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### Adv - Pandemic Response

#### Plan: The member nations of the World Trade Organization ought to reduce intellectual property protections for emergency use listing medicines during public health emergencies of international concern.

#### The intellectual property system is fundamentally mismatched with emergency pandemic conditions – creating a broad precedent that weakens restrictions lays the groundwork for future pandemics that are inevitable. Ensuring we are ready for next time is vital

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Although focusing on these immediate constraints is vital, we cannot confine our attention to the short term. First of all, the COVID-19 pandemic is far from over. Although Americans can now see the light at the end of the tunnel thanks to the rapid rollout of vaccines, most of the world isn’t so lucky. The virus is currently raging in India and throughout South America, overwhelming health care systems and inflicting suffering and loss on a horrific scale. And consider the fact that Australia, which has been successful in suppressing the virus, recently announced it was sticking to plans to keep its borders closed until mid-2022. Criticisms of the TRIPS waiver that focus only on the next few months are therefore short-sighted: this pandemic could well drag on long enough for elimination of patent restrictions to enable new vaccine producers to make a positive difference.

Furthermore, and probably even more important, this is almost certainly not the last pandemic we will face. Urbanization, the spread of factory-farming methods, and globalization all combine to increase the odds that a new virus will make the jump from animals to humans and then spread rapidly around the world. Prior to the current pandemic, the 21st century already saw outbreaks of SARS, H1N1, MERS, and Ebola. Everything we do and learn in the current crisis should be viewed from the perspective of getting ready for next time.

THE NATURE OF THE PATENT BARGAIN

When we take the longer view, we can see a fundamental mismatch between the policy design of intellectual property protection and the policy requirements of effective pandemic response. Although patent law, properly restrained, constitutes one important element of a well-designed national innovation system, the way it goes about encouraging technological progress is singularly ill-suited to the emergency conditions of a pandemic or other public health crisis. Securing a TRIPS waiver for COVID-19 vaccines and treatments would thus establish a salutary precedent that, in emergencies of this kind, governments should employ other, more direct means to incentivize the development of new drugs.

#### Reducing IP restrictions on medicine is essential for expanding access – especially in developing countries, where lack of capital and domestic industry makes the same people who are most vulnerable to diseases the least likely to have access to expensive brand-name drugs

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TRIPS-Plus provisions in U.S. FTAs impede access to pharmaceuticals for indigent populations.42 The similarities between U.S. patent law and the TRIPS Agreement demonstrate the United States's influence in establishing global intellectual property standards.43 Despite the suc- cess of the United States in shaping global intellectual property stan- dards, the TRIPS Agreement maintains several flexibilities, namely data exclusivity and compulsory licensing, which were affirmed by the Doha Declaration.44 The United States's dissatisfaction with the level of intellectual property protection afforded by the TRIPS Agreement prompted the proliferation of TRIPS-Plus provisions in U.S. FTAs.45

A. Values and Ideals in U.S. Patent Law

The preeminence of patents in the United States is evidenced by the fact that patents are constitutionally protected to promote innova- tion and discovery.46 A patent is a grant of property issued by a gov- ernment that provides limited rights to the patent owner.47 A patent owner in the United States is granted monopolistic control over his or her invention for twenty years, during which time no one may make, sell, or use the patented product, absent permission from the patent holder.48 This exclusive right promotes innovation by enabling the pat- ent owner to avoid pricing competition when selling the patented product.49 In return for monopolistic power to exclude, a patent owner must disclose the technological processes and data behind the prod- uct.50 Other producers use this information, saving on the cost of re- search and development while also expediting the regulatory process, in order to offer competitive pricing when the patent terminates.51

Patents are particularly valuable to the drug industry given the plethora of research and development required to produce pharma- ceuticals.52 When a drug is no longer under patent, pharmaceutical companies must compete with generic producers who provide medi- cines at much lower prices.53 Pharmaceutical companies assert that re- search and development challenges require a rigid patent system to recover investment, turn profit, and promote continued innovation.54

In the context of international trade, pharmaceutical companies have much at stake as LMICs produce generic versions of patented drugs and sell these medications around the world, undercutting brand- name profitability.55 Although the pharmaceutical industry ranks as one of the most profitable industries in the United States, these patent con- cerns have led to the development of powerful special interest groups that the United States relies on when considering trade agreements, in- cluding the TRIPS Agreement.56

B. Global Expansion of U.S. Patent Ideals Through the TRIPS Agreement

The combination of special interests and traditional value placed on patent protection has encouraged the United States to enforce its patent ideals globally by linking patent protection and international trade through the TRIPS Agreement.57 Touted as "unquestionably the most important development in international intellectual property law [in a century]," the TRIPS Agreement "attempts to strike a balance be- tween the long term social objective of providing incentives for future inventions and creation, and the short term objective of allowing peo- ple to use existing inventions and creations."58 To accomplish this, the agreement requires all WTO signatories to implement minimum stan- dards of intellectual property law.59

The United States's influence is acutely evident throughout the TRIPS Agreement's patent provisions, which practically mirror U.S. patent law.60 For example, like U.S. patent law, the TRIPS Agreement grants patent owners exclusive rights to prevent others from making, using, selling, or importing the patented product for twenty years.61 Moreover, neither the TRIPS Agreement nor U.S. patent law permits exceptions for patenting pharmaceuticals or pharmaceutical proc- esses.62 Both the United States and the TRIPS Agreement prohibit the use of compulsory licensing for products not developed locally.63 Lastly, both the United States and the TRIPS Agreement stipulate that in ex- change for a period of monopolistic control, the patent owner must disclose the invention "in a manner sufficiently clear and complete for the invention to be carried out by a person skilled in the art . . . ."64

Although the United States was largely successful in expanding its patent ideals through the TRIPS Agreement, LMICs maintained considerable flexibility to promote access to drugs.65 This success is highlighted by the TRIPS Agreement's treatment of data exclusivity and compulsory licensing.66

1. Data Exclusivity

The TRIPS Agreement requires patent holders to disclose relevant information regarding the development of the patented product, in- cluding clinical data.67 Pharmaceutical companies invest a significant amount of time and money to develop the clinical data required to patent new drugs.68 Generic drug companies rely on the clinical data collected by brand-name drug companies in order to demonstrate that the generic drug is pharmacologically equivalent to the brand-name pharmaceutical.69 In doing so, generic producers avoid the inordinate time and expense required to generate this data, enabling expeditious regulatory approval and delivery of affordable medicines upon the ex- piration of brand-name patents.70 The TRIPS Agreement requires pro- tection of such data but affords signatories broad discretion to utilize clinical data to protect the public and promote public health, as long as steps are taken to prevent unfair commercial use.71 Moreover, scholars contend that in light of the TRIPS Agreement's purpose and objectives, the agreement does not require a period of data exclusivity, contrary to U.S. patent law.72

2. Compulsory Licensing

A compulsory license is a government authorized license to a third party for the purpose of manufacturing and producing a patented in- novation without consent from the patent owner.73 Article 31 governs compulsory licenses under the TRIPS Agreement, granting a govern- ment broad discretion in issuing these licenses.74 The following re- quirements must be met in order to obtain a compulsory license: (1) the country must ensure that the third party seeking the license at- tempts to obtain authorization from the patent holder on reasonable commercial grounds; (2) the scope and duration of the compulsory license must be limited to the purpose for which the license was author- ized; (3) the compulsory license must be predominately used "for the supply of the domestic market of the Member authorizing such use;" and finally (4) the country must provide the patent holder with "ade- quate remuneration . . . taking into account the economic value of the authorization."75 Article 31 may be waived in cases of extreme urgency, national emergency, or public non-commercial use.76

Although HICs and LMICs reached a compromise on compulsory licensing, the issue became increasingly contentious upon implementa- tion.77 HICs were dismayed with the lack of clarity surrounding terms like "adequate remuneration" and "national emergency."78 LMICs were frustrated with Article 31(f) which stipulates that compulsory licenses must be predominately used for distribution within the domestic mar- ket.79 Because many low-income countries lack manufacturing capacity, compulsory licensing under Article 31 does not provide a viable method of obtaining pharmaceuticals at a competitive price.80 At the same time, alarm over HIV/AIDS, malaria, and tuberculosis grew as developing countries struggled to contain and treat infectious disease epidemics.81 These concerns led to the signing of the Doha Declaration at the WTO Ministerial Conference in 2001.82

C. A Blow to U.S. Interests: The Doha Declaration and Article 31bis

As WTO signatories began implementing the TRIPS Agreement, the scourge of HIV/AIDS proliferated and infections increased by ten percent from 2000 to 2001.83 At that time, the World Health Organization estimated that less than four percent of those in need of HAART had access.84 It is in this context that the Doha Declaration "recog- nize[d] the gravity of the public health problems afflicting many [LMICs], especially those resulting from HIV/AIDS, tuberculosis, ma- laria and other epidemics."85 WTO delegates agreed that signatories should interpret and implement the TRIPS Agreement in a way that promotes public health and access to medicines for all.86

Intellectual property flexibilities promoted by the TRIPS Agree- ment were reaffirmed in the Doha Declaration.87 Specifically, the Doha Declaration implicitly affirmed the TRIPS Agreement's deferential data exclusivity provisions and explicitly confirmed the use of compulsory licenses.88 The Doha Declaration granted broad discretion with regard to compulsory licensing, asserting that WTO signatories have "the right to grant compulsory licences [sic] and the freedom to determine the grounds upon which such licences [sic] can be granted."89 Perhaps most importantly, the Doha Declaration recognized the ineffectiveness of compulsory licensing for countries with limited or no manufacturing capacity.90 To address this weakness, WTO signatories amended the TRIPS Agreement with Article 31bis, which enables countries with lim- ited or no manufacturing capacity to import generic drugs from other countries, thereby promoting access to more affordable medicines.91

Despite the Doha Declaration's affirmance of deferential data exclusivity and compulsory licensing as valuable mechanisms to promote access to medicine, the United States dominated the TRIPS Agreement negotiations.92 A World Bank study concluded that low-income countries stand to lose twenty billion dollars from transfers of technology, including pharmaceuticals, if the TRIPS Agreement is fully imple- mented.93 Still, the United States had to accept compromises during the negotiations and has remained discontent with the level of protection afforded to pharmaceutical patents by the TRIPS Agreement.94 This dissatisfaction spurred the proliferation of TRIPS-Plus provisions in bilateral U.S. FTAs.95

D. The Proliferation of TRIPS-Plus Provisions in U.S. FTAs

The TRIPS Agreement creates a regulatory "floor," consisting of minimum levels of protection that must be afforded to intellectual property by all WTO signatories.96 Countries are therefore permitted to seek higher levels of protection in FTAs, and the United States has done so in negotiating bilateral FTAs with numerous countries.97 These trade agreements are commonly called TRIPS-Plus U.S. FTAs because they incorporate more stringent intellectual property protection provisions than the TRIPS Agreement, while also limiting the freedoms and flexibilities provided by the TRIPS Agreement.98

