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Original Article

Healthy Economy And "One Health": Central Pillars of Veterinary Education

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ABSTRACT

This manuscript advances a critical framework that integrates "healthy economics" into One Health to strengthen veterinary education, research, and extension in Latin America. Healthy economics is defined as an approach that aligns economic organization—equity, democratic participation, and care—with the production of health across human, animal, and environmental domains. Drawing on Marxist political economy (mode of life), activity theory (systemic analysis of practices, rules, and division of labor), Gramsci's concept of organic intellectuals, feminist theory of social reproduction, and proposals for economic democracy and community wealth building, we argue that many persistent One Health challenges are rooted in political-economic arrangements rather than technical deficits. We synthesize illustrative cases from the region: smallholder versus industrial livestock systems and their links to zoonotic emergence and antimicrobial resistance; community-based public health and primary care that formally value care work; humane management of companion animal populations as a One Welfare strategy; participatory vector control that couples environmental management with local employment; and community-led wildlife stewardship that reconciles conservation, livelihoods, and zoonosis prevention. Across these domains, outcomes improve when communities' co-own resources and decisions, when care labor is recognized and supported, and when professionals act as organic intellectuals facilitating collective problem-solving. We translate these insights into actionable implications for veterinary and allied health education (curricular integration of political economy, participatory methods, and ethics), research (transdisciplinary, participatory, and translational designs with equity metrics), and extension (interdisciplinary One Health teams that build local capacity and cooperative institutions). By embedding healthy economics within One Health, veterinary education becomes a catalyst for socio-ecological transformation, producing graduates able to link technical expertise with community empowerment. This framework offers a scalable pathway to advance health, animal welfare, and ecosystem integrity simultaneously, particularly in contexts marked by inequality, rapid agri-food change, and climate stress.

Keywords: One Health; healthy economics; veterinary education; Latin America; community empowerment

INTRODUCTION

One Health is a holistic paradigm that recognizes the interdependence of human, animal, and environmental health (1,2). Global Health similarly seeks to improve health equity worldwide. Yet, these frameworks often overlook the political-economic structures that shape health outcomes. This chapter develops a theoretical framework to enrich One Health and Global Health with *"healthy economics,"* a concept proposing that an economy organized around equity, democratic participation, and care is foundational for health. Drawing on Marxist economics, activity theory, the concept of "mode of life," Gramsci's theory of intellectuals, Silvia Federici's analysis of social reproduction, Richard D. Wolff's *democracy at work*, and Grace Blakeley's ideas on community empowerment, we outline a socially transformative approach to One Health grounded in Latin American realities. We illustrate with examples from Latin America's farm animal production – from precarious smallholders to industrial agribusiness – public health initiatives, human-animal bonds – especially pets – pest control,

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and wildlife management. We then discuss implications for education, research, and extension in veterinary and health sciences. The goal is to embed critical economic thinking into One Health/Global Health frameworks to advance health and social justice.

Theoretical Foundations: Critical Social-Economic Perspectives on Health

Marxist Economics and the "Mode of Life"

Marxist political economy provides insight into how capitalist modes of production can undermine health. Karl Marx and Friedrich Engels argued that the way people produce their subsistence is also "a definite mode of life on their part" (3). In other words, economic systems shape everyday life and well-being. Industrial capitalism's drive for profit often externalizes costs to workers, animals, and environments – creating what some call a **"metabolic rift"** in human-nature relations. For example, rapid agribusiness expansion has intensified livestock production at the expense of environmental balance, selecting for dangerous pathogens. Evolutionary epidemiologist Rob Wallace notes that "agribusiness is probably the worst – or the best – model one can come up with for selecting the deadliest pathogens imaginable." (4). Indeed, capitalist agribusiness has contributed to the emergence of avian influenzas, swine flu, Zika, and other zoonoses. Wallace famously dubbed the 2009 H1N1 swine flu in Mexico the "NAFTA flu," linking its origin to trade policies that enabled multinational firms – e.g. Smithfield Foods – to introduce industrial hog factories in Latin America. Such examples illustrate how global capitalist dynamics and modes of production directly influence pathogen flows, labor conditions, and ecosystem health – ultimately shaping the mode of life and health risks of communities. A "healthy economics" approach rooted in Marxist analysis would thus address exploitative production arrangements and aim for equitable, sustainable modes of life that promote health rather than undermine it.

Activity Theory and Systemic Analysis

To integrate these complex factors, we turn to **activity theory**, a framework for analyzing human practices as developmental, socially-situated processes (5). Activity theory considers an entire activity system – including individuals, communities, mediating tools, rules, and division of labor – as the unit of analysis. This systemic perspective is well-suited to One Health, which inherently spans multiple sectors and knowledge domains. For example, a One Health intervention to control a zoonotic disease can be seen as an *activity system*: the subject might be a multidisciplinary One Health team; the object – goal – is disease control; tools include scientific knowledge, tests, and vaccines; the community involves villagers, farmers, clinicians, veterinarians, and ecologists; rules include cultural norms and regulations; and division of labor assigns roles – e.g. community health workers, animal health technicians, researchers. Activity theory alerts us to contradictions that can hinder collective outcomes – such as tensions between global policies and local practices, or between economic imperatives and health goals. By identifying and addressing these structural contradictions, One Health initiatives can be reoriented towards more transformative outcomes. A systemic-structural variant of activity theory (6) further emphasizes analyzing the **structure of activities** in a society – for instance, how health-related practices are structured by institutional and economic forces. Adopting an activity theory lens encourages One Health practitioners to go beyond siloed approaches and view problems in context: understanding how a farming practice that causes deforestation – and hence vector proliferation – is driven by economic pressures, or how community beliefs – part of the cultural "rules" – affect disease reporting. In sum, activity theory provides a conceptual toolkit for *holistically mapping the human–animal–environment interactions* and the socio-economic context, thus informing interventions that align with local realities and engage stakeholders as co-creators of solutions.

