COVID-19 and animals:

Rethinking our relationship with animals to reduce the likelihood of the next global pandemic

JUNE 2020

ANIMAL LEGAL DEFENSE FUND

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The Animal Legal Defense Fund was founded in 1979 to protect the lives and advance the interests of animals through the legal system. To accomplish this mission, the Animal Legal Defense Fund files high-impact lawsuits to protect animals from harm; provides free legal assistance and training to prosecutors to assure that animal abusers are punished for their crimes; supports tough animal protection legislation and fights harmful legislation; and provides resources and opportunities to law students and professionals to advance the emerging field of animal law. For more information, please visit **aldf.org**.

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A. INTRODUCTION

Global outbreaks of zoonotic diseases — like COVID-19, a novel coronavirus disease — are on the rise.[1] Zoonotic diseases are the cause of most epidemics and pandemics, including the deadliest,[2] and they need only a human-animal interaction to arise. Given the increasing incursion of human beings into wildlife habitat around the world[3] and the growing demand for meat and other animal products,[4] it's not a question of "if" there will be another zoonotic-derived pandemic but "when." Therefore, even as governments mobilize to limit the staggering impact of COVID-19, it is *imperative* that they also take urgent action to prevent the next pandemic.

While this task is daunting, it is a solvable problem. It will require policymakers and the public to honestly confront not only the root causes of COVID-19, but *all factors* that foster the development and transmission of zoonotic disease — namely how humanity's relationship with animals keeps us at a heightened risk.

Policymakers are rightly preoccupied with the current crisis. However, now is the time to also look beyond relief, recovery, and reform to a more holistic reimagining of the systems and conditions that created this pandemic and exacerbated its impacts. In looking to the future, we must craft policy solutions that will create transformative change and social conditions that are more humane, equitable, and sustainable.

The attention given to the fact that this particular pandemic can be traced to spread that began in a foreign country misses most of the lesson. Emerging and re-emerging zoonotic disease[5] need only the spark of a human-animal interaction, billions of which are happening every day and around the world.

This paper seeks to identify the root causes of zoonotic disease and to offer solutions that will mitigate pandemic risk by reimagining the human-animal interactions that have contributed to the current crisis and are presently laying the groundwork for the next.

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1 Over half of human pathogens are zoonotic. Zoonoses caused the three most deadly pandemics history—the Black Death, Spanish Flu, and HIV/AIDS—and are the source of 60-70% of more recently emerging infectious disease events. James O. Lloyd-Smith et al., *Epidemic Dynamics at the Human-Animal Interface,* Science, Dec. 4, 2009, at 1362, 1362, Link Here. The rate for emerging infections disease events has increased by 400% in the last century, and by 300% in the last 40 years alone, driven by demographic factors like the more-than doubling of the human population coupled with urbanization, and by modern agricultural practices, including a staggering increase in the production of livestock. Adekunle Sanyaolu, *Epidemiology of Zoonotic Diseases in the United States: A Comprehensive Review*, 2 J. Infectious Diseases & Epidemiology, Nov. 15, 2016, at 2, Link Here; Bryan Walsh, *Covid-19: The History of Pandemics*, BBC Future, Mar. 25, 2020, Link Here. We have "*more livestock now than we did over the last 10,000 years of domestication up to 1960 combined, and viruses can leap from those animals to us*." Walsh, *supra*. (emphasis added).

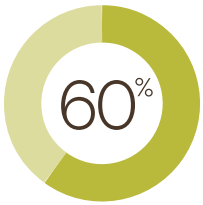
2 Stephen S. Morse et al., *Zoonoses 3: Prediction and Prevention of the Next Pandemic Zoonosis*, 380 The Lancet 1956, 1956 (2012), Link Here.

3 The pressure to house and feed more than seven billion people has led to a dramatic increase in incursions into precious natural habitats, including previously pristine and protected spaces. U. Cambridge, *Extent of Human Encroachment into World's Protected Areas Revealed*, ScienceDaily (Oct. 28, 2019), Link Here.

4 Hannah Ritchie & Max Roser, *Meat & Dairy Production*, Our World in Data Link Here (last updated Nov. 2019); Timothy Robinson & Francesca Pozzi, Mapping Supply and Demand for Animal-Source Foods to 2030 (2011), *available at* Link Here. Heightened demand and improved shipping infrastructure have fueled a dramatic increase in the international wildlife trade. Commercial trade in furs, skins, and traditional medicines accounts for the significant numbers of animals legally traded on the international wildlife market. In addition, illegal trade in items such as exotic pets and fashion items is worth billions of dollars annually. CITES, E*radicating Poverty and Promoting Prosperity in a Changing World: A Contribution to the Global Follow-Up and Review in the 2017 High Level Political Forum (HLPF) on the Work of the Convention on International Trade in Endangered Species of Wild Fauna and Flora*,UN (2017), Link Here.

5 Emerging and re-emerging zoonoses are newly appearing in a population or have existed previously but are rapidly increasing in incidence or geographical range.

B. PRIMER ON ZOONOTIC DISEASES



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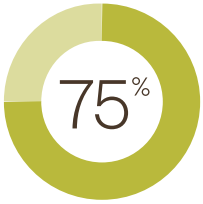

OF NEW INFECTIOUS DISEASES IN THE PAST DECADE ARE ZOONOTIC

Globally, many of the most serious infectious diseases are zoonotic, causing an estimated 3 million deaths per year.[6] A zoonotic disease is a disease caused by a pathogen that has jumped, in an event known as a "spillover," from some animal population to humans.[7] Such pathogens include prions, viruses, bacteria, protozoa, parasites, or fungi.[8] Transmission of zoonotic disease may occur via direct or indirect contact with animals or zoonotic disease may be vector-borne, foodborne, or waterborne.[9]

Emerging diseases are almost invariably zoonotic and/or vector-borne.[10] An estimated 60% of all viruses that infect humans came from animals, and 75% of new infectious diseases in the past decade are zoonotic.[11]

In the recent past, numerous viruses previously unknown, or unknown to infect and produce disease in humans, have developed in animals and then spread to humans. Examples include SARS, avian influenza, human immunodeficiency virus (HIV), Ebola virus, West Nile virus, monkeypox, Nipah virus, and Hanta virus.[12] These are not isolated events.

Once a pathogen spills over from animals to humans, infections transmitted directly among humans are dependent on at least the following factors: the frequency and duration of contacts between susceptible and infectious people; the number of individuals susceptible to the disease; the time period that the infected are infectious to others; and population density and the mixing of populations.[13] A model commonly used to measure disease transmission is known as the Susceptible-Infected–Removed (SIR) model.[14]

6 Wondwassen A. Gebreyes et al., *The Global One Health Paradigm: Challenges and Opportunities for Tackling Infectious Diseases at the Human, Animal, and Environment Interface in Low-Resource Settings*, 8 PLOS NEGLECTED TROPICAL DISEASES e3257 (2014).

7 *See* DAVID QUAMMEN, SPILLOVER: ANIMAL INFECTION AND THE NEXT HUMAN PANDEMIC *20* (2012).

8 *Id.* at 23-24.

9 *Zoonotic Diseases*, CDC, Link Here (last visited June 11, 2020).

10 Duane J. Gubler, *The Global Threat of Emergent /Reemergent Vector-Borne Diseases, in* VECTOR-BORNE DISEASES: UNDERSTANDING THE ENVIRONMENTAL, HUMAN HEALTH, AND ECOLOGICAL CONNECTIONS: WORKSHOP SUMMARY 62 (Stanley M. Lemon et al., rapporteurs, 2008), *available at* Link Here.

11 *Zoonotic Diseases, supra note 9;* PRIORITIZING ZOONOTIC DISEASES FOR MULTISECTORAL, ONE HEALTH COLLABORATION IN THE UNITED STATES: WORKSHOP SUMMARY 25 (2017), *available at* Link Here.

12 *WHO/FAO/OIE,* REPORT OF THE WHO/FAO/OIE JOINT CONSULTATION ON EMERGING ZOONOTIC DISEASES 5, 23 (2004), *available at* Link Here. A virus causes an infection in a host. If the infection induces host responses, those consequences are the disease. "Pathogenic mechanisms of viral disease include (1) implantation of virus at the portal of entry, (2) local replication, (3) spread to target organs (disease sites), and (4) spread to sites of shedding of virus into the environment. Factors that affect pathogenic mechanisms are (1) accessibility of virus to tissue, (2) cell susceptibility to virus multiplication, and (3) virus susceptibility to host defenses." SAMUEL BARON ET AL., VIRAL PATHOGENESIS IN MEDICAL MICROBIOLOGY ch. 45 (4th ed., Samuel Baron ed., 1996).

13 Johanna F. Lindahl & Delia Grace, *The Consequences of Human Actions on Risks for Infectious Diseases:* A REVIEW, 5 INFECTION ECOLOGY & EPIDEMIOLOGY, 2015, Link Here.

14 *Id.* at 4.

Once a zoonotic disease jumps to humans, scientists and disease experts also attempt to estimate how contagious it is, which is quantified in an "R0" score.[15] This value represents the average number of new cases that result from each infection. If R0 is greater than 1.0, the outbreak grows in size. If it is less than 1.0, the outbreak shrinks. COVID-19's R0 score is estimated to be somewhere between 1.4 and 6.8,[16] *substantially less* than that of many other diseases, such as measles[17] or polio.[18] Despite this, COVID-19 has still managed to severely impact public health, our economy, and even our daily home and work lives. Having the best strategies in place to break the cycle of human-to-human transmission must be among our highest priorities moving forward.

Further, the global rate of zoonotic disease is increasing.[19] Without understanding the factors that lead to the creation and spread of zoonoses, we cannot hope to prevent the next pandemic.

15 Paul L. Delamater et al., *Complexity of the Basic Reproduction Number (R_0)*, 25 Emerging Infectious Diseases, Jan. 2019, at 1-2, Link Here (stating "[t]he basic reproduction number (R_0), pronounced 'R naught,' is intended to be an indicator of the contagiousness or transmissibility of infectious and parasitic agents.").

16 Giulio Viceconte & Nicola Petrosillo, *COVID-19 R0: Magic Number or Conundrum?*, 12 Infections Disease Rep., Feb. 25, 2020, at 1, Link Here.

