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TOWARDS A GENERAL PEDAGOGIC MODEL OF PLAGUES AND PANDEMICS

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ABSTRACT

Plagues have been recorded, as a natural part of human history, since time immemorial. They have also acted as trigger points for major socio-political change, in Egypt, according to biblical history, and in the world's then most powerful and advanced civilization of Athens, millennia ago. Quite possibly we are witnessing something of a similar nature: the unleashing of social fissures, plus expectations of radical systemic and/or institutional change, under the pressure of the current plague. This would seem to potentially parallel the Athens crisis in the most powerful, yet currently most vulnerable nation of the world today -the U.S. Athens succumbed to the new superpower Sparta. America seems to be threatened by a similar challenge from our modern world's second-most superpower, -China. This paper offers a simplified, pedagogic model of the process of plagues, and the stages that humanity invariably has to deal with. In so doing, it is hoped to reduce the opacity of the phenomenon, together with the deceptions foisted on a gullible populace, by official leaders -both authoritarian and democratic. Its simplicity is intended to encourage the youngest in the world, to be able to actively participate in the epidemiological research effort. The traditional response of vast portions of humanity to consider plagues with resignation, as probably Divine retribution for wrong-doing, could thus be reduced, and supplanted by a set of expectations for plague control, based on rational decision-making and empirical research. Advances in science in the past century have encouraged a change in human expectations, regarding health, longevity and disease control. Political and economic evolution are argued not to have kept up with this scientific evolution. The aspiration is that the youngest generation be offered an institutional opportunity, at a global level, to help change the current disequilibrium.

JEL: I10, I13, I15, I18, I20, 131, I38, I39

KEYWORDS: Plagues, Pandemics, History, Coronavirus, Covid-19, Pedagogic Model, Systemic Change, Institutional Change, Black Lives Matter

INTRODUCTION

The Central Issue to Be Addressed, Plus Urgent Issues Arising

The central issue to be addressed is how to conceptualize the current pandemic in terms which are available for comprehension by the majority of the population, from children to heads of State, with the aid of a simplified model. The model is deliberately generalized to be able to explicate not just the current plague, but all plagues throughout history. The intention is to remove some of the mystery and deceptions which have gone along with the explanation of plagues, their trajectories and policies for remedies, all of which have been foisted on gullible populations throughout history, and still remain a major issue, both national and global, in the 21st century. How the world confronts the cluster of central issues currently facing humanity, and exposed by the current pandemic, but not caused by it, is proposed as an organizational problem, which in addition to systemic change, requires more fundamental and global institutional change. The role of the youngest generation is suggested as invaluable, if not crucial, in this endeavor.

Many of the issues arising from the present crisis are spillovers from the central issue of disease management/control, into the social, political and economic domains, e.g. compliance vs defiance in societies, the conflicting 'modi vivendi', as well as ideology, of authoritarianism and democratic liberalism; and how expectations, like entitlement, can be exposed under the extreme pressure of the calamity, which has laid bare racial and ethnic cleavages in some societies, notably but by no means exclusively, in the U.S. Ensuring that the economy does not 'tank' has been a major preoccupation of both major world powers. It is not addressed in this paper. However, equity in the distribution of economic and life-sustaining resources has also raised its head again, in Canada and elsewhere, although not (yet) to the point of pan-revolution, as occurred across Europe, in 1848, the time Marx was writing his Communist Manifesto (Marx and Engels, 1848). Nonetheless, it is regarded as crucial to an understanding of all the dimensions of 'collateral damage' which have ensued from the evolution of the pandemic crisis: in food shortages amongst the poor, to the point of starvation among hundreds of millions, in the growth in numbers of other diseases, and fatalities therefrom, e.g. Tuberculosis, which are not being adequately controlled, due to lack of resources; or worse, lack of concern about other health issues due to the focus on the Coronavirus, e.g. the rise in deaths from opiate overdoses, whose numbers have exceeded the numbers of fatalities from Covid-19, in large jurisdictions. Finally, the notion of humans as no longer at the apex of the food chain, but as potential fodder for the trillions of cells, which are proliferating and mutating on a daily basis, may become one of the most pressing scientific issues confronting humanity. Whilst potentially urgent in its implications, in the long term, it has been considered outside the scope of the present paper.

The remainder of the paper is organized as follows. First, a broad review of the history of plagues in general, and its recording in historical literature from early times, to the present. Second, presentation of a pedagogic model, consisting of the following stages, which are metaphorically referred to as Ocean, Pool, Tank, Bucket and Earth. Each is explained and explored. The intention is to help naïve readers, especially children, but also the less informed members of society, to follow some of the major steps in dealing with a plague, and particularly a pandemic, such as the current epidemic. In addition, it is hoped that it also may serve as a guide, useful for the more sophisticated members of the community, such as scientific researchers, professionals and administrators, who are involved in plague management, insofar as its modules can be magnified and divided as needed by the user, without losing sight of the simplified, skeletal model. Third, Implications of the model are explored, contemplating some of the some of the social, political and health-related issues brought to the fore by plagues, both in the long past, the more recent and the current situation. These include:

The role of truth and transparency among those responsible for plague management;
Human expectations regarding disease and plagues;
Spread and its control;
Spill-over effects;
The resurgent specter of the theory of 'Eugenics';
Truth, trust and power;
Kids, truth and trust.

