An Overview of Plague:

CO and NM |

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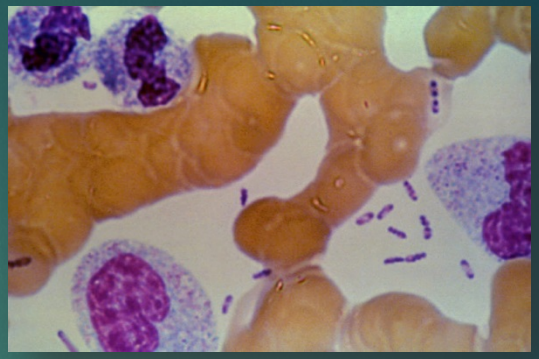
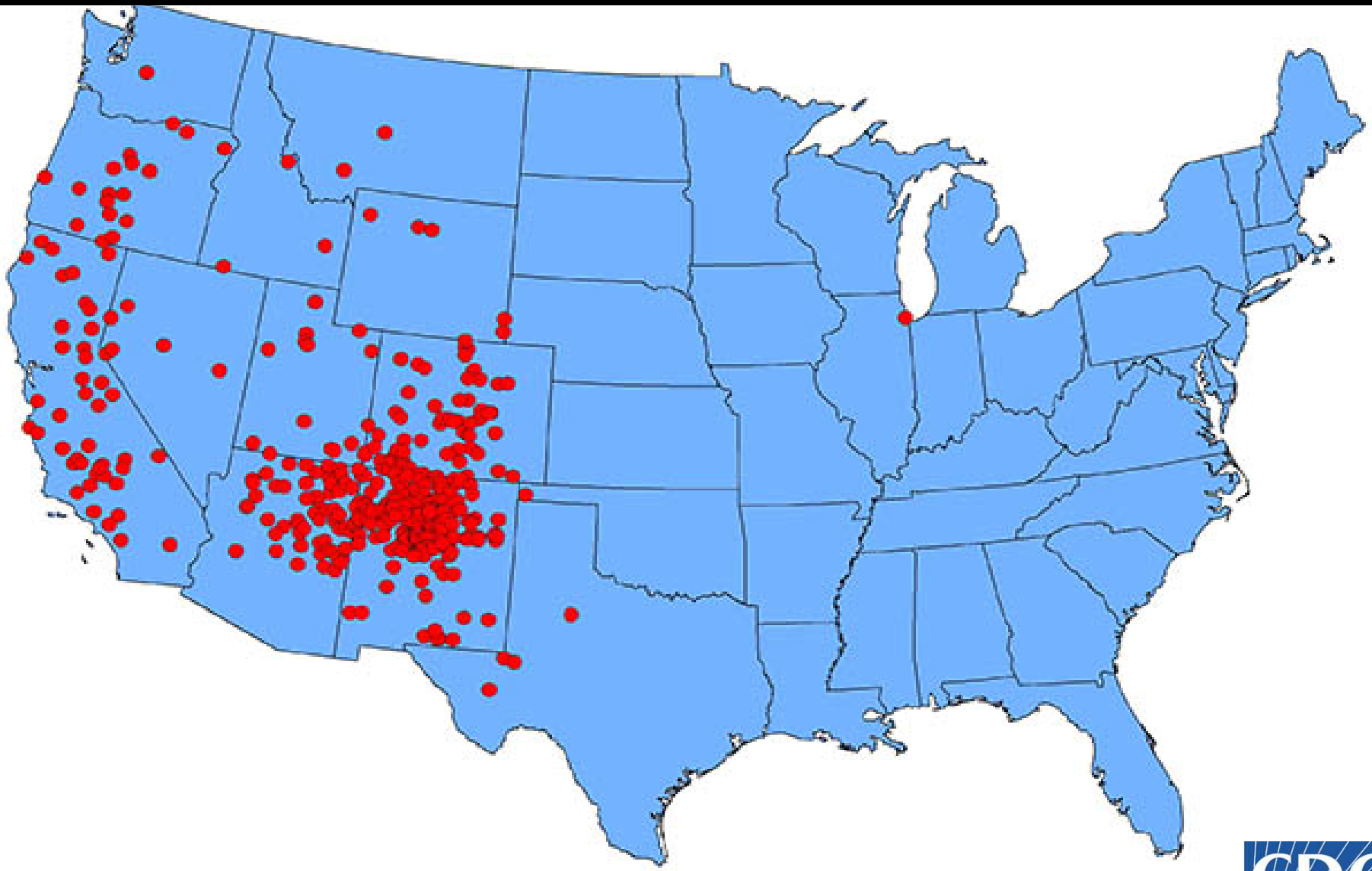
COLORADO
Department of Public Health & Environment

Plague



- *Yersinia pestis*
  - Gram negative
  - Non-spore forming
- Endemic in Western States only
- Most cases occur in
  - New Mexico
  - Colorado
  - Arizona
  - California

Human Plague Cases in the Western U.S., 1970-2016

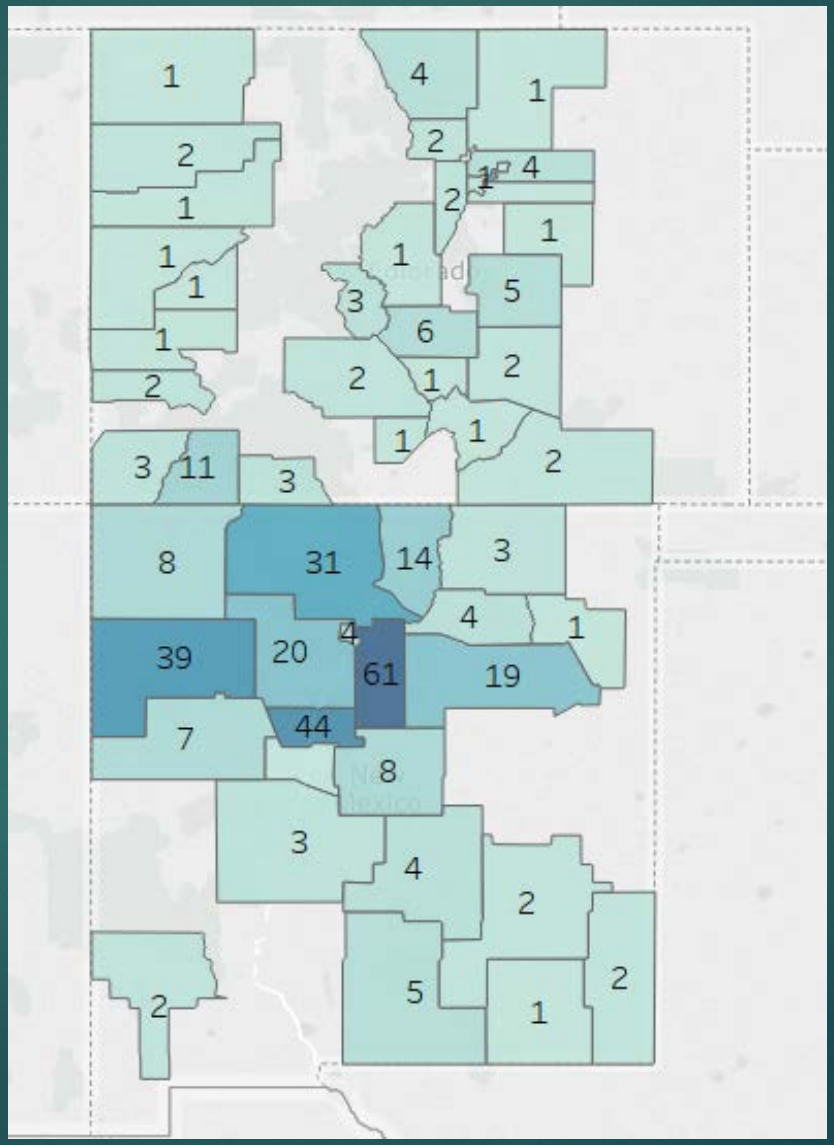


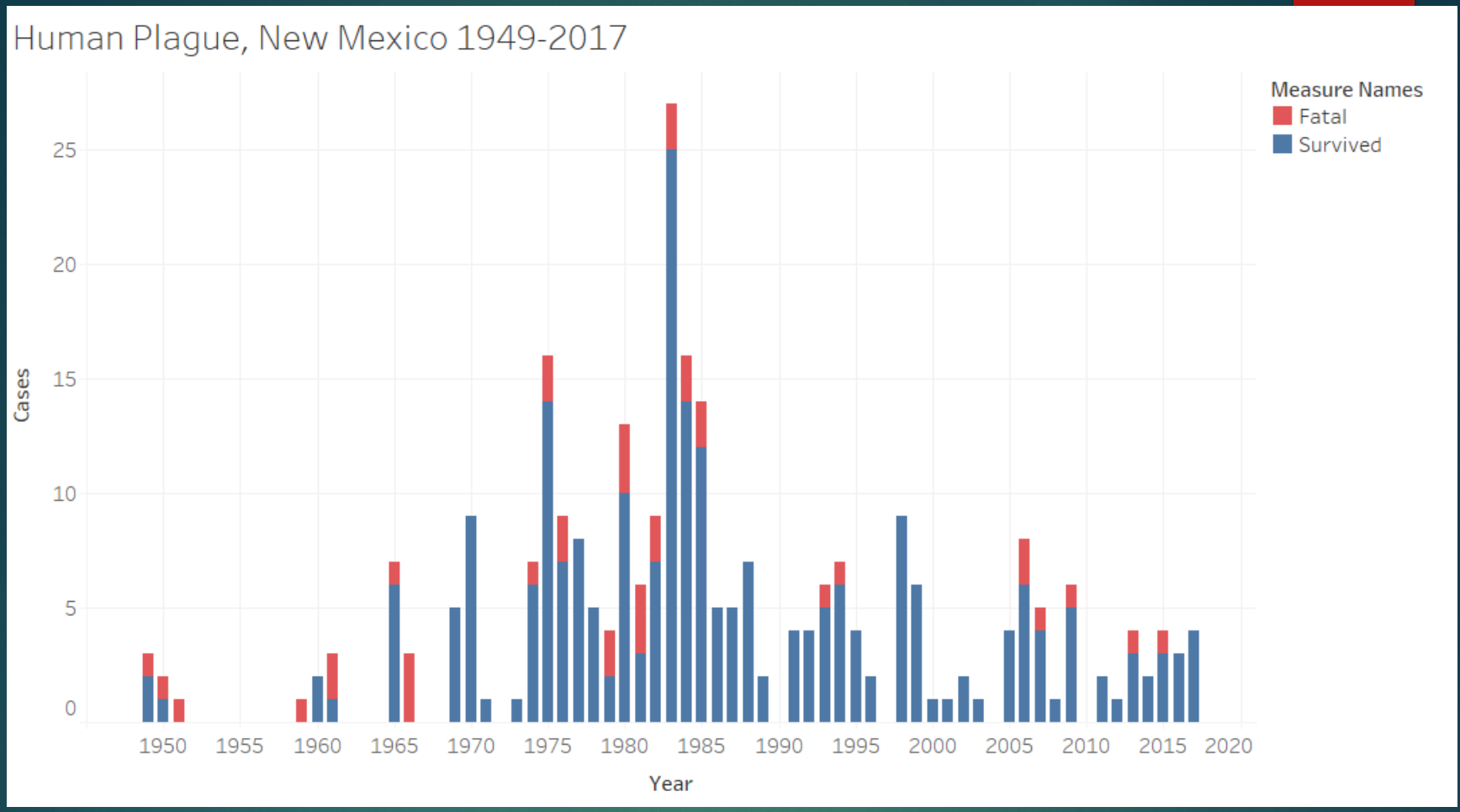
1 dot placed randomly in most likely county of exposure for each confirmed plague case

CDC
Centers for Disease Control and Prevention

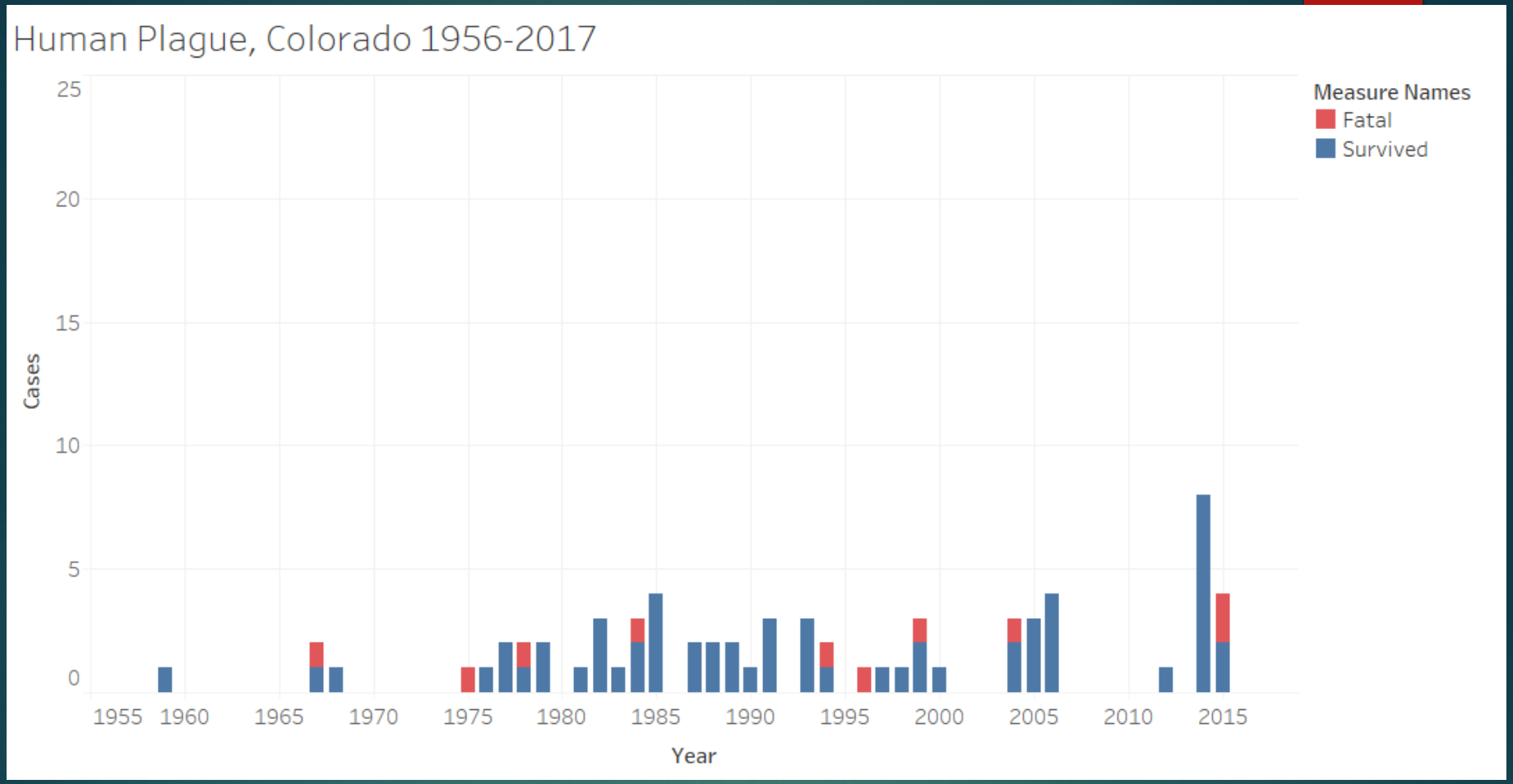
Human Plague Cases,

Colorado (1956-2017) and New Mexico (1949-2017)