17 Fionna M. Guerra et al., *The Basic Reproduction Number (R_0) of Measles: A Systematic Review*, 17 Lancet Infectious Diseases e420 (2017), Link Here (claiming measles R_0 score is 12-18).

18 P. Fine et al., *Community Immunity, in* Vaccines (6th ed., Stanley Plotkin et al. eds., 2012).

19 Adekunle Sanyaolu et al., *Epidemiology of Zoonotic Diseases in the United States: A Comprehensive Review,* 2 J. Infectious Diseases & Epidemiology, Nov. 15, 2016, Link Here.

C. PROLIFERATION OF ZOONOSES, INCLUDING COVID-19

1. COVID-19 Arose from Animal Exploitation

COVID-19 is a disease caused by a type of virus known as a coronavirus. Other members of the coronavirus family include the viruses that cause the common cold, as well as two deadly strains that caused the 2003 Severe Acute Respiratory Syndrome (SARS) epidemic in China, and the outbreak of Middle East Respiratory Syndrome (MERS) in Saudi Arabia in 2012.[20]

An honest look at the origin and early spread of COVID-19 compels us to acknowledge that humanity's exploitation of animals was a critical factor, particularly a culinary affinity for wildlife. Although precisely when and where the virus made first contact with humans remains unknown, COVID-19 almost certainly originated from animal sources, or "reservoirs."[21] The best science at present indicates that the virus originated from a bat coronavirus and then transferred to an intermediate host species before evolving into SARS-CoV-2, the coronavirus responsible for the disease abbreviated as COVID-19, and spreading to humans.[22]

However, there are two possible origin scenarios. In the first, the virus evolved to its current pathogenic state through natural selection in bats and then jumped to humans. Bats are the most likely reservoir as COVID-19 is very similar to a bat coronavirus.[23] There are no documented cases of direct bat-to-human transmission, however, suggesting that an intermediate host was likely involved between bats and humans.[24] Although not yet identified, this intermediate animal host could be a domestic animal or a wild animal, whether truly wild or kept in captivity.[25]

In the second possible scenario, some non-pathogenic version of a coronavirus was transmitted from animals to humans and thereafter evolved to its current pathogenic state, becoming what we now call SARS-CoV-2.[26]

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20 Scripps Research Institute, *COVID-19 Coronavirus Epidemic Has a Natural Origin*, ScienceDaily (Mar. 17, 2020), Link Here; *Q&A on Coronaviruses (COVID-19): What Is a Coronavirus?*, WHO (Apr. 17, 2020), Link Here.

21 "The reservoir of an infectious agent is the habitat in which the agent normally lives, grows, and multiplies. Reservoirs include humans, animals, and the environment. The reservoir may or may not be the source from which an agent is transferred to a host. For example, the reservoir of *Clostridium botulinum* is soil, but the source of most botulism infections is improperly canned food containing *C. botulinum* spores." CDC, Principles of Epidemiology in Public Health Practice 1-62 (3d ed., 2012), *available at* Link Here.

22 "The leading theory for the origin of SARS-CoV-2 is that a bat virus long ago jumped into another species, where it then mutated into a variant that later infected humans. …Looking for coronaviruses outside of bats may still be key to the origin mystery. 'While bats are clearly major hosts for coronaviruses, until we have a wider sampling of wildlife species we will not be able to fully resolve the evolutionary events involved in the genesis of SARS-CoV-2, particularly whether it jumped straight from bats to humans or went through an intermediate host.'" Jon Cohen & Kai Kupferschmidt, *NIH-Halted Study Unveils Its Massive Analysis of Bat Coronaviruses*, Science (Jun. 1, 2020), Link Here (quoting evolutionary biologist Edward Holmes).

23 Kristian G. Andersen et al., The Proximal Origin of SARS-CoV-2, 26 Nature Med. 450 (2020), Link Here; Susanna K.P. Lau et al., *Possible Bat Origin of Severe Acute Respiratory Syndrome Coronavirus 2*, 26 Emerging Infectious Diseases, Apr. 21, 2020, Link Here. Although the origin of SARS-CoV-2, the virus that causes COVID-19, is yet unconfirmed, one genus, *Rhinolophus*, also known as Chinese horseshoe bats, has been identified as crucial to the evolution of coronaviruses. "'It seems that by sheer phylogeographic, historical, evolutionary bad luck, R*hinolophus* ends up being the major reservoir for SARS [severe acute respiratory syndrome]-related coronaviruses.'" Cohen & Kupferschmidt, *supra* note 22 (quoting Peter Daszak, president of EcoHealth Alliance); see also Alice Latinne, et al., *Origin and Cross-Species Transmission of Bat Coronaviruses in China*, BIORXIV (May 31, 2020), Link Here.

24 Anderson, *supra* note 23; Scripps Research Institute, *supra* note 24; *Origin of SARS-CoV-2*, WHO (Mar. 20, 2020), Link Here.

25 *Origin of SARS-CoV-2, supra* note 24.

26 *Id.* ("For instance, some *coronaviruses* from pangolins, armadillo-like mammals found in Asia and Africa, have an RBD structure very similar to that of SARS-CoV-2. A coronavirus from a pangolin could possibly have been transmitted to a human, either directly or through an intermediary host such as civets or ferrets.").

That COVID-19 emerged from animal reservoirs is now such a scientific consensus that the U.S. intelligence community has also adopted that position.[27]

The human devastation resulting from this human-animal interaction is staggering. As of June 16, 2020, the U.S. death toll from COVID-19 surpassed 115,000 out of 2.1 million positive cases.[28] Early inaction by the federal government, despite international warnings, followed by months of *insufficient* action contributed to this toll. The hodgepodge of often-conflicting state, county, and city lockdowns of varying degrees could not alone sufficiently mitigate the spread of this pandemic. Indeed, this haphazard approach likely made the situation worse by eroding public trust and causing confusion. The uncertainty and anxiety caused by COVID-19's anticipated and actual impact, coupled with the real economic consequences of lockdown orders, caused broad economic disruptions, with some segments of the U.S. economy grinding to a virtual halt.

The counterfactual (i.e., COVID's effect on the U.S. had there been no lockdowns), of course, cannot be known. Under an early "worst-case scenario" model[29] — which includes estimates of how transmissible the virus is, the severity of the illness it can cause, and assumes little to no interventions taken to mitigate spread of the virus — the Centers for Disease Control and Prevention (CDC) suggested up to 210 million Americans could have become infected, with as many as 1.7 million deaths over months or even a year.[30] Although early forecasts, have not borne out in mortality rates, they appear to have *underestimated* the transmission rate — and we are by no means out of the woods.

To date, the U.S. has confirmed over 2.1 million cases, with 117,972 deaths.[31] And current CDC forecast suggests that there will likely be between 124,000 and 140,000 total reported COVID-19 deaths by July 4th.[32] On top of that, experts now worry that a subset of people who contract COVID-19 will suffer long-term health complications.[33] As testing and tracing improves, we are only beginning to get a fuller picture of the devastation.

With so much at risk, it is critical that we recognize how our current relationship with animals is *tempting fate* for the next pandemic.

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27 *See* Press Release, Intelligence Community Statement on Origins of COVID-19, Director of Nat'l Intelligence (Apr. 30, 2020), Link Here.

28 *Coronavirus Disease 2019 (COVID-19): Cases in the U.S.*, CDC, Link Here (last updated June 16, 2020).

29 Mathematical models are not intended to act as predictions, but take into account multiple variables, such as severity of illness and rate of transmission, to assist authorities in planning how best to respond to potential scenarios. *Coronavirus Disease 2019 (COVID-19): COVID-19 Pandemic Planning Scenarios*, CDC, Link Here (last updated May 20, 2020).

30 *See, e.g.*, Sheri Fink, *Worst-Case Estimates for U.S. Coronavirus Deaths*, N.Y. Times, Mar. 18, 2020, Link Here; Reid Wilson, *Worst-Case Coronavirus Models Show Massive US Toll*, The Hill (Mar. 13, 2020), Link Here.

31 *Coronavirus Resource Center: World Map,* John Hopkins U. & Med., Link Here (last visited June 18, 2020). The first confirmed case of COVID-19 in the U.S. occurred in Washington State on January 19, 2020. Michelle L. Holshue et al., *First Case of 2019 Novel Coronavirus in the United States*, 382 New Eng. J. Med. 929 (Mar. 5, 2020) Link Here.

32 *Coronavirus Disease 2019 (COVID-19): Mortality Forecasts,* CDC, Link Here (last updated June 12, 2020).

33 *See, e.g.*, Lois Parshley, *The Emerging Long-Term Complications of Covid-19, Explained*, Vox (June 12, 2020), Link Here.

2. Our Troubled Relationship with Animals Keeps Humanity at a Constant Heightened Risk for Zoonotic Outbreaks

A variety of factors contributed to the development and spread of COVID-19 and aggravate humanity's risk from further zoonotic diseases. To safeguard ourselves and future generations, we must candidly analyze the risks at hand. The common thread binding all risk factors, however, is our exploitation of both animals and the natural environment we share with them. Unfortunately, it would be impossible to catalogue every risk and misstep we have taken, but the most salient issues unquestionably include the following:

i. Modern Food Production Involves Billions of High-Risk Interactions Between Humans and Animals

No objective analysis of the COVID-19 pandemic can be performed without a serious examination of the exploitation of animals in our food system. The unprecedented globalization and industrialization of animal agriculture,[34] along with exponential increases in demand for meat and other animals products worldwide,[35] have combined to create a "pressure cooker" almost perfectly constructed to incubate and then churn out zoonotic diseases.

The animals in our food system are relentlessly stressed, confined on top of one another, forced to share space with dead and/or diseased animals, constantly sharing bodily fluids and airborne pathogens, all while being fed a steady supply of antibiotics with little state or federal governmental oversight.[36] These practices would be a recipe for disaster on even a small scale. But with up to ten billion land animals raised per year in the U.S.,[37] our animal agriculture system invites zoonotic disaster.

34 FAO, Sustainable Small-Scale Livestock Production (2020), *available at* Link Here.

35 Ritchie & Roser, *supra* note 4; Robinson & Pozzi, *supra* note 4;

36 *See* Aysha Akhtar, Animals and Public Health: Why Treating Animals Better is Critical to Human Welfare ch. 4 (2012).