Beginning with the Bush administration and continuing through the Obama administration, the U.S. has sought to "ensur[e] that the provisions of any multilateral or bilateral trade agreement governing intellectual property rights that is entered into by the United States re- flect a standard of protection similar to that found in United States law."99 Pressure from the pharmaceutical industry led to the implementation of several TRIPS-Plus provisions, including rigid data exclusivity policies and limitations on compulsory licensing, thereby impeding access to affordable medicines for indigent populations in desperate need.100

1. TRIPS-Plus Impact on Data Exclusivity Provisions

TRIPS-Plus data exclusivity provisions in U.S. FTAs constrict the flexibilities afforded by the TRIPS Agreement.101 Whereas the TRIPS Agreement applies a deferential approach towards data exclusivity, U.S. FTAs apply the same level of protection afforded under U.S. patent law.102 In U.S. FTAs, competing manufacturers are prohibited from relying on clinical data for five to fifteen years after the date of a pharmaceutical's initial regulatory approval.103 Brand-name pharmaceutical companies favor data exclusivity provisions because they enable drug companies to exploit profits by suspending competition.104

Clinical data is costly and time consuming, and data exclusivity provisions may prohibit generic producers from introducing more affordable medication immediately following a patent's expiration by prohibiting access to data previously gathered by the patent holder.105 To compete, generic producers may be forced to conduct their own costly research and development, negating their ability to provide affordable drugs.106 Alternatively, generic companies would have to delay regulatory approval and production of generic drugs.107 Thus, TRIPS- Plus data exclusivity provisions in U.S. FTAs effectively empower patent holders to extend monopolistic control of pharmaceuticals by obstructing generic competition, consequently diminishing access to medicines for indigent populations.108

2. TRIPS-Plus Impact on Compulsory Licensing

Although to the TRIPS Agreement enables WTO signatories to es- tablish their own national compulsory licensing scheme, TRIPS-Plus provisions in U.S. FTAs significantly limit compulsory licensing.109 Under U.S. FTAs, parties may typically only grant compulsory licenses in emergency situations, as an anti-trust remedy, or for public non- commercial use.110 Notably, U.S. FTAs do not define "emergency situa- tions" or "public non-commercial use."111 Some TRIPS-Plus provisions require "reasonable and entire" remuneration for patent owners as op- posed to "adequate remuneration" required by the TRIPS Agree- ment.112 Finally, U.S. FTAs permit challenges to compulsory licenses on the grounds that a license was not warranted under the specific circum- stances.113 By confining a government's ability to issue compulsory licenses and providing an opportunity for the patent holder to challenge the issuance of compulsory licenses, TRIPS-Plus compulsory licensing provisions diminish a generic producer's ability to compete and enable the patent holder to manipulate drug pricing.114 The net result is diminished access to medicines for Hope Tukahirwa and millions like her.115

II. Why TRIPS-Plus Provisions are Problematic: Rigid Data Exclusivity Provisions and Compulsory Licensing Provisions Obstruct Access to Medicine

TRIPS-Plus provisions promote unyielding data exclusivity and limit compulsory licensing to the detriment of indigent populations lacking access to affordable pharmaceuticals.116 Data exclusivity provisions in U.S. FTAs with Guatemala and Vietnam, two countries struggling with staggering poverty, have led to increased pharmaceutical prices by delaying generic competition.117 Moreover, the exclusion of compulsory licensing from FTAs or proposed FTAs with the Dominican Republic, Thailand, and the Southern African Customs Union (SACU) could lead to overwhelming public health challenges as generic competition is strangled from the market while patent holders maintain monopolistic control over pharmaceutical prices.118

A. Examples of How Rigid TRIPS-Plus Data Exclusivity Provisions Have Had a Deleterious Effect on Public Health

U.S. FTAs include rigid data exclusivity provisions that ultimately obstruct generic drug competition, resulting in disastrous public health consequences for destitute populations.119 Trade agreements with Gua- temala and Vietnam illustrate the injurious effect that data exclusivity provisions have on access to affordable drugs.120

1. Guatemala

The number of people living with HIV/AIDS in Guatemala has doubled since 2001; an estimated 62,000 people are living with the dis- ease and less than 11,000 are receiving antiretroviral therapy.121 Fur- thermore, approximately twenty percent of Guatemala's largely rural population lacks regular access to health facilities and services.122 TRIPS-Plus data exclusivity provisions exacerbate these public health concerns by restricting access to affordable pharmaceuticals in Guate- mala where over fifty percent of the population lives below the national poverty line.123

The U.S.-Dominican Republic-Central American Free Trade Agreement (DR-CAFTA) came into effect in Guatemala in 2006.124 The DR-CAFTA is an agreement between the United States and six Central American countries, namely Costa Rica, El Salvador, Guatemala, Hon- duras, Nicaragua, and the Dominican Republic.125 Rigid data exclusiv- ity provisions in the DR-CAFTA have prohibited a number of generic drugs from entering the Guatemalan pharmaceutical market, despite the fact that many of these drugs may successfully treat major causes of morbidity and mortality.126 For example, Pfizer's Vfend, which is used to treat invasive fungal infections generally found in patients with com- promised immune systems (like those suffering from HIV/AIDS), costs 810% more than the generic version.127 Vfend, however, is subject to fifteen years of data exclusivity, thus barring generic producers' access to clinical information, quashing competition, and granting Pfizer mo- nopolistic pricing control.128

Similarly, data exclusivity provisions have restricted access to af- fordable antiretrovirals.129 For example, the Guatemalan government provides a list of drugs that public organizations may procure at subsi- dized costs.130 A generic antiretroviral was registered in 2004, yet when Abbott Laboratories' patented version of the same drug, Kaletra, which costs 166% more than the generic pharmacological equivalent, was reg- istered a year later, it was granted retroactive data exclusivity through 2000-the patent expires in 2015.131 Accordingly, only Kaletra, and not the generic version, has been listed by the Guatemalan government as available through subsidized costs.132 Public organizations seeking the more affordable generic drug are required to procure the drug else- where.133 Thus, rigid TRIPS-Plus data exclusivity provisions in the DR- CAFTA have reduced or eliminated generic pharmaceutical competi- tion, resulting in an inordinate pricing structure making critical drugs unavailable to much of Guatemala's indigent population.134

2. Vietnam

The United States signed a trade agreement with Vietnam in 2000.135 When Vietnam adopted data exclusivity provisions as part of the agreement, the United States praised the country for its alignment with U.S. data exclusivity standards.136 From 2000 through 2005, the Vietnamese government saw a threefold increase in health spending, much of which was attributed to rising pharmaceutical costs.137 This is particularly evident in the pricing of antiretrovirals produced in Viet- nam, which cost five to seven times more than the lowest international prices for the same pharmaceuticals.138

The precipitous increase in the cost of antiretrovirals occurred as HIV/AIDS became increasingly problematic in Vietnam.139 In 2009, an estimated 280,000 people were living with HIV/AIDS, a figure that has doubled since 2001, shortly after the U.S.-Vietnam Trade Agreement was reached.140 Nearly seven percent of all people living with HIV/AIDS in Southeast Asia live in Vietnam.141 In 2009, over fourteen thousand Vietnamese died from AIDS related causes.142 Additionally, only half of those in need of HAART currently receive antiretroviral therapy.143 Un- der these conditions, stringent data exclusivity provisions limit access to medicines in Vietnam, exacerbating an already dire public health situa- tion in a country where fifteen percent of the population lives below the national poverty line.144

For example, like many LMICs, Vietnam requires greater access to second-line antiretroviral treatment.145 As HIV/AIDS evolves, it may grow resistant to first-line treatment, requiring second-line drugs, many of which are patented by multinational pharmaceutical companies.146 One of these second-line pharmaceuticals is Kaletra from Abbott Labo- ratories.147 It was recently reported that Abbott Laboratories has a pat- ent pending for Kaletra in Vietnam, and it intends to use that patent to prevent the procurement of generic alternatives.148 Unyielding TRIPS- Plus data exclusivity provisions prohibit the use of clinical data for at least five years (and upwards of fifteen years, as seen in Guatemala), thereby eliminating generic competition for a pharmacological equiva- lent to Kaletra.149 Thus, Abbott Laboratories will be able to charge in- ordinate prices, rendering access to affordable pharmaceuticals unat- tainable for low-income populations gravely in need of second-line antiretroviral therapy.150

B. U.S. Policy Towards Compulsory Licensing Severely Harms Public Health in Middle and Low-Income Countries

TRIPS-Plus provisions in U.S. FTAs discourage the use of compulsory licensing thereby restricting generic competition and furthering a patent holder's monopolistic control of pricing, which results in restricted access to affordable drugs.151 These potentially negative effects of U.S. policy towards compulsory licensing are illustrated in two proposed, but stalled, FTAs with Thailand and the Southern African Customs Union.152

1. Dominican Republic

The island of Hispaniola, comprised of the Dominican Republic and Haiti, contains approximately eighty-five percent of all HIV/AIDS cases in the Caribbean, the region with the second highest per capita prevalence of HIV/AIDS after sub-Saharan Africa.153 In 2009, an esti- mated 57,000 people living with HIV/AIDS were domiciled in the Do- minican Republic, with 3,200 new infections that year.154 Also in 2009, an estimated 2,300 people died from AIDS-related causes.155 TRIPS- Plus compulsory licensing provisions further exacerbate the Dominican Republic's public health landscape by contributing to rising pharma- ceutical costs and discouraging generic competition, thereby limiting access to affordable drugs in a country where fifty percent of the popu- lation lives below the national poverty line.156

Although it has never issued a compulsory license, the Dominican Republic maintains liberal compulsory licensing provisions in its na- tional intellectual property law.157 Moreover, the Dominican Republic's commitment to compulsory licensing as a vital mechanism for securing access to medicines is evidenced by the fact that the Dominican Repub- lic was a sponsor of both the Doha Declaration and the Article 31bis Amendment, which sought to ease the process for issuing compulsory licenses.158 The Dominican Republic also maintains a strong generic pharmaceutical industry with generic firms controlling approximately fifty percent of the domestic pharmaceutical market.159 In fact, the in- troduction of generic antiretrovirals in the Dominican Republic led to a ninety-nine percent decrease in their cost.160