Gramsci's Organic Intellectuals and Health Praxis

Italian Marxist Antonio Gramsci introduced the idea of **"organic intellectuals"** (7) – thinkers who emerge from and remain connected to the struggles of their social class, in contrast to "traditional intellectuals" who regard themselves as autonomous or allied with the status quo. One Health and Global Health professionals can be reconceptualized as *organic*

intellectuals working with communities to achieve health equity. In Latin America, there is a rich tradition of health professionals serving as "medicos sociales" or public intellectuals advocating for the poor. For Gramsci, every social group "creates its own organic intellectuals" to articulate its experience. Veterinarians, physicians, and community health workers can become organic intellectuals of marginalized rural and urban communities – translating critical understanding of diseases, food systems, and environment into emancipatory action. This involves moving beyond purely technical roles to also address issues of power, education, and organization. For example, a veterinarian working with peasant farmers in Brazil or indigenous pastoralists in the Andes might help them document how agribusiness or mining affects their animals and water, thereby co-producing knowledge that challenges dominant narratives. By doing so, the vet becomes an organic intellectual fostering a counter-hegemonic understanding of health – one anchored in the community's mode of life and aimed at empowering that community. Gramsci's theory also reminds us that building a new hegemony – e.g. a One Health paradigm centered on social justice – requires a network of such organic intellectuals to lead moral and intellectual reform (8). Healthy economics thus entails cultivating professionals and local leaders who understand and challenge the economic and ideological forces harming health, and who work as allies of the people most affected. In this sense, veterinarians in Latin America perceive the connections between animal welfare and One Health. Awareness is growing but there are also gaps in policy integration. Noticeably, there is a need for public policies that jointly address animal, human, and environmental well-being (9), a fact that underscores the need for health professionals to align in favor of welfare policies.

Social Reproduction and Care Economy

Feminist scholar Silvia Federici highlights that much of the labor that sustains society – raising children, caring for the sick, cooking, cleaning, and maintaining communities – is unpaid and performed largely by women (10). This **social reproductive labor** is the invisible foundation of the formal economy (11). Federici argues that under capitalism, tasks in the home and community are mystified as expressions of love or duty rather than recognized as work – *"what goes on in the home… wasn't seen as work… making it difficult to value, and even to see."* (11). The result is that care work is systematically undervalued, even though it is essential for **producing** and **maintaining** a healthy workforce and population. In a One Health context, social reproduction includes, for example, a mother in Peru ensuring her children and livestock are nourished and vaccinated, or a community in Mexico organizing to clean up trash that breeds disease-carrying mosquitoes. These activities typically don't count in GDP or attract much institutional support, yet they are cornerstones of health. A "healthy economics" approach insists on bringing social reproduction to the center: valuing caregiving, preventive health activities, and ecosystem stewardship as key economic activities **that must be supported and shared more equitably**. Federici's perspective pushes One Health to address gender and labor inequities – for instance, acknowledging how rural women's unpaid work caring for animals can be supported through extension programs, or how the mental health burden on community caregivers after a disease outbreak need addressing. It also opens the door to reimagining health systems: what if healthcare and animal care were structured as commons, supported by public investment, rather than as commodities or unpaid burdens? In Latin America, the concept of *"buen vivir"* – living well collectively – resonates here, calling for an economy oriented to collective well-being rather than profit. By integrating social reproduction into One Health, we ensure that policies do not inadvertently exploit caregivers but rather empower and remunerate them – thereby strengthening the very fabric of health resilience.

Economic Democracy and Community Empowerment

American heterodox economist Richard D. Wolff advocates "**democracy at work**," envisioning workplaces run by workers themselves rather than hierarchical bosses (12). He argues that to have a truly democratic society, democracy must extend to the realm where adults spend much of their lives – the workplace (13). In Wolff's proposal, worker self-directed enterprises would replace top-down capitalist firms, allowing workers to collectively decide on production, investment, and use of surplus. How does

this relate to One Health? Economic democracy can transform sectors crucial to health: for instance, a worker-run meat processing cooperative in Argentina might prioritize employee safety and food quality far more than a multinational corporation would, thus reducing occupational hazards and foodborne illness. Wolff writes that workers "must become the collective decision-makers in productive enterprises, no longer the directed wage and salary receivers" (12). If veterinary and public health services were organized democratically by their workers and users, these services could become more responsive to community needs – focusing on prevention, education, and equity rather than narrow metrics or profit. Grace Blakeley, a British economist, complements this with her emphasis on community wealth building and local empowerment (14). Blakeley observes that taking control of resources at the community level – through initiatives like participatory budgeting, cooperatives, municipal enterprises, and tenant associations – is key to challenging inequality (15). In her vision, a "democratic economy" is essential for an egalitarian society (15). Applied to One Health, community empowerment means that communities are not just passive recipients of health interventions but co-owners of health initiatives and the local economy. For example, a town in Colombia might establish a community-owned clinic and animal health center, funded by local cooperative businesses, thereby aligning economic activity with holistic health goals. Or an indigenous community in Bolivia might co-manage a wildlife reserve, deriving income from ecotourism while conserving biodiversity and controlling zoonoses – a form of community wealth building that ties directly into One Health. Blakeley's and Wolff's ideas guide us toward an economy where health and wellbeing are explicit goals of production, and where those most affected by health decisions have a real say in them. This democratization of the economy – *"healthy economics"* – would mean, in practice, empowering communities and workers – including health and veterinary workers – to direct resources towards preventive care, environmental sanitation, safe food systems, and other One Health priorities. Figure 1 illustrates the integrative framework of "healthy economics" within One Health. The traditional One Health Venn diagram – human–animal–environment health overlap – is enriched with socio-economic dimensions: the outer layer represents the political-economic context – e.g. mode of production, labor conditions, community control of resources – and cross-cutting foundational layers represent social reproduction – care work, education, cultural practices – sustaining the triad. The arrows indicate flows of influence – for instance, how economic policies affect environmental conditions and thus animal/human health, or how community empowerment feeds back to improve economic decisions.