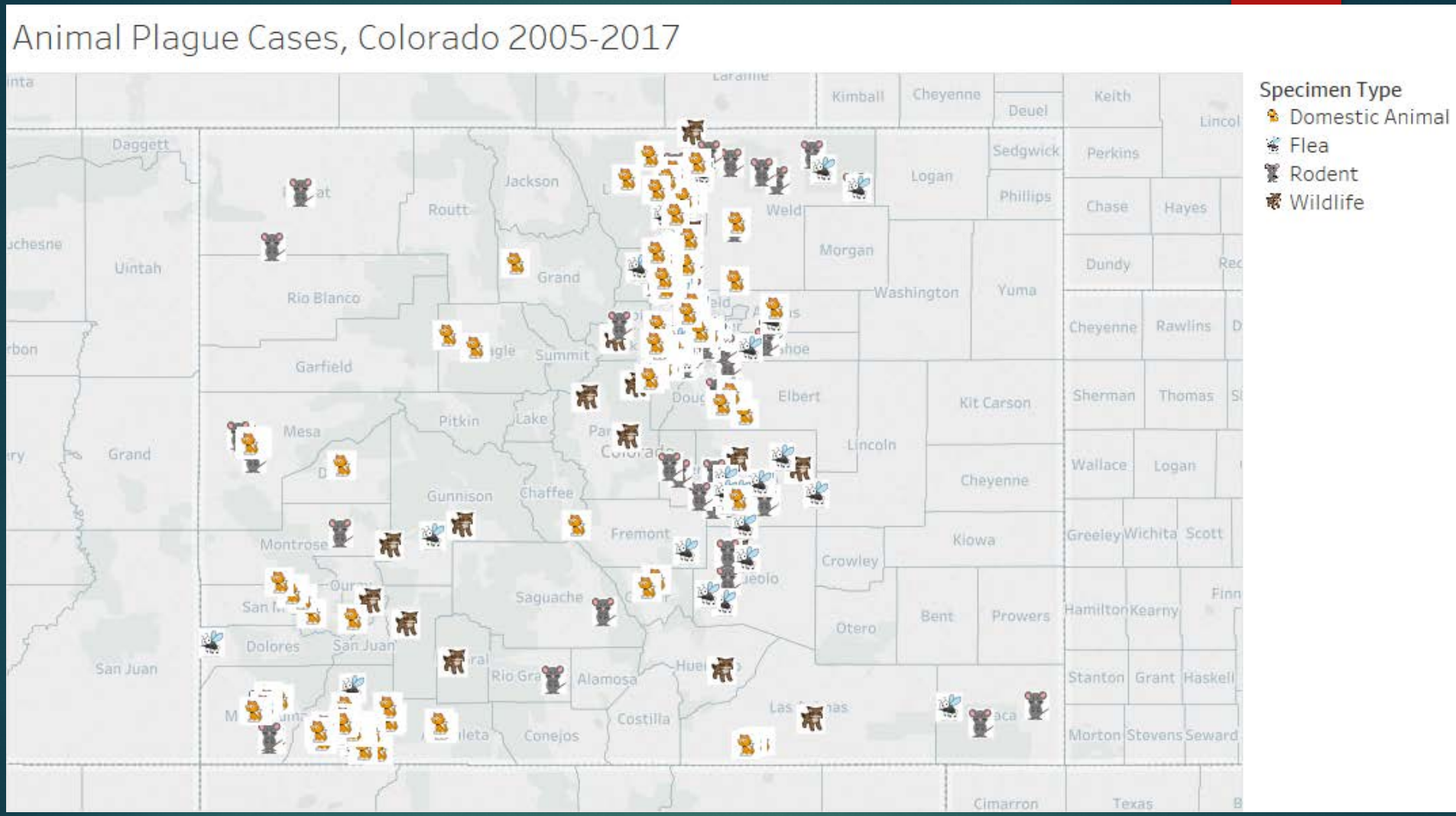
282 total cases
39 fatalities



69 total cases
10 fatalities

Animals

- Wildlife
  - Rodent reservoir (specific one unknown)
  - Rodents such as Prairie dogs, Tree Squirrels, are highly susceptible and can amplify the risk
- Companion Animals
  - Cats—highly susceptible
  - Dogs—more resistant but can still get sick
  - Pets can bring fleas into the home and expose people
- Livestock
  - Mostly resistant

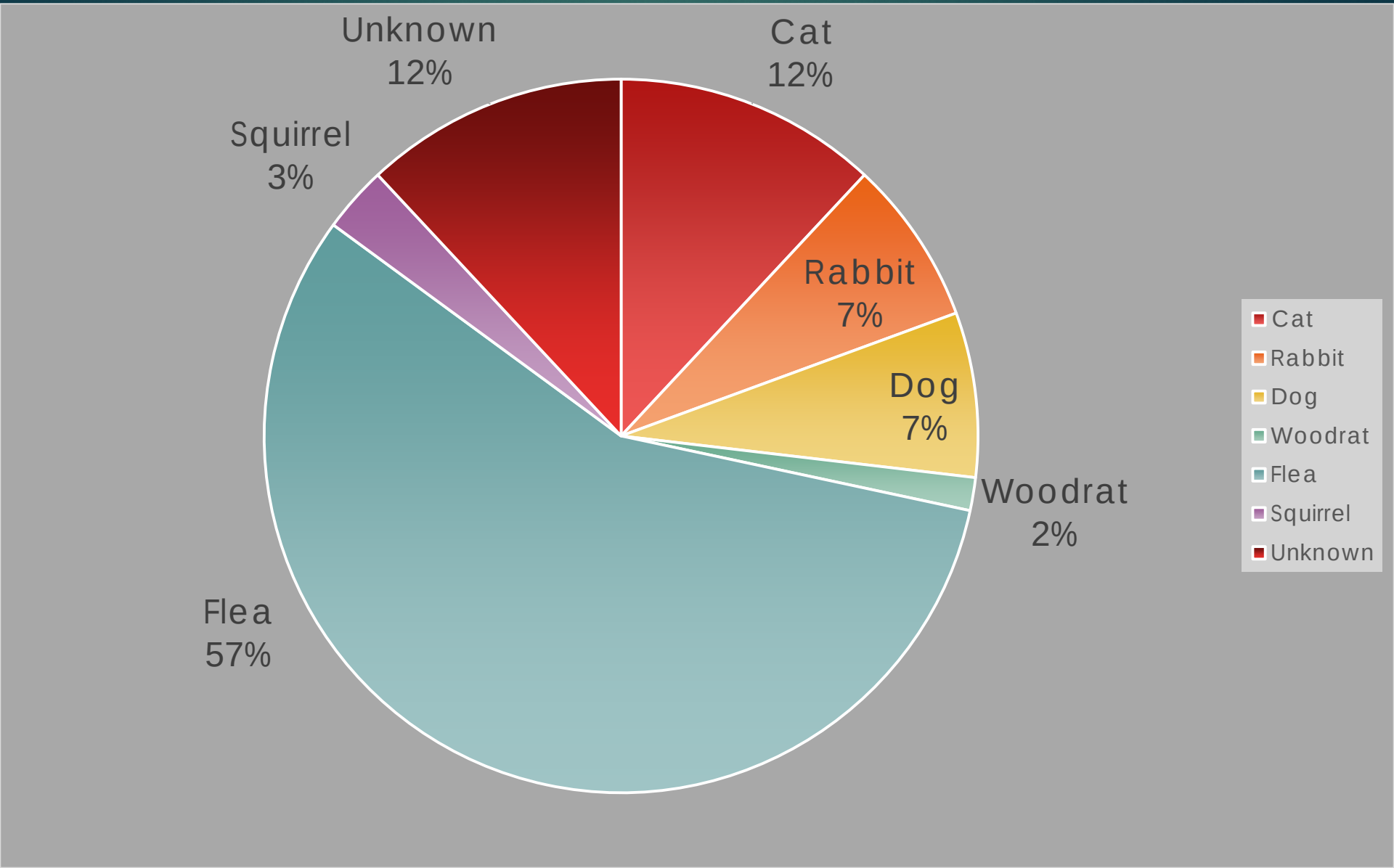


405 Total Positives

Routes of Transmission

- Flea bite
  - Majority of cases exposed this route
  - Infected fleas - dead rodents
- Direct contact with blood/tissue
  - Ground Squirrels
  - Domestic Cats
- Droplet inhalation
  - Wildlife
  - Human-to-Human

Exposure Source of Human Plague Cases (n=69), 1959-2018

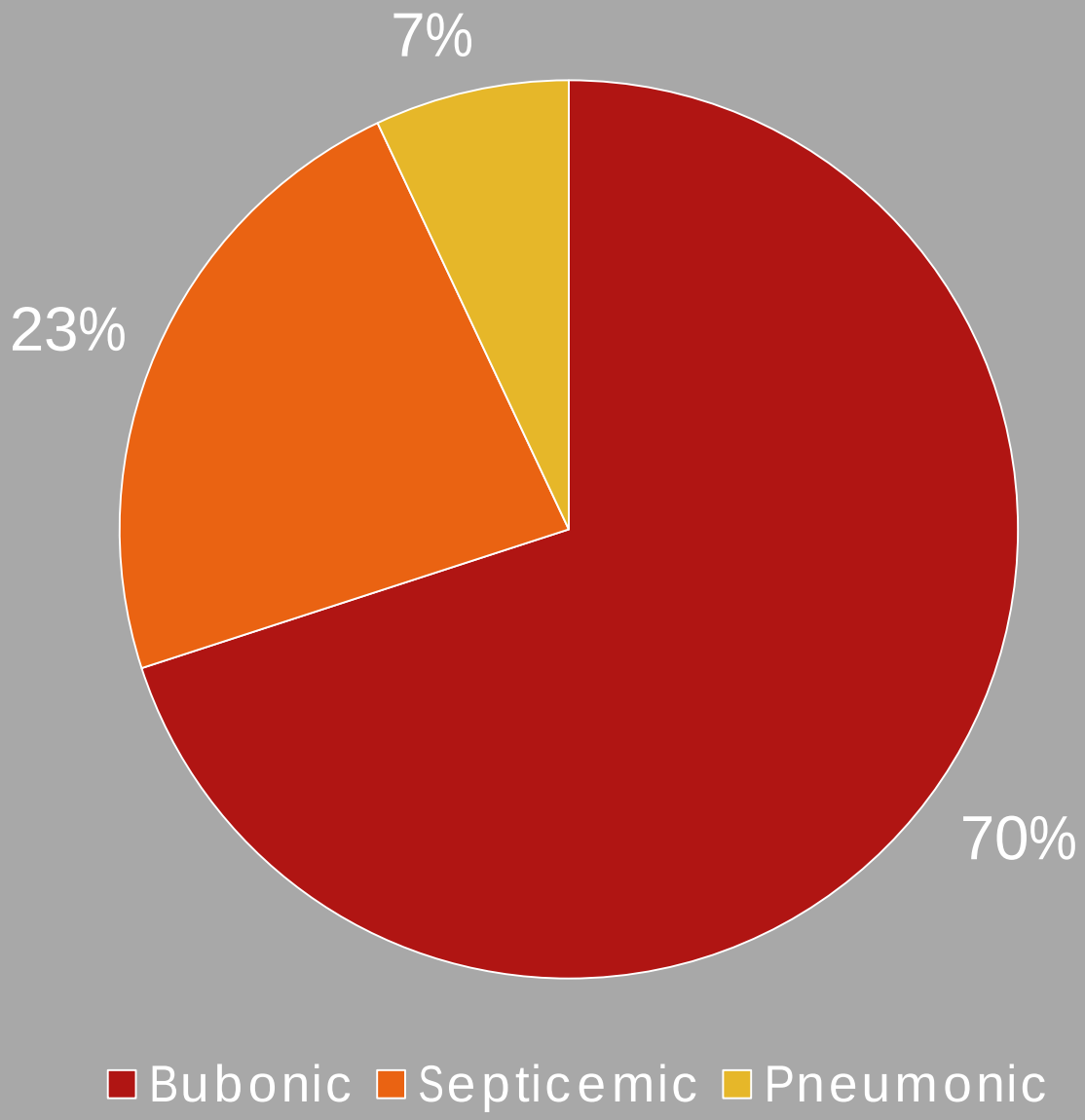


Forms of Disease

- Bubonic
  - Fever, headache, chills
  - Swollen, tender, and painful lymph nodes (bubo)
- Septicemic
  - Fever, chills, weakness, abd pain, shock
  - Tissues may turn black and die
- Pneumonic
  - Fever, headache, weakness,
  - Rapidly developing pneumonia,
    - SOB, chest pain, cough, and bloody mucous