The Dominican Republic ratified the DR-CAFTA on March 1, 2007.161 TRIPS-Plus provisions in the DR-CAFTA have been character- ized as the most "onerous" protections among all U.S. FTAs with LMICs.162 Researchers assert that by 2027, the Dominican Republic will experience a nine to fifteen percent increase in pharmaceutical prices as a result of the DR-CAFTA.163 Evidence of TRIPS-Plus compulsory licensing provisions on price increases and diminished access to phar- maceuticals, however, is already prevalent as illustrated by the second- line antiretroviral Efavirenz, which costs three times more than its ge- neric pharmacological equivalent.164

TRIPS-Plus patent provisions in the DR-CAFTA effectively bar com- pulsory licensing by linking marketing approval of generic pharmaceu- ticals to the consent of patent holders.165 Thus, if a generic drug com- pany developed the pharmacological equivalent to Efavirenz under a compulsory license issued by the Dominican Republic, the generic pro- ducer would still be required to obtain consent from the patent holder to sell the generic version of the drug, which is highly unlikely.166 Be- cause debilitating poverty prohibits procurement of brand name Efavirenz and compulsory licensing provisions constrict generic compe- tition, Dominicans are forced to use a similar but slightly more harmful drug, Nevirapine.167 Nevirapine may weaken a patient's immune system if provided too early in the progression of HIV/AIDS, thereby further compromising the patient's health.168 By delaying treatment, however, individuals diagnosed with HIV/AIDS face the same risk of a weakened immune system.169

Given rampant poverty and rising pharmaceutical costs, one healthcare provider suggested that Dominicans have the bleak choice of, "[buying] medication [or] buying lunch."170 TRIPS-Plus compulsory licensing standards included in the DR-CAFTA have paralyzed the Do- minican Republic from utilizing this TRIPS-compliant method of pro- viding affordable access to antiretrovirals and other drugs.171

2. Thailand

In 2002, an estimated 670,000 people were living with HIV/AIDS in Thailand.172 The Thai government recognized the threat posed by the pandemic and initiated a national HIV/AIDS program aiming to provide its citizens with universal access to HAART.173 The program has been widely successful; the number of people receiving treatment rose from 3,000 in 2002 to 52,000 by 2005.174 The annual number of HIV/AIDS related deaths prior to the universal access program was ap- proximately 52,000, but in 2009, after several years of universal access, that number decreased by nearly fifty percent.175 By 2010, nearly sev- enty percent of those in need of antiretroviral therapy received treat- ment.176 Thailand's commitment to universal access to antiretroviral therapy has been praised by the World Health Organization and non- governmental organizations from around the world.177 The most criti- cal aspect to the success of the universal access program has been the Thai government's ability to promote the availability of inexpensive generic antiretrovirals.178

To ensure the success of the HIV/AIDS program, however, Thai- land required access to patented second-line pharmaceuticals.179 These patented medications are significantly more expensive than the generic alternatives.180 For example, Abbott's Kaletra cost well over two thou- sand dollars per patient per year, limiting the Thai government's provi- sion of the medication to six hundred patients out of eight thousand in need.181 The World Bank reported that by issuing compulsory licenses, Thailand could reduce the cost of second-line antiretroviral treatments by ninety percent.182 Thailand attempted to negotiate reduced prices for several pharmaceuticals, including Kaletra, but failed to reach an agreement.183 Thus, in late 2006 and early 2007, the Thai government issued compulsory licenses for two antiretrovirals, including Kaletra, and a third compulsory license for Plavix, a pharmaceutical used to treat cardiovascular disease.184

The United States and Thailand began negotiating a trade agree- ment in 2004, but suspended negotiations in 2006 following a military coup in Thailand.185 The World Bank concluded that TRIPS-Plus provi- sions in the proposed U.S.-Thailand FTA would have crippled Thai- land's ability to issue compulsory licenses, resulting in costs exceeding 3.2 billion dollars over twenty years.186

U.S. FTAs permit challenges to compulsory licenses on the grounds that the license was not warranted under the specific circumstances.187 Given that Abbott Laboratories and Thailand were unable to reach an agreement about the price of Kaletra, it is likely that Abbott Laborato- ries challenged the Thai government's decision to issue a compulsory license.188 In fact, Abbott was so furious with Thailand's issuance of a compulsory license for Kaletra, that it withdrew several pending phar- maceutical patents from Thailand-an unprecedented move in which a U.S. drug company retaliated against a foreign government by cutting off the supply of certain pharmaceuticals.189 If Abbott Laboratories were to prevail in such a challenge, Thailand may have been subject to U.S. sanctions and may have been required to discontinue the license.190 Thus, rigid TRIPS-Plus compulsory licensing provisions in the proposed U.S.-Thailand FTA may have curbed Thailand's use of this critical mechanism for improving access to affordable antiretrovirals necessary for Thailand's remarkably successful HIV/AIDS program.191

3. The Southern African Customs Union

Perhaps nowhere on Earth has the scourge of HIV/AIDS afflicted more people than the members of the Southern African Customs Un- ion (SACU), which is comprised of Botswana, Lesotho, Namibia, South Africa, and Swaziland.192 The SACU is burdened by over twenty percent of the global HIV/AIDS epidemic, as approximately seven million peo- ple living with HIV/AIDS inhabit SACU member countries.193 The SACU member countries are rife with poverty as nearly one-quarter of the population in each country live below the national poverty line.194 This rampant poverty has quashed access to antiretrovirals, with less than sixty percent of those in need of treatment currently receiving therapy.195 Despite extreme poverty, the SACU forms a formidable trad- ing block and has agreed to treaties with several European countries, South American countries, and is in the midst of negotiating a trade agreement with India.196

In fact, in 2003, the United States and the SACU entered negotia- tions to establish a U.S.-SACU FTA.197 The United States insisted on sev- eral TRIPS-Plus provisions, many of which are similar to those included in current U.S. FTAs.198 The SACU nations expressed particular con- cern over the proposed compulsory licensing provisions.199 The United States sought to impose a ban on exportation of pharmaceuticals devel- oped by compulsory licenses, which would have prohibited South Af- rica's generic pharmaceutical industry from supplying SACU nations with affordable drugs, including antiretrovirals.200 Thus, rigid TRIPS- Plus compulsory licensing provisions in the proposed U.S.-SACU FTA would have compromised access to generic drugs that SACU nations rely on to handle the scourge of HIV/AIDS in sub-Saharan Africa.201

The SACU refused the TRIPS-Plus provisions that the United States obstinately sought, recognizing that such compulsory license provisions would limit the delivery of affordable medicines, and as a result, nego- tiations stalled in 2006.202 Nevertheless, in 2008, the United States and the SACU signed a Trade, Investment, and Development Cooperative Agreement that "establishes a forum for consultative discussions, coop- erative work, and possible agreements on a wide range of trade issues" which would "[i]deally . . . put in place the 'building blocks' for a future FTA. . . ."203 Given the tremendous burden of HIV/AIDS on SACU na- tions, standard U.S. TRIPS-Plus compulsory licensing provisions could provoke devastating consequences.204

III. Promoting Access to Medicine Through Amendment of U.S. FTAs

TRIPS-Plus provisions in U.S. FTAs have come under fire and have even been criticized by Congress.205 The congressional response to TRIPS-Plus provisions in the Bipartisan Agreement on Trade Policy has fallen short of addressing the burdensome data exclusivity and compulsory licensing provisions in U.S. FTAs.206 To remedy these shortcom- ings, the United States should amend all U.S. FTAs to incorporate a balancing test that would provide review panels an opportunity to weigh the benefits and detriments associated with relaxing data exclu- sivity and compulsory licensing provisions for various drugs.207

#### Expansion enables domestic manufacturing and innovation that decentralizes pharma supply chains

HRW 6/3 — (Human Rights Watch, “Seven Reasons the EU is Wrong to Oppose the TRIPS Waiver“, 6-3-2021, Available Online at https://www.hrw.org/news/2021/06/03/seven-reasons-eu-wrong-oppose-trips-waiver, accessed 10-5-2021, HKR-AR)

The European Commission claims that intellectual property (IP) is not a barrier to scaling up the manufacturing of vaccines or other health products needed for the Covid-19 response, suggesting that sharing IP would not immediately speed up manufacturing. Right now, there are manufacturers with capacity to produce additional Covid-19 vaccines and other health products at factories in Bangladesh, Canada, Denmark, India, and Israel, but they are unable to contribute because they do not yet have the right licenses. So, **IP is a barrier to them.** The TRIPS waiver proposal sponsors and experts at the leading science journal Nature, Médecins Sans Frontières (MSF) Access Campaign, the Third World Network, and others have presented many other concrete examples of how enforcement of IP rules blocked, delayed, or limited production of chemical reagents for Covid-19 tests, ventilator valves, Covid-19 treatments, and elements of Covid-19 vaccines. IP constraints have not only led to vaccine shortages but have also led to shortages of key raw materials like bioreactor bags and filters.

Rather than manufacturers being held back by an inherent lack of manufacturing and technological capability, studies have shown that transnational claims to IP impede new manufacturers from entering and competing in the market. The same dynamics are playing out today with Covid-19.

Even though a waiver will not automatically expand production overnight, it paves the way for speedy technology transfers and manufacturing.

The waiver by itself will not automatically result in widespread and diversified manufacturing, but it will ease complex global rules governing IP and exports and give governments freedom to collaborate on technology transfers and exports **without fearing trade-based retaliation.** It will help reduce the dependence on any one country or region for medical products and mitigate the risks of export restrictions. With new variants emerging and some evidence that repeat vaccine boosters may be needed, the waiver will enable governments around the world to be prepared for a long-term response to Covid-19.

Experts have mapped out plans for how the manufacturing of mRNA and other vaccines, could be dramatically expanded in a relatively short period of time. Waiving certain IP rules in the TRIPS agreement over the next three years could help create diverse regional manufacturing hubs and protect the EU and the rest of the world from future pandemics, supply chain disruptions, and resulting economic disaster.

Concerns that widening the universe of producers may lower or compromise quality standards are unfounded because stringent regulatory authorities and the World Health Organization (WHO) would continue to play their existing role as arbiters of quality and safety for vaccines, which have a very stringent process for approval.

Dose-sharing and COVAX will not be enough to deliver universal and equitable vaccine access.

The European Commission points to its participation in COVAX to suggest that it is effectively leading efforts to promote equitable access to vaccines. Individual member states have begun to use COVAX to share some of the doses they prebooked with countries in need.

However, COVAX currently only aims to provide vaccines for 20 percent of participants’ populations, far from the coverage needed to end the pandemic. Vaccine supply shortages have already hampered COVAX’s ability to reach that target. The facility began delivering vaccine doses in late February, but has only been able to deliver 71 million vaccine doses to over 100 countries as of May 25, 2021 barely enough to cover 1 percent of the combined populations of those countries.

