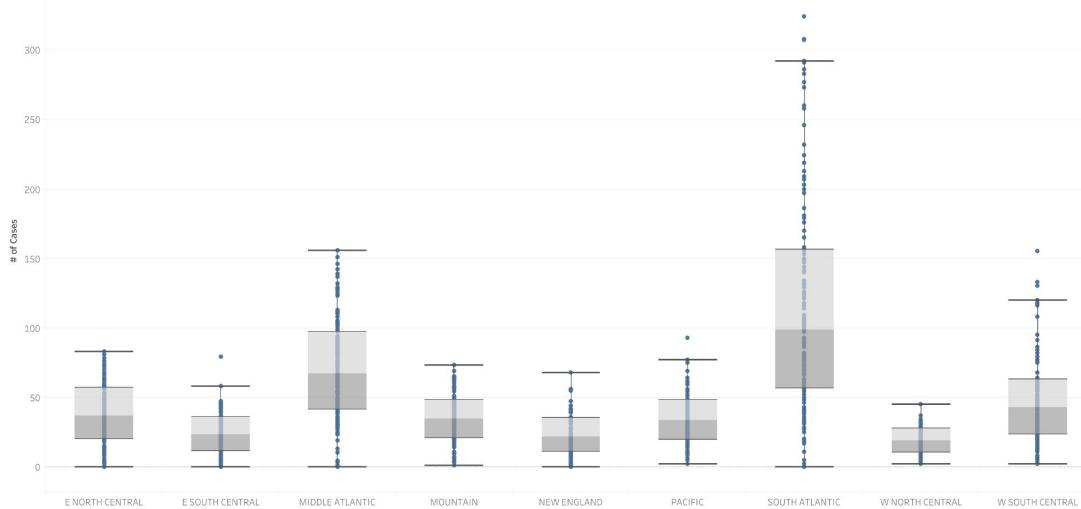


Salmonellosis

- Most prevalent in South Atlantic and Middle Atlantic regions, especially in Florida
- Cases spike in Summer
- Significant increase in cases from 2022-2024
- Geographical spread to Ohio over time



Distribution of Weekly Cases of Salmonellosis from 2022-2024 in the US by Census Divisions
Reporting Area

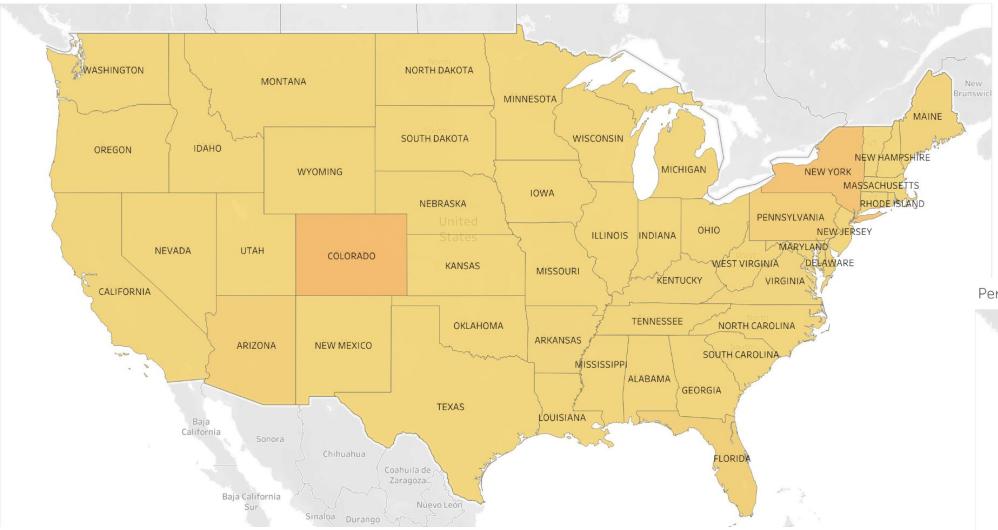


Year	Average Cases	Diff. in Cases	% change	p-value
2022	306.19			
2023	369.65	63.45	20.72	0.048
2024	444.17	74.53	20.16	0.0073

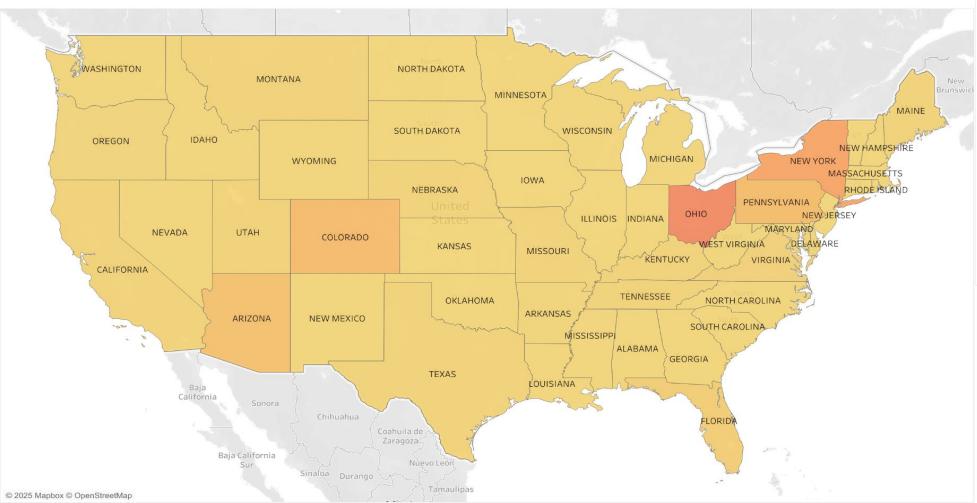
Background Info and Prevention Strategies

