Companion Animal Vaccine Hesitancy

Current Evidence and Practical Communication Strategies

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KEYWORDS

• Vaccine • Hesitancy • Preventative medicine • Communication • Veterinary • Dog • Cat

KEY POINTS

- Vaccine hesitancy in veterinary medicine ranges from mild concern to refusal and is driven by many of the same behavioral and social factors as human medicine.
- Pet owner concerns include vaccine safety, necessity, overvaccination, cost, and disease risk, with human vaccine attitudes strongly influencing companion animal vaccine hesitancy.
- Veterinarians are the most trusted vaccine information source, making effective communication and strong veterinarian-client relationships essential for maintaining vaccine uptake.
- Motivational interviewing, presumptive recommendations, and empathetic listening may improve vaccine acceptance while reducing defensiveness during vaccine discussions.
- Additional veterinary-specific research is needed to further describe the depth of vaccine hesitancy and evaluate interventions that improve vaccine acceptance and preventive care compliance.

INTRODUCTION TO VACCINE HESITANCY

Vaccine hesitancy is defined by the World Health Organization (WHO) as a "delay in acceptance or refusal of vaccination despite availability of vaccination services" and was named a top 10 threat to global health in 2019 by WHO.[1,2] Importantly, a person

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Abbreviations	
AAP	American Academy of Pediatrics
BeSD	WHO Behavioral and Social Drivers of Vaccine Uptake Taskforce
CDC	Centers for Disease Control
CFIA	Canadian Food Inspection Agency
GLM	general linear mixed-effect regression
LR	logistic regression
MMR	Measles-Mumps-Rubella
MNLR	multinominal linear regression
MVRA	multivariable regression analysis
OISA	Oficina de Inspección de Sanidad Agropecuaria
OR	odds ratio
PACV	Parent Attitudes About Childhood Vaccines
PMT	Protection-Motivation Theory
SAGE	Strategic Advisory Group of Experts
WHO	World Health Organization

who is vaccine hesitant is different from those who might describe themselves as "antivaxxers." Vaccine hesitancy can be transient, apply only to some vaccinations, and is a state of indecision, while an individual who identifies as aligned with the anti-vaccination movement has decided on the utility of vaccination.

In humans, routine vaccination prevents millions of deaths each year around the world.[3] Aside from deaths alone, the avoided costs and morbidity avoided through routine vaccination save millions each year as well.[3] Discrete numbers are less available in veterinary medicine, but the benefit of vaccination is illustrated in the rarity of canine distemper, rabies, and canine parvovirus cases most family veterinarians see each year. The 2013 introduction of quadrivalent antileptospiral vaccines (L4) in Europe offered unique insights into the effect of an efficacious vaccine on disease rates in an endemic area.[4] In one Swiss hospital, the rate of acute kidney injury secondary to leptospirosis before and after the introduction of L4 vaccines were compared and decreased from 56.5 cases per year before L4 to only 15.7 cases per year after L4 introduction.[4]

Veterinarians know vaccination is a core and efficacious means of disease prevention, and a better understanding of vaccine hesitancy in humans and animals can help improve vaccination uptake. This review summarizes the historical development of vaccine hesitancy in human medicine, explores how many of the same behavioral and social drivers now influence vaccination decisions for companion animals, and introduces communication strategies to address vaccine hesitant clients.

ORIGINS OF VACCINE HESITANCY

As long as there has been vaccination, there have been concerns about vaccination safety. In 1796, Edward Jenner began the practice of vaccination (derived from the Latin word for cow, *vacca*) after noting that infection with cowpox would protect from smallpox infection.[5] Utilizing material from cowpox sores to inoculate the masses was not uniformly adopted by any means, despite the gravity of smallpox infections. Posters showing children turning into cows, physicians and pharmacists chasing children with needles, and women growing horns after vaccination are preserved icons of the first antivaccination campaigns.[6]

The rise of contemporary vaccine hesitancy is often ascribed to 2 phenomena: concerns about the preservative thimerosal, and a now-retracted manuscript attempting to link childhood vaccination to autism.[7] In the late 1990s, there was a worldwide focus

on the effects of mercury exposure, and a portion of that was directed at the vaccine preservative thimerosal. Unlike the more dangerous methylmercury, vaccines with thimerosal contained a minute amount of ethylmercury. While it was later determined that ethylmercury was innocuous and rapidly excreted from the body,[8] the American Academy of Pediatrics (AAP) recommended removal of thimerosal from vaccines in 1999,[9] which was linked to substantial drops in infant hepatitis B vaccination rates.[10] As further research demonstrated the safety of thimerosal, the AAP revised its position that thimerosal posed no danger other than local hypersensitivity.[11] However, the concern persisted, and in 2025 the Advisory Committee on Immunization Practices voted to ban the use of thimerosal in influenza vaccines in the United States.[12] Contemporary to the thimerosal concerns, a former physician researcher, Andrew Wakefield, published a manuscript in 1998 (retracted in 2010) attempting to link Measles-Mumps-Rubella (MMR) vaccines and autism. While no reputable research has since linked vaccination or mercury-containing vaccine preservatives to childhood developmental disorders such as autism, concerns remain a driving force of childhood vaccine hesitancy globally.[7]

The most recent example of the consequences of vaccine hesitancy in the United States was seen in the Measles outbreaks of 2025. Across the United States, starting in Texas and eventually spreading to 33 states, large gaps in MMR vaccination coverage in certain communities allowed rapid spread of the virus to susceptible infants, children and adults.[13] While the United States had declared measles eliminated in 2000, more than 2 decades of vaccine hesitancy and declining vaccination rates culminated in a stark demonstration of the consequences of lost herd immunity.[13] Data from social media surveys during the COVID pandemic showed widespread vaccine hesitancy across the United States that clearly persists today.[14]

PROTECTION-MOTIVATION THEORY AND VACCINE DECISIONS

It is long been known that a better understanding of the motivations behind falling vaccination rates allows for targeted interventions. Protection-Motivation Theory (PMT) is a framework for understanding how individuals might make health care decisions when fear appeals are used to prompt change.[15] Within the PMT framework, an individual's threat appraisal and coping appraisal work in parallel to drive behavior. Threat appraisal is one's recognition of the threat, its severity, their own vulnerability to it, and potential rewards for not adopting the suggested health change. Coping appraisal, meanwhile, refers to one's belief in the efficacy of the intervention, any barriers to adoption, and the belief that one can partake in the intervention. A veterinary example utilizing canine influenza vaccination is shown in **Fig. 1**.

