



# Better Together: TNVR and Public Health

G. Robert Weedon, DVM, MPH

Community Cat Surgeon

TLC PetSnip



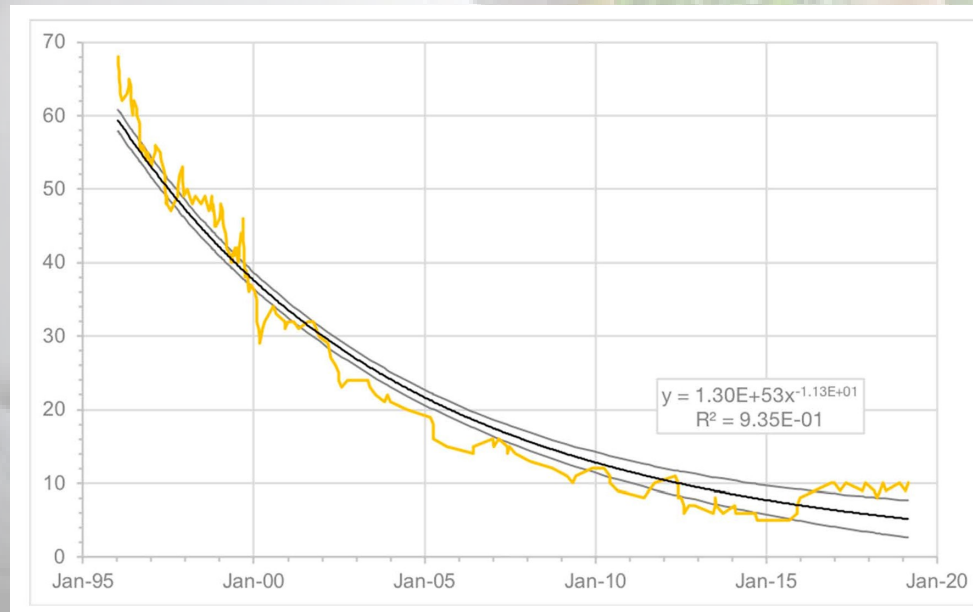
# Introduction

- TNVR: Trap-Neuter-Vaccinate-Return
- Emphasis on the “V”
  - Vaccination
    - Emphasizes the public health aspect of TNVR programs
    - Specifically, vaccinating against rabies as a means of protecting the health of the public



# Introduction

- A growing body of evidence indicates that trap-neuter-return (TNVR) is not only effective at reducing community cat numbers, but that such reductions are sustainable over extended periods.



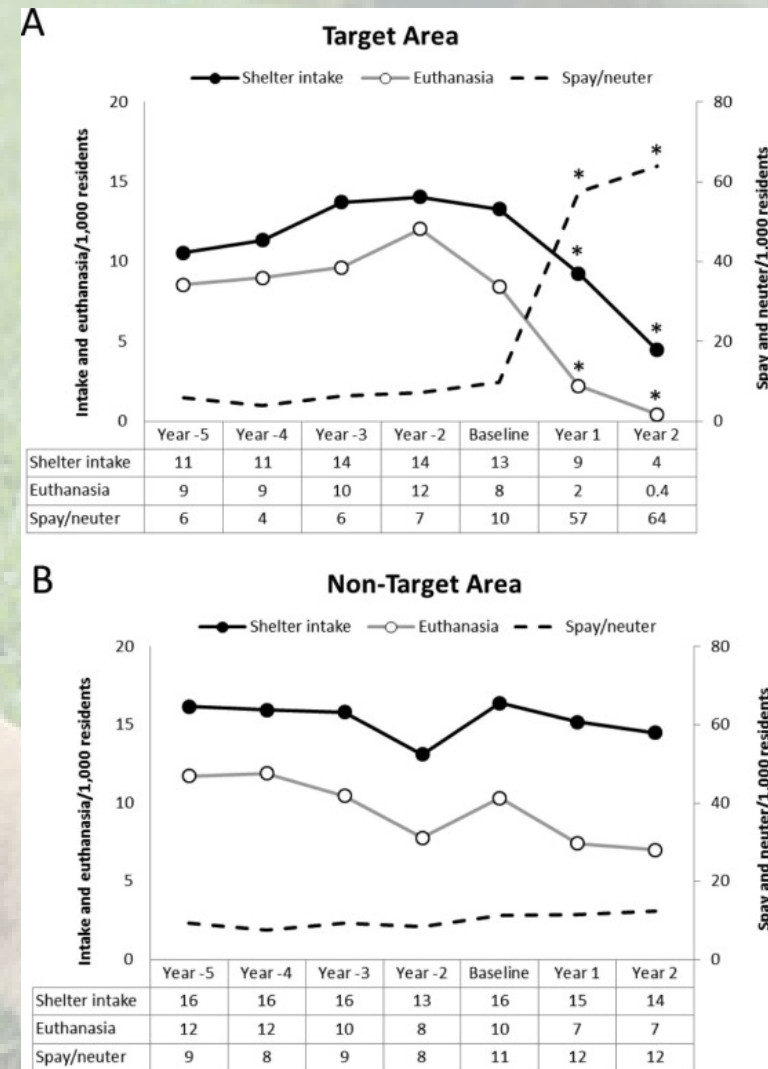
This figure shows an 85% decline from the number of cats present on the UCF campus in 1996 due to a long-term TNVR program.

Back to School: An Updated Evaluation of the Effectiveness of a Long-Term Trap-Neuter-Return Program on a University's Free-Roaming Cat Population. *Animals* 2019, 9, 768

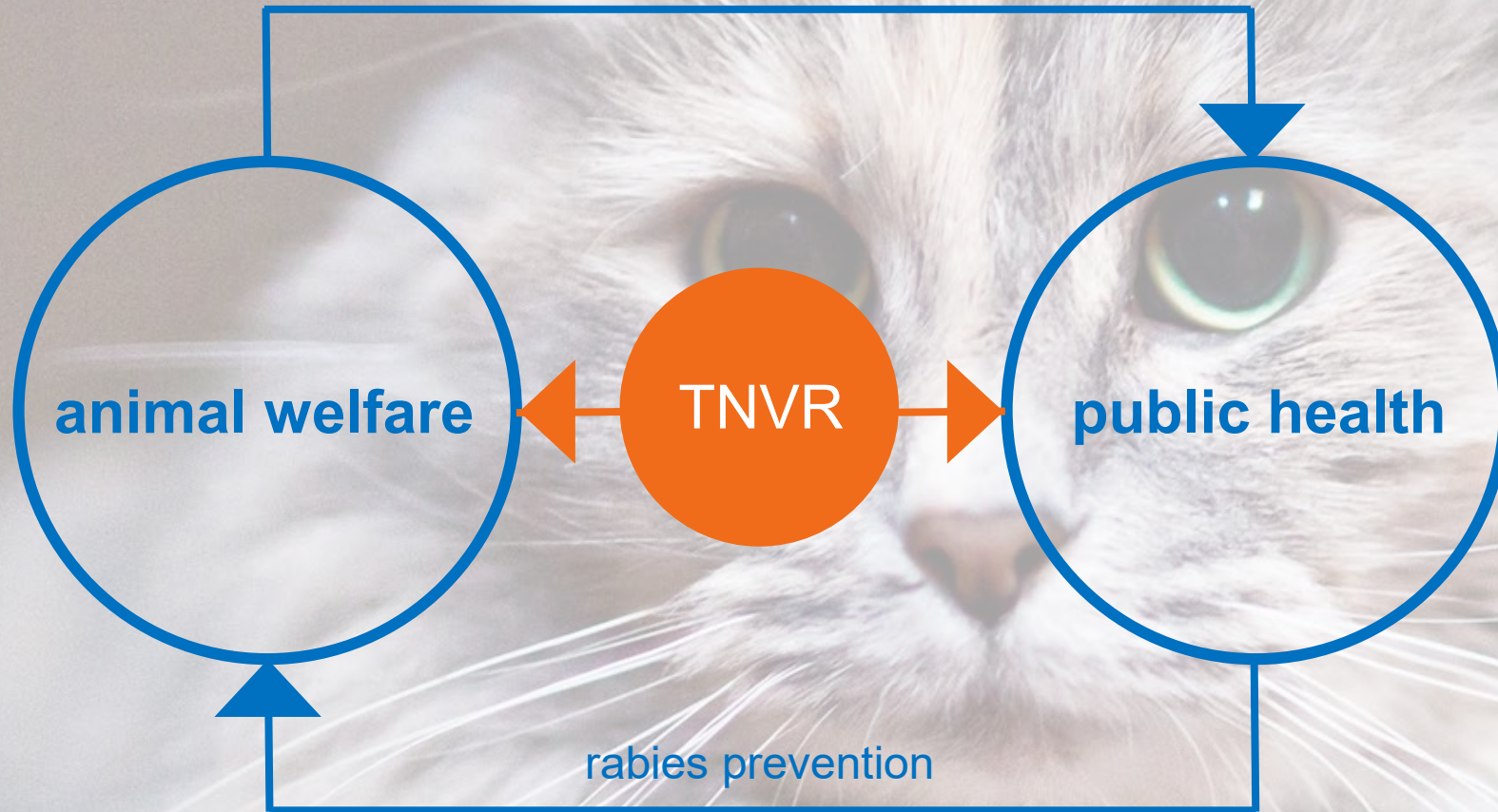


# Introduction

- The only *humane* way to deal with the problem of community (feral, free-roaming) cats.
- When properly applied, TNVR has been shown to help control/reduce the population of free-roaming cats.