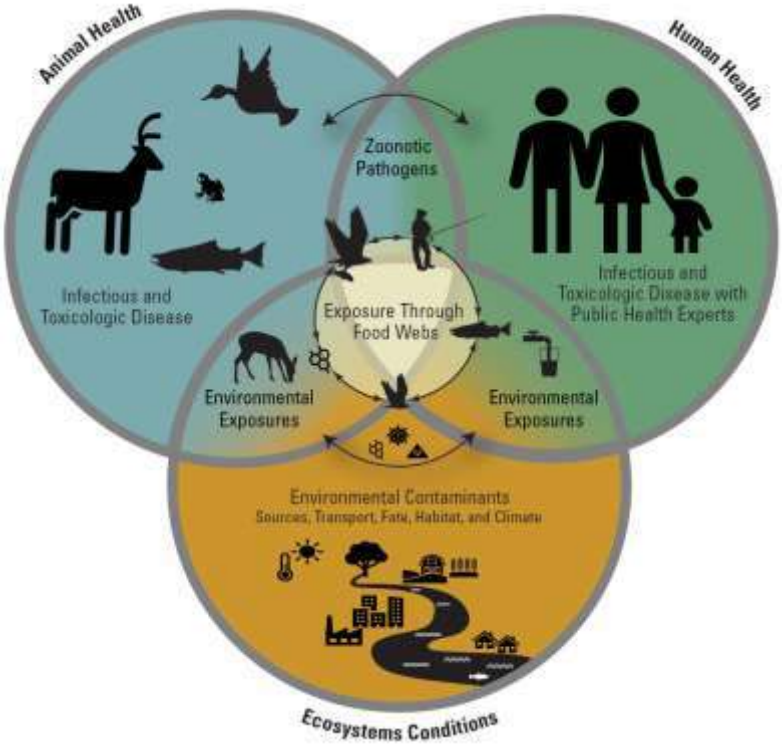

Figure 1: One Health conceptual diagram. Traditionally, One Health examines the overlap between human health, animal health, and ecosystem conditions – as shown in the Venn diagram. Our framework adds that political-economic structures – e.g. capitalist vs. cooperative models – and social reproductive activities underpin these health domains. A "healthy economics" approach seeks to align economic structures with the goal of optimizing this entire system for health and equity. Taken from the (16).

Building on these theoretical pillars, we propose that One Health and Global Health can be fundamentally strengthened by embracing healthy economics: transforming the economic drivers of health problems and leveraging economic democracy, feminist care ethics, and community power to create sustainable health for all. In the next sections, we explore concrete Latin American cases exemplifying this approach and discuss practical implications for education, research, and extension.

Latin American Realities: Cases from Farm to Wildlife

Latin America offers fertile ground to apply this critical One Health framework, given its stark social inequalities, rich biodiversity, and histories of collective action. We examine several domains – farm animal production, public health, human–animal bonds, pest control, and wildlife management – highlighting regional examples that illustrate the interplay of economics, culture, and health.

Farm Animal Production: Precarious Peasants and Industrial Agribusiness

Agriculture and livestock production in Latin America range from small family farms – *campesinos* – with precarious livelihoods to massive industrial operations integrated into global supply chains. This sector starkly demonstrates why One Health must address economic structures. Small-scale farmers often live in poverty, lacking access to veterinary services, land tenure security, or markets. Their **mode of life** is one of subsistence and uncertainty, which impacts herd health and human nutrition. For example, many small dairy farmers in the Andes struggle with low milk prices set by processors, pushing them to overwork their cattle or cut corners on animal health (17). In contrast, large industrial

farms, some foreign-owned, operate on economies of scale but introduce new health and environmental risks: crowded feedlots that can breed disease, heavy antibiotic use driving antimicrobial resistance, exploitation of farm workers, deforestation for pasture, and huge manure waste impacting waterways (4). The 2009 swine flu pandemic – H1N1 – provides a cautionary tale: it was first detected in a rural community in Veracruz, Mexico, near a large industrial pig farm partly owned by a US corporation. Investigations linked the emergence of this virus to the densely packed conditions and global genetic mixing of swine in that industrial system (4). As Rob Wallace noted, NAFTA-led market changes had forced Mexican farmers to either exit or emulate U.S.-style concentrated animal feeding operations, facilitating the genetic "reassortment" that spawned H1N1 (4). Thus, trade policies and capitalist consolidation literally had pathogenic consequences – a textbook One Health scenario where economics, animal health, and human health collided. A healthy economics approach in this domain means supporting agroecological, equitable models of livestock production. Latin America has promising examples: cooperatives and indigenous communities practicing sustainable animal husbandry that protects both livelihoods and land. In Brazil, the Landless Workers' Movement – MST – has established cooperative farms where families collectively decide farming practices, often incorporating organic methods and animal welfare (18). These cooperatives prioritize local food needs and environmental care, aligning economic activity with human and animal health goals – for instance, reducing pesticide exposure and improving diet quality. In Mexico, some campesino organizations have revived the traditional milpa integrated farming system (19) – mixed crops and animals – which not only preserves biodiversity but also buffers communities against market shocks and disease outbreaks by diversifying food sources. These bottom-up approaches contrast with the top-down agribusiness model and exemplify Gramsci's idea of organic intellectuals: peasant leaders and their NGO allies acting as intellectual-organizers to create a new "mode of life" in farming. **Veterinary extension** can play a critical role here as an ally – not just delivering technical advice, but facilitating farmer-to-farmer learning and cooperative organization. For example, in Chile, university veterinary programs have sent students to work with small dairy farmers on improving animal health through participatory methods, finding that when farmers collectively assess problems – like mastitis outbreaks – and negotiate solutions, they implement changes more sustainably than when they are simply told what to do by an external expert (1). This participatory extension approach treats farmers as co-knowledge producers – echoing activity theory – and often leads to innovations blending scientific and traditional knowledge. In short, addressing farm animal production through healthy economics in Latin America involves **land reform, cooperative business models, fair trade, and public policies that favor small-scale producers**, combined with vet/public health support that is culturally appropriate and empowering. The outcome can be win–win: reduced risk of zoonoses and foodborne illness, improved animal welfare, enhanced incomes, and resilience against climate change and market volatility (1).

