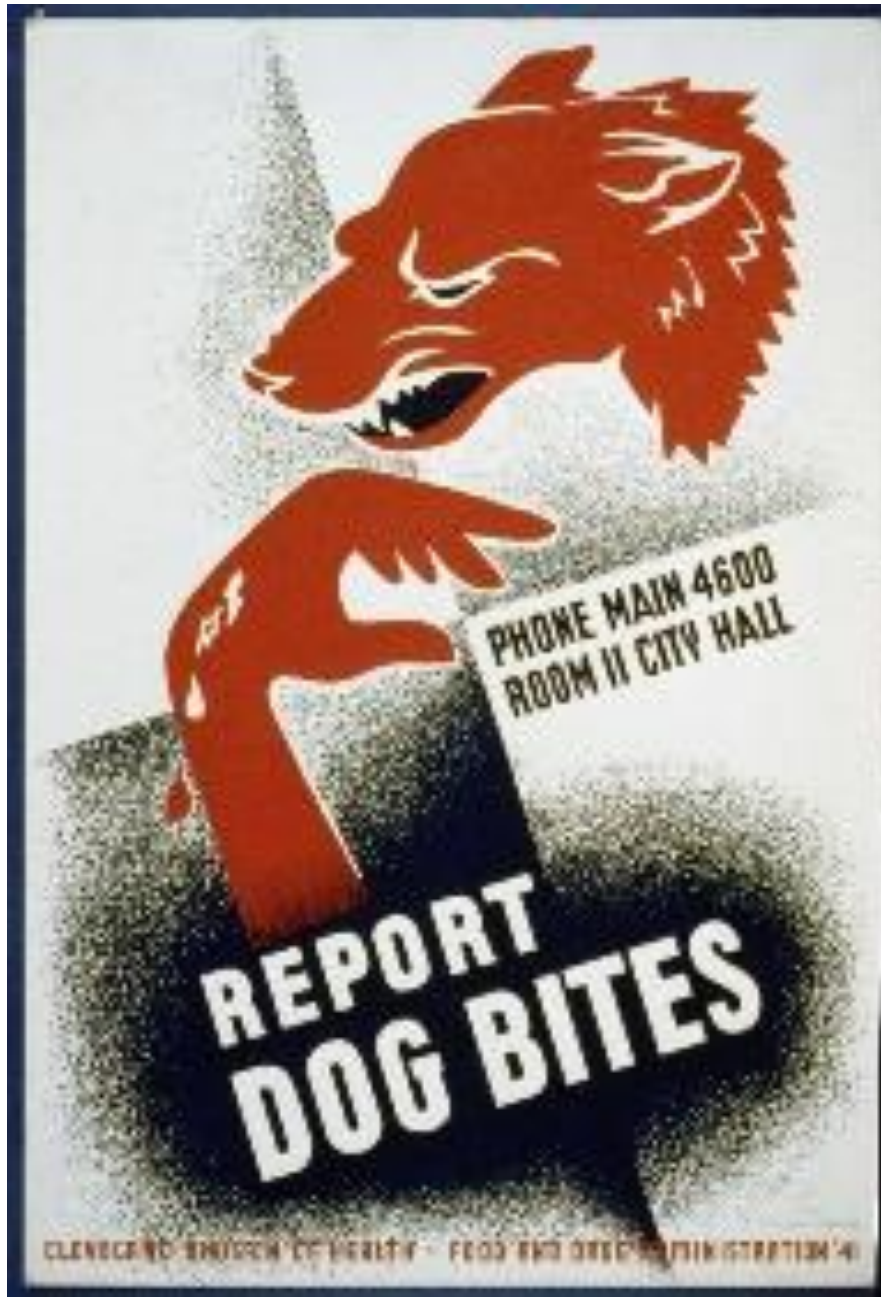




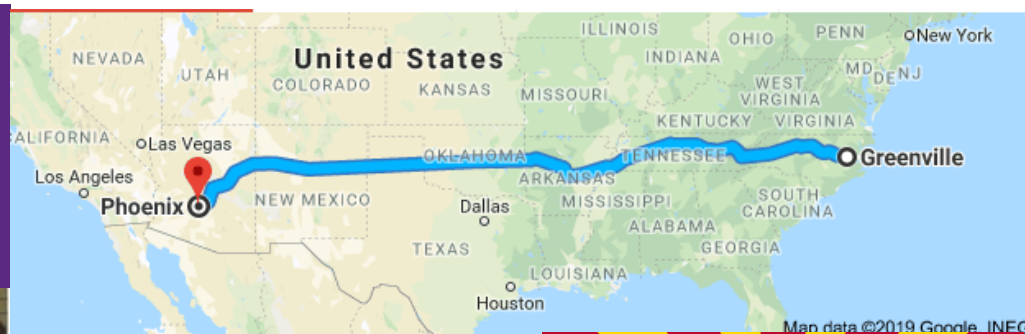
Rabies Post Exposure Prophylaxis Syndromic Surveillance Project

Anna Laughman, BSPH, MD Candidate
CDC Epidemiology Elective Program Intern
ADHS Office of Infections Disease

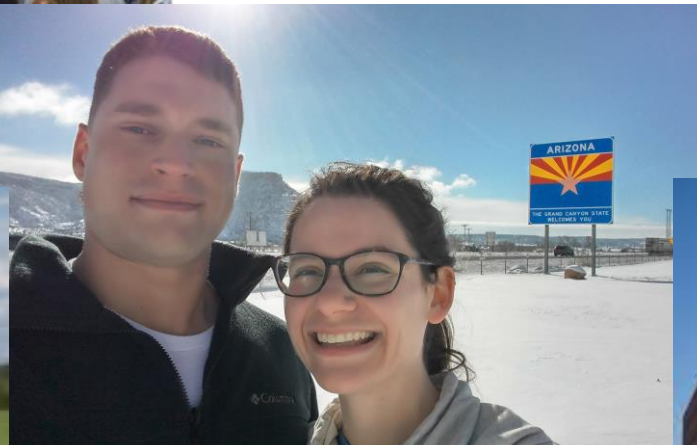
Supervisors: Heather Venkat, DVM, MPH, DACVPM
Hayley Yaglom, MS, MPH



My Background



33 h (2,255.7 mi) via I-40 W



Agenda



- Project Background
- Key Terms
- ESSENCE Query
- Data Findings
- Public Health Implications
- My Thoughts
- Future Project Ideas
- Questions

Internship Project

CDC Epidemiology Elective Program

For more information and to apply
online, visit us at:

www.cdc.gov/EpiElective

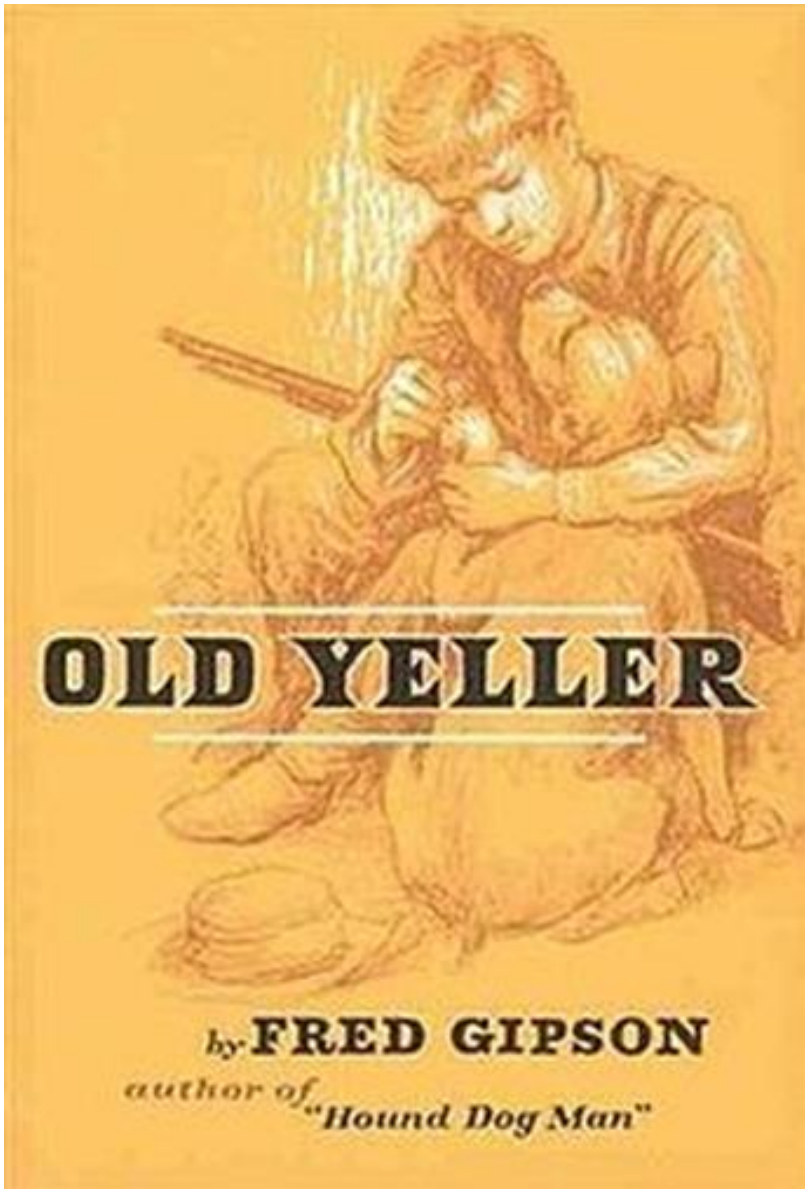


Objective:

The Arizona Department of Health Services is proposing an exploratory analysis of syndromic surveillance data to assess the appropriateness of rabies post exposure prophylaxis (RPEP) administration for domestic animal and wildlife exposures by health care facilities.

Q1: Can ESSENCE be utilized by the state health department to accurately analyze RPEP vaccination data?

Q2: If so, is RPEP being given when indicated based on public health recommendations?



Disclaimers

- No prior experience with syndromic surveillance or ESSENCE.
- Not a rabies expert.

Project Background Information

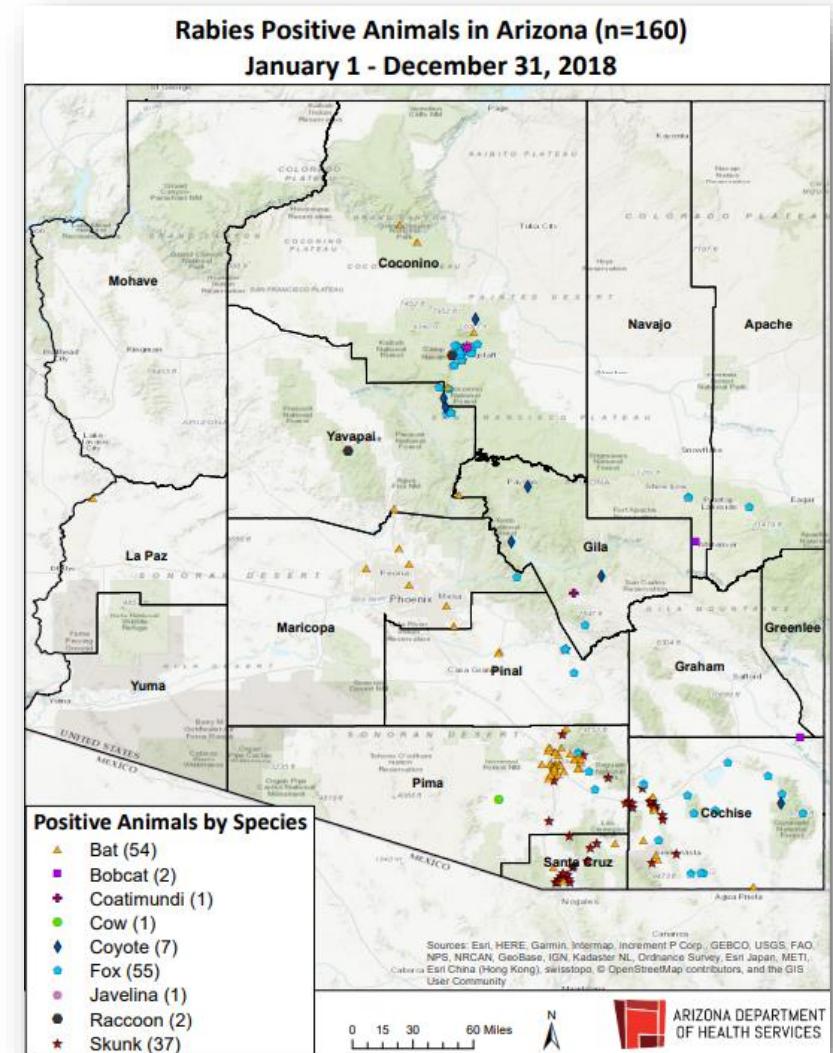
- Arizona:



NOT



- In 2018, Arizona had 160 positive rabid animals.
- Humans exposed to known rabid animal in 2018 = 29.
- Last human case of rabies in Arizona: 1981



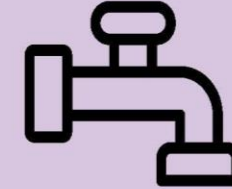
What is Rabies Post Exposure Prophylaxis?

- Human Rabies Immune Globulin
- A series of 4 vaccinations (Day 0,3, 7, 14) given to human patient after potential rabid animal exposure.
- 100 % effective at preventing rabies if given properly.

Rabies Post-Exposure Prophylaxis Guidelines



Contact [public health](#) to assess patient need for post-exposure prophylaxis



Clean exposure area thoroughly with soap and water



Administer HRIG* directly into exposure area (20 IU/kg body weight) and give remaining in deltoid



Administer vaccine in the opposite deltoid from HRIG on days 0, 3, 7, and 14

*Human Rabies Immune Globulin

Special Considerations

Previously vaccinated
Immunocompromised

Do not administer HRIG, vaccinate on days 0 and 3
Administer 5 doses of vaccine on days 0, 3, 7, 14, and 28

azhealth.gov/rabies
[CDC Rabies Prophylaxis](http://CDC.RabiesProphylaxis)

Rabies Post Exposure Prophylaxis (RPEP) Reporting in Arizona

- The state does track all rabid animal test results from the state lab and as reported by USDA.
- **Animal bites** and patients receiving **RPEP** are only reported at the **local / county level**.
- The State Health Department does not get automatic reporting of RPEP and has **no clear way to track state-wide RPEP administration**.



W

Key Terms / Definitions

O

Exposure

R

Inclusion Criteria

Exclusion Criteria

D

Rabies post-exposure prophylaxis (RPEP)

When is RPEP Indicated?

S

When is RPEP NOT Indicated?

Exposure:

- Bitten or scratched by an animal
- Contact with a known rabid animal
- Close proximity to a bat

Inclusion Criteria

- Human contact with an animal exposure that includes mammal species.

Exclusion Criteria

- Human contact with an exposure to another human, insect, arachnid, reptile, bird species; or not enough information provided for exposure species.

Rabies Post Exposure Prophylaxis (RPEP) Administered

Patients who had:

- CC comments that included rabies shot, rabies vaccination, rabies series
- or ICD 10 code for rabies (A82.9 Rabies, unspecified)
- or ICD 10 code for human immunoglobulin vaccination (Z29.14 = prophylactic rabies immune globin) + CC animal bite.