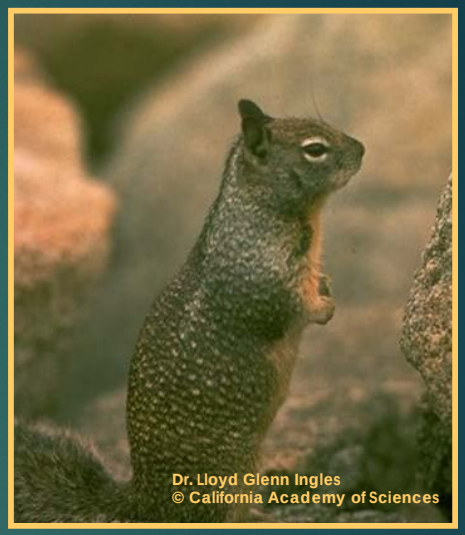
Other less typical forms are possible

Forms of human plague, Colorado 1959 – 2018 (n=69)



Disease Cycles

- Sylvatic (wild)
- Enzootic
  - Steady level of disease
  - Low rodent mortality
- Epizootic
  - Increased rodent mortality
  - Fleas seek out new hosts
  - Expansion into human occupied areas
  - Greatest threat to humans

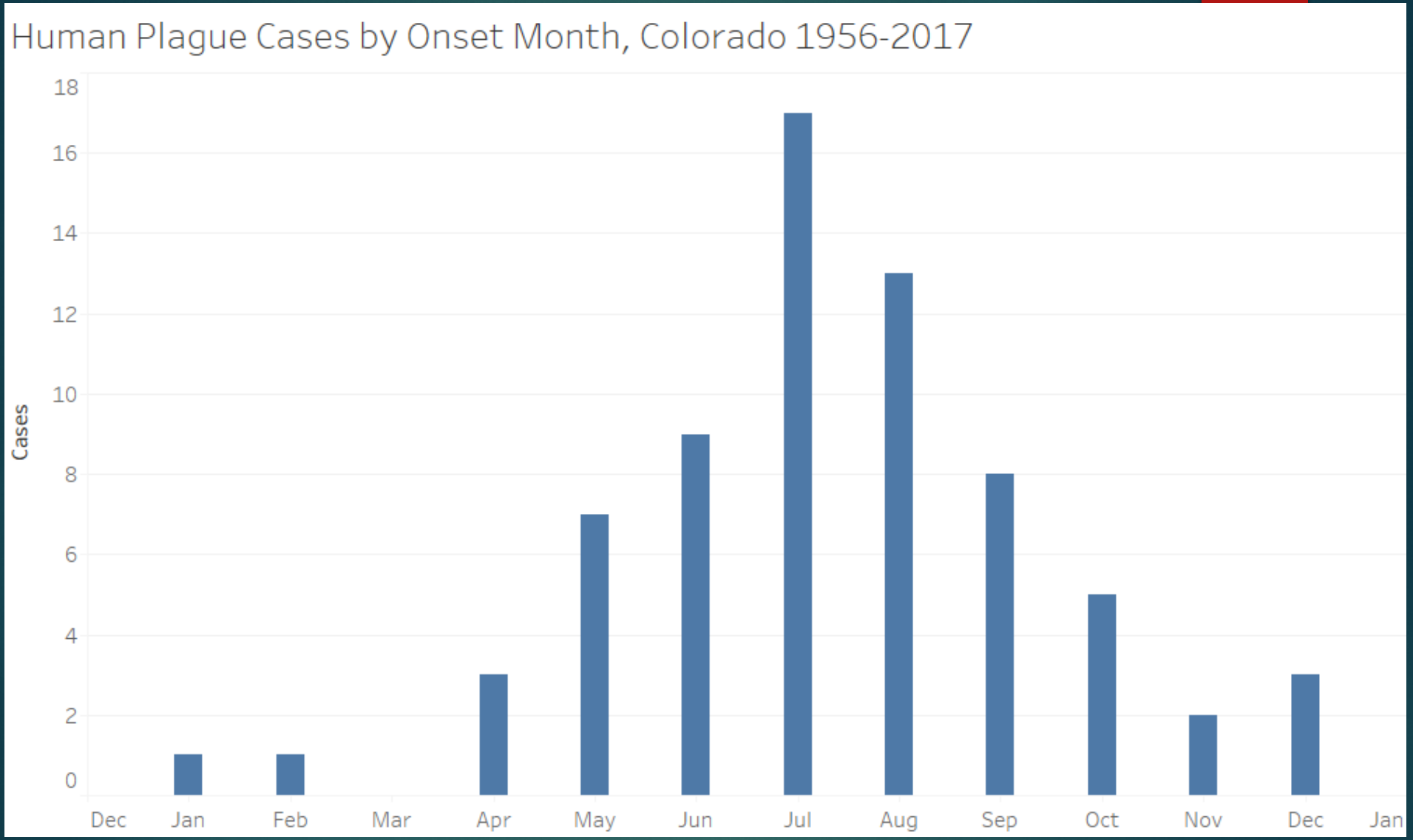


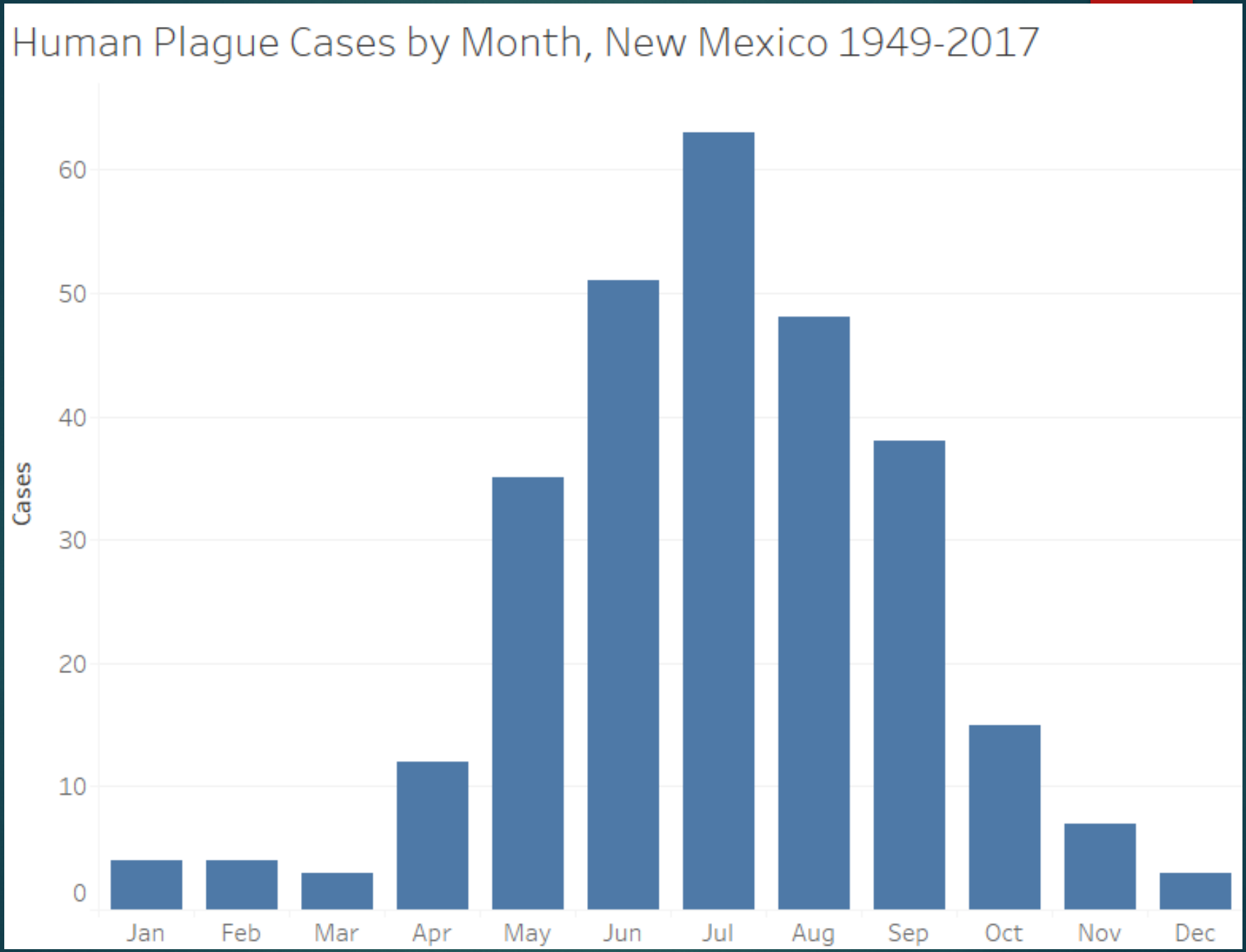
Disease Cycles

- Urban
- Infected fleas or rodents move into urban areas
- Domestic rodents infected
  - High rodent mortality
- Fleas seek new host
  - Domestic cats, dogs, and even humans

Seasonality?

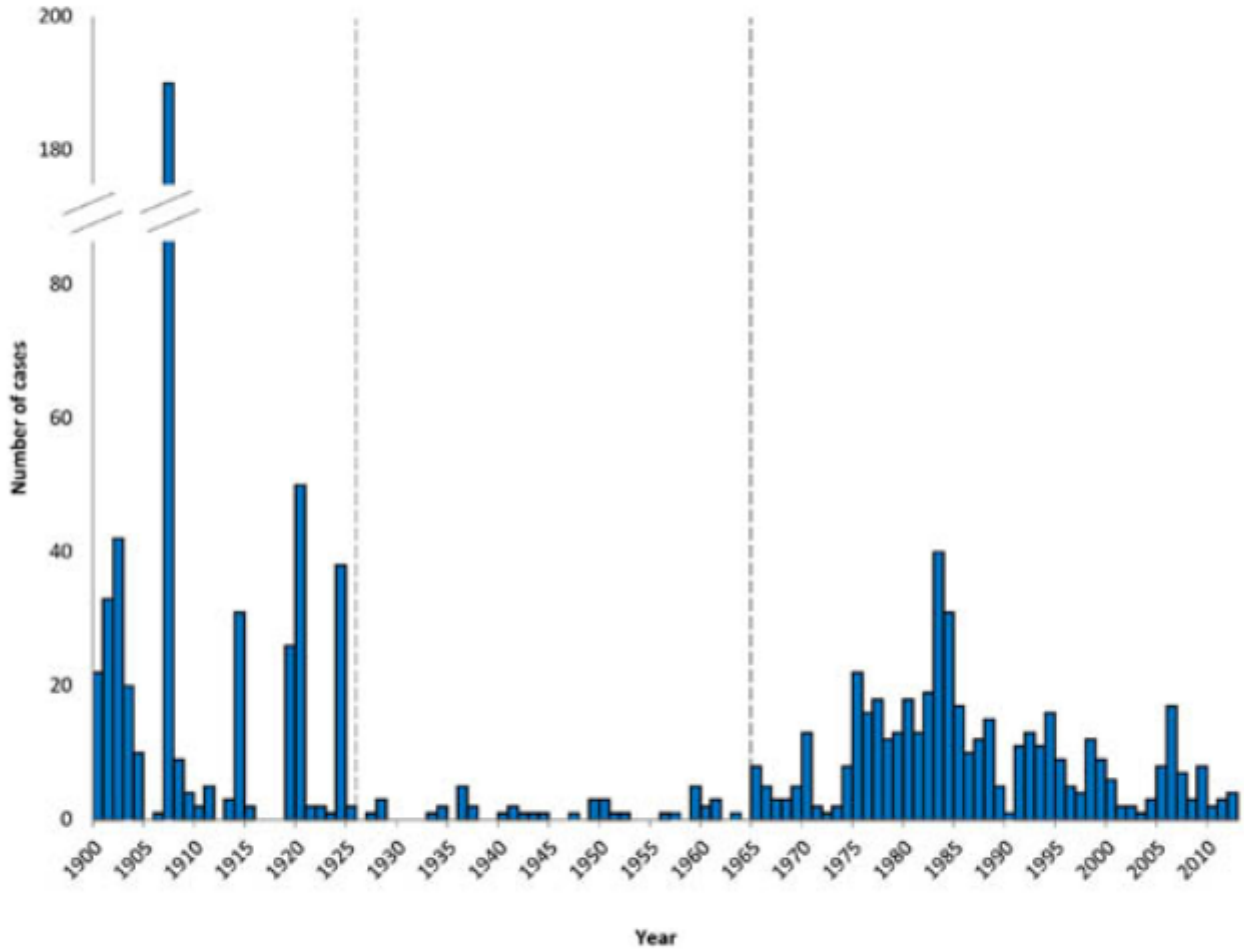
- Can occur ANY month of the year
- Most common in the hot summer months


Human Plague Cases by Onset Month, Colorado 1956-2017
Cases
18
16
14
12
10
8
6
4
2
0
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan

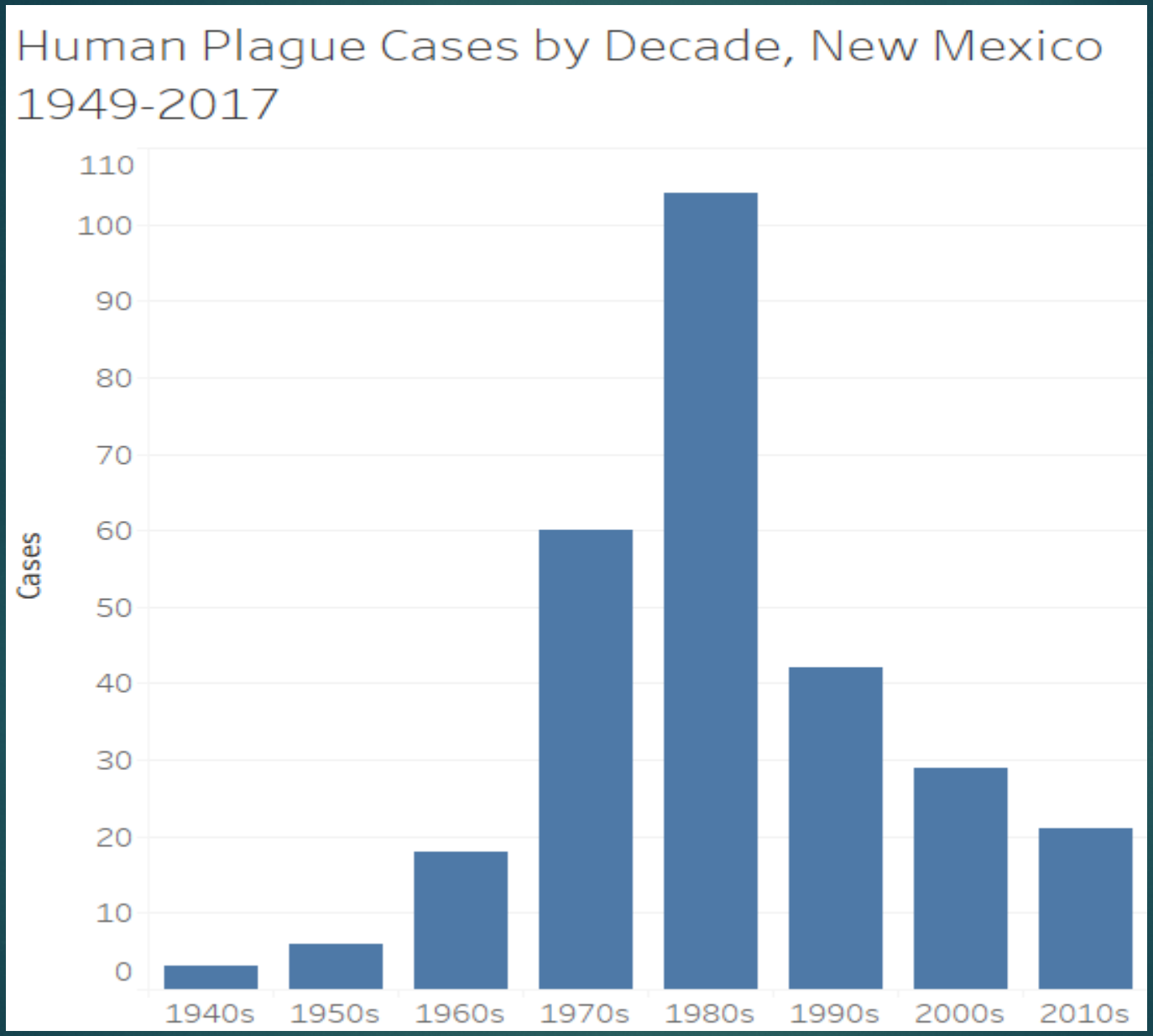

Human Plague Cases by Month, New Mexico 1949-2017
Cases
60
50
40
30
20
10
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Does Climate Play a Role?

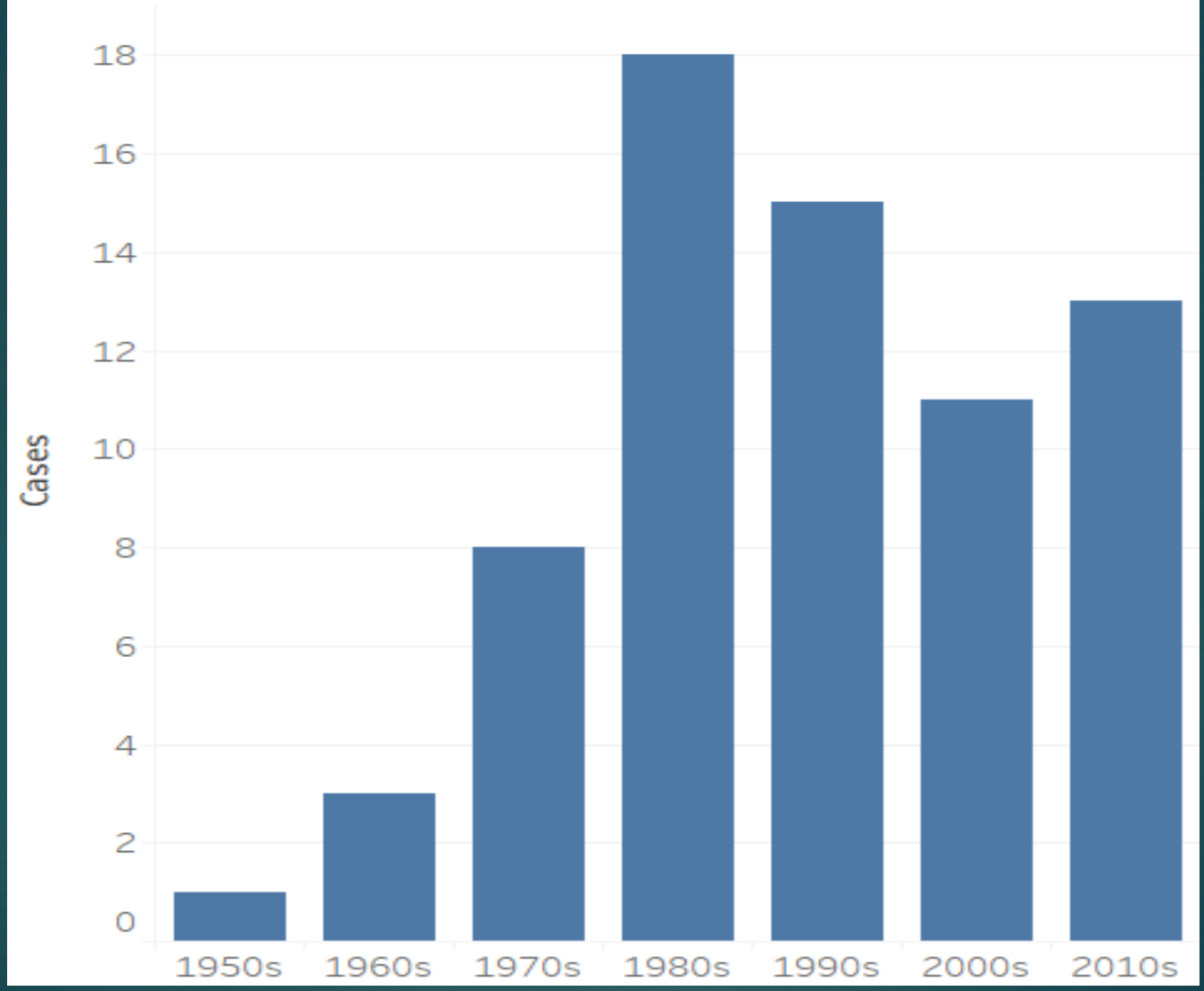
Number of Reported Confirmed and Probable Plague Cases per Year in the United States: 1900-2012



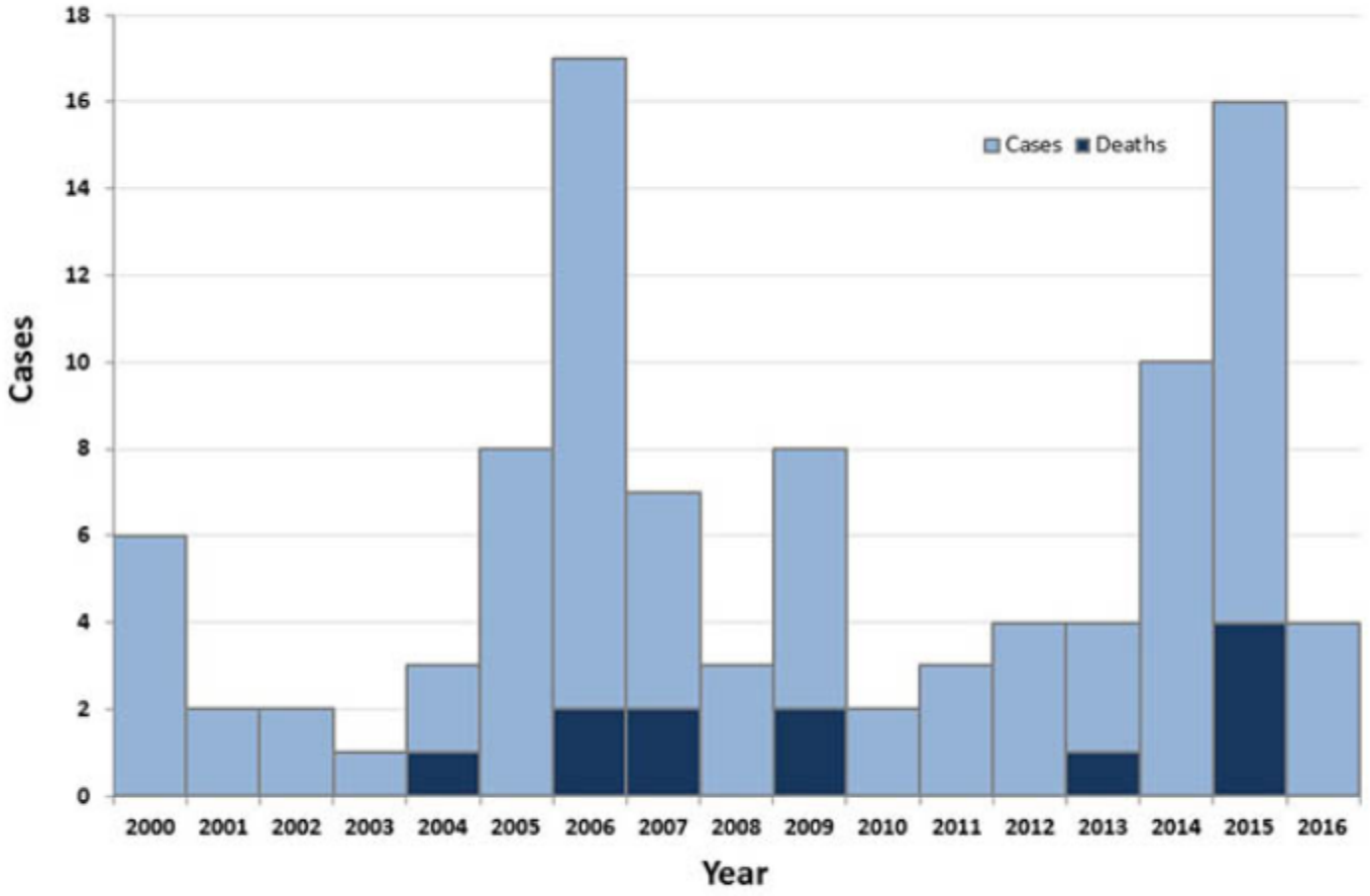
Between 1900 and 2012, 1006 confirmed or probable human plague cases occurred in the United States.


Human Plague Cases by Decade, New Mexico 1949-2017
Cases
110
100
90
80
70
60
50
40
30
20
10
0
1940s
1950s
1960s
1970s
1980s
1990s
2000s
2010s

Human Plague Cases by Decade, Colorado 1956-2017



Human Plague Cases and Deaths - United States, 2000-2016



In recent decades, an average of seven human plague cases have been reported each year (range: 1–17 cases per year).

Prevention and Control

Awareness

- Report suspected animal die offs
  - Public Health Officials
  - Animals may serve as sentinels
- Education of public
  - Risks, transmission, prevention
  - Notices to avoid specific areas/parks/etc
- Take extra precautions during epizootics

Prevention and Control

- Pets:
- Isolate infected pet
  - Limit number of people in contact
  - Personal protection
    - (mask, gloves, eye protection)
  - Flea Control of other dogs and cats

Prevention and Control

- Prevent pets from free roaming
  - cats and dogs
- Rodent control
  - Eliminate rodent habitat around home
    - Brush, food sources, firewood, junk
- Insect repellents for skin & clothes
- Insecticide use in epizootic areas

Investigation Objectives

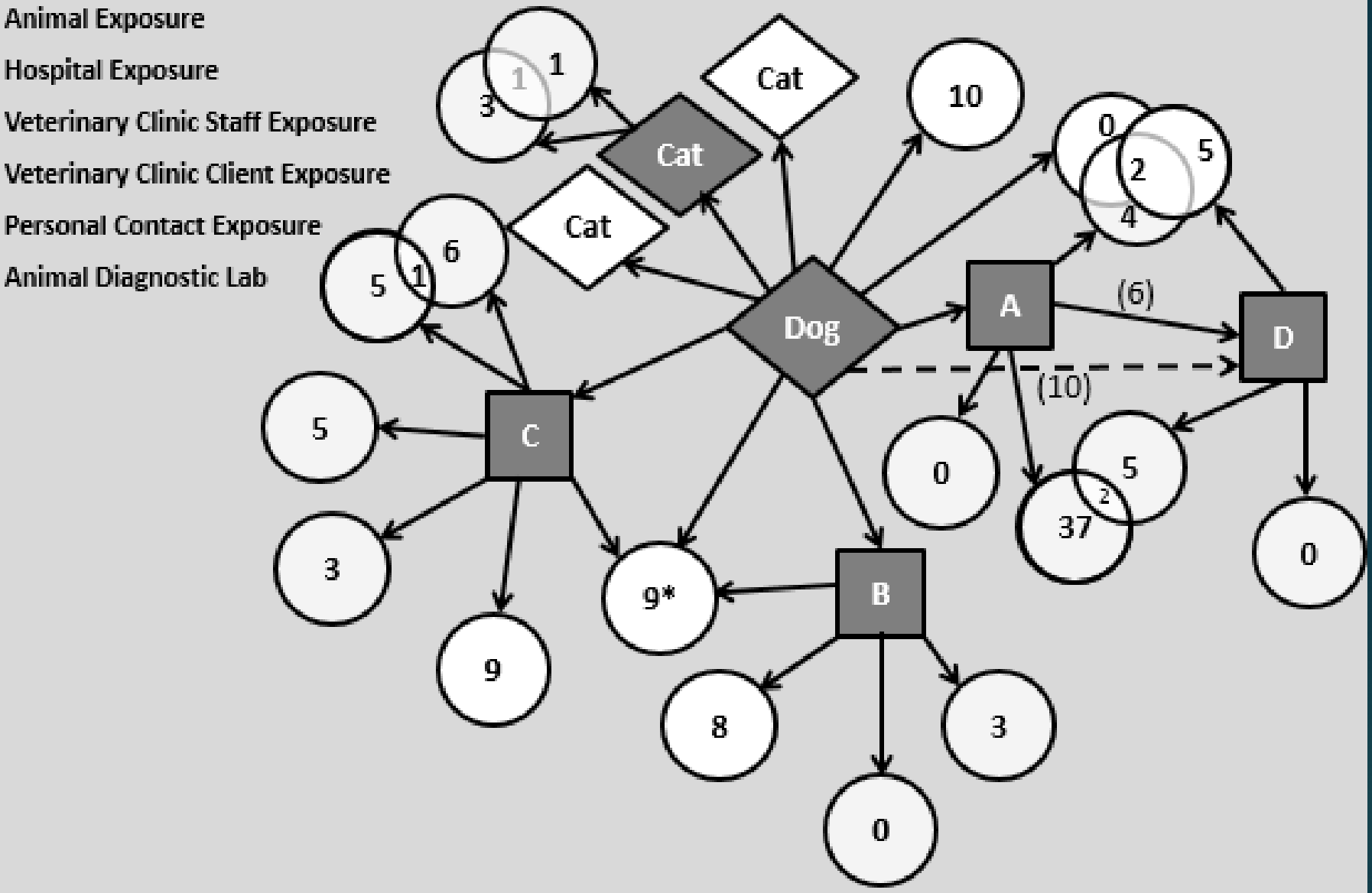
- Identify sources of exposure
- Identify persons at risk of infection
- Identify additional cases
- Prevention and control measures
- Environmental assessment

