

OWNERSHIP, WELFARE AND ZOO NOTIC RISK: A ONE-HEALTH ASSESSMENT OF COMPANION ANIMALS, PUBLIC SAFETY AND URBAN ENVIRONMENTS

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Abstract

Public health risk landscapes, especially those pertaining to zoonotic diseases spread by companion animals, have been transformed by the increased human-animal interactions in metropolitan areas. Although there have been empirical investigations that have shown some zoonotic effects, there is still a lack of theoretical knowledge of the interplay between urban environmental architecture, animal welfare standards, and ownership patterns. This research presents a theoretical paradigm called One-Health that views zoonotic risk as a result of environmental factors, animal welfare ethics, societal behaviour, and institutional governance. The article presents a unified theoretical framework for understanding zoonotic susceptibility in urban companion-animal systems, drawing on ecological public health models, risk society theory, and the One Health framework. To ensure the public's safety and the well-being of animals, the study provides a normative and analytical basis for the creation of policies, the establishment of legislative regulations, and the implementation of multidisciplinary governance.

Keywords: *One Health, zoonotic risk, companion animals, animal welfare, urban public safety, theoretical framework.*

1. INTRODUCTION

A dramatic shift is taking place in the dynamics of human-animal relationships in urban communities around the globe. A growing number of people see their companion animals—especially dogs and cats—as more than just a means to an end—becoming integral, emotionally invested members of their families. This change has been more noticeable in city dwellers, who are more likely to have shorter family lifespans, more likely to be single, and who are more likely to acknowledge the mental health benefits of having a pet as a companion. Consequently, urban ecosystems are now teeming with companion animals, who share homes, parks, transportation, and social circles with people. This change has

improved human health, but it has also changed patterns of zoonotic risk by increasing the frequency and closeness of human-animal contacts.

Traditional routes of disease transmission have changed due to the growing physical contact between people and companion animals. Pathogens are able to travel more efficiently between animals, humans, and the environment in urban areas due to factors such as high population density, limited living space, shared infrastructure, and restrictive environmental sanitation. Despite this, traditional public health models typically view zoonotic diseases through the lens of separate biological events, with an emphasis on the virus, the host, and the outbreak. Instead of investigating the root causes of zoonotic risks—the larger social, ethical, and institutional settings—these methods place an emphasis on treatment and containment as reactionary actions. So far, mainstream zoonotic risk theories have failed to adequately account for urban governance systems, animal welfare regulations, and the common habits of pet ownership.

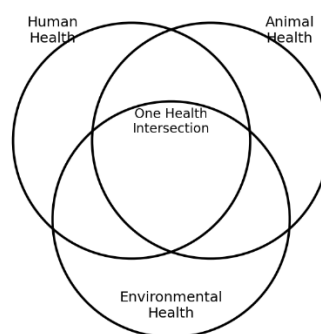


Figure 1: One Health Venn schematic

To overcome these shortcomings, the One-Health paradigm provides a holistic theoretical perspective. Instead of viewing zoonotic risk as a collection of individual episodes, the concept of One Health reframes it as a systemic phenomenon that is inherently dependent on human health, animal health, and environmental factors. Within this perspective, companion animals play an active role in the intricate socio-ecological systems formed by human actions, welfare policies, and environmental regulation, rather than just being disease vectors. Despite One Health's meteoric rise to prominence as a guiding philosophy, the majority of published works have stuck to descriptive methods, focussing on things like case studies, prevalence estimates, and intervention effects. The interaction of ownership behaviour, welfare ethics, and urban government systems to create diverse zoonotic vulnerabilities in urban contexts has received little theoretical attention.

The increasing focus on sustainable urban development and preventative public health makes this theoretical gap all the more noticeable. Vaccination adherence, personal cleanliness upkeep, and trash disposal are a few examples of ownership behaviour that affect exposure pathways. Due to the increased likelihood of infectious agent harbouring and transmission in animals that are stressed or neglected, animal welfare circumstances impact biological vulnerability and pathogen dynamics. Concurrently, the housing laws, sanitation systems, availability of veterinary services, and enforcement of regulations are all aspects of urban government that shape the institutional and environmental setting in which interactions between humans and animals take place. Not only do biological variables increase zoonotic risk, but systemic social and environmental problems do the same when these areas are not properly governed or are not aligned.