In every study of hesitancy, it is clear vaccination decisions result from a culmination of many influencing factors, which have been described and surveyed by the WHO Strategic Advisory Group of Experts (SAGE) on Immunization[16] and later the WHO Behavioral and Social Drivers of Vaccine Uptake Taskforce (BeSD).[17] BeSD utilized available data to illustrate the factors both within and outside simple PMT that might motivate vaccination decisions, and suggested interventions and surveys based on the initial SAGE work for those invested in vaccine hesitancy research.[17] These basic motivations and drivers of vaccination are illustrated in **Fig. 2**.

VACCINE HESITANCY AMONG HUMAN HEALTH CARE TEAMS

While vaccine hesitancy is often seen as a patient-level issue, evidence from human medicine shows that hesitancy can also develop within health care teams. Although most health care workers support vaccination, studies from various countries and

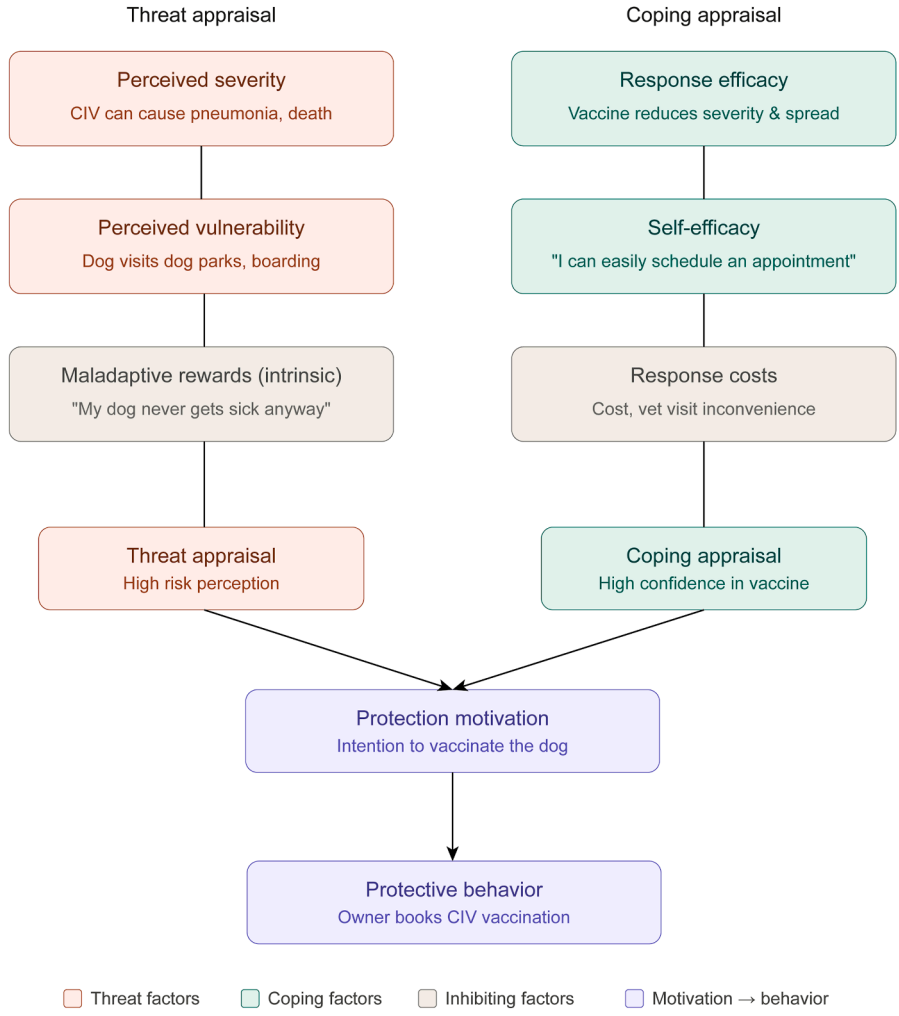


Fig. 1. An example of Protection Motivation Theory used to understand the decision-making process of a theoretic owner with respect to *canine influenza* vaccination.

groups have identified a subset of providers who express doubts about vaccine safety, the necessity of vaccines, or official recommendations. This issue is important because health care professionals are among the most trusted sources of vaccine information and play a vital role in influencing patient attitudes toward vaccination. Hesitancy among health care teams can impact clinical advice, patient confidence, and ultimately, vaccine uptake.