Further, COVAX is heavily dependent on AstraZeneca’s vaccines manufactured at the Serum Institute of India. Because of the huge surge in Covid-19 in India, the Indian government has currently restricted export of vaccines, and COVAX is facing a shortfall of 190 million vaccine doses. Serum Institute of India recently announced that it expects to resume supplying COVAX only by the end of 2021.

Finally, COVAX only applies to procurement and allocation of vaccines. India and South Africa’s proposal would cover a broader range of health products and technologies needed for the Covid-19 response including tests, treatments, personal protective equipment, and more. The devastating recent surge in infections and deaths in India, Brazil, and Nepal shows that we need more than vaccines to save lives.

Temporarily waiving patent monopolies will not end all future innovation to develop vaccines and drugs.

Pharmaceutical companies and their lobbying groups claim that patent monopolies to commercialize their inventions spur innovation and that waiving such monopoly rights during a devastating global pandemic, “would jeopardize future medical innovation, making us more vulnerable to other diseases.”

The UN Committee on Economic, Social and Cultural Rights stated in April 2020 that “[P]andemics are a crucial example of the need for scientific international cooperation to face transnational threats … [i]f a pandemic develops, sharing the best scientific knowledge and its applications, especially in the medical field, becomes crucial to mitigate the impact of the disease and to expedite the discovery of effective treatments and vaccines…. The Committee reiterates that ultimately, intellectual property is a social product and has a social function and consequently, States parties have a duty to prevent unreasonably high costs for access to essential medicines.”

It is a disservice to humanity to claim scientists and researchers would have no interest in developing lifesaving vaccines and drugs without the promise of patent monopolies. Jonas Salk, the inventor of the polio vaccine, did not claim any monopoly over it and gave it away for free. When he was asked who owned the patent for his vaccine, he reportedly said, “Well, the people, I would say. There is no patent. Could you patent the sun?”

Economists Mariana Mazzucato and Jayati Ghosh, and public health activist Els Torreele, argue that IP rights were never designed to be used during pandemics. “Patents erect barriers against competitors when what is needed is technological co-operation, harnessing our global scientific and technological capabilities to fight the virus together,” they explain. The 1994 Marrakesh Agreement, which established the WTO allows for waivers in exceptional circumstances. What could be a more exceptional circumstance than a global pandemic that has claimed the lives of 3.5 million people? Dr. Tedros Adhanom Ghebreyesus, the director-general of the WHO, supported the waiver, asking poignantly: “If not now, when?”

The argument that we need market-based incentives like patents to spur innovation also ignores the fact that billions of Euros of public money have funded research, development, and delivery of Covid-19 vaccines and other health technologies. For example, a recent study found that public money from government and philanthropic sources accounted for 97.1 to 99 percent of the funding toward research and development of the Oxford-AstraZeneca vaccine. Johnson & Johnson received an estimated US$1 billion (€820 million) in funding from the US government for development of its Covid-19 vaccine; Moderna’s vaccine was also significantly funded by public money from the US government. Even where public money was not directly given for research and development, experts say that governments’ advance market commitments significantly de-risked the investments of pharmaceutical companies, by providing them a guaranteed market even before their vaccines were proven to be safe and effective.

#### Building domestic productive capacity is key to future pandemic resilience after COVID

UNCTAD 20 [The United Nations Conference on Trade and Development was established in 1964 as an intergovernmental organization intended to promote the interests of developing states in world trade. UNCTAD is the part of the United Nations Secretariat dealing with trade, investment, and development issues. "COVID-19 heightens need for pharmaceutical production in poor countries." https://unctad.org/news/covid-19-heightens-need-pharmaceutical-production-poor-countries]

With more than 100 projects to develop a COVID-19 vaccine underway around the globe – eight of which have entered the clinical stage – hope is growing for a miracle breakthrough. But so is concern over who would and would not have access to the shot, if and when one is approved. “Once a vaccine for COVID-19 is available, the massive demand is likely to outstrip supply quickly,” said James Zhan, UNCTAD’s director of investment and enterprise. “If the pharmaceutical industry cannot keep up with demand, populations in poor countries will be the ones left behind,” he said while opening a webinar organized with the World Health Organization (WHO). Lack of access to essential medicines is a tragic reality for many families in developing nations. For example, nearly half a million children in sub-Saharan Africa die each year from vaccine-preventable diseases, according to the WHO. Back in the spotlight COVID-19 has thrust the issue back in the spotlight. Fears that access would be based on some sort of pecking order peaked on 13 May when French pharmaceutical giant Sanofi Pasteur said the first doses of their vaccine, if approved, would go to the United States because its government had invested first in the required research and development. The following day, more than 140 world leaders and public figures signed an open letter calling for global public health interests to be given priority over nationalism and corporate profits. The call for a “people’s vaccine” followed a European Union-led event that a week earlier had secured nearly $8 billion from governments within and outside the bloc to help ensure universal and affordable access to COVID-19 medication. And on 19 May, the World Health Assembly adopted a historic resolution co-sponsored by more than 130 countries calling for equitable access to vaccines and treatments against the virus. Untapped local production While the resolution and funds will help, they provide a temporary solution. And with discussions focused on the issue of patents and profits, a fundamental issue is being overlooked: the lack of productive capacity in developing countries. Vaccine production is currently concentrated in a few developed countries, in the hands of a few major players. According to the WHO, nearly one third (32%) of vaccines have fewer than four suppliers, while nearly two thirds (63%) have two or fewer prequalified products. “COVID-19 has shown just how vulnerable medical product supply chains are when relying on a small number of manufacturers for raw materials and final products,” said Emer Cooke, director of the WHO’s regulation and prequalification department. According to UNCTAD and the WHO, many developing countries need help to build their capacity to produce essential medical products, whether they are vaccines, antibiotics or personal protective equipment. Those that have so far succeeded in establishing a local pharmaceutical industry capable of complying with international quality standards are mostly middle-income and low middle-income countries in Asia, such as India and Thailand. Productive capacity has remained largely untapped in Africa, where the majority of the least developed countries are located. 25 million doses Of the 40 vaccine manufacturers in 14 nations that are part of The Developing Countries Vaccine Manufactures Network, only one is African: the Biovac Institute based in Cape Town, South Africa, which currently delivers over 25 million doses of vaccines each year for illness such as measles, polio and tuberculosis. Biovac’s chief executive officer, Morena Makhoana, said Africa’s public health security requires ramped-up local production. Otherwise, the continent’s 1.2 billion people remain vulnerable to shocks in global supply chains and foreign governments’ trade policies. Since the pandemic began, nearly 80 countries have imposed some form of restriction on the export of medical supplies. “African governments should look at domestic capacity as an insurance for the next pandemic,” Mr. Makhoana said. “We cannot continue to rely on external sources.”

#### Drug access solves AMR and 15 million deaths a year

AMI 21 [Access to Medicine Index. The 2021 Index analyses how 20 of the world's largest pharmaceutical companies are addressing access to medicine in 106 low- and middle-income countries for 82 diseases, conditions and pathogens. Find out more about the scope of the Index research. "Why access matters." https://accesstomedicinefoundation.org/access-to-medicine-index/about-the-index/why-access-matters#]

Achieving universal healthcare is critical to help populations access health services they need without financial constraint. Access to medicines is an important part of this. Increasing access depends on a range of factors and involves action from a variety of parties. The pharmaceutical industry, in collaboration with the global health community, plays a critical role in responding to defined priorities for global health, developing much-needed innovative products, expanding access to those products that already exist and forging new partnerships to promote sustainable, long-term access to medicines.

Global health issues hit lower-income countries the hardest

The growth in development aid for health has fallen in recent years as donor government budgets have tightened. This is particularly concerning for low-income countries that rely heavily on aid to provide health services to their populations. Low-income countries are being hit the hardest: in these countries, government health expenditure as a percentage of GDP has been in decline in recent years, resulting in more needing to be done with less. In 2015, the UN agreed the Sustainable Development Goals, including global health targets such as the elimination of major disease epidemics and the reduction in the burden of childhood obesity. To ramp up progress towards these goals, in September 2019, the UN Secretary General called for a Decade of Action to deliver the Global Goals by 2030.

Progress in global health is not inevitable. Non-communicable diseases (NCDs) such as diabetes, cancer and heart disease are a growing challenge due to rapid urbanisation, worsening diets and increasingly sedentary lifestyles, they account for 71% of deaths globally each year, including 15 million people aged between 30 and 69 years, with more than 85% of these so-called premature deaths occurring in low- and middle-income countries. Access to prevention, detection, screening, treatment for NCDs is essential.

In addition, new public health crises have posed further challenges to global health and have put more pressure on already strained health systems and families paying out of pocket for health services. For instance, in 2019 the resurgence of measles was a threat with 6,000 deaths recorded in the Democratic Republic of the Congo by January 2020. Antimicrobial resistance, which already causes more than 700,000 deaths each year worldwide, is growing. The newly emergent coronavirus (SARS-CoV-2) which causes a severe acute respiratory disease, COVID-19, was identified in Wuhan, China in December 2019 and has been declared a global health pandemic by the World Health Organization since March 2020. To help address current and future global health issues, governments and regulators – as well as stakeholders from the public and private sectors – need to develop, support and implement innovative practices to reach more people in need.