Public Health: Community-Based Approaches and Social Medicine

Latin America has been a cradle of "collective health" and **social medicine** movements, which explicitly link health outcomes to social and economic structures. Pioneering Latin American epidemiologists like Jaime Breilh and Asa Cristina Laurell have critiqued narrow "social determinants of health" frameworks and instead advanced a paradigm of **"social determination of health,"** emphasizing how health is produced or undermined by the broader political-economic formation (20,21). This perspective aligns with Marxist economics: rather than treating factors like poverty or housing as static risk factors, it asks how poverty itself is produced – e.g. through land dispossession or labor exploitation – and how that process can be transformed to improve health. A classic example is the approach to chronic malnutrition and infectious disease in Northeastern Brazil. Instead of viewing malnutrition as a mere lack of food – to be fixed by supplements – social medicine physicians in the 1980s pointed to land inequality and the export-oriented plantation economy that left peasants without enough to eat. They worked with peasant leagues to push for land redistribution and community gardens – an upstream solution attacking the root cause of poor nutrition. This reflects a

politically engaged public health practice where doctors and health workers acted as organic intellectuals in Freirean "culture circles" with villagers, raising critical consciousness about the causes of illness and empowering communities to demand change. The result in some areas was not only better nutrition but greater social cohesion and political voice, contributing to health in a holistic sense. Another hallmark of Latin American public health is **community health workers and participatory primary care**. Countries like Brazil and Cuba have long employed community-based approaches. Brazil's Estratégia de Saúde da Família – Family Health Strategy – deploys teams with community health agents who visit households regularly, integrating prevention and health education into everyday life. These agents, often local women with high school education, receive a stipend and training, effectively valuing reproductive/care labor in a formal way (22). By being embedded in the community, they can address the social context of disease – connecting families to social assistance, advocating for sanitation infrastructure, and mediating between biomedical services and local culture. During the Zika virus outbreak – 2015 - 2016 – Brazil's community health workers were instrumental in educating families about mosquito control and assisting mothers of infants with Zika-related microcephaly. However, austerity measures threatened this program, illustrating how neoliberal economics can undermine even successful One Health efforts. In contrast, Cuba's public health system – despite limited resources – achieved remarkable outcomes in part due to its *socialist* orientation, prioritizing primary care and prevention in every neighborhood. Cuban epidemiologists also explicitly link health with environmental sanitation and literacy, exporting such expertise – e.g. Cuban doctors helped Haiti with a cholera epidemic by combining medical treatment with water infrastructure advice (23). These cases underscore that public health gains in Latin America often stem from community empowerment and state support for social welfare, not just biomedical advances. The healthy economic framework would encourage **scaling up participatory, intersectoral public health models**. For example, in El Salvador and Nicaragua, recent initiatives have adopted a *"One Health, One Welfare"* approach in poor rural communities, simultaneously tackling human health – e.g. child diarrhea – animal health – livestock vaccination – and environmental sanitation – building latrines, protecting water sources – with full community involvement. An illustrative project in Central America trained local people as "*brigadistas*" to improve housing conditions to combat Chagas disease, a parasitic illness transmitted by insects dwelling in adobe walls and thatched roofs. Rather than relying only on insecticide spraying, communities were organized – with support of NGOs and researchers – to plaster walls, install cement floors, and move domestic animals into separate corrals – simple upgrades that dramatically cut infestations. These interventions were low-cost, relied on local materials and labor, and were sustainable, with infestation rates dropping to zero in some areas and remaining low years later. Importantly, the process built local capacity and job skills – construction, health education – – reflecting an economic empowerment dimension. The success led health ministries to adopt this approach as a best practice for Chagas prevention (24). It exemplifies how engaging communities in improving their physical environment and housing – a social determinant) also strengthens social fabric and yields health benefits, embodying the principle that healthy communities must have control over the conditions of their lives. Thus, Latin America's public health innovations teach that merging critical social theory with practice – e.g. viewing a slum's lack of sewerage as an injustice to be rectified through collective action – can lead to meaningful health improvements. Education for health professionals should therefore include these social science insights and methods – we return to this in the implications section.

Human–Animal Bonds: Pets, Stray Animals, and Urban Health

Throughout Latin America, human relationships with companion animals – pets – are deeply culturally significant, and they carry both positive health benefits and public health challenges. On one hand, strong human–animal bonds have been observed across the region. Surveys indicate Latin Americans have some of the highest pet ownership rates in the world: for example, about **80% of people in Argentina and Mexico own a pet**, one of the highest rates among 22 countries surveyed (25). Figure 2

shows the distribution of species in these countries. Moreover, **over 70% of Latin American pet owners consider their pets as family members** (26), the highest such sentiment of any region. These bonds can provide significant psychosocial benefits – companionship for the elderly, improved mental health, security in high-crime neighborhoods, and even physical health benefits – as pets encourage exercise. There is a burgeoning field of *One Welfare* that recognizes these interconnections between animal welfare and human well-being. For instance, programs in Chile have used therapy dogs to support children with autism and patients in hospitals, leveraging the human–pet bond for therapeutic outcomes. During the COVID-19 pandemic, many Latin Americans turned to their pets for emotional support, and some cities – like Bogotá – even considered pet needs in lockdown rules – e.g. allowing dog-walking – recognizing their importance for human mental health.

Figure 2: Distribution of species as pets

On the other hand, the management of dog and cat populations presents public health issues, especially in low-income urban areas. Stray dogs are common in many Latin American cities and villages – the result of abandonment and uncontrolled breeding. This can create sanitation issues – accumulated feces, garbage scattering – and disease risks. For example, a **single large stray dog can excrete 340 grams of feces per day**, contributing to environmental contamination and potential spread of parasites and bacteria (27). In some cities, airborne dried dog feces have been noted as a respiratory health hazard (28). Stray dogs – and cats – can also be reservoirs or vectors for diseases: canine rabies remains a concern in areas where vaccination coverage is low, and stray dogs have been implicated in transmission of Leptospirosis, Chagas – by carrying infected insects – and other zoonoses (29). In southern Mexico, studies found high rates of intestinal parasites like hookworm and roundworm in stray dogs, which can infect people – especially children – who come into contact with contaminated soil (29). Animal welfare is also a concern, as strays often suffer from malnutrition, injuries, and illness (29). The issue of overpopulation of stray dogs in Latin America is thus a **One Health problem** at the nexus of human public health, animal health/welfare, and environmental cleanliness (29). Adopting our healthy economics lens, the root causes of this issue include social and economic factors: poverty – limiting households' ability to care for pets or access spay/neuter services – cultural attitudes towards sterilization, and government underinvestment in animal control infrastructure. Many municipalities resort to periodic culling or catch-and-impound campaigns, which often fail to sustainably reduce stray populations and can spark public outcry from animal rights groups. A more transformative approach being tried in some locales is **community-based**