Research on health care workers' beliefs indicates hesitancy exists among various professional roles, including physicians, nurses, and other health care staff. The rate of hesitancy varies by population and vaccine, but international data shows that about 15% of health care providers report some degree of hesitancy toward COVID-19 vaccines.[18] Common concerns include vaccine safety, potential side effects, and the rapid development of new vaccines. Other factors associated with hesitancy are perceived personal risk of disease, doubts about vaccine effectiveness, and distrust

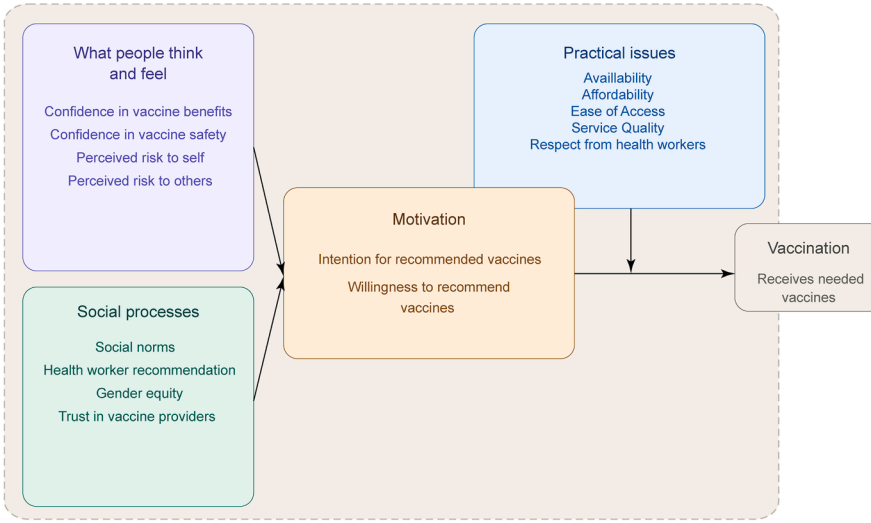


Fig. 2. The social and behavioral drivers of vaccination, adapted from the WHO and UNICEF, as they may be applied to veterinary medicine. The coalescing of all the included factors result in the motivation to get a pet vaccinated, which could still be hampered by practical issues. (*Reproduced from* Behavioural and social drivers of vaccination: tools and practical guidance for achieving high uptake, Introduction, Pages No. 2, World Health Organization; 2022.)

in health institutions or regulatory agencies.[18] A study of nurses and nursing students found that worries about long-term effects remain a consistent reason for hesitancy.[19]

Qualitative research clarifies beliefs that contribute to vaccine hesitancy among health care workers. Many hesitant providers do not see themselves as "antivaccine" but rather are cautious about current vaccination practices. Some worry about long-term safety or the number of vaccines recommended, while others prefer more personalized instead of standardized vaccination protocols.[20] Skepticism toward pharmaceutical companies or government health agencies may also add to uncertainty. One qualitative study found that vaccine-hesitant physicians are more likely to have training in complementary or alternative medicine, to be dissatisfied with conventional health care systems, or to be involved in professional networks that support vaccine skepticism.[20] Workplace and logistical factors also matter. Health care workers often report not having enough time to address vaccine concerns and lack training in vaccine communication. Exposure to misinformation via social media can further complicate these discussions.[19]

Most importantly, health care professionals' views and behaviors can influence patient and caregiver vaccination decisions. Providers who are vaccinated or confident in vaccines are more likely to recommend vaccination, while those with doubts may give more hesitant or less direct recommendations, even if they support routine vaccination.[21] Since health care providers are among the most trusted sources of vaccine information, differences in their confidence can significantly affect patient choices and vaccine uptake.

Most research on health care worker vaccine hesitancy comes from human medicine, but these insights are highly relevant to veterinary practice. Veterinary professionals are also the primary and often most trusted source of vaccine information for

pet owners, and their confidence can strongly influence client decisions.[22] Recognizing that hesitancy can also occur within health care teams is an important step in maintaining consistent vaccine advocacy and effective client communication.

VACCINE HESITANCY IN VETERINARY MEDICINE

Compared to human health care, vaccine hesitancy in veterinary medicine has been less widely characterized. Extrapolating from people, *veterinary* vaccine hesitancy can be described as an *owner's* "delay in acceptance or selective refusal of recommended vaccinations despite adequate vaccine availability."[16] Yet, this definition fails to capture additional pet owners that fully vaccinate their pets yet still have individual concerns.[23] Thus, the definition for pet owners' vaccine hesitancy appears broader and is best captured by "the tendency for [pet] owners to express doubts about the safety, efficacy, and or importance of routine vaccination for one's [pets]."[24] Thus, *veterinary vaccine hesitancy* spans a continuum from direct vaccine refusal to delay in vaccine acceptance to vaccine-hesitant individuals still electing full vaccination for their animals (**Fig. 3**).

Vaccination Requirements, Guidelines and Reported Vaccination Rates in Companion Animals

To define the scope of vaccine hesitancy in veterinary medicine, one must first consider the current vaccine mandates and guidelines placed on companion animal vaccination and the prevalence of routine vaccination practices. In North America, entities including the Centers for Disease Control (CDC) and (USDA APHIS) for the United States, Canadian Food Inspection Agency (CFIA) for Canada, and Oficina de Inspección de Sanidad Agropecuaria (OISA) and Servicio Nacional de Sandida, Inocuidad y Calidad Agroalimentaria (SENASICA) in Mexico specifically regulate and require vaccination for imported and exported animals. For example, the Animal Welfare Act requires dogs imported into the United States to be vaccinated against rabies 30 days prior to arrival and against distemper, hepatitis, parvovirus, parainfluenza, and leptospirosis within a year of entry.[25] Guidelines for the vaccination of companion animals are outlined by numerous veterinary professional organizations. For companion animal practitioners, the World Small Animal Veterinary Association Guidelines group has produced global guidelines in multiple languages and across specific geographic regions.[26–28] Updates for core, noncore, and recommended vaccines as well as adverse events are described to tailor vaccine coverage upon considering a pet's lifestyle and needs to protect against a broad range of infectious diseases. Both the vaccinating veterinarian and pet owner must consider the factors of vaccine mandates and guidelines when electing vaccination for their patients and pets.