- *Salmonella*: gram-negative rod bacteria
- Typhi species causes typhoid fever w/ abdominal pain and rose spots, constipation, fever and possible GI ulceration; transmitted via human contact; oral and IM vaccine offered and treated w/ ceftriaxone and fluoroquinolone
- Non-typhoid species cause gastroenteritis w/ possibly bloody diarrhea; transmitted via humans and animals by eating poultry or eggs or contact w/ pets or turtles; no vaccine and antibiotic tx not indicated
- Encourage food hygiene and handwashing after touching pets or turtles
- Recommend vaccination in Middle Atlantic regions and Florida

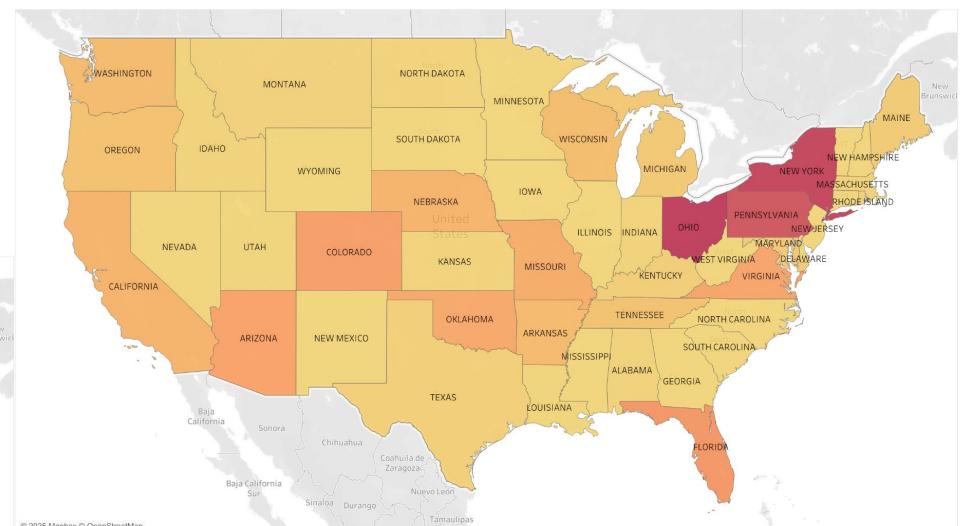
Pertussis - 2022



Pertussis - 2023

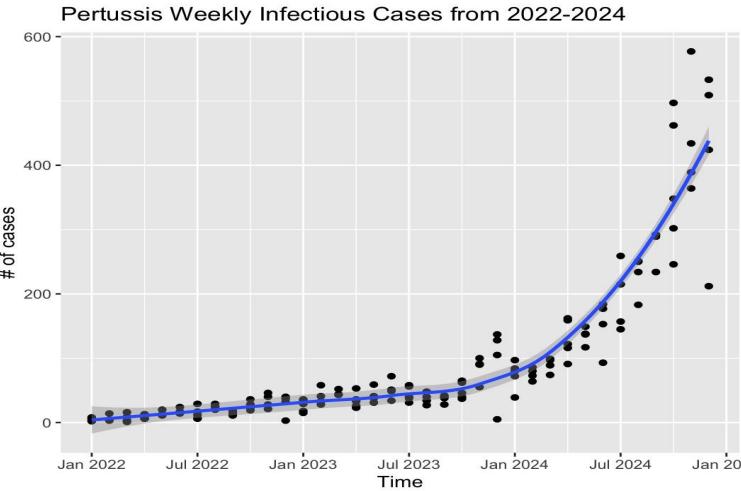


Pertussis - 2024

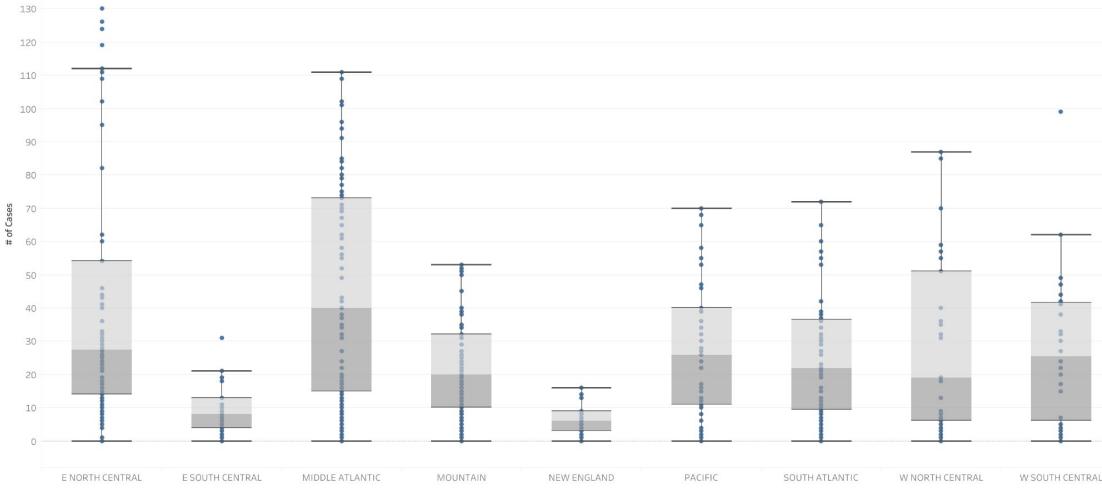


Pertussis

- Prevalent throughout US
- Geographical spread from Colorado to Pacific and Midwest regions and from New York to Pennsylvania and Ohio
- Significant exponential increase in cases from 2022-2024



Distribution of Weekly Cases of Pertussis from 2022-2024 in the US by Census Divisions
Reporting Area