RPEP Indicated:

Patients with exposure to:

- wildlife
- out-of-country dog or monkey
- known rabid animal exposure

RPEP *Not* Indicated:

Patients with exposure to:

- domestic animals
- non-rabies reservoir mammals

Cook County, Illinois

References Used when Designing the Query

^rabies^,or,^post exposure prophy^,or,^skunk^,or,^raccoon^,or^raccoon^,or,^raccon^,or,(,^fox^,andnot,^dr. fox^,andnot,^dr fox^,),or,^coyote^,or,(,^bat^,andnot,^bal^,andnot,^batt^,andnot,^abate^,andnot,^hit ^,andnot,^lac^,andnot,^metal^,andnot,^contusion^,andnot,^combat^,andnot,^plasti c^,andnot,^assaul^,andnot,^bation^,andnot,^bating^,andnot,^bath^,andnot,^intubat ^,andnot,^exacerb^,),or,^979.1^,or,^9791^,or,^E949.1^,or,^E9491^,or,^V04.5^,or, ^V045^,or,^V01.5^,or,^V015^,or,^Z20.3^,or,^Z203^,or,^W55.5^,or,^W555^,or,^ T50.B91A^,or,^ T50B91A^

Florida

(,^rabie^,or,^rabbie^,or,^bitten^,or,^bite^,or,bit ^,or,^ bit,or,^ bit ^,),andnot,(,^bug^,or,^ant^,or,^child^,or,^insect^,or,^flea^,or,^person^,or,^human^ ,or,^snake^,or,^caterpil^,or,^pygmy rattler^,or,^something^,or,^spider^,or,^wasp^,or,^mosquito^,or,^tick^,or,^fish^,or, ^recluse^,)

Marion County, Indiana

(, (^ bat ^, or, ^ bat, or, bat
^), and, (^bite^, or, ^exposure^,)), or, (, (^rabies^, or, ^A82^, or, ^Z20.3^, or, ^Z203^
,), andnot, (^second^, or, ^third^, or, ^fourth^, or, ^final^, or, ^last^, or, ^followup^, or,
^follow up^, or, ^follow-up^,)),)

Hendricks and Tippecanoe Counties:

(, (^ bat ^, or, ^ bat, or, bat
^), and, (^bite^, or, ^exposure^,)), or, (, (^rabies^, or, ^A82^, or, ^Z20.3^, or, ^Z203,)

Our Query...

^rabies^,or,^post exposure prophylaxis^,or,^skunk^,or,^raccoon^,or,^raccoon^,or,^racoon^,or,
^coyote^,or,^coyot^,or,^javelina^,or,^javalina^,or,^bobcat^,or,^mountain lion^,or,^cow^,or,
^coati^,or,^bit by^,or,^bitten by^,or,^dog^

,or,
(,^fox^,andnot,^dr. fox^,andnot,^dr fox^,)

,or,
^coyote^

,or,
(,^bat^,andnot,^bal^,andnot,^batt^,andnot,^abate^,andnot,^hit ^,andnot,^lac^,andnot,^metal^
,andnot,^contusion^,andnot,^combat^,andnot,^plastic^,andnot,^assault^,andnot,^bation^,andnot,
^bating^,andnot,^bath^,andnot,^intubate^,andnot,^exacerbate^,)

,or,
^979.1^,or,^9791^,or,^E949.1^,or,^E9491^,or,^V04.5^,or,^V045^,or,^V01.5^,or,^V015^,or,^Z20.3^,or,
^Z203^,or,^W55.5^,or,^W555^,or,^ T50.B91A^,or,^ T50B91A^,or,^A82^,or,^Z20.3^,or,^Z29.14^,or,
^W54.0XXA^,or,^W55.01XA^,or,^W55.51XA^,or,^W53.11^,or,^W53.21^,or,^W53.81^,or,^W54.0^,or,^W55.01^,
or,
^W55.11^,or,^W55.21^,or,^W55.51^,or,^W55.81^,

More Query Details within ESSENCE

- **Timeline:** January 1 – December 31, 2018
- **Patient Location:** Arizona

Data Refinement



8819

- Raw data count for query.

4378

- Removed non-mammalian species.
- Deduplicated patients with multiple follow-up encounters for same exposure (ex: return rabies vaccinations).
- Each row = 1 unique animal exposure.

365

- Exposures that were determined to have likely received RPEP per our project definition.

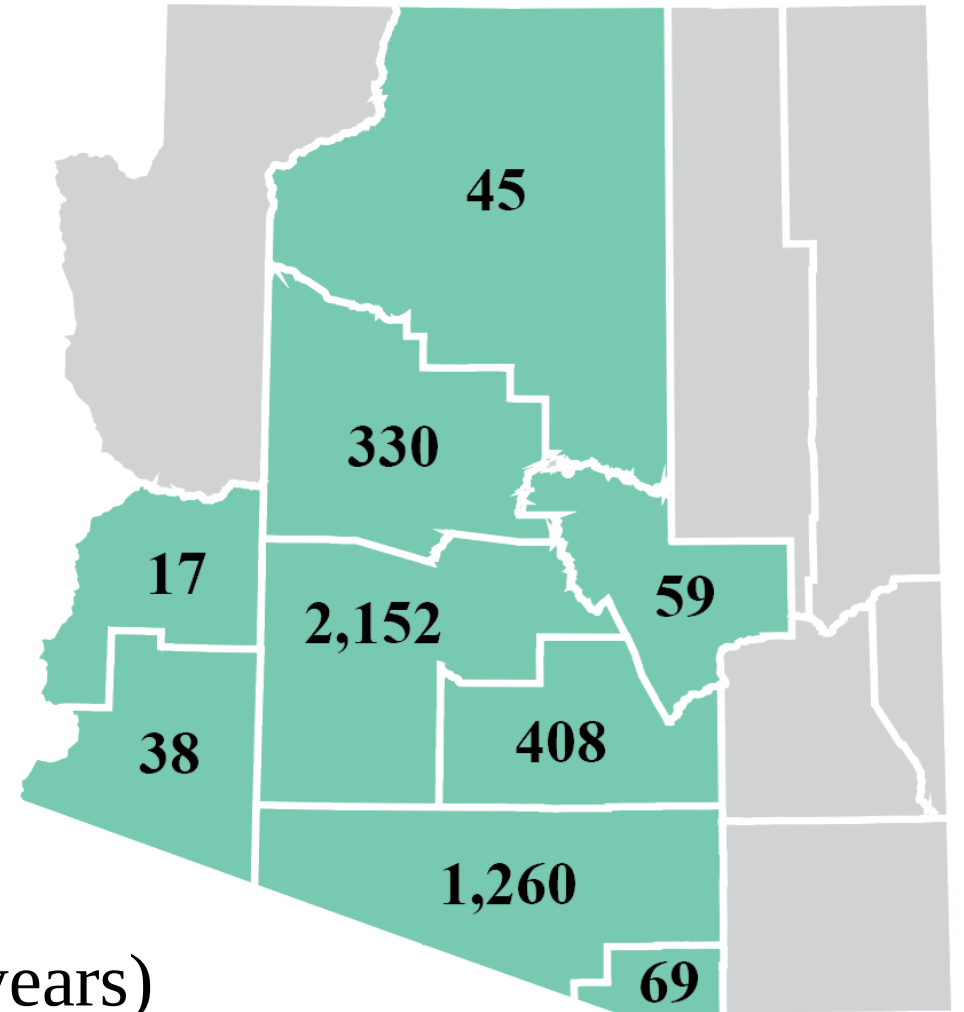
Using the Data

- Excel
- Adding my own columns to Excel
 - Animal type (ex: Dog, Cat)
 - Was the animal a dog? (Y, N)
 - Animal known to patient?
 - RPEP indicated? (Y, N, NEI)
 - Reason RPEP indicated/ not indicated (ex: Bat, Provoked, UTD on shots)
 - Rabies code A82.9 alone mentioned? (Y,N)
 - “Rabies” vaccine or rabies immunization code A82.9 mentioned? (Y,N)
 - Code for human immunoglobulin vaccination Z29.14 mentioned? (Y, N)



Data Demographics

- 9 / 15 counties in state (60%)
- Exposures occurred every day of 2018
- 29 unique animal exposure types included
(ex: dog, cat, bat, cow)
- 50:50 Male: Female
- Mean age: 34 years (range < 1 month – 98 years)



N = 4378

Of all animal exposures (N = 4378):



Dog 85.0%



Cat 8.1%



Bat 1.6%.