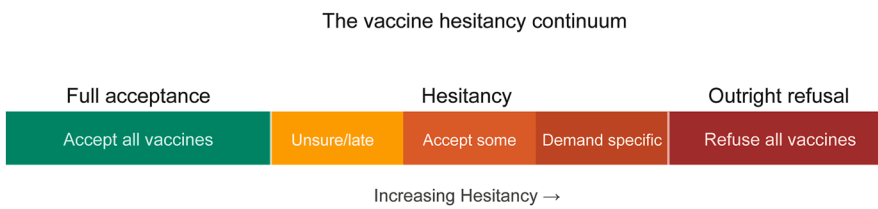


Fig. 3. The continuum of vaccine hesitancy in veterinary medicine adapted from WHO SAGE Working Group on Vaccine Hesitancy in humans. Hesitancy can be a transient state and is subject to change based on any number of factors. (*Adapted from* WHO SAGE Working Group on Vaccine Hesitancy, 2014.)

Determining the prevalence of pet vaccination, particularly core vaccines, helps to define the magnitude of vaccine election versus other elements associated with vaccine hesitancy in veterinary medicine. Surveys of owners have been used most often to characterize vaccination rates in companion animals and are summarized in **Table 1**. Between 2013 and 2023, dog owner survey respondents reported vaccination rates ranging 39% to 84% in the United States, Germany, and Chile.[24,29,30] Additional studies, aiming to reduce owner recall bias by utilizing veterinary transaction records and recruited veterinary practice records, revealed similar canine vaccinations ranges of 51% to 82%, respectively.[31,32] In comparison, for cats, owner-reports of vaccinations ranged from 25% to 91% in the United Kingdom, Germany, Italy, and Chile.[30,33–36] Additional UK veterinary medical records and US veterinary practice transactions revealed 66% and 41% cats receiving a vaccine, respectively.[30,31] Overall, these studies highlight the significant variability in prevalence of reported vaccine elections across the globe in companion animals. A close review of these studies is needed to identify factors and predictors associated with vaccine hesitancy that could be associated with refusal and/or delay.

Pet Owner Demographics, Beliefs and Attitudes, and Correlation to Vaccination Uptake

Owner reported surveys, transaction records, and convenience medical record reviews have been the predominant strategy used to identify individual factors that correlate with reasons for veterinary vaccine refusal, delay, and acceptance. Efforts and tools to characterize vaccine hesitancy are available yet no standardized tool for measuring veterinary vaccine hesitancy has been defined in the veterinary field. Thus far, the Parent Attitudes about Childhood Vaccines survey,[37] as well as the WHO SAGE vaccine hesitancy survey tool[16] have been used in combination with veterinary vaccination guidelines for surveying pet owner vaccine hesitancy.[38,39] Additional studies included and reviewed here developed their own questionnaires and metrics based on individual populations.

A nationally representative online survey of US adults (n = 2200) defined canine vaccine hesitancy probability by comparing respondents' answers of their dogs' vaccination status with attitudes toward policies that encourage canine vaccination.[24] Results of the study found a large proportion of dog owners consider vaccines administered to dogs to be unsafe (37%), ineffective (22%), and/or unnecessary (30%); a slight majority (53%) of dog owners aligned with at least one of these positions.[24] American dog owners with a college degree were significantly *less* likely to be classified as vaccine hesitant; alternatively, dog owners who endorsed misinformation about the safety of human vaccine were *more* likely to be classified as canine vaccine hesitant.[24] Further, in 2 regression analysis models, canine vaccine hesitancy was tightly associated with opposition to mandatory rabies vaccination.[24]

In exploring perceptions of human versus pet vaccines, Haeder and colleagues found that a large majority (>90%) of dog and cat owners (n = 3958) surveyed felt that pet vaccines were safe, important, and effective, as compared to human vaccines (86%–88%).[40] Using these 3 respective measures (safe, effective, and important), a 10-point measure defined a respondent's vaccine hesitancy index; higher numbers indicating higher rates of vaccine hesitancy. A weighted least squares regression model of this index revealed human vaccine hesitancy was a strong predictor of animal vaccine hesitancy, and women scored consistently lower on the vaccine hesitancy indices for dogs and cats than men.[40] Higher trust in scientists was negatively associated with both dog and cat vaccine hesitancy and dog ownership was a predictor for lower levels of vaccine hesitancy.[40]

Table 1
Vaccination rates reported by various sources (ie, pet-owners, veterinary transactions, and medical records) by species, time frame, and region

Species	Time Frame	Variable	No./Total (%) Reporting Vaccination	Source	Region	Sampling Method//Mechanism	Reference
Dog	2013, Nov–2015, Oct	Vaccination recorded; >1 y >3 y	(82%) (7%) (2%)	Veterinary medical records	Great Britain	Convenience recruitment (SAVSNET veterinary practices)// medical record	Sánchez-Vizcaíno et al,[32] 2018
	2018, Aug–2019, Feb	Core vaccination	1818/3881 (47%)	Pet owner	Germany	Convenience//online survey	Eschle et al,[29] 2020
	2018, Nov–2020, Jan	Core vaccination	2,798,875/ 5,531,866 (51%)	Veterinary practice transactions	USA	Convenience (VetSuccess)// transaction records	Malter et al,[31] 2022
	2021, Dec	Vaccinated in last year	2763/7048 (39%)	Pet owner	Chile	Convenience//in-person questionnaires	Salgado-Caxito et al,[30] 2023
	2023, March–April	Vaccination status	1848/2200 (84%)	Pet owner	USA	Nonprobability sampling (YouGov)//online survey	Motta et al,[24] 2023
Cat	2007	Vaccinated within last 52 wk	332/549 (60%)	Pet owner	UK	Random sample//telephone questionnaire	Murray et al,[34] 2009
	2008, April–May	Vaccinated in last 12 mo	2128/3163 (69%)	Pet owner	UK	Convenience sample of "cat" Web sites and newsletters//online questionnaire	Habacher et al,[33] 2010
	2014–2015	Vaccinated in last 3 y	717/920 (78%)	Pet owner	Germany	Convenience//online questionnaire	Gehrig et al,[36] 2019
	2013, Nov–2015, Oct	Vaccination recorded; >1 y >3 y	(66%) (7%) (3%)	Medical records	UK	Convenience recruitment (SAVSNET veterinary practices)// medical record	Sanchez-Vizcaino et al, 2018

