## 1AC

#### Contention 1 is inherency.

#### Overwhelming stats show patent thickets are infringing on genetic testing, disincentivizing innovation, and lowering quality

Cho et. al. 03 [Mildred Cho, PhD, PROFESSOR (RESEARCH) OF PEDIATRICS (CENTER FOR BIOMEDICAL ETHICS) AND OF MEDICINE (PRIMARY CARE AND POLULATION HEALTH). Samantha Illangasekare, Center for Biomedical Ethics, Stanford University. Meredith Weaver, project manager at Stanford University’s Center for Biomedical Ethics. Debra G. Leonard, MD, PhD. Chair, Pathology and Laboratory Medicine. Pathologist. Professor and Chair, Department of Pathology, at UVM. Jon F. Merz, JD, PhD, MBA · Titles: · Associate Professor of Medical Ethics & Health Policy at Penn. “Effects of Patents and Licenses On the Provision of Clinical Genetic Testing Services.” February 2003. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1907368/pdf/0108.pdf]

Effects of Patents and Licenses on Clinical Genetic Testing Services Our findings suggest that a substantial fraction of laboratories in the United States that provide genetic tests have been affected by patents and licenses. Almost two thirds of the laboratory directors in our sample had been contacted by a patent- or license-holder about the laboratory’s potential infringement of a patent by performance of a genetic test. The majority of the patent holders enforcing their patents were universities or research institutes, and more than half of their patents resulted from government sponsored research. If these patents are inhibiting commercialization of genetic tests, our findings would suggest that the Bayh-Dole Act may not enhance technology transfer of this kind of invention in the intended manner. As a result of patent- or license-holders exercising their intellectual property rights, one-quarter of the laboratory directors in our sample stopped performing a genetic test that they had been offering. In addition, just more than half of the laboratory directors had decided not to develop or perform a test specifically because of intellectual property considerations (eg, knowledge of the existence or possible future existence of a patent or license). All but one of our respondents represented laboratories that performed genetic testing for clinical, as opposed to research, purposes. Thus, the implications of these results are fully applicable to the availability of genetic testing in clinical settings. These results also suggest an impact on hospital budgets, to the extent that hospitals are forced to send laboratory tests out to a licensed laboratory at a higher cost to the institution than if they were to perform the tests in-house. Although the absolute number of genetic tests that the laboratories in our sample stopped performing is not large, and the proportion of all tests offered is not high, the tests that laboratories have stopped performing seem to have high clinical relevance because they detect common alleles and/or are relatively commonly used in clinical practice. Laboratories at companies seem to be more affected than university laboratories in their ability to continue to perform tests that they had been offering, but not necessarily more affected in their decision to develop new tests. This may indicate that companies are more likely to be challenged for patent infringement activities than universities. These findings are virtually identical to those we obtained in a pilot study of laboratory directors conducted in November 1998,5 suggesting that patenting and licensing practices affecting genetic tests has not changed dramatically in the last 3 years.5 They are also generally consistent with a 1999 laboratory survey concerning testing for hemochromatosis.4 However, with the explosion in the discovery of new genes and the likely development of many commercially viable genetic tests (including those designed to predict susceptibility to prevalent conditions and those to predict responses to drugs), these practices may change. One reason may be that intellectual property could be perceived to be more important for niche markets created by pharmacogenomics research. Opinions about Effects of Patents and Licenses on Genetic Testing It was striking that virtually no respondents, including those from commercial laboratories, thought that the effects of patents and licenses on the cost, access, and development of genetic tests have been positive. In contrast, most respondents thought that patents did not have a significant impact on the quality of testing (although nearly half stated that the effects were somewhat negative). Our data indicate that United States laboratory directors performing genetic tests think that gene patents hinder rather than facilitate clinical genetic testing. In addition, our data suggest that laboratory directors may feel more strongly than genetics researchers that patents have a negative effect on research; a recent survey of the members of the American Society of Human Genetics found that 46% of the respondents feel that patents have delayed or limited their research, whereas two thirds of laboratory directors in our survey felt that patents inhibit research.6 This may point to a more pronounced effect of patents on clinical genetic testing research than other kinds of research. Conclusion and Limitations of the Study We conclude that patents and licenses have a significant negative effect on the ability of clinical laboratories to continue to perform already developed genetic tests, and that these effects have not changed substantially throughout the past 3 years. Furthermore, the development of new genetic tests for clinical use, based on published data on disease-gene associations, and information sharing between laboratories, seemed to be inhibited. Our study does not address the issue of whether patents provided a major incentive for the initial research that led to the patent and development of the genetic tests that the laboratories subsequently stopped providing. However, our findings here and elsewhere4 demonstrate that laboratories are able to quickly translate published data into clinical tests without the incentives provided by patents, and that laboratories are stopped from performing tests after patents issue. This suggests that patents are not critical for the development of an invention into a commercially viable service when the invention is the finding of an association between a genetic variant and a particular condition.

#### Studies find even individual patents are severely dampening genetic testing

Berthels et. al. 11 [Nele Berthels, Centre for Intellectual Property Rights, Faculty of Law, University of Leuven. Gert Matthijs, Centre for Human Genetics, Faculty of Medicine, University of Leuven. Geertrui van Overwalle, Tilburg Institute for Law, Technology and Society, Faculty of Law, Tilburg University. “Impact of gene patents on diagnostic testing: a new patent landscaping method applied to spinocerebellar ataxia.” 2011. *European Journal of Human Genetics.* https://www.nature.com/articles/ejhg2011109.pdf]

Stacking of patents may affect both genetic testing laboratories, by seriously reducing a clinical diagnostician’s freedom to operate, and patients, by reducing the availability of genetic tests. However, not only patent thickets but also singular patents can throw up a roadblock in the field of molecular diagnostics. Only a few gene patents have direct impact on diagnostic testing, but their scope of protection and exclusive manner of out-licensing is a point of concern. Our study highlights the striking differences between patenting for SCA in Europe and the United States. The abundance of blocking patents, particularly in the United States, claiming either the gene sequence or the basic method of genetic testing is remarkable. In combination with a restrictive licensing regime, these patents appear to exclude all laboratories from offering the genetic SCA test in the US, Canada and Japan until at least 2015, except the exclusive licensee. On the other hand, even in the absence of a patent thicket, the enforcement of one blocking patent can have far-reaching consequences in some European countries. The present study is intended to serve as an eye-opener to the genetics community. Geneticists are either not aware of patents related to their tests or choose to ignore them.2 This does not provide a sustainable solution in the long run. Especially in the era of establishing standards for genetic testing,11,12 it appears necessary to raise awareness on patent matters. Moreover, worldwide efforts to harmonize and standardize genetic testing require a way to practice genetic diagnostics legitimately, without violating IP rights, in line with recommendations made by the OECD26 and the ESHG.27 Recent evolutions in the field of molecular diagnostics at the nanoscale (eg, biochips) not only provide for increased sensitivity and earlier disease detection, but also facilitate multiplexed diagnostics both in preventive and predictive medicine.28 In this way, individuals can be screened rapidly, accurately and simultaneously for the presence or the risk of developing different genetic diseases. For example, inherited mutations in neurological disease genes that could lead to overlapping phenotypes could become part of one single test panel based on several disease genes. It has already been suggested to incorporate genetic testing of SCA2 in the genetic screening of autosomal dominant Parkinsonisms, and more recently, it has been proposed that intermediate-length CAG-repeats in the SCA2 (ATXN2) gene might confer genetic risk for amyotrophic lateral sclerosis.29,30 As cerebellar ataxia has been reported along with Parkinsonism in SCA1, SCA2, SCA3, SCA7 and SCA1716 and phenotypic overlap has also been documented with FXTAS31 and Huntington’s disease,32 multiplexing could become more a general or standard practice in future.

#### Patents are abused to prevent access for research and diagnostics

Soini et. al. 08 [Sirpa Soini, Faculty of Law, University of Helsinki, Helsinki; and Department of Medical Genetics, University of Turku, Turku. Segolene Ayme, INSERM SC11, Paris. Gert Matthjis, Center for Human Genetics, University of Leuven. “Patenting and licensing in genetic testing: ethical, legal, and social issues.” 2008. *European Journal of Human Genetics.* https://www.nature.com/articles/ejhg200837.pdf]

The most current concerns about genetic patents relate to their consequences (upstream patents vs downstream ones), some patent-holders’ abusive use of their monopoly position, patent-thickets (ie overlapping sets of patent rights with different ownership, requiring several licences), overly broad patent claims; and blocking patents due to defensive IPR policies of the companies. Many companies file patent applications for defensive purposes (ie to ensure freedom to operate), but seldom pursue them. There is often an assumption that all applications filed will be granted, or that they are even already ‘patents’ before this. These problems are viewed as hindering further research and development, increasing the costs and/or to preventing access to new diagnostic tools in clinical practice. In the United States, one survey reported that 25% of the interviewed genetic clinics had stopped performing a clinical genetic test because of a previously existing patent or licence.8 Other reports, however, have not yet found significant burdens for biomedical researchers, though it is anticipated the situation is changing in this direction.3 Most factors, other than genes, affecting the function of the human DNA are still not well understood. Recent knowledge suggests that non-coding DNA (‘junk-DNA’) is much more significant than previously assumed. For example, as epigenetic regulation affects gene expression, it has been claimed that modern genetic research should shift its focus to epigenetic factors to understand the genetic framework.16 Patents over non-coding biological materials further complicate the situation simply because patent claims wrongly assume that knowledge of their existence equals knowledge of how to apply this knowledge in medical and scientific research. Therefore, it is essential for future research to ensure that existing gene patents do not block the possibility of studying factors that underlie or are associated with the functioning of a certain gene or its interaction with other factors, such as the environment. It is anticipated that new areas of patenting might include diagnostic or prognostic tests based on gene expression profiling or SNPs, and therapeutics based on RNA interference. Such patent filings might reopen concerns on the anticommons effect and patent thickets.4, 17 Biochip development will enable rapid detection of hundreds of genetic mutations, but practising this might also violate hundreds of patents. These and other prospective new uses of a gene sequence that were not anticipated at the time of a patent application might give undeserving benefit to the patent-holder. Moreover, with respect to possibilities of further development of patented inventions, there is a difference between upstream and downstream patents: licensing difficulties of the first may pose a hindrance to exploitation of the second, even though both are patentable as such. Some fear that the increasing number of upstream patents gives patent holders too much control on the downstream development and delivery of all genetic tests associated with a gene for a limited period of time.2, 15 There are concerns as to whether patent authorities appropriately interpret the patentability criteria. Clinical utility and validity of many granted patents have been reported to be deficient.15 Particularly, many of the patents have been broad in scope and the criteria for inventiveness and utility have been weakly applied.5 The Nuffield Council report has, however, ignored the invention threshold and focused on novelty and inventive step, whereas the Danish Council of Bioethics Report in 2004 stated, that ‘… it cannot be said with any reasonableness that a sequence or partial sequence of a gene ceases to be part of the human body merely because an identical copy of the sequence is isolated from or produced outside of the human body.’18 The scope and interpretation of the research exemption is legally too uncertain to offer a sustainable solution to these problems. The EC report of 2003 revealed that there are many deficits in genetic testing services in Europe.2 The accuracy and interpretation of the results were not regarded to be at an acceptable level. It could be anticipated that the situation might get even worse if certain tests are performed exclusively in only a few laboratories, if tests cannot be validated and developed further, or if genetic testing services were moved to other territories for patent reasons. Consequently, major concerns include how to access existing knowledge, whether patented or not, and how to be able to do research in the field of biotechnology, while at the same time not losing the patent system as an incentive for product development. Many articles suggest that there is no adequate empirical data on the implications of genetic patents for policy-makers.1, 11, 19 In fact, not only the potential benefits, but also the adverse effects of these patents may have been overestimated particularly in the media.7 From a clinical geneticists’ perspective, the main concern with respect to increasing patenting of genes is securing affordable access to diagnostic tools.9, 14 There are often multiple mutations correlated with a particular disease. Before performing any genetic test, one must determine which mutations to look for. Problems arise, if several of the chosen mutations, SNPs, and mutational diagnostic tests have been patented by different parties. One of the feared consequences is that the costs of genetic diagnostic tests will greatly increase due to the accumulation of the many licence fees.