37 It is estimated that over nine billion land animals are raised and killed for food every year in the U.S. Hannah Ritchie & Max Roser, *Number of Animals Slaughtered for Meat: United States*, 1961-2018, Our World in Data, Link Here (last updated Nov. 2019). Statistics for aquatic animals killed in the U.S. are kept in tonnages, not individual beings. However, it's safe to say that billions of fish and crustaceans are farmed for U.S. consumption each year. See Hannah Ritchie & Max Roser, *Seafood and Fish Production: United States*, 1961-2013, Our World in Data, Link Here (last updated 2019).

a. Live Markets

An early COVID-19 super-spreader event — where one person spread the virus to many other people — is believed to have occurred at a live market or so-called "wet market" in Wuhan, China, which offers the sale and on-site slaughter of a multitude of animals, sometimes including rare, wild animals, at its patrons' requests.[38]

The sale and on-site slaughter of a multitude of animals, sometimes including rare, wild animals, at its patrons' requests.

Consumers patronize them for both fresh meat[39] and for components of so-called traditional medicine.[40] Live markets are ubiquitous across Asia. In fact, despite an abundance of supermarkets, live markets remain the most prevalent food outlets in China.[41] Some of these markets offer both domestic and wild animals for sale and on-site slaughter, sometimes this includes endangered or threatened wild animals and animals who may never come into contact with one another in the wild.[42]

Live markets are characterized by sequestering a diversity of animals into confined areas, packing and stacking them on top of one another,[43] creating a virtual gravity well for pathogens. Apart from the glaring animal welfare issues at play, these animals are also sharing air, and often expelling their own waste upon one another.[44] The physiological stresses that animals endure from such confinement itself weakens their immune responses to pathogens and, as a consequence, they are much more likely to become vectors of disease.[45] Given the public's interactions with animals in these conditions, live markets undoubtedly increase the risk that a human will come into contact with a pathogen that ultimately results in a zoonotic disease.

38 *Origin of SARS-CoV-2, supra* note 24. Before it was closed by authorities on January 1, 2020, the Hunan Seafood Wholesale Market, also known as the Hunan Seafood Market, in Wuhan, China, included "stalls selling meats, poultry and fish, as well as more exotic fare, including live reptiles and wild game…" Chris Buckley & Steven Lee Myers, *As New Coronavirus Spread, China's Old Habits Delayed Fight,* N.Y. Times, Feb. 1, 2020, Link Here. "Reports indicate that before the Huanan market closed, vendors there sold seafood, meat, and live animals, including chickens, donkeys, sheep, pigs, foxes, badgers, bamboo rats, hedgehogs, and snakes." Aylin Woodward, *Both the New Coronavirus and SARS Outbreaks Likely Started in Chinese 'Wet Markets": Historic Photos Show What the Markets Looked Like*, Business Insider (Feb. 26, 2020), Link Here.

39 Nat'l Research Council (US) Comm. on Achieving Sustainable Global Capacity for Surveillance & Response to Emerging Diseases of Zoonotic Origin, Sustaining Global Surveillance and Response to Emerging Zoonotic Diseases 77 (Gerald T. Keutsch et al., eds., 2009), *available at* Link Here.

40 *See Why 'Wet Markets' Persisted In China Despite Disease And Hygiene Concerns*, NPR (Jan. 22, 2020), Link Here.

41 Taiyang Zhong et al., *The Impact of Proximity to Wet Markets and Supermarkets on Household Dietary Diversity in Nanjing City, China*, 10 Sustainability (2018), Link Here.

42 "The trade increases the risk of virus transmission between hosts that might not otherwise interact in nature, leading some scientists to contend that wildlife trade can exacerbate the spread of zoonoses." U.S. Congressional Research Service, *Wildlife Trade, COVID-19, and Other Zoonotic Diseases*, (IF11494; Apr. 6, 2020), Link Here; see also Dina Fine Maron, *'Wet Markets' Likely Launched the Coronavirus. Here's What You Need to Know.*, National Geographic (Apr. 15, 2020), Link Here.

43 Woodward, *supra* note 38; Buckley & Myers, supra note 38; Patrick Greenfield, Ban Wildlife Markets to Avert Pandemics, *Says UN Biodiversity Chief*, Guardian, Apr. 6, 2020, Link Here; *China: A Peek Inside Live Animal Markets*, Guardian (May 15, 2009),Link Here; Charlie Campbell, *Here's What It's Like in Wuhan, the Chinese City at the Center of the Deadly Coronavirus Outbreak*, Time Magazine, Jan. 22, 2020, Link Here.

44 Woodward, *supra* note 38; Buckley & Myers, *supra* note 43; Aria Bendix, *Everything We Know About the Pangolin — The Scaly Mammal That May Have Spread the Coronavirus to Humans*, Business Insider (Feb. 9, 2020), Link Here.

45 Frank André Maurice Tuyttens, *The Importance of Straw for Pig and Cattle Welfare: A Review*, 92 Applied Animal Behavior Sci. 261 (2005); D. Maes et al., *Herd Factors Associated with the Seroprevalences of Four Major Respiratory Pathogens in Slaughter Pigs from Farrow-To-Finish Pig Herds*, 31 Veterinary Res. 313 (2000); Clive Phillips, *Live Animals Are Stressed in Wet Markets, and Stressed Animals Are More Likely to Carry Diseases*, The Conversation (Apr. 15, 2020), Link Here.

The health of farmed animals in our food system is the "weakest link" in our global health.

Such markets also, unfortunately, exist in the U.S., though in far fewer numbers.[46] No definitive accounting has been conducted, but reports indicate that the numbers are at least in the hundreds.[47] U.S.-based live markets have already, in fact, facilitated outbreaks of zoonotic disease. For instance, the avian influenza known as H5N2, which originally triggered an outbreak in 1981, reemerged two years later in Massachusetts, New Jersey, Ohio, and Pennsylvania after it was transmitted from birds at live poultry markets in New York City.[48]

The live market in Wuhan, China, associated with the early spread of COVID-19 is known to have offered for slaughter other wild animals in addition to bats, such as snakes, beavers, porcupines, and baby crocodiles.[49] Thus, the present epidemic and all the related chaos the world is experiencing can be traced back to the continued inhumane treatment and exploitation of animals.

Given their direct contribution to the COVID-19 pandemic, the United Nations (U.N.) has recommended stricter regulations of live markets,[50] and other countries have called for global investigations of their practices.[51]

b. Factory Farming

Although not the culprit in the COVID-19 pandemic, factory farms pose a *serious* risk for outbreaks.

The infamous "Great Influenza" of 1918-19 influenza, which sickened one third of the world's population and resulted in the death of up 50 million people, sprang from domestic or wild birds.[52] And, within just the past half-century, zoonotic diseases emerging from farmed animals have sickened or killed hundreds of thousands of people. For example, both the 1997 Bird Flu (H5N1)[53] and the 2009 Swine Flu (H1N1)[54] epidemics emerged from agricultural facilities. H5N1, thought to have originally emerged from a chicken farm in China, has an estimated mortality rate of 60 percent and could have devastating effects for the human population should the virus mutate to become more easily transmissible between people.[55] H1N1 is thought to have

46 Recent research conducted by the Animal Legal Defense Fund indicates that many of the live markets identified in the U.S. to date are live bird markets.

47 *See, e.g., Live Animal "Wet Markets" in New York City Face Protests Amid Coronavirus Pandemic*, CBS News (May 9, 2020), Link Here. The Hill reported that New York City, for example, has roughly 80 wet markets, most of which are located in Brooklyn, the Bronx, and Queens. Anagha Srikanth, *America Has Dozens of Live Animal "Wet" Markets–And Joaquin Phoenix is Calling for Them to be Banned Because of Coronavirus,* The Hill (Apr. 21, 2020), Link Here. *See also Map of Known Slaughterhouses and Live Animal Markets in NYC*, Slaughter Free NYC, Link Here (last accessed June 9, 2020).

48 D.A. Senne et al., *Live Poultry Markets: A Missing Link in the Epidemiology of Avian Influenza*, in Proceedings of the 3rd International Symposium on Avian Influenza May 27-29, At 50-58 (1997).

49 *Origin of SARS-CoV-2, supra* note 24.

50 FAO, No. 17, FAO Animal Production and Health Guidelines: Biosecurity Guide for Live Poultry Markets (2015), *available at* Link Here.

51 *See, e.g., Coronavirus: Australia Urges G20 Action on Wildlife Wet Markets*, BBC (Apr. 23, 2020), Link Here.

52 Hannah Hoag, St*udy Revives Bird Origin for 1918 Flu Pandemic*, Nature (Feb. 16, 2014), Link Here; Jerry K. Taubenberger, Origin and Virulence of 1918 "Spanish" Influenza Virus, 150 Proc. Am. Phil. Soc'y 86 (2006), Link Here; Johnathan Runstadler, *Influenzas Wild Origins in the Animals Around Us*, Sci. Am. (Mar 11, 2018), Link Here; Jeffrey K. Taubenberger & David M. Morens, *1918 Influenze: The Mother of All Pandemics*, 12 Emerging Infectious Diseases 15 (2006), Link Here.

53 WHO, H5N1 Avian Influenza: Timeline of Major Events (Jan. 25, 2012), *available at* Link Here.

54 Mark Jerome Walter, *Birds, Pigs, and People: The Rise of Pandemic Flus,* Nature Pub. Group, Link Here (last visited June 18, 2020).