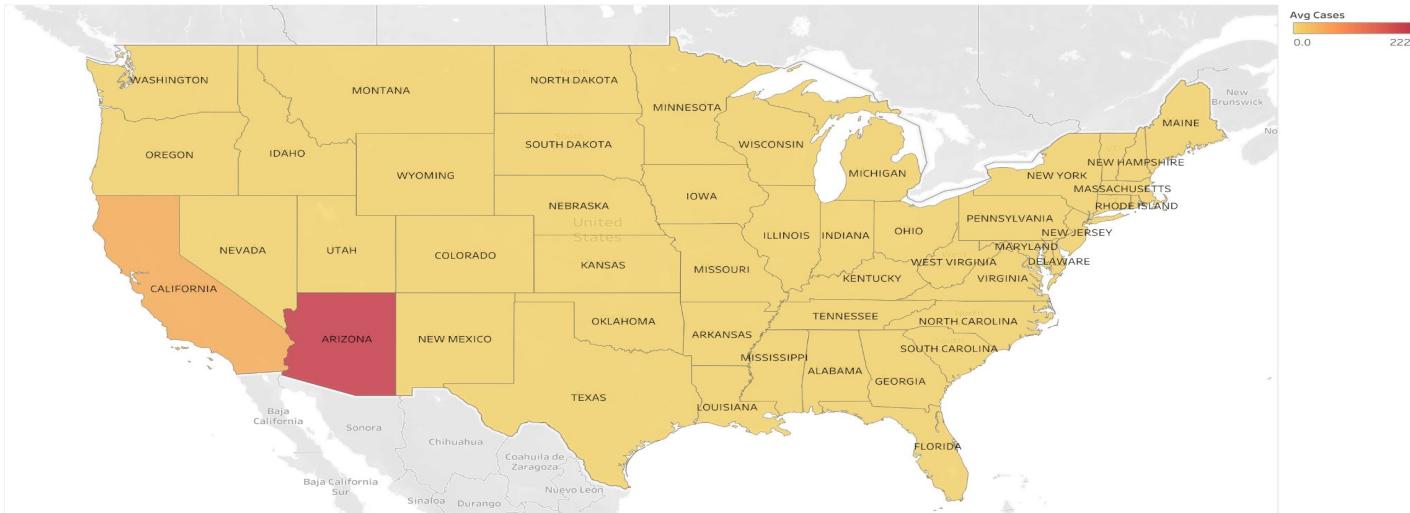


Year	Average Cases	Diff. in Cases	% change	p-value
2022	16.58			
2023	48.22	31.64	190.83	<0.01
2024	214.33	166.11	344.48	<0.01

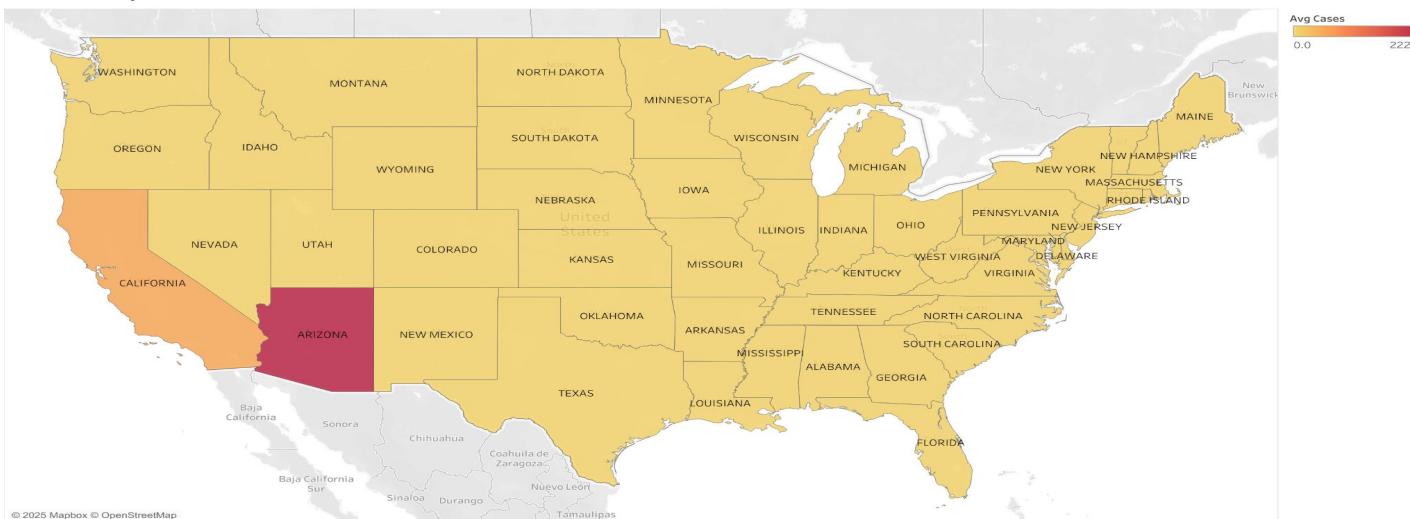
Background Info and Prevention Strategies

- *Bordetella Pertussis*: gram negative coccobacilli bacteria
- Clinical stages of pertussis:
 - Catarrhal: fevers and coryza,
 - Paroxysmal: intense whooping coughs
 - Convalescent: recovery of cough
- Prevented with Tdap and DTaP vaccines
- Tx: antibiotic macrolides and if allergic, TMP-SMX
- Recommend vaccination throughout all of the US to prevent further spread