In light of this, the purpose of this study is to propose a theoretical One-Health evaluation model that views the zoonotic risk of companion animals as a product of the interplay between urban environmental governance, welfare ethics, and ownership practices. The study's overarching goal is to shed light on zoonotic vulnerability in urban settings by laying a consistent conceptual groundwork that goes beyond pathogen-centric explanations. For multidisciplinary governance techniques, laws, and policymaking to advance animal welfare, public safety, and urban health resilience all at once, this kind of framework is necessary.

2. LITERATURE REVIEW

Meers et al. (2022) stressed the need of animal welfare evaluations for both ethical and practical reasons, including the protection of human health. Their research showed that animals can experience more physiological stress and a higher risk of pathogen shedding and zoonotic transmission if their welfare was not properly evaluated during curative or supportive interventions. Public health risk management was deemed integral to wellbeing indicators, according to the authors. These indicators encompassed health screening, behavioural stress signals, and environmental suitability. Significantly, the research highlighted the role of companion animals as possible intermediaries of zoonotic exposure in cases where welfare frameworks were inadequate or inconsistently implemented. This research provided theoretical support for the idea that institutional failures to incorporate welfare science into regulations governing human-animal interactions are a more significant source of zoonotic risk than biological agents alone.

Oliveira Carneiro et al. (2025), who considered the management of domestic animals as hosts from a One Health perspective. Their research showed that ownership habits, veterinarian care accessibility,

and disease preventative measure adherence were all greatly affected by socioeconomic vulnerability. The authors discovered that zoonotic exposure risks were higher for marginalised urban people due to structural constraints that hindered vaccination coverage, deworming methods, and proper housing for animals. Social inequality, not individual carelessness, was the primary determinant of zoonotic vulnerability, according to the study. This vulnerability was also shown to be unevenly distributed across urban populations. The authors put up a theoretical framework for zoonotic risk as a socially created phenomenon entangled with urban poverty, governance gaps, and unequal health infrastructure by viewing domestic animal management as a One Health issue with socioeconomic roots.

Pedroza and Fontgalland (2024), who saw homeless animals as both a public health concern and a possible opportunity for comprehensive One Health approaches. According to their research, zoonotic dangers have not been adequately addressed by exclusionary methods like eradication or removal, and these strategies have frequently made public health and welfare issues worse. Street animals could be turned into stabilising elements of urban health ecosystems through community participation, vaccination, and inclusive management practices, according to the authors. The research highlighted the fact that uncontrolled populations of street animals were a reflection of larger problems with governance, such as the division of labour among public health organisations, environmental regulators, and animal welfare authorities. This viewpoint provided theoretical support for the claim that zoonotic risk is not just a veterinary problem, but rather a problem with systemic governance.

Jegatheesan et al. (2023). Both animal welfare and human health have been traditionally damaged by restrictive housing rules, pet exclusion regulations, and inadequate living areas. Their contribution shed light on this troubling trend. The authors stated that pets were more likely to be overcrowded, abandoned, or hidden due to housing insecurity, which made them more vulnerable to stress-related diseases and reduced their access to preventive veterinarian care. This chapter emphasised how zoonotic risk was influenced by decisions made in urban planning and legislative frameworks for companion animals, and how housing served as a structural interface where the well-being of humans, animals, and the environment all met. One Health discourse was broadened by this theoretical breakthrough to encompass built environments and social policy as determinants of zoonotic vulnerability, in addition to clinical and environmental factors.