Animal Type Category	Exposure Count (N: 4378)	Percent of Total
Domestic Animals	4079	93.17 %
Unknown Animal Type	146	3.34 %
Rabies Reservoir Species	75	1.70 %
Rodents	40	0.91 %
Wildlife	26	0.59 %
Livestock	12	0.27 %

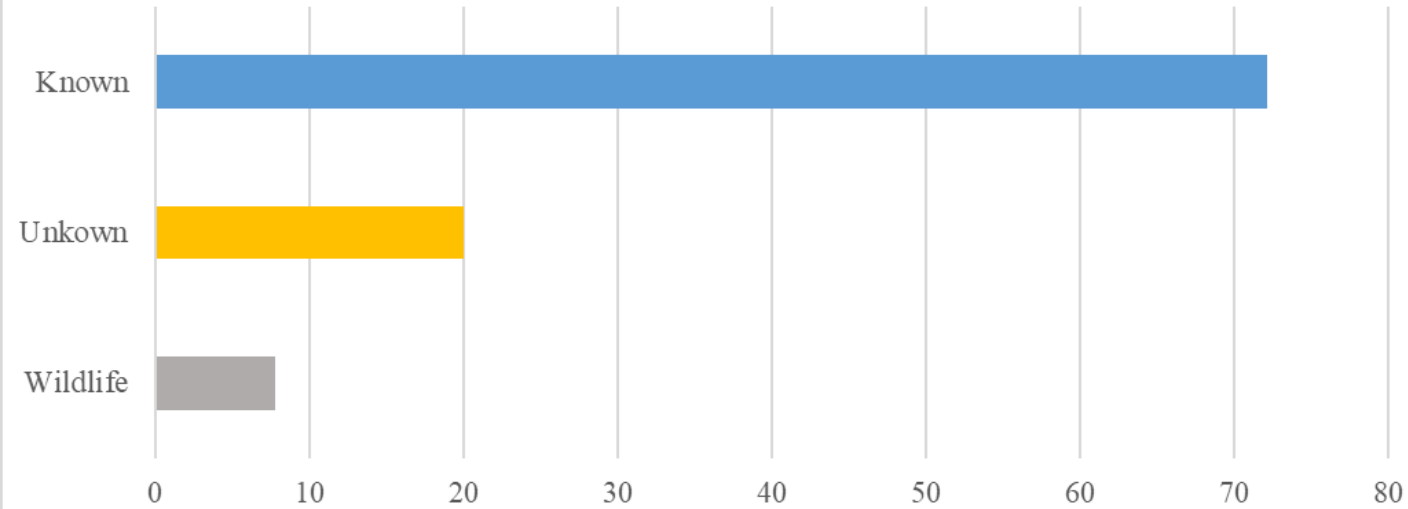
<u>Animal Type</u>	<u>Exposure Count</u>	<u>Animal Type</u>	<u>Exposure Count</u>
Rabies Reservoir Species	75	Livestock	12
<i>Bat</i>	68	<i>Cow</i>	2
<i>Fox</i>	5	<i>Horse</i>	8
<i>Skunk</i>	2	<i>Pig</i>	2
Wildlife	26	Rodents	40
<i>Badger</i>	1	<i>Mouse</i>	10
<i>Coati</i>	1	<i>Rabbit</i>	5
<i>Coyote</i>	5	<i>Rat</i>	14
<i>Deer</i>	1	<i>Rodent</i>	2
<i>Gopher</i>	1	<i>Squirrel</i>	9
<i>Javelina</i>	7		
<i>Monkey</i>	3	Unknown	146
<i>Prairie Dog</i>	1	<i>“Dog or coyote”</i>	1
<i>Raccoon</i>	5	<i>“Fox, cat”</i>	1
<i>Sea Lion</i>	1	<i>Unknown animal</i>	143
		<i>“Wild Cat”</i>	1
Domestic Animals	4079		
<i>Cat</i>	354		
<i>Dog</i>	3723		
<i>“Dog, cat”</i>	1		
<i>Ferret</i>	1		

Question I wanted to investigate....

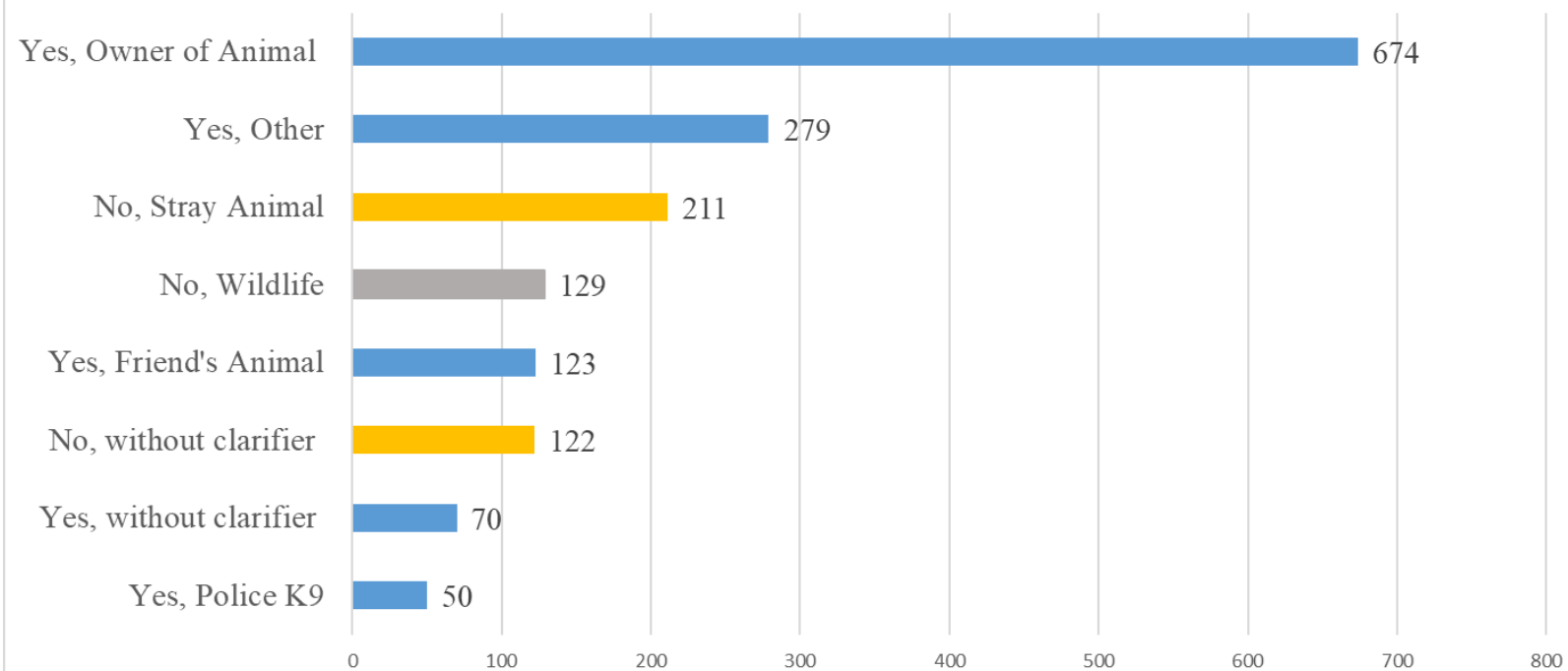
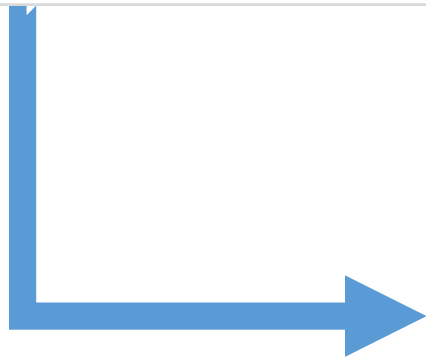
Was the animal involved in the exposure known to the patient?