animal welfare programs: for example, in São Paulo, Brazil, an NGO works in *favelas* to provide free spay/neuter clinics, veterinary check-ups, and public education, employing local youth as animal care assistants. This not only reduces stray births but creates local jobs and awareness – a social reproduction win. Similarly, several Chilean cities have implemented mass dog sterilization campaigns with door-to-door outreach, subsidized by government as a public health measure (29). By 2020, Chile had reportedly spent millions on spay/neuter programs, acknowledging that *"overpopulation of stray dogs is a serious public health problem…mass sterilization programs have been proposed to manage the issue and avoid euthanasia of approximately 4 to 10 million animals annually."* (29) This quote highlights the scale of the effort and the shift from reactive to preventive, humane strategies. In Mexico, student-led organizations – often from veterinary schools – run vaccination and deworming drives in poor communities for owned pets, recognizing that keeping owned pets healthy – and neutered – prevents them from being abandoned and reduces disease risk for humans. These initiatives illustrate how an ethic of care – valuing the lives of animals – intertwines with human health benefits. They also show the need for **cross-sector collaboration**: veterinarians, public health officials, city planners, and community leaders coming together. By empowering communities with knowledge – e.g. the importance of vaccination and neutering – and resources – e.g. free clinics – Latin American cities are moving toward a One Health solution that respects animals and protects humans, rather than treating stray animals as merely a nuisance. This embodies the concept of One Welfare and aligns with a healthy economy idea by investing public funds and creating jobs around care activities that were previously invisible and unpaid – like neighborhood dog catching now turned into formal employment in neutering programs. In short, supporting the human–animal bond in healthy ways – through accessible veterinary care, public education, and community engagement – can transform a vicious cycle into a virtuous one: pets contribute positively to human welfare, and humans ensure good welfare for animals.

Pest and Vector Control: Participation and Environmental Management

Latin America faces significant burdens from vector-borne diseases – dengue, Zika, chikungunya, malaria, Chagas, leishmaniasis, and more – many of which disproportionately affect impoverished communities. Conventional vector control often relies on top-down spraying of insecticides or reactive campaigns during outbreaks. However, mounting evidence suggests that sustainable control of pests and vectors requires addressing underlying environmental and social conditions and actively involving communities. A striking example is the control of *Aedes aegypti* mosquitoes, which transmit dengue, Zika, and chikungunya. These mosquitoes breed in standing water around households, so community behavior – e.g. water storage practices, waste management – critically determines risk. In Cuba, which has a long history of mosquito-borne disease control, the approach has been highly community-oriented: neighborhoods form *"vector control committees"* that mobilize residents to eliminate breeding sites weekly, often in concert with local health brigades. Cuba's success in containing dengue in certain periods has been attributed to this social mobilization model backed by political will. Similarly, Brazil has experimented with **participatory dengue control** – for instance, the city of Salvador, Bahia engaged schoolchildren in producing theater skits and songs about mosquito control, turning education into action as kids convinced their families to cover water barrels and clean yards (30,31) . Some Brazilian programs have trained residents as "Mosquito Hunters" to conduct surveillance in their own communities and report problem areas, effectively crowdsourcing public health data and fostering peer accountability. Reviews of interventions in Latin America note that **community empowerment interventions** – those that include training local leaders, establishing dengue committees, and promoting community surveillance – have yielded reductions in mosquito indices, though results vary with context (31). Importantly, these approaches build social capital and local capacity, aligning with healthy economics by privileging local knowledge and labor rather than just expensive chemical inputs. From an economic perspective, why do mosquito-borne diseases persist? Often it is linked to urban poverty and inadequate public infrastructure: irregular water supply – forcing water storage that becomes breeding habitat – poor garbage collection – leading to containers that collect rainwater – and

unplanned urbanization – creating stagnant water. In other words, **structural poverty creates ecologies favorable to vectors**. Tackling these issues requires political-economic solutions like improving water and sanitation services, urban planning, and housing – which are beyond the traditional scope of health agencies but very much within a One Health purview. A case in point is the resurgence of urban yellow fever in some Brazilian cities, which has been tied to declining public investment in sanitation and the growth of informal settlements near forest fringes. Healthy economics would argue for upstream investment: rather than pouring funds into endless spraying or emergency response, allocate resources to provide secure water access, drainage, and waste services in marginal communities, employing local people to maintain these systems. Not only would this reduce vectors, it would also create jobs – improving the social determinants of health. There are examples: in Medellín, Colombia, an initiative to employ underemployed residents in a "Green and Healthy Jobs" program involved cleaning street gutters and converting dumping areas into pocket parks, which reduced rodent and mosquito infestations and gave participants a livelihood. In Peru, the fight against **Malaria** in the Amazon has combined medical treatment with community-led environmental management: recognizing that deforestation and rudimentary fish-farming were creating mosquito habitats, NGOs helped villagers reforest swampy areas and introduce mosquito-eating fish in ponds. This integrated approach reduced malaria incidence while also restoring ecosystem services. Scientific studies validate the link between deforestation and malaria – a **10% increase in deforestation was associated with a 3.3% increase in malaria incidence in the Amazon** (32), and conversely, where forest cover was restored or conserved, mosquitoes transmitting malaria found fewer suitable breeding sites (33). Thus, One Health interventions for pests must be as interdisciplinary as the problem: ecologists, economists, health professionals, and communities devising solutions together. Chagas disease control via housing improvement, already discussed, is another exemplary narrative. There, instead of seeing the insect vector as the sole target, the approach considered the socio-economic drivers: why do people live in homes susceptible to infestation? Because of poverty and traditional building methods. The solution was not only insecticide – short-term relief – but **better homes** – long-term prevention. When villagers in Honduras plaster their own walls to keep bugs out, with materials provided by a public–NGO partnership, we see an economic shift: investing in *people's assets* – housing – and skills, rather than just selling chemical products. It's a shift toward what we might call a **preventive economy** – one that prioritizes investments yielding sustained health benefits. Healthy economics in pest control also means scrutinizing the insecticide-centric industry: in some instances, costly pesticides are repeatedly applied without community buy-in, benefiting manufacturers more than local health. By contrast, community-based environmental management is labor-intensive but uses local labor, circulating money locally. In Suriname, for example, a malaria elimination project hired villagers as "malaria workers" to educate and distribute bed nets in their own remote communities, rather than paying outside contractors; this not only achieved near-zero malaria, but also left those communities with trained health workers who then addressed other issues like HIV and tuberculosis. Such models illustrate how aligning economic empowerment with health objectives creates synergies – reduced disease and reduced unemployment/hardship. In summary, pest control in Latin America is moving from a paradigm of "fight the bug" to "transform the environment and empower the people," reflecting the ethos of One Health and healthy economics combined.