Hawes et al. (2024). Their research laid the groundwork for a systematic method of assessing the extent to which local government systems prioritised the health of humans, animals, and the environment. Collaboration across sectors, methods of animal management, cleanliness of the environment, and

readiness for public health were some of the aspects evaluated by the evaluation framework. The authors proved that communities that were more integrated with One Health were better able to withstand health concerns, such as zoonotic dangers. Particularly for theoretical progress, this study was important since it allowed for the comparative evaluation of community-level readiness and governance efficacy by turning abstract One Health ideals into quantitative dimensions. Institutional coherence, not standalone initiatives, was reaffirmed by the OHCA as being necessary for zoonotic risk mitigation.

3. CONCEPTUAL FOUNDATION

The theoretical underpinnings of this research stem from a variety of fields and disciplines, and they all work together to clarify the social production, ethical mediation, and ecological sustenance of zoonotic risk in urban settings as it pertains to companion animals. This article builds a holistic theoretical lens by integrating the Ecological Public Health model, One Health theory, and Risk Society theory, instead of depending on a single explanatory framework. Taken as a whole, these viewpoints shed light on how zoonotic risk is influenced by a web of interrelated factors, including human activities, animal care, institutional policies, and urban environmental factors. To place zoonotic susceptibility within larger social and environmental systems, we must go beyond reductionist biomedical explanations, which cannot be achieved without this integrative conceptual foundation.

3.1. One-Health Theory

The core principle of One Health theory is based on systems thinking, which acknowledges that health outcomes are produced by the interplay of several systems, including biological, social, and ecological ones. Health hazards arise from the interaction of various actors, institutions, and environments throughout time, according to One Health, in contrast to conventional public health methods that focus on host-pathogen connections or isolate disease agents. Theoretically, this approach recognises that biological elements alone are insufficient to explain illness origin and transmission; societal behaviours, governmental institutions, and environmental surroundings must also be considered.

The role of companion animals is distinct and essential within the context of the One Health paradigm. They mediate the everyday interactions between human families and urban habitats, functioning as interface species. Living in people's homes while also utilising public and private areas including parks, streets, veterinary clinics, and waste disposal systems is a common occurrence for companion animals. Soil, water, wildlife, and vector exposure are just a few of the larger ecological and environmental processes that these migrations link human populations to. Consequently, pets are no longer seen as just

disease vectors but as active participants in urban health systems. As a result, zoonotic risk can be conceptualised within the framework of One Health theory, which explains how societal norms, welfare practices, and environmental management impact the interrelated human-animal-environment linkages.

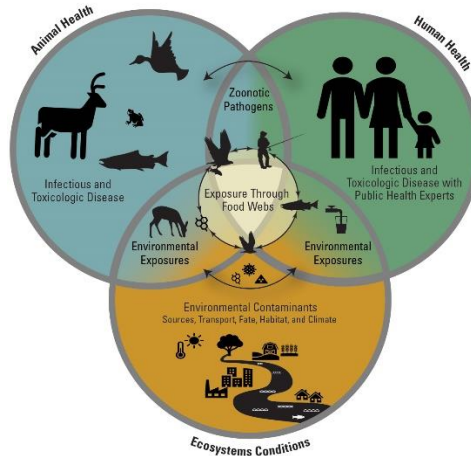


Figure 2: One Health

3.2. Risk Society Theory

By recasting risk as an outcome of contemporary social organisation rather than purely natural causes, Ulrich Beck's Risk Society theory provides an extra analytical layer. Risks are more often than not "made" in modern societies as a result of institutional structures, regulatory inadequacies, and the unforeseen effects of modernisation. Concerning zoonotic risk in urban environments, this theoretical viewpoint is especially pertinent because dangers stem not only from the presence of animals but also from the way society structures and regulates human-animal interaction.