Case #1

- June 28—Develops Fever and cough
- June 29—Hospitalized with pneumonia
- July 6—Develops respiratory distress and transferred to facility with infectious disease specialists
- Testing (Sputum)
  - Hosp. Lab grew gram negative rods
    - Automated system ID *Pseudomonas luteola*
    - HCP did NOT suspect Plague
  - CDPHE identifed *Yersinia pestis* by PCR
    - Confirmed Plague diagnosis by culture and serum antibodies

Case #1 History

- June 24—Patient's dog develops sudden, unexplained illness
- June 25—Dog has respiratory distress and has bloody discharge from nose and mouth, euthanized
- June 26—Dog sent for necropsy, plague not suspected or tested for
- July 8—Stored specimens *Yersinia pestis* positive



Slide Provided by Tri-County Health Department, Colorado

Case #2

- August 1—Develops Bubo
- August 2—Hospitalized w/ suspect plague
- Testing (Whole Blood)
  - Hosp. Lab grew gram negative rods
    - Automated system ID *Pseudomonas luteola*
    - HCP did NOT believe this to be Plague
  - CDPHE cultured *Yersinia pestis*
    - Confirmed Plague diagnosis

Case #3

- August 26th—Fever, vomiting, back pain
  - Exposures consistent with plague
- August 29th— Pt. hospitalized
- Testing (Whole Blood)
  - Hosp. Lab grew gram negative rods
    - Automated system ID'd *Yersinia pestis*
    - HCP did NOT believe this to be Plague b/c the patient did not have bubos
  - CDPHE cultured *Yersinia pestis*
    - Confirmed Plague diagnosis

Case #4

- October 28th—Fever and painful lymph node
- October 30th—Hospitalized
  - Sepsis and bubo
  - Isolate sent directly to CDPHE
  - CDPHE cultured *Yersinia pestis*
    - Confirmed Plague diagnosis

Case #5

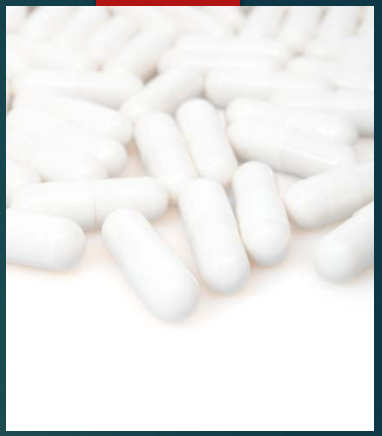
- December 26-Influenza-like illness & enlarged lymph nodes
- January 5th
  - Hosp lab automated system identified

    Yersinia pseudotuberculosis
- January 22nd
  - CDPHE cultured *Yersinia pestis*
    - Confirmed Plague diagnosis

What specimens do you take?

- Depends on Form of Disease
  - Lymph node aspirate
  - Blood culture
  - Sputum
  - Bronchial/tracheal wash
  - Postmortem organ tissues
- Goal is to isolate bacteria

Plague Treatment



- Take specimens first—then start!
- Do not wait for lab results to treat.
- Antibiotic choices:
  1. Streptomycin (or Gentamicin)-injectible
  2. Levofloxicin
  3. Moxifloxacin
  4. Doxycycline
  5. Ciprofloxacin

- Relapse of fever following antibiotic therapy may indicate a secondary site of infection.

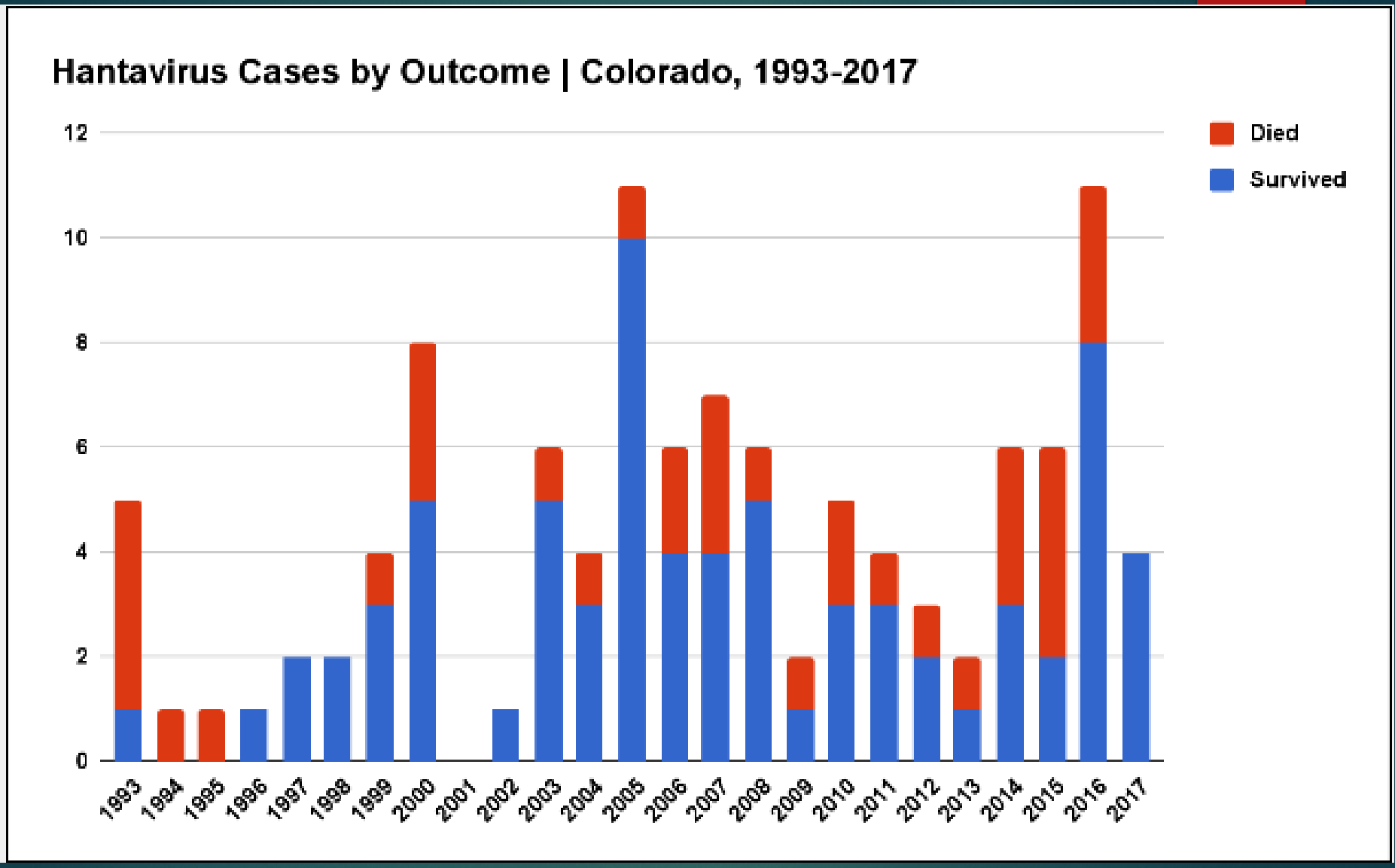
Other Reportable Vector-borne Diseases within Colorado

Zoonotic Diseases Reported in Colorado, 2012-2017

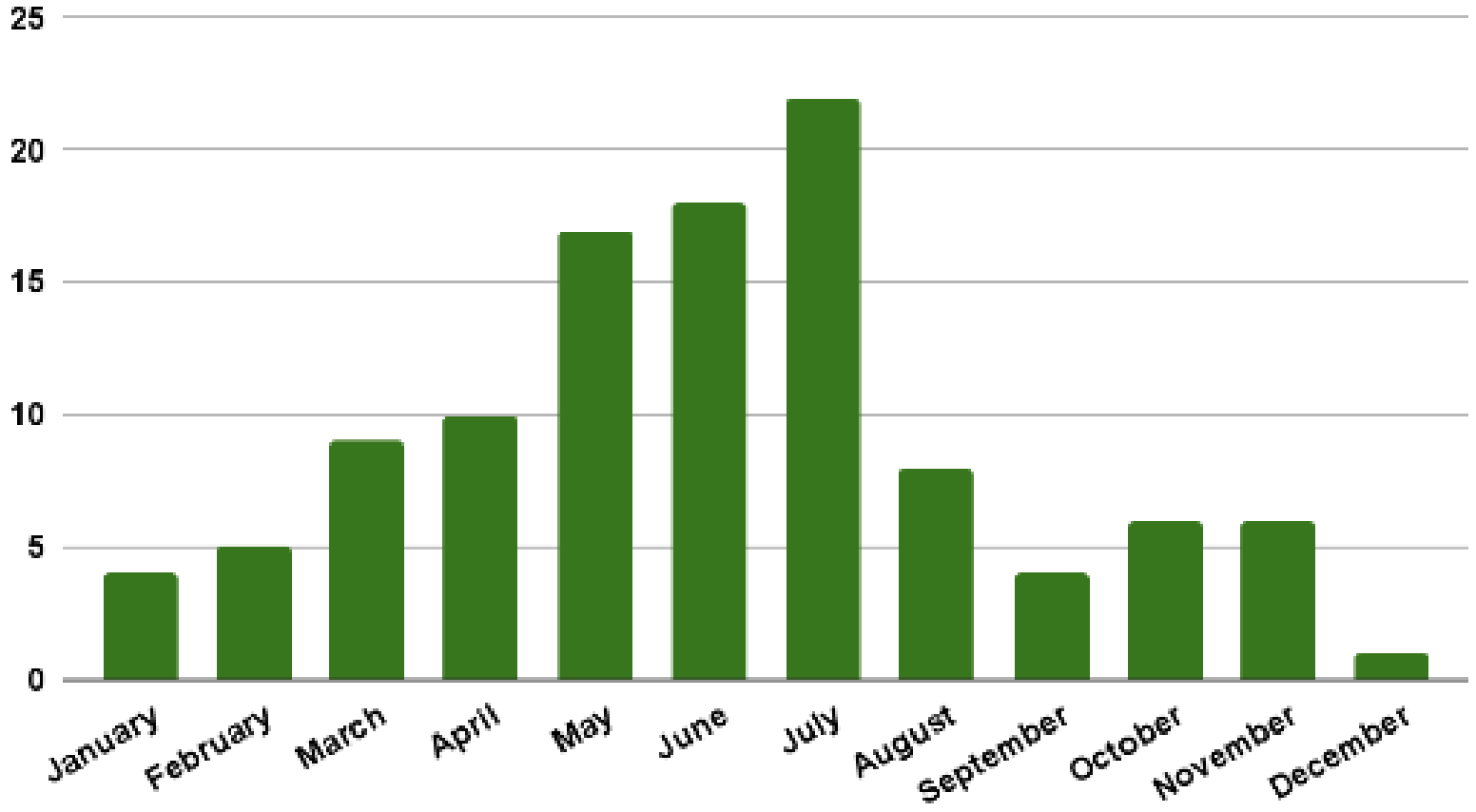
Report Year	5-Year Average (2012-2016)	2017
Anthrax	0	0
Brucellosis	1	0
Chikungunya	-	2
Dengue	-	5
Hantavirus	5	4
Malaria	27	32
Plague	2	0
Psittacosis	0	0
Q-Fever, Acute	5	6
Q-Fever, Chronic	1	0
Rabies, Human	0	0
Rabies, Animal	141	165
Rocky Mountain Spotted Fever	5	10
Tick-borne Relapsing Fever	4	3
Tularemia	16	5
West Nile Virus	164	68
Zika	-	7