#### Unique DNA configurations make inventing alternatives impossible --- the first patent has a default monopoly

Soini et. al. 08 [Sirpa Soini, Faculty of Law, University of Helsinki, Helsinki; and Department of Medical Genetics, University of Turku, Turku. Segolene Ayme, INSERM SC11, Paris. Gert Matthjis, Center for Human Genetics, University of Leuven. “Patenting and licensing in genetic testing: ethical, legal, and social issues.” 2008. *European Journal of Human Genetics.* https://www.nature.com/articles/ejhg200837.pdf]

Patents on diagnostic gene tests based on DNA sequences, per se, have been questioned because the inventions usually concern knowledge of an association between a gene variant and disease; thus, they are to be considered discoveries.5 One serious problem of sequence-based diagnostic gene patents stems from the fact that unlike in many other fields, these are difficult to ‘invent around’, that is, to invent an alternative test by using a different method. Thus, the patent holder essentially has a monopoly over all ways of testing for the specific disease in question. The Nuffield Council raises the question whether it is in the public's interest that there is only one diagnostic test available for a particular disease. This stalls further test development. It is feared that quality of testing could be jeopardised through restrictive licensing2, 8 because few clinics can use a diagnostic test subject to patent protection, research and improvement of the tests will be impeded.26 Results of scientific research indicate that human DNA has more variation than previously thought. This variability should be included in the definition of DNA, emphasising that the genome in its natural state is highly variable. It follows that discovering a new allelic polymorphism or variation may have medical relevance and be regarded as invention only if its association to well defined clinical condition and/or therapeutic consequence is proven by evidence-based and reproducible observations. This evidence-based support usually takes many years.

### 1AC - AMR

#### New diagnostics solve AMR --- stop overprescription, increase longevity, and create new resistance

O’Neill 15 [Jim O'Neill, chair of the United Kingdom's review into antimicrobial resistance. “Rapid Diagnostics: Stopping Unnecessary Use of Antibiotics.” October 2015. https://amr-review.org/sites/default/files/Paper-Rapid-Diagnostics-Stopping-Unnecessary-Prescription-Low-Res.pdf]

We need diagnostics that can be deployed widely throughout the developed and developing world. These might be used at home, or in pharmacies, primary care clinics, or hospitals. These new generations of diagnostics will do at least three crucial things. First, they will improve patient treatment by getting the right drug to the right patient quickly. Second, they will make our arsenal of existing drugs go further and last longer. Third, they may reduce our need to develop new ‘broad-spectrum’ drugs, which are often the hardest drugs to find. In order to achieve this, we not only need to have diagnostics available in the right settings, which may differ by country, we also need to ensure that financial rewards, culture and systems support their use. Ultimately what we want are high quality, affordable rapid diagnostics that can be rolled out as widely as possible. Diagnostics can reduce costs for hospitals, patients and healthcare systems Cost is often thought of as a barrier for rapid diagnostics. With most antibiotics being so cheap, it is often said that for a doctor, pharmacist or patient to use a diagnostic test before prescribing or using an antibiotic is an added cost, falling on hard pressed patients and healthcare systems. Yet this is a very narrow way of looking at the costs of diagnostics, and makes clear the ‘public good’ issue, in which individuals bear additional upfront costs but patients in aggregate reap benefits and healthcare systems save money. Drug-resistant infections are a large drain on hospital resources, with a study by Tufts University estimating that in a US hospital a resistant infection costs between 18,588 USD and 29,069 USD per patient5. A rapid diagnostic that allows doctors to target the right drug to the right patient immediately could save money by reducing the length of stay in hospital for these patients. Identifying patients with a drug-resistant infection quickly also prevents their infection being passed on to patients around them because they can be rapidly isolated and infection control measures put in place. Conversely, patients who might otherwise be identified empirically as being at high risk of carrying drugresistant infections like Methicillin-resistant Staphylococcus aureus – and thus subjected to precautionary isolation pending confirmatory diagnosis – could be quickly screened using a rapid diagnostic and unnecessary (and costly) isolation and expensive infection control measures more promptly stepped down. One Netherlands-based study of such an approach found that rapid diagnostics could reduce the demand for scarce hospital intensive care unit isolation rooms by more than 40 percent6. Even when an infection is not drug-resistant, it is common that without a rapid and reliable test a doctor can ‘miss out’ on giving an antibiotic to someone who actually needed it. That patient may deteriorate and end up in a hospital, out of hours: in this case, from a financial point of view, the doctor’s surgery has shifted much higher costs to the hospital system that dwarf any ‘saving’ derived from not using a test to guide the prescription. Another important aspect in the cost-benefit debate about diagnostics is their potential for saving precious doctor’s surgery time by allowing a first ‘screening’ for bacterial infections to be done in pharmacies, or even at home like self-tests that are now available in other areas. In some countries diagnostic tests, for example for strep throat, are already used in certain pharmacies, enabling the pharmacist to prescribe an antibiotic if the test indicates that the infection is highly likely to be bacterial. This has the potential to alleviate some of the pressure on primary care facilities, enabling someone who has a sore throat, for instance, to walk into a local pharmacy and take a quick test, rather than wait to see a doctor. And, of course, diagnostics that reduce overall antibiotic use should also slow the rise of resistant bacteria, meaning fewer patients with resistant infections end up presenting to doctors across primary care and hospital settings. We need a better understanding of the benefits to healthcare systems of using diagnostics but it seems reasonable that increased use of diagnostics to better inform treatment decisions is not only in patients’ interests, but also in the financial interest of healthcare systems. We return to this question below, with a recommendation for the payer organisations in health systems to support cost-effectiveness studies. Rapid diagnostics are essential for the transition from broad to targeted antibiotics By indicating to doctors what bacteria are harming their patient diagnostics will make it easier for them to prescribe narrowspectrum antibiotics (Appendix B sets out more details). The terms ‘broad-spectrum’ and ‘narrow-spectrum’ are regularly used to describe antibiotics and indicate whether antibiotics are active against a wide variety of bacteria or a more limited range of species. Bacteria may be divided into two major groups, called Grampositive and Gram-negative. Antibiotics that can be used to treat infections caused by (at least some) bacteria in both of these groups are defined as broad-spectrum. Broad-spectrum antibiotics are needed when a doctor suspects that a patient has a bacterial infection, but does not have any information about what bacteria are causing it; if they consider antibiotics necessary they must prescribe one (or more) that ‘covers’ a wide range of possible causes and so must reach for broad-spectrum agents. Other antibiotics, however, are active only against Grampositive or Gram-negative bacteria and are described as narrowspectrum. Doctors use these when they are more confident about the type of bacteria causing an infection, for example after diagnostic test results have become available. When someone takes antibiotics, even if used appropriately, many bacterial species in or on their bodies (their ‘good bacteria’) are exposed to some extent, not just those that are causing the infection. Narrow-spectrum antibiotics do not cause as much ‘collateral damage’ to these ‘good bacteria’ as broad-spectrum agents; they cause less disruption to someone’s normal bacteria, and do not exert as much selective pressure for the emergence and spread of resistance as broad-spectrum agents. In addition to enabling better targeting of therapies to patients, rapid diagnostics can reduce the cost of clinical trials for narrow-spectrum drugs by making it easier to find patients who have a potentially susceptible infection of interest and therefore reducing the number of patients that need to be screened to join a trial. Ideally clinical trial patients need to be found and enrolled before they start treatment with a different drug in order to best capture the effect of the drug of interest. Because culturing bacteria to see what is wrong with a patient takes too long, clinical researchers must enrol people in a trial through empirical diagnosis. For example when trying to test a drug against Pseudomonas (a bacterium that causes a wide range of infections), because patients are enrolled before their bacteria can be cultured, only one in four people on the trial may actually have this infection. This means that in order to run a trial with 200 truly eligible patients, researchers have to screen, register and treat at least 800 people, which drives up the costs of trials 7. Appendix B sets out more details about the use of diagnostics in clinical trials

#### New forms of genetic testing can detect AMR --- only diagnosing antibodies when necessary solves, but more research is needed

Steward 3-11 [Karen Steward, PhD, After completing an undergraduate degree in Natural Sciences at the University of Cambridge in 2006, Karen became a research scientist at the Animal Health Trust, UK. During her time there, she completed a PhD in molecular microbiology and evolutionary genetics in partnership with the University of Cambridge and went on to hold a post-doctoral position. Her research focused on the fundamental biology of infectious diseases, outbreak analysis and the development of vaccines and diagnostic assays. “Antimicrobial Resistance.” March 11, 2021. https://www.technologynetworks.com/immunology/articles/antimicrobial-resistance-335336#D3]

Sensitivity testing, in which a lawn of the bacterial strain of interest is cultured on agar plates onto which antibiotic-infused discs are placed has been a popular phenotypic screening technique for many years and remains the gold standard. The larger the area of clearance around a disc, the more sensitive the strain is to that particular antibiotic. Microfluidic devices designed to look at the minimum inhibitory concentration of antibiotics needed to kill a strain have been used to the same end. However, the downside of methods requiring culture is the length of time it can take to isolate, culture and then test the sensitivity of a strain, often taking 48 hours of more to draw a conclusion. When treating aggressive infections this can be too long. Major advances in the last decade have seen whole genome sequencing (WGS) take its place in the study and fight against AMR. WGS enables known and unknown AMR-related genes to be identified and their propagation through a population monitored. Multiple mutations or genes may confer the same resistance which is not typically differentiated by phenotypic methods. WGS provides a much more detailed picture of resistance progression and spread and has enabled the chains of resistant infection spread to be mapped precisely, which is helpful in monitoring studies. Amplification tests, such as PCR, RT-qPCR and LAMP assays, can offer a quick and specific solution to the detection of resistance genes. However, they are only able to identify known targets and further mutations within the area target by the assay can render it ineffective. Hybridization assays, such as arrays, fluorescent in situ hybridization (FISH) and line probe assays (LPAs), rely on the hybridization of probes to target DNA sequences which can then be detected using techniques such as fluorescence. As with amplification-based tests, they require prior knowledge of target mutations and will not identify any novel AMR-conveying targets. Immunoassays, including lateral flow tests and enzyme-linked immunosorbent assays (ELISAs), can be useful for AMR detection too. The binding of antibodies either to the target gene or gene product can be then be used to detect their presence, usually via conjugation to a visible indicator. There is a real push towards rapid point-of-care testing to which assays like lateral flow and some microfluidic devices lend themselves, enabling clinicians to overcome some of the current antimicrobial stewardship challenges and prescribe appropriately. Funding opportunities are vital in facilitating research to improve the diagnostics available, promoting the development of affordable, accurate, fast and easy-to-use tests for bacterial infections. No matter what techniques are used for bacterial isolation and identification, and which methods of resistance testing are employed, it is important that bacteria are cultured appropriately and handled safely. Good aseptic technique is essential to protect yourself and your sample. AMR prevention It is vitally important that steps are taken to prevent further development and spread of AMR. Simple hygiene precautions, such as handwashing, appropriate handling of food items and using clean water can help to reduce the likelihood of contracting a resistant infection. However, they do not avoid the pressure exerted by antibiotic exposure on microbes that drive the development of AMR in the first place. Limiting the exposure of bacteria to antibiotics is important and there are a number of measures that can help. Antibiotic stewardship - the effort to measure and improve how antibiotics are prescribed by clinicians and used by patients - is at the heart of reducing AMR. This includes the use of narrow rather than broad spectrum antibiotics to target the infection more specifically, use only when necessary and only for as long as necessary. Responsibility does not all fall to medics and vets, the public also have their part to play to ensure that they (or their animals) only take the antibiotics prescribed to them, at the prescribed dose, at the advised times and that they complete the course. Reducing prophylactic use of antibiotics, especially in the food animal industry, is key in preventing unnecessary exposure of both the body’s own bacteria and those that come into contact with antibiotic-containing feces. Measurement of procalcitonin, the precursor to the hormone calcitonin, via immunoassay has been shown to be a good indicator of bacterial infection where levels become elevated. These indicators aid treatment decision making for clinicians, and consequently antibiotic stewardship. Where infections are suspected or progression to sepsis is a risk, antibiotic stewardship promotes appropriate use of, and aims to reduce the number of days on, antibiotic therapy. Rapid multiplex PCR has also been put to use in distinguishing bacterial from viral infections to guide antibiotic prescribing. Whilst we may still not have an answer to antibiotics entering the environment from domestic effluent, stricter monitoring and enforcement of the wastewater discharged by pharmaceutical companies can help to prevent antibiotics from entering the environment and water system. AMR monitoring programs are vital in keeping diagnostics up-to-date as new AMR targets emerge and identifying patterns from which remedial plans can be actioned. Artificial intelligence is also playing its part, helping to monitor microbes in real time and predict AMR and antibiotic susceptibility.