2018	Vaccinated Vaccinated in last 3 y	1131/1247 (91%) 998/1247 (80%)	Pet owner	Italy	Convenience (social networks, email, leaflets)//online questionnaire	Filipe et al,[35] 2021
2018, Nov–2020, Jan	Core vaccination	788,722/ 1,914,373 (41%)	Veterinary practice transactions	USA	Convenience (VetSuccess)// transaction records	Malter et al,[31] 2022
2021, Dec	Vaccinated in last year	821/2450 (25%)	Pet owner	Chile	Convenience//in-person questionnaires	Salgado-Caxito et al,[30] 2023

A similar study utilized an instrument validated for use in humans, the Parent Attitudes About Childhood Vaccines (PACV) survey, adapted for dogs and cats among adults in the United States including 2853 dog owners and 1977 cat owners.[39] Of those surveyed, most reported supporting their veterinarian's recommended vaccine schedule (dog owners 60.7%; cat owner 57%), wanted a potential new puppy (88.3%) or kitten (81.2%) to be fully vaccinated, had not avoided vaccines in a healthy pet (dog owners 73.6%; cat owners 67.4%), and believed that the diseases vaccines protected against were severe (dog owners 72.5%; cat owners 67.2%).[39] However, around 50% of respondents had concerns or felt unsure about vaccine safety, side effects, and efficacy, and nearly 60% felt that dogs and cats were receiving too many vaccines.[39] In total, 21.7% of dog owners and 25.9% of cat owners surveyed were classified as vaccine hesitant.[39] Overall, these studies defined individual variables correlating behavioral vaccine hesitancy with specific owner demographics and, yet showed inconsistent effects of those demographics (age, ethnicity, political affiliation, and religiosity) across all pet owners.

In 2008, UK researchers distributed a web-based "Cat Health Questionnaire" where respondents noted 69% of 3163 cats were vaccinated in the previous 12 months.[33] A multivariable regression model revealed cat owners aged 16 to 24 years and those living in the Midlands and south-west England were significantly more likely to report vaccination than older (>24 year) respondents and other UK regions.[33] Cat owners who had an unvaccinated cat with disease had previously seen severe infectious disease were more likely to vaccinate (**Table 2**).[33] A survey of Italian cat owners reported a 91% vaccination status with lower rates vaccination of cats (80%) within the previous 3 years in respondents in a nonhealth care-associated job and lower household

Table 2
Association of owner demographics associated with higher (>1 OR) and lower (<1 OR) owner-reported pet vaccination rates compared to nonrecently vaccinated or unvaccinated reference populations

Species owned	Owner Demographics	Parameter	OR or Adj OR	Region	Stat	Reference
Dog	Owner birth year range	Silent Generation (1925-45) Baby Boomer (1946-64) Millenials (1980-94)	0.06[a] 0.38[b] 2.3[b]	Chile	GLM	(Salgado-Caxito et al[30] 2023)
Cat	Owner Age	25+ years	0.24[c]	UK	MVRA	(Habacher et al., 2010)
	Sex of respondent	Female	0.34	Germany	LR	(Gehrig et al., 2019)
	Job of respondent	Non-student, Non-healthcare field job[1]	0.29[c]	Italy	MNLR	(Filipe et al., 2021)
	Household income	< 9000 Euro[2]	0.20[c]	Italy	MNLR	(Filipe et al., 2021)
	Household location	Non-Midlands, south-west England	0.65[b]	UK	MVRA	(Habacher et al., 2010)

[a]p<0.001, [b]p<0.01, [c]p value < 0.05. OR based on reference population not being vaccinated in previous 12 months (Habacher et al.,2010) and between cat not recently being vaccinated[1] and recently vaccinated[2] versus unvaccinated reference (Filipe et al., 2021) adapted from Table 6).

Abbreviations: GLM, general linear mixed-effect regression; MNLR, multinominal linear regression; MVRA, multivariable regression analysis; OR, odds ratio.

income brackets; in contrast, highest level of education in respondent's household did not meet statistical significance for vaccination coverage.[35]

These survey metrics highlight species-specific vaccination variability and are a starting point for understanding demographic and regional factors that may correlate with owner-reported vaccination status, additional study-reported factors are summarized in **Table 3**. However, these factors alone will likely fail to consistently predict an owner's ultimate vaccination election as other confounding factors contribute.

Other Factors Contributing to Vaccine Hesitancy

Vaccine hesitancy is not uniform across a population and analysis of vaccine uptake often detects individual pet variables as well as subgroups with lower-than-expected vaccine coverage rates (Butler and colleagues, 2015).[41] Social, community, and cultural factors contributing to barriers and motivators for human vaccination are likely

Table 3
Owner-reported factors and beliefs significantly influencing attitudes toward vaccination of a pet dog or cat

Category	Variable	Response (baseline comparison)	Odds Ratio or Adjusted OR	Significance determined by	Reference
Dog	Pet seen as family member	Totally disagreed Totally agreed	28.1[b] 14.6[b]	GLM	(Salgado-Caxito et al., 2023)
Cat	Cost[2]	Important (unimportant)	0.441[c]	MNLR	(Filipe et al., 2021)
	Cat's lifestyle	Important (unimportant)	2.801[b]	MNLR	(Filipe et al., 2021)
	Importance of stress	Very important (not important to rather important)	0.43[a]	MVRA	(Habacher et al., 2010)
	Importance of age of cat	Neutral to important (not to rather important	0.54[b]	MVRA	(Habacher et al., 2010)
	Have/had an unvaccinated cat with disease	Yes (vs No)	2.02[c]	MVRA	(Habacher et al., 2010)
	Severity of infectious disease observed previously	Very important (not to rather important)	4.27[b]	MVRA	(Habacher et al., 2010)
	Importance of vaccination		0.7[a]	Continuous Variable, MVRA	(Habacher et al., 2010)
	Importance of veterinary advice		1.48[a]	Continuous Variable, MVRA	(Habacher et al., 2010)
	Veterinary consultation	Very important	3.35	LR	(Gehrig et al., 2019)
	Time involved (waiting times)		0.00	LR	(Gehrig et al., 2019)