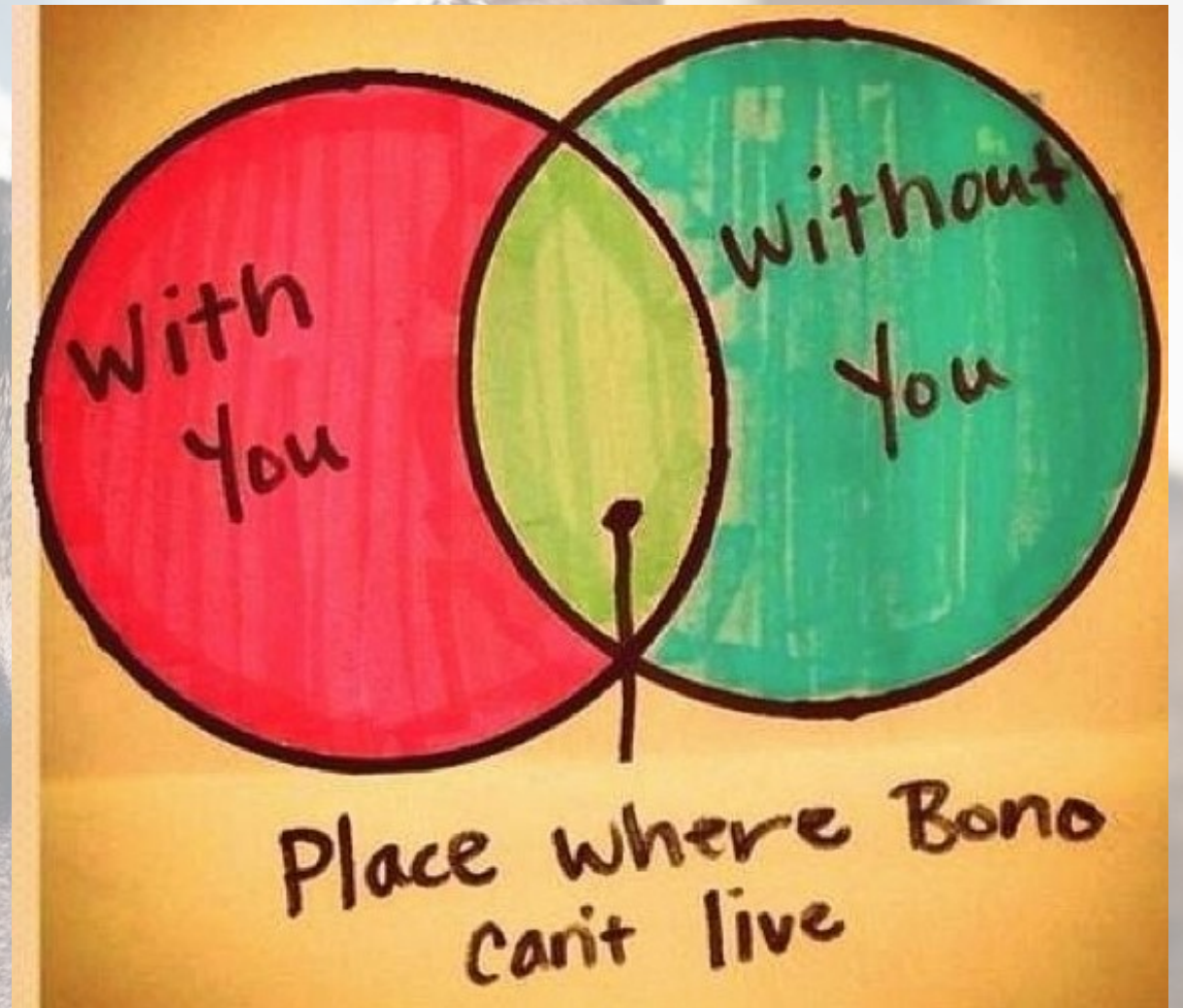


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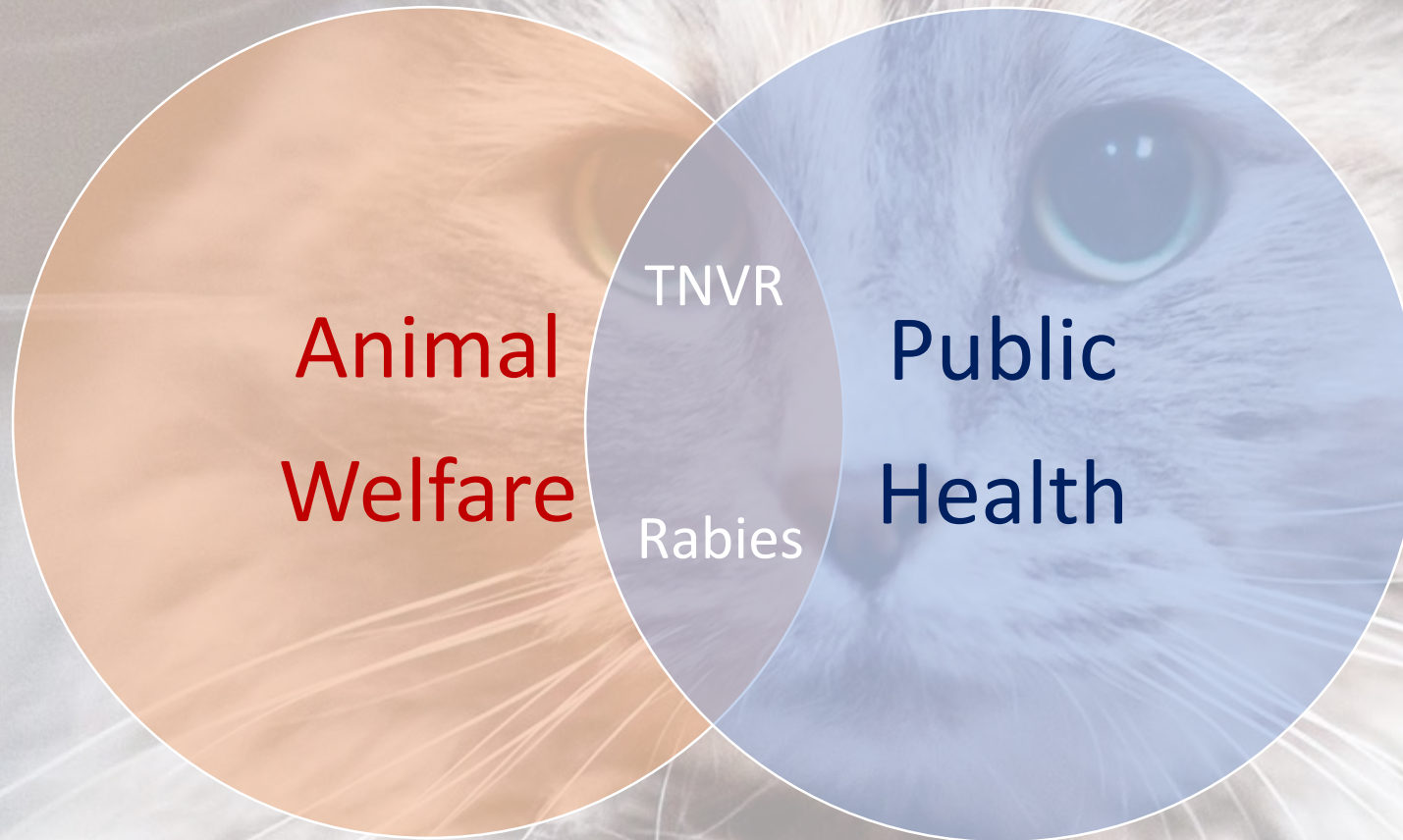


# Introduction

- Who knows what a Venn Diagram is?