55 *WHO, supra note 53*. The 1997 H5N1 outbreak resulted in the deaths of six people and an estimated 1.5 million chickens and other birds. Over the next eight years, the H5N1 virus mutated, become extremely lethal, resulting in the deaths of 62 more people and the deaths of 140 million birds. *This Day in History: Avian Flu Kills Young Boy*, History, Link Here (last update May 20, 2020). When a similar strain of virus emerged in the U.S. in 2015, chicken farmers killed tens of millions of chickens to contain the outbreak, which fortunately did not spill over into the human population. Stephanie Strom, *Egg Farms Hit Hard as Bird Flu Affects Millions of Hens*, N.Y. Times, May 14, 2015, Link Here; Robert G. Wallace, *Breeding Influenza: The Political Virology of Offshore Farming*, 41 Antipode 916, 928-29 (2009), Link Here.

originated in pigs on a North Carolina factory farm, resulting in more than 200,000 infections and 18,000 deaths — including more than 250 children.[56] Earlier this year, yet another "highly pathogenic" strain of Bird Flu (H7N3), and a strain that has caused illness in humans,[57] was discovered on a turkey factory farm in South Carolina,[58] again highlighting the considerable risks factory farms pose as epicenters of disease.[59] On factory farms, thousands of genetically similar animals are packed together in unsanitary, overcrowded spaces and vulnerable to disease due to the stress placed on their immune systems by these living conditions. These conditions make factory farms an ideal environment for viruses and other pathogens to circulate, mutate, and potentially "spill over" to human populations.[60] Indeed, a 2013 report from the Food and Agriculture Organization of the U.N. noted that the health of farmed animals in our food system is the "weakest link" in our global health.[61]

Factory farms engage in many of the same risky practices as live markets, but on a scale orders of magnitude greater. Indeed, an estimated 99% of the ten billion land animals killed for food in the U.S. every year are confined in factory farms before they are slaughtered, with between 8,000 and 9,000 farms each housing over 50,000 animals at any given time.[62] For example, the average broiler house (sometimes called a "growout house") holds approximately 20,000 birds[63] at any particular moment.[64]

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56 Some researchers suggest that the 2009 H1N1 outbreak may have led to the deaths of up to 200,000 people worldwide, rather than the 18,000 typically reported, which reflects only the minority of cases that were confirmed by lab testing. Baha Gholipour, *2009 Swine Flu Death Toll 10 Times Higher than Thought*, Live Science (Nov. 26, 2013), Link Here; Brandon Keim, *Swine Flu Ancestors Born on U.S. Factory Farms*, Wired (May 1, 2009), Link Here; Sue Stirgis, *Swine Flu Genes Traces to North Carolina Hog Farm*, Facing South (May 5, 2009), Link Here. Hundreds of pigs from an infected herd were killed and, despite the World Health Organization advising the action was unnecessary because the virus was spreading through humans, an estimated 300,000 pigs were killed as a *precaution*. Link Here. Walter, *supra* note 54.

57 S. Aleina Tweed et al., *Human Illness from Avian Influenza H7N3, British Columbia*, 10 Emerging Infectious Diseases 2196 (2004), Link Here.

58 The outbreak is the first confirmed instance of highly pathogenic H7N3 in a U.S. commercial poultry facility since 2017. The strain is thought to have mutated from a less pathogenic strain that has been circulating the area recently. *USDA Confirms Highly Pathogenic H7N3 Avian Influenza in a Commercial Flock in Chesterfield County, South Carolina*, U.S. Dep't Agric. (May 13, 2020), Link Here.

59 Since 1980, the number of disease outbreaks per year has more than tripled. The drastic increase in farmed animals is thought to contribute to this considerable uptick. Walsh, *supra* note 1.

60 Factors that are likely to influence disease risks include the number of animals in a herd or flock; population structure and dynamics in the herd; number of sources and health status of incoming animals or animals they come into contact with; biosecurity practices; group sizes and animal density; housing systems; ventilation systems and air quality; sources, quality and delivery systems of feed and water; hygiene and effluent management; nutritional value of feed; weaning age; and health interventions including antibiotic use and vaccination. P. R. Davies, *One World, One Health: The Threat of Emerging Swine Diseases. A North American Perspective*, 59 Transboundary & Emerging Diseases 18, 20 (2012), Link Here.

61 "With regard to the pressures and the state of livestock and global health, this publication shows clearly that disease must be addressed at its source, particularly in animals. Livestock health is the weakest link in our global health chain, and disease drivers in livestock as well as wildlife are having increasing impacts on humans. … Livestock densities are changing, and production systems are impacting each other in new ways. Livestock-related trade is on the rise, and climate change is creating new opportunities for animal diseases to thrive. Food chain dynamics are enabling more diseases to develop more quickly, and the degradation of natural habitats is reducing natural coping mechanisms." FAO, World Livestock 2013: Changing Disease Landscapes ix (2013), *available* at Link Here.

62 Jacy R. Anthis, *US Factory Farming Estimates*, The Sentience Institute, Link Here (last updated Apr. 11, 2019).

63 "Broilers" refers to young chickens raised exclusively for meat. These animals live out their short lives (typically less than 40 days) indoors and confined to the floor. With over 60 billion individual birds slaughtered for their meat in a single year, meat from chickens and other domesticated birds raised for food is the second most popular meat worldwide, making chickens the most common farmed animal on the planet. Cherie E. Part et al., *Prevalence Rates of Health and Welfare Conditions in Broiler Chickens Change with Weather in a Temperate Climate*, 3 Royal Soc'y Open Sci., Sept. 2016, at 2, Link Here (internal citation omitted).

64 *See Animal Welfare for Broiler Chickens*, National Chicken Council, Link Here (last visited June 10, 2020).

Most producers have more than one broiler house on their farm; for instance, the average number of chickens most U.S. producers with production contracts hold is nearly 500,000 per year.[65] Factory farms and industrial animal agriculture will always result in these unnatural, crowded conditions; this conclusion cannot be denied, as the arithmetic of their business model does not allow for any other outcome.[66] The crowding of animals on factory farms can increase the transmission of certain viruses.[67]

Just as animals confined in live markets are severely stressed, so too are animals on factory farms. For example, hens in battery cages[68] cannot engage in natural behaviors such as nesting, spreading their wings, and dust bathing.[69]This causes frustration, leading to maladaptive behaviors such as birds pecking and injuring one another out of survival instinct.[70] Pigs can drop dead from the stress of being confined, sometimes labeled porcine stress syndrome.[71] Persistent, unnaturally high levels of stress are industry standard across all factory farms, and with this comes a collective weakening of animals' immune systems, making them more susceptible to pathogens, which then may get passed to humans.

Zoonotic disease transmission to humans from farmed animals may occur via direct or indirect contact or may be foodborne, waterborne, or vector-borne.[72] For farm and food workers, zoonotic diseases are an occupational disease;[73] workers can be

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65 James M. Macdonald, The Economic Organization of U.S. Broiler Production (Econ. Research Serv., Econ. Info. Bulletin No. 38, 2008), *available at* Link Here.

66 The true cost of factory farmed products isn't reflected in their prices at the store. Factory farms externalize their true costs – extreme confinement and other forms of animal cruelty, worker safety, air and water pollution, soil contamination, food safety threats, diet-related disease, antibiotic resistance, pesticide toxicity, processing and shipping, use of finite resources like petroleum, loss of biodiversity, and the economic decline and public health outcomes in proximal communities. Industrial agriculture would not be profitable and could not produce food so cheap if agribusiness and food corporations had to factor these externalized costs into their prices. For example, a 2005 study estimated that the price of the US's reliance on pesticides equals approximately $10 billion in environmental and societal costs. The agriculture industry would look quite different if pesticide companies and users were responsible for paying this sum. *See* David Pimentel, *Environmental and Economic Costs of the Application of Pesticides Primarily in the United States*, 7 Env't, Dev. & Sustainability 229 (2005), Link Here; Nicole E. Negowetti, *Exposing the Invisible Costs of Commercial Agriculture: Shaping Policies with True Costs Accounting to Create a Sustainable Food Future*, 51 Val. U. L. Rev. 447 (2017), Link Here.

67 Roberto A. Saenz et al., *Confined Animal Feeding Operations as Amplifiers of Influenza*, 6 Vector Borne and Zoonotic Diseases 338 (2006), Link Here.

68 Battery cages are the small wire cages that are the current industry standard for housing egg-laying hens, in which hens are crowded together so tightly they can barely move. In commercial operations, birds are typically housed at a density of 7 to 8 birds per cage. These systems severely inhibit birds' natural behaviors such as dust-bathing, nesting, and foraging; they also restrict birds' comfort behaviors such as wing flapping and stretching. H. Mollenhorst et al., *On-Farm Assessment of Laying Hen Welfare: A Comparison of One Environment-Based and Two Animal-Based Methods*, 90 Applied Animal Behav. Sci. 277 (2005); M.J. Albentosa, *Effects of Cage Height and Stocking Density on the Frequency of Comfort Behaviours Performed by Laying Hens Housed in Furnished Cages*, 13 Animal Welfare 419 (2004).

69 Ian J.H. Duncan, T*he Pros and Cons of Cages*, 57 World's Poultry Sci. J. 381, 385 (2001).

70 Karen Davis, Prisoned Chickens Poisoned Eggs: An Inside Look at the Modern Poultry Industry 67 (1996).

71 *See, e.g.*, Lauren Orrico, *Squashing the Superbugs: A Proposed Multifaceted Approach to Combatting Antibiotic-Resistant Bacteria*, 27 J.L. & HEALTH 259, 270 n. 95 (2014) (discussing that "pigs are kept in small confinement crates and can drop dead from the stress of being confined" known as "porcine stress syndrome.")

72 As defined by the CDC, direct contact means, "Coming into contact with the saliva, blood, urine, mucous, feces, or other body fluids of an infected animal. Examples include petting or touching animals, and bites or scratches." Indirect contact is "[c]oming into contact with areas where animals live and roam, or objects or surfaces that have been contaminated with germs. Examples include aquarium tank water, pet habitats, chicken coops, barns, plants, and soil, as well as pet food and water dishes." Vector-borne diseases result from "[b]eing bitten by a tick, or an insect like a mosquito or a flea." About foodborne diseases, the CDC says, "Each year, 1 in 6 Americans get sick from eating contaminated food. Eating or drinking something unsafe, such as unpasteurized (raw) milk, undercooked meat or eggs, or raw fruits and vegetables that are contaminated with feces from an infected animal. Contaminated food can cause illness in people and animals, including pets." Waterborne diseases result from "[d] rinking or coming in contact with water that has been contaminated with feces from an infected animal." *Zoonotic Diseases, supra* note 9.