How I phrased it / thought of it:		Example:
N	No	An “unknown animal” bit the patient
NS	No, stray	A “stray (animal) bit the patient”
NWILD	No, wildlife	A “bat bit the patient”
Y	Yes, not specified	Animal is “up to date on shots”
YF	Yes, friend’s	“patient bit by friend’s dog”
YO	Yes, owner	“patient bit by own dog”
YOTH	Yes, other	“patient bit by neighbor’s dog”
YPD	Yes, Police Dept K9	“patient bit by police K9”
NEI	not enough information	“animal bite”

72 % of all animals involved in exposure were known by the patient* (N=1658).



Of the records with enough information regarding animal “known status,” most animals in the exposure were owned by the patient. (N=1658)





Down the rabbit hole we go....

8819

- Raw query patient count.

4378

- Removed non-mammalian species.
- Deduplicated patients with multiple follow-up encounters for same exposure (ex: return rabies vaccinations).
- Each row = 1 unique animal exposure.

365

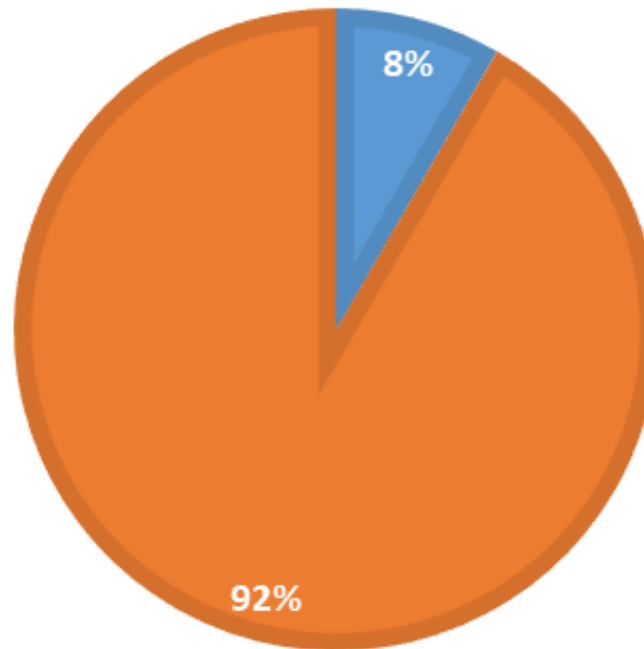
- Patient encounters that mentioned any combination of: rabies shot; rabies vaccine; rabies series; ICD code A82.9 for rabies, unspecified; ICD code Z29.14 or Z2914 for prophylactic rabies immune globin
- ICD Code Z23 Encounter for Immunization alone not criteria for inclusion unless also mentioned rabies vaccine/ rabies shot/ etc.



RPEP

RPEP CAPTURED IN < 10 % OF PATIENTS

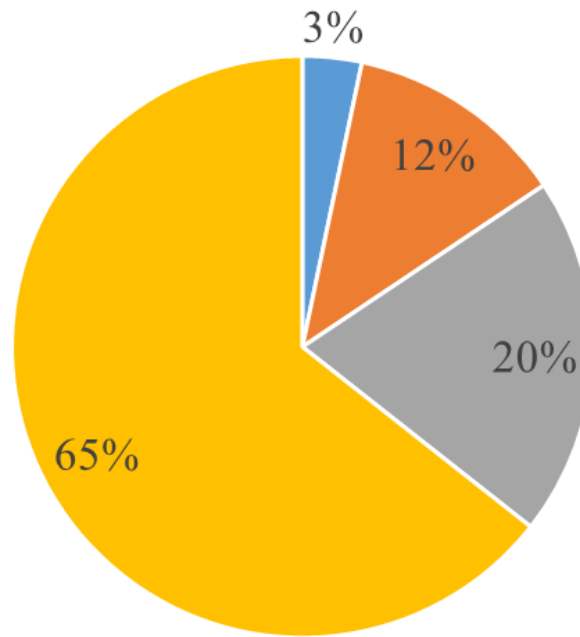
■ RPEP Captured ■ RPEP Not Captured



RPEP was captured per our project definition in 8.34 % (365/4378) of patients.

RPEP...

Of patients who likely were given RPEP, most records did not include enough information to determine if the patient knew the animal that was involved in the exposure. (N=365)