# Introduction



# Think of TNVR as a Slide Rule...

- Imagine being the slide rule manufacturer the day that the pocket calculator came out...
- TNVR is like the slide rule. Something better will come along, but until that time, it is better than doing nothing...





# Think of TNVR as a Slide Rule...

- TNVR is the best public policy for community cats; it:
  - Reduces shelter intake and euthanasia
  - Reduces complaint calls to municipality
  - Saves taxpayer money
  - Supported by ~70% of the American public

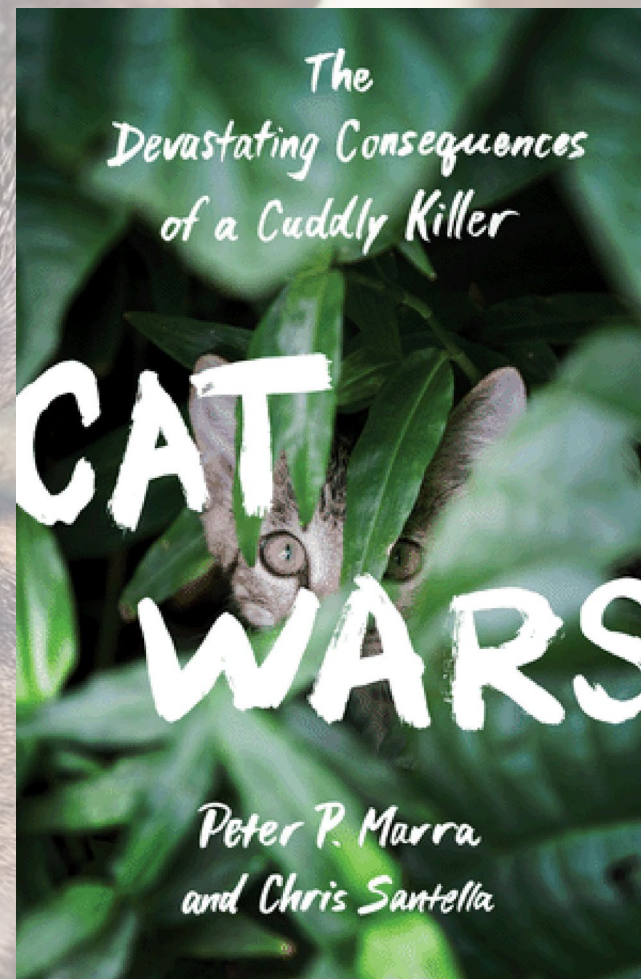


Wolf, P. J. (2015, March 17). New Survey Reveals Widespread Support for Trap-Neuter-Return. Retrieved from <https://faunalytics.org/new-survey-reveals-widespread-support-for-trap-neuter-return/>

*Innovation to save lives.*

# TNVR and Public Health

- Why the focus on public health?
  - Recent attacks on TNVR have focused on free-roaming cats being a threat to the public's health
  - There is a lot of misinformation out there...



# TNVR and Public Health

- CDC annual surveillance data
  - 21,764 cats tested for rabies in 2018, of which 241 (1.1%) were confirmed rabid.
  - This represented a 12.7% decrease in the number of rabid cats, compared with the 276 reported in 2017
  - The percentage of cats tested for rabies that were confirmed to be rabid (1.1%) was similar to the mean percentage during the previous 5 years (1.2%; 95% CI, 1.1% to 1.2%)

Ma, X., Monroe, B. P., Cleaton, J. M., Orciari, et al. (2020). Rabies surveillance in the United States during 2018. *Journal of the American Veterinary Medical Association*, 256(2), 195–208.

## Public Veterinary Medicine: Public Health

### Rabies surveillance in the United States during 2018

Xiaoyue Ma MPH

Ben P. Monroe MPH

Julie M. Cleaton MPH

Lillian A. Orciari MS

Crystal M. Gigante PhD

Jordana D. Kirby MS

Richard B. Chipman MS

Christine Fehlner-Gardiner PhD

Veronica Gutiérrez Cedillo PhD

Brett W. Petersen MS

Victoria Olson PhD

Ryan M. Wallace DVM

From the Poxvirus and Rabies Branch, Division of High-Consequence Pathogens and Pathology, National Center for Emerging and Zoonotic Infectious Diseases, CDC, 1600 Clifton Rd NE, Atlanta, GA 30333 (Ma, Monroe, Cleaton, Orciari, Gigante, Petersen, Olson, Wallace); Wildlife Services, APHIS, USDA, 59 Chenell Dr, Ste 7, Concord, NH 03301 (Kirby, Chipman); Center of Expertise for Rabies, Canadian Food Inspection Agency, 3851 Fallowfield Rd, Nepean, ON K2J 4S1, Canada (Fehlner-Gardiner); Centro Nacional de Programas Preventivos y Control de Enfermedades, Secretaría de Salud de México, Avenida Benjamin Franklin 132, Escandón II Secc, 11800 Miguel Hidalgo, CDMX, México (Gutiérrez Cedillo); and Oak Ridge Institute for Science and Education, 1299 Bethel Valley Rd, Oak Ridge, TN 37830 (Cleaton).

Address correspondence to Ms. Ma (HJV4@cdc.gov).

This article has not undergone external peer review.

**T**he present report provides detailed information on the epidemiology of rabies and rabies-associated events in the United States during 2018 as well as a brief update of rabies in 2019. Summaries of 2018 rabies surveillance data for Canada and Mexico are also provided.

Rabies is a viral zoonosis caused by any of the 15 recognized viruses of the genus *Lyssavirus*. Globally, however, the rabies virus is the leading cause of rabies and is responsible for an estimated 59,000 human deaths annually.<sup>1</sup> Although all mammals are susceptible to rabies virus infection, certain reservoir species are responsible for maintaining enzootic transmission. There is great diversity in the global

#### ABBREVIATIONS

CI Confidence interval  
ORV Oral rabies vaccine  
PEP Postexposure prophylaxis  
RVV Rabies virus variant

#### OBJECTIVE

To describe rabies and rabies-related events occurring during 2018 in the United States.

#### ANIMALS

All animals submitted for laboratory diagnosis of rabies in the United States during 2018.

#### PROCEDURES

State and territorial public health departments provided data on animals submitted for rabies testing in 2018. Data were analyzed temporally and geographically to assess trends in domestic animal and wildlife rabies cases.

#### RESULTS

During 2018, 54 jurisdictions reported 4,951 rabid animals to the CDC, representing an 11.2% increase from the 4,454 rabid animals reported in 2017. Texas (n = 695 [14.0%]), Virginia (382 [7.7%]), Pennsylvania (356 [7.2%]), North Carolina (332 [6.7%]), Colorado (328 [6.6%]), and New York (320 [6.5%]) together accounted for almost half of all rabid animals reported in 2018. Of the total reported rabies cases, 4,589 (92.7%) involved wildlife, with bats (n = 1,635 [33.0%]), raccoons (1,499 [30.3%]), skunks (1,004 [20.3%]), and foxes (357 [7.2%]) being the major species. Rabid cats (n = 241 [4.9%]) and dogs (63 [1.3%]) accounted for > 80% of rabid domestic animals reported in 2018. There was a 4.6% increase in the number of samples submitted for testing in 2018, compared with the number submitted in 2017. Three human rabies deaths were reported in 2018, compared with 2 in 2017.