#### Extinction - generic defense doesn’t apply.

Srivatsa 17 Kadiyali Srivatsa 1-12-2017 “Superbug Pandemics and How to Prevent Them” <https://www.the-american-interest.com/2017/01/12/superbug-pandemics-and-how-to-prevent-them/> (doctor, inventor, and publisher. He worked in acute and intensive pediatric care in British hospitals)//Elmer

It is by now no secret that the human species is locked in a race of its own making with “superbugs.” Indeed, if popular science fiction is a measure of awareness, the theme has pervaded English-language literature from Michael Crichton’s 1969 Andromeda Strain all the way to Emily St. John Mandel’s 2014 Station Eleven and beyond. By a combination of massive inadvertence and what can only be called stupidity, we must now invent new and effective antibiotics faster than deadly bacteria evolve—and regrettably, they are rapidly doing so with our help. I do not exclude the possibility that bad actors might deliberately engineer deadly superbugs.1 But even if that does not happen, humanity faces an existential threat largely of its own making in the absence of malign intentions. As threats go, this one is entirely predictable. The concept of a “black swan,” Nassim Nicholas Taleb’s term for low-probability but high-impact events, has become widely known in recent years. Taleb did not invent the concept; he only gave it a catchy name to help mainly business executives who know little of statistics or probability. Many have embraced the “black swan” label the way children embrace holiday gifts, which are often bobbles of little value, except to them. But the threat of inadvertent pandemics is not a “black swan” because its probability is not low. If one likes catchy labels, it better fits the term “gray rhino,” which, explains Michele Wucker, is a high-probability, high-impact event that people manage to ignore anyway for a raft of social-psychological reasons.2 A pandemic is a quintessential gray rhino, for it is no longer a matter of if but of when it will challenge us—and of how prepared we are to deal with it when it happens. We have certainly been warned. The curse we have created was understood as a possibility from the very outset, when seventy years ago Sir Alexander Fleming, the discoverer of penicillin, predicted antibiotic resistance. When interviewed for a 2015 article, “The Most Predictable Disaster in the History of the Human Race, ” Bill Gates pointed out that one of the costliest disasters of the 20th century, worse even than World War I, was the Spanish Flu pandemic of 1918-19. As the author of the article, Ezra Klein, put it: “No one can say we weren’t warned. And warned. And warned. A pandemic disease is the most predictable catastrophe in the history of the human race, if only because it has happened to the human race so many, many times before.”3 Even with effective new medicines, if we can devise them, we must contain outbreaks of bacterial disease fast, lest they get out of control. In other words, we have a social-organizational challenge before us as well as a strictly medical one. That means getting sufficient amounts of medicine into the right hands and in the right places, but it also means educating people and enabling them to communicate with each other to prevent any outbreak from spreading widely. Responsible governments and cooperative organizations have options in that regard, but even individuals can contribute something. To that end, as a medical doctor I have created a computer app that promises to be useful in that regard—of which more in a moment. But first let us review the situation, for while it has become well known to many people, there is a general resistance to acknowledging the severity and imminence of the danger. What Are the Problems? Bacteria are among the oldest living things on the planet. They are masters of survival and can be found everywhere. Billions of them live on and in every one of us, many of them helping our bodies to run smoothly and stay healthy. Most bacteria that are not helpful to us are at least harmless, but some are not. They invade our cells, spread quickly, and cause havoc that we refer to generically as disease. Millions of people used to die every year as a result of bacterial infections, until we developed antibiotics. These wonder drugs revolutionized medicine, but one can have too much of a good thing. Doctors have used antibiotics recklessly, prescribing them for just about everything, and in the process helped to create strains of bacteria that are resistant to the medicines we have. We even give antibiotics to cattle that are not sick and use them to fatten chickens. Companies large and small still mindlessly market antimicrobial products for hands and home, claiming that they kill bacteria and viruses. They do more harm than good because the low concentrations of antimicrobials that these products contain tend to kill friendly bacteria (not viruses at all), and so clear the way for the mass multiplication of surviving unfriendly bacteria. Perhaps even worse, hospitals have deployed antimicrobial products on an industrial scale for a long time now, the result being a sharp rise in iatrogenic bacterial illnesses. Overuse of antibiotics and commercial products containing them has helped superbugs to evolve. We now increasingly face microorganisms that cannot be killed by antibiotics, antifungals, antivirals, or any other chemical weapon we throw at them. Pandemics are the major risk we run as a result, but it is not the only one. Overuse of antibiotics by doctors, homemakers, and hospital managers could mean that, in the not-too-distant future, something as simple as a minor cut could again become life-threatening if it becomes infected. Few non-medical professionals are aware that antibiotics are the foundation on which nearly all of modern medicine rests. Cancer therapy, organ transplants, surgeries minor and major, and even childbirth all rely on antibiotics to prevent infections. If infections become untreatable we stand to lose most of the medical advances we have made over the past fifty years. And the problem is already here. In the summer of 2011, a 43-year-old woman with complications from a lung transplant was transferred from a New York City hospital to the Clinical Center at the National Institutes of Health (NIH), in Bethesda, Maryland. She had a highly resistant superbug known as Klebsiella pneumoniae carbapenemase (KPC). The patient was treated and eventually discharged after doctors concluded that they had contained the infection. A few weeks later, a 34-year-old man with a tumor and no known link to the woman contracted KPC while at the hospital. During the course of the next few months, several more NIH patients presented with KPC. Doctors attacked the outbreak with combinations of antibiotics, including a supposedly powerful experimental drug. A separate intensive care unit for KPC patients was set up and robots disinfected empty rooms, but the infection still spread beyond the intensive care area. Several patients died and then suddenly all was silent on the KPC front, with doctors convinced they had seen the last of the dangerous bacterium. They couldn’t have been more mistaken. A year later, a young man with complications from a bone marrow transplant arrived at NIH. He became infected with KPC and died. This superbug is now present in hospitals in most, if not all U.S. states. This is not good. This past year an outbreak of CRE (carbapenem-resistant enterobacteriaceae) linked to contaminated medical equipment infected 11 patients and killed two in Los Angeles area hospitals. This family of bacteria has evolved resistance to all antibiotics, including the powerful carbapenem antibiotics that are often used as a last resort against serious infections. They are now so resilient that it is virtually impossible to remove them from medical tools such as catheters and breathing tubes placed into the body, even after cleaning. Then we have gonorrhea, chlamydia, and other sexually transmitted diseases that we cannot treat and that are spreading all over the world. Anyone who has sex can catch these infections, and because most people may not exhibit any symptoms they spread infections without anyone knowing about it. Sexually transmitted diseases used to be treatable with antibiotics, but in recent years we have witnessed the rise of multi-drug resistant STDs. Untreated gonorrhea can lead to infertility in men and women and blindness and other congenital defect in babies. As is well known, too, we have witnessed many cases of drug-resistant pneumonia. These problems have arisen in part because of simple mistakes healthcare professionals repeatedly make. Let me explain. Neither superbugs nor common bacterial infections produce any special symptoms indicative of their cause. Rashes, fevers, sneezing, runny noses, ear pain, diarrhea, vomiting, coughing, fatigue, and weakness are signs of common and minor illnesses as well as uncommonly deadly ones. Therefore, the major problem for clinicians is to identify a common symptom that may potentially be an early sign of a major infection that could result in an epidemic. We know that dangerous infections in any given geographical area do not start at the same time. They start with one victim and gradually spread. But that victim is only one among hundreds of patients a doctor will typically see, so many doctors will miss patients presenting with infections that are serious. They will probably identify diseases that kill fast, but slow-spreading infections such as skin infections that can lead to septicemia are rarely diagnosed early. In addition, I have seen doctors treating eczema with antibiotic cream, even though they know that bacteria are resistant to the majority of these drugs. This sort of action encourages simple infections to spread locally, because patients are therefore not instructed to take other, more useful precautions. On top of that, some people are frivolous about infections and assume doctors are exaggerating the threat. And some people are selfish. Once I was called to see a passenger during a flight who had symptoms consistent with infection. He boarded the plane with these symptoms, but began to feel much worse during the flight. I was scared, knowing how infections such as Ebola can spread. This made me think about a way to screen passengers before they board a flight. Airlines could refund a traveler’s ticket, or issue a replacement, in case of sickness—which is not the policy now. We currently have no method to block infectious travelers from boarding flights, and there are no changes in the incentive system to enable conscientious passengers to avoid losing their money if they responsibly miss a flight because of illness. Speaking of selfishness, I once saw a mother drop her daughter off at school with a serious bout of impetigo on her face. When I asked her why she had brought her daughter to school with a contagious infection, she said she could not spare the time to keep her at home or take her to the doctor. By allowing this child to contact other children, a simple infection can become a major threat. Fortunately, I could see the rash on the girl’s face, but other kids in schools may have rashes we cannot see. Incorrect diagnosis of skin problems and mistaken use of antibiotics to treat them is common all over the world, and so we are continually creating superbugs in our communities. Similarly, chest infections, sore throats, and illnesses diagnosed as colds that unnecessarily treated with antibiotics are also a major threat. By prescribing antibiotics for viral infections, we are not only helping bacteria develop resistance, but we are also polluting the environment when these drugs are passed in urine and feces. All of this helps resistant bacteria to spread in the community and become an epidemic. Ebola is very difficult to transmit because people who are contagious have visible and unusual symptoms. However, the emerging infections and pandemics of the future may not have visible symptoms, and they could break out in highly populous countries such as India