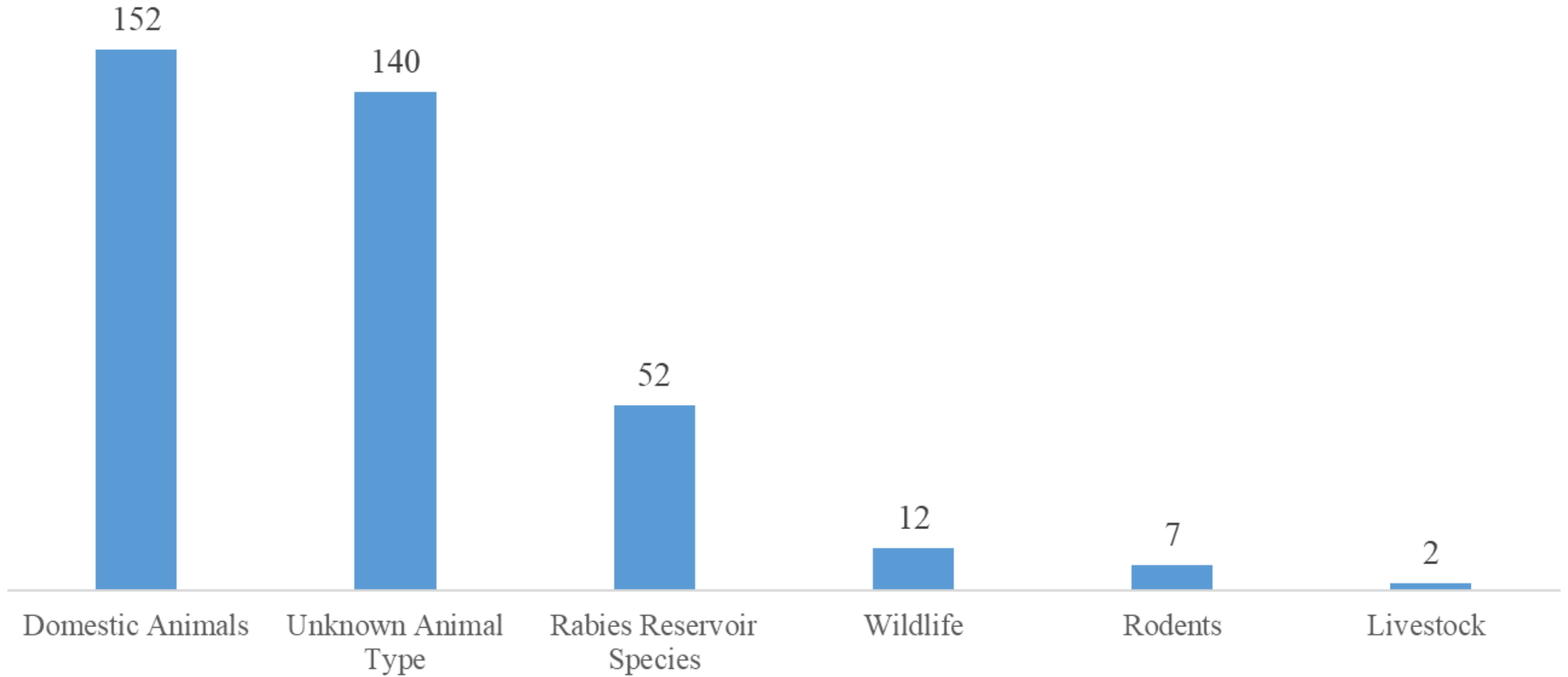
■ Animal Known by Patient

■ Animal Not Known by Patient

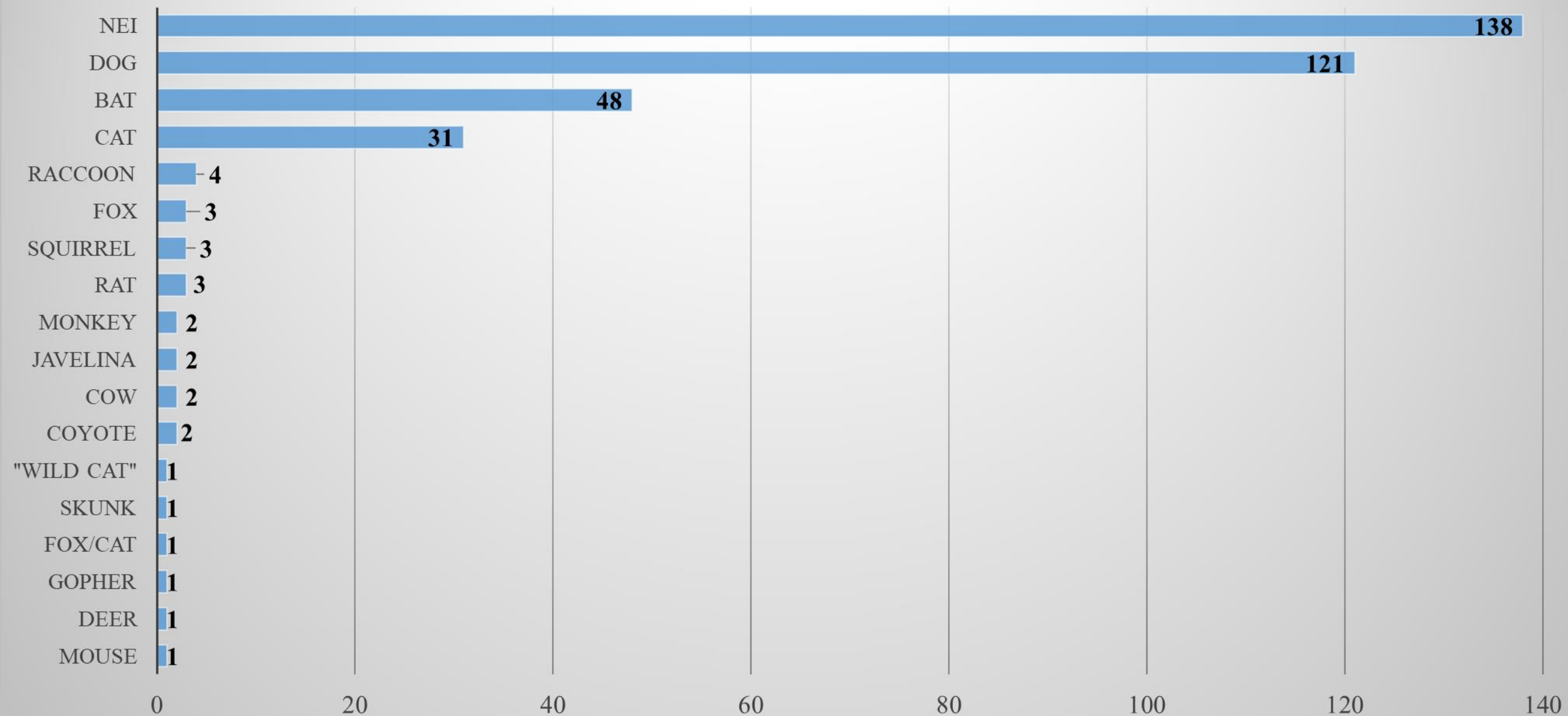
■ Wildlife

■ Not Enough Information Provided

Most RPEP Given After Exposure to a Domestic Animal. (N=365)



The animal involved in an exposure that resulted in RPEP was most often not able to be identified based on the "chief complaint" section of patient record. (N=365)



Of the top 3 animal species exposures resulting in RPEP...