Fourth, the notion of one path forward is replaced by the admission of multiple paths forward, some of which are explored:

Research: -playing the numbers game of multiple paths;
Policy, strategy and rational decision-making: market vs government rationing;
'Leave it to the kids': the potential value inherent in a pedagogic model of plagues;
Institutional vs systemic change;
Defiance vs Compliance: Don Quixote and 'Don Presidente';
Alternatives to the defiance-compliance dichotomy;
A tentative path mapping out institutional change, at a global level.

Finally, concluding comments are followed by a brief concluding summary.

LITERATURE REVIEW

A Few Brief Statistics About the Magnitude and Significance of the Issue

As with all pandemics, the potential human population at risk, for contracting the plague, and dying therefrom, is whatever the global population happens to be at the time. Thus, the appropriateness of the 'ocean' metaphor. At present about 8 billion humans are at risk. Consequences to the global animal population have been ignored in this paper, and have not so far been a major focus of current research. At time of writing (late July, 2020) some 16 million cases have been reported, together with some 2/3 million deaths, world-wide. Using ECDC (2020) reporting, the following is a brief synopsis of some of the salient data:

Total global cases recorded: 15.8 million (approx. 0.2% of the human population)
Total global deaths reported: 640,000 (less than 1 in 10,000 persons).

The ability to control the virus varies enormously, not just by country, but by specific areas within a country. The U.S. would be the most publicized example of aggregate cases and deaths, being by far the highest in the world, at over 4 million cases, and nearly 150,000 deaths, both figures still rising fast. However, the aggregated figures hide the phenomenon of variability by area. To give just a few examples:

The State of Hawaii had recorded a cumulative figure of 1,435 cases until July 22, and a total of 25 deaths. By contrast, the State of Florida had recorded 379,619 cases by July 22, and deaths of 5,345. To put Florida's plight into starker perspective, the daily totals for July 22 alone were: 9,785 new cases, and 139 deaths. In the State of Texas, the day's number of deaths on July 22 rose to a new record, of 197, to reach a cumulative total of 4,348. The highest State case load has now passed from New York to California, with 413,576 cases accumulated, but a lower fatality rate of just under 8,000, actually significantly lower than New York State's cumulative fatalities of more than 25,000 (L.A. Times, 2020).

Elsewhere in the world, the insulation afforded to island States seems to be reflected in lower case incidence and lower fatality rates: Cyprus recorded 1,000 cumulative cases and 19 deaths, to July 25; Iceland 1,800 cases and just 10 deaths; and the most publicized success story: New Zealand, recorded 1,200 cases, and 22 deaths. It should be noted that NZ has a far larger population than the other island States reported, with a shade under 5 million inhabitants. The population of Hawaii is a shade over 1.4 million, or roughly ¼ that of NZ., but with very similar case numbers and fatalities. (ECDC, 2020).

The number of countries worldwide, whose reported case load has reached 200,000, or more, is 16. It remains nevertheless difficult to ascertain with any accuracy the veracity of the numbers of cases and deaths reported from each country. However, the computation of "excess deaths", at a national and global level, might provide a better, more realistic indicator of actual morbidity, than the figures reported. This method cannot be employed for authentication of number of cases, for a multitude of reasons: incomplete record-keeping, conscious deception on the part of various levels of administration, including both health and government, local and central. At time of writing, again, neither a vaccine nor a successful drug treatment is available for global use. However, there are some 200 vaccines being tested, and hundreds of organizations are presently employed in formulating and testing drug treatments. The US Federal Government announced, July 22, a deal to purchase 100 million vaccines, from US company Pfizer Inc, at a price of $1.95billion. Hedging its bets, the same US dept. of Health and Human Services announced previously that it would provide "up to 1.2 billion to the UK company AstraZeneca, which is collaborating to develop a vaccine with Oxford University, and plans to take the vaccine to "Phase 3", with a 30,000-person study to be conducted in N. America. The hope is to have 300 million vaccines available, the first

doses possibly by October, 2020. AstraZeneca has also announced "agreements with several governments and other organizations to produce at 400 million doses, and stated it had "secured manufacturing capacity for one billion doses. The HHS's agency BARDA (Biomedical Advanced Research and Development Authority) agreed earlier to "provide up to 483million to the biotech company Moderna and $500million to Johnson and Johnson for their separate vaccine efforts." (New York Times, Report by Kirkpatrick, D., 2020).