Coccidioidomycosis- 2023

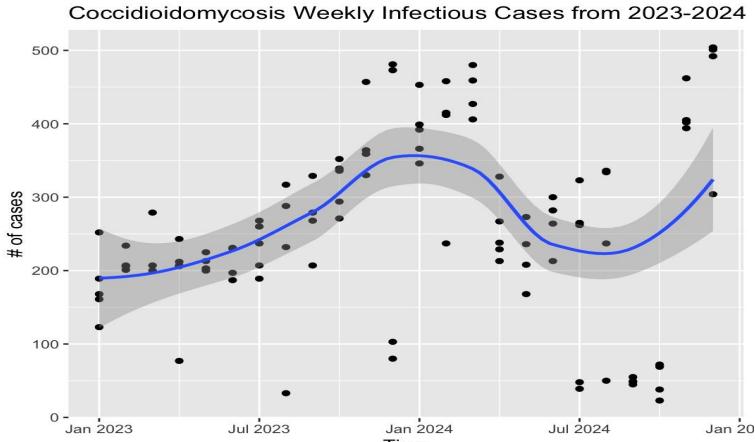


Coccidioidomycosis- 2024

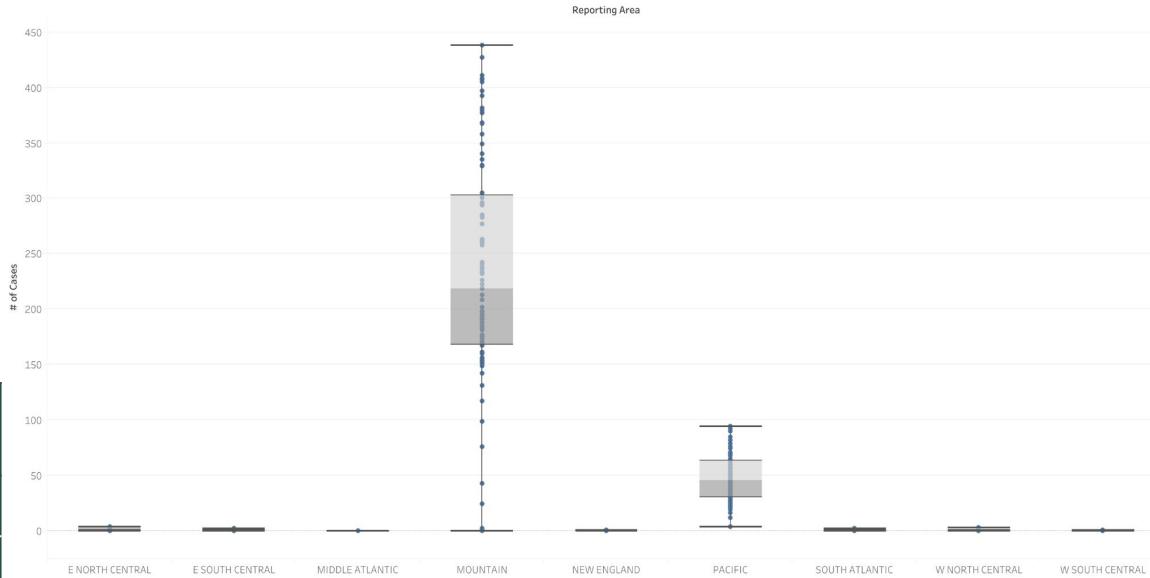


Coccidioidomycosis

- Common in Mountain region of the US in states Arizona and California
- Nonsignificant increase in cases from 2023-2024



Distribution of Weekly Cases of Coccidioidomycosis from 2023-2024 in the US by Census Divisions

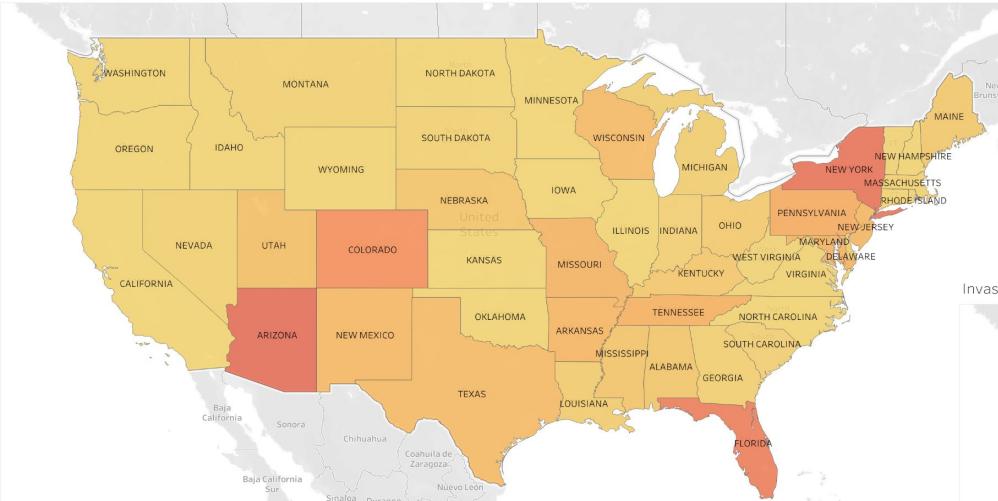


Year	Average Cases	Diff. in Cases	% change	p-value
2023	243.35			
2024	274.94	31.59	12.98	0.2

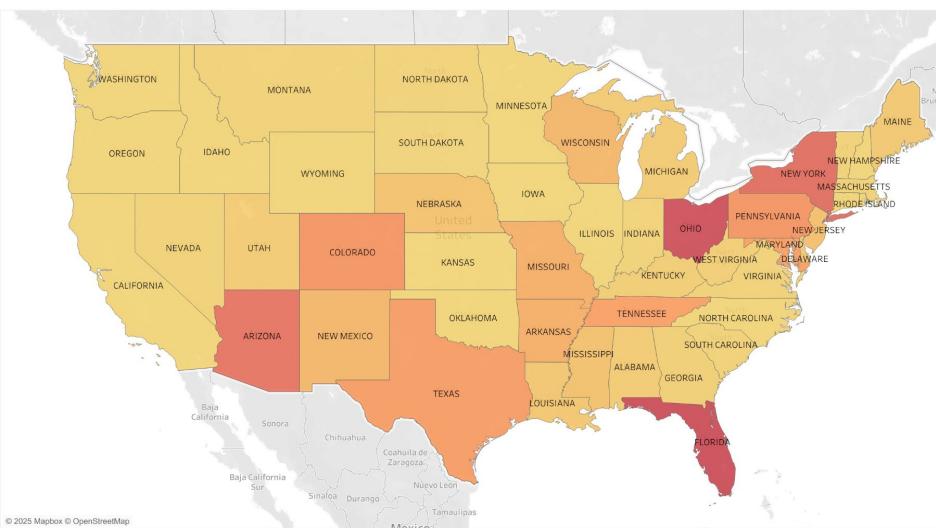
Background Info and Prevention Strategies