73 An illness that occurs as a result of one's profession that puts the person at an increased risk than the general population.

exposed *throughout* the supply chain. For example, a person may be exposed through close contact or handling of infected animals or their bodily fluids (direct contact) or by coming into contact with contaminated surfaces where infected animals lived or traveled (indirect contact), including drinking (waterborne) or coming into contact with water contaminated with feces from infected animals and inhaling pathogenic droplets or particles (airborne). In particular, infections with zoonotic disease occur at slaughter, when people handle potentially infected meat and other bodily fluids.[74]

Animals at factory farms can serve as an "amplifier host"[75] of infectious agents and people in close contact with them (i.e. workers) can serve as a "bridge population"[76] for disease. For example, occupational exposure to pigs has been shown to increase the risk of swine influenza virus infection in humans.[77]

Additionally, factory farms contribute to human disease through the food they produce (e.g. meat, milk, eggs, and fish) as well as the crop fields they contaminate (e.g. vegetables grown in fields with contaminated manure from factory farms).[78]

The CDC estimates that, annually, roughly 48 million people in the U.S. become ill from a foodborne pathogen acquired within its borders[79] and that 45% of foodborne diseases that result in hospitalization come from meat and dairy foods.[80] The U.S. Department of Agriculture (USDA) Economic Research Service estimates the economic burden of major foodborne illnesses acquired in the U.S. is approximately $15.5 billion annually.[81] These major foodborne illnesses include, for example, Campylobacter originating from poultry[82] and Salmonella originating from cows and chickens.[83]

74 Kristina Roesel & Reinhard Fries, *Occupational Disease Risks for Handlers of Pigs and Pork*, Pig33.Com (Apr. 20, 2018), Link Here.

75 An amplifier host is one in which infectious agents multiply rapidly to high levels, providing an important source of infection for vectors in vector-borne diseases. "For the many viruses shared by wildlife and domestic animals, domesticated species play a critical role in facilitating direct contact with people, as well as amplification of disease transmission in intensive animal production facilities." Christine Kreuder Johnson et al., *Spillover and Pandemic Properties of Zoonotic Viruses with High Host Plasticity*, 5 Scientific Rep. (Oct. 7, 2015), Link Here.

76 "Bridge hosts provide a link through which pathogens can be transmitted from maintenance host populations or communities to receptive populations that people want to protect (i.e., target hosts)... Bridge hosts can be particularly important for understanding and managing infectious disease dynamics in multi-host systems at wildlife/domestic/human interfaces, including emerging infections." Alexandre Caron et al., *Bridge Hosts, a Missing Link for Disease Ecology in Multi-Host Systems*, 46 Veterinary Research, Jul. 21, 2015, Link Here; *see also* Saenz, *supra* note 67.

77 Kendall P. Myers, et al., *Are Swine Workers in the United States at Increased Risk of Infection with Zoonotic Influenza Virus?*, 42 Clinical Infectious Diseases (Jan. 1, 2006), at 14, Link Here Christopher W. Olsen et al., *Serologic Evidence of H1 Swine Influenza Virus Infection in Swine Farm Residents and Employees*, 8 Emerging Infectious Disease 814 (2002), Link Here.

78 Colin G. Scanes. Animals and Human Society 331-54, 427-49 (2018), *available at* Link Here.

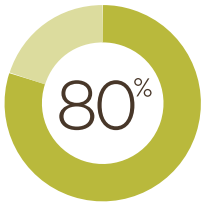
79 Sandra Hoffmann Et Al., Economic Burden of Major Foodborne Illnesses Acquired in the United States 2 (2015), *available at* Link Here.

80 Scanes, *supra* note 78.

81 *See generally id*.

82 *Campylobacter*, CDC, Link Here (last visited Apr. 9, 2020).

83 Imperial College London, *How Salmonella Bacteria Contaminate Salad Leaves*, ScienceDaily (Sept. 5, 2008), Link Here.



OF THE ANTIBIOTICS PRODUCED ARE FED TO FARMED ANIMALS

2.8 million people suffer from antibiotic-resistant infections annually in the U.S., with 35,000 mortalities each.

Given that factory farms are almost the perfect pathogen conveyor belt, producers are compelled to continually feed animals antibiotics, as preventative disease treatment is the only practical way to prevent a mass sickness.[84] In fact, in the U.S. and many other countries, up to 80% of the antibiotics produced are fed to farmed animals to treat disease as well as promote growth.[85] *But this practice is a time bomb.* Prior to the advent of antibiotics, people routinely died from infections a modern human would not concern themselves over. Yet, it is now well established that modern animal agriculture's abuse of antibiotics fosters new antibiotic-resistant diseases for which humans will eventually have no defense. According to the World Health Organization (WHO), "[w]ithout urgent action, we are heading for a post-antibiotic era, in which common infections and minor injuries can once again kill."[86] The CDC concurs, stating that antimicrobial resistance is one of the biggest public health challenges of our time.[87] Today, at least 2.8 million people suffer from antibiotic-resistant infections annually in the U.S., with 35,000 mortalities each year.[88]

For example, antimicrobial drug resistance occurs frequently in zoonotic salmonellae and is largely promoted by using antimicrobial drugs in animals farmed for food.[89] S. Typhimurium DT104, a zoonotic salmonella found in poultry, pigs, and sheep, is commonly resistant to five drugs. S. Typhimurium DT104 was first isolated in the early 1980s in the United Kingdom in cattle.[90] Throughout the 1990s, it spread to other parts of the world and is now a common Salmonella type in many countries, including the U.S., the United Kingdom, Germany, and France, in a host of animals bred for food. So drastic is the threat of antibiotic-resistant bacteria that the WHO is now recommending that farmers and the food industry *stop* routinely using antibiotics to promote growth and prevent disease in healthy animals.[91]

The widespread, routine use of antibiotics is also among the myriad concerns with using manure as fertilizer.[92] Antibiotic-resistant bacteria arising from the pathogenic crucible of factory farms can be readily spread via animal manure.There are over 150 pathogens in manure which impact human health and pathogens on factory farms *mainly* arise in animal manure. [93] This matters because individual factory farms can, *and do*, produce millions of tons of waste per year — *more waste than major*

84 Orrico, *supra* note 71, at 263.

85 Awa Aidara-Kane et al., *World Health Organization (WHO) Guidelines on Use of Medically Important Antimicrobials in Food-Producing Animals*, 7 Antimicrobial Resistance & Infection Control, Jan. 17, 2018, Link Here; Alan M. Goldberg, *Farm Animal Welfare and Human Health*, 3 Current Envt'l Health Reps. 313, 319 tbl. 4 (2016), Link Here.

86 *Antibiotic Resistance*, WHO (Feb. 5, 2018), Link Here.

87 *Antibiotic/Antimicrobial Resistance*, CDC, Link Here (last visited Apr. 9, 2020).

88 *Id.*; *Stop Using Antibiotics in Healthy Animals to Prevent the Spread of Antibiotic Resistance*, WHO (Nov. 7, 2017), Link Here (identified as a public the World Health Organization, "over-use and misuse of antibiotics in animals and humans is contributing to the rising threat of antibiotic resistance." In some countries, as much as 80% of total consumption of medically important antibiotics occurs in animal agriculture, mostly for growth promotion.).

89 M. Helms et al., *International Salmonella Typhimurium DT104 Infections, 1992–2001*, 11 Emerging Infectious Diseases 859 (2005), Link Here.

90 *Id.*

91 *Stop Using Antibiotics in Healthy Animals to Prevent the Spread of Antibiotic Resistance, supra* note 88.

92 Carl Wepking, et al., *Prolonged Exposure to Manure from Livestock Administered Antibiotics Decreases Ecosystem Carbon Use Efficiency and Alters Nitrogen Cycling*, 22 Ecology Letters 2067 (2019).

93 Carrie Hribar, Understanding Concentrated Animal Feeding Operations and their Impact on Communities 8 (2010), *available at* Link Here.

American cities.[94] This routinely leads to zoonotic events; for example, Salmonella and E. coli O157, a strain of E. coli that can cause serious sickness in humans, can spread to vegetables when they are fertilized with contaminated manure; irrigated with contaminated water; or if they come into contact with contaminated products during cutting, washing, packing, or other preparation processes.[95] In December 2019, people across 27 states became ill from E. coli sourced from ranches downslope from cattle grazing pastures.[96] In 2018, another E. coli outbreak, traced again to lettuce tainted by a nearby cattle lot, killed at least five people and affected 200 others.[97] Like overcrowding, the production of manure from factory farms cannot be avoided — nor can the attendant risk of zoonotic disease.

It must also be noted that, along with the manure, pathogen runoff from factory farms can permeate water supplies, leading to bacterial contamination of rivers and streams, which may impact fish and wildlife.[98] These pathogens include fecal coliforms and Streptococcus, Campylobacter, Giardia, Cryptosporidium and, again, E. coli. There is also evidence that even viruses can migrate from factory farms to water sources.[99]

In short, although COVID-19 might not be linked directly to factory farming, these systems are so inherently combustible that we can no longer justifiably maintain them. We simply cannot risk civilization over a cheeseburger.

ii. Wildlife Trade

The global trade in wildlife is measured in the billions, perhaps as high as $300 billion,[100] and the global black market trade in wildlife is as high as $23 billion.[101] While the drivers of the trade include demand for private possession as "exotic pets," bushmeat,[102] and décor or trinkets, derived from animal parts such as ivory, it is largely driven by demand for traditional medicine in China and Southeast Asia.[103] Tackling unfalsifiable beliefs regarding the efficacy of wild animal parts in treating disease might be the most durable challenge we face in reducing the wildlife trade.

94 *Id*. at 2 ("Large farms can produce more waste than some U.S. cities — a feeding operation with 800,000 pigs could produce over 1.6 million tons of waste a year. That amount is one and a half times more than the annual sanitary waste produced by the city of Philadelphia, Pennsylvania." Philadelphia is the sixth largest U.S. city).

95 *See, e.g.*, Imperial College London, *supra* note 83.

96 *Cows Linked to E. Coli Lettuce Outbreaks that Sickened Nearly 200*, CBS (May 22, 2020), Link Here.

97 *Id*.

98 EPA, No. EPA 820-R-13-002, Literature Review of Contaminants in Livestock and Poultry Manure and Implications for Water Quality (2013), *available at* Link Here.

99 *Id*.