#### CONCLUSIONS AND CLINICAL RELEVANCE

The overall number of animal rabies cases increased from 2017 to 2018. Laboratory diagnosis of rabies in animals is critical to ensure that human rabies postexposure prophylaxis is administered judiciously. (*J Am Vet Med Assoc* 2020;256:195–208)

epidemiology of rabies and distribution of rabies virus reservoir species. Rabies and nonrabies lyssaviruses are found in the Americas, Europe, Asia, Africa, and Australia. At least 30 reservoir species have been identified, consisting primarily of terrestrial carnivores, hematophagous bats, and insectivorous bats. Globally, the canine RVV, maintained by domestic dogs, presents the greatest human health risk and has been implicated in > 99% of human rabies deaths.<sup>2</sup>

In the United States, national canine rabies control efforts began in earnest in the early 1940s and led to elimination of the canine RVV from the country during the late 1970s. Since then, wildlife has accounted for > 90% of all rabid animals. The primary reservoir species responsible for maintaining RVVs in the United States are bats (multiple RVVs in multiple species), raccoons (raccoon RVV), striped skunks (south central, north central, and California skunk RVVs), gray foxes (Arizona gray fox RVV), arctic foxes (arctic fox RVV), and mongooses (dog-mongoose RVV

# TNVR and Public Health

- CDC annual surveillance data
  - During 2018, antemortem samples from 23 human patients in 17 states and US territories suspected to have rabies were submitted to the CDC for laboratory diagnostic testing, of which 3 (13.0%) were confirmed to be positive
  - Nowhere does CDC list the cat as a source of exposure for a person being infected with rabies during 2018
    - The latest year for which reporting exists

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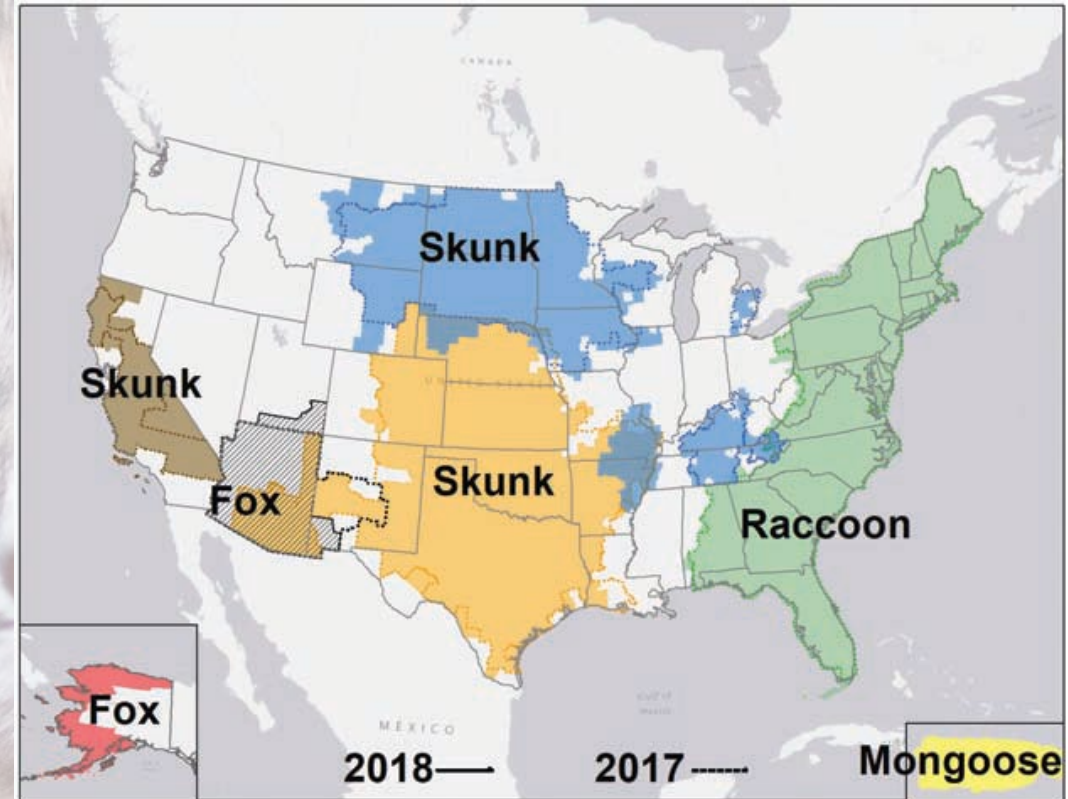
- CDC annual surveillance data
  - The last documented case of human rabies from exposure to a rabid cat was in 1975

Sung, J. H., Hayano, M., Okagaki, T., & Mastri, A. (1976). A Case of Human Rabies and Ultrastructure of the Negri Body. *Journal of Neuropathology & Experimental Neurology*, 35(5), 541–559.



# TNVR and Public Health

- CDC annual surveillance data
  - Distribution of major rabies virus variants in US and Puerto Rico, 2014—2018