- *Coccidioides immitis*: dimorphic fungi
- Transmitted from dust exposure in areas such as excavation sites
- Causes erythema nodosum/multiforme and arthralgias; can progress to meningitis
- Tx: antifungals fluconazole or itraconazole for local infections and amphotericin B for systemic infections
- Recommend facial mask usage at construction sites in California and Arizona to reduce dust inhalation

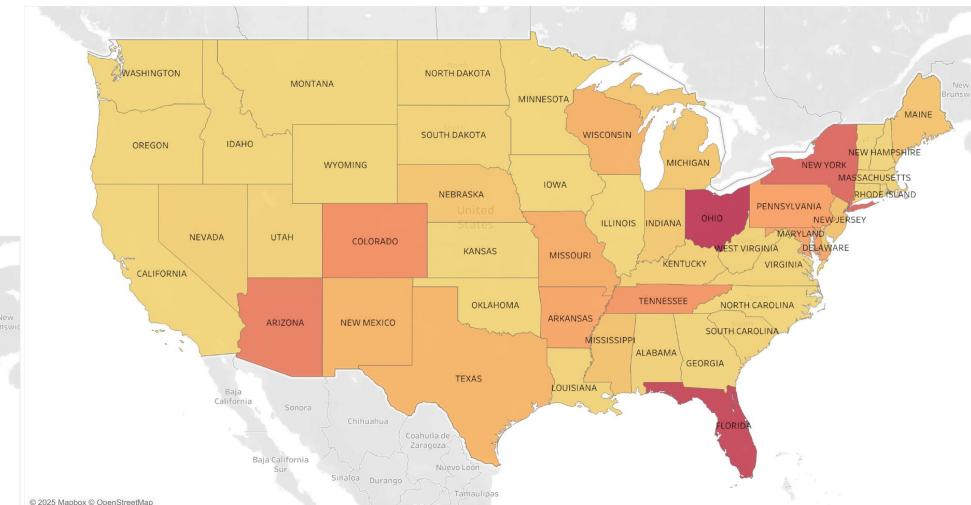
Invasive Pneumococcal Disease - 2022



Invasive Pneumococcal Disease - 2023



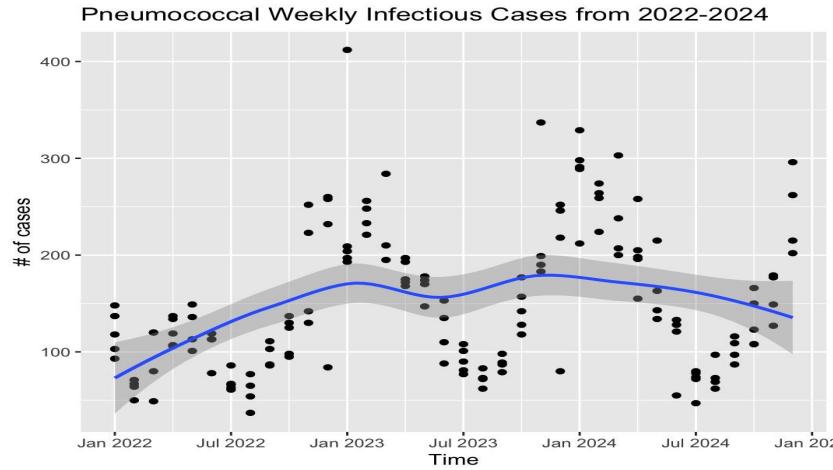
Invasive Pneumococcal Disease - 2024



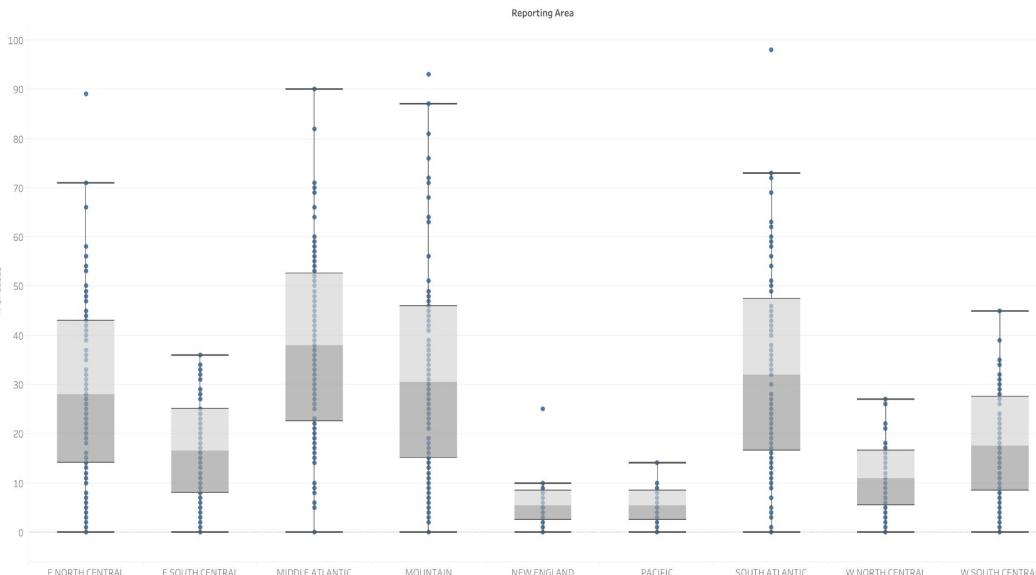
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Invasive Pneumococcal Disease

- Common throughout US except for Pacific and New England regions
- Geographical spread to Ohio over time
- Significant increase in cases from 2022-2023
- Cases spike in January



Distribution of Weekly Cases of Invasive Pneumococcal Disease from 2022-2024 in the US by Census Divisions