and China that send thousands of travelers all over the world every day. When a person is infected with a contagious disease, he or she can expect to pass the illness on to an average of two people. This is called the “reproduction number.” Two is not that high a number as these things go; some diseases have far greater rates of infection. The SARS virus had a reproduction number of four. Measles has a reproduction number of 18. One person traveling as an airplane passenger and carrying an infection similar to Ebola can infect three to five people sitting nearby, ten if he or she walks to the toilet. The study that highlighted this was published in a medical journal a few years ago, but the airline industry has not implemented any changes or introduced screening to prevent the spread of infections by air travel passengers, a major vehicle for the rapid spread of disease. It is scary to think that nobody knows what will happen when the world faces a lethal disease we’re not used to, perhaps with a reproduction number of five or eight or even ten. What if it starts in a megacity? What if, unlike Ebola, it’s contagious before patients show obvious symptoms? Past experience isn’t comforting. In 2009, H1N1 flu spread around the world before we even knew it existed. The Questions Remains Why do seemingly intelligent people repeatedly do such collectively stupid things? How did we allow this to happen? The answer is disarmingly simple. It is because people are incentivized to prioritize short-term benefits over long-term considerations. It is what social scientists have called a “logic of collective action” problem. Everyone has his or her specialized niche interest: doctors their patients’ approval, business and airline executives their shareholders’ earnings, hospitals their reputations for best-practice hygienics, homemakers their obligation to keep their own families from illness. But no one owns the longer-term consequences for hundreds of millions of people who are irrelevant to satisfying these short-term concerns. Here is an example. At a recent Superbug Super Drug conference in London that I attended, scientists, health agencies, and pharmaceutical companies were vastly more concerned with investing millions of dollars in efforts to invent another antibiotic, claiming that this has to be the way forward. Money was the most pressing issue because, as everyone at the conference knew, for many years pharmaceutical companies have been pulling back from antibiotics research because they can’t see a profit in it. Development costs run into billions of dollars, yet there is no guarantee that any new drug will successfully fight infections. At the same conference Dr. Lloyd Czaplewski spoke about alternatives to antibiotics, in case we cannot come up with new ones fast enough to outrun superbug evolution. But he omitted mention of preventive strategies that use the internet or communication software to help reduce the spread of infections among families, communities, and countries. It is madness that we don’t have a concrete second-best alternative to new antibiotics, because we need them and we need them quickly. Of course, this is why we have governments, which have been known occasionally in the past as commonwealths. Governments are supposed to look out for the wider, common interests of society that niche-interested professionals take no responsibility for, and that includes public health. It is why nearly every nation’s government has an official who is analogous to the U.S. Surgeon General, and nearly every one has a public health service of some kind. Alas, national governments do not always function as they should. Several years ago physician and former Republican Senator Bill Frist submitted a proposal to the Senate for a U.S. Medical Expeditionary Corps. This would have been a specialized organization that could coordinate and execute rapid responses to global health emergencies such as Ebola. Nothing came of it, because Dr. Frist’s fellow politicians were either too shortsighted or too dimwitted to understand why it was a good idea. Or perhaps they simply realized that they could not benefit politically from supporting it. Plenty of mistakes continue to be made. In 2015, a particularly infectious form of bird flu ripped through 14 U.S. states, leading farmers to preventively slaughter nearly 40 million birds. The result of such callous and unnecessary acts is that, instead of exhausting themselves in the host population of birds, the viruses quickly find alternative hosts in which to survive, and could therefore easily mutate into a form that can infect humans. Earlier, during the 1980s, AIDS garnered more public attention because a handful of rich and famous people were infected, and because the campaign to eradicate it dovetailed with and boosted the political campaign on behalf of homosexual rights. Methicillin resistant Staphylococcus aureus (MRSA) in hospitals, by far the bigger threat at the time, was virtually ignored. Some doctors knew that MRSA would bring us to our knees and kill millions of people worldwide, but pharmaceutical companies and device and equipment manufacturers ignored these doctors and the thousands of patients dying in hospitals as a result of MRSA. They prioritized the wrong thing, and government did not correct the error. And that is partly how antibiotic-resistant infection went from an obscure hospital problem to an incipient global pandemic. Politics well outside the United States plays several other roles in the budding problem that we are confronting. Countries often will not admit they have a problem and request help because of the possible financial implications in terms of investment and travel. Guinea did not declare the Ebola epidemic early on and Chinese leaders, worried about trade and tourism, lied for months in 2002 about the presence of the SARS virus. In 2004, when avian influenza first surfaced in Thailand, officials there displayed a similar reluctance to release information. Hospitals in some countries, including India, are managed and often owned by doctors. They refuse to share information about existing infections and often categorically deny they have a problem. Reporting infections to public health authorities is not mandatory, and so hospitals that fail to say anything are not penalized. Even now, the WHO and the CDC do not have accurate and up-to-date information about the spread of E. coli or other infections, and part of the reason is that for-profit hospitals are reluctant to do anything to diminish their bottom line. Syria and Yemen are among those countries that are so weak and fragmented that they cannot effectively coordinate public healthcare. But their governments are also hostile to external organizations that offer relief. Part of the reason is xenophobia, but part is that this makes the government look bad. Relatedly, most poor-nation governments do not trust the efficacy of international institutions, and think that cooperating with them amounts to a re-importation of imperialism. They would rather their own people suffer and die than ask for needed help. That brings us to the level of international public health governance. Alas, sometimes poor-country governments estimate the efficacy of international institutions accurately. The WHO’s Ebola response in 2014-15 was a disaster. The organization was slow to declare a public health emergency even after public warnings from Médecins Sans Frontières, some of whose doctors had already died on the front line. The outbreak killed more than 28,000 people, far more than would have been the case had it been quickly identified. This isn’t just an issue of bureaucratic incompetence. The WHO is under-resourced for the problems it is meant to solve. Funding comes from voluntary donations, and there is no mechanism by which it can quickly scale up its efforts during an emergency. The result is that its response to the next major disease outbreak is likely to be as inadequate as were its responses to Ebola, H1N1, and SARS. Stakeholders admit that we need another mechanism, and most experts agree that the world needs some kind of emergency response team for dangerous diseases. But no one knows how to set one up amid the dysfunctional global governance structures that presently exist. Maybe they should turn to Bill Frist, whose basic concept was sound; if the U.S. government will not act, perhaps some other governments will, and use the UN system to do so. But as things stand, we lack a health equivalent of the military reserve. Neither government leaders nor doctors can mobilize a team of experts to contain infections. People who want to volunteer, whether for government or NGO efforts, are not paid and the rules, if any, are sketchy about what we do with them when they return from a mission. Are employers going to take them back? What are the quarantine rules? It is all completely ad hoc, meaning that humanity lacks the tools it needs to protect itself. And note, by the way, the contrast between how governments prepare for facing pandemics and how they prepare for making war. War is not more deadly to the human race than pandemics, but national defense against armed aggression is much better planned for than defense against threats to public health. There is a wealth of rules regarding it, too. Human beings study and plan for war, which kills people both deliberately and accidentally, but they do not invest comparable effort planning for pandemics, which are liable to kill orders of magnitude more people. To the mind of a medical doctor, this is strange. Creating Conditions for Infections to Spread Superbug infections spread for several interlocking reasons. Some are medical-epidemiological. Most of the infections of the past thirty years have started in one place and in one family. As already noted, they spread because many infectious diseases are highly contagious before the onset of symptoms, and because it is difficult to prevent patients who know they are sick from going to hospitals, work, and school, or from traveling further afield. But again, one reason for the problem is political, not medical. Many governments have no strategies in place to prevent pandemics because they are unwilling to tell their people how infections spread. They don’t want to worry people with such talk; it will make them, they fear, unpopular. So governments may have mountains of bureaucracy with great heaps of rules and regulations concerning public health, but they are generally unwilling to trust their own citizens to use common sense on their own behalf. This, too, seems very strange. Until now, no one has come forward to help us develop strategies to educate people how to identify and prevent the spread of infection to their families and communities. The majority of stakeholders have also been oblivious to the use of new technologies to help reduce the spread of these infections. There are some exceptions. In a fun blog post called Preparedness 101: Zombie Apocalypse, the CDC uses the threat of a zombie outbreak as a metaphor to encourage people to prepare for emergencies, including pandemics. It is well meaning and insightful, yet when my colleagues and I try to discuss ways of scaling up the CDC’s example with doctors and nurses, they shut down. Nobody plans for an actual crisis partly because it is too scary and hence paralyzing to think about. But it is also because it is not most health professionals’ job; it is not what they are trained and paid to do. It is always someone else’s job, except that it has turned out to be nobody’s job. Worse, the situation is not static. While we sit paralyzed, superbugs are evolving. Epidemiological models now predict how an algorithmic process of disease spread will move through the modern world. All urban centers around the entire globe can become infected within sixty days because we move around and cross borders much more than our ancestors did, thanks to air travel. A new pandemic could start crossing borders before we even know it exists. A flu-like disease could kill more than 33 million people in 250 days.3