[a]p value<0.001, [b]p value <=0.01, [c]p value <0.05; OR based on reference population not being vaccinated in previous 12 months (Habacher et al., 2010) and between cat not recently being vaccinated[1] and recently vaccinated[2] versus unvaccinated reference (Filipe et al., 2021) adapted from Table 6).

Abbreviations: MNLR, multinomial logistic regression; MVRA, multivariable regression analysis.

mirrored among pet owners.[42] Additional influencing factors specifically for pet owners include ease of veterinary access, competing priorities for resources, social norms, as well as compulsory institutional (ie, animal shows, boarding facilities, day-cares, etc) rules and regulations (ie, vaccination required for residency, working service, etc) not observed in human counterparts.[23] For example, in Italian cat owners surveyed, an adult cat (2–4 years), originating from either a breeder or a pet shop, and a respondent's low importance on vaccine cost (resource priority) and high annual household income had the highest and most significant positive correlation on recently vaccinated status.[35] Factors associated with recent vaccination included participation in a cat show and higher compliance with possible use of vaccine titers, variables associated with access and community knowledge.[35] Variability in pet demographics and lifestyle factors across studies are summarized in **Table 4**. Interestingly, a Chilean study found dogs were more likely to be vaccinated (than a cat), and when purebred, allowed to sleep indoors, or regularly receiving parasite control.[30]

Table 4
Owner-reported *pet demographics and lifestyle factors* significantly associated with higher (>1 OR) and lower (<1 OR) owner-reported vaccination and immunization rates

Species	Pet factor	Specific parameter	OR or Adjusted OR	Stat	Reference
Dog	Species	Being a dog (versus cat)	3.39[a]	GLM	(Salgado-Caxito et al., 2023)
	Breed	Purebred	2.63[a]	GLM	(Salgado-Caxito et al., 2023)
	Housing	Allowed to sleep indoors	3.87[a]	GLM	(Salgado-Caxito et al., 2023)
	Preventative	Regularly receives parasite control	197.39[a]	GLM	(Salgado-Caxito et al., 2023)
Cat	Age	1 year or older	0.45[c]	MVRA	(Habacher et al., 2010)
	Age	8 weeks – 1 year[1]	0.02[a]	MNLR	(Filipe et al., 2021)
		2-4 years[1,2]	0.15[a], 7.79[a]		
	Age	> 10 years	0.20		(Gehrig et al., 2019)
	Breed	Pure bred	1.79	LR	(Gehrig et al., 2019)
	Vaccination age	Kitten vaccination	20.54[a]	MVRA	(Habacher et al., 2010)
	Origin of cat	Breeder/shop[1]	0.24[c]	MNLR	(Filipe et al., 2021)
	Cattery exposure	Visiting cattery next year	14.35[a]	MVRA	(Habacher et al., 2010)
	Cat show exposure	Visiting cat show next year	11.88[a]	MVRA	(Habacher et al., 2010)
	Cattery, cat show, travel abroad	Visiting cattery, cat show or travel abroad in next 12 months	6.95		(Gehrig et al., 2019)
	Type of previous vaccine associated adverse event in cat	Lethargy	2.57		(Gehrig et al., 2019)
		Other	0.38		

[a]p value <0.001,[b]p value <0.01, [c]p value <0.05; OR based on reference population not being vaccinated in previous 12 months (Habacher et al., 2010) and between cat not recently being vaccinated[1] and recently vaccinated[2] versus unvaccinated reference (Filipe et al., 2021) adapted from Table 6).

OR based on reference population not being vaccinated in previous 12 mo (Habacher et al, 2010) or unvaccinated reference populations (Filipe et al, 2021).

Abbreviations: GLM, general linear mixed-effect regression; LR, logistic regression; MNLR, multinominal linear regression; MVRA, multivariable regression analysis; OR, odds ratio.

Cats displayed significant variability in vaccination across stratified ages in studies, yet cattery, cat show, or travel exposure was correlated with vaccination status in 2 studies.[33,36]

Veterinarian Impact, Perceptions, and Role in Veterinary Vaccine Hesitancy

Veterinarian recommendation for vaccination or revaccination was often a statistically significant factor for owners electing revaccination in pets.[22,33,35] Veterinarians asked to note their top 3 concerns vaccinating healthy animals for the first time included anaphylaxis, injection site soreness, and lethargy in the dog and vaccine-associated sarcoma, multiple day lethargy, and injection site soreness in cats.[43] When US and Canadian veterinarians (n = 2385) were asked if a client had ever expressed concern or refused to vaccinate their dog or cat, most veterinarians responded in the affirmatory; in particular, vaccine hesitancy was associated with both canine (rabies 78%, other core 92%) and feline (rabies 85%, other core vaccines 91%) vaccinations.[43] Four top responses ("often/very often") from those surveyed US and Canadian veterinarians for a clients' level of concerns for potential issues associated with vaccination of a healthy pet were the (1) "[pet] never goes outside, so never exposed (dog 43.7%, cat 78%), (2) "belief that vaccine was unnecessary" (dog 44%; cat 50%), (3) "belief that vaccination can lead to chronic or severe illness" (dog 34%, cat 29%), and (4) "cost" (dog 23%; cat 24%).[43] In a similar study in 2022, primary client concerns relayed by US veterinarians were static in hierarchy yet present at even higher percentages (ie, 59% and 81% responses for dog and cat, respectively, "[pet] never goes outside, so never exposed"), suggesting temporal and regional variability exists for client concerns and/or veterinarian perceptions.[44] At that time, surveyed veterinarians noted increased frequency in vaccine hesitant or resistant owners referencing the human medicine antivaccine movement and a positive correlation existed between *local* organized childhood antivaccine movements and veterinary vaccine resistance.[43] Thus, veterinary teams and client concerns for vaccination vary, and conclusions must be interpreted considering temporal and regional factors.