#### Resistance causes extinction---microbiome collapse and superbugs.

Garrett 16. (Laurie Garrett is a Pulitzer prize-winning science journalist and writer of two bestselling books. She was awarded the Pulitzer Prize for Explanatory Journalism in 1996 for a series of works published in Newsday, chronicling the Ebola virus outbreak in Zaire. Antibiotic-Resistant Bacteria and the World's Peril. September 19, 2016. https://blogs.scientificamerican.com/guest-blog/antibiotic-resistant-bacteria-and-the-world-s-peril/)

Welcome to the Anthropocene, the era in which one species—human beings—so utterly dominates the planet that all of the driving forces of climate, oceans, geology, air and every other life form on Earth are controlled by the activities of humanity. Most of the damage is thoughtless. Humans don’t decide to pollute, they just do so. People don’t make a choice to lower the numbers of oxygen-producing trees on the planet, they just chop them down without thinking about it. Among the most dangerous of these thoughtless actions executed by our species is wild misuse of antibiotics. On September 21, the United Nations General Assembly is convening a special session to look at ways to curb use of precious medicinal drugs that are swiftly being outwitted by drug-resistant bacteria, making everything from a scraped knee to a bout of pneumonia far more dangerous and difficult to treat. But that focus, important as it is, remains limited to human use of chemicals and concern about their misuse to our species’ health. Genuine governance and stewardship in the Anthropocene requires a far broader look at what our activities mean for the planet, writ large. At the most basic levels of life every single system on Earth is controlled, or influenced, by microbes—microscopic creatures ranging from nano-sized viruses to enormous colonies of bacteria; from populations of microbes in the depths of the oceans to the inside of the human gut. A human being is made up of about 30 trillion cells and 39 trillion microbes, most of which are indispensable to our mental and physical health. If all the viruses and parasites swarming inside and on the skin of a human being are tallied the microbe-to-cell ratio is about ten-to-one. The microbes—collectively known as the Human Microbiome—digest our food, help us do battle with invading pathogens, clean our skin and provide us fuel. Life without microbes is no life at all. Antibiotics kill bacteria, and as anybody who has been on a long course of the drugs to treat an ailment knows, the medicine is indiscriminate, knocking off not only invaders like the bugs that cause pneumonia and ear infections, but also those that prevent stomach aches and constipation in response to ingestion of food. Human overuse or misuse of antibiotics has bred the emergence of Superbugs that are not only resistant to the drugs, but may be able to surge in numbers within a person’s gut, for example, leading to dangerous imbalances in bacterial populations that then cause diabetes, some types of heart disease, depression and an enormous range of common diseases. The Earth has its own microbiome, representing about a third of the weight of all biological material and life forms on the planet. And it is every bit as indispensable to the planet as your microbiome is to your personal health. Microbes living on the surface of the oceans, for example, aerosolize and end up in the atmosphere, where water droplets collect on their surfaces, forming clouds . Eliminating those microbes would directly affect rainfall. More oxygen that humans breathe is made by microbes than plants. And even the plants rely upon the microbiome of soil to transfer nutrients into their roots, allowing trees and forests to make more oxygen for humans to breathe. So it should be with some considerable alarm that we consider the killing potential manmade antibiotics have for Earth’s microbiome.

#### Pandemics are inevitable - climate change and a host of other factors make them more common and more dangerous, so ensuring we are as ready as possible is key

**CAN 17,** California Nurses Association, January 2017, “SARS, EBOLA, AND ZIKA: What Registered Nurses Need to Know About Emerging Infectious Diseases,” accessed via Google Cache