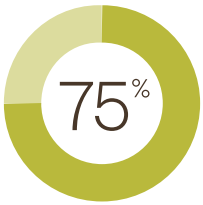
100 K.M. Smith et al., *Summarizing US Wildlife Trade with an Eye Toward Assessing the Risk of Infectious Disease Introduction*, 14 EcoHealth, Feb. 7, 2017, at 29, Link Here.

101 *See, e.g.*, Simon Worrall, *Inside the Disturbing World of Illegal Wildlife Trade*, National Geographic (Nov. 9, 2018), Link Here.

102 See Lindahl & Grace, *supra* note 13, at 10. ("The habits of bushmeat consumption are known risk factors for disease transmission…The handling and trade with bushmeat includes direct contact of multiple people in the value chain with the pathogens of the wild animals and the products are brought to an increasing urban market where outbreaks can be caused…").

103 *Id*.

Wild animals are also traded for entertainment purposes for photography props, zoos, and private possession. For example, from 2005 to 2007, approximately 22,000 great apes were captured and sold, or killed, and in many cases these acts served these purposes.[104]



OF EARTH'S LAND AREAS HAVE ALREADY BEEN HEAVILY TRANSFORMED BY HUMAN ACTIVITY AND SPECIES ARE PRESENTLY GOING EXTINCT AT APPROXIMATELY 1,000 TIMES THE NATURAL RATE

The most significant point, however, is that, regardless of the particular purpose for which a particular animal is trafficked, the legal and illicit trade in wildlife poses significant risks to human health. In fact, outbreaks linked to wildlife trafficking and consumption of wild animals already include HIV, SARS, and Ebola.[105] Being that this trade necessarily requires human interaction with millions of wild animals carrying unknown pathogens, it is only a matter of time until something else spills over — and that may spark the next global pandemic.

iii. Habitat Loss and Human Encroachment

Other major, and increasingly important, factors contributing to the rising global risk from zoonoses are habitat destruction, biodiversity loss, and humanity's attendant encroachment on wildlands. The relevant figures are jarring: 75% of Earth's land areas have already been heavily transformed by human activity[106] and species are presently going extinct at approximately 1,000 times the natural rate.[107]

Scientists now agree habitat loss is positively correlated with increased zoonotic disease[108] because, among other reasons, humans are living closer to previously separated animal populations.[109] Moreover, it is also the case that high biodiversity actually protects human health through what is called the Dilution Effect.[110] This is because high biodiversity reduces the risk of zoonotic disease, buffering against its transmission to humans by: (1) lowering the population density of natural reservoirs for pathogens; (2) reducing the population density of arthropod vectors for pathogens; and (3) reducing encounter rates between vectors and reservoirs or among reservoirs.[111]

Because habitat loss, human encroachment on natural areas, and biodiversity loss collectively operate at all times, constantly raising the likelihood that humans will encounter and contract new zoonoses, any policy prescription to stave off future pandemics must account for those issues.

104 Stolen Apes – The Illicit Trade in Chimpanzees, Gorillas, Bonobos and Orangutans: A Rapid Response Assessment (D. Stiles, et al. eds., 2013), *available at* Link Here.

105 Vanda Felbab-Brown & Bradley S. Porter, *The Global Poaching Vortex*, The Brookings Institution (Mar. 2, 2016), Link Here; William B. Karesh et al., *Wildlife Trade and Global Disease Emergence*, 11 Emerging Infectious Diseases 1000 (2005), *available at* Link Here.

106 Betsy Mason, *Maps Show Humans' Growing Impact on the Planet*, National Geographic (Aug. 23 2016), Link Here.

107 S. L. Pimm et al., *The Biodiversity of Species and their Rates of Extinction, Distribution, and Protection*, 344 Science 987 (2014), Link Here.

108 Sarah Zohdy, et al., *The Coevolution Effect as a Driver of Spillover*, 35 Trends Parasitology 399 (2019).

109 *See, e.g.*, John Vidal, *Destruction of Habitat and Loss of Biodiversity Are Creating the Perfect Conditions for Diseases like COVID-19 to Emerge*, ENSIA (Mar. 17, 2020), Link Here.

110 "The 'dilution effect' implies that where species vary in susceptibility to infection by a pathogen, higher diversity often leads to lower infection prevalence in hosts. For directly transmitted pathogens, non-host species may "dilute" infection directly (1) and indirectly (2)." Hussein Khalil et al., *Declining Ecosystem Health and the Dilution Effect*, 6 Sci. Rep., 2016, Link Here.

111 R.S. Ostfeld, *Biodiversity Loss and the Rise of Zoonotic Pathogens*, 15 Clinical Microbiology & Infection 40 (2009), Link Here.

iv. Climate Change

Climate change also facilitates an acceleration of zoonotic disease.[112] Scientists have known this for quite some time.[113] For example, higher land temperatures increase the activity of arthropods, including mosquitoes, which are known to carry diseases such as West Nile Fever.[114] Higher land temperatures also increase rodent populations, sometimes driving them closer to human enclaves. Pathogens from these animals are then passed down the chain to other animals repeatedly, until they reach a human.

Similarly, higher ocean temperatures lead to rising sea levels and, in turn, greater coastal flooding with increased risk for waterborne zoonoses. It also brings greater rainfall in certain areas, causing additional increases in mosquitos and other vectors.[115] Again, the pathogens eventually will reach a human.

v. Recent Regulatory Obstruction

The U.S. is further clearing the road for future pandemics by rolling back some of our bedrock environmental laws. Since 2016, the executive branch has removed or diluted at least 64 environmental regulations, with many more anticipated.[116] These rollbacks include at least 19 deregulations of greenhouse gas emissions and air pollution, further aggravating the effects of climate change on zoonoses. The rollbacks also include 11 deregulations of drilling and mining, including opening up previously protected areas in Alaska, further reducing the buffer between wild animals and humans.

While it is unclear how deleterious these rollbacks will be with respect to zoonotic disease, they will all but certainly act as some type of accelerant.

112 Preneshni R. Naicker, *The Impact of Climate Change and Other Factors on Zoonotic Diseases*, 2 Archives Clinical Microbiology, 2011, Link Here.

113 *Climate Change and Human Health - Risks and Responses: Summary*, WHO, Link Here (last visited May 27, 2020).

114 Naicker, *supra* note 112.

115 *Id.*

116 Nadja Popovich, et al., *The Trump Administration Is Reversing Nearly 100 Environmental Rules*, N.Y. Times, May 20, 2020, Link Here.

D. U.S. LAWS ARE POORLY CALIBRATED TO DEAL WITH THE INCREASING THREATS OF ZOONOTIC DISEASE

Although the U.S. has laws and agencies tasked with identifying and reacting to zoonotic disease, there is woefully inadequate attention given to *prevention*. Our policies appear to reflect willful ignorance of the looming threat from outbreaks posed by industrial-scale animal exploitation and climate change. Addressing the ongoing risks from factory farming, environmental degradation, and climate change is essential for protecting both the health and the security of our nation. While COVID-19 is a public health and economic disaster, it by no means represents a worst-case scenario. How would the U.S. react, for example, if a variant of avian influenza with a 60% mortality rate mutated and became more communicable?

1. U.S. Laws and Regulatory Oversight of Zoonoses

Existing U.S. laws aimed at managing zoonotic diseases are regulated by the USDA and the Department of Health and Human Services. The Secretary of Agriculture, the Director of the CDC, and the Commissioner of the Food and Drug Administration (FDA) have been granted authority by Congress to surveil, and coordinate their surveillance of, zoonotic diseases.[117]

With respect to U.S. statutory schemes, the Federal Meat Inspection Act,[118] the Poultry Products Inspection Act,[119] and the Egg Products Inspection Act[120] each attempt to manage various zoonoses, although this is but one of multiple purposes. The Food Safety and Inspection Service Agency (FSIS) administers these statutes, removing adulterated food from commerce to ensure that the products are safe and sanitary for human consumption domestically and internationally.[121]

FSIS partners with the FDA for safety inspections and examinations of other animal products such as fish.[122] FSIS also developed the Public Health Information System to document and trace recalls of foodborne illness clusters and outbreaks of contaminated foods.[123] In addition, FSIS partners with the Animal and Plant Health Inspection Service to monitor and manage existing agricultural diseases and discover the root causes of foodborne illnesses.[124]

117 7 U.S.C. § 8319 (2018).
118 21 U.S.C. §§ 601-695.
119 *Id.* §§ 451-472.
120 *Id.* §§ 1031-1056.
121 *See generally id.* §§ 601(m), 603-620; 9 C.F.R. § 301.2 (2020).
122 Memorandum of Understanding, FSIS- FDA, Apr. 30, 2014, Link Here.
123 *Topics: Inspection*, USDA, Link Here (last visited May 27, 2020).
124 Memorandum of Understanding, FSIS-APHIS, Apr. 21, 2014, Link Here.

The CDC regulates zoonoses through their National Center for Emerging and Zoonotic Infectious Diseases.[125] The CDC also has the power to issue quarantines to stop the spread of communicable diseases (including zoonoses) as well as promulgate regulations for same.[126] CDC and FSIS further partner to run the Foodborne Diseases Active Surveillance Network, which monitors various foodborne illnesses, including some zoonoses.[127]

These laws demonstrate a U.S. policy of reaction only.

Given that none of these regulatory strategies actually deal with the main causes of zoonotic disease (such as factory farming, diet, habitat loss, and climate change), they are, at best, stopgaps. These laws demonstrate a U.S. policy of reaction only. This policy failed us with respect to COVID-19, as none of these laws were set up to detect its arrival until it had already broken loose in the U.S., and by that moment, it was too late.