<u>The Current State of the Literature in General Terms</u>

The current state of the literature is unsurprisingly in a state of extreme flux. The number of papers multiply in compound fashion, on a daily basis. It is therefore considered outside the scope of this introduction to do justice to the present state of its progress. Suffice to say that, owing to 1/ the availability of communication channels, not just TV, radio, printed word and internet-based, and 2/ the extremely low cost of putting out one's perspective, and 3/ the general consciousness of the existence of the plague and the risks that it poses, among billions of people, we can expect the literature to continue to multiply logarithmically, until another more urgent topic takes the plague's place. In terms of reliable sources of information, some of the most reputable universities have a stake in providing accurate, fact-based information. Imperial College, London, Oxford University, the University of Edinburgh, have all produced worthwhile 'progress reports' and made some valuable suggestions, some of which are addressed in the body of this paper. Johns Hopkins University and the European CDC have both done their best to keep up with daily incidences of cases and fatalities, and have made them available gratis. Whilst general theories are not in abundance, an increasing number of researchers and commentators are considering the wider aspects of the calamity, such as the collateral damage of higher incidences of other diseases and plagues, domestic violence and addictions (especially opiates, which in some jurisdictions, (such as British Columbia, in Canada, have given rise to more deaths than the virus itself!). Agencies providing valuable data include the WFP, the WHO, UNICEF, all of whom work, and write reports, under the umbrella of the UN. Journal such as the Lancet and Science have been constantly publishing research, some of which have had to be withdrawn, through lack of authentication, but most of which indicate the state of progress of information, as well as highlighting our present state of flux.

This paper endeavors to add to the now enormous existing body of literature, by outlining a novel approach to explicating epidemics, via a simplified pedagogic model, which hopefully will be found to be 'kid-friendly', and in addition, via delving into some of its implications, explores a multi-focus approach to plagues in general, and the current epidemic in particular. Some of the wider issues brought to light in and through the current pandemic, are explored, including the diverse approaches to plague management which have been exposed: coercive, representative, science-based and institution-changing. This will segue into considering some novel paths for the future.

<u>Review of the Literature of Plagues Through Human History</u>

Fast-spreading diseases, known by various names, have plagued living species (vegetable, animal and human), since antiquity. The Old Testament of the Bible recorded the 10 Plagues, but it was ethnocentric, and reported through the prism of religion and Divine intervention. Despite any modern misgivings about accuracy, it is noteworthy that locusts, boils and the ultimate plague of the "Slaying of all the First-born male" have had resounding echoes, in the history of human plagues, from the writing of the Scriptures - recorded inter alia via the Dead Sea Scrolls (Anon., 70 CE., reviewed by Cohen, 2018); through the most well-documented of international plagues through the ages; until the most recent 'avalanche' of information, correct and false, plus explanation, again much of it unfortunately conflicting, ambiguous and lacking clarity, in the present plague, which by now has, unfortunately correctly, been given the appellation of a 'pandemic'.

The earliest well documented plague, still somewhat localized, was one which killed off some 35% of the population of the City State of Athens, at the time one of the greatest cities, by population size, economic and political power, and social development. The Plague lasted some 4-5 years (430 BCE-426 BCE). It triggered the beginning of the end of Athenian, more popularly recognized as 'Greek', supremacy in Europe and the Middle East (Ancient History, 2016).

The 'scientific endeavor' was promoted by Thucydides (426, BCE), in his depiction of the Athens Plague. Many of his insights are highly germane to the progress of the current plague in the Nation State currently most afflicted, namely the United States of America, in the current year of 2020 CE (Common Era).

Since we find ourselves in the middle of what has been hailed as the worst plague since the "Spanish Flu" of a century ago (Johnson and Mueller, 2002) it is difficult, not to say impossible, to do justice to the plethora of literature which is currently being added to this topic, on a daily basis. However, the paper is more concerned with tracing the history of plagues, and how humanity has dealt with them, than just focusing solely on our current crisis. Thus, we do need to return to some of civilization's early writings. The Dead Sea Scrolls, the writing of which was attributed to the Essenes in a span of time from around 150 BCE to about 70 CE (Cohen, 2018), recount virtually all of the Old Testament of the Bible, so we no longer have to rely on the King James Authorized Version of the Bible (Old plus New Testament), to read, among much else, an account of the 10 Plagues, which were ostensibly quite selective, in smiting just one nation. According to the Scriptures, the Plagues were a Divine punishment meted out exclusively to the Egyptians. At least 4 of them will be familiar to historians and epidemiologists alike, in modern times: Boils, Pestilence, Locusts, and the death of first-born males. It is noteworthy that the locusts would have stripped vegetation bare, thus striking at the food supply. (as is happening again, during our current viral pandemic! Just like in the biblical narrative, it is quite selectively targeting, not Egypt, but a wider N. African region - Ethiopia/Yemen, in particular, with numbers of locusts counting in the trillions posing a grave risk almost overlooked, through the world focus on Coronavirus (FAO, Science Monitor, 2020)). Likewise the mysterious targeting of first-born male children has its counterpart in the disproportionately high number of deaths of young adults ("high death rate among healthy adults 15 to 34 years of age") in the historically recent Spanish Flu (Jordan, 2019); and in the current pandemic it has been found that males have a far higher probability of dying than females, a discovery attributed to the extra chromosome in the female DNA, which provides a 'double dose' of protective resources, to combat the novel coronavirus. (Conti, P., Younis, A., 2020). However a major difference between what was reported in the Bible, and, likewise, also in the history of the early 20th century Spanish Flu, and what has been recorded thus far for the current pandemic, is that the older age cohorts are progressively more susceptible to major impact, from catching the virus, to the extent that (in Canada, according to its Chief Medical Officer, Dr. Theresa Tam -Globe and Mail, April 29, 2020), the proportion of deaths attributable to the institutionalized elderly has been estimated at 79% of the total of all Canadian deaths.