### 1AC - Bioterror

#### Bioterror is coming---motivation and best technical assessment concludes affirmative

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ow, Emerging Leaders in Biosecurity Johns Hopkins University, Bloomberg School of Public Health, Center for Health Security, August 2014, “Bioterrorism: An Emerging Global Health Threat” Review Article, Journal of Bioterror and Biodefence, 5:129, https://www.omicsonline.org/open-access/bioterrorism-an-emerging-global-health-threat.php?aid=30147&view=mobile

Bioterrorism as a Realistic Threat

The threat of bioterrorism is more likely to occur now than ever before, including the following: 1. As evident from past and present cases of bioweapons, nations and dissident individuals and groups exist that have both the motivation and access to skills to develop and disperse biological agents [8]. 2. The former Soviet Union’s bioweapons facility that was used to produce weaponized infectious diseases, such as plague and anthrax, has missing stockpiles of its bioweapons. Intelligent reports indicate the stockpiles were sold on the black-market to Middle Eastern countries [3]. Furthermore, the scientists who worked in the offensive biological weapons program until the early 1990s have gone to other countries, such as North Korea and other Middle Eastern countries and are suspected to be collaborating with those governments in their clandestine bioweapons programs [8]. 3. Biotechnology is growing tremendously, and there is readily information available on the Internet as to how to develop and manufacture sophisticated types of biological weapons with modest cost [8]. Furthermore, there are numerous publications in scientific journals, explaining how to produce very sophisticated, highly pathogenic agents [8]. 4. Individuals with basic biology and engineering training could develop effective weapons at little cost [8]. 5. Populations have become increasingly vulnerable to disease, and medical providers are less familiar with appropriate diagnosis and treatment, thus making such weapons an ideal choice for those looking to cause mass causalities [3]. Overall, bioweapons are relatively inexpensive, easy to produce, conceal and transport, and can cause considerable damage without elaborate weaponization [8,3] Thus, making them an ideal candidate to use as a weapon [8]. The fear of bioterrorism and its implication on public health is already starting to be seen in certain countries around the world [9]. In the United States for example, after the discovery of human anthrax cases in 2001, the Illinois Department of Public Health received over a thousand human samples of potential anthrax, all of which were negative. This data of increased volume of submissions to a local public health laboratory demonstrates the fear of bioterrorism in the general population [9]. Category A, B, and C Agents Broadly speaking, the CDC separates agents of bioterrorism into three categories depending upon the lethality of the agent (i.e., how fast it can spread and the severity of the illness or death it causes; [10]). These categories are category A, category B, and category C. Category A agents Category A agents are considered the highest risk and highest priority because they can easily spread from person-to-person, result in high mortality rates, possess the potential for major public health impact (i.e., can cause extreme concern and social disruption), and require special public health preparedness provisions [10]. Category A agents include anthrax (Bacillus anthracis), botulism (Clostridium botulinum toxin), plague (Yersinia pestis), smallpox (variola major), tularemia (Francisella tularensis), and viral hemorrhagic fevers (filoviruses [i.e., ebola, marburg] and arenaviruses [i.e., lassa, machupo]; [11]). Category B agents Category B agents are the second highest priority because they can be moderately spread, result in moderate morbidity rates and low mortality rates, and require enhanced disease surveillance and specific enhancements of the CDC’s laboratory capacity [10]. Category B agents include brucellosis (Brucella species), epsilon toxin of Clostridium perfringens, food safety threats (i.e., Salmonella species, Escherichia coli O157:H7, Shigella), glanders (Burkholderia mallei), melioidosis (Burkholderia pseudomallei), psittacosis (Chlamydia psittaci), Q fever (Coxiella burnetii), ricin toxin from Ricinus communis(castor beans), Staphylococcal enterotoxin B, typhus fever (Rickettsia prowazekii), viral encephalitis (alphaviruses, such as Venezuelan equine encephalitis, eastern equine encephalitis, western equine encephalitis), and water safety threats (i.e., Vibrio cholerae , Cryptosporidium parvum; [11]). Category C agents Category C agents are the third highest priority and are considered emerging threats for disease. These agents are easily available, easily produced and transmitted, and have the potential for high mortality and morbidity rates [10]. Category C agents include Nipah virus, hantavirus, severe acute respiratory syndrome (SARS), and HIV [11]. Select Agents of Bioterrorism and Medical Countermeasures for Tier 1 Select Agents Select agents, short for biological select agents or toxins (BSATs), are a subset of biological agents based on CDC’s three category bioterrorism agents that have been declared by the United States Department of Health and Human Services (HHS) or by the United States Department of Agriculture (USDA) as “posing severe threat to public health and plant health, or to animal or plant products” [12]. Thus, they have been divided into three broad categories: HHS select agents and toxins (affecting humans), USDA select agents and toxins (affecting agriculture), and overlap select agents and toxins (affecting both; [13]). To further divide select agents, in accordance with Executive Order 13546, Optimizing the Security of Biological Select Agents and Toxins in the United States, HHS and CDC have designated specific select agents and toxins that present the greatest risk of intentional misuse with the most significant potential for mass causalities or devastating effects to the economy, critical infrastructure, or public confidence as “Tier 1” agents [14]. Tier 1 Select Agents Tier 1 select agents possess the greatest risk to human health and safety [14]. They are the most important for health care first responders to understand [14]. Bacillus anthracis : Anthrax is caused by gram-positive, rod shaped bacteria, known as Bacillus anthracis, and can result in a serious infectious disease [15]. Depending upon the portal of entry, anthrax can cause cutaneous anthrax (presented by small blisters with a black center), inhalation anthrax (presented by shortness of breath, nausea, body aches), and gastrointestinal anthrax (presented by swelling of neck glands, swelling of abdomen, bloody diarrhea; [16]). Because it can be found naturally in soil and commonly affects wild and domestic animals, people can contract the disease if they come in contact with infected animals or contaminated animal products ([15]). Anthrax can be treated with antibiotics, including penicillin, tetracycline, erythromycin, and ciprofloxacin [15]. Francisella tularensis : Tularemia is caused by the bacterium Francisella tularensis found in animals and is a potentially serious illness [17]. Patients present with symptoms of progressive weakness and joint pain and sometimes ulcers on the skin or mouth. If exposed by inhalation, then symptoms would include severe respiratory illness, including life-threatening pneumonia and systemic infection [17]. Treatment of tularemia is administering antibiotics, including the tetracycline class (i.e., doxycycline) or fluoroquinolone class (i.e., ciprofloxacin; [17]). Yersinia pestis: Plague is caused by the bacterium Yersinia pestis found in rodents and their fleas [18]. In an aerosol attack using Yersinia pestis , patients will present the pneumonic form of plague. Treatment of plague includes administering antibiotics, such as the tetracycline class (i.e., doxycycline) or fluoroquinolone class (i.e., ciprofloxacin; [18]). Brucella species: Brucellosis is caused by bacteria and is a serious infectious disease [19]. Individuals can get the disease through contact with an infected animal or contaminated animal product [19]. Characteristic symptoms of brucellosis include anorexia, swelling of the liver and/or spleen, and arthritis. Treatment entails administering a cocktail of antibiotics, including tetracyclines, rifampicin, and the aminoglycoside streptomycin [19]. Burkholeria mallei: Glanders is caused by the bacterium Burkholeria mallei and results in an infectious disease [20]). Characteristic symptoms of glanders include light sensitivity, ulceration if through localized infection, pneumonia through pulmonary infection, and potential multiple abscesses within the muscles and skin of limbs if chronic [20]). Humans can contract the disease by contact with infected animals or through inhalation of infected aerosols. Glanders can be treated with antibiotics, including tetracyclines, gentamicin, and others [20]). Burkholderia pseudomallei : Melioidosis, an infectious disease, is caused by the bacterium Burkholderia pseudomallei found in contaminated water and soil [21]. Humans can become infected through contact with the contaminated source. Characteristic symptoms of melioidosis include ulceration and abscess; however, pulmonary, bloodstream, and disseminated infections of the disease may present different clinical manifestations. Treatment of melioidosis includes antimicrobial agents, such as trimethoprim-sulfamethoxazole and ceftazidime [21]. Variola virus: Smallpox is caused the variola virus and results in a serious infectious disease [22]. A characteristic symptom of the disease is pustules that begin to crust and then scab. There is no treatment for smallpox [22]. Clostridium botulinum : Botulism is caused by the toxin made by the bacterium Clostridium botulinum [23]. It is a muscle-paralyzing disease and can be foodborne (ingesting toxin) or cause wound botulism (wounds infected with C. botulinum). The treatment includes taking the antitoxin [23]. A commonality seen in these agents is that they occur naturally in nature and could be isolated and grown in a rogue laboratory [24]. The most devastating scenario using these pathogens would be airborne dispersal over a concentrated population along with food and water contamination [25]. Characteristics that make a pathogen especially high-risk for bioterrorism include highly contagious, low infective dose, survival in a variety of environmental conditions, and ability to be aerosolized. Almost all the Tier 1 agents mentioned above possess nearly all of these characteristics [25].

#### Genetic testing allows for attribution against next-gen bioweapons

Petro et. al. 03 [James B. Petro, PhD, Theodore R. Plasse, MS, and Jack A. McNulty are with the Counterproliferation and Technology Office, Defense Intelligence Agency, Bolling AFB, Washington, DC. Dr. Petro is also with the Joint Military Intelligence College, Bolling AFB. “Biotechnology: Implications for Biological Warfare and Biodefense.” 2003. *Biosecurity and Bioterrorism: Biodefense Strategy, Practice and Science.* Volume 1, Number 3. https://web.archive.org/web/20170809003928id\_/http://www.eubarnet.eu/wp-content/uploads/2012/10/Biotechnology.pdf]

Some current thoughts regarding attribution are focused on developing a post-incident ability to identify an agent’s source by comparing genetic polymorphisms against a database of different strains and isolates from the environment and laboratories around the world. Advanced biological warfare agents would make attribution via this route nearly impossible. However, the potential for attribution could be increased by incorporating software into DNA synthesizers that “tags” products with signature sequences. Although concerns regarding the effects of incorporating “genetically silent” DNA tags into synthetic DNA sequences will need to be addressed, such markers would provide some measure for attributing agents based on synthetic DNA. Also, many of the materials involved in production and refinement of organisms and toxins into BW agents are commercially available. Introducing trace amounts of inert, identifiable material that ultimately would become part of the agent into culture media and components used in refinement and weaponization may provide insight regarding the source of materials used for agent engineering and production, providing an additional avenue to pursue attribution. Such long-term approaches would require interaction with corporations on an international level, would likely require a minimal investment, and could have a major impact by helping attribute an attack to its source.

#### Attribution deters terror, stops arms racing, and prevents false crises

Lewis et. al. 20 [Gregory Lewis1,2, Jacob L. Jordan 3, David A. Relman 4,5, Gregory D. Koblentz 6, Jade Leung1 , Allan Dafoe1 , Cassidy Nelson 1 , Gerald L. Epstein 7, Rebecca Katz8, Michael Montague9, Ethan C. Alley2,10,11, Claire Marie Filone12, Stephen Luby4, George M. Church 2,11, Piers Millett1,13, Kevin M. Esvelt 2,10, Elizabeth E. Cameron3 & Thomas V. Inglesby9. 1 Future of Humanity Institute, Oxford University, Oxford, UK. 2Alt. Technology Labs, Inc., Berkeley, CA, USA. 3Nuclear Threat Initiative, Washington, DC, USA. 4Department of Medicine, Stanford University School of Medicine, Stanford, CA, USA. 5Department of Microbiology & Immunology, Stanford University School of Medicine; and Center for International Security and Cooperation, Stanford University, Stanford, CA, USA. 6 Schar School of Policy and Government, George Mason University, Washington, DC, USA. 7 Center for the Study of Weapons of Mass Destruction, National Defense University, Washington, DC, USA. 8 Center for Global Health Science and Security, Georgetown University, Washington, DC, USA. 9 Center for Health Security, Johns Hopkins University, Baltimore, MD, USA. 10 Media Laboratory, Massachusetts Institute of Technology, Cambridge, MA, USA. 11Department of Genetics, Harvard Medical School, Boston, MA, USA. 12 The Johns Hopkins University Applied Physics Laboratory, Laurel, MA, USA. 13 International Genetically Engineered Machine Competition. “The biosecurity benefits of genetic engineering attribution.” 2020. *Nature Communications.* https://www.nature.com/articles/s41467-020-19149-2.pdf]

These rapid developments have potential as techniques, alongside publications and patents, to help understand patterns of influence and performance within the synthetic biology community, and also a means to identify and protect intellectual property. Our interest is in the biosecurity promise of using these advances to develop forensic tools which can aid attribution of genetically engineered agents and organisms. The central benefit would be an increase in the actual and perceived accuracy of attribution decisions. This increases the likelihood of the right people being implicated in any misuse of genetic engineering in case of either an accident or an attack. The converse—avoiding mistaken attribution—is also key, given the potentially catastrophic consequences of one state mistakenly believing it is a victim of a biological attack. An indirect effect of this improved accuracy is deterrence of misuse in the first place. Some actors may be incentivized to be reckless if they believe they are unlikely to be held accountable for any accidents arising from their actions. Malicious actors may be attracted to biological weapons as a means of clandestine violence. Better attribution tools deter both by increasing the risk of discovery. Three additional features of genetic engineering forensics make it particularly attractive as a biodefense technology. First, unlike other instances where the interests of science and security conflict, the development of genetic engineering forensic tools does not impede scientific enquiry. If anything, it offers co-benefits for the overwhelming majority of well-intentioned and responsible genetic engineers: further means of receiving due credit and recognition, and further safeguards of their intellectual property. Second, biodefense activity can paradoxically worsen security, by what is known as a security dilemma16. A given state’s biodefense activity, even if wholly defensive in intent, may nonetheless provoke concern in other states that this activity could both harbour and be co-opted for offensive purposes. Mutual suspicion can drive an arms race. Compared to other aspects of biodefense, genetic engineering forensics has more limited prospects for offensive use, and so state investment in this aspect of biodefense poses a lower risk of triggering suspicions and insecurity in its peers. Third, the efficacy of genetic engineering attribution is coupled to biotechnological progress, so the trends that make misuse more concerning also enhance this approach to help address them. The rapidly growing corpus of genetically engineered sequence information provides more data that can be fed into these forensic tools; the increasing diversity of biotechnological methods also increases the diversity of ‘methodological signatures’ among practitioners.

#### Extinction

Piers Millett 17, Consultant for the World Health Organization, PhD in International Relations and Affairs, University of Bradford, Andrew Snyder-Beattie, “Existential Risk and Cost-Effective Biosecurity”, Health Security, Vol 15(4), http://online.liebertpub.com/doi/pdfplus/10.1089/hs.2017.0028

Historically, disease events have been responsible for the greatest death tolls on humanity. The 1918 flu was responsible for more than 50 million deaths,1 while smallpox killed perhaps 10 times that many in the 20th century alone.2 The Black Death was responsible for killing over 25% of the European population,3 while other pandemics, such as the plague of Justinian, are thought to have killed 25 million in the 6th century—constituting over 10% of the world’s population at the time.4 It is an open question whether a future pandemic could result in outright human extinction or the irreversible collapse of civilization.