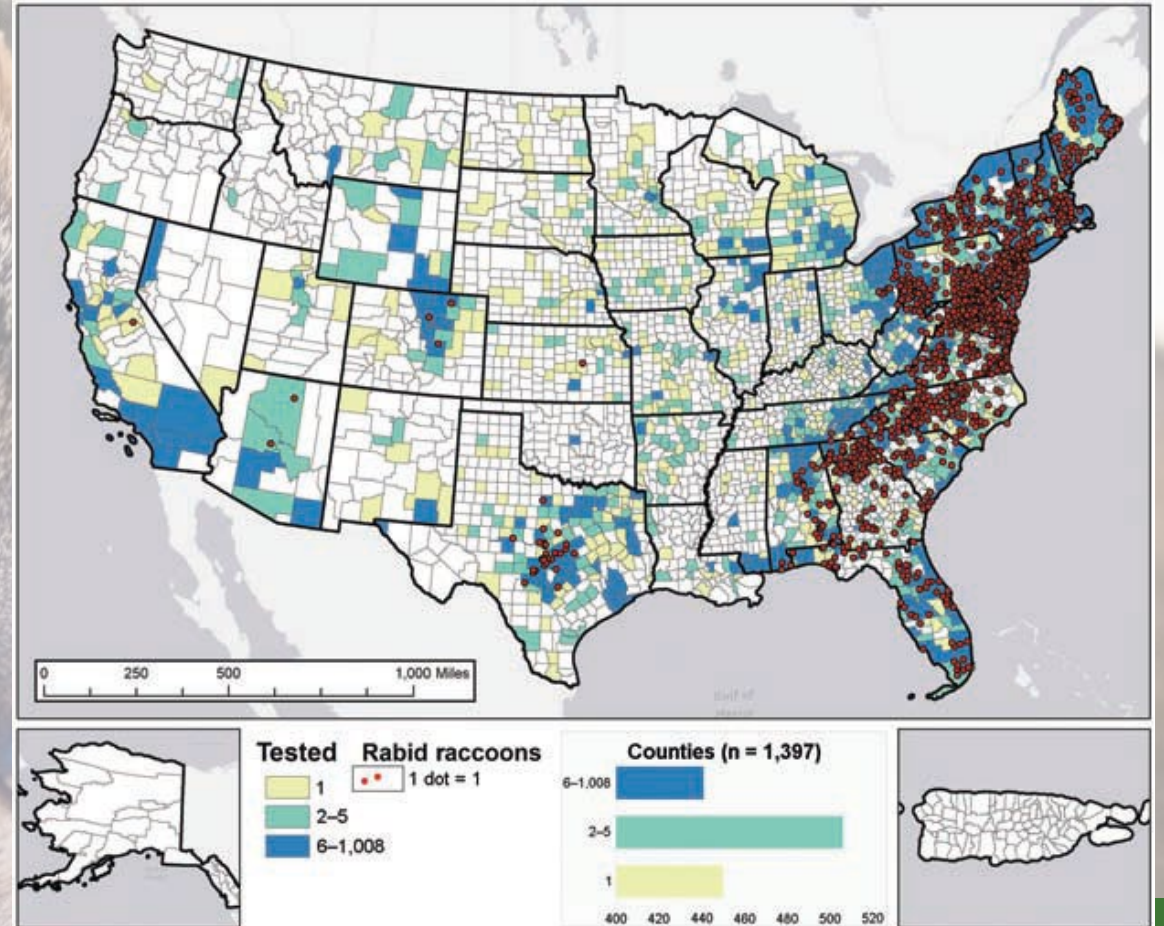


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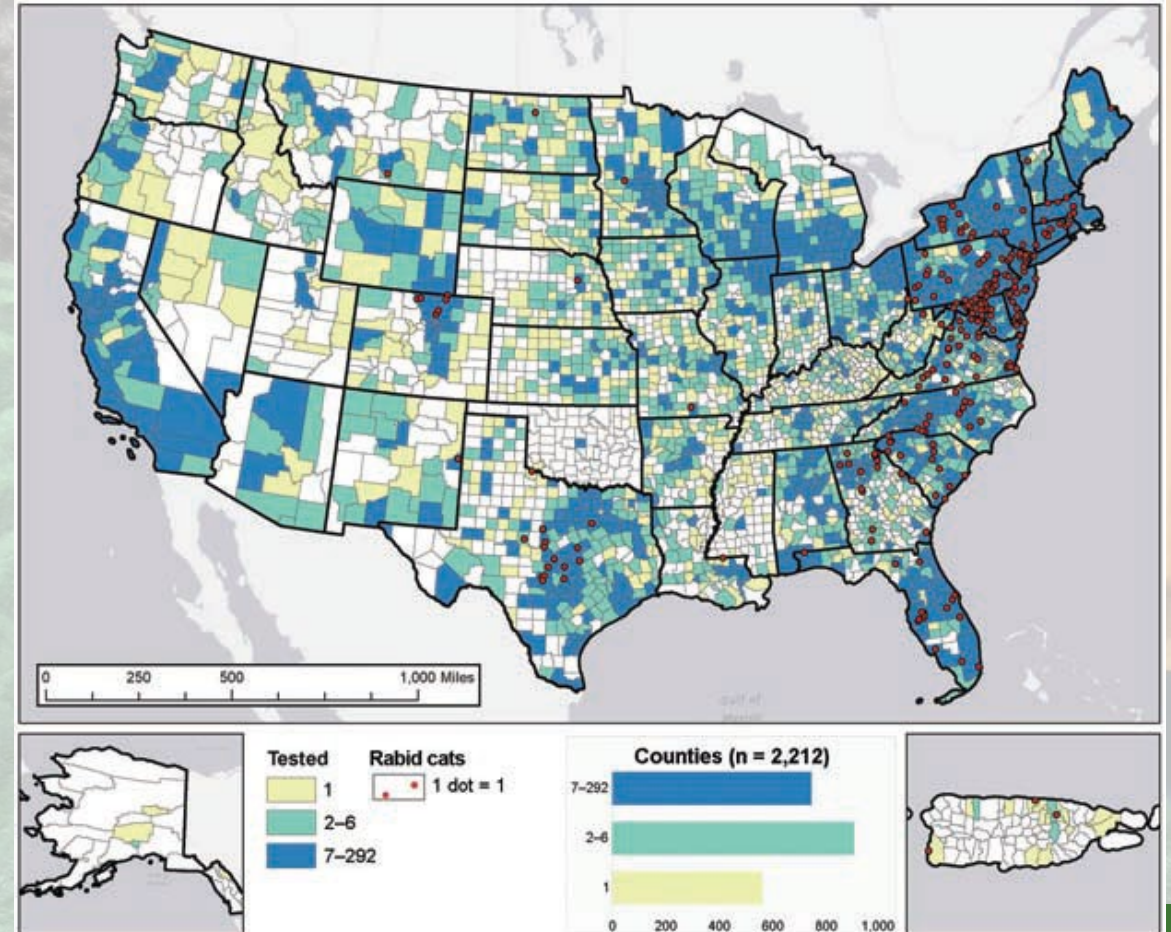
- CDC annual surveillance data
  - Reported cases of rabies in **raccoons**, by county, 2018



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# TNVR and Public Health

- CDC annual surveillance data
  - Reported cases of rabies in **cats**, by county, 2018

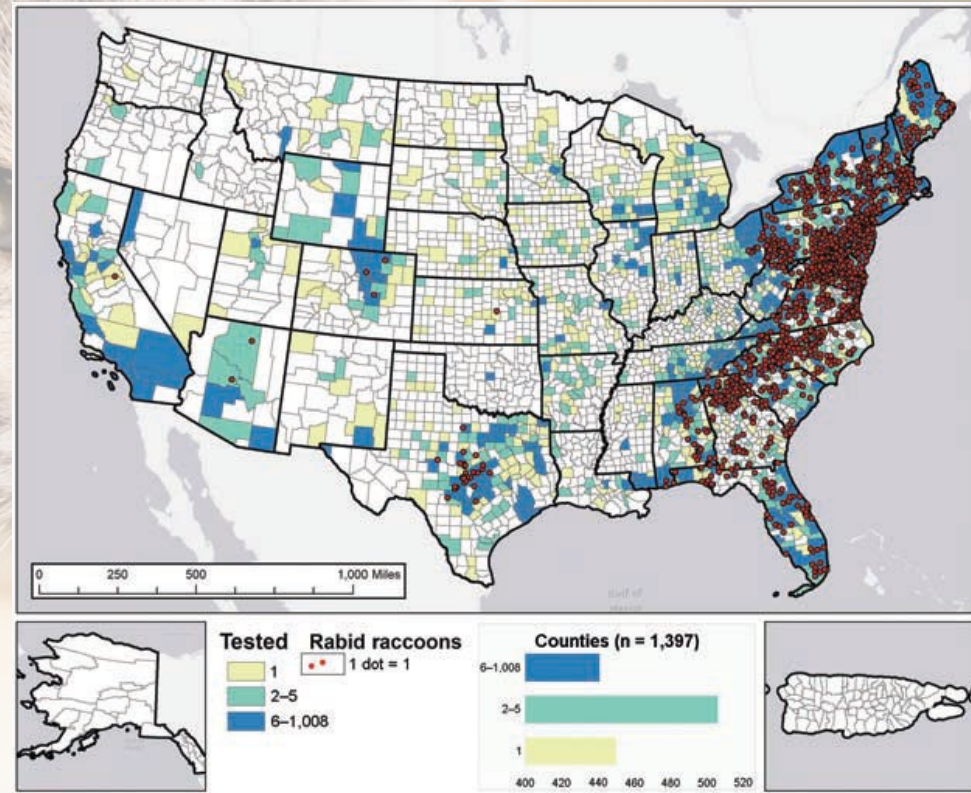
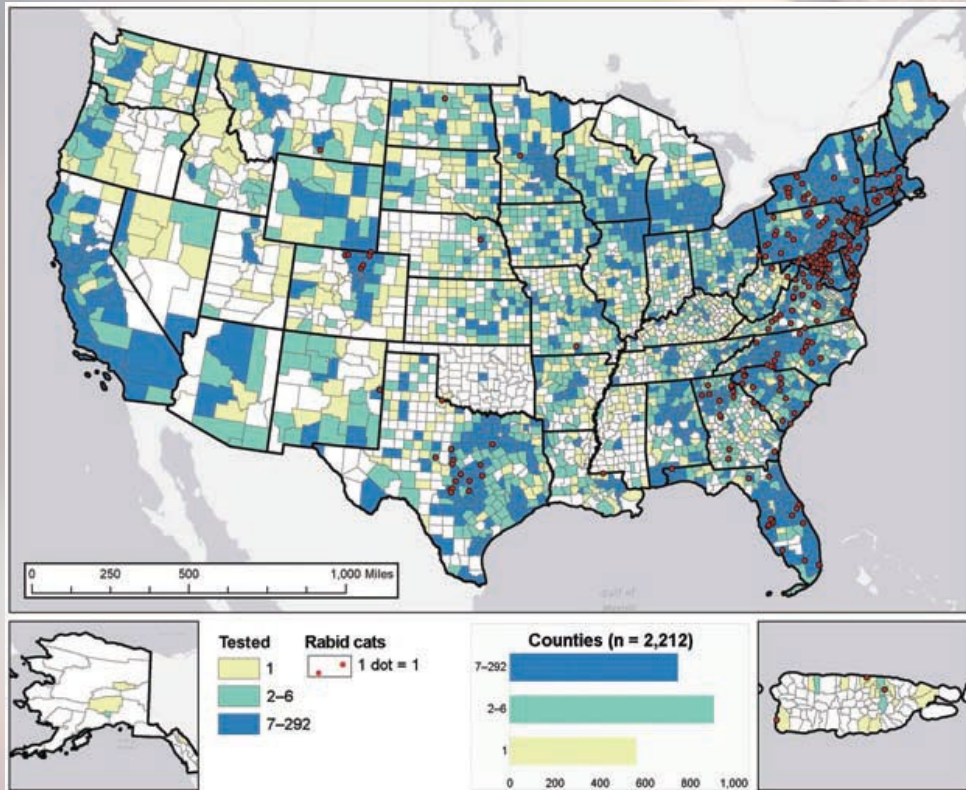