Apparently, cholera was less picky -all ages seem to have been at risk, and continue to be so, but children below the age of 5 seem to have been, and to this day to remain still, the most vulnerable to sickness and death, according to the WHO's Global Task Force on Cholera Control (WHO: GTFCC, 2017). In the mid 19th century a Dr. John Snow is attributed with the honor of founding the new science of epidemiology, by punctiliously recording the incidence and location of an outbreak of cholera cases in Central London, and tracing them to one fecal-polluted source of water used for drinking (Snow, 1850).

In providing a scientific and empirically observable explanation for the incidence and spread of a plague, Snow was able, at least potentially, to change the discourse as to the root cause of plagues. No longer would it be quite so easy to persuade a credulous people that a Divine Force had decided to wreak vengeance on a recalcitrant community or nation. Nonetheless, all major faiths still encourage the notion of "Insha'alla" (for Moslems) (Oxford Dictionary 2019); "Si Dios Quiere" (for Latin Christians) (Linguee Dictionary, 2020); and "Im Yirtzeh Hashem" (for traditional Jews) (Letterstojosep.com, 2015). All have in common,

at least on the face of it, a fatalistic belief in the Divine Will of God remaining at the root of natural calamities, such as plagues (and floods, and earthquakes, etc.); and perhaps even more tragically, a facile justification for the human 'plague' of wholesale killing, of both warriors and civilian populations, in war. (the Bible, again, per Dead Sea Scrolls, op. cit., the Qu'ran, 609-632, CE, Julius Caesar, 58-49, BCE).

Remarkable for his rationalistic and prematurely psychological approach, to chronicling the course and consequences of the Plague of Athens, historians, scientists and other academics alike owe a debt of gratitude to Thucydides (426 BCE). It was he who noted that the disease followed international trade routes -unlike others at the time, who attributed the cause to deliberate poisoning by Athens' enemies. Likewise, he noted how the social behavior of citizens became less civilized and more concerned with self-preservation, as this new norm, sparked by the epidemic, was reducing the sense of cohesion and communal responsibility in the face of everyone's potential demise. It is worth noting some parallels in the historic Athenian Plague, and the current pandemic. Today, the pressure on all human systems, (health and economic in particular, but food provision and distribution, political, policing, social, juridical, and other aspects of public governance and administration) can be likened to the pressure of natural phenomena, like volcanoes and earthquakes; where fissure points create cracks, some major and devastating, to the cohesion of human society. American society, always open to inspection by both national and global sources, seems in some respects to have fragmented, under the pressure, in its capacity to administer itself, with many cities and States coming to increasingly oppose or ignore entirely the admonition of the federal government; and many citizens choosing to ignore safe practice, and manifest self-interest, as was noted in similar circumstances over two and a half millenia ago, in the then leading world power. During our current 2020 pandemic, the Administration of the richest country in the world, the USA, playing a role similar to that of historical Athens, has blamed the virus spread on its contemporary arch-rival, the PRC, with the US President referring to the source of the disease as 'the Chinese virus' (possibly taking his cue from the "Spanish Flu"). For a time it was suggested, by members of the US Administration, that it might have been produced, either deliberately or accidentally, in a laboratory in Wuhan, (CTV News, 2020), rather than being transmitted from an animal to a human in one of the so-called 'wet markets', which was the explanation provided by Chinese authorities, and accepted as the most plausible explanation, by the majority of the scientific community (CIDRAP, 2020). More recently many people in China have been led by Chinese politicians, such as Lijhian Zhao, a spokesperson for China's foreign ministry, to believe that the virus was imported from the West, possibly implemented deliberately by the US Military (The Guardian, April 14, 2020, and CTV, op.cit., 2020). That rejoinder smacks of being a deliberate quid pro quo for comments by the US Administration, including President Trump himself, cited in the article. Whilst plagues are indubitably human disasters, they come with political ramifications, not just in the pre-Christian times of the Greek and Roman Empires, but also in our own. The politics deflect attention from the primary need -understanding the plague process, which in marrying structure and systems, the model proffered in this paper (below), is an albeit simplistic attempt to move towards its containment, but in so doing possibly helping us come to grips with it.