A skeptic would have many good reasons to think that existential risk from disease is unlikely. Such a disease would need to spread worldwide to remote populations, overcome rare genetic resistances, and evade detection, cures, and countermeasures. Even evolution itself may work in humanity’s favor: Virulence and transmission is often a trade-off, and so evolutionary pressures could push against maximally lethal wild-type pathogens.5,6

While these arguments point to a very small risk of human extinction, they do not rule the possibility out entirely. Although rare, there are recorded instances of species going extinct due to disease—primarily in amphibians, but also in 1 mammalian species of rat on Christmas Island.7,8 There are also historical examples of large human populations being almost entirely wiped out by disease, especially when multiple diseases were simultaneously introduced into a population without immunity. The most striking examples of total population collapse include native American tribes exposed to European diseases, such as the Massachusett (86% loss of population), Quiripi-Unquachog (95% loss of population), and theWestern Abenaki (which suffered a staggering 98% loss of population).

In the modern context, no single disease currently exists that combines the worst-case levels of transmissibility, lethality, resistance to countermeasures, and global reach. But many diseases are proof of principle that each worst-case attribute can be realized independently. For example, some diseases exhibit nearly a 100% case fatality ratio in the absence of treatment, such as rabies or septicemic plague. Other diseases have a track record of spreading to virtually every human community worldwide, such as the 1918 flu,10 and seroprevalence studies indicate that other pathogens, such as chickenpox and HSV-1, can successfully reach over 95% of a population.11,12 Under optimal virulence theory, natural evolution would be an unlikely source for pathogens with the highest possible levels of transmissibility, virulence, and global reach. But advances in biotechnology might allow the creation of diseases that combine such traits. Recent controversy has already emerged over a number of scientific experiments that resulted in viruses with enhanced transmissibility, lethality, and/or the ability to overcome therapeutics.13-17 Other experiments demonstrated that mousepox could be modified to have a 100% case fatality rate and render a vaccine ineffective.18 In addition to transmissibility and lethality, studies have shown that other disease traits, such as incubation time, environmental survival, and available vectors, could be modified as well.19-2

### 1AC - Plan/Solvency

#### Plan: The member nations of the World Trade Organization ought to reduce intellectual property protections for medical diagnostics.

Johnson 17 [Alexa Johnson is a patent attorney on the Oregon Bar, and has a bachelor’s in bioengineering. “A Crisis of Patent Law and Medical Innovation: The Category of Diagnostic Claims in the Wake of Ariosa v. Sequenom.” 2017. *Health Matrix: The Journal of Law and Medicine.* https://scholarlycommons.law.case.edu/cgi/viewcontent.cgi?article=1612&context=healthmatrix]

One of the main arguments against granting patents to diagnostic tests is the effect on the public’s access to medical treatment.38 Patents raise the costs of diagnostic tests because they create market exclusivity, allowing companies to charge whatever they would like due to the lack of competition.39 Companies then pass on the increased costs to the medical industry and, by extension, to the consumers themselves. Higher prices mean that some consumers will be unable to afford necessary diagnostic treatments. Lack of patent protection would allow for a competitive market, which has the potential to lower prices, increasing access for consumers who need diagnostic treatments. Another strong argument raised against patent protection for diagnostic tests is that they may in some ways restrict access to information.40 In other ways, as discussed in Section I.A, patent protection may also aid in the disclosure of information. Many types of research build on the foundation of preceding tests and discoveries that came before. Over-patenting or overbroad patents themselves can create a thicket of licensing issues that exponentially raise the cost and difficulty of research. If claims directed at a diagnostic test are overly broad, they may preempt all other uses of the natural phenomenon on which the diagnostic test relies. Furthermore, there is a public-health concern that allowing the patenting of diagnostic treatments will open the door to patent infringement suits against doctors.41 Because patents on diagnostic tests often claim a method for using the test itself, a doctor who utilizes a particular test to diagnose a patient may find herself suddenly being sued for patent infringement. Furthermore, doctors or medical practices unwilling or unable to afford licensing fees for particular tests may disadvantage their patients by using outdated or less-effective diagnostic tests instead of the more-effective patented ones. Any efforts to create a test that clearly defines the patent eligibility of diagnostic methods must account for these concerns

#### Eliminating genetic patenting stops industry clamp down and allows innovation

Caulfield et. al. 06 [Timothy Caulfield, Canada Research Chair in Health Law and Policy Professor, Faculty of Law and Faculty of Medicine and Dentistry Research Director, Health Law Institute, University of Alberta Robert M. Cook-Deegan, Director, IGSP Center for Genome Ethics, Law & Policy Research Professor of Public Policy Studies, Sanford Institute of Public Policy Research Professor, Department of Internal Medicine, School of Medicine Duke University F. Scott Kieff, and Associate Professor, School of Law, Washington University Research Fellow, Hoover Institution, Stanford University John P. Walsh Associate Professor, School of Public Policy Georgia Institute of Technology. “Evidence and Anecdotes: An Analysis of Human Gene Patenting Controversies.” September 24, 2006. *Nature.* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2701726/pdf/nihms-111170.pdf]

One important exception is in the area of gene patents that cover a diagnostic test. Here, there are more instances of researchers and firms claiming that the patent owner is asserting exclusivity or license terms that are widely viewed as inappropriate [18,30] — thus lending some empirical evidence to support the concerns highlighted by the Myriad Genetics story. For example, Merz, et al. (2002) find that 30% of clinical labs report not developing or abandoning testing for HFE after the patent issued. Cho, et al [30] find that 25% of labs had abandoned one or more genetic test due to patents, with Myriad’s patents among the most frequently mentioned. Such unlicensed lab testing, from the perspective of the patent owner, competes with its commercial activity and hence, it is not surprising to find owners asserting their rights. There is also substantial empirical evidence that university researchers are becoming more secretive and less willing to share research results or materials [31-36,22]. The causes of this secrecy, however, are still in dispute. In particular, we cannot determine the impact of patents themselves on secrecy, in part because many studies of academic secrecy [31,32,36] use composite measures and, as a result, it is difficult to tease out specific causes thereof. Still, Walsh and Hong (2003) [33] and Walsh, Cho and Cohen (2005) [22] find that patents per se have little effect on discussing on-going research or on sharing of research materials. In contrast, several studies have found that commercial activity, as well as scientific competition and the cost and effort involved in sharing, all have negative effects on open science [22,31, 32,36]. Industry funding is also often associated with delayed publication [31,32,37,38]. This failure to share research materials seems to have a negative impact on research [32,22]. For example, Walsh, et al. [22] find that 19% of recent requests were not fulfilled (and that failures to supply materials are increasing), and that at least 8% of respondents had a project delayed due to an inability to get timely access to research materials (compared to 1% who were delayed by an inability to get a patent license). Finally, some studies show reduced citations to publications once a corresponding patent is granted [26,27]. However, the causes and implications of such a relationship are unclear. In particular, is this a result of a change in research practices, or simply of citations practices (i.e., an unwillingness to announce infringement in print)? Even if it is the former, does this simply reflect changing incentives causing a shift by researchers (especially industry researchers) towards less encumbered research areas? The overall social welfare implications of this redirection are also uncertain, as there is both the potential loss of fewer people working on a problem, and a potential gain of a more diverse research portfolio [39]

#### Reducing IP protections stops royalty stacking, reach through claims, and spin-off patents

Soini et. al. 08 [Sirpa Soini, Faculty of Law, University of Helsinki, Helsinki; and Department of Medical Genetics, University of Turku, Turku. Segolene Ayme, INSERM SC11, Paris. Gert Matthjis, Center for Human Genetics, University of Leuven. “Patenting and licensing in genetic testing: ethical, legal, and social issues.” 2008. *European Journal of Human Genetics.* https://www.nature.com/articles/ejhg200837.pdf]

Reach-through claims, royalty-stacking By reach-through claims a patent holder may attempt to acquire royalty rights or other benefit from prospective inventions made by someone else with the use of the patent-holder’s invention. The real problem is the breadth of claim. The broader the scope of the claim, the more the patent holder can exclude others from exploiting technologies that come within the scope of the claim and therefore the greater the patentholder’s negotiating position. The patent holder typically has an upstream patent to a research tool, that is, biological materials or methods, such as reagent kits, markers, assays etc. According to an OECD survey,26 a research tool patent does not normally contain claims to products found by using the tool. Nevertheless, there seems to be a trend towards demanding downstream royalties from the sales of a medicinal product discovered with a research tool. The breadth of claim therefore encourages patent holders to seek to capture within the scope of the claim technologies which are further downstream. This would cause royalty stacking.26 Royalty stacking means a situation in which the use of certain invention requires many licences from different patent holders, and thus increases the prices for end products. EPO, JPO and USPTO have noticed the increasing number of reach-through claims and made a comparative study on how the patentability standards and examination strategies in the respective offices apply to these types of claims to enhance mutual understanding.55 The study assessed different kinds of cases and reported rather similar views with regard to the claims that do not comply with one or more of the patentability requirements, that is, industrial applicability, utility, enablement, support, clarity and/or written description (see www.trilateral.net). Dependent patents are also problematic and may lead to uncertainty or higher prices of the end products. If many patents are granted for inventions that claim respectively a partial gene sequence, the full-length cDNA or gene, and the protein encoded, it may be unclear which title holder will be able to prevent the others from the use of his invention.26 Furthermore, some fear that full-length DNA sequence patents may require a host of licences from the patent holders of ESTs or SNPs presenting in that sequence. This is however not a realistic vision as EST patents are invalid, and SNP patents cannot cover a full sequence (PW Grubb, personal communication). The use of a subsequent patent depends on the first patent: exploitation and commercialisation needs consent of the patent holder of the first patent. The first patent holder has absolute protection, whereas the second has usually, but not always, only purpose-bound limited protection. For example, a dependent patent may cover a group of products smaller than that claimed in a first patent (‘selection invention’). As a rationale for this it has been stated that the second patent-holder has used the work of another to develop something. The counterargument is, however, that science is generally cumulative and builds on previous knowledge in all fields. In this fashion it is easy to envisage how royalty stacking may hinder access to proteins, technology, promoters, determinants, isolation because of overload of licence fees due to many patents. Product patents The problem with product patents is that under the current patent systems the protection may extend to all subsequently invented new uses, even if they were not anticipated in the patent application. Many acknowledge that it is reasonable that a test itself may merit protection, but not all the possible uses of the gene it is associated to. Genes have unknown functions, they can produce several proteins; introns can have independent functions, so called junk-DNA can be involved in regulating the genes and how and when genes are expressed. Many functions are still to be found. Therefore, product patents in biotechnology are not generally held fair and justifiably, and very stringent application of the criterion for inventiveness ought to be applied.5 In particular, the Nuffield Council supports opposition to product patents by arguing that in genetic tests it is usually an association that has been brought to light rather than the invention of a gene. Hence, it is the knowledge that becomes applied in the context of a test. But the dichotomy of invention and knowledge or discovery is not always that obvious.

#### The standard is maximizing pleasure and minimizing pain. Prefer -

#### Prioritize material, observable effects as the basis for ethics – anything else is epistemically inaccessible

Papinau ’07 (David [David Papineau is an academic philosopher. He works as Professor of Philosophy of Science at King's College London, having previously taught for several years at Cambridge University and been a fellow of Robinson College, Cambridge], “Naturalism”. [http://plato.stanford.edu/entries/naturalism/](http://plato.stanford.edu/entries/naturalism/)) 2007)

Moore took this argument to show that moral facts comprise a distinct species of non-natural fact. However, any such non-naturalist view of morality faces immediate difficulties, deriving ultimately from the kind of causal closure thesis discussed above. If **all physical effects are due to a limited range of natural causes, and if moral facts lie outside this range, then it follow that moral facts can never make any difference to what happens in the physical world** (Harman, 1986). At first sight **this** may seem tolerable (perhaps moral facts indeed don't have any physical effects). But it **has** **very awkward epistemological consequences.** For beings like us, **knowledge of the spatiotemporal world is mediated by physical processes involving our sense organs and cognitive systems. If moral facts cannot influence the physical world, then [we can’t] it is hard to see how we can have any knowledge of them.**

#### Phenomenal experiences prove that pain is intrinsically bad – one cannot understand what pain without associating it with objective disvalue.