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# TNVR and Public Health

- TNVR: Trap-Neuter-Vaccinate-Return
- Emphasis on the “V”
  - Vaccination
    - Emphasizes the public health aspect of TNVR programs
    - Vaccinating against rabies as a means of protecting the health of the public
    - Vaccinating Community Cats creates a barrier to the disease between wildlife and domestic animals and people



# TNVR and Public Health

- Herd Immunity
  - The resistance to the spread of a contagious disease within a population that results if a sufficiently high proportion of individuals are immune to the disease
    - Especially through vaccination
  - If a large percentage of the population is immune, the entire population is likely to be protected
    - Not just those who are immune



# TNVR and Public Health

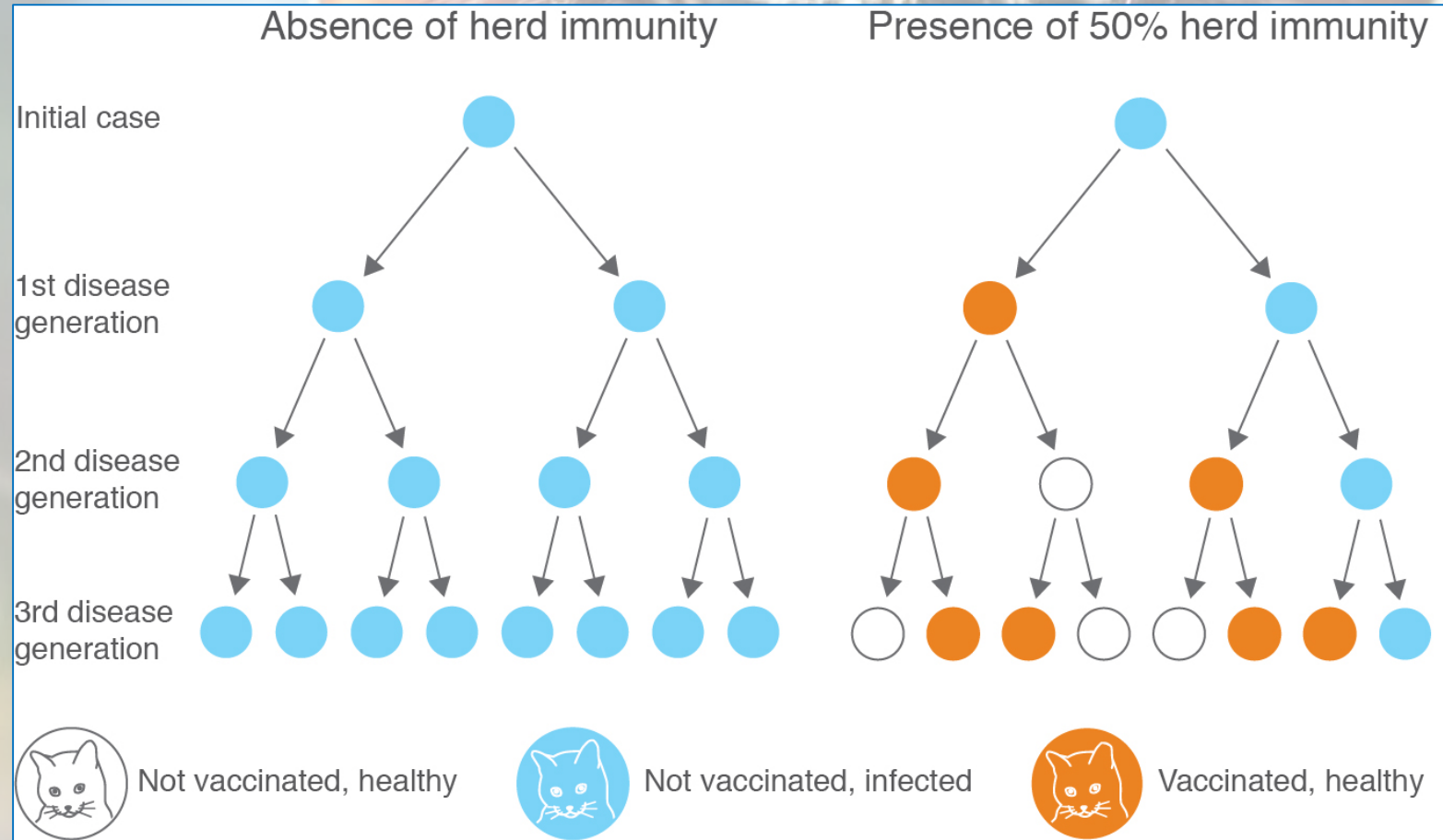
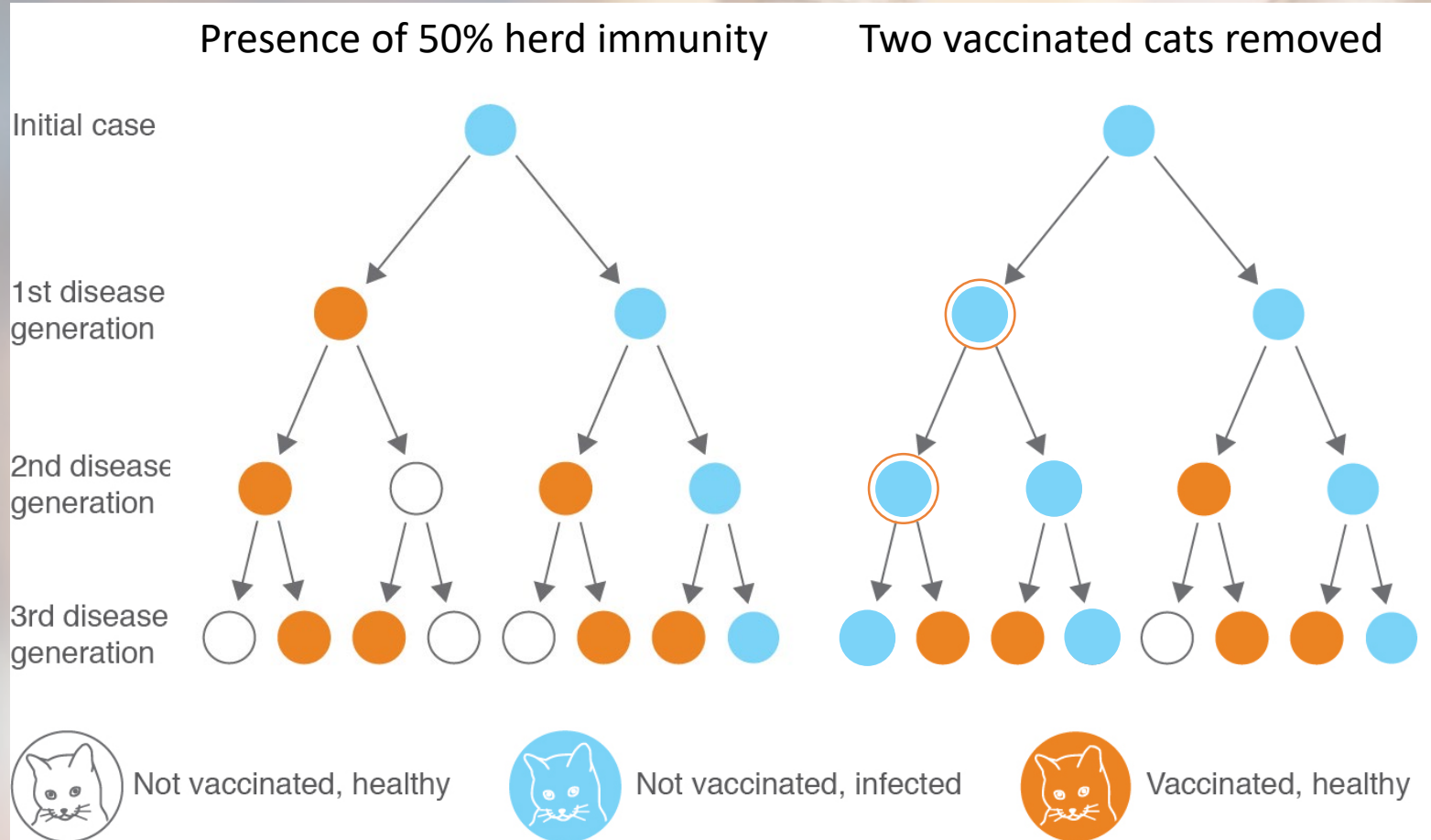


Figure adapted from Jekel, J. F. Epidemiology, Biostatistics, and Preventive Medicine. 3rd ed., 421 (Elsevier Health Sciences, 2007).