Wildlife Management and Conservation: From Conflict to Coexistence

Latin America's rich wildlife – from Amazonian bats to Andean vicuñas – is a source of both treasured biodiversity and potential health concerns – e.g. wildlife as reservoirs for emerging diseases. The traditional approach to wildlife in health has often been either neglect – ignoring animal reservoirs until an outbreak occurs – or coercive measures – culling wildlife or restricting local use. A healthy economics perspective, informed by critical theory, instead asks: how can protecting wildlife and ecosystems be reconciled with the livelihoods and rights of local communities? And how can local knowledge and stewardship be harnessed to improve health outcomes for all species? This connects to **Gramsci's idea of**

hegemony – historically, conservation in Latin America sometimes mirrored colonial patterns, excluding indigenous and rural poor from decision-making – traditional intellectuals dictating policy. But a counter-hegemonic trend is emerging where local communities are recognized as essential partners or leaders in wildlife management, often with impressive results. One example comes from the Gran Chaco region – spanning Paraguay, Bolivia, Argentina – home to ranchers, indigenous groups, and wildlife like jaguars and peccaries. Conflicts arose as cattle ranchers would kill jaguars that preyed on livestock, threatening the apex predator's survival. A new approach involved NGOs facilitating *cattle rancher committees* that trialed non-lethal methods – like better corrals, guard animals – and engaged local schools in jaguar conservation education. Simultaneously, eco-tourism initiatives started paying ranchers to allow tourists on their land to spot jaguars, turning the predator from a liability into an asset. Over time, attitudes shifted and jaguar killings dropped, improving the ecological balance – One Health: healthier ecosystem – and even providing ranchers with supplementary income – economic benefit. This community-based conservation model reflects **Grace Blakeley's community empowerment** – resources – tourism revenue, conservation jobs – flow into the local community, and they gain a sense of ownership over the wildlife. It also exemplifies activity theory in practice: conservationists reframed the "activity" of cattle ranching to include wildlife stewardship as part of the shared community-objective, altering rules – no killing jaguars – and tools – financial incentives, knowledge – within that activity system. Another case is the **community vicuña management** in Peru and Bolivia. Vicuñas – wild camelids – were endangered by poaching for their fine wool. Instead of strict bans alone, authorities worked with Andean communities to set up *vicuña management committees*. Communities were granted rights to periodically round up vicuñas – Chaccu – and shear them for fiber, which could then be sold legally. The revenue goes to the community, funding local development projects. This model, operational since the 1990s, led to a remarkable recovery of vicuña populations – from near extinction to tens of thousands – and provided income to impoverished high-altitude villages. It's often cited as a win-win for conservation and development. Why is it a One Health matter? Because vicuña health and numbers also affect pasture ecology which in turn affects livestock health – competition for grazing, disease exchange with alpacas – and the improved community economic status translates to better human nutrition and health service access. It also reduced conflicts – poachers vs. rangers – which in the past had even led to violence. Now, communal ownership and use of wildlife is the hegemonic practice in those regions, embodying what Gramsci might call a new "historical bloc" of values – valuing biodiversity and collective benefit over individual greed. Zoonotic disease surveillance is another area where engaging local communities and indigenous knowledge is vital. In the Amazon rainforest, researchers working on Ebola, coronavirus, and other emerging pathogen surveillance – e.g. USAID's PREDICT project – learned that enlistment of local people – as field assistants, as informants on unusual animal die-offs, and as communicators of risk – greatly enhanced the effectiveness and cultural appropriateness of surveillance. For instance, in north-eastern Peru, villagers were trained to humanely capture bats and collect samples, gaining both monetary compensation and training in why disease monitoring matters. This participatory approach meant that when bats in their area later tested positive for a rabies virus variant, the community more readily cooperated with vaccination of humans and livestock, averting a potential outbreak. Contrastingly, in places where outside teams tried to handle wildlife sampling without local buy-in, there were rumors and resistance – e.g. locals fearful that scientists were spreading disease or harming sacred animals. The lesson aligns with **decolonizing One Health**: acknowledging and respecting indigenous and local communities' relationship with wildlife, and involving them in decision-making not just as guides or labor, but as partners with valuable knowledge. Indigenous cosmologies that view humans, animals, and nature as one interconnected family resonate strongly with the One Health concept; for example, many Amazonian tribes traditionally regulate hunting to avoid overharvesting and see diseases as signals of disharmony with nature. Such worldviews, if integrated, can steer One Health programs towards more reciprocal relationships with the environment – an antidote to the exploitative mindset of colonial-capitalist economics. In summary, Latin American experiences in wildlife management suggest that a

One Health approach rooted in community empowerment and respect for local socio-ecological systems can turn potential conflicts – human versus wildlife, development versus conservation – into synergistic solutions – coexistence and co-benefits. This requires shifting from an economy that treats wildlife either as exploitable commodities or inconvenient obstacles, to one that recognizes wildlife and ecosystems as part of the community's wealth – natural and cultural wealth. Mechanisms like community forestry, payments for ecosystem services – as pioneered in Costa Rica's PSA program – and biocultural heritage tourism all incentivize conservation while alleviating poverty. They operationalize healthy economics by ensuring that the well-being of people, animals, and environment are advanced together, rather than pitted against each other.

Implications for Education, Research, and Extension Practices

Implementing this enriched One Health framework calls for changes in how we educate practitioners, how we conduct research, and how we engage communities through extension services. We outline key implications for each, with an emphasis on veterinary, animal, and health sciences in Latin American contexts.