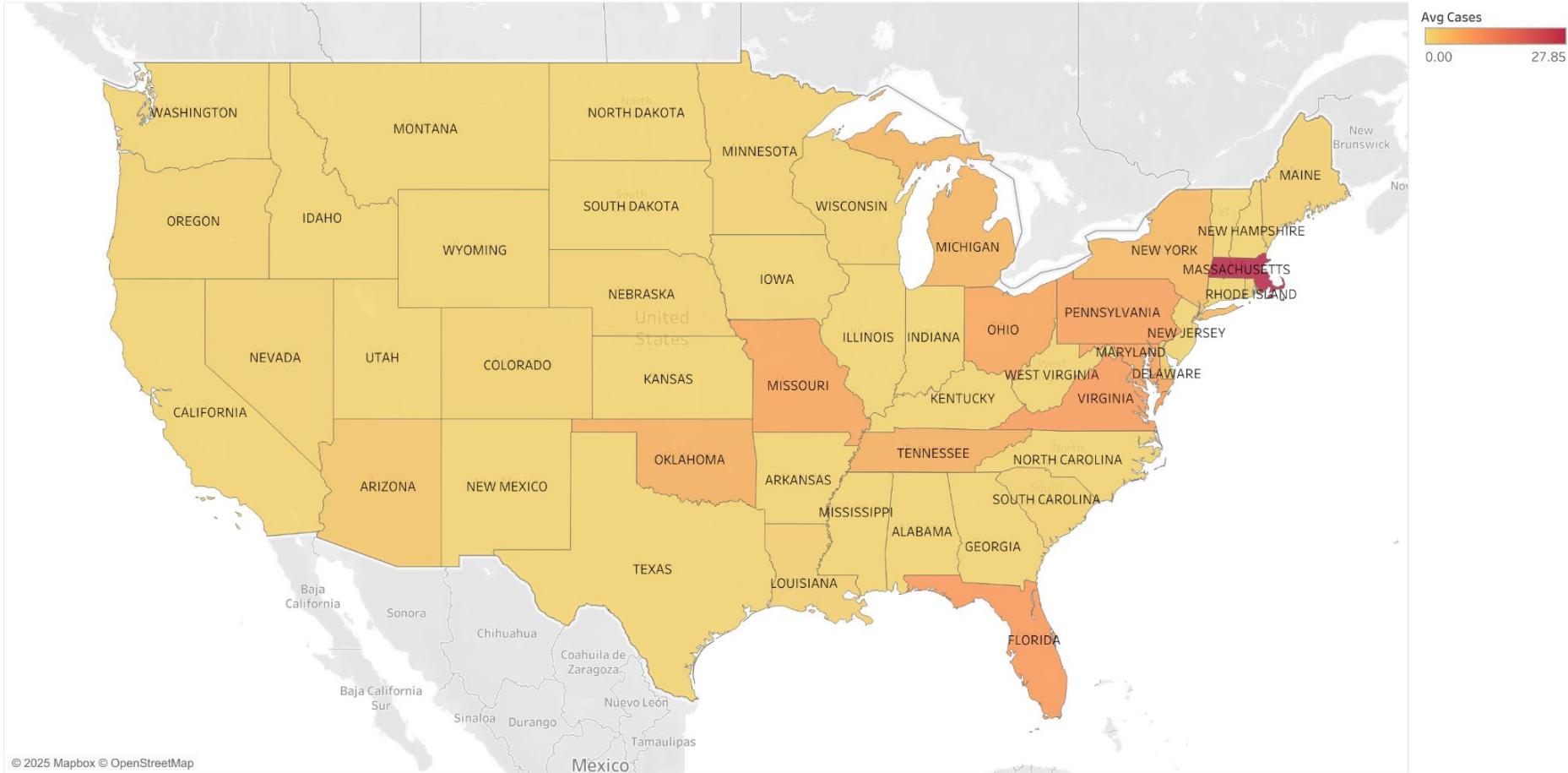


Year	Average Cases	Diff. in Cases	% change	p-value
2022	112.96			
2023	165.67	52.71	46.66	<0.01
2024	169.52	3.85	2.32	0.8

Background Info and Prevention Strategies

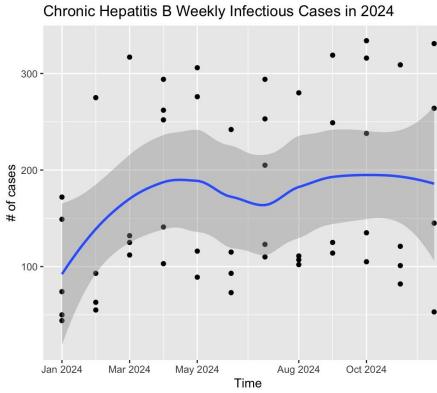
- *Streptococcus Pneumoniae*: gram-positive lancet-shaped diplococci bacteria
- IPD is a serious strep pneumo infection that can invade the blood, brain and spinal cord and lead to meningitis, bacteremia and pneumonia
- Transmitted through respiratory droplets
- Prevented w/ PCV13 or PPSV23 vaccinations
- Tx: medical emergency w/ prompt antibiotics and possible hospitalization w/ oxygen therapy or ventilation
- Recommend vaccination throughout the US
- Encourage proper hygiene or face masks to prevent transmission