[ INTRODUCTION ] Infectious diseases are a part of life, from the bubonic plague of the 15th century that decimat- ed populations in Europe to the Ebola outbreak of 2015 that has killed over 10,000 people in West Africa. Science and technology have allowed us to escape the effects of many diseases like yellow fever and rubella through vaccines. Since 1975, however, over 30 new diseases have appeared, including AIDS, Ebola, Lyme disease, Legionnaires’ disease, and antibiotic-resistant organisms. Most of these new infections are caused by pathogens present in the environment but infecting a new host or different population. Rarely, new pathogens may evolve to cause a new disease. New or newly noticed diseases are not the only concern. Old diseases, like malaria and cholera, have made comebacks. Underfunded, declining public health programs and crowded poor urban environments foster the transmission of diseases that spread through social contact between peo- ple, like tuberculosis and diphtheria. Vector-borne infections have also reappeared due to climate change and human disruption of ecosystems. Arboviruses, which are viruses spread by mosqui- toes and ticks, are responsible for more than 130 human diseases and the ranges of the vectors are rapidly expanding. Nurses are at the forefront of healthcare and are in a position to recognize new and re-emerging infectious diseases. Nurses are often the first to be exposed to infectious diseases. During an ongoing epidemic, little may be known about the disease, how it is transmitted, or what kinds of protections healthcare workers need. In these situations, it is vital — literally — that hospitals and other healthcare employers adhere to the precautionary principle — even in the face of scientific uncertainty, protective measures should be taken. In this home study, you will read about three recently emerged or re-emerged infectious dis- eases. Primary and secondary sources are used to demonstrate the kinds of literature that emerge surrounding infectious disease outbreaks. The conditions that led to the rise and/or spread of the outbreak into an epidemic are discussed. I. SEVERE ACUTE RESPIRATORY SYNDROME (SARS) The first major epidemic of the 21st century, the SARS epidemic of 2003 began in China and spread globally. The progression of the epidemic is described and the forces of urbanization and globalization on the emergence of the novel disease are discussed. II. ZIKA VIRUS DISEASE The current Zika epidemic began in Brazil in 2015 and has rapidly expanded to other Latin American and Caribbean countries in late 2015 and early 2016. The status of the epidemic is described. The impact of climate change and fragmented public health infrastructure on the emergence of the epidemic are discussed. III. EBOLA VIRUS DISEASE The origin and progression of the 2014 Ebola epidemic originating in West Africa is described. The spread of Ebola to the United States is dis- cussed in detail. The contributions of inadequate protections for healthcare workers and the frag- mented public health infrastructure of the United States are discussed. Page 3 3 [ SECTION I ] SEVERE ACUTE RESPIRATORY SYNDROME (SARS): FROM CHINA TO TORONTO A previously unknown respiratory disease began ailing people in the southern Chinese province Guangdong in late 2002. It spread rapidly across Asia and around the world, causing severe acute respiratory syndrome (SARS). This epidemic was the first major infectious disease epidemic of the 21st century and forced the need to reshape understanding of public health as global instead of national. The story of SARS clearly demonstrates the impact of urbanization and globalization on emerging infectious diseases. It also demonstrates how unprepared public health infrastructure can prolong an epidemic. By the end of 2003, all cases worldwide had been treated and the epidemic was over. Probable SARS cases were identified in 8,096 people worldwide and infection resulted in 774 deaths. On May 20, 2003, the World Health Organization (WHO) published a status report on the epidemic. This excerpt describes how the epidemic was started, which was an important discovery for breaking the transmission cycle. Excerpt below from: Severe acute respiratory syndrome (SARS): Status of the outbreak and lessons for the immediate future SARS: a puzzling and difficult new disease SARS is the first severe and readily trans- missible new disease to emerge in the 21st century. Though much about the disease remains poorly understood and frankly puzzling, SARS has shown a clear capacity for spread along the routes of internation- al air travel. At present, the outbreaks of greatest concern are concentrated in trans- portation hubs or spreading in densely populated areas. WHO regards every coun- try with an international airport, or border- ing an area having recent local transmis- sion, as at potential risk of an outbreak. The first cases of SARS are now known to have emerged in mid-November 2002 in Guangdong Province, China. The first official report of an outbreak of atypical pneumonia in the province, said to have affected 305 persons and caused 5 deaths, was received by WHO on 11 February. Around 30% of cases were reported to occur in health care workers. Confirmation that cases were consistent with the defi- nition of SARS was made after permission was granted, on 2 April, for a WHO team to visit the province. In the meantime, SARS was carried out of Guangdong Province on 21 February by an infected medical doctor who had treated patients in his home town. He brought the virus to the ninth floor of a four-star hotel in Hong Kong. Days later, guests and visi- tors to the hotel’s ninth floor had seeded outbreaks of cases in the hospital systems of Hong Kong, Viet Nam, and Singapore. Simultaneously, the disease began spread- ing around the world along international air travel routes as guests at the hotel flew home to Toronto and elsewhere, and as other medical doctors who had treated the earliest cases in Viet Nam and Singapore travelled internationally for medical or other reasons. When the disease moved out of southern China, the outbreaks it seeded — in Hanoi, Hong Kong, Singapore, and Toronto — became the initial “hot zones” of SARS, characterized by rapid increases in the number of cases, especially in health care workers and their close contacts. In these areas, SARS first took root in hospital settings, where staff, unaware that a new disease had surfaced and fighting to save the lives of patients, exposed themselves to the infectious agent without barrier pro- tection. All of these initial outbreaks were subsequently characterized by chains of secondary transmission outside the health care environment. By 15 March, WHO had received reports of more than 150 cases of a new disease, which it named severe acute respiratory syndrome. Epidemiological analysis indi- cated that the new disease was spreading along the routes of international air travel. WHO immediately issued emergency travel recommendations to alert health authori- ties, physicians, and the travelling public to what was now perceived to be a worldwide threat to health. The global alert achieved its purpose. After the recommendations, all countries with imported cases, with the exception of provinces in China, were able, through prompt detection of cases, imme- diate isolation, strict infection control, and vigorous contact tracing, to either prevent Page 4 4 further transmission or keep the number of additional cases very low. During the last week of April, the out- breaks in Hanoi, Hong Kong, Singapore, and Toronto showed some signs of peak- ing. On 28 April, Viet Nam became the first country to stop local transmission of SARS. However, new probable cases, including cases in hospital staff, additional deaths, and first cases imported to new areas continued to be reported from several countries. The cumulative total number of cases surpassed 5,000 on 28 April, 6,000 on 2 May, and 7,000 on 8 May, when cases were reported from 30 countries on six continents. At present, most new cases are being reported from Beijing and, increas- ingly, other parts of mainland China. Of the cumulative global total of 7761 probable cases and 623 deaths reported on 17 May, 5209 cases and 282 deaths had occurred in mainland China. Also of concern is a rapidly growing outbreak in Taiwan, China, with a cumulative total, on 18 May, of 344 cases, including many in hospital staff, and 40 deaths. [End excerpt] Later, it was discovered that the virus arose from exposure to and between wild animals in wet markets in Guangdong. China has experienced rapid urbanization and industrialization in recent decades, leading to the formation of a young, wealthy class. The new class seeks to eat exotic wild animals, which has encouraged the growth of wet markets where live animals are kept and sold. China has less wild expanse close to the city in which to hunt so many people hunt animals in Thailand and other countries. Many different animals who would stay far away from each other in the wild are kept in very close contact in transit and at these markets. It is hypothesized that SARS originated in horseshoe bats and jumped to other animals nearby, particularly palm civets, a type of wild cat. Because people who sell their catches at the wet markets also live there, the virus has the opportunity to jump from animal to animal to humans. SARS spread to Toronto in late February 2003, prompting the WHO to issue a global alert on March 12 and elevate the alert on March 15. The events in Toronto clearly demonstrate issues regarding protections for healthcare workers and isolation precautions in an emerging disease event. Excerpt below from: Learning from SARS: Preparing for the Next Disease Outbreak Phase I of the Toronto SARS Outbreak The index case and her husband had vacationed in Hong Kong and had stayed at a hotel in Kowloon from February 18 to 21, 2003. The index case began to experience symptoms after her return on February 23 and died at home on March 5. During her illness, family members, including her son (case A), provided care at home. Case A became ill on February 27 and presented to the index hospital on March 7 (Varia et al., 2003). Nosocomial transmission in the hospital began when case A presented to the emer- gency department on March 7 with severe respiratory symptoms. He was placed in a general observation area of the emergency department and received nebulized salbu- tamol. During this time, SARS was trans- mitted to two other patients in the emer- gency department (cases B and C). Case B, who had presented with rapid atrial fibrillation, was in the bed adjacent to case A, about 1.5 meters away and separated by a curtain, and was discharged home after 9 hours in the emergency department. Case C, who had presented with shortness of breath secondary to a pleural effusion, was three beds (about 5 meters) away from case A and was transferred to a hos- pital ward and later discharged home on March 10. The three patients were cared for by the same nurse. Case A was transferred briefly to a medical unit, then to the intensive care unit (ICU) 18 hours after his presentation to the emer- gency department. Three hours later, he was placed in airborne isolation because tuberculosis was included in his differential diagnosis. Contact and droplet precau- tions were implemented on March 10 by ICU staff caring for case A, and the patient remained in isolation until his death, on March 13. Case A’s family visited him in the ICU on March 8, 9, and 10. During this time, some family members were febrile, and two were experiencing respiratory symp- toms. Chest radiographs were taken of the family members on March 9 and again on March 11. Four members had abnormal radiographs and were instructed to wear masks at all times, wash their hands upon entering and leaving the ICU, and limit their visits to the ICU. Page 5 5 On March 12, the WHO alerted the global community to a severe respiratory syn- drome that was spreading among HCWs in Hanoi, Vietnam, and Hong Kong. The alert was forwarded to infectious disease and emergency department physicians in Toronto. The following day, case A died and it became clear that several other family members had worsening illness. The clinicians involved and the local public health unit suspected the family’s illness- es might be linked to cases of atypical pneumonia reported in Hong Kong. Four family members were admitted to three different hospitals on March 13, and anoth- er family member was admitted to hospi- tal on March 14. All were managed using airborne, droplet, and contact precautions. No further transmission from these cases occurred after admission to hospital. Case B became febrile on March 10, 3 days after exposure to case A in the emergency department and discharge home. Respi- ratory symptoms evolved over the next 5 days. He was brought to the index hospital on March 16 by two Emergency Medical Services paramedics, who did not immedi- ately use contact and droplet precautions. After 9 hours in the emergency depart- ment, where airborne, contact and droplet precautions were used, case B was trans- ferred to an isolation room in the ICU. His wife became ill on March 16. She was in the emergency department with case B on March 16 (no precautions used) and visited him in the ICU on March 21 (precautions used); he died later that day. The infection also spread to three other members of case B’s family. SARS developed in a num- ber of people who were in contact with case B and his wife on March 16, including the 2 paramedics who brought him to the hospital, a firefighter, 5 emergency department staff, 1 other hospital staff, 2 patients in the emergency department, 1 housekeeper who worked in the emergency department while case B was there, and 7 visitors who were also in the emergency department at the same time as case B (symptom onset March 19 to 26). The 16 hospital staff, visitors, and patients trans- mitted the infection to 8 household mem- bers and 8 other family contacts. In the ICU, intubation for mechanical ventilation of case B was performed by a physician wearing a surgical mask, gown and gloves. He subsequently acquired SARS and transmitted the infection to a member of his family. Three ICU nurses who were present at the intubation and who used droplet and contact precautions had onset of early symptoms between March 18 and 20. One transmitted the infection to a household member. Case C became ill on March 13 with symptoms of a myocardial infarction and was brought to the index hospital by paramedics. It was unknown that he had been in contact with case A on March 7, and thus it was not recognized that he had SARS. As a result, he was not isolated, and other precautions were not used. He was admitted to the coronary care unit (CCU) for 3 days and then trans- ferred to another hospital for renal dialysis. He remained in the other hospital until his death, on March 29. Subsequent transmis- sion of SARS occurred within that hospital (Dwosh et al., 2003). Case C’s wife became ill on March 26. At the index hospital, case C transmitted SARS to 1 patient in the emergency department, 3 emergency department staff, 1 housekeeper who worked in the emergency department while case C was there, 1 physician, 2 hos- pital technologists, 2 CCU, patients, and 7 CCU staff. One of the paramedics who transported case C to the index hospital also became ill. Further transmission then occurred from ill staff at the index hospital to 6 of their family members, 1 patient, 1 medical clinic staff, and 1 other nurse in the emergency department. On March 23, 2003, officials recognized that the number of available negative pres- sure rooms in Toronto was being exhaust- ed. In a 4-hour period on the afternoon of March 23, staff at West Park Hospital, a chronic care facility in the city, recom- missioned 25 beds in an unused building formerly used to house patients with tuberculosis. Despite the efforts of West Park physicians and nurses, and assistance from staff at the Scarborough Grace and Mount Sinai Hospitals, qualified staff could be found to care for only 14 patients. Faced with increasing transmission, the Ontario government designated SARS as Page 6 a reportable, communicable, and virulent disease under the Health Protection and Promotion Act on March 25, 2003. This move gave public health officials the authority to track infected people, and issue orders preventing them from engag- ing in activities that might transmit the new disease. Provincial public health activated its emergency operations center. By the evening of March 26, 2003, the West Park unit and all available negative pressure rooms in Toronto hospitals were full; however, 10 ill Scarborough Hospital staff needing admissions were waiting in the emergency department, and others who were ill were waiting at home to be seen. Overnight, with the declaration of a provincial emergency, the Ontario govern- ment required all hospitals to create units to care for SARS patients. By March 25, 2003, Health Canada was reporting 19 cases of SARS in Canada — 18 in Ontario and the single case in Van- couver. But 48 patients with a presumptive diagnosis of SARS had in fact been admitted to hospital by the end of that day. Many more individuals were starting to feel symptoms, and would subsequently be identified as SARS patients. Epidem- ic curves later showed that this period was the peak of the outbreak. On March 19, nine Canadians developed “probable” SARS, the highest single-day total. Taking “suspect” and “probable” cases together, the peak was March 26, and the 3 days, March 25 to 27 are the highest 3-day period in the outbreak. The Ontario government declared SARS a provincial emergency on March 26, 2003. Under the Emergency Management Act, the government has the power to direct and control local governments and facili- ties to ensure that necessary services are provided. All hospitals in the Greater Toronto Area (GTA) and Simcoe County were ordered to activate their “Code Orange” emergency plans by the government. “Code Orange” meant that