



KEY TAKEAWAYS

- ▶ A recent study was the first of its kind to evaluate the variability of non-core vaccination rates across the United States.
- ▶ Substantial variability in non-core vaccination rates was identified between adjacent states as well as practices within the same state.
- ▶ Study results provide evidence that factors other than disease risk influence non-core vaccination rates.
- ▶ Clinics should review protocols and use combination vaccines to increase compliance and close gaps in protection.

Non-Core Vaccination Rates: Where Does the Data Drive Us?

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THE STUDY

Malter KB, Tugel ME, Gil-Rodriguez M, et al. Variability in non-core vaccination rates of dogs and cats in veterinary clinics across the United States. *Vaccine*. 2022;40(7):1001-1009.

Vaccination is a safe, affordable, and reliable means for preventing infectious diseases in dogs and cats¹⁻³; however, rabies is the only vaccine required by law in most states. Administration of other vaccines is left up to practitioner discretion, along with the owner's decision based on patient risk assessment.^{1,2} Vaccines that are not required (eg, *Leptospira*, *Borrelia burgdorferi*, *Bordetella bronchiseptica*, feline leukemia virus [FeLV]) are termed “non-core” or “lifestyle” vaccines, as this term conveys that a pet's individual risk and lifestyle should be factors when decisions surrounding vaccination are made.

When considering vaccinations, components such as geographic location,

patient lifestyle, and other risk factors may actually make a lifestyle vaccine core for a particular animal. However, appropriate risk assessment presents challenges, requiring careful questioning, accurate disease prevalence information, and factual owner responses.

Inaccurate risk assessment leaves dogs and cats unprotected from preventable infectious diseases, including leptospirosis, Lyme disease, bordetellosis, and FeLV. This difficulty is compounded by several factors, including limited expert guidelines on many vaccines. Such is the case with *Bordetella bronchiseptica*, for which guidelines may be conflicting or unclear, and with leptospirosis, which may be considered core in many areas across the United States but still termed a lifestyle vaccine.^{2,5} In addition, there is disagreement amongst experts in the Lyme borrelio-



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sis consensus statement, in which opinions were evenly split on vaccination and no consensus was reached.⁶ With such limitations, an improved understanding of how and where lifestyle vaccines are being used across the country, as well as geographic vaccination rates and variability across nearby clinics, could help ensure practitioners make decisions to best protect their patients.

The Study

A recent study was the first of its kind to evaluate vaccination rates for several lifestyle vaccines in dogs and cats that were current on core vaccines (dogs: distemper, adenovirus, parvovirus [DAP]; cats: feline viral rhinotracheitis, calicivirus, and panleukopenia virus [FVRCP]).⁴ The study utilized data obtained between November 1, 2016, and January 1, 2020. Patients were included only if they were current for core vaccines as recommended by AAHA² and at least 6 months of age. Thus, the study's authors selected the most compliant clients at each practice, implying the data is likely a best case scenario or overestimation for lifestyle vaccination rates across the country. Patients current on core vac-

cines, adjusted for whether clinics followed 1-year or 3-year protocols and with a 2-month grace period, were divided into those current on lifestyle vaccines.

Results

The records of 5.5 million dogs in 1,670 clinics and 1.9 million cats in 1,661 clinics in 48 states were screened for inclusion. Just <2.8 million dogs and 790,000 cats were considered fully compliant with core vaccines; their lifestyle vaccine status was analyzed, with respect to *Leptospira*, *B burgdorferi*, *B bronchiseptica*, canine influenza virus, and FeLV vaccines (**Table**).

Leptospirosis

Nationally, 63.4% of core compliant dogs in the study received leptospirosis vaccines, with a median clinic rate of 70.5%. Vaccination rates were higher in the midwest and south-central states. There was high variability within clinics in the same geographic region; some clinics had very high or even 100% leptospirosis vaccination rates, suggesting that the disease is approached as core amongst those practitioners and likely a geographic risk to dogs in those areas, whereas neighboring clinics had a 0% vaccination rate.