# TNVR and Public Health

What happens if two vaccinated cats (shown in orange) are trapped and removed, and replaced with susceptible cats...?

# TNVR and Public Health



# TNVR and Public Health

- Prior to vaccination
  - Some cats had protective serum antibody titers
    - FPV (33%)
    - FHV (21%)
    - FCV (64%)
    - RV (3%)

SMALL ANIMALS

## Response of feral cats to vaccination at the time of neutering

Sarah M. Fischer, MS; Cassie M. Quest, MS; Edward J. Dubovi, PhD; Rolan D. Davis, MS; Sylvia J. Tucker, MS; John A. Friary, MS; P. Cynda Crawford, DVM, PhD; Teri A. Ricke, MS; Julie K. Levy, DVM, PhD, DACVIM

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**Design**—Prospective study.

**Animals**—61 feral cats included in a trap-neuter-return program in Florida.

**Procedures**—Each cat received vaccines against feline panleukopenia virus (FPV), feline herpes virus (FHV), feline calicivirus (FCV), FeLV, and rabies virus (RV). Immediately on completion of surgery, vaccines that contained inactivated RV and FeLV antigens and either MLV or inactivated FPV, FHV, and FCV antigens were administered. Titers of antiviral antibodies (except those against FeLV) were assessed in serum samples obtained immediately prior to surgery and approximately 10 weeks later.

**Results**—Prior to vaccination, some of the cats had protective serum antibody titers against FPV (33%), FHV (21%), FCV (64%), and RV (3%). Following vaccination, the overall proportion of cats with protective serum antiviral antibody titers increased (FPV [90%], FHV [56%], FCV [83%], and RV [98%]). With the exception of the FHV vaccine, there were no differences in the proportions of cats protected with inactivated virus versus MLV vaccines.

**Conclusions and Clinical Relevance**—Results suggest that exposure to FPV, FHV, and FCV is common among feral cats and that a high proportion of cats are susceptible to RV infection. Feral cats appeared to have an excellent immune response following vaccination at the time of neutering. Incorporation of vaccination into trap-neuter-return programs is likely to protect the health of individual cats and possibly reduce the disease burden in the community. *J Am Vet Med Assoc* 2007;230:52–58.

Feral cats have successfully adapted to almost every ecologic niche in the world, including rural and urban settings, extremes of desert and Antarctic conditions, and areas populated by or devoid of humans.<sup>1</sup> The population of unowned feral cats in the United States is suspected to rival that of the owned cat population (the latter estimated as 90.5 million in 2006)<sup>2</sup> and may be the most important source of cat overpopulation.<sup>3</sup> The impact of feral cats on animal welfare, public health, and the environment is an increasingly controversial topic, and there is little agreement among policy makers and opinion leaders regarding the best methods for the control of feral cat populations.<sup>1,4–7</sup>

Attempted control of feral cat populations through TNVR programs is an increasingly popular alternative to mass euthanasia.<sup>8</sup> These programs involve capture and neutering of the cats, followed by their return to their colonies to live out their normal life spans. Depend-

From the Department of Small Animal Clinical Sciences, College of Veterinary Medicine, University of Florida, Gainesville, FL 32610 (Fischer, Quest, Tucker, Friary, Crawford, Levy); the Animal Health Diagnostic Center, College of Veterinary Medicine, Cornell University, Ithaca, NY 14852 (Dubovi); and Department of Diagnostic Medicine and Pathobiology, College of Veterinary Medicine, Kansas State University, Manhattan, KS 66506 (Davis, Ricke).

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Address correspondence to Dr. Levy.

### ABBREVIATIONS

TNR	Trap-neuter-return
MLV	Modified-live virus
TKX	Tiletamine, zolazepam, ketamine, and xylazine
RV	Babies virus
FPV	Feline panleukopenia virus
FHV	Feline herpesvirus
FCV	Feline calicivirus
FVRCP-FeLV vaccine	Multivalent vaccine against FPV, FHV, FCV, and FeLV
IQ range	The range from the 25th to the 75th percentiles of the data
CDV	Canine distemper virus
CPV	Canine parvovirus

ing on the program involved, a variety of other services may also be provided for the cats, including assessment for infectious diseases, treatment of illnesses and injuries, vaccination, regular feeding, parasite treatment, and removal of socialized cats for adoption.<sup>8,9</sup>

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# TNVR and Public Health

- Following vaccination
  - Overall proportion of cats with protective serum antiviral antibody titers increased

- FPV (90%)
- FHV (56%)
- FCV (93%)
- RV (98%)

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SMALL ANIMALS

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Scientific Reports: Original Study

JAVMA, Vol 230, No. 1, January 1, 2007





# TNVR and Public Health

- Conclusions

- Feral cats appeared to have excellent immune response following vaccination at the time of neutering

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- Conclusions
  - Incorporation of vaccination into TNR programs is likely to protect the health of individual cats
  - And possibly reduce the disease burden in the community

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**Conclusions and Clinical Relevance**—Results suggest that exposure to FPV, FHV, and FCV is common among feral cats and that a high proportion of cats are susceptible to RV infection. Feral cats appeared to have an excellent immune response following vaccination at the time of neutering. Incorporation of vaccination into trap-neuter-return programs is likely to protect the health of individual cats and possibly reduce the disease burden in the community. *J Am Vet Med Assoc* 2007;230:52–58

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Attempted control of feral cat populations through TNR programs is an increasingly popular alternative to mass euthanasia.<sup>8</sup> These programs involve capture and neutering of the cats, followed by their return to their colonies to live out their normal life spans. Depend-

ing on the program involved, a variety of other services may also be provided for the cats, including assessment for infectious diseases, treatment of illnesses and injuries, vaccination, regular feeding, parasite treatment, and removal of socialized cats for adoption.<sup>8,9</sup>

Many public health care guidelines concerning both humans and animals advise against vaccine administration during anesthesia or surgery,<sup>10,11</sup> whereas some guidelines do not mention vaccination in these

### ABBREVIATIONS

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MLV	Modified-live virus
TKX	Tiletamine, zolazepam, ketamine, and xylazine
RV	Rabies virus
FPV	Feline panleukopenia virus
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FCV	Feline calicivirus
FVRCP-FeLV vaccine	Multivalent vaccine against FPV, FHV, FCV, and FeLV
IQ range	The range from the 25th to the 75th percentiles of the data
CDV	Canine distemper virus
CPV	Canine parvovirus



# TNVR and Public Health

- Conclusions
  - Vaccination of feral cats at the time of neutering may protect them for much of their remaining life span
  - Immunity that develops following vaccination has been shown to persist for a minimum of 3 to 7 years in most cats

**SMALL ANIMALS**

## Response of feral cats to vaccination at the time of neutering

Sarah M. Fischer, MS; Cassie M. Quest, BS; Edward J. Dubovi, PhD; Rolan D. Davis, MS; Sylvia J. Tucker, MS; John A. Friary, MS; P. Cynda Crawford, DVM, PhD; Teri A. Ricke, BS; Julie K. Levy, DVM, PhD, DACVIM

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# TNVR and Public Health

- Conclusions
  - Ideally, feral cats should be recaptured and receive booster vaccinations, particularly with a vaccine against rabies
  - According to the guidelines established by the American Association of Feline Practitioners