the involved hospitals suspend- ed nonessential services. They were also required to limit visitors, create isolation units for potential SARS patients, and implement protective clothing for exposed staff (i.e., gowns, masks, and goggles). Four days later, provincial officials extended access restrictions to all Ontario hospitals. On May 14, 2003, WHO removed Toron- to from the list of areas with recent local transmission. This was widely understood to mean that the outbreak had come to an end. Consistent with the notion that the disease was contained, the government of Ontario lifted the emergency on May 17. Directives continued to reinforce the need for enhanced infection control practices in health care settings. Code Orange status for hospitals was revoked. It appeared that the total number of cases had reached a plateau — 140 probable and 178 suspect infections. Twenty-four Cana- dians had died, all in Ontario. [End of excerpt] In mid-May of 2003, after hospitals had discontin- ued SARS precautions, five patients in a Toronto rehabilitation hospital reported with febrile illness. Two of these patients were found to have been hospitalized at North York General Hospital, where a subsequent investigation of pneumonia cases identified eight previously unrecognized SARS cases. The first patient in this second transmis- sion apparently had no history of contact with a SARS patient or healthcare worker with SARS. The hospital was closed to new admissions on May 23, and infection control directives increased required protections. The second transmission of SARS in Toronto came to an end in June with 79 new SARS cases. Guangdong Province, China NOV. 2002 Toronto, Canada FEB. 2003 Page 7 7 [Excerpt continued] Transmission The SCoV has been isolated in sputum, nasal secretions, serum, feces, and bronchi- al washings (Drosten et al., 2003; Peiris et al., 2003b). Evidence suggests that SCoV is transmitted via contact and/or droplets (Peiris et al., 2003a; Poutanen et al., 2003) and that the use of any mask (surgical or N95) significantly decreases the risk of infection (Seto et al., 2003). However, there are cases that defy explanation based on these modes of transmission suggesting that alternative modes of transmission may also occur (Varia et al., 2003). SCoV remains viable in feces for days and the outbreak at the Amoy Gardens apartments highlights the possibility of an oral-fecal or fecal-droplet mode of transmission (WHO, 2003m,n). A number of cases occurred in HCWs wearing protective equipment following exposure to high risk aerosol- and drop- let-generating procedures such as airway manipulation, administration of aerosolized medications, noninvasive positive pressure ventilation, and bronchoscopy or intuba- tion (Lee et al., 2003; Ofner et al., 2003). When intubation is necessary, measures should be taken to reduce unnecessary exposure to health care workers, includ- ing reducing the number of health care workers present and adequately sedating or paralyzing the patient to reduce cough. Updated interim infection control pre- cautions for patients who have SARS are under development and will be available from CDC at http://www.cdc.gov/ncidod/ sars/index.htm. Currently, epidemiological evidence sug- gests that transmission does not occur prior to the onset of symptoms or after symptom resolution. Despite this, shedding of SCoV in stool has been documented by reverse-transcription polymerase chain reaction (RT-PCR) for up to 64 days fol- lowing the resolution of symptoms (Ren et al., 2003). A small group of patients appear to be highly infectious and have been referred to as superspreaders (CDC, 2003a). Such superspreaders appear to have played an important role early in the epidemic but the reason for their enhanced infectivity remains unclear. Possible explanations for their enhanced infectivity include the lack of early implementation of infection control precautions, higher load of SCoV, or larger amounts of respiratory secretions. [End of excerpt] The spread of SARS in Toronto was exacerbated due to delayed public health authority action in recognizing the outbreak, declaring an emergency, and tracing and isolating contacts. The complete lack of protections provided to healthcare work- ers and the late use of precautionary isolation of potential cases presenting with respiratory illness meant that many healthcare workers became infected and continued to infect others before they sickened. Note in the section discussing transmission, no description is given of the type of personal protective equipment (PPE) that healthcare workers wore during the high risk aerosol-generating procedures. Clearly, it was not protective enough. The outbreak was successfully contained after measures were taken to isolate cases and provide protection for healthcare workers. The outbreak in Toronto extended into the second phase because of the lack of integration of new information about SARS. Eight pneumonia cases were later identified as SARS cases, only after patients had had contact with others. Page 8 8 URBANIZATION AND SARS The pace of urbanization has increased significantly in the last century. Only 20% of the world’s pop- ulation lived in cities about 100 years ago. Trends towards urbanization are expected to increase in all countries from 45% in 1995 to 61% in 2030. Urban infrastructure has lagged behind and many cities host dense regions of people living in crowd- ed slums, with limited fresh water, sanitation, and healthcare access. The United Nations (UN) pre- dicts that “slums will become the dominant urban form within the next 15 years.” People living in these slums do and will continue to be dispropor- tionately affected by infectious diseases through more exposure to pathogens and vectors and less availability of healthcare and prophylaxis than their wealthier counterparts. The destruction of environment to create cities and even in rural areas increases the contact between humans and animals. This can accelerate the introduction of new zoonotic diseases, like SARS, into humans. More than 60% of the 335 emerging infectious diseases identified between 1940 and 2004 have been zoonotic. Living in close contact with wild or domesticated animals, hunting, killing, or preparing food can be risk factors for an emerging disease to jump species to humans. Close contact between bats and primates in particular is thought to be a significant risk factor. This kind of new and close contact between different species was seen in China’s wet markets where SARS emerged. Food handlers at the wet market in Guangdong were found to be disproportionately affected by SARS early in the epidemic. Urbanization of China forced hunters to travel to new places, bringing different animals back to small areas in wet mar- kets waiting for sale. A key fact to dealing with the SARS epidemic was recognizing that a significant proportion of the initial illnesses occurred in food handlers catching, selling, and killing wild animals. Understanding how diseases are introduced into the population is critical to controlling ongoing epidemics and to preventing outbreaks from progressing to epidemics. GLOBALIZATION AND SARS The spread of SARS from Singapore and Hong Kong to Toronto served as a wake-up call for many about how connected the world had become. Historically, infectious disease outbreaks were geographically confined. International shipping transported some diseases like cholera and the technological developments of the Industrial Revolution like the steam engine and the railroad allowed diseases to be transported more quickly. International airplane travel significantly decreased the amount of time it takes to get from one place to another, allowing not-yet-symptom- atic people incubating a disease to travel to a new place before they even know they are sick. Inter- national tourist arrivals have exploded from 25 million in 1950 to more than one billion in 2013. Author Sonia Shah chronicles the development of several different infectious diseases over the past two centuries. In her book, Pandemic: Tracking Contagions, from Cholera to Ebola and Beyond, she describes the effect of increased global travel: [People] don’t just fly in and out of a hand- ful of prominent airports in major cities, but into and out of tens of thousands of airports in small towns and minor cities in even the most remote and far-flung nations. There are some fifteen thousand airports in the United States, but not only that: there are also more than two hundred in the Democratic Republic of Congo, one hundred in Thailand, and, as of 2013, nearly five hundred in China. New York City is no longer the center of today’s global trans- portation network, of course. The hub has shifted. Of the ten largest and busiest air- ports in the world, nine are in Asia, seven in China alone. And just as the United States’ gateway to the world was once New York City, China’s gateway to the world is Hong Kong, where more cargo — both visible and invisible — is loaded onto airplanes than anywhere else. Increased globalization enabled the spread of SARS to Toronto from China and later we will see how globalization contributes to other epidemics. A globalized, integrated public health system is needed to protect all people’s health in our inter- connected, modern world. Page 9 9 [ SECTION II ] ZIKA: AN EMERGING EPIDEMIC IN PROGRESS Note: The info on Zika is current as of the time of writing. As it is an ongoing epidemic, new informa- tion may emerge in the coming months. Zika virus is a positive sense, single-stranded RNA virus in the same family of mosquito-borne arbo- viruses as yellow fever, dengue, West Nile virus, and encephalitis. Zika virus was first isolated in 1947 during surveillance of diseases in macaques in Uganda. The first documented human infection was in 1954, and the virus spread slowly through sub-Saharan Africa to Asia by the 21st century. Outbreaks of Zika have been identified only in recent years: Yap Island in the Federated States of Micronesia in 2007, French Polynesia in 2013, and Brazil spreading to other parts of Latin America in 2015-16. Information about Zika virus is limited including symptoms, length of viremia, transmission, and potential neurological complications. A signifi- cant amount of data has become available during the 2013 and 2015-16 epidemics. Prior to the first recorded outbreak in 2009, only 25 papers were published in peer-reviewed literature compared to 225 in the first three months of 2016 alone. How- ever, few definitive answers have been reached. Zika virus has shown an extremely unusual propensity for multiple transmission pathways. Initially, it was thought that Zika was transmitted only by mosquitoes from human to human and possibly monkey to human. Now, there is evidence that Zika is sexually transmitted, transmitted through blood transfusions, and from a mother to her baby during pregnancy and birth. Additionally, there is one case where Zika was transmitted through bodily fluids from a patient with extreme- ly high levels of Zika virus in his body. Zika virus has been found in various bodily fluids, including saliva, urine, breast milk, the female genital tract, and semen. Viral particles appear to remain in semen for at least 90 days and the female genital tract for at least 14 days. Mosquito-borne transmission of Zika virus con- tinues to be the pathway of most concern in stopping the epidemic. Aedes mosquitoes have adapted to live near humans, requiring only the smallest amount of still water to reproduce. They are active and biting during the day, unlike other mosquito species that only feed at night. In the United States, the Aedes mosquitoes were nearly eradicated in the 1970’s through pesticide appli- cation, but they have made comebacks in some areas after pesticide use has declined or ceased. Urban poverty in Brazil has created “the perfect set of conditions for the transmission of such mosquito-borne viruses.” The lack of infrastructure and water security in conjunction with crowding and poor housing conditions has created a situ- ation where an abundance of breeding grounds exists in close proximity to living quarters where residents also have limited access to prevention like bug spray and air conditioning as well as limited healthcare access. These same conditions exist in many places in the United States that are vulnerable to mosquito-borne disease outbreaks, including Florida, Texas, and other Gulf Coast states. While the Aedes species is the confirmed Zika vector, some suspect other species may have adapted to carry Zika virus, which would help explain the sudden widespread nature of the Brazil outbreak as compared to previous progression of the disease. Global travel has also accelerated the spread of Zika virus. Symptoms of Zika virus infection are typically mild and self-limiting and include fever, itchy maculo- papular rash, joint paint, and conjunctivitis. The case definition of Zika virus disease has evolved during the 2015-16 epidemic from two symptoms with exposure to just one symptom with exposure. Symptoms last a few days to a week; severe illness and death are rare. The incubation period is esti- mated to be between three and twelve days. Up to 80% of people infected with the virus have no symptoms. When diagnostic assays are of limited availability as they have been in the Zika epidemic, establish- ing reliable and consistent case definition is crucial for treatment and prevention of further spread. Fever Conjunctivitis Rash Joint Pain Only 1 out of 5 people develop symptoms Page 10 10 ZIKA: INFORMATION EVOLVES DURING EPIDEMICS The most recent two outbreaks in French Poly- nesia and Brazil have brought to light potential neurological complications geographically and temporally associated with Zika virus infections. The 2013 outbreak in French Polynesia was accompanied by a “concomitant epidemic of 73 cases of Guillain-Barré syndrome and other neuro- logical conditions in a population of approximately 270,000.” Guillain-Barré Syndrome (GBS) is a rare auto-immune disorder that results in damaged nerve cells, weakened muscles, and paralysis. Most people recover from GBS, but some suffer perma- nent damage or death. The most recent outbreak that began in Brazil in 2015 has been accompanied by “an apparent 20-fold increase in incidence from 2014 to 2015” in microcephaly rates. Microceph- aly (head smaller than average) has been seen in infants born to women infected with Zika virus during pregnancy and is related to developmental delay, intellectual disability, vision problems, and other effects. CLIMATE CHANGE AND ARBOVIRUSES The rapid spread of Zika through Latin Ameri- can countries should serve as an exposition of the disastrous effects of climate change and the interactive effect with poverty on infectious disease. Climate change has been influencing weather patterns all over the globe, making them less predictable and weather more severe. The 2015 El Niño, “which is characterized by warming waters in the central and eastern Pacific Ocean,” has brought “warmer temperatures and shifting precipitation patterns to South America and can create conditions that help mosquito populations, and the diseases they can transmit, thrive.” Mas- sive flooding in parts of Uruguay, southern Brazil, and Paraguay in recent months has displaced 150,000 people and led to standing water, provid- ing breeding ground for mosquitoes and disrupted living situations and access to healthcare, water, and other vital services. On the other hand, north- ern Brazil, Venezuela, Guyana, and Suriname have had drier than usual weather. Because these areas lack a consistent water supply, many people have begun stockpiling water, creating mosquito breed- ing grounds near human dwellings. Additionally, 2015 was the hottest year on record; these warmer temperatures may mean mosquitoes are more active, reproducing more, and biting more there- fore infecting more people. Diseases carried by mosquitoes are particularly sensitive to meteorological conditions — warmer temperatures increase mosquito reproduction and biting activity and the rate at which pathogens mature inside them. Temperature also limits the range of mosquito vectors. Freezing kills Aedes larvae and eggs. As the earth warms, fewer plac- es will freeze over completely and Aedes vectors will increase their territory and spread infectious diseases to new places. Fossil evidence from the end of the last Ice Age “demonstrate[s] that rapid, poleward shifts of insects accompanied warming.” POVERTY AND INFECTIOUS DISEASES Many of the areas where Zika has been the biggest problem are also the poorest areas of Brazil. The low quality housing, lacking screens and air conditioning that help prevent exposure to mosquitoes, in addition to no reliable water or waste disposal systems creates situations where breeding grounds abound in urban, crowded areas. Brazil eradicated Aedes mosquitoes in 1958 through coordinated efforts and funding. However, over the years, the mosquitoes have returned and multiplied. Not only do residents in these areas have a higher risk for contracting Zika, they will also experience more challenges if they develop GBS or give birth to a baby with microcephaly. Lack of resources compounds the ramifications of disability. We see similar conditions in the United States in areas where Aedes mosquitoes are common, like Florida and Texas. These states have large impov- erished populations, a warm climate, and did not expand Medicaid. Not only are the mosquitoes present, which increases the risk for transmitting the disease from a returning infected traveler, the Page 11 11 housing stock in some areas is dilapidated, missing screens and air conditioning, and trash is abandoned to become breeding grounds for mosquitoes after rainfall. The mortgage foreclo- sure crisis hit Florida especially hard, where many houses remain empty, creating mosquito breeding territory. Further, if people begin to be infected locally and develop GBS or microcephaly, their access to healthcare is extremely limited due to their states’ limitations on Medicaid.