Mendola 06 [Joseph Mendola, (Joseph Mendola is professor and chair in the Department of Philosophy at the University of Nebraska–Lincoln. He is the author of Human Thought and of articles on ethics, metaphysics, and philosophy of mind.) "Goodness and Justice: A Consequentialist Moral Theory" Cambridge University Press, 2006, https://www.cambridge.org/core/books/goodness-and-justice/AE25780DC33533E8797FB684C5FBD36E, DOA:6-7-2019 // WWBW]

While this view is of course controversial in our historical situation, in which many hold that sensory experience is as of yellow though there is nothing in the world that is so, not even a sense datum, or at the very least that the yellow we experience is a natural property constituted by physical properties like a certain range of surface spectral reflectance, still the view in question is, as I’ve said, one live competitor. Indeed, it is often motivated by arguments that are structurally similar to the open-question argument: You look at a gold bar and have a certain sort of phenomenal experience. But it seems to some that it might well be an open question whether your physical twin in a physically identical environment has the same phenomenal experience, or any at all. He might be a zombie or a qualia invert. And the openness of that question suggests to some that **the physical cannot constitute** your **phenomenal experience.** At least such qualia dualism is relatively concrete and robust. Even though it involves physically unconstituted qualia, it involves nothing that is non-natural in Moore’s sense. It is at least concretely comprehensible. And that gives it a great advantage over alternative forms of normative realism. That is my main point, that this so far familiar qualia dualism unexpectedly but very plausibly implies a form of normative realism. **Painfulness** – or, more accurately, the phenomenal property present in certain sorts of extreme and paradigmatic physical pain – **is** a kind of **disvalue**. That is my new idea.34 The phenomenal difference between those in bliss and those in agony includes a difference in a sort of felt phenomenal value. **The phenomenal difference between pain and pleasure seems** (at least in part and sometimes) **to be that the phenomenal component of the former is nastier, intrinsically worse than that of the second. The red knight was stabbed to death.** Just as no one can adequately describe what it was like to be him without capturing his sensation of his red and flowing blood and hence the property of phenomenal redness, so no one can describe what it was like to be him without capturing the nasty sensations he felt and hence the property of phenomenal nastiness or disvalue. And **no one can understand what his phenomenal state was without knowing that it was intrinsically bad, worse than pleasure. No one, not even a Martian, can give a complete and adequate characterization of the red knight’s murder while ignoring the phenomenal state that was a part of that situation. And no one, not even a Martian, can give a complete and adequate characterization of that phenomenal state without capturing its nastiness, its intrinsic disvalue.** The red knight’s murder possessed what we might call objective intrinsic disvalue. If someone feels bad, then there is something bad, at least in cases of extreme physical pain. My further claim, to which constitutive naturalists dissent, is that this involves unconstituted but natural disvalue. **Like other phenomenal properties, the disvalue present in agony is unconstituted by physical properties, though it is itself concrete and natural. It is just like phenomenal yellow.** The objective but unconstituted phenomenal component of agony involves a correspondingly objective and unconstituted phenomenal property that is usually present in cases of at least extreme physical pain, a painfulness or “unpleasant hedonic tone”, as it was once called.35 And **such objective phenomenal properties are, at least in part, a sort of intrinsic disvalue or badness.** Something analogous is true of certain paradigmatic physical pleasures. They involve objective intrinsic value.

#### Revisionary intuitionism is true and proves util

Yudkowsky 08 [Eliezer Yudkowsky (research fellow of the Machine Intelligence Research Institute; he also writes Harry Potter fan fiction). “The ‘Intuitions’ Behind ‘Utilitarianism.’” 28 January 2008. LessWrong. http://lesswrong.com/lw/n9/the\_intuitions\_behind\_utilitarianism/]

I haven’t said much about metaethics – the nature of morality – because that has a forward dependency on a discussion of the Mind Projection Fallacy that I haven’t gotten to yet. I used to be very confused about metaethics. After my confusion finally cleared up, I did a postmortem on my previous thoughts. I found that my object-level moral reasoning had been valuable and my **meta-level moral reasoning had been** worse than **useless**. And this appears to be a general syndrome – **people do much better when discussing whether torture is** good or **bad than**when they discuss **the meaning of “good” and “bad”. Thus, I deem it prudent to keep moral discussions on the object level** wherever I possibly can. Occasionally people object to any discussion of morality on the grounds that morality doesn’t exist, and in lieu of jumping over the forward dependency to explain that “exist” is not the right term to use here, I generally say, “But what do you do anyway?” and take the discussion back down to the object level. Paul Gowder, though, has pointed out that both the idea of choosing a googolplex dust specks in a googolplex eyes over 50 years of torture for one person, and the idea of “utilitarianism”, depend on “intuition”. He says I’ve argued that the two are not compatible, but charges me with failing to argue for the utilitarian intuitions that I appeal to. Now “intuition” is not how I would describe the computations that underlie human morality and distinguish us, as moralists, from an ideal philosopher of perfect emptiness and/or a rock. But I am okay with using the word “intuition” as a term of art, bearing in mind that “intuition” in this sense is not to be contrasted to reason, but is, rather, the cognitive building block out of which both long verbal arguments and fast perceptual arguments are constructed. **I see** the project of **morality as a project of renormalizing intuition.** We have intuitions about things that seem desirable or undesirable, intuitions about actions that are right or wrong, intuitions about how to resolve conflicting intuitions, intuitions about how to systematize specific intuitions into general principles. **Delete all** the **intuitions, and** you aren’t left with an ideal philosopher of perfect emptiness, **you’re left with a rock. Keep all your** specific **intuitions and** refuse to build upon the reflective ones, and you aren’t left with an ideal philosopher of perfect spontaneity and genuineness, **you’re left with a** grunting **caveperson** running in circles, due to cyclical preferences and similar inconsistencies. “Intuition”, as a term of art, is not a curse word when it comes to morality – there is nothing else to argue from. **Even modus ponens is an “intuition”** in this sense – **it**‘s **just** that modus ponens **still seems like a good idea after being** formalized, **reflected on**, extrapolated out to see if it has sensible consequences, etcetera. So that is “intuition”. However, Gowder did not say what he meant by “utilitarianism”. Does utilitarianism say… That right actions are strictly determined by good consequences? That praiseworthy actions depend on justifiable expectations of good consequences? That probabilities of consequences should normatively be discounted by their probability, so that a 50% probability of something bad should weigh exactly half as much in our tradeoffs? That virtuous actions always correspond to maximizing expected utility under some utility function? That two harmful events are worse than one? That two independent occurrences of a harm (not to the same person, not interacting with each other) are exactly twice as bad as one? That for any two harms A and B, with A much worse than B, there exists some tiny probability such that gambling on this probability of A is preferable to a certainty of B? If you say that I advocate something, or that my argument depends on something, and that it is wrong, do please specify what this thingy is… anyway, I accept 3, 5, 6, and 7, but not 4; I am not sure about the phrasing of 1; and 2 is true, I guess, but phrased in a rather solipsistic and selfish fashion: you should not worry about being praiseworthy. Now, what are the “intuitions” upon which my “utilitarianism” depends? This is a deepish sort of topic, but I’ll take a quick stab at it. First of all, it’s not just that someone presented me with a list of statements like those above, and I decided which ones sounded “intuitive”. Among other things, **if you try to violate** “**util**itarianism”, **you run into paradoxes, contradictions**, circular preferences, **and other** things that aren’t **symptoms of** moral wrongness so much as **moral incoherence**. After you think about moral problems for a while, and also find new truths about the world, and even discover disturbing facts about how you yourself work, you often end up with different moral opinions than when you started out. This does not quite define moral progress, but it is how we experience moral progress. As part of my experienced moral progress, I’ve drawn a conceptual separation between questions of type Where should we go? and questions of type How should we get there? (Could that be what Gowder means by saying I’m “utilitarian”?) The question of where a road goes – where it leads – you can answer by traveling the road and finding out. If you have a false belief about where the road leads, this falsity can be destroyed by the truth in a very direct and straightforward manner. When it comes to wanting to go to a particular place, this want is not entirely immune from the destructive powers of truth. You could go there and find that you regret it afterward (which does not define moral error, but is how we experience moral error). But, even so, wanting to be in a particular place seems worth distinguishing from wanting to take a particular road to a particular place. Our intuitions about where to go are arguable enough, but our intuitions about how to get there are frankly messed up. **After** the two hundred and eighty-seventh **research** study **showing that people will chop their own feet off if you frame the problem the wrong way, you start to distrust first impressions. When you’ve read** enough **research on scope insensitivity** – people will pay only 28% more to protect all 57 wilderness areas in Ontario than one area, **people will pay the same amount to save 50,000 lives as 5,000** lives… that sort of thing… Well, the worst case of scope insensitivity I’ve ever heard of was described here by Slovic: Other recent research shows similar results. Two Israeli psychologists asked people to contribute to a costly life-saving treatment. They could offer that contribution to a group of eight sick children, or to an individual child selected from the group. The target amount needed to save the child (or children) was the same in both cases. Contributions to individual group members far outweighed the contributions to the entire group. There’s other research along similar lines, but I’m just presenting one example, ’cause, y’know, eight examples would probably have less impact. If you know the general experimental paradigm, then the reason for the above behavior is pretty obvious – focusing your attention on a single child creates more emotional arousal than trying to distribute attention around eight children simultaneously. So people are willing to pay more to help one child than to help eight. Now, **you could** look at this intuition, and **think it was** revealing **some** kind of incredibly **deep moral truth** which shows that one child’s good fortune is somehow devalued by the other children’s good fortune. But what about the billions of other children in the world? Why isn’t it a bad idea to help this one child, when that causes the value of all the other children to go down? How can it be significantly better to have 1,329,342,410 happy children than 1,329,342,409, but then somewhat worse to have seven more at 1,329,342,417? **Or you could** look at that and **say: “The intuition is wrong: the brain can’t** successfully **multiply** by eight and get a larger quantity than it started with. **But it ought to**, normatively speaking.” And once you realize that the brain can’t multiply by eight, then the other cases of scope neglect stop seeming to reveal some fundamental truth about 50,000 lives being worth just the same effort as 5,000 lives, or whatever. You don’t get the impression you’re looking at the revelation of a deep moral truth about nonagglomerative utilities. It’s just that the brain doesn’t goddamn multiply. Quantities get thrown out the window. If you have $100 to spend, and you spend $20 each on each of 5 efforts to save 5,000 lives, you will do worse than if you spend $100 on a single effort to save 50,000 lives. Likewise if such choices are made by 10 different people, rather than the same person. As soon as you start believing that it is better to save 50,000 lives than 25,000 lives, that simple preference of final destinations has implications for the choice of paths, when you consider five different events that save 5,000 lives. (It is a general principle that Bayesians see no difference between the long-run answer and the short-run answer; you never get two different answers from computing the same question two different ways. But the long run is a helpful intuition pump, so I am talking about it anyway.) The aggregative valuation strategy of “shut up and multiply” arises from the simple preference to have more of something – to save as many lives as possible – when you have to describe general principles for choosing more than once, acting more than once, planning at more than one time. Aggregation also arises from claiming that the local choice to save one life doesn’t depend on how many lives already exist, far away on the other side of the planet, or far away on the other side of the universe. Three lives are one and one and one. No matter how many billions are doing better, or doing worse. 3 = 1 + 1 + 1, no matter what other quantities you add to both sides of the equation. And if you add another life you get 4 = 1 + 1 + 1 + 1. That’s aggregation. **When you’ve read** enough heuristics and **biases research, and**enough **coherence** and uniqueness **proofs for** Bayesian probabilities and **expected utility**, and you’ve seen the “Dutch book” and “money pump” effects that penalize trying to handle uncertain outcomes any other way, then **you don’t see** the **preference reversals** in the Allais Paradox **as** revealing some incredibly **deep moral truth** about the intrinsic value of certainty. **It** just **goes to show that the brain doesn’t** goddamn **multiply.** The primitive, perceptual intuitions that make a choice “feel good” don’t handle probabilistic pathways through time very skillfully, especially when the probabilities have been expressed symbolically rather than experienced as a frequency. So you reflect, devise more trustworthy logics, and think it through in words. When you see people insisting that no amount of money whatsoever is worth a single human life, and then driving an extra mile to save $10; or when you see people insisting that no amount of money is worth a decrement of health, and then choosing the cheapest health insurance available; then you don’t think that their protestations reveal some deep truth about incommensurable utilities. Part of it, clearly, is that **primitive intuitions don’t**successfully **diminish the emotional impact of** symbols standing for **small quantities** – anything you talk about seems like “an amount worth considering”. And part of it has to do with preferring unconditional social rules to conditional social rules. Conditional rules seem weaker, seem more subject to manipulation. If there’s any loophole that lets the government legally commit torture, then the government will drive a truck through that loophole. So it seems like there should be an unconditional social injunction against preferring money to life, and no “but” following it. Not even “but a thousand dollars isn’t worth a 0.0000000001% probability of saving a life”. Though the latter choice, of course, is revealed every time we sneeze without calling a doctor. The rhetoric of sacredness gets bonus points for seeming to express an unlimited commitment, an unconditional refusal that signals trustworthiness and refusal to compromise. So you conclude that moral rhetoric espouses qualitative distinctions, because espousing a quantitative tradeoff would sound like you were plotting to defect. On such occasions, people vigorously want to throw quantities out the window, and they get upset if you try to bring quantities back in, because quantities sound like conditions that would weaken the rule. But you don’t conclude that there are actually two tiers of utility with lexical ordering. You don’t conclude that there is actually an infinitely sharp moral gradient, some atom that moves a Planck distance (in our continuous physical universe) and sends a utility from 0 to infinity. You don’t conclude that utilities must be expressed using hyper-real numbers. Because the lower tier would simply vanish in any equation. It would never be worth the tiniest effort to recalculate for it. All decisions would be determined by the upper tier, and all thought spent thinking about the upper tier only, if the upper tier genuinely had lexical priority. As Peter Norvig once pointed out, if Asimov’s robots had strict priority for the First Law of Robotics (“A robot shall not harm a human being, nor through inaction allow a human being to come to harm”) then no robot’s behavior would ever show any sign of the other two Laws; there would always be some tiny First Law factor that would be sufficient to determine the decision. Whatever value is worth thinking about at all, must be worth trading off against all other values worth thinking about, because thought itself is a limited resource that must be traded off. When you reveal a value, you reveal a utility. I don’t say that morality should always be simple. I’ve already said that the meaning of music is more than happiness alone, more than just a pleasure center lighting up. I would rather see music composed by people than by nonsentient machine learning algorithms, so that someone should have the joy of composition; I care about the journey, as well as the destination. And I am ready to hear if you tell me that the value of music is deeper, and involves more complications, than I realize – that the valuation of this one event is more complex than I know. But that’s for one event. When it comes to multiplying by quantities and probabilities, complication is to be avoided – at least if you care more about the destination than the journey. **When you’ve reflected** on enough intuitions, **and corrected enough absurdities, you** start to **see a common denominator**, a meta-principle at work, **which one might phrase as “Shut up and multiply.”** Where music is concerned, I care about the journey. When lives are at stake, I shut up and multiply. It is more important that lives be saved, than that we conform to any particular ritual in saving them. And the optimal path to that destination is governed by laws that are simple, because they are math. **And that’s why I’m a utilitarian** – at least when I am doing something that is overwhelmingly more important than my own feelings about it – which is most of the time, because there are not many utilitarians, and many things left undone.