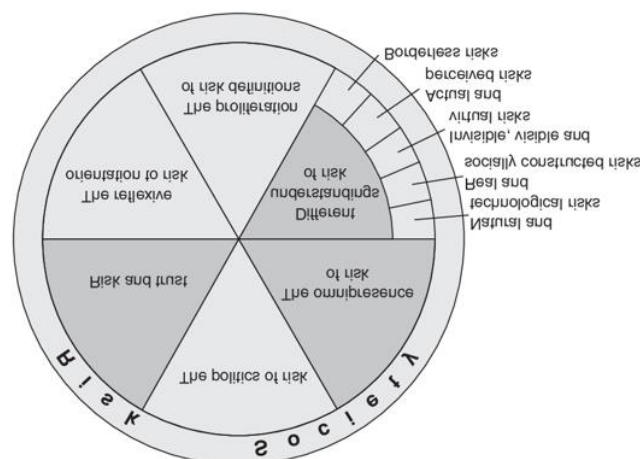


Figure 3 :The Parameters of the Risk Society

The failure of governmental systems to properly oversee environmental factors, animal welfare requirements, and ownership duties gives rise to zoonotic dangers, according to risk society theory. Conditions that normalise zoonotic exposure are created by a combination of factors, including insufficient regulation of pet ownership, unequal access to veterinary services, fragmented urban design, and ineffective enforcement mechanisms. Thus, institutional blind spots and policy fragmentation transform risk from an individual or biological concern into a systemic one. This theory brings attention to the ethical and political aspects of managing zoonotic risks to public health, since zoonotic risk is socially dispersed and frequently impacts vulnerable communities disproportionately.

3.3. Ecological Public Health Model

By placing illness risk inside numerous, interacting layers of influence, the Ecological Public Health model extends upon this conceptual foundation even further. Individual actions, family routines, social standards, formal structures, and natural systems as a whole all make up these tiers. Instead of viewing health outcomes as discrete occurrences at a single scale, we should think of them as the sum of all interactions across various levels.

The ecological public health paradigm encompasses companion animals in all its levels. Owner actions like feeding, cleanliness, and healthcare procedures have an impact on them on an individual level. They engage in social interactions in communal areas with both other animals and humans. Housing policies, veterinary infrastructure, and public health restrictions all have an impact on their administration at an institutional level. From an ecological perspective, they are part of urban settings defined by trash, wildlife interactions, and pollution. Companion animals serve as vectors for the transmission and maintenance of zoonotic risk because they connect private households to communal public and ecological areas. Preventative measures should be multi-tiered and based on integrated governance and environmental stewardship, according to the ecological public health paradigm.

4. OWNERSHIP AS A SOCIAL DETERMINANT OF ZOO NOTIC RISK

As a socially controlled institution that functions within larger public health, legal, and ethical frameworks, companion animal ownership should not be reduced to a simple human-animal bond. Zoonotic risk exposure is greatly influenced by ownership patterns in metropolitan areas, where more and more human-animal interactions take place in shared and densely crowded locations. In theory, ownership acts as a social determinant of zoonotic risk by influencing public health and safety via the organisation of daily behaviours, the assignment of legal obligation, and the reflection of ethical convictions.

Table 1: Dimensions of Ownership as a Social Determinant of Zoonotic Risk

Dimension	Key Components	Mechanism of Risk Influence	Zoonotic Risk Outcome
Behavioral	Hygiene practices, vaccination, deworming, waste disposal	Directly affects exposure and pathogen transmission	Increased or reduced human–animal transmission
Legal	Licensing, registration, liability frameworks	Regulates accountability and compliance	Weak enforcement amplifies public exposure
Ethical	Responsibility toward animal welfare and community safety	Shapes care quality and preventive behavior	Poor welfare increases pathogen shedding

To better understand this function, we can look at Table 2, which shows a theoretically organised categorisation of ownership into three interconnected aspects: behavioural, legal, and ethical. These aspects all play a part in the creation and reduction of zoonotic risk. The relationship between ownership and the health outcomes experienced by a population can be better understood with the help of this categorisation.

According to Table 2, the most direct route by which ownership impacts zoonotic risk is via the behavioural dimension. Factors that influence the frequency and severity of pathogen exposure at the human-animal interface include compliance with vaccination protocols, deworming efforts, hygiene maintenance, and the correct disposal of animal waste. The table shows that ignoring these behaviours increases the risk of zoonotic infections through unprotected physical contact and increased environmental contamination. In metropolitan settings, these behavioural issues manifest in public areas as well as private ones, turning individual carelessness into a communal threat.