#### New diseases cause extinction – uniquely probable due to environmental changes.

Mooney 21 — (Tom Mooney, Senior Communications & Advocacy Manager for the Coalition for Epidemic Preparedness Innovations, “Preparing for the next “Disease X””, CEPI, 2-1-21, Available Online at <https://cepi.net/news_cepi/preparing-for-the-next-disease-x/>, accessed 9-10-21, HKR-AM)

Disease X represents the knowledge that a serious international pandemic could be caused by a pathogen currently unknown to cause human disease. It was first included in the WHO’s list of priority pathogens in 2018. COVID-19 represents the first occurrence of Disease X since its designation was established, emerging much sooner than anticipated.

While the world battles to control COVID-19, we know that future outbreaks of Disease X are **inevitable**. Our interconnected world has made us more vulnerable than ever to the rapid spread of new emerging infectious diseases. Rapid urbanisation, deforestation, intensive agriculture, livestock rearing practices, climate change and globalisation are increasing opportunities for animal-to-human contacts and for human-to-human transmission of disease on a global scale. **The threat of Disease X infecting the human population, and spreading quickly around the world, is greater than ever before.**

COVID-19: CEPI’s first Disease X

When CEPI was established in 2017 we classed Disease X as a serious risk to global health security, for which the world needed to prepare. Prior to the COVID-19 pandemic, CEPI had initiated a rapid response programme—including mRNA vaccines—against novel pathogens. Our goal was to be able to start safety testing of vaccines within months of a new pathogen being genetically sequenced.

In January 2020—within 2 weeks of the publication of the genome sequence of the COVID-19 virus, and with just 141 confirmed cases of COVID-19 globally—CEPI began work on developing vaccine candidates against the virus. CEPI was able to move with such agility because it had already identified coronaviruses as serious threats and invested over $140 million in the development of vaccines against MERS. Within a few weeks of the COVID-19 outbreak, most of CEPI’s MERS vaccine development partners had pivoted to work on the new virus.

Just one year later, two CEPI-supported vaccine candidates are amongst the first in the world to be approved by regulatory authorities and deployed to protect people from the virus; and potentially over one billion doses of vaccine enabled by CEPI investment will be available to the COVAX Facility in 2021.

The speed of the scientific progress has been astounding, compressing vaccine development—which typically takes a decade into the space of 12 months—yet over 2 million lives have been lost to COVID-19 already and economies the world over have been devastated.

So, could we move even faster next time?

What next for Disease X?

We don’t know where or when the next Disease X will emerge, only that it will. As COVID-19 has demonstrated, diseases do not respect borders so we need to be prepared on a global scale to respond to future outbreaks of Disease X, and we need to do it fast.

In many ways COVID-19 is a proof of concept for rapidly developing a vaccine against a new viral threat. Scientists were already working on vaccines against MERS and SARS—pathogens from the same virus family as COVID-19—which gave us a crucial head start this time around.

25 viral families are known to infect humans, and over 1.6 million yet-to-be-discovered viral species from these viral families are estimated to exist in mammal and bird hosts—the most important reservoirs for viral zoonoses.

We cannot develop vaccines against all potential viral threats, but we could produce a library of prototype vaccines and other biological interventions against representative pathogens from each of these 25 viral families. Having such a library of prototype vaccines, which could be ‘pulled off the shelf’, and advanced into clinical testing as soon as a related threat emerges would dramatically accelerate the development of vaccines.

We also know that beta coronaviruses that cause SARS and MERS are associated with case fatality rates of 10-35% (25-88 times worse than COVID-19) and that coronaviruses circulate widely in animal reservoirs. The emergence of a coronavirus variant combining the transmissibility of COVID-19 with the lethality of SARS or MERS would be utterly devastating. We must minimise this threat as a matter of urgency. One way to do this in the long-term would be to develop a vaccine that provides broad protection against coronaviruses in general.

If we can produce vaccines against Disease X in a matter of months instead of a year or more, we could revolutionise the world’s ability to respond to epidemic and pandemic diseases. **Disease X and other emerging infectious diseases pose an existential threat to humanity**. But for the first time in history, with the right level of financial commitment and political will, we could credibly aim to eliminate the risk of epidemics and pandemics.

### FW

#### the standard is maximizing expected wellbeing

#### 1 – Extinction o/ws under any framework, even under moral uncertainty – infinite future generations

Pummer 15 — (Theron Pummer, Junior Research Fellow in Philosophy at St. Anne's College, University of Oxford, “Moral Agreement on Saving the World“, Practical Ethics University of Oxford, 5-18-2015, Available Online at http://blog.practicalethics.ox.ac.uk/2015/05/moral-agreement-on-saving-the-world/, accessed 7-2-2018, HKR-AM) \*\*we do not endorse ableist language=

There appears to be lot of disagreement in moral philosophy. Whether these many apparent disagreements are deep and irresolvable, I believe there is at least one thing it is reasonable to agree on right now, whatever general moral view we adopt: that it is very important to reduce the risk that all intelligent beings on this planet are eliminated by an enormous catastrophe, such as a nuclear war. How we might in fact try to reduce such existential risks is discussed elsewhere. My claim here is only that we – whether we’re consequentialists, deontologists, or virtue ethicists – should all agree that we should try to save the world. According to consequentialism, we should maximize the good, where this is taken to be the goodness, from an impartial perspective, of outcomes. Clearly one thing that makes an outcome good is that the people in it are doing well. There is little disagreement here. If the happiness or well-being of possible future people is just as important as that of people who already exist, and if they would have good lives, it is not hard to see how reducing existential risk is easily the most important thing in the whole world. This is for the familiar reason that there are so many people who could exist in the future – there are trillions upon trillions… upon trillions. There are so many possible future people that reducing existential risk is arguably the most important thing in the world, even if the well-being of these possible people were given only 0.001% as much weight as that of existing people. Even on a wholly person-affecting view – according to which there’s nothing (apart from effects on existing people) to be said in favor of creating happy people – the case for reducing existential risk is very strong. As noted in this seminal paper, this case is strengthened by the fact that there’s a good chance that many existing people will, with the aid of life-extension technology, live very long and very high quality lives. You might think what I have just argued applies to consequentialists only. There is a tendency to assume that, if an argument appeals to consequentialist considerations (the goodness of outcomes), it is irrelevant to non-consequentialists. But that is a huge mistake. Non-consequentialism is the view that there’s more that determines rightness than the goodness of consequences or outcomes; it is not the view that the latter don’t matter. Even John Rawls wrote, “All ethical doctrines worth our attention take consequences into account in judging rightness. One which did not would simply be irrational, crazy.” Minimally plausible versions of deontology and virtue ethics must be concerned in part with promoting the good, from an impartial point of view. They’d thus imply very strong reasons to reduce existential risk, at least when this doesn’t significantly involve doing harm to others or damaging one’s character. What’s even more surprising, perhaps, is that even if our own good (or that of those near and dear to us) has much greater weight than goodness from the impartial “point of view of the universe,” indeed even if the latter is entirely morally irrelevant, we may nonetheless have very strong reasons to reduce existential risk. Even egoism, the view that each agent should maximize her own good, might imply strong reasons to reduce existential risk. It will depend, among other things, on what one’s own good consists in. If well-being consisted in pleasure only, it is somewhat harder to argue that egoism would imply strong reasons to reduce existential risk – perhaps we could argue that one would maximize her expected hedonic well-being by funding life extension technology or by having herself cryogenically frozen at the time of her bodily death as well as giving money to reduce existential risk (so that there is a world for her to live in!). I am not sure, however, how strong the reasons to do this would be. But views which imply that, if I don’t care about other people, I have no or very little reason to help them are not even minimally plausible views (in addition to hedonistic egoism, I here have in mind views that imply that one has no reason to perform an act unless one actually desires to do that act). To be minimally plausible, egoism will need to be paired with a more sophisticated account of well-being. To see this, it is enough to consider, as Plato did, the possibility of a ring of invisibility – suppose that, while wearing it, Ayn could derive some pleasure by helping the poor, but instead could derive just a bit more by severely harming them. Hedonistic egoism would absurdly imply she should do the latter. To avoid this implication, egoists would need to build something like the meaningfulness of a life into well-being, in some robust way, where this would to a significant extent be a function of other-regarding concerns (see chapter 12 of this classic intro to ethics). But once these elements are included, we can (roughly, as above) argue that this sort of egoism will imply strong reasons to reduce existential risk. Add to all of this Samuel Scheffler’s recent intriguing arguments (quick podcast version available here) that most of what makes our lives go well would be undermined if there were no future generations of intelligent persons. On his view, my life would contain vastly less well-being if (say) a year after my death the world came to an end. So obviously if Scheffler were right I’d have very strong reason to reduce existential risk. We should also take into account moral uncertainty. What is it reasonable for one to do, when one is uncertain not (only) about the empirical facts, but also about the moral facts? I’ve just argued that there’s agreement among minimally plausible ethical views that we have strong reason to reduce existential risk – not only consequentialists, but also deontologists, virtue ethicists, and sophisticated egoists should agree. But even those (hedonistic egoists) who disagree should have a significant level of confidence that they are mistaken, and that one of the above views is correct. Even if they were 90% sure that their view is the correct one (and 10% sure that one of these other ones is correct), they would have pretty strong reason, from the standpoint of moral uncertainty, to reduce existential risk. Perhaps most disturbingly still, even if we are only 1% sure that the well-being of possible future people matters, it is at least arguable that, from the standpoint of moral uncertainty, reducing existential risk is the most important thing in the world. Again, this is largely for the reason that there are so many people who could exist in the future – there are trillions upon trillions… upon trillions. (For more on this and other related issues, see this excellent dissertation). Of course, it is uncertain whether these untold trillions would, in general, have good lives. It’s possible they’ll be miserable. It is enough for my claim that there is moral agreement in the relevant sense if, at least given certain empirical claims about what future lives would most likely be like, all minimally plausible moral views would converge on the conclusion that we should try to save the world. While there are some non-crazy views that place significantly greater moral weight on avoiding suffering than on promoting happiness, for reasons others have offered (and for independent reasons I won’t get into here unless requested to), they nonetheless seem to be fairly implausible views. And even if things did not go well for our ancestors, I am optimistic that they will overall go fantastically well for our descendants, if we allow them to. I suspect that most of us alive today – at least those of us not suffering from extreme illness or poverty – have lives that are well worth living, and that things will continue to improve. Derek Parfit, whose work has emphasized future generations as well as agreement in ethics, described our situation clearly and accurately: “We live during the hinge of history. Given the scientific and technological discoveries of the last two centuries, the world has never changed as fast. We shall soon have even greater powers to transform, not only our surroundings, but ourselves and our successors. If we act wisely in the next few centuries, humanity will survive its most dangerous and decisive period. Our descendants could, if necessary, go elsewhere, spreading through this galaxy…. Our descendants might, I believe, make the further future very good. But that good future may also depend in part on us. If our selfish recklessness ends human history, we would be acting very wrongly.” (From chapter 36 of On What Matters)

#### 2 – Actor specificity:

#### [A] Governments must aggregate since every policy benefits some and harms others, which also means side constraints freeze action. [B] States lack wills or intentions since policies are collective actions. [C] No act- omission distinction— governments must vote on bills, so inaction is an explicit act taken, and governments are responsible for the public sphere so they must aggregate. Actor-specificity comes first since different agents have different ethical standings.

#### 3 - only it can explain degrees of wrongness- it is worse to kill thousands than to lie to a friend- either ethical theories cannot explain comparative badness, or it collapses