An additional comment needs to be made concerning potential commonalities between the Athens Plague and the Covid-19 pandemic. Thucydides was aware of the impact of their plague on the power and cohesion of Athenian society. It was the beginning of the end of the Greek Empire, which was overrun, within a generation or so, by the Spartans. Together with its political might, Athens lost its economic hegemony, and both it and the rest of the world lost the momentum of its highly advanced civilization. Although it is too early to predict definitively, an increasing number of scholars (Atlantic Monthly, March 23, 2020) are predicting a much more precipitous decline in the power of the U.S., at a global level, triggered by its handling of the current pandemic, however the decline is measured: politically, economically, or ideologically. It could not have been possible for any contemporary social scholars to ignore the disparity between the management of the pandemic in China, where the number of cases and deaths has been reported as having more or less peaked, and remained quite static, since March, at the level of some 85,000 cases, and 4,500 deaths; whereas the number of both cases and deaths in the U.S. has continued to steeply rise -

surpassing 3 million cases, and 130,000 deaths in early July. The contrast is made even more stark (some might say horrific), if one adjusts for the disparity in each country's population size: China has roughly 4 times the number of citizens to protect; conversely the US might have been expected to have roughly ¼ of cases and deaths than China, instead of its actual numbers of roughly 35 times more cases, and still increasing daily, and correspondingly, 30 times more deaths. If one were to adjust for population size, China has reportedly succeeded in containing Covid-19 spread some 140 times better than the US, relative to its population, and suffered 1/120 the proportion of deaths (i.e. less than 1% of that of its arch-rival)! It is arguable that much of the rest of the world is watching, and will be judging which system of government has proven itself more efficacious, in protecting its citizens. An early barometer of a shift in world opinion might have been provided by the number of member states in the United Nations, which supported the Cuban declaration that the PRC was completely entitled to reduce the autonomy of Hong Kong, through recent new legislation, which came into effect at 23.00, June 30 2020. (Science Mag, July 1, 2020,). The extremely unfunny joker in the pack, of Covid-19 statistics reported and updated daily by China, is that a less than credible world, as exists at present, might be forgiven for looking askance at a completely static trajectory of cases and deaths, over the last several months, in a population approaching 1.4 billion; whilst other countries with mega-populations, even apart from the US, e.g. India, Iran, Brazil, Mexico and Russia, have all (albeit reluctantly and often belatedly) had eventually been impelled, by independent evidence, to report their constantly increasing numbers of cases and deaths. The issue could then become: by how much is any given jurisdiction providing incorrect figures, either by deliberate falsification, or by faulty accounting? This would of course include not just China, but all jurisdictions. Verification becomes significantly more difficult in a jurisdiction run as a Police State, where whistleblowers are 'disappeared'.

THE SIMPLE PEDAGOGIC MODEL PROPOSED

The current pandemic has led to the depiction of its progress principally by means of statistically based charts of its daily and cumulative incidences and deaths. The results are presented mostly by country, but in the case of 'hot spots' of reported infections, by more localized areas, such as States, Provinces, cities and even localities within each. In some instances, the number of tests is also provided, but not in all. The quality of the testing process(es) employed is not generally included or assessed in the statistical reporting. The result is publication of figures which have been clothed with the respectability of statistical professionalism and integrity, but owing to the methods of data collection, can (and arguably should) be considered to some extent inconsistent, incomplete, and inaccurate. In some cases, the data is provided and reported bona fides, even when not complete; in others it has been considered to be deliberately falsified and misleading -mostly for political reasons within each jurisdiction. In more confusing cases, it can be a combination of the two! Brazil would be a well-illustrated culprit, but by no means alone: Venezuela is an additional S. American State, clearly 'cooking its books'; Belarus and Nicaragua likewise -the list goes on (Reuters, 2020; Courthouse News, 2020; The New Humanitarian, 2020; Science, 2020; Financial Times, 2020).

By depicting the overall global pandemic, and its constituent components per jurisdiction, in the foregoing statistical manner, the public has become accustomed to thinking of its progress as, originally, a wave, somewhat like a tidal wave; and more recently as a potential series of waves.

It is argued here that this portrayal originally compounded the misleading nature of the reporting; and even with the more recent recognition of a 'second wave', and even more recently the admission of the possibility of successive waves, that presentation of the reality can and should be augmented by other means. This suggestion is oriented in particular towards those unaccustomed to statistical analysis and reporting, which may be the majority of the world population, all of whom are affected, both directly and indirectly, by the current pandemic.