Education: Toward a Critical One Health Curriculum

Veterinary and medical education traditionally emphasize biological sciences and clinical skills. To produce professionals who can serve as organic intellectuals and leaders of socially transformative One Health, curricula must integrate social science, economics, and humanities. This means teaching the **political economy of health** – for example, including modules on health policy, agricultural economics, and social medicine history. Latin American faculty can draw on their rich legacy of thinkers like Rudolf Virchow – who famously said "politics is nothing but medicine on a large scale" – and the Latin American Social Medicine movement (21) to illustrate the connections between socioeconomic structures and pathology. Case studies from the region, such as those in this chapter, should be incorporated into teaching: students could analyze the "NAFTA flu" case to understand how trade agreements impact epidemiology (4), or debate the ethics and outcomes of the Chagas housing improvement program. The use of **interdisciplinary problem-based learning** is ideal – e.g. having vet, med, and environmental science students jointly develop a One Health intervention for a fictional village facing leptospirosis outbreaks, economic hardship, and deforestation. This would train them to coordinate across sectors and consider social feasibility, not just technical efficacy. Another educational implication is fostering **critical thinking and reflexivity**. Just as Freire's pedagogy of the oppressed advocates for education that raises consciousness, One Health education should encourage students to reflect on their role in society. Are they content being traditional intellectuals who implement programs designed elsewhere, or will they act as change agents with communities? Training in community engagement, participatory methods, and cross-cultural communication is essential. Some vet schools in Latin America now have rotations where students live in rural villages for a few weeks, learning from farmers and experiencing local livelihood challenges. These immersive experiences can be transformative, breaking down prejudices and building empathy. Education should also address topics like gender in health – so students appreciate, for instance, the role of women's unpaid work in animal care – indigenous health perspectives, and environmental ethics. By graduation, a veterinarian or physician should be as comfortable discussing a community's economic development plan or facilitating a town hall meeting as they are diagnosing a disease. This broad skillset will prepare them to implement One Health in the real world, which is far messier than any single-discipline problem. In faculty development, institutions might bring economists and social scientists into vet/health faculties, or encourage dual degrees – e.g. DVM-MPH programs – that explicitly cover health policy and management. The One Health University Network in Latin America – if formed – could share curricula on "One Health and Sustainable Development" and produce open-access case materials in Spanish and Portuguese to ensure linguistic accessibility. Ultimately, education needs to cultivate an **ethos of service and activism**. One concrete idea is to establish **One Health extension scholarships**: similar to medical residencies, young professionals spend a year in underserved

communities working on integrated projects – like improving a local abattoir's safety while running school health talks and conservation activities. This bridges education and extension and grounds the abstract theories in practice.

Research: Participatory and Translational Science

Research in One Health and Global Health must evolve to address complex problems that do not fit neatly into single disciplines. A healthy economics approach implies focusing research on upstream, structural interventions and co-creating knowledge with stakeholders. **Transdisciplinary research** teams are needed – ones that include not only veterinarians, physicians, ecologists, and economists, but also sociologists, anthropologists, and importantly, community representatives. Latin America has been a pioneer in participatory action research (PAR), influenced by Orlando Fals Borda and others, which aligns perfectly with One Health goals. For example, instead of researchers deciding the questions alone, a PAR One Health project on leptospirosis might involve sugarcane cutters – who are at risk for leptospirosis – cane farm owners, public health officials, and scientists jointly diagnosing why cases are happening and testing interventions – maybe improving protective gear or drainage in fields. Such an approach ensures research produces practical, acceptable solutions and empowers those involved. It treats local people as experts in their context, addressing the power imbalance in knowledge production. Donors and research institutions should encourage this by funding community-led pilots and requiring stakeholder engagement plans in One Health grants. Another implication is broadening metrics of success. Traditional research often prioritizes narrow health outcomes – infection rates, mortality – or economic output. Our framework suggests including indicators for empowerment, equity, and sustainability. For instance, when evaluating a new brucellosis control program in smallholder dairy farms, researchers should measure not only reduction in Brucella infections, but also changes in farmers' income or knowledge, gender dynamics – who in the household takes on the tasks? – and any environmental effects – how were livestock waste managed? Mixed-methods research – combining quantitative data with qualitative insights – will be especially valuable to capture these dimensions. This can illuminate unintended consequences: e.g. did a vaccination campaign inadvertently marginalize those who couldn't afford the follow-up costs? Are there traditional practices that achieve similar ends that were overlooked? By publishing such findings, researchers contribute to a more holistic evidence base. One Health research should also be **translational** – aiming to move from findings to implementation and policy. Given that many Latin American countries have adopted One Health language in national plans, there is an opportunity for researchers to inform policy design with evidence. Scientists should engage with policymakers through briefings, accessible policy papers, and by serving on advisory committees – as several countries formed One Health commissions post-COVID-19. Including economic analysis in research is key: policy influence often requires showing cost-benefit or cost-effectiveness. Demonstrating, for example, that a $1 investment in community tick-control – to prevent Rocky Mountain spotted fever in Mexico – yields $5 in saved healthcare costs and productivity, strengthens the case for funding prevention. Here, collaboration with health economists and use of tools like **One Health economic modeling** – which is an emerging field – can be useful (31). Latin American researchers are well-placed to pioneer models that incorporate social justice criteria – perhaps a "One Health Equity Index" that tracks not just aggregate health improvement but distribution among populations (34). Finally, it's important to disseminate research in local languages and to the communities concerned. Far too often, data collected from rural Latin America get published in English journals and never reported back. Ethical research in this framework mandates **reciprocity** – sharing results in community meetings, co-authorship with community researchers, and making findings open-access whenever possible. The trust built through this transparency will facilitate future collaborations and ensure that research truly serves the public. It also contributes to what Gramsci called the "war of position" in civil society – using knowledge to slowly build a new common sense about health and economy. As One Health research documents the benefits of cooperative farms, or the health costs of extractive industries, it arms social movements and enlightened officials with evidence to argue for change.