2. The U.S. Response to COVID-19 Goes Beyond Severely Deficient — to Counterproductive

An objective assessment of the U.S. response to COVID-19 would deem the response woefully inadequate. The response was slow and policymakers have, paradoxically, doubled down on some of the very behaviors that keep the U.S. population at elevated risk.

a. Positive Actions

On April 14, 2020, the U.S. House of Representatives introduced a resolution for all nations to permanently close live markets where wildlife are sold.[128] Congress further resolved that the WHO should encourage all member states to close such markets around the world.[129] The U.S. House of Representatives also introduced the "HEROES Act," in which they appropriated $21 million to the U.S. Fish and Wildlife Services to fund surveillance of zoonotic disease and to assist foreign countries to end the trade of wildlife presenting health risks to humans.[130] Additionally, the funds must also be used to establish a list of wildlife species that could pose a biohazard risk to human health.[131]

The HEROES Act also proposes an amendment to existing law imposing fines and up to six months of imprisonment for any person who imports, ships, or transports a species that can cause diseases in humans, or risks injury to U.S. agriculture.[132] The Act also includes funds earmarked to establish a national database at the National Wildlife Health Center for diagnostic tests of potential zoonotic diseases, public outreach with respect to same, and strategies to mitigate zoonotic threats.[133]

These few positive examples are largely overshadowed, if not completely derailed, by much of the U.S.'s remaining response to COVID-19.

125 *See National Center for Emerging and Zoonotic Infectious Diseases*, CDC, Link Here (last visited May 27, 2020).

126 42 U.S.C. §§ 264-272 (2018).

127 *See Foodborne Diseases Active Surveillance Network (Foodnet),* CDC, Link Here (last visited May 27, 2020).

128 H.R. Res. 922, 116th Cong. (2020), *available at* Link Here.

129 *Id.* On April 16, 2020, WHO's Director-General, Dr. Tedros Adhanom Ghebreyesus, stated that WHO believes governments should rigorously enforce bans on the sale of wildlife and should establish a strong regulatory system to enforce the highest standards of cleanliness, hygiene, and safety for food. *WHO Director-General's Opening Remarks at the Mission Briefing on COVID-19*, WHO (Apr. 16, 2020), Link Here.

130 Wildborne Disease Prevention Act of 2020, H.R. 6800, 116th Cong. § 190402 (2020), Link Here.

131 *Id.*

132 *Id.* § 190403.

133 *Id.* § 190404.

b. Negative Actions

Even presumably well-intentioned actions compound the myriad existing factors contributing to our risk from zoonotic disease. For example, the recent $2 trillion stimulus package, known as the CARES Act,[134] signals even more fidelity to the same animal exploitation practices that create and exacerbate the risk of zoonotic disease. In 2018, the President signed into law the Agriculture Improvement Act, the current version of what is also known as the "Farm Bill."[135] The previous version that was passed into law in 2014 made a significant, long-awaited change in agricultural policy by ending direct subsidies to agricultural producers, instead focusing on commodity and crop insurance programs, and financially assisting agricultural producers only when they actually need it.[136] Unfortunately, the CARES Act now provides direct, rather than indirect, assistance to industrial animal agriculture, allocating $9.5 billion for "support for agricultural producers…of specialty crops, producers that supply local food systems, including farmers markets, restaurants, and schools, *and livestock producers, including dairy producers*."[137] The Act provides direct assistance to the actors most likely to engage in intensive confinement and antibiotic misuse in animals, thus increasing the risk of future zoonoses.

The CARES Act also provides another $14 billion to fund the Farm Bill's various safety nets for commodity production,[138] such as, among others, the Dairy Margin Coverage Act, Agricultural Risk Program, Price Loss Coverage Program, and Marketing Assistance Loans,[139] which themselves subsidize factory farms by enabling lower-cost meat and dairy production.[140] The CARES Act also provides $3 million to the USDA's Farm Service Agency, which administers these subsidies for factory farms, so it has more funds to pay its staff.[141]

134 CARES is an acronym for the "Coronavirus Aid, Relief, and Economic Security Act." H.R. 748, 116th Cong. (enacted as Pub. L. No. 116-136, Mar. 27, 2020), *available at* Link Here.

135 The "Farm Bill" is a piece of omnibus agricultural legislation that is renewed every five years. Congressional Research Service, No. RS22331, What is the Farm Bill? (2019), *available at* 2020, Link Here (last visited June 10, 2020).

136 *Farm Bill Ends Direct Payment Subsidies*, U.S. Senate Committee on Agric., Nutrition, & Forestry (Jan. 28, 2014), Link Here.

137 *See* H.R. 748, 116th Cong. div. B, tit. I (emphasis added).

138 *Id.* § 11002. Funds for these programs are distributed through the USDA's Commodity Credit Corporation (CCC).

139 *Commodity Credit Corporation,* USDA, Link Here (last visited Apr. 9, 2020).

140 "[T]he handful of farmers who consistently harvest the most greenbacks from crop subsidies, research shows, are livestock producers. The reason: corn and soybeans are the main items on the menus for livestock, accounting for the majority of feed ingredients in factory farms (where virtually all [U.S.] farm animals are raised). This makes factory farms the biggest consumers of these subsidized commodities, and they buy most of the corn and soybeans grown in the United States." David Robinson Simon, Meatonomics: How The Rigged Economics Of Meat And Dairy Make You Consume Too Much — And How To Eat Better, Live Longer, And Spend Smarter 81 (2013).

141 *Farm Service Agency*, USDA, Link Here (last visited April 9, 2020); *see also Farm Service Agency History and Mission*, USDA, Link Here (last visited Apr. 9, 2020).

In propping up these bad actors, the U.S. has done virtually nothing to assist the farm workers exploited by these systems,[142] nor addressed the disproportionate economic and social impacts the virus is having on marginalized groups,[143] nor facilitated a transition to lower-risk systems of animal agriculture[144] (e.g. pasture-raised)[145] or low-risk foods[146] (i.e. plant-based foods[147] or cultivated meats).[148]

Finally, on April 28, 2020, President Trump signed Executive Order 13917, which granted the Secretary of Agriculture authority to use the Defense Production Act of 1950 to ensure that meat and poultry processors continue operations during the pandemic and to use any funds from the treasury to accomplish that goal.

Despite their inherent dangers, the U.S. government remains committed to, and has fortified with economic stimulus funding, the very practices most likely to usher in the next pandemic, while simultaneously ignoring the welfare of almost all of the human and animal victims of those practices.

142 Already, during this pandemic, thousands of U.S. workers have tested positive for COVID-19, including more than 29,300 meatpacking workers, 1,900 food processing workers, and 2,200 farm workers, and nearly 100 have died. (Meatpacking facilities typically slaughter animals as well as process, package, and distribute meat; Food processing facilities transform agricultural into food (e.g. grinding grain for flour, butchering animals for meat, homogenizing and pasteurizing milk, etc.).) Leah Douglas, *Mapping Covid-19 Outbreaks in the Food System*, Food & Env't Reporting Network (June 11, 2020), Link Here. See also Liz Crampton, *In Absence of Federal Action, Farm Workers' Coronavirus Cases Spike*, Politico (June 9, 2020), Link Here.

143 Neeta Kantamneni, *The Impact of the COVID-19 Pandemic on Marginalized Populations in the United States: A Research Agenda*, 119 J. Vocational Behavior, June 2020, Link Here.

144 Crowding thousands of animals together in often unsanitary cages, where they are unable to exhibit their natural behaviors — including simply standing up or turning around — stresses animals' immune systems and leaves them particularly vulnerable to disease. Alternative systems with lower stocking densities typically better enable animals to engage in these natural behaviors. For example, cage-free systems for egg-laying hens and group housing systems for breeding pigs and calves raised for veal allow the animals to stand up, turn around, and lie down — behaviors they are unable to perform in intensive confinement (i.e. battery cages, gestation crates, or veal crates, respectively). Systems that allow animals to spend time outdoors (e.g. pasture-raised) typically allow the animals to exercise and exhibit natural behaviors like foraging, which can improve animal health — making them less vulnerable to disease.

145 Pasture-raised is typically understood to mean the animals have had continuous, free access to the outdoors throughout their usual grow-out period — a stage in which the animals are "growing" to reach their market weight. However, the USDA allows producers to self-define the pasture-raised claim; there is no regulatory or policy guidance from the USDA or FDA regarding the term.

146 A shift to plant-based foods — including plant-based meats — and cultivated meats can help protect against zoonotic disease by removing or decreasing humans' interactions with farmed animals.

147 Plant-based foods come entirely from plants; they contain no animal products or byproducts, including meat, poultry, fish, dairy, or eggs. Plant-based meat, eggs, and dairy are, as the name suggests, derived from plants.

148 Cultivated meat — also referred to as slaughter-free meat or cell-based meat — is produced from animals' cells, with no slaughter involved.

E. POLICYMAKERS MUST ADDRESS ONGOING RISKS OF ZOONOTIC DISEASE

A comprehensive assessment of the U.S. response to COVID-19 thus far concludes we failed. Fortuitously, however, despite its massive and tragic impact, COVID-19 (in its present form) does not amount to the type of event that will *deconstruct* civilization as we know it. But among the millions of undiscovered zoonotic diseases, there are likely several with the potential to do just that.[149] In fact, we should be preparing for the equivalent of avian flu known as H5N1, with its 60% fatality rate, to become highly contagious — or worse, Ebola, which at times has a 90% fatality rate. While it is comforting to ignore these risks, and in fact humanity might be hardwired to give such risks less weight than they are due,[150] we fail to face them at our peril.

Moving forward, to protect against the risk of novel zoonotic diseases, including the next global pandemic, our policymakers must address at least the following issues:

1. Animal Exploitation

Moving forward, the main focus of any sensible national policy to mitigate zoonotic disease risk, and the next pandemic, must be to drastically reduce animal exploitation. Our relationship with animals needs a complete overhaul, requiring reorganization from the ground up. Nearly every aspect of our global animal-based food system, whether it be factory farming, wildlife trafficking, live markets, or otherwise, needs reform ranging from novel and effective regulation to complete proscription and abandonment.

In short, any industry or practice that involves human interaction with confined animals, especially those in close proximity to one another, must be addressed if the U.S. truly wants to meaningfully reduce its risk from zoonotic diseases and the next global pandemic.

2. Access to Safe and Plant-Focused Food

Policymakers must pivot to incentivizing sustainable plant-based foods, which remove human-animal interaction entirely, as well as alternative proteins.

Currently, the federal government propagates zoonotic disease transmission through subsidizing production of high-risk foods at the behest of politically connected, agribusiness special interest groups and producers. For example, the 2018 Farm Bill illustrates how federal subsidies incentivize an assembly line of disease transmission.[151]

149 *See, e.g.*, Katherine J. Wu, *There Are More Viruses Than Stars in the Universe: Why Do Only Some Infect Us?,* National Geographic (Apr. 15, 2020), Link Here.