It is therefore proposed here to use a more basic pedagogic approach. This would be especially valuable perhaps for children, but also 1/ for the wider population and even 2/ for those most involved in getting to grips with the pandemic, by using a more comprehensive approach than the current "wave" or "waves" model. We could call our approach a process or a system or decision-making/strategic model, to likewise clothe it in academic respectability. However, for pedagogic purposes, and especially if oriented towards children, it might be better to label it something like the "Ocean-bucket-Earth" model of plagues and pandemics. As with the current design of cars, whilst there is a basic prototypical model, there are potentially as many intermediate stages as the model-user wants to employ, in order to minimize or maximize its "system sophistication". As at least a start-point it is suggested that, to possibly give the model more "kid-appeal", the start-point should be the recognition of children being born daily, which serves to augment the ''ocean" of humans. It might also put the model and hence the modelling process in a more positive or sanguine light, by acknowledging humankind's continuing capacity to replenish itself, even in the midst of a plague such as we are all experiencing, including our children. In addition, the two intermediate stages most valuable for both comprehension, and possibly more detailed system analysis, would be the "Pool", followed by the "Tank". Thus, the basic model could be presented in very simplified graphic terms (see Figure 1).

The model is quite skeletal. As a pedagogic tool aimed at youngsters, it behooves the user to keep it simple, and within the comprehension of the audience. That does not mean they should be patronized, but a huge quantity of statistical information and complex explanations of technique would be out of place, esp. if both source data and many of the techniques currently employed are suspect, and have later to be amended or supplanted. As a start, each of the dimensions marked in bold lettering need nonetheless be given greater yet still simple pedagogic explanation:

'**OCEAN**' is intended to depict an entire population, be it that of the globe as a whole, or a selected part thereof (e.g. all persons currently within the European Union). Although the model just shows its constant flow of augmentation as by natural human births, of course the reality is far more complex: all persons entering the segmented area will add to that 'ocean' of persons. This would include immigrants (legal and illegal, tourists, refugees, etc.), who have managed to enter, plus military foreigners, mercenaries and those classified as 'terrorists. At the outset of a plague, this means that all persons who have yet to be grouped and categorized, with regard to their status for plague infection, make up this very large entity. In the world's current situation, this refers to Covid-19 infection. However, it is worth bearing in mind that further pandemics and plagues would require a repetition of the model's approach, starting with the ocean of all the world's populations, which could be aggregated to encompass our present number of some 8 billion live souls.

'**POOL**' represents the reservoir of persons under current or potential investigation, or "testing" for infection by the disease in question -in the current situation, most eyes are on the most recently discovered pandemic, Covid-19; however, there are still currently many other plagues deserving of a similarly searching and rigorous approach, including cholera, malaria, dengue, AIDs, tuberculosis, and such commonplace diseases as measles, chicken pox and the flu. In historical terms, our current pandemic has as yet killed a tiny proportion of the total world population, compared to some of its worst predecessors, which often did not cease until it had killed off a significant proportion, if not the majority of the population. The New World succumbing to the plague of Smallpox, in the 15th Century, is a case in point. Roughly 95% of the population of Mexico, or some 10 million people, succumbed. (Roos, 2020). If we were to extrapolate that rate of extinction to our present global population, we would of course no longer be talking of millions of deaths, but billions. Even at a 'pool' level, a 95% mortality would virtually extinguish our human civilization, as we presently know it.