#### Actor-Specificity—util’s the only theory that assigns culpability to policymakers and allows us to assess policies.

Hirschel-Burns 16—PhD Student in Political Science @ Yale (Danny, In Defense of Consequentialism: A Response to Shadi Hamid," Apr 19, 2016, <https://thewideninglens.wordpress.com/2016/04/19/in-defense-of-consequentialism-a-response-to-shadi-hamid/>)

My difference of opinion is fundamental: I believe most US foreign policy to be short-sighted, and consequentialism, or the weighing of long-term ramifications against the initial intended effect of a particularly intervention to represent the ideal method of policymaking. Policies cannot solely be judged on intention, due to the frequency with which good intentions produce negative outcomes, nor can they be judged solely on initial effects due to the long-running causal chains produced by order-altering things like military interventions. However, Hamid is right that it is impossible to foresee some ramifications (even if we can see general correlations) of foreign policy, but he doesn’t apply that standard of doubt consistently across his analysis. Early in the essay, Hamid makes the point that to evaluate the Libyan intervention, it is necessary to compare the current situation with the counterfactual: what would Libya look like if the US hadn’t intervened. In general, the assertion is correct, but the practice of counterfactuals is tricky. Hamid’s analysis of where the Libyan conflict was at when the US intervened is enlightening, but his conclusion that Libya would likely look like Syria today had the US not intervened is highly questionable. Political prediction, especially on rare events like mass atrocities or civil wars, is really, really hard. And when you consider all the differences between Libya and Syria (total population, population density, salience of sectarian divides, regime configuration, military capability of opposition, etc.) along with all contingencies that could have occurred in the past four years, it is impossible to say with any certainty that Libya would bear a resemblance to Syria. Syria is merely a convenient standard of comparison because it’s an ongoing civil war in the Middle East, but saying Libya would be Syria doesn’t actually tell us that much about Libya or the effects of intervention. It’s not that the intervention can’t be justified with counterfactuals, but they need to be more carefully constructed. The central thrust of Hamid’s essay is to deride what he calls consequentialism, or evaluating the efficacy of foreign policy based on events years after the initial intervention in the target location. For Hamid, such an approach is particularly problematic because it a policy cannot be retroactively deemed a mistake if the limited goal of the intervention is achieved initially. Therefore consequentialism creates an impossibly high bar for foreign policy decisions: unless a foreign policy results in a peaceful, liberal democracy, than it’s a failure. This is, however, a major straw man. Certainly there are some critics that would deem the Libyan intervention a failure based on this standard, but Hamid lumps in those with reasonable concerns that a civil war (likely to continue for many years based on what we know about civil wars and foreign intervention) at least partially produced by the NATO intervention will have more negative long-term effects on Libyans than Gaddafi’s intended repression. Worrying about consequences does not preclude making foreign policy decisions. Recognizing that every decision has potential positive and negative effects is no more than an accurate framework for analyzing policy. There are an additional two problems with Hamid’s argument here. First, the dismissal of consequentialism is one of the central dynamics that leads Western policymakers to struggle with conflict prevention. Short-term thinking produces short-term solutions. Policymakers become trapped in a vicious circle of continual crises that overwhelm them and prevent longer-term thinking that could go a long way in preventing violence. Second, Hamid’s insistence that the initial moral righteousness of an intervention negates any negative effects, is deeply problematic. As many before me have argued, focusing only on moral imperatives disincentives careful planning and allows policymakers to wash their hands of responsibility if the situation starts to go south. Evaluating military interventions isn’t personal morality, because very rarely can doing the right thing in your personal life lead to deaths of thousands of people. Afghanistan is a valid example. The United States was going after the Taliban in response to 9/11 initially, but the war has had disastrous long-term effects for the country. It would take quite a bit of chutzpah to declare it a success. Moral arguments without strategic and humanitarian (writ large) considerations are also prone to abuse, because liberal interventionists and neoconservatives aren’t actually that far apart: both believe in the wisdom of Western democracies to improve the world through military force. Without more consequentialist standards, there’s not a clear line the prevents Iraq-like decisions. So Hamid’s own argument that Obama being right about Iraq decreases his likelihood he’ll be right about other situations is undermined by a lack of a standard that allows leaders to tell the difference between the two.

#### Adopt a Parliamentary model to account for moral uncertainty. This entails minimizing existential risk.

Bostrom 09 [Bostrom, Nick (*Existential*ist of a different sort). “Moral uncertainty – toward a solution?” 1 January 2009. <http://www.overcomingbias.com/2009/01/moral-uncertainty-towards-a-solution.html>]

It seems people are overconfident about their moral beliefs. But **how should one** reason and **act if one** acknowledges that one **is uncertain about morality** – not just applied ethics but fundamental moral issues? if you don’t know which moral theory is correct? It doesn’t seem **you can[’t] simply plug your uncertainty into expected utility** decision theory and crank the wheel; **because many** moral **theories** state that you **should not** always **maximize** expected **utility.** Even if we limit consideration to consequentialist theories, it still is hard to see how to combine them in the standard decision theoretic framework. For example, suppose you give X% probability to total utilitarianism and (100-X)% to average utilitarianism. Now an action might add 5 utils to total happiness and decrease average happiness by 2 utils. (This could happen, e.g. if you create a new happy person that is less happy than the people who already existed.) Now what do you do, for different values of X? The problem gets even more complicated if we consider not only consequentialist theories but also deontological theories, contractarian theories, virtue ethics, etc. We might even throw various meta-ethical theories into the stew: error theory, relativism, etc. I’m working on a paper on this together with my colleague Toby Ord. We have some arguments against a few possible “solutions” that we think don’t work. On the positive side we have some tricks that work for a few special cases. But beyond that, the best **we have managed** so far is **a** kind of **metaphor, which** we don’t think is literally and exactly correct, and it is a bit under-determined, but it **seems to get things roughly right** and it might point in the right direction: **The Parliamentary Model.** Suppose that you have a set of mutually exclusive moral theories, and that you assign each of these some probability. Now imagine that **each** of these **theorie**s **gets to send** some number of **delegates to The Parliament**. The number of delegates each theory gets to send is **proportional to the probability of the theory.** Then the delegates bargain with one another for support on various issues; and the Parliament reaches a decision by the delegates voting. What you should do is act according to the decisions of this imaginary Parliament. (Actually, we use an extra trick here: we imagine that the delegates act as if the Parliament’s decision were a stochastic variable such that the probability of the Parliament taking action A is proportional to the fraction of votes for A. This has the effect of eliminating the artificial 50% threshold that otherwise gives a majority bloc absolute power. Yet – unbeknownst to the delegates – the Parliament always takes whatever action got the most votes: this way we avoid paying the cost of the randomization!) The idea here is that moral theories get more influence the more probable they are; yet **even a** relatively **weak theory can still get its way on some issues** that the theory think are extremely important **by sacrificing** its influence **on other** i**s**sues that other theories deem more important. For example, **suppose you assign 10% probability to** total **util**itarianism and 90% to moral egoism (just to illustrate the principle). Then **the Parliament** would mostly take actions that maximize egoistic satisfaction; however it **would make some concessions to util**itarianism **on** issues that utilitarianism thinks is especially important. In this example, the person might donate some portion of their income to **existential risks** research and otherwise live completely selfishly. I think there might be wisdom in **this model**. It **avoids the** dangerous and **unstable extremism** that would result **from letting one’s current favorite moral theory completely dictate action**, while still allowing the aggressive pursuit of some non-commonsensical high-leverage strategies so long as they don’t infringe too much on what other major moral theories deem centrally important