As the public perceives veterinarians favorably as "approachable," "sensitive," and "understanding," the entire veterinary team, including veterinarians, technicians, assistants, and receptionists, are keenly positioned in clinical settings to discuss potential concerns and navigate misinformation associated with vaccination.[45] To clarify owners' decision-making processes for their pets, participants in one survey answered questions about their relationship with their veterinarian and where they received vaccine information.[22] Their veterinarian was their primary source of information for vaccines chosen by most dog and cat owners, regardless of whether they were categorized as trusting or less trusting of vaccination.[22] Additionally, more than half of those surveyed were categorized as having a high level of trust in their veterinarian and those clients with veterinarian relationships longer than 1 year and up to more than 5 years had an increased likelihood of vaccination.[22] In this survey, utilizing the Internet as the primary source of vaccine information was negatively correlated with vaccination status, highlighting the potential negative effects of information easily available online.[22] Most US and Canadian veterinarians in one study noted "often" being successful in changing the minds of dog and cat owners who declined vaccination, though the frequency was reportedly higher for rabies (dogs 63%, cats 57%) vaccines than with other core vaccines (dogs 37%, cats 30%).[43] Exploring successful communication strategies of the veterinary medical team is key in bridging pet owner misinformation and resolving perceptions associated with vaccine hesitancy.

COMMUNICATION STRATEGIES TO ADDRESS VACCINE HESITANCY

Addressing vaccine hesitancy in veterinary medicine can be clinically challenging and, at times, professionally discouraging.[46] Effective communication requires careful consideration of both verbal and nonverbal messaging, with the overarching goals of improving client education, strengthening the veterinarian–client relationship, and increasing vaccine acceptance to benefit both individual animal and public health outcomes.

First establishing rapport is fundamental when discussing vaccination with hesitant clients. Trust is developed through consistent ethical decision-making, transparency, and relationship-centered care. A strong veterinarian–client relationship increases the likelihood that owners will perceive recommendations as being motivated by the best interests of the animal rather than financial incentives. Recognizing early signs of resistance or hesitancy allows the veterinarian to tailor communication strategies appropriately. In these situations, an empathetic and open approach is often more effective than immediately providing corrective information. Clients are generally more receptive to education after they have been given the opportunity to express their own perspectives and concerns.[47] Encouraging dialogue may reduce defensiveness and foster collaborative problem-solving. Communication techniques such as empathy, reflective listening, and validation of client concerns have been shown to improve client engagement and satisfaction.[48]

In human medicine, evidence-backed strategies endorsed by the AAP include the use of presumptive messaging and truth sandwich messaging.[49] Presumptive messaging relies upon the assumption that a vaccination recommendation will be accepted while participatory messaging makes no assumptions and invites discussion. For a dog due for *Borrelia* and leptospirosis vaccines an example of participatory messaging might be, "Would you like to hear about the vaccines Fluffy could receive today?" While presumptive messaging of the same information would be, "Fluffy is due for her *Borrelia* and leptospirosis vaccines today." In a study highlighting the success of presumptive vaccine messaging, 30 clinics offering HPV vaccination were randomized to either presumptive or participatory messaging training.[50] The clinics utilizing presumptive messaging saw a significant increase in HPV vaccine uptake over the 6 months following the training.[50] Truth sandwich messaging involves addressing a falsehood by surrounding it with 2 shared truths. This technique relies upon the fact that the human brain tends to remember what it hears first and most often, thus beginning and ending with shared truths. In the middle of your sandwich, the falsehood can briefly be corrected. An example related to leptospirosis vaccination might look like:

> *We both want Fido to be able to swim and enjoy the water this summer. [Shared Truth] Leptospirosis is a serious bacterial infection that we see in dogs, and vaccination is one of the best ways we have to reduce the risk of severe kidney and liver disease. You may see things online suggesting the lepto vaccine is especially dangerous, but most dogs do very well with it. Like any vaccine, mild side effects like soreness or tiredness can happen, and serious reactions are uncommon. The disease itself is generally much riskier than the vaccine for most dogs. [Correction of Misinformation] What's important is that we individualize recommendations based on Fido's lifestyle and risk. Because leptospirosis is spread through wildlife and standing water, even many suburban and urban dogs are exposed. My goal is always to keep your dog as safe and healthy as possible while minimizing risk, and I know that's your goal too. Because Fido swims, and we see lepto here regularly in unvaccinated dogs, he's at risk for the disease. [Shared Truth]*

Motivational interviewing represents a particularly useful framework for vaccine-related discussions.[51] This communication strategy recognizes that clients vary in their readiness to change health-related behaviors and emphasizes partnership rather than directive counseling. Motivational interviewing seeks to activate the client's intrinsic motivation to protect their pet's health through nonjudgmental, client-centered dialogue. Open-ended questioning, reflective listening, and collaborative exploration of concerns are key components of this approach. Questions to encourage discussion and provide insight into the client's beliefs and decision-making process include,

Tell me more about your concerns regarding vaccination? or

What are your thoughts about what could happen if your pet is vaccinated?