Figure 1: A Simplified Model of Plagues and Pandemics

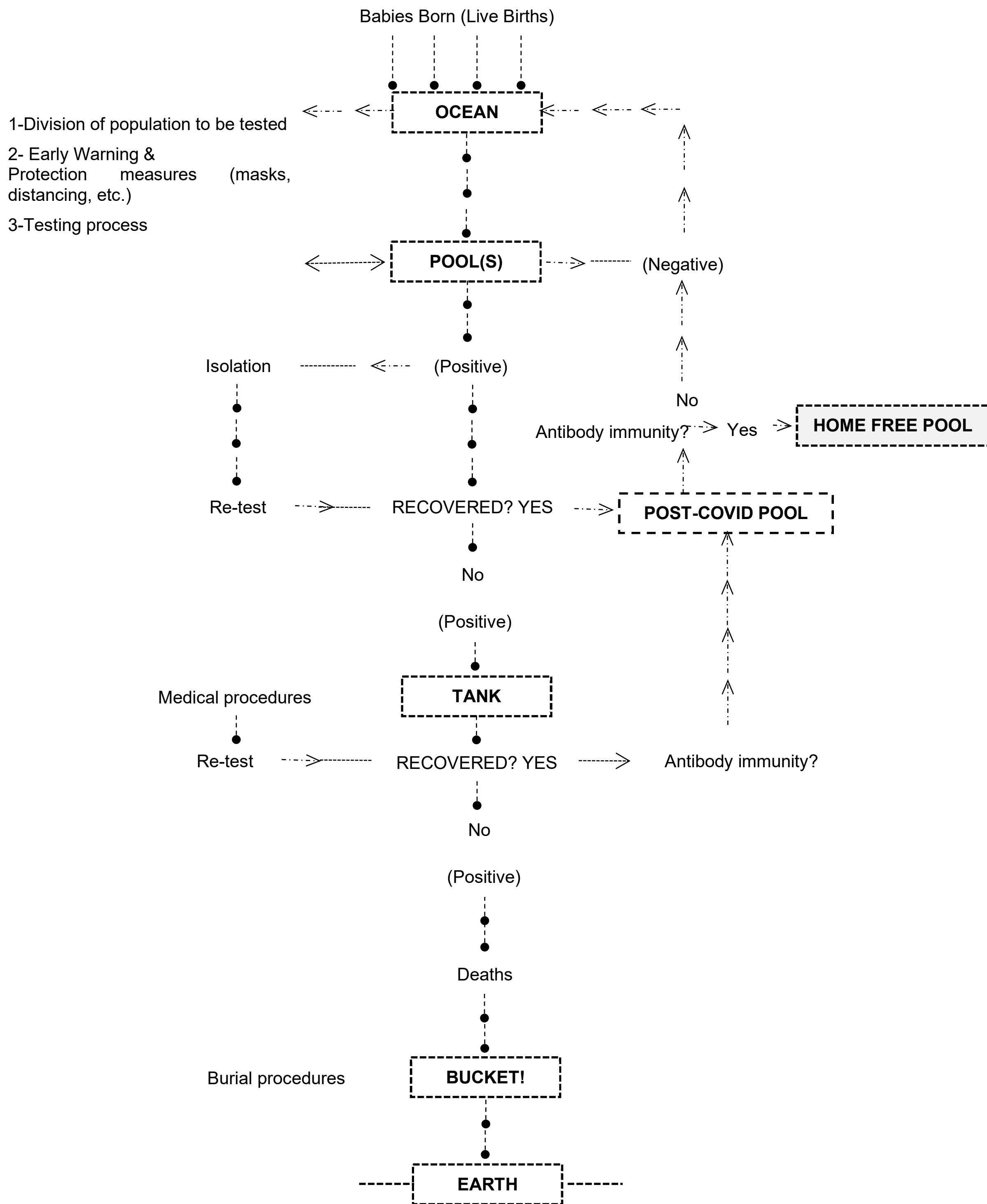

Figure 1 presents a proposed pedagogic model

The image of the pool may still have a salutary impact: it conjures up a relatively enclosed and specifically identifiable location, where inhabitants, whether fish or humans, swimming or potentially infecting each other with germs and disease, can be dangerously close to each other, actually in contact; OR they can be advised, or cajoled, as necessary, to spread themselves apart; thus, keeping themselves, (or being kept by others), physically separate from each other.

Regrettably, the testing process was initially highly restricted, due to widespread supply shortages and system bottlenecks. For example, by mid-May, 2020, some 1 million persons had been tested in Canada, which has a population of over 37 million, and is considered a rich country, from a global perspective, with an adequate health infrastructure, in normal circumstances. Clearly these cannot be considered normal circumstances when

> 1/ at that early rate of testing, it would have taken years before the whole population had undergone testing procedures; (the situation is incomparably worse in under-resourced countries, esp. in Africa, Asia and Latin America (KFF, 2020));
>
> 2/ the testing procedures cannot be guaranteed to give accurate results, owing to the high incidence of false positives and, probably worse in terms of outcomes, false negatives;
>
> 3/ consequently, repetition of tests is both valuable yet not available for the vast majority of 'pools' worldwide, and worse, still inconclusive, in terms of results and perhaps most disquieting of all, when;
>
> 4/ again at point of writing, no sure cure has yet been discovered, and treatments are therefore at best 'hit and miss.'

In order to reduce anxiety among the young and potentially more impressionable, hence psychologically vulnerable segment of the readers/population at large, it would be worth underlining the risk/probabilities of recovery, if (or, more probably, at this point in the world's aggregate inability to control spread, <u>when</u>) an individual contracts the disease. In the case of Covid-19, the preliminary research marks a low incidence of severe symptoms and fatalities among the younger segment of the population, and a correspondingly far greater incidence of severe symptoms and fatalities, among older segments. In Canada, for example, where records of fatalities at least can be given reasonable epidemiological credence, the incidence of fatalities of 'seniors' measures over 80% of the total, (Toronto Star, May 7, 2020,). This was reported some 4 months into the pandemic, and 2 months into official Government response by Federal and Provincial authorities, in Canada: the time lag is both worthy of historic note, for future pandemics, and of concern and investigation, in the context of the current plague.

For adult readers/audiences the pedagogic model can be fleshed out, amplified and expanded upon, depending on the target group on which it is focused. For example, the "ocean" of persons potentially infected could comprise all humans on the globe, or a specifically demarcated global region, such as a continent (e.g. Africa, which as of mid-May had not received its due attention, to the point of being virtually ignored by the 'developed' world, during the current pandemic. One might argue that the same phenomenon occurred in previous plagues and pandemics, such as AIDS, Ebola and others -a potentially immense cause for the BLM movement to take up, connected to Covid-19 indirectly via "collateral damage" through fissures in the social fabric -see infra.).