Chronic Hepatitis B 2024

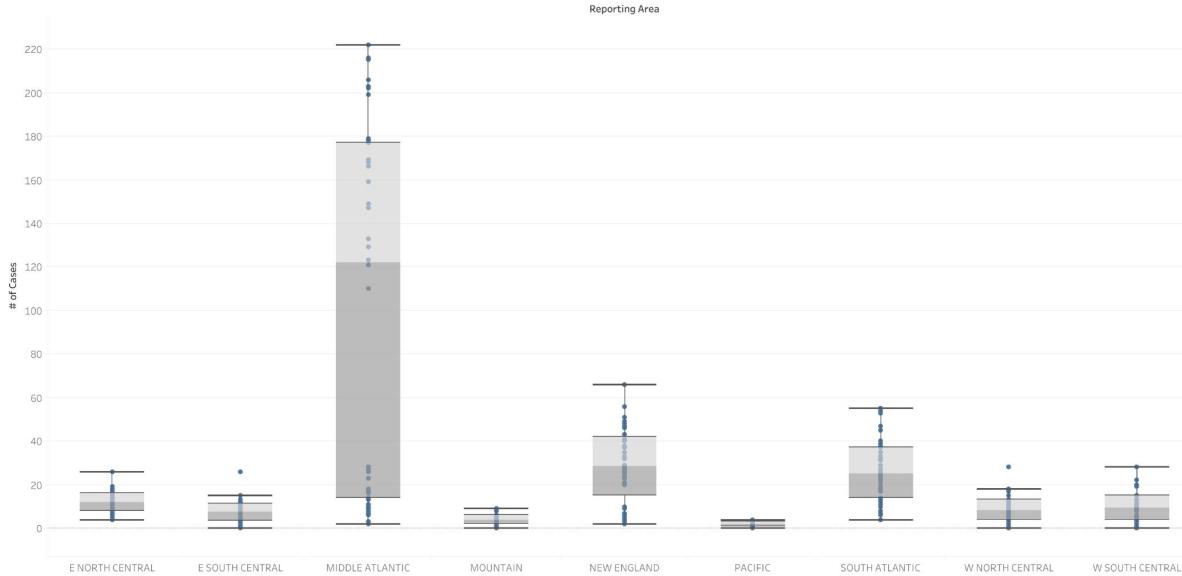


Chronic Hepatitis B

- Common in Middle Atlantic region, especially Massachusetts



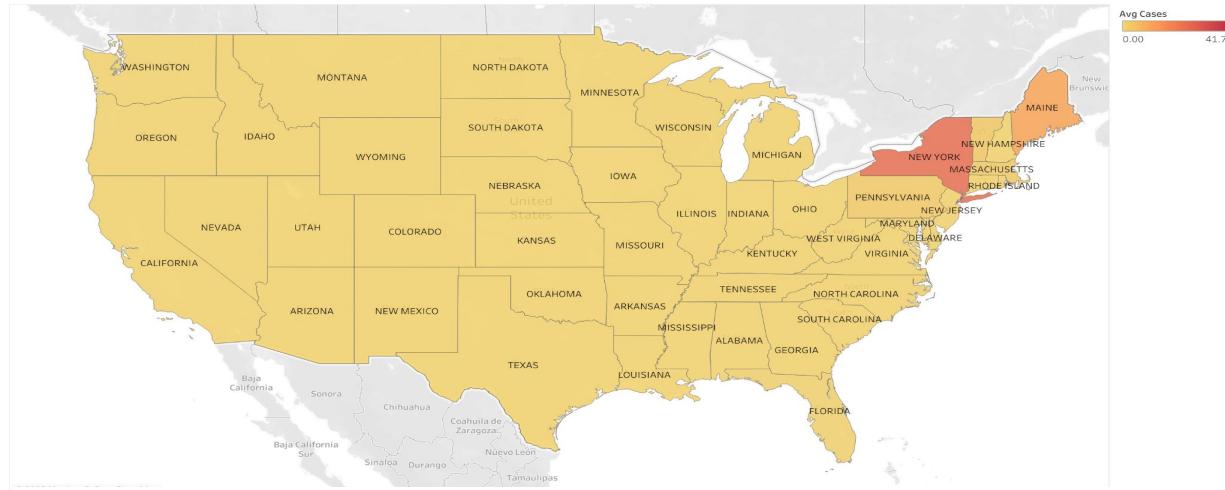
Distribution of 2024 Weekly Cases of Chronic Hepatitis B in the US by Census Divisions



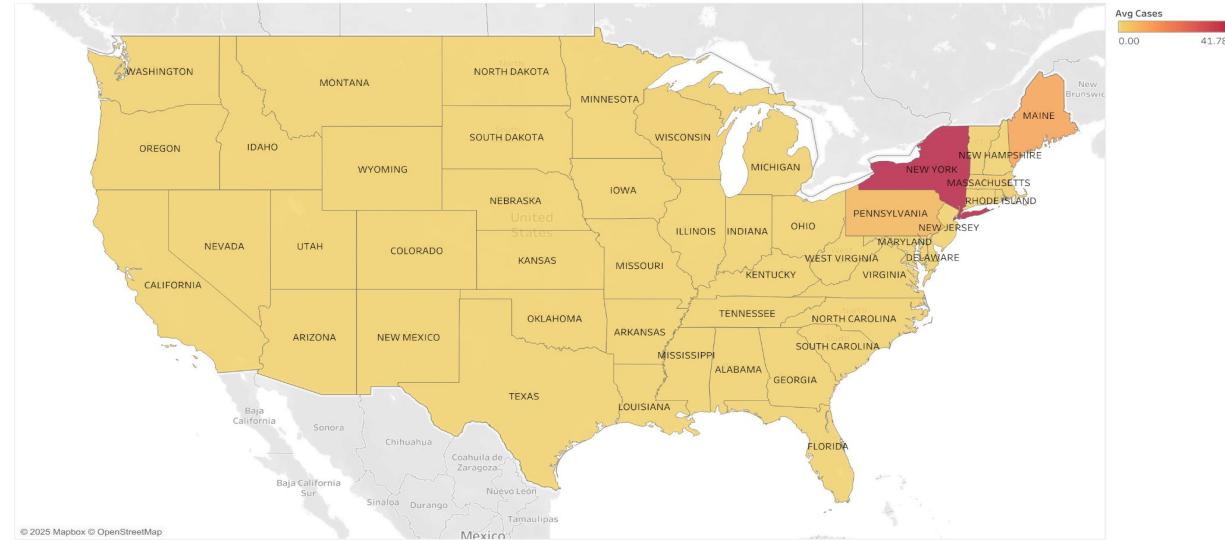
Background Info and Prevention Strategies