Hantavirus

SIN NOMBRE

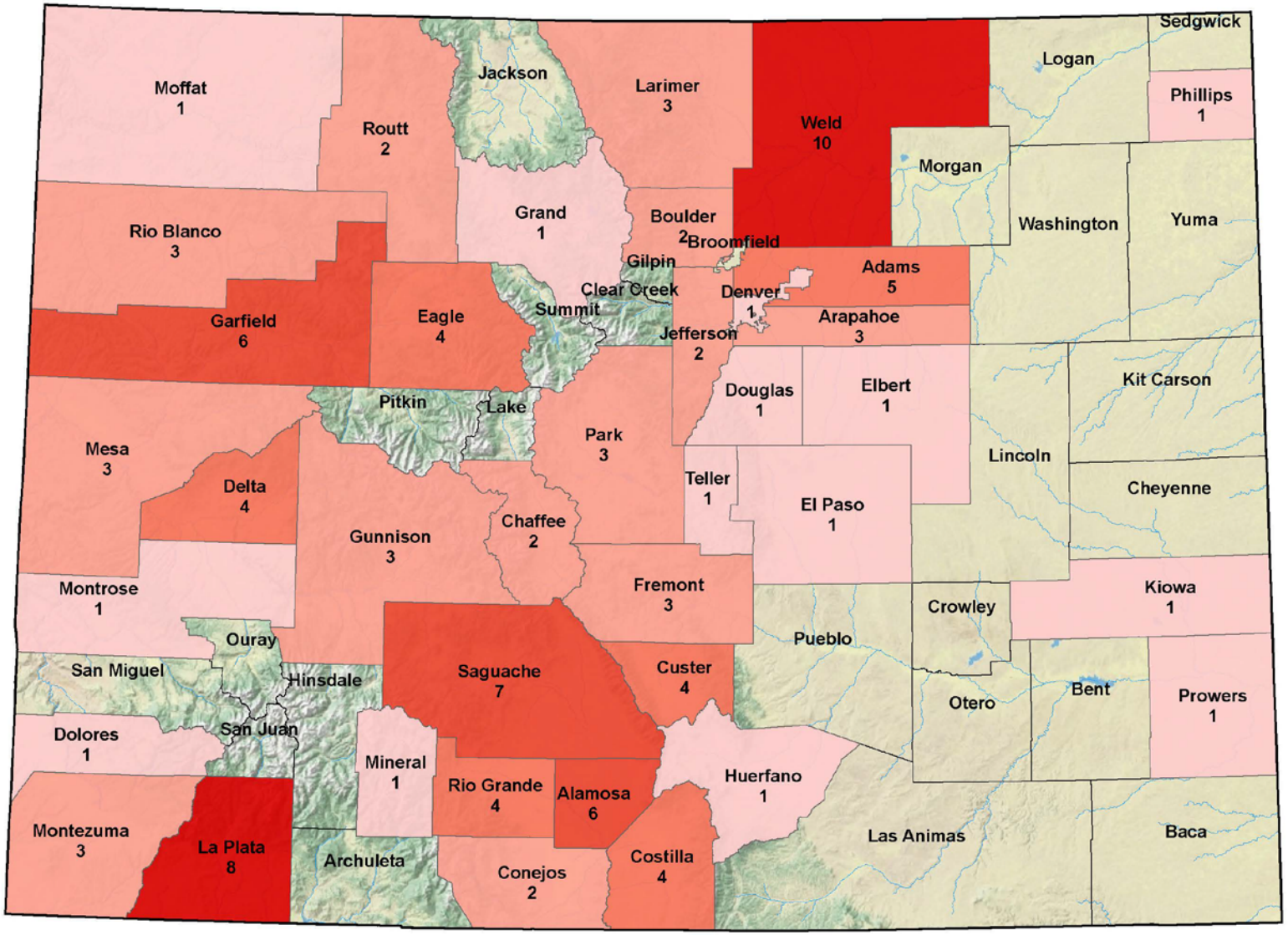

Hantavirus Cases by Outcome | Colorado, 1993-2017
Died
Survived
12
10
8
6
4
2
0
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017

Hantavirus Cases by Month of Onset | Colorado,1993-2017



Hantavirus Pulmonary Syndrome (HPS) Cases, Colorado

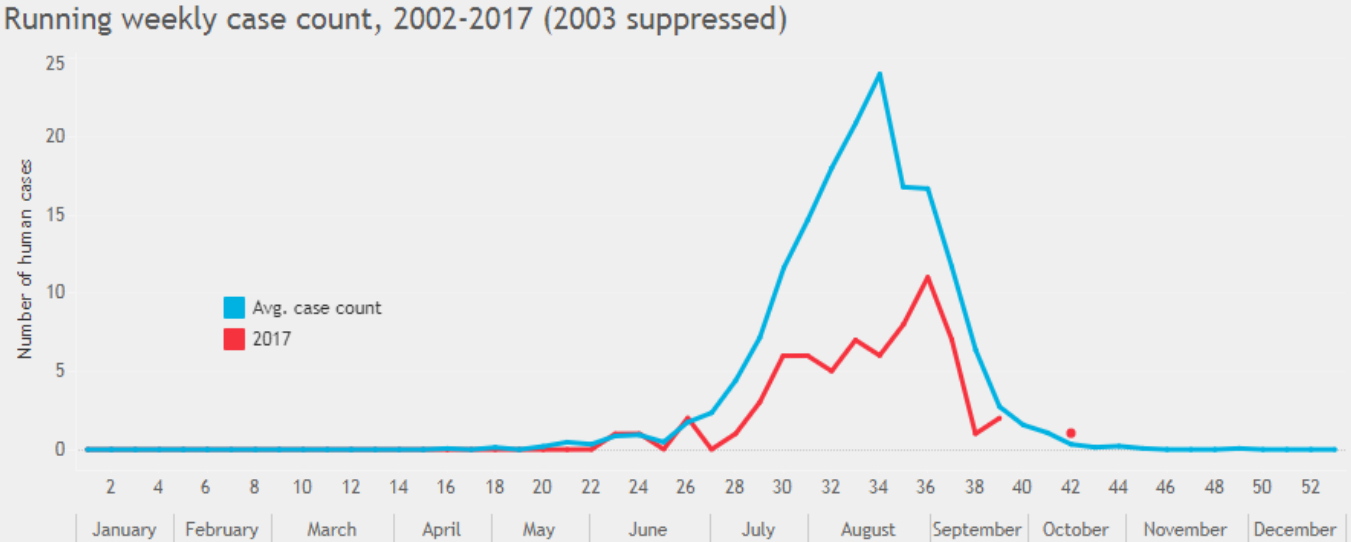
January 1, 1993 through December 31, 2017



West Nile virus

VECTOR: *CULEX TARSALIS* AND *CULEX PIPIENS*

West Nile virus cases, Colorado, 2017



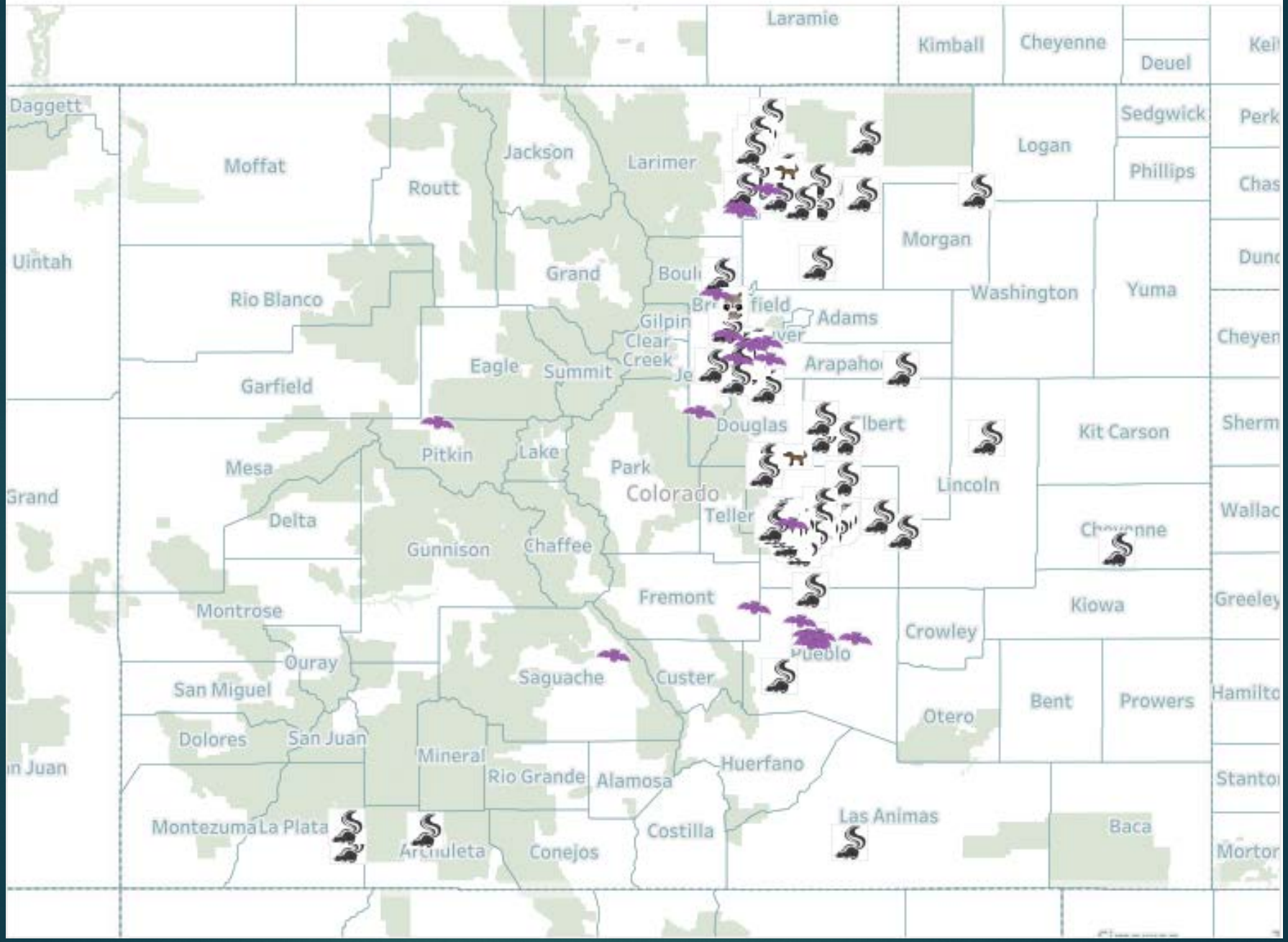
For questions, feedback, or more information contact us at 303-692-2700