Responsibility is institutionalised through procedures like as licensing, registration, and liability regimes, which are explained in Table 2 as part of the legal dimension of ownership. Enforcing minimal health standards and ensuring traceability in the event of disease spread are the goals of these regulatory bodies. Urban environments can harbour sick or unvaccinated animals due to the table's demonstration of how compliance is undermined and accountability is diluted due to fragmented legislative control or

insufficient enforcement. This aspect shows, theoretically speaking, how zoonotic risk is created both behaviourally and legally through regulatory loopholes and governance mistakes.

Table 2 summarises the ethical dimension, which positions ownership as a moral obligation to ensure the well-being of animals and the safety of the community. The inherent connection between animal welfare and public health outcomes is highlighted by ethical ownership. Neglect and poor treatment become the norm when ethical concerns are downplayed, leading to higher levels of stress, impaired immunity, and pathogen shedding in animals. See how ethical disengagement shapes treatment quality and preventative attitudes? It's a powerful indirect driver of zoonotic risk, according to the table.

Table 2's incorporation into the theoretical discussion reveals ownership as a multi-faceted concept linking personal conduct, governmental oversight, and ethical responsibility. When several dimensions fail at the same time, it normalises dangerous relationships and puts public health at risk. This is called irresponsible ownership. This theoretical framework supports the claim that zoonotic risk in companion animals is a product of society and may be reduced through a One-Health-based strategy that integrates behavioural, legal, and ethical interventions.

5. ANIMAL WELFARE AS A MEDIATING VARIABLE

For the One-Health model to work, animal welfare had to mediate the relationship between ownership patterns and zoonotic health consequences. According to the welfare theory, animals whose immune systems were damaged due to factors like prolonged stress, poor diet, overcrowding, or untreated illness were more likely to get infections and spread disease. In turn, welfare conditions changed ownership behaviours into observable public health outcomes by impacting the biological mechanics of disease transmission. Animals' reduced health increased their exposure to zoonotic diseases outside of homes in urban areas due to the high volume of human interaction and shared ecological spaces.

From a One-Health vantage point, the unethical treatment of animals constituted a systemic risk amplifier in the context of social and environmental systems. Inadequate fulfilment of ownership responsibilities, limited access to veterinarians, or minimal regulatory control led to welfare shortfalls. As a result, pets went from being socially and emotionally stable resources to being epidemiological links between human populations and urban diseases. The danger of zoonotic infections was enhanced due to a combination of factors, including immunosuppression brought on by stress, difficulties in

diagnosing infectious diseases, and more environmental contamination. Notably, these risks were not evenly distributed, but rather, they were amplified in contexts where there was a lack of animal health infrastructure, housing instability, and socioeconomic vulnerability.

Table 3 provides a conceptual summary of the manner in which particular welfare circumstances affected zoonotic risk pathways, which should help to elucidate the mediating role of wellbeing. The table shows that ownership and environmental elements converged through wellbeing, which acted as the biological and ethical interface. Reducing zoonotic risk in urban environments requires a preventative public health policy that prioritises animal welfare. This theoretical framing emphasises that this is more than just a moral obligation.

Table 2: Animal Welfare as a Mediating Variable in Zoonotic Risk Production

Welfare Condition	Underlying Cause	Biological Effect	Zoonotic Risk Implication
Chronic stress	Overcrowding, neglect, abandonment	Immunosuppression	Increased pathogen shedding
Poor nutrition	Inadequate care, poverty	Weakened immunity	Higher infection susceptibility
Untreated illness	Limited veterinary access	Persistent infection	Prolonged transmission period
Poor hygiene	Unsanitary living conditions	Environmental contamination	Indirect human exposure

6. URBAN ENVIRONMENTS AS RISK MULTIPLIERS

When it comes to the development of zoonotic sensitivity, urban areas are more like active risk multipliers than neutral or passive backgrounds. Dense populations, shared infrastructures, and the ongoing interplay between humans, animals, and the natural world all contribute to the increased likelihood of adverse health effects in urban areas, according to theoretical frameworks in ecological public health and urban ecology. Because of shared areas, trash, and ecological overlap with urban animals, zoonotic agents can live and spread in these environments beyond individual homes. Because of this, zoonotic risk is intrinsic to the way cities are planned and run.