Extension and Outreach: Empowering Communities for Action

Extension – the practice of extending knowledge and services to communities – is a cornerstone of agriculture and public health in Latin America. However, extension approaches need revision to align with healthy economics. Traditional agricultural extension often had a top-down character – "transfer of technology" model – while a One Health extension must be **participatory, bidirectional, and transformative**. We propose an integrated "One Health extension service" akin to the rural extension services, but interdisciplinary. For instance, an extension team in a region could include a veterinarian, a nurse or physician, an agronomist, and a community organizer. This team could tackle issues ranging from improving poultry production and preventing avian flu, to nutrition education and water sanitation, all in coordination with community committees. The key is that extension agents become facilitators of community problem-solving rather than just instructors. They can help communities conduct their own needs assessments, map their health and resource conditions, and then assist with accessing knowledge or funds to address priorities. Successful models exist in Latin America's past: the **"Campesino-a-Campesino" – Farmer-to-Farmer)** methodology, widely used in agroecology, relies on empowering local promoters to share innovations with peers. This horizontal extension could be expanded to One Health promoters – for example, training motivated villagers as community paraveterinarians – to do basic animal care – community water technicians, or wildlife monitors. Such paraprofessionals, drawn from the community, are more sustainable and trusted than external experts. In Amazonian Peru, after researchers helped local people set up a system to report wildlife diseases, those local "monitors" continued the surveillance even after the project ended, because it had become part of community vigilance structure – and they were given a small stipend by the local municipality which recognized its value. Extension programs should lobby for institutionalizing these roles – e.g. government paying community health workers or paraveterinarians, which also injects income locally – reflecting Federici's point on remunerating care work. International agencies and NGOs can support by providing initial training and resources. Another crucial aspect of extension is **communication**. One Health topics can be complex – think of explaining antibiotic resistance or climate change's health impacts. Extension must develop culturally appropriate communication tools: *radio novelas* in local languages about disease prevention, comic book guides on agroecology and health for semi-literate audiences, or interactive workshops that use theater or games to teach concepts (35). Latin America has rich traditions of popular education – thanks to Freire – and street theater that can be leveraged. For example, in Guatemala, an NGO working on rabies control created a puppet show featuring a dog character to teach children about responsible pet ownership, which was performed at village fairs. The children then became advocates in their homes for vaccinating and not mistreating dogs. Such creative methods acknowledge that lasting change often comes through shifts in mindset and local culture, not just knowledge transfer. Extension workers should also act as **bridges linking communities to resources and policy**. They can help communities organize to demand services – serving as facilitators in meetings between villagers and government officials about, say, getting a new health post or enforcing environmental regulations on a polluting mine. In this sense, extension overlaps with community development and social work. It requires soft skills and an understanding that sometimes the role is to support communities in advocating for their rights – which may put extensionists in a delicate position if the "system" is resistant. Here, support from universities and NGOs as back-up is valuable, to legitimize and protect such boundary-spanning work. In veterinary extension specifically, adopting a One Health approach means veterinarians advising not just on animal care, but integrated farm management that considers zoonoses, nutrition, and environmental impacts. A veterinarian visiting a smallholder farm might advise on manure composting – to prevent fly breeding and provide fertilizer – safe butchering practices – to avoid contaminating meat and waterways – and even diversification – perhaps introducing fruit trees that provide shade and nutrition. This broad advisory role makes the vet a true rural health agent in a broader sense, aligning with the concept of "extensionista" as a change agent for sustainability. It also resonates with **democracy at work**: extension should help form

cooperatives or farmer associations where none exist, because collective organization often is key to solving systemic problems. For instance, if dairy farmers band together, they can afford a bulk milk cooler and negotiate better prices, improving incomes – and diets for their families – an economic change with health dividends. Extension agents can catalyze such collective efforts, thereby extending their impact from individual behavior change to community-level economic empowerment. To summarize, extension and outreach in a healthy economics paradigm is about **facilitating self-reliance and collective action**. It measures success not just by technical indicators – e.g. number of cows dewormed – but by empowerment metrics: Did the community form a health committee? Are women more involved in decision-making now? Has local leadership emerged to continue projects? Extensionists become partners in community-driven development, ensuring that improvements in One Health are sustained by local ownership and tied into local economies – e.g. training local people to run a water purification business or an animal feed cooperative. This transforms extension from a unidirectional service into a co-creative social process, integral to achieving the socially just One Health we envision.

CONCLUSION

In this chapter, we have articulated a theoretical and practical proposal for embedding socially transformative economic thinking – "healthy economics" – into One Health and Global Health frameworks, with a focus on Latin America. By weaving together Marxist political economy, activity theory, the concept of mode of life, Gramsci's organic intellectuals, Federici's social reproduction theory, Wolff's workplace democracy, and Blakeley's community empowerment, we formed a rich tapestry of ideas explaining why and how health is interlaced with social and economic structures. The Latin American examples – from cooperative farms mitigating zoonoses, to community health worker programs, pet ownership trends, participatory vector control, and community wildlife management – demonstrate that these concepts are not abstract ideals but are already in motion, pointing the way to a holistic One Health praxis. They show that when communities gain power over their local economies and when care and sustainability are valued, outcomes improve across the board: humans, animals, and ecosystems thrive together. For veterinary, animal, and human health professionals, the implication is clear: technical expertise must be coupled with social consciousness and collective action. Education systems need to produce professionals who are as comfortable analyzing a class structure or facilitating a community meeting as they are diagnosing disease. Research needs to transcend disciplines and be done with people, not on people. Extension and public engagement should empower communities to define and solve their own problems with supportive guidance. In essence, One Health must evolve from a primarily biomedical or ecological endeavor into a **socio-ecological movement** for health justice. This aligns with Latin American calls for *"salud colectiva"* and *"buen vivir,"* which insist that health is a social product and a commons, not a commodity. The challenges are undoubtedly great – entrenched inequalities, political resistance, resource constraints, and the sheer complexity of issues like pandemics and climate change. However, the COVID-19 crisis and ongoing climate disruptions have laid bare the costs of our current economic and health paradigms, perhaps creating an opening for new approaches. The framework of healthy economics within One Health offers a hopeful path forward: one where addressing a public health issue also means empowering a community economically, where improving animal welfare also strengthens social solidarity, and where protecting an ecosystem also sustains a culture. By anchoring One Health in the daily "mode of life" of communities and enabling those communities to reshape that mode of life, Latin America can continue to offer the world innovative models of collective health. In doing so, it honors the wisdom of thinkers like Gramsci and Freire – that lasting change comes from the grassroots, guided by theory but forged in praxis. Health professionals, as organic intellectuals in this process, have a historic role to play. We hope this chapter provides both the inspiration and the critical lens needed to advance that mission, in Latin America and beyond.

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