COLORADO
Department of Public Health & Environment

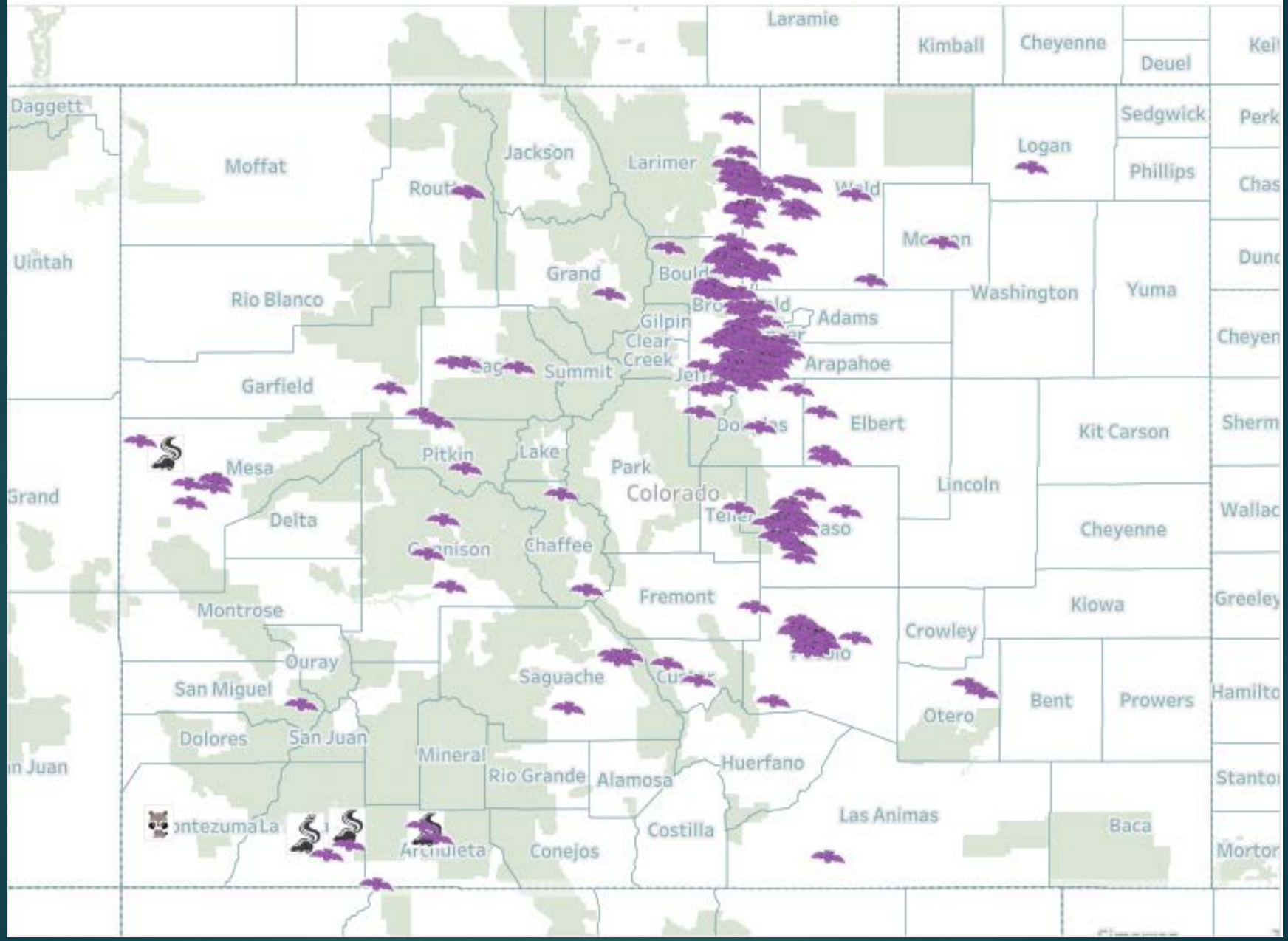
Rabies

SOUTH CENTRAL SKUNK VARIANT AND BAT VARIANTS

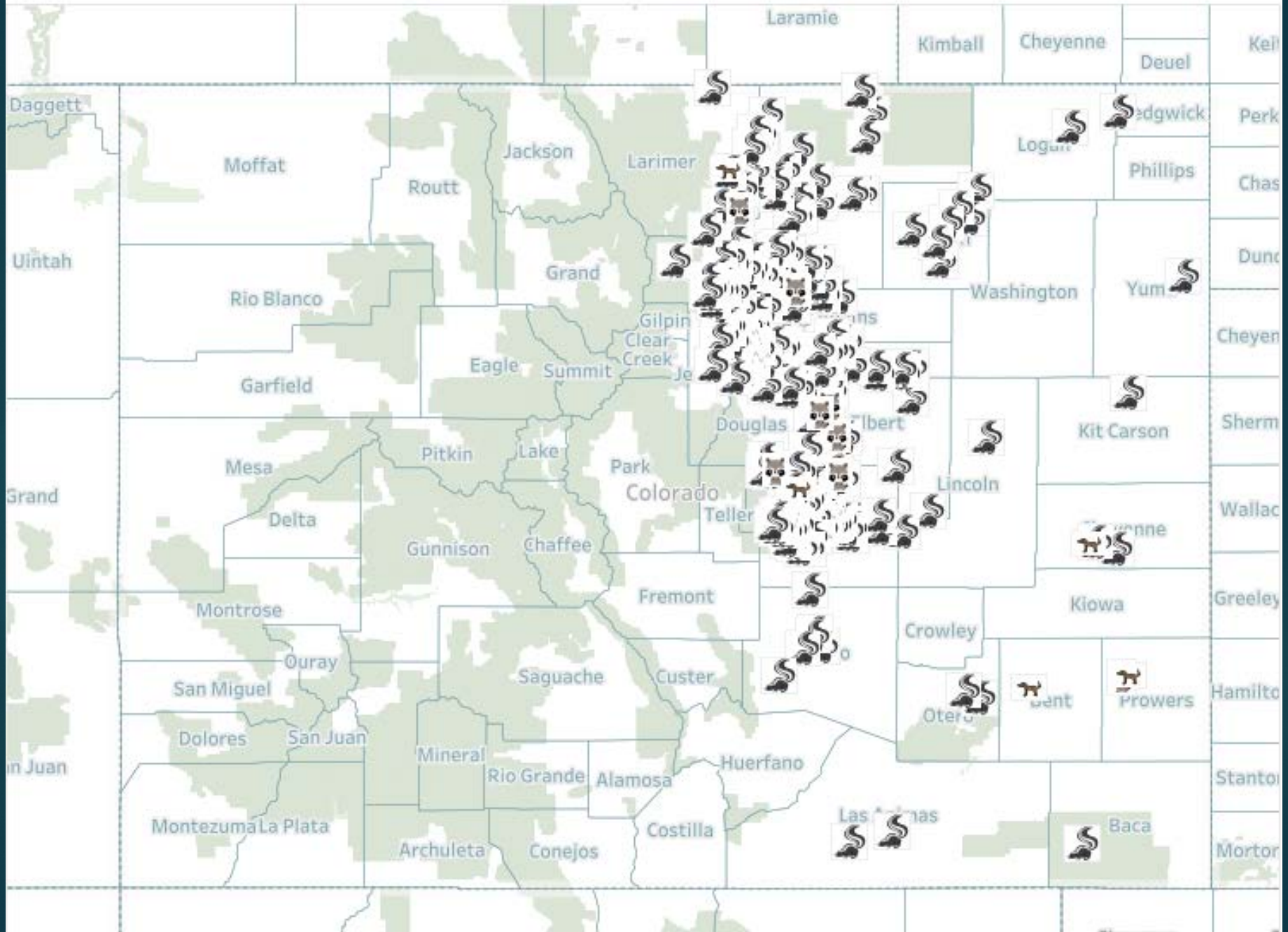
Rabid Animals, Colorado 2018



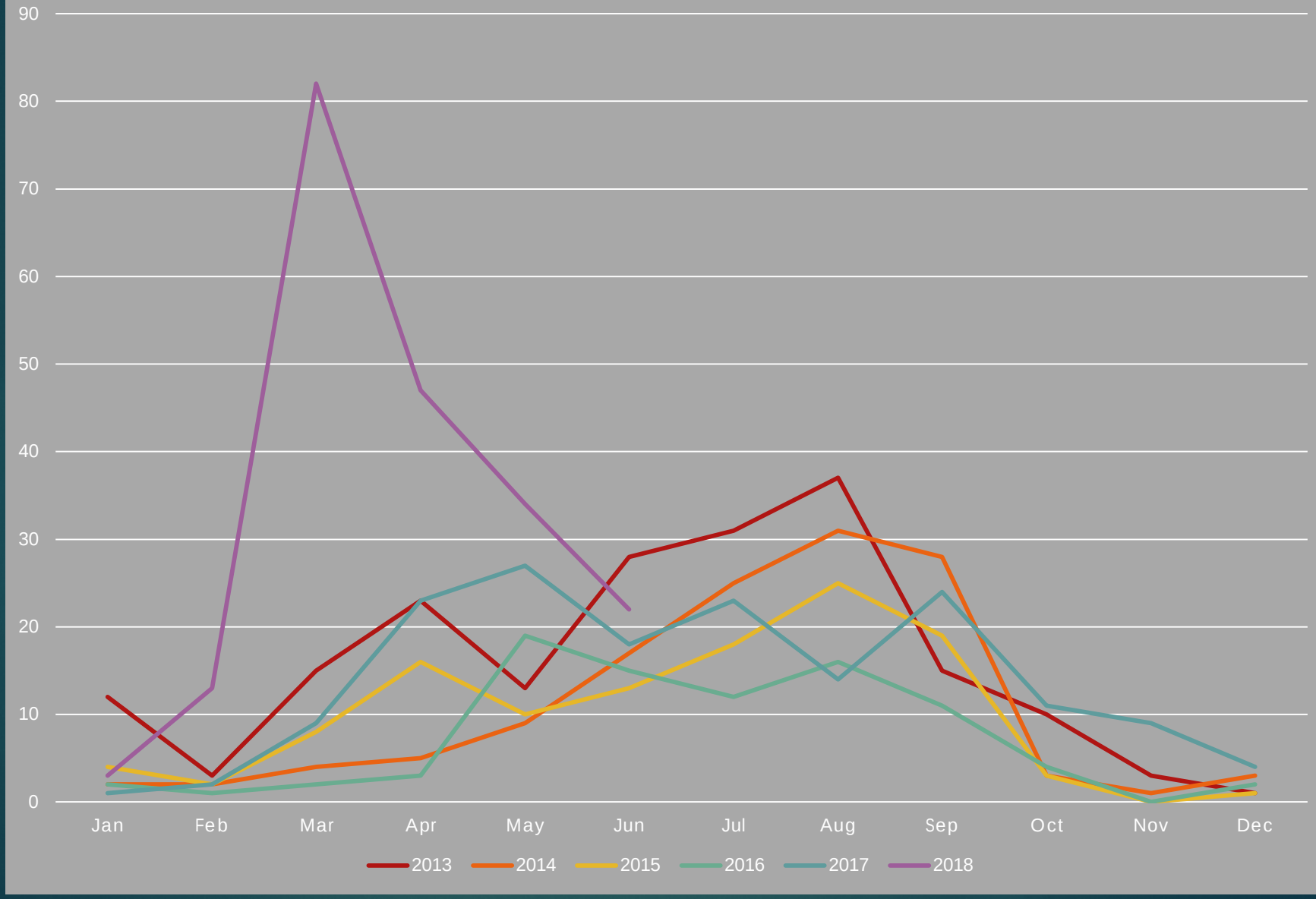
Bat Variant Rabies, Colorado 2005-2018



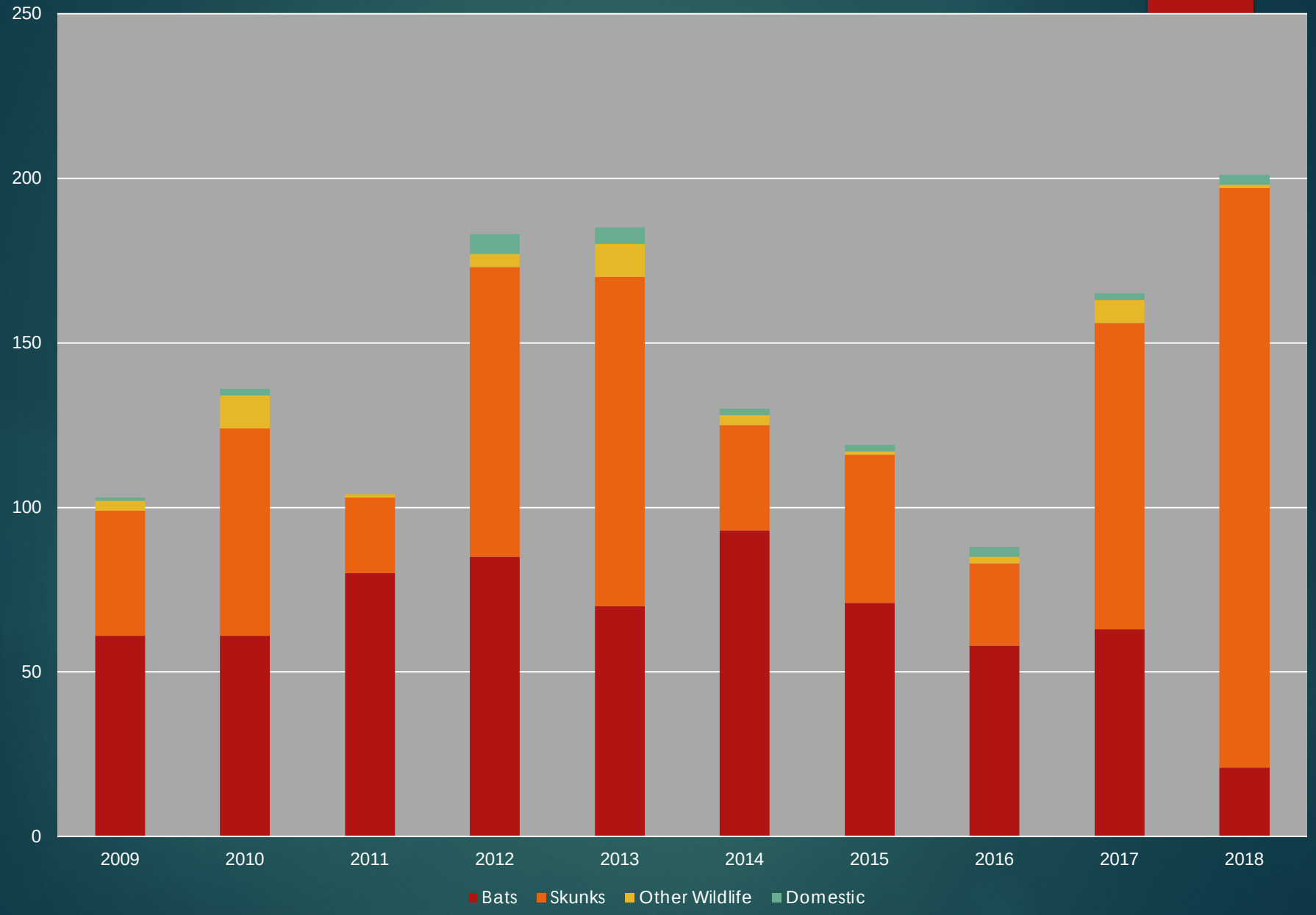
Skunk Variant Rabies, Colorado 2005-2018