% of *total* Bat exposures resulting in RPEP



70.59 %

% of *total* Cat exposures resulting in RPEP



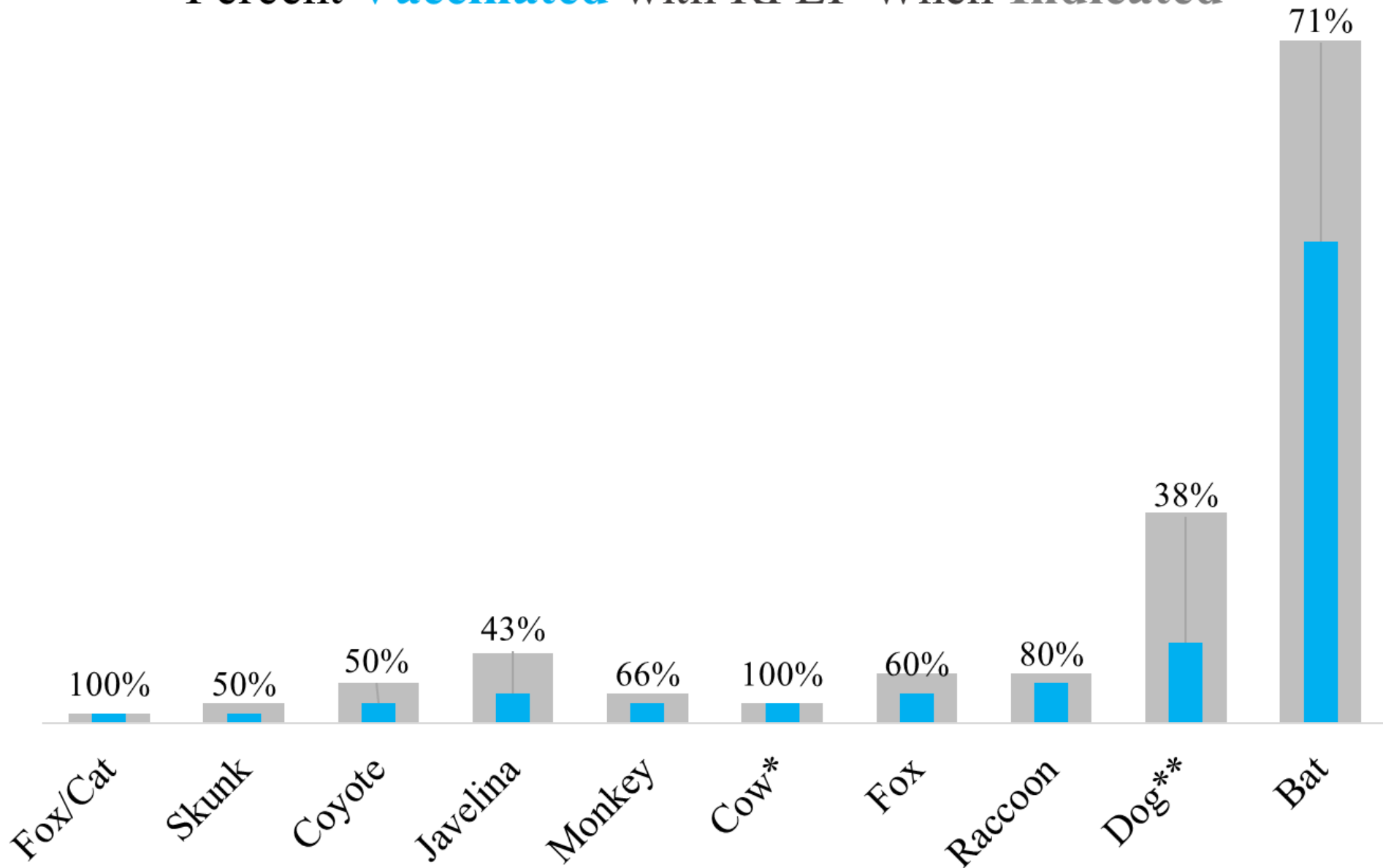
8.76 %

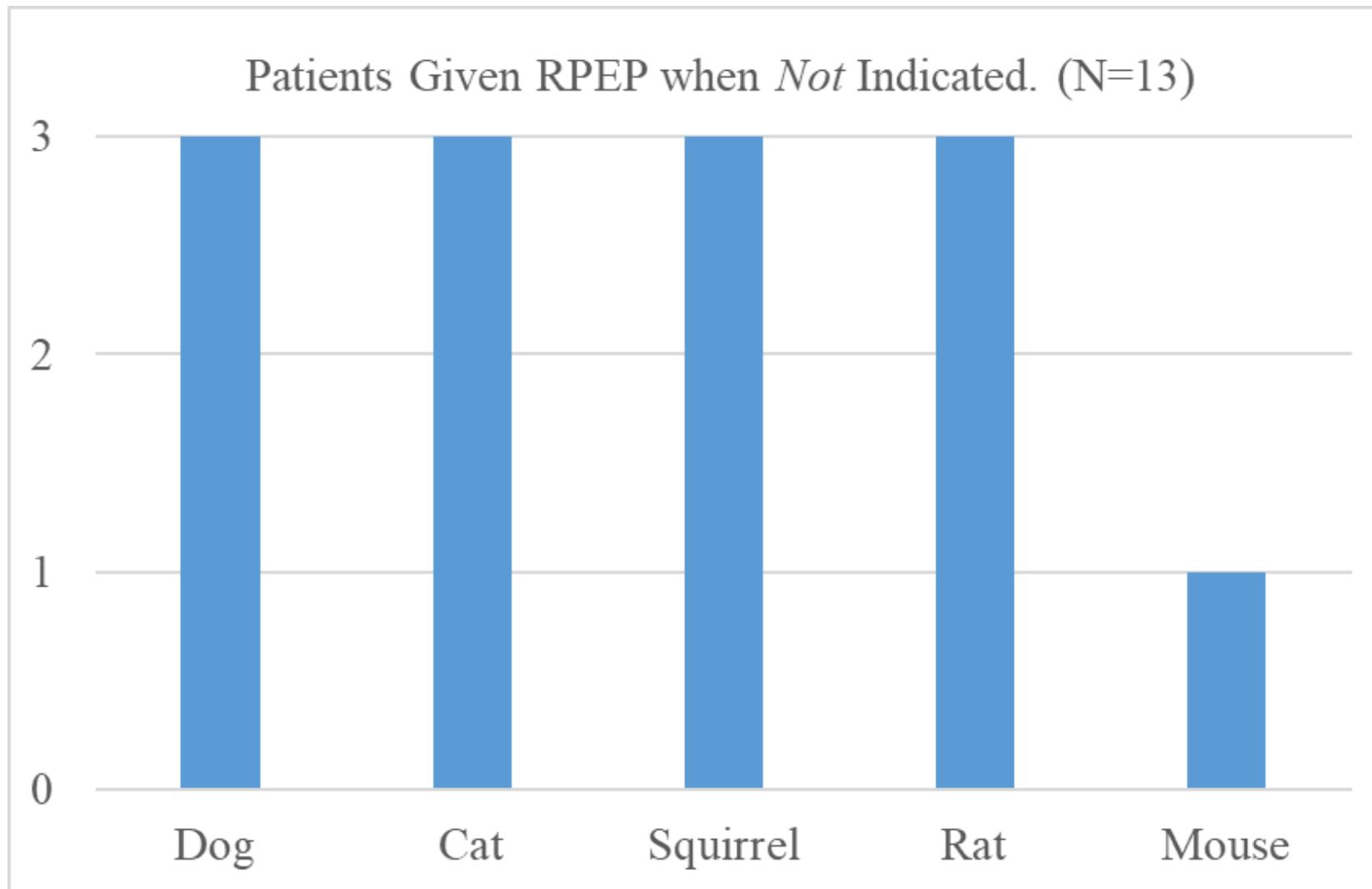
% of *total* Dog exposures resulting in RPEP



3.25 %

Percent **Vaccinated** with RPEP When Indicated





At least **17 RPEP** vaccinations may have been **given when *not* indicated**.

Other Results

- Rabies ICD 10 code A83.9 in “DischargeDiagnosis” officially used 10 times.
- The majority of patient records did not contain enough information to determine animal exposure or RPEP administration.

Those patients that had “Not Enough Information” (NEI):

Column	Count (N = 4378)	Percent
NEI to determine Exposure Animal Species	143	3.27 %
NEI to determine “Was the animal known by the patient?”	2720	62.13 %
NEI to determine “Is RPEP Indicated?”	3402	77.71 %