SMALL ANIMALS

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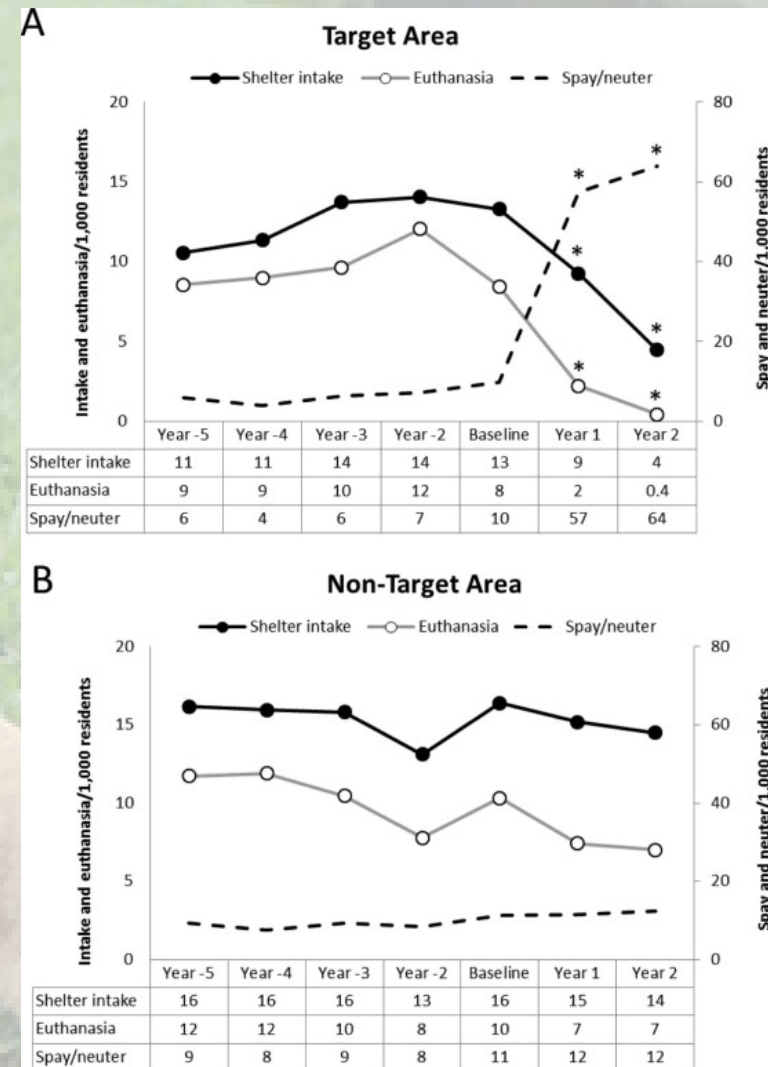
# TNVR and Public Health

- TNVR: Trap-Neuter-Vaccinate-Return
- Emphasis on the “V”
  - Vaccination
    - Emphasizes the public health aspect of TNVR programs
    - Specifically, vaccinating against rabies as a means of protecting the health of the public



# TNVR and Public Health

- The only *humane* way to deal with the problem of community (feral, free-roaming) cats.
- When properly applied, TNVR has been shown to help control/reduce the population of free-roaming cats.



# TNVR and Public Health

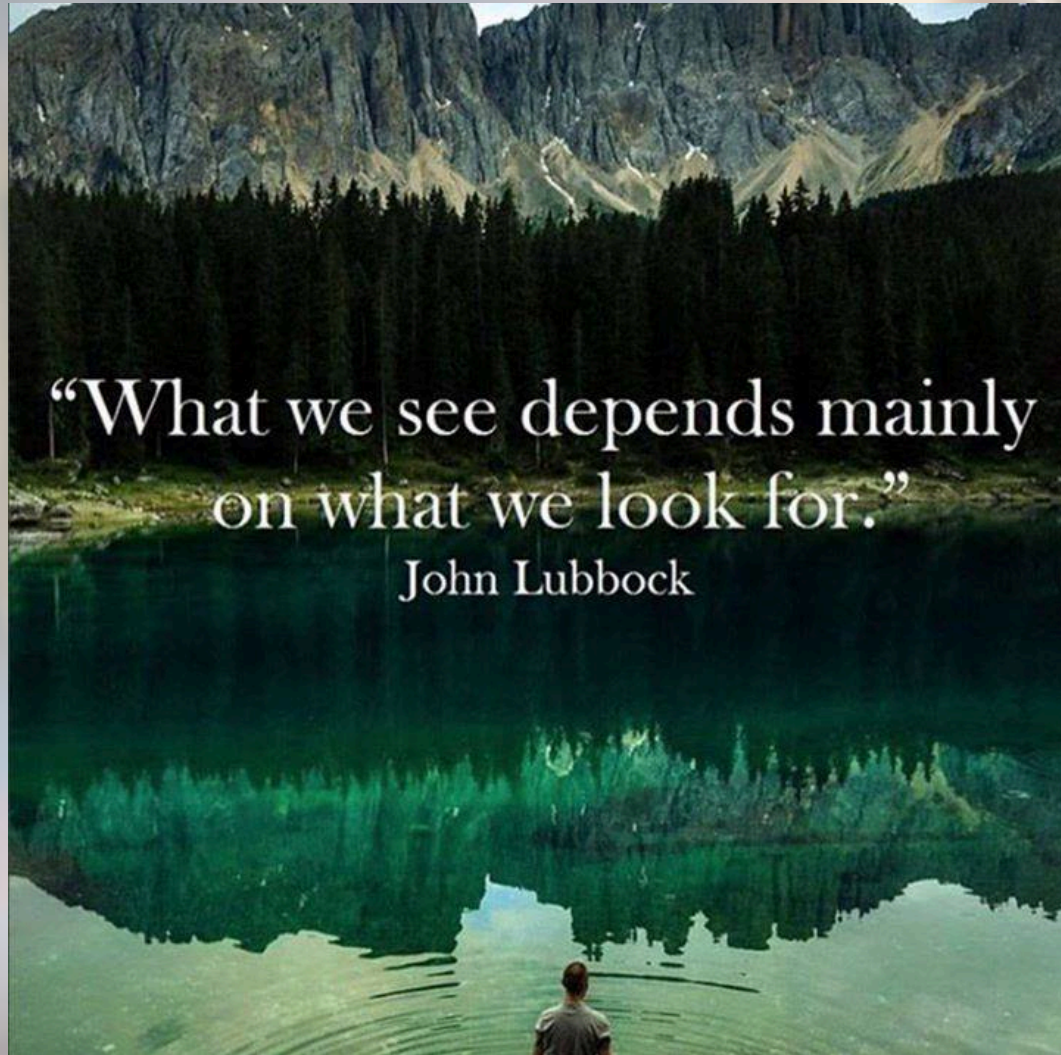
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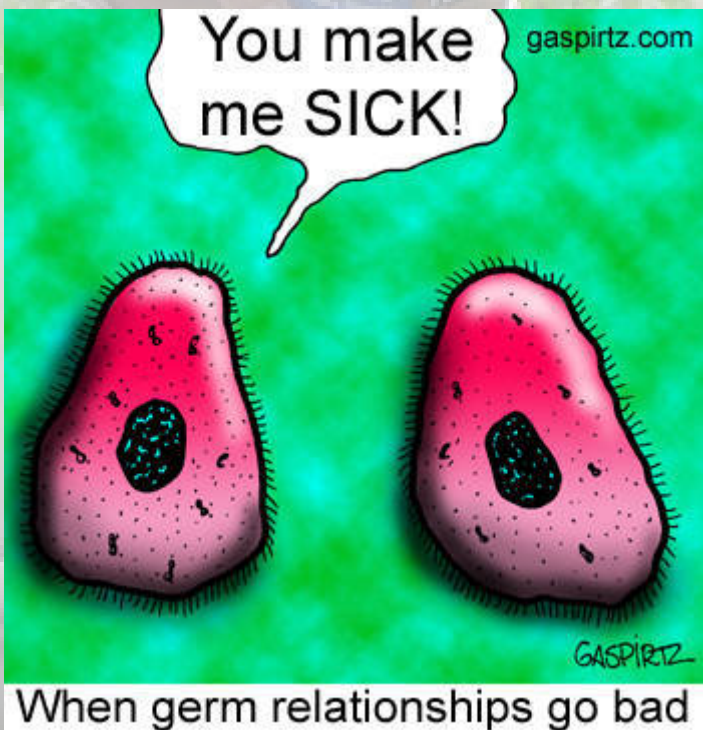


# TNVR and Public Health





# TNVR and Public Health



Questions?

G. Robert Weedon, DVM, MPH  
Community Cat Surgeon  
TLC PetSnip  
[weedondvm@tlcpetsnip.org](mailto:weedondvm@tlcpetsnip.org)



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