- DNA hepadnavirus
- Transmitted parenterally, sexually and perinatally
- Causes serum sickness w/ fever, rash and arthralgias that may progress to hepatocellular carcinoma
- Prevented with Hepatitis B vaccination
- Tx: antivirals tenofovir, entecavir or lamivudine and liver transplant if serious
- Encourage increased perinatal vaccination in Middle Atlantic regions, specifically Massachusetts

Ehrlichiosis and Anaplasmosis - 2022

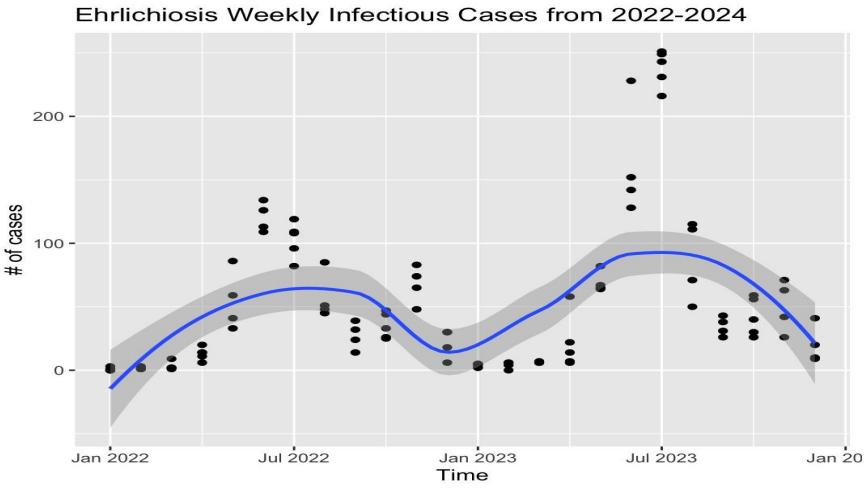


Ehrlichiosis and Anaplasmosis - 2023

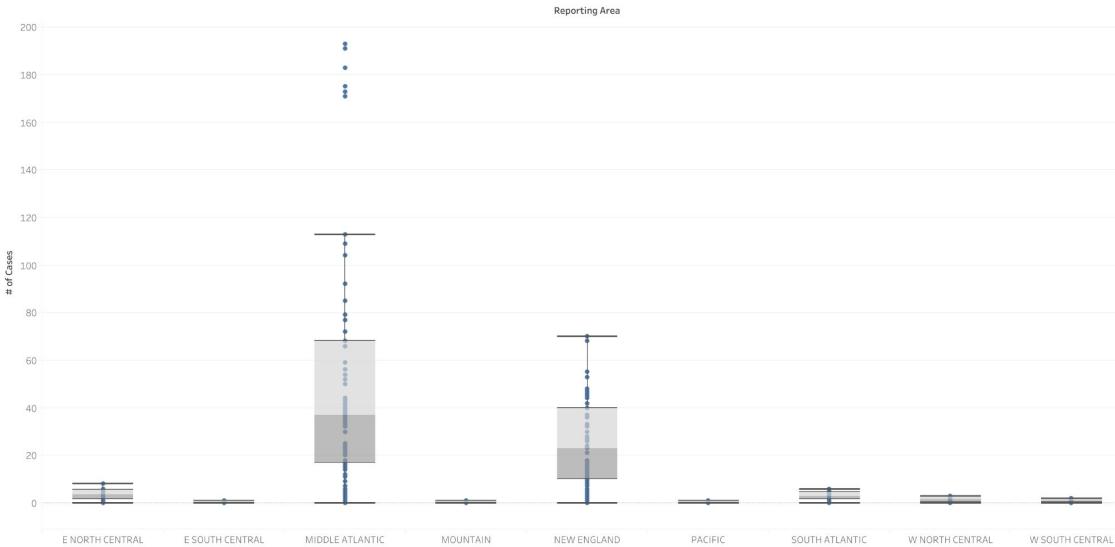


Ehrlichiosis and Anaplasmosis

- Common in Middle Atlantic and New England regions, specifically New York and Maine
- Geographical spread to Pennsylvania
- Cases spike in Summer
- Almost significant increase in cases from 2022-2023



Distribution of Weekly Cases of Ehrlichiosis and Anaplasmosis from 2022-2023 in the US by Census Divisions



Year	Average Cases	Diff. in Cases	% change	p-value
2022	41.77			
2023	63.84	22.07	52.84	0.064

Background Info and Prevention Strategies

- *Ehrlichia Chaffeensis*: obligate intracellular bacteria transmitted via Lone Star ticks; causes fever, chills, headache, nausea, vomiting, joint pain and rash and can progress to organ or respiratory failure
- *Anaplasma phagocytophilum*: gram-negative bacteria transmitted via Ixodes ticks; causes fever, headache, chills, fatigue, nausea, vomiting and diarrhea and can progress to organ or respiratory failure
- Both agents are treated with antibiotic doxycycline
- Recommend the use of insect repellant, long-sleeved clothes and regular washing of clothes during the summer months in New York and Maine

Final Discoveries and Recommendations

- Most of the top 10 US infectious agents have been increasing in average cases from 2022 to 2024
- California, Florida and Middle Atlantic states are common zones of infection
- Recommend safe sex practices and awareness of Chlamydia and Gonorrhea in California and Florida
- Recommend vaccination for *Salmonella typhi*., Pertussis, IPD, Hepatitis B
- Recommend proper food hygiene for non-typhoidal *Salmonella* and *Campylobacteriosis* in the Summer
- Recommend face masks for Coccidioidomycosis and IPD to reduce dust inhalation and respiratory droplet transmission
- Avoid tick bites in New York and Maine for Ehrlichiosis/Anaplasmosis

Thank you!

References

Le, T., Bhushan, V., & Sochat, M. (2021). *USMLE First Aid*. McGraw Hill.

Office of Public Health Data, Surveillance and Technology. (2025, January 31). *NNDSS weekly data*. Centers for Disease Control and Prevention. https://data.cdc.gov/NNDSS/NNDSS-Weekly-Data/x9gk-5huc/about_data