When private animal behaviours spread into public domains, zoonotic risk was demonstrated to hypothetically increase. Pathogens from private homes could easily spread to public areas due to the frequent movement of companion animals via parks, walkways, apartment complexes, and recreational areas. This risk was magnified even more by the disjointed nature of environmental governance. Poor public space maintenance, inadequate sanitation services, and waste management all contributed to the creation of ecological niches where diseases might thrive for long periods of time. Because of a lack of oversight, these problems became even worse as a result of cross-species transmission and the amplified spread of diseases among pets, stray animals, and urban wildlife like birds and rodents.

Thus, zoonotic risk was spatially produced in large part due to ineffective urban planning and policies. Everyday urban spaces become sites of repeated exposure in cities that failed to combine animal management, garbage control, and public health oversight. Urban infrastructure, governmental coherence, and ecological relationships were systematically changed by zoonotic risk, according to this theoretical framework.

Table 3: Urban Environmental Factors as Risk Multipliers for Zoonotic Transmission

Urban Factor	Mechanism of Risk Amplification	Zoonotic Risk Outcome
High population density	Increased human–animal contact	Rapid disease spread
Shared public spaces	Repeated exposure to contaminated surfaces	Indirect transmission
Poor waste management	Environmental persistence of pathogens	Prolonged exposure
Urban wildlife presence	Cross-species pathogen exchange	Spillover and amplification
Fragmented governance	Weak surveillance and control	Unmanaged zoonotic risk

7. INTEGRATED THEORETICAL MODEL

Expanding on earlier theoretical analyses, this part integrates the concepts of ownership, animal welfare, and the dynamics of urban environments into a unified framework. This approach aims to shed light on zoonotic risk by framing it as a product of systems and relationships rather than a singular biological event. The integrated approach presents a unified view of zoonotic vulnerability by highlighting the interplay between social conduct, biological mediation, and environmental factors. Advancements in One-Health theory towards a more unified framework for explaining urban companion-animal systems.

7.1 The Ownership–Welfare–Environment Triad

The article put up a Triadic One-Health Model in which the three fundamental areas of ownership, animal welfare, and urban environment continuously interact to generate zoonotic risk. Table 1 summarises the ways in which ownership served as a legal and social institution that regulated accountability and shaped daily behaviours. By impacting immunity, stress levels, and pathogen shedding, animal welfare served as a biological mediator, connecting ownership practices to health outcomes. Pathogens survived and propagated in the urban environment, which influenced the length and severity of exposure. The triad proved that zoonotic risk did not originate from any one area but rather resulted from the mutual reinforcement and dependency of all three.

Table 4: Theoretical Domains Influencing Zoonotic Risk

Domain	Theoretical Role	Risk Contribution
Ownership	Social and legal institution	Behavioral exposure
Animal Welfare	Biological mediator	Pathogen amplification
Urban Environment	Ecological context	Transmission persistence

7.2. Pathway Logic

The Triadic One-Health Model's conceptual route showed the sequential but interactive unfolding of zoonotic risk. Declining preventative behaviours and worsening welfare standards occurred in tandem with weakening ownership norms. As a result of immunosuppression and protracted infection, decreased wellbeing led to an increase in pathogen load. Finally, elevated public exposure was a result of disease persistence and transmission in densely populated, communal areas with poor sanitation. According to this line of reasoning, zoonoses were not random biological accidents but rather systematic results of structural and behavioural inadequacies. So, the model drove home the point that One-Health principles must underpin integrated preventative governance.