Rabid Animals by Month, 2013-2018
Data Current to June 22, 2018

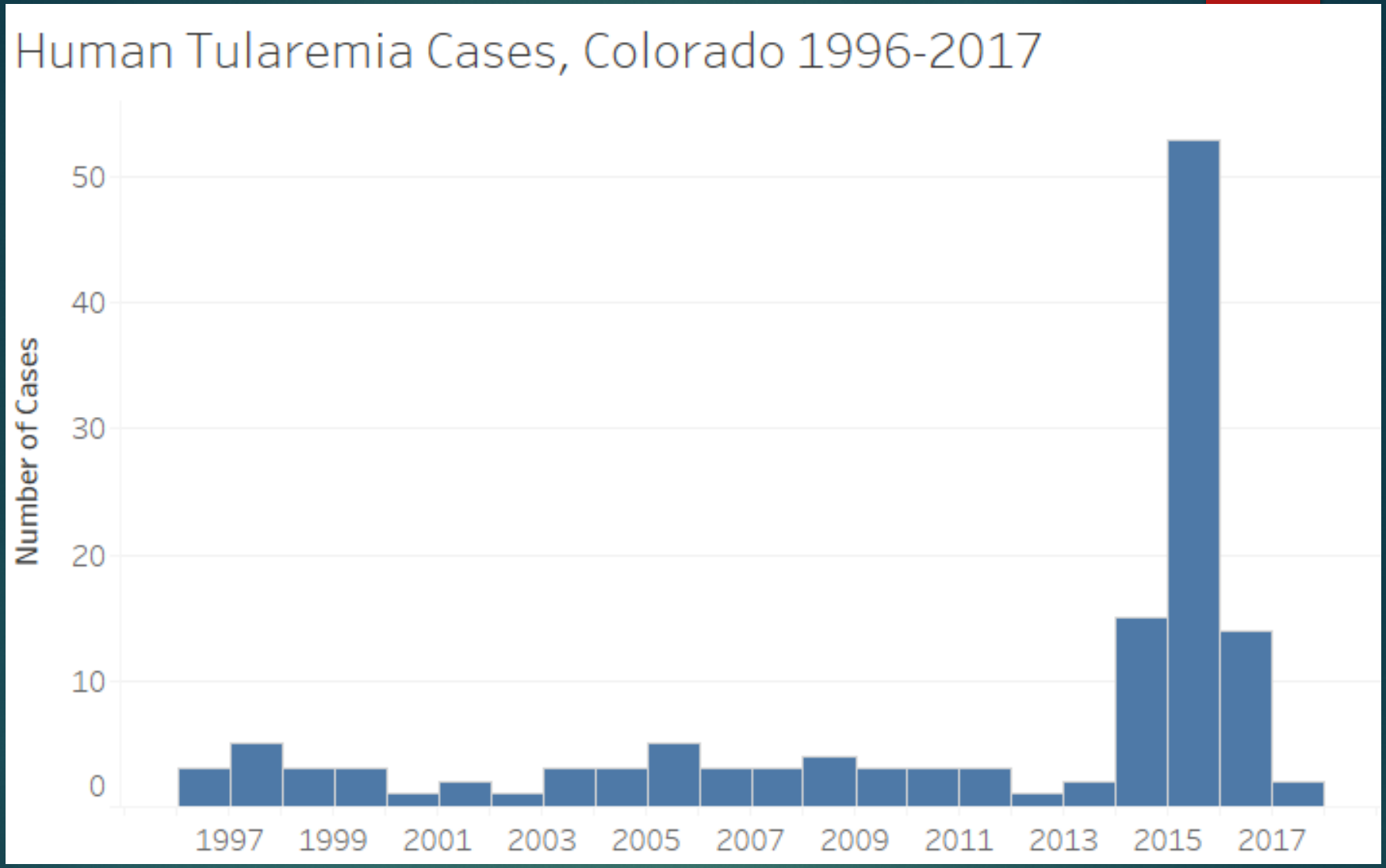


Rabid Animals, Colorado, 2009-2018

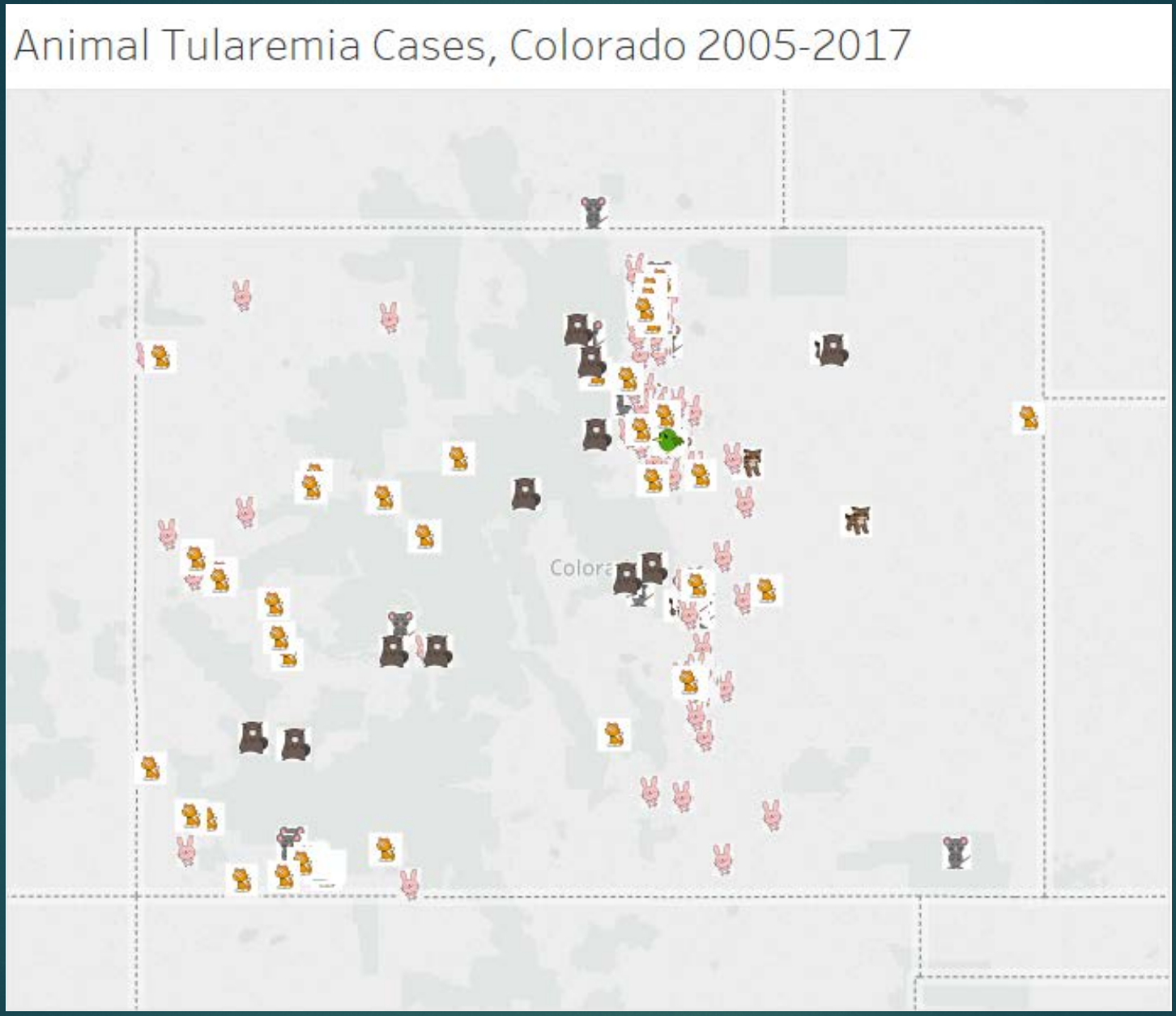


Tularemia

FRANCISELLA TULARENSIS



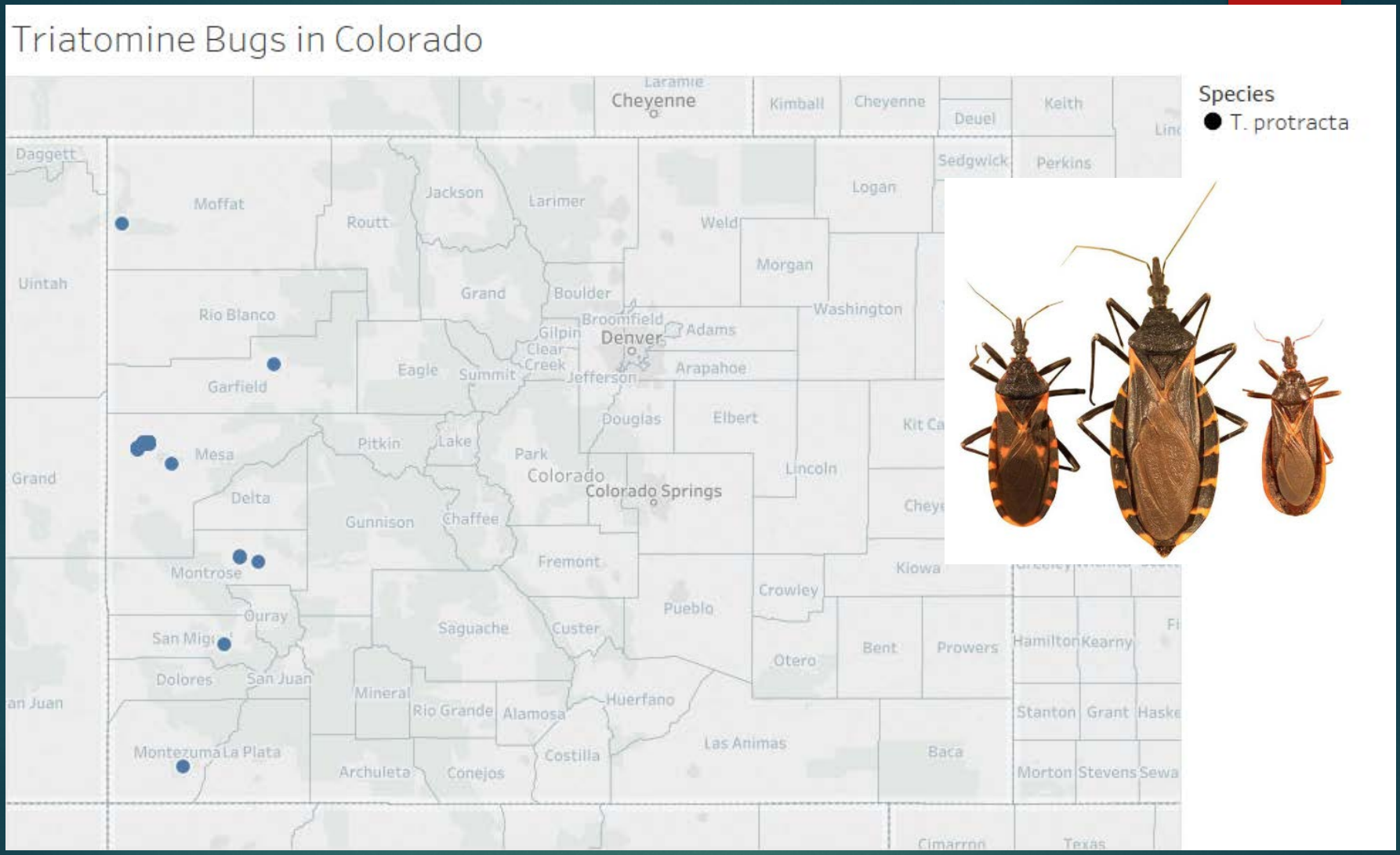
135 Total Cases



237 Total Animal Positives

Kissing Bugs in Colorado

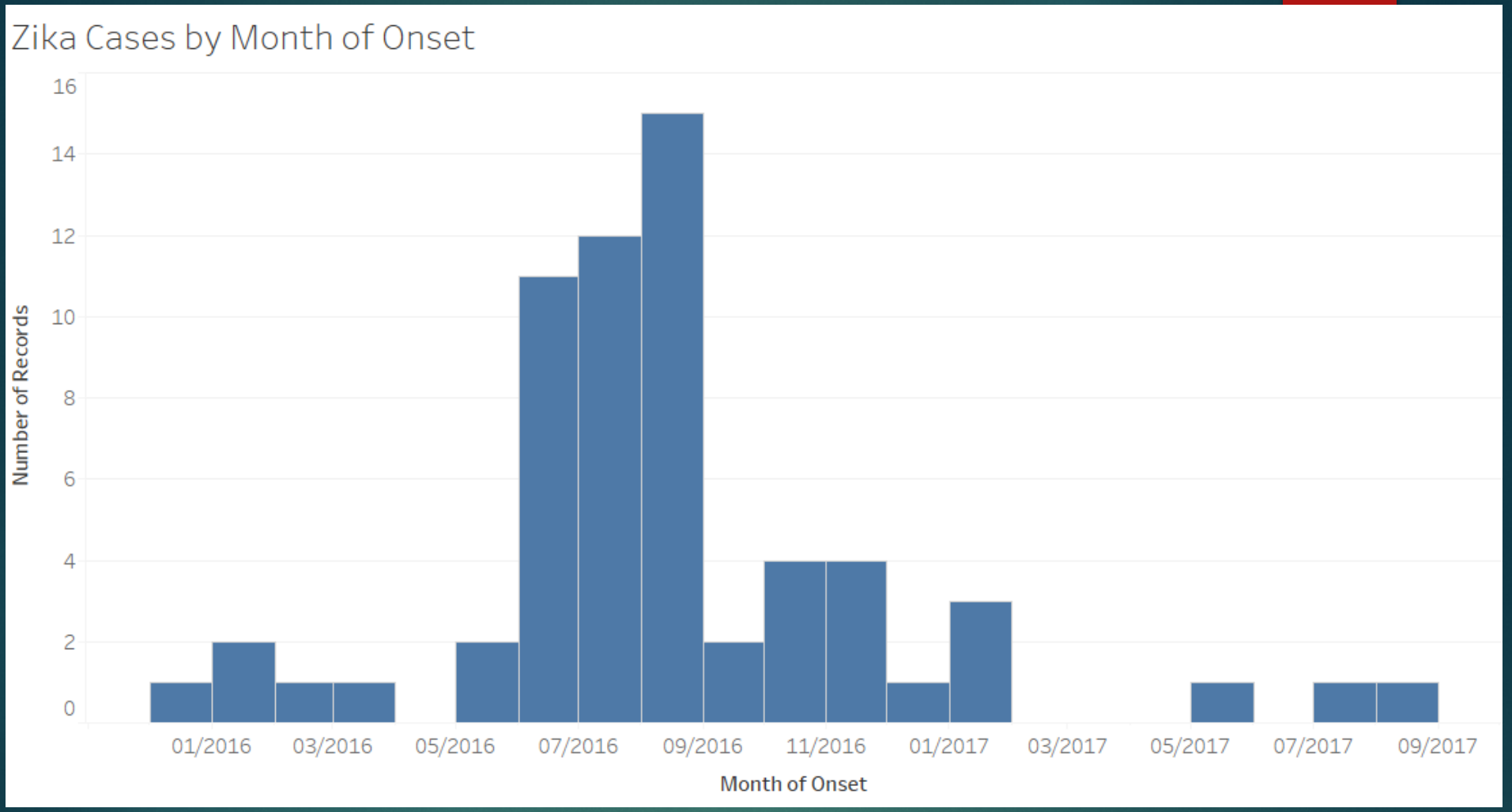
THE VECTOR OF *TRYPANOSOMIA CRUZI*



Known to be in CO 6 counties (so far)

Zika virus in Colorado

INTERNATIONAL TRAVELERS


Zika Cases by Month of Onset
Number of Records
16
14
12
10
8
6
4
2
0
01/2016
03/2016
05/2016
07/2016
09/2016
11/2016
01/2017
03/2017
05/2017
07/2017
09/2017
Month of Onset

Zika Cases by Exposure Country

e..	Exposure Country	Onset Date 2015	2016	2017	Grand..
Caribbean	Bahamas		1		1
	Barbados		2		2
	British Virgin Islands		1		1
	Cuba		1	2	3
	Dominican Republic		2		2
	Grenada		1		1
	Haiti		2		2
	Jamaica		3		3
	Puerto Rico		6		6
	Sint Maarten			2	2
	Turks and Caicos		1		1
Central America	Costa Rica		3	1	4
	Guatemala		3		3
	Honduras		2		2
	Nicaragua		8		8
North America	Florida		1		1
	Mexico		17	1	18
South America	Colombia		1		1
	Venezuela	1			1
Grand Total		1	55	6	62

Questions?

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Plague Resources

•Gould LH, Pape J, Ettestad P, et al. Dog-Associated Risk Factors for Human Plague. Zoonoses and Public Health. 2008; 55: 448-454.

•Kugeler KJ, Staples E, Hinckley AF, et al. *Epidemiology of Human Plague in the United States, 1900-2012*. Emerg Infect Dis. 2015; 21: 16-22.

•Nichols MC, Ettestad PJ, VinHatton ES, et al. *Yersinia pestis* infection in dogs: 62 cases (2003-2011). JAVMA. 2014; 244 (10): 1176-1180.

•Runfola, J, House, J, Miller, L, et. Al. Outbreak of Pneumonic Plague with Dog-to-Human and Possible Human-to-Human Transmission – Colorado, June-July 2014. MMWR. May 1, 2015; 64(16); 429-434.

•Tourdjman M, Ibraheem M, Brett M, et. al. Misidentification of *Yersinia pestis* by Automated Systems, Resulting in Delayed Diagnoses of Human Plague Infections – Oregon and New Mexico, 2010-2011. Clinical Infectious Diseases. 2012; 55 (1 October): e58-e60.

•Wang, H, Cui Y, Wang Z, et al. A Dog-Associated Primary Pneumonic Plague in Qinghai Province, China. CID 2011; 52: 185-190.

•https://www.colorado.gov/pacific/sites/default/files/DC_CD_Zoo-Plague-Recs-for-Management-Diagnosis-and-Treatment-of-Vet-Plague-Cases.pdf