Borreliosis

In 11 states identified as Lyme-endemic by the CDC, 47.9% of core compliant dogs in the study were vaccinated against Lyme disease, with a median clinic vaccination rate of 51.8%. Of those states, the lowest vaccination rate was Virginia (18.2%). As with leptospirosis, there was high variability amongst clinics in the same geographic area, with 1 clinic having a vaccination rate exceeding 90% and a neighboring clinic at 0%. Additional data available to assess perceived borreliosis risk for Lyme-endemic region dogs included information on the purchase of tick prevention at the clinic in the last year. The purchase of tick prevention suggests that the dog has been determined to be at risk for tick exposure.

Year-round tick prevention and annual vaccination are recommended for dogs at risk for Lyme borreliosis in

TABLE

MEDIAN VACCINATION RATES FOR NON-CORE VACCINES

Canine Non-Core Vaccine	Median Vaccination Rate at All Study Clinics
<i>Leptospira</i>	70.5%
<i>B burgdorferi</i>	51.8%
<i>B bronchiseptica</i>	68.7%
Feline Non-Core Vaccine	Median Vaccination Rate at All Study Clinics
FeLV	34.6%

endemic regions.⁷ In this study, tick prevention was purchased in clinic by >40% of owners of dogs that were core compliant but not vaccinated against Lyme borreliosis and living in a Lyme-endemic state. This marks a disconnect between perceived risk (recommendation of tick prevention) and recommended disease prevention strategies for year-round tick prevention and vaccination in some clinics in those endemic areas.

Bordetella bronchiseptica

Nationally, 64.6% of core compliant dogs in the study received *B bronchiseptica* vaccines, with a median clinic rate of 68.7%. The south-central and southeast regions had higher rates geographically, and the northeast had the lowest vaccination rate. There was wide vaccination rate variability within states, ranging from 0% to almost 100% in similar geographic regions.

Feline Leukemia

Nationally, 32.8% of core compliant adult cats were vaccinated against FeLV, with a median clinic rate of 34.6%. FeLV vaccination is considered to be core for all cats <1 year of age, as this age group is most susceptible to infection.² For cats for which the vaccine was considered core (ie, cats <1 year of age), national and median clinic rates were similar at 36.8%. **Of kittens and 1-year-old cats, 63.2% were not vaccinated for FeLV, despite expert guidelines classification as a core vaccination.**²

Discussion

This study was the first to evaluate lifestyle vaccination rates in a large number of dogs and cats to help practitioners make risk-assessment decisions. Given that the sampled dogs and cats represented the most compliant clients at their respective practices, there is likely a

substantially larger population that is unprotected from those diseases in each state. Less compliant or non-compliant patients represent an opportunity for further evaluation, owner education, practice growth, and preventive healthcare.

In this study, the differences in vaccination rates among states are understandable for diseases with a defined geographic risk. However, of current lifestyle vaccines for dogs and cats, only Lyme borreliosis has defined endemic states, and consideration should be given to the fact that Lyme borreliosis in humans is spreading geographically.⁸ This study also did not assess risks to pets associated with traveling among states, which is increasingly common and a way in which a pet outside an endemic state may encounter risk for exposure to Lyme borreliosis.

FeLV, leptospirosis, and *B bronchiseptica* are not strictly geographically limited with endemic and non-endemic regions; thus, the variability between states represents an opportunity for growth in risk assessment and protection of dogs and cats.^{9,10} However, the data also show that, to some degree, risk assessment is indeed at play for some of these vaccine recommendations. Of dogs vaccinated for Lyme borreliosis, 85.5% also received leptospirosis vaccines, showing an understanding of the overlap in risk factors between the 2 diseases. Dogs assessed to be at risk for exposure to *Ixodes* spp ticks carrying *B burgdorferi* are