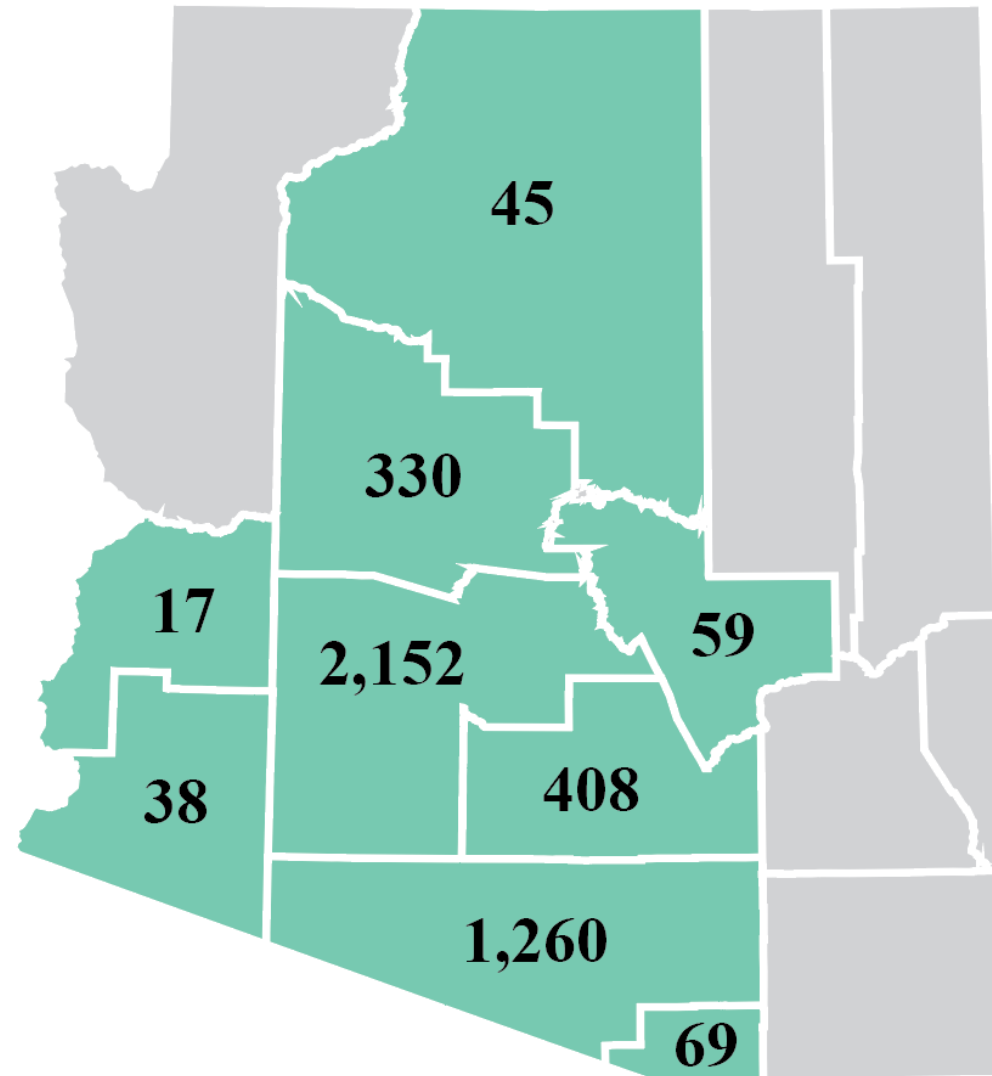
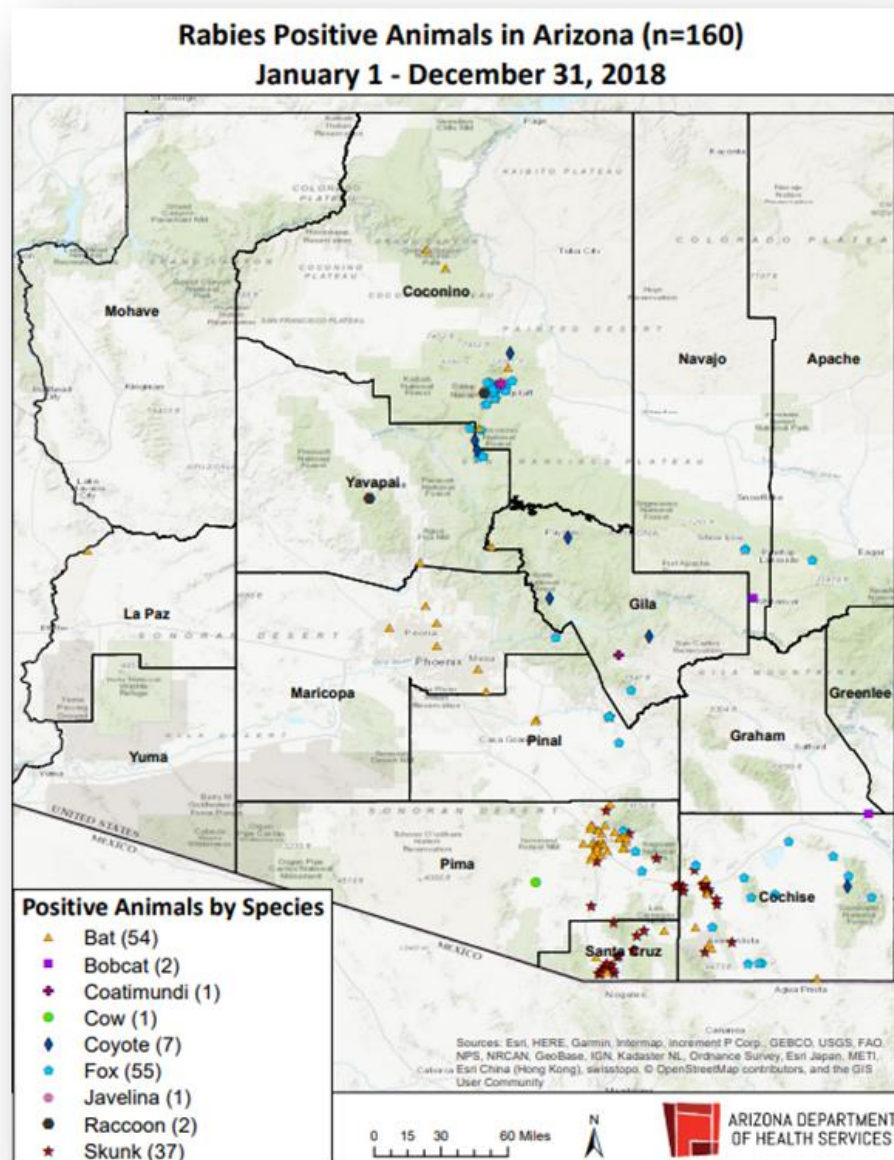
Benefits of this query...

- Some of the patients “ChiefComplaintOrig” rabies vaccinations could be valid.

Ex: Cow positive in 2018 and 2 patients vaccinated after cow “tested positive for rabies” exposure.

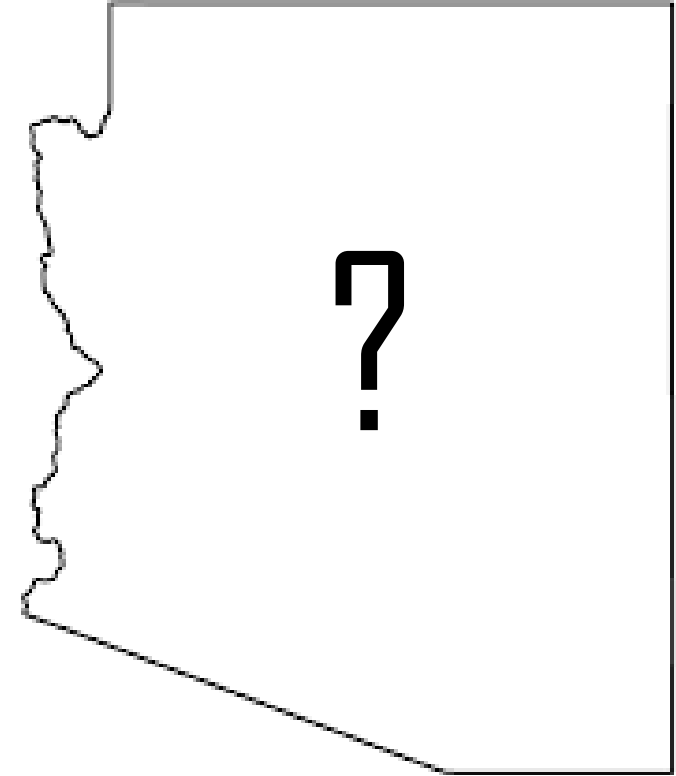


Data Limitation: only 9 counties represented.



Public Health Implications

- Not an easy way at state level to compare patients RPEP potentially given in Essence to RPEP patients tracked at county levels.
- The state cannot easily track # RPEP or animal bites for Arizona.



Public Health Implications

- Patients mostly exposed to known or even owned animals
- RPEP potentially given when not indicated
- Potential avoidable cost to the healthcare system
- Educational opportunities for ED providers

Some thoughts...

1. Excellent exploratory project
2. ESSENCE not too challenging
3. Easily repeated by another tech-not-so-savvy person
4. Medical jargon in the “ChiefComplaintOriginal” section
5. Clinical correlation projects may have limitations using ESSENCE
6. Considering adding “History of Present Illness”
& actual order set for labs/medications

Future Projects Using this Dataset...

- Assess frequency of wound infections after animal exposure
- Explore tetanus administration for each patient with an animal exposure
- Compare or map where patients were from (“Patient City”) vs facility location where they were treated (“Facility Region”)

CDC Epidemiology Elective Program

ADHS Faculty:

Heather Venkat

Hayley Yaglom

Irene Ruberto

Mike Fink

Sara Chronister

Krystal Collier

Sara Johnston



Any Questions?