8. GOVERNANCE AND NORMATIVE IMPLICATIONS

Looking at the zoonotic risk linked to companion animals through the lens of theoretical governance, we can see how the current legal and institutional frameworks have significant structural constraints. The lack of coordination between several regulatory bodies dealing with public health, animal welfare, and city planning was a major obstacle. Regulatory gaps, ambiguous accountability, and overlapping duties were the results of these areas' historical operation in isolation. In highly populated urban areas

in particular, this disintegration hampered institutions' ability to foresee zoonotic dangers that arose at the junction of human-animal-environment interactions.

The prevalent reactive approach to public health governance was another major impact. In the past, zoonotic risk management mostly focused on actions taken after an outbreak had occurred, such as containment, treatment, and emergency interventions, instead of incorporating preventive ethics into routine government. This model failed to take into account the impact of environmental design, welfare standards, and ownership practices on zoonotic vulnerability over the long run. Consequently, systemic risk factors were left unattended until the occurrence of disease became apparent and expensive.

Municipal levels' governance competence was already compromised due to the lack of official One-Health institutionalisation. Coordination among public health agencies, veterinary services, and city governments was haphazard and unorganised in the absence of unified One-Health frameworks. Consequently, this article contended that One-Health governance should not be seen as a technical add-on but as a normative framework. With an emphasis on ethical responsibility, shared risk management, and sustainable urban coexistence, this kind of government would unite veterinary regulation, urban planning, and public health accountability into a single preventative system.

9. POLICY THEORY IMPLICATIONS

A change in policy focus from reactive enforcement to preventive regulation that tackles the structural causes of zoonotic risk could be facilitated by the suggested theoretical paradigm. A welfare-centered public health policy that incorporates veterinarian treatment, ownership education, and environmental management is necessary, as the model emphasises animal wellbeing as a public health variable. Furthermore, the paradigm promoted rethinking companion animals not as private property but as public-health players integrated into urban ecosystems. Policies that allowed for a balance between private ownership rights and collective health and safety obligations were made possible by this viewpoint, which justified tighter regulatory cooperation and ethical accountability.

10. CONTRIBUTION TO THEORY

To the multidisciplinary literature on zoonotic risk in urban companion-animal systems, our work added three significant theoretical advances. To start with, it showed that illness onset and transmission were influenced by social behaviour, institutional frameworks, and urban environmental circumstances, rather than being purely biological occurrences. It conceptualised zoonotic risk as a socio-ecological construct. Secondly, the study argued that welfare deficits were structural risk amplifiers and redefined animal wellbeing as a public health variable, expanding its scope beyond ethical and moral discussions. Last

but not least, the article elevated One Health from a theoretical or operational framework to a philosophy of normative governance, with an emphasis on environmental, animal, and human health-related preventive ethics, institutional integration, and shared accountability. The repositioning of One Health's theoretical framework enhanced its policy and explanatory significance.

11. CONCLUSION

Theoretically, this research put forward an integrated One-Health viewpoint to clarify the zoonotic danger posed by city pets. To show that zoonotic vulnerability is a systemic product of interrelated social, biological, and ecological processes, the article used the following framework: ownership as a social determinant, animal welfare as a mediating variable, and urban environs as active risk multipliers. The proposed trinity of ownership, welfare, and environment goes beyond pathogen-centric theories and shows how public health risks are exacerbated by fragmented governance, ethical neglect, and poor urban design. Pets are more than just property or hosts; the study recasts them as integral public health agents whose welfare depends on the security of their communities. The article laid the groundwork for preventative, welfare-centered, and institutionally integrated policy approaches to sustainable urban health by upgrading One Health from an operational framework to a philosophy of normative governance.

Future Research Directions

- Empirical validation of the proposed triadic One-Health model across diverse urban settings
- Comparative legal analysis of companion-animal regulation under One-Health governance frameworks
- Quantitative assessment of animal welfare indicators as predictors of zoonotic risk
- Examination of housing policy and urban design as determinants of human–animal–environment interactions
- Development of community-level One-Health governance indicators for municipal implementation

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