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EXPERT COMMENTARY

As veterinarians, few things are as frustrating as seeing our patients suffer from vaccine-preventable diseases. For vaccines considered core, the choice to vaccinate is easy, but for vaccines considered non-core or lifestyle, the choice can be less clear. For those diseases, we are charged with accurately assessing risk to each pet to create individualized vaccine plans. Some diseases for which vaccines are considered lifestyle (eg, leptospirosis, FeLV) can be deadly, and expert guidelines recommend they be considered core in some animals. This large-scale study was the first of its kind to report lifestyle vaccine rates amongst core vaccine-compliant dogs and cats across 48 US states. This study showed a wide range in vaccination rates within states and among states for diseases for which minimal geographic differences in risk exist. Importantly, it also showed that clinicians recognize the overlap in risk factors between dogs at risk for Lyme and leptospirosis, as most dogs vaccinated for Lyme borreliosis also received leptospirosis vaccines. The results of this study will hopefully empower clinicians to more strongly advocate for the use of appropriate lifestyle vaccines in their practice, moving some such as leptospirosis to core when appropriate.

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also at risk for both direct or indirect exposure to leptospirosis reservoirs (eg, rats, mice, voles, skunks, raccoons); therefore, dogs that receive Lyme vaccines should also be protected from leptospirosis by vaccination.

There was also a high degree of variability within states between practices for each disease studied, which suggests that factors other than disease risk are influencing those lifestyle vaccine rates. Using leptospirosis as a well-documented example, recent work has shown that urban and small-breed dogs are also at risk for leptospirosis.^{11,12} Thus, the variability in protection within states may be due to the difficulty of risk assessment, lack of awareness of expert guidelines or regional disease risk, the strength of the veterinary recommendation, and/or pet owner adherence to recommendations for any number of reasons, including vaccine hesitancy.¹³ Ultimately, there is likely a substantial gap in lifestyle vaccine compliance with unprotected dogs and cats at risk for preventable diseases across the United States.

Limitations of the study include that practice records cannot account for vaccines not received at that clinic, as clients may utilize multiple clinics or low-cost vaccine clinics, may provide limited information about individual patient risk factors, and/or may not note when vaccines were offered but declined and for what reasons. Better knowledge of when and why pet owners agree to some vaccines but decline others is needed to address vaccine hesitancy in pet owners and ensure best protection for dogs and cats from preventable diseases.¹³

Implications for Practice

The study indicates that substantial variability exists in lifestyle vaccination rates, and these inconsistencies leave

dogs and cats at risk for vaccine-preventable diseases.

For the first time, data are available to evaluate lifestyle vaccine compliance in a large group of core compliant dogs and cats. Although this is an exceptionally large cohort for a study in veterinary medicine, the numbers become much more narrow when limiting inclusion to core compliant dogs and cats. Dogs included dropped from 5.5 million to 2.8 million, meaning almost half of the clinics' dogs were not core compliant. Cats included decreased from 1.9 million to 790,000, demonstrating that almost 60% of clinics' cats were not core compliant at the time of evaluation.

Ensuring that dogs and cats receive appropriate lifestyle vaccines ultimately hinges upon accurate risk assessment. It is important for clinics to have a consistent, well-understood protocol for risk assessment. These data should help practitioners better understand where and how vaccines for leptospirosis, Lyme borreliosis, *B bronchiseptica*, and FeLV are being used in their geographic region and empower them to make stronger recommendations or consider moving some vaccines such as leptospirosis to core in alignment with expert guidelines.⁵ Practices may choose to expand protection for their patients without sacrificing client experiences and aligning with Fear Free[®] practices by using multivalent vaccines, including core and lifestyle vaccines such as low-volume FVRCP with FeLV or Lyme and leptospirosis combination vaccines in clinics using a 3-year DAP protocol. Properly identifying dogs and cats at risk for diseases such as leptospirosis, Lyme borreliosis, *B bronchiseptica*, and FeLV and creating individualized vaccination plans will ensure more dogs and cats are maximally protected against preventable, costly, and potentially fatal diseases.

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