Organizing educational information thoughtfully and delivering it after the client feels heard may improve comprehension, reduce emotional defensiveness, and promote more collaborative decision-making. After clients have shared their perspectives and concerns, it may be helpful to ask permission before providing additional education or recommendations. Using invitational language can help foster a sense of togetherness and respect for client autonomy. For example, statements such as,

Thank you for sharing your concerns with me. Would you be open to hearing some additional information about vaccination and how I approach these recommendations?

Acknowledge the client's perspective while inviting continued dialogue. This type of participatory messaging encourages engagement and may increase receptiveness to evidence-based education.

Once the client has expressed their concerns and granted permission to discuss vaccination further, education can be structured in a clear and practical framework. One approach used extensively by one of the authors (Z.N.) is giving the "PEP" talk, which focuses on *Prevalence, Effects, and Price*. This framework helps contextualize disease risk and prevention strategies in a manner that is relevant to the individual patient and owner.

Prevalence involves communicating that the infectious disease represents a genuine and relevant risk to the patient, not just a theoretic risk. Discussion should incorporate regional epidemiologic information whenever possible, including local disease prevalence, geographic risk maps, recent outbreaks, or published surveillance data. Recent public health data, including region-specific updates from sources such as Pet Disease Alerts (petdiseasealerts.org) or the Companion Animal Parasite Council (capcvet.org) may be useful for conveying timely and geographically relevant risk assessment. Individual lifestyle and environmental risk factors should also be emphasized to personalize the discussion. Even when the overall reported prevalence of a disease appears relatively low, patient-specific information you have already acquired personalizes this risk.

Although the local prevalence of leptospirosis in our area is seemingly low at 2%, this number doesn't fully capture individual risk factors. You telling me that you hike every weekend with your dog may increase his risk of infection, making him at higher risk than the numbers suggest.

Framing the discussion in the context of the pet's daily activities may help owners better appreciate susceptibility. Clinicians may also reference recent local cases

encountered in practice to make the disease feel more immediate and less theoretic. Personal clinical experience, when used appropriately, may strengthen risk perception and improve relevance for the client.

Effects focus on educating the owner about the potential consequences of infection. Clients should be informed about the clinical manifestations of disease, anticipated diagnostic and treatment requirements, prognosis, and potential long-term complications. Describing what disease progression may realistically look like can help owners understand the purpose of prevention.

> *If he were to become infected with leptospirosis, he may act tired, have decreased appetite, increase in drinking and urination, and ultimately succumb to kidney and liver failure. This may result in hospitalization for many days and ultimately, death.*

Visual aids, clinical descriptions, or case examples may improve client understanding and retention of information. Conversely, the expected effects of vaccination itself should also be discussed transparently.

> *There are a lot of different bugs that can cause signs that look like what we call 'kennel cough' in dogs. Giving this vaccine in Fido's nose helps get that local nasal immune system ready to attack some of them, however, it's still possible for others to get by and cause something that looks like kennel cough. Ultimately, this vaccine has very few side effects, and is required for the boarding and day-care you want Fido to go to later this year.*

Price addresses the financial implications of both prevention and disease management. Economic considerations influence decision-making across all client demographics and should be discussed openly and without judgment. Veterinarians should provide realistic estimates regarding the costs associated with diagnostics, hospitalization, treatment, and potential long-term management of infectious disease, while also comparing these costs with those associated with routine vaccination. In addition to financial expense, the emotional burden and potential mortality associated with severe infectious disease should be acknowledged.

Presenting information within this structured framework may improve client comprehension and facilitate informed, collaborative decision-making regarding vaccination. Conversations about vaccine hesitancy can be challenging for practitioners. However, with appropriate preparation, the use of motivational interviewing techniques, and incorporation of the "PEP" framework, many of these discussions can be approached more effectively. The central focus should consistently remain on the patient, emphasizing that the primary goal is to act in the best interest of the pet's health and well-being.

FUTURE DIRECTIONS AND RESEARCH NEEDS

Despite increasing recognition of vaccine hesitancy in companion animal medicine, substantial gaps remain in the veterinary literature. Additional research is needed to better characterize the prevalence, severity, and drivers of vaccine hesitancy among dog and cat owners across different geographic regions and practice settings. The use of validated veterinary-specific vaccine hesitancy assessment tools will allow for more standardized evaluation and comparison between studies.

Future studies will ideally evaluate the effectiveness of communication interventions within veterinary practices. Motivational interviewing, presumptive recommendations, and other evidence-based communication techniques have demonstrated benefit in human health care settings, but their impact on vaccine acceptance in veterinary

medicine remains largely unknown.[50,52] Similarly, further investigation into the role of social media, online misinformation, breeder influence, and nonveterinary information sources on owner decision-making is warranted.

Economic barriers to vaccination also deserve additional attention. While some vaccine refusal may reflect solely ideological concerns, financial limitations likely contribute to declining vaccine uptake in many households. Understanding the interaction between cost, access to care, and hesitancy may help practices develop more effective preventive care strategies. Finally, ongoing surveillance of vaccine-preventable diseases in companion animals will be important to determine whether changes in owner attitudes ultimately influence disease prevalence, outbreak frequency, or public health risk.

CLINICS CARE POINTS

- Recognize that vaccine hesitancy is multifactorial. Explore each owner's specific concerns, perform an individualized risk assessment, and tailor vaccine recommendations to the pet's lifestyle, health status, and exposure risk.
- Use presumptive vaccine recommendations whenever appropriate. Present recommended vaccines as the standard of care while remaining prepared to address questions with empathy and evidence if concerns arise.
- Promote a unified message within the veterinary team. Although veterinary team vaccine hesitancy remains poorly studied, open discussions can help ensure everyone communicates consistent, evidence-based recommendations to pet owners.

DECLARATION OF AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this work, the authors used Generative AI. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

DISCLOSURE

J.C. Pritchard has received honoraria, research funding, and/or has served on an advisory board for Elanco, Boehringer-Ingelheim, Dechra.

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