150 Humans are subject to an Optimism Bias, which "is the human tendency to discount bad news. For instance, highlighting previously unknown risk factors for diseases is surprisingly ineffective at altering an individual's perception of their medical vulnerability. … On the other hand, when people are informed that they are less at risk for encountering adverse events (e.g., car accidents or a sport injury) than they previously thought, they will alter their beliefs appropriately." Christina Moutsiana et al., *Human Development of the Ability to Learn from Bad News*, 110 Proc. Nat'l Acad. Sci. 16,396, 16,396 (2013).

151 Agricultural Improvement Act of 2018, Pub. L. 115-334, 132 Stat. 4490.

We must redirect federal funds from industrialized animal agriculture to low-risk plant-centered agriculture.

Remaining in effect until 2023, the 2018 Farm Bill provides $428 billion in funding inapposite to our interests in preventing zoonotic disease. The Congressional Budget Office estimates that, over this time period, $28 billion of those funds will go towards subsidizing producers with guaranteed returns on specific commodities[152] through the Agriculture Risk Coverage[153] and Price Loss Coverage[154] programs. Because the government protects producers of animal feed against financial loss,[155] it encourages high-risk food by enabling lower-cost meat production.[156]

The U.S. similarly incentivizes dairy production by guaranteeing minimum prices for producers and handlers[157] and, in some instances, the ultimate purchase of their products. For example, in 2019 the Farm Bill set aside $9 billion to purchase milk under the Milk Donation Program.[158] Like meat production, dairy production carries with it a heightened risk of zoonotic disease.[159]

Production and procurement of high-risk, animal-based foods are further incentivized through multiple "nutrition" programs, accounting for 76% of 2018 Farm Bill allocations, and totaling approximately $326 billion.[160] These programs subsidize the ultimate purchase of animal products, ensuring that the current factory farming system continues.

To properly contain the proliferation of zoonotic disease, we cannot simply monitor a high-risk food system; we must shift our food production from high-risk to lower- or low-risk production. In other words, we must redirect federal funds from industrialized animal agriculture to low-risk plant-centered agriculture, as well as provide funding to assist farmers with the transition from animal to plant-based agriculture.[161]

152 "The term 'covered commodity' means wheat, oats, and barley (including wheat, oats, and barley used for haying and grazing), corn, grain sorghum, long grain rice, medium grain rice, pulse crops, soybeans, other oilseeds, and peanuts." 7 U.S.C. § 9011(6) (2018).

153 *Id.* § 9017.

154 *Id.* § 9016.

155 The 2018 Farm Bill provides no direct assistance to livestock producers. It nevertheless does provide programs to insure some producers against losses of livestock due to natural disasters. *See id.* § 9081.

156 "[T]he handful of farmers who consistently harvest the most greenbacks from crop subsidies, research shows, are livestock producers. The reason: corn and soybeans are the main items on the menus for livestock, accounting for the majority of feed ingredients in factory farms (where virtually all [U.S.] farm animals are raised). This makes factory farms the biggest consumers of these subsidized commodities, and they buy most of the corn and soybeans grown in the United States." Simon, *supra* note 140.

157 *See* 7 U.S.C. §§ 602, 608c.

158 *Id.* § 608c. This section of the Agricultural Marketing Agreement Act allows Federal Milk Marketing Orders aimed at stabilizing milk pricing and flow for different US markets.

159 *Protecting Dairy Workers from Infectious Disease*, U.C. Davis W. Center for Agric. Health & Safety (Apr. 17, 2019), Link Here.

160 "Nutrition title makes up approximately 76% of farm bill spending," totaling approximately $326 Billion from 2018 to 2023. Randy Alison Aussenberg & Kara Clifford Billings, *2018 Farm Bill Primer: SNAP and Nutrition Title Programs* (CRS No. IF11087 Jan. 30. 2019), *available at* Link Here.

161 For example, the pending Farm System Reform Act of 2019, S. 3221, 116th Cong., would instruct the USDA "to cover costs relating to the transition of [a given farmer's] property on which [an animal feeding operation] is located to be used for alternative agriculture activities, such as raising pasture-based livestock, growing specialty crops, or organic commodity production." *Id.* § 103.

3. Equitable Resource Allocation

The COVID-19 pandemic has exposed that certain populations are disproportionally impacted by upheaval events based on a variety of intersecting cultural, economic, and historical factors.[162] Workers from low-income and racial/ethnic minority backgrounds have been most impacted by COVID-19. Although trends are still emerging, data from a recent CDC Morbidity and Mortality Weekly Report suggest an overrepresentation of Black people among hospitalized patients.[163] During public health emergencies, social and economic conditions can isolate people from the resources they need to prepare for and respond to outbreaks.[164]

Additionally, COVID-19 has led to an increase in discrimination against Asian Americans.[165] Women have also been subjected to additional stress from managing added unpaid work, including caretaking responsibilities, while continuing to engage in paid work.[166]

Addressing the needs of vulnerable populations in emergencies requires improving day-to-day life, including addressing unequal treatment based upon race, ethnicity, socioeconomic status, and gender. The impact and implications of these human rights concerns can neither be avoided nor ignored.[167] In this, we are guided by our belief that justice must be available to all.[168]

These insights should come as no surprise. Policymakers must be mindful of these disparities and innovate ways for society to achieve greater equity.

4. Climate Change

Finally, all policymakers must meaningfully address climate change. Increased temperatures place pressure on all ecosystems, leading to increased migration and birth rates.[169] Climate change increases habitat loss, causing further collision between humans and wildlife. The aggregate effect of the symptoms of climate change will only increase the risk of zoonotic disease.[170] It is vital that we take proactive action against climate change and to restore nature.

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162 Kantamneni, *supra* note 143.

163 Shikha Garg et al., *Hospitalization Rates and Characteristics of Patients Hospitalized with Laboratory-Confirmed Coronavirus Disease 2019 — COVID-NET, 14 States, March 1–30, 2020*, 69 Morbidity & Mortality Wkly Rep. 458 (2020), Link Here.

164 A. Fothergill, *Race, Ethnicity and Disasters in the United States: A Review of the Literature*, 23 Disasters 156 (1999); Deborah S.K. Thomas et al., Social Vulnerability to Disasters (2d ed. 2013); Bob Bolin & Liza C. Kurtz, *Race, Class, Ethnicity, and Disaster Vulnerability, in* Handbook Of Disaster Research 181-203 (2d ed., Havidan Rodriguez et al., eds., 2018).

165 *Covid-19 Fueling Anti-Asian Racism and Xenophobia Worldwide*, Human Rights Watch (May 12, 2020, 3:19 PM), Link Here.

166 United Nations Sec'y Gen., Policy Brief: The Impact Of Covid-19 On Women 2 (Apr. 9, 2020), *available at* Link Here.

167 To address inequity, we must first be able to accurately measure it. Although demographic information is becoming more complete, as of June 13, 2020, the CDC still did not have racial information for nearly 15 percent of all COVID-19 associated hospitalization records, and not every state has released demographic information for hospitalizations or mortality rates. Of those that have, minority populations are significantly overrepresented. *See e.g.*, *COVIDView: Weekly Summary Ending on June 13, 2020*, CDC, Link Here (last updated June 19, 2020); APM Research Lab Staff, *The Color of CoronaVirus: COVID-19 Deaths by Race and Ethnicity in the U.S.*, APM Res. Lab (June 10, 2020), Link Here.

168 The overall impact of COVID-19 on minority populations is currently unknown. Due to lack of data capture, availability, and consistency in race and ethnicity COVID-19 data, it may remain unknown. Inaccurate or incomplete reports of data can paint a misleading picture — one that can misinform public health policies. Anna Sandoiu, *Racial Inequities in COVID-19–The Impact on Black Communities*, Med. News Today (June 5, 2020), Link Here.

169 *Climate Change Impacts: Climate Impacts on Ecosystems,* EPA (Jan. 19, 2017), Link Here.

170 Abrahm Lustgarten, *How Climate Change Is Contributing to Skyrocketing Rates of Infectious Disease*, ProPublica (May 7, 2020), Link Here.

F. CONCLUSION

Understanding the issues outlined above is necessary before any serious reforms can be taken to mitigate our national zoonotic disease risk. But these issues are the beginning of the conversation. Moving forward, the Animal Legal Defense Fund will be introducing a series of papers, each outlining policy strategies calibrated to reduce specific zoonotic risks.

G. ACKNOWLEDGMENTS

The Animal Legal Defense Fund thanks our colleagues at Advancing Law for Animals, including Co-Directors Ryan Gordon and Vanessa Shakib, who provided insight and expertise that greatly assisted the development of this paper. We thank Jackie Bowen, MS, MPH, of Clean Label Project, and Aysha Akhtar, MD, MPH, of the Center for Contemporary Sciences, for their generous feedback and guidance.

We are grateful to our staff for their meaningful contributions. Stephanie Harris, Senior Legislative Affairs Manager, spearheaded this undertaking. Nicole Pallotta, Senior Policy Program Manager, Stacey Gordon Sterling, Animal Law Program Director, and Alicia Prygoski, Legislative Affairs Manager, each provided comments and revisions that greatly improved the manuscript.

We would also like to express our gratitude to our reviewers, including (alphabetically): Chris Berry, Senior Staff Attorney; Carter Dillard, Senior Policy Advisor; Lora Dunn, Director of the Criminal Justice Program; Jennifer Hauge, Legislative Affairs Manager; Kim Kelly, Director of Legislative Affairs; Matthew Liebman, Director of Litigation; Alicia Prygoski, Legislative Affairs Manager; Elizabeth Putsche, Communications Director; David Rosengard, Senior Staff Attorney; Kathleen Schatzmann, Senior Legislative Affairs Manager; Mark Walden, Chief Programs Officer; and Stephen Wells, Executive Director. Additionally, thank you to our 2020 summer law clerks within the Legislative Affairs Program, Sonia Paauwe and Bailey McHargue, for their assistance. Finally, we appreciate Sue Kennedy, Senior Graphic Designer, for her design work.