Each smaller, more contained group ('pool' in model terms) could comprise a country e.g. Australia, or a state within a country (e.g. New South Wales), or a city or even a district thereof (Sydney; then the further subdivision of the beach suburb Bondi). Should it be considered clearer for users, the model could be expanded to provide an additional intermediary level, which we could label 'reservoir'; that potential extra level has been omitted here, in order to maintain the model's relative simplicity. Clearly the smaller the

pool, the more manageable one would expect the organizational process to be, for attempting to contain the spread of any plague/pandemic, including our current one, which has underlined many gaps and inefficiencies, not to mention the potential for corruption and deception, within organizational processes, public and private. Regrettably, catastrophes can provide fertile ground for the increased practice of fraud, corruption and deception -an opportunity which corrupt regimes as well as private business organizations with flexible ethics would be unlikely to miss. Eight million defective medical face masks were exported from a Chinese supplier to Canada, at a time when Canada was facing a dire medical predicament of acute shortages. (Global News, May 8, 2020).

Not to be too cynical, in reporting progress on managing the current pandemic, we should point out that such relatively small nations as S. Korea, Taiwan, Singapore, (all in S.E. Asia), New Zealand (in Oceania), Austria (in W. Europe), and Costa Rica (in Latin America), were all quite nimble and efficient in establishing effective procedures along the lines proposed in our model: Costa Rica, for example has been publishing regular reports from its governmental health authorities, which identify cases and fatalities by each local and specifically identified region. This can be taken as a nice example of splitting the total pool (or reservoir, if preferred) into what kids would easily comprehend as mini-pools or 'puddles' -which of course is a relatively easier administrative job in a country of 5 million potential positive cases, but might have helped direct the country as a whole towards the extraordinarily minuscule number of some 42 fatalities in total (as of July 16 -Tico Times); compared to, for example, the United Kingdom with admittedly 12 times the population, at some 60 million persons, but instead of having some 500 deaths, which might have been extrapolated, following Costa Rica's lead, it had suffered some 110 times that number, at over 45,119 deaths (as of July 16, Statista, Conor Stewart, 2020). That should be sufficient reason to encourage large nations to split their total population into pools of a size sufficiently manageable to engage in "efficient and effective" testing, to coin a popular management accounting phrase. In fact, rather late in the game, Toronto health authorities have just announced (CBC News, May 27) the identification of so-called 'hot-spots' of contagion, employing the computer and phone-based identification technology ('contact tracing') harnessed already months ago by the countries with greatest success rates at identifying and thus potentially containing the spread of the disease. Whilst privacy issues assuredly arise, and are a legitimate concern, especially in less ethical and transparent regimes, still potentially ravaged communities might be expected to opt for less freedom, (at least temporarily), in return for a higher potential for longevity, for a large proportion of its population.

Whilst pools identified by region/location may be more readily acceptable, identification and classification by other categories may be both medically salutary and ethically more questionable, in terms of privacy issues. Classification by age pools would make clearly intelligible sense, given the differential of infection and probability of death, for different age cohorts. Classification by race or ethnicity might also be helpful in terms of identifying high-risk 'pools', but might give rise to greater concerns about potential abuse by those with access to such potentially sensitive information. The same caveats will apply.

Not splitting a very large pool into more manageable, 'bite-size', container groups may also lead to the administration in charge providing less scientifically-based projections of infection. Time reported (July 18, 2020) that Hassan Rouhani, President of Iran, had cited his Health Ministry as estimating a figure of 25 million existing cases of COVID-19; on top of that estimate, which has not been substantiated, the President "also said he believes an additional 30-35 million people could be infected in coming months…without citing the basis for his estimate." (op. cit.). Taken together, that would represent some 75% of Iran's total population. Such an estimate may fit into the structure of our model, if Iran is unwilling or unable to divide its total population into more manageable 'pools', for the purposes of both testing and then providing the necessary information for the 'tanks' available, to provide treatment. Leaving some 80 million people with little hope of survival, and relying on the religious philosophy of "insha'allah" would seem to hearken back to 'managing' (or not managing) the far earlier plagues of history, alluded to elsewhere in this paper.

Are there any other 'short-cut' methods, other than pool segmentation, to help reduce the total number of cases to test to a more manageable number? According to a study conducted in the U.K. roughly 20% of the population is at relatively high risk (the older age cohort, plus those with chronic diseases making them more prone and vulnerable) In addition, each person in the above 2 categories is generally looked after by a principal caregiver, which the research team labelled appropriately "the shielder". This made up an additional 20% of the population. The other 60% are considered to be low risk -meaning that even if they fall prey to the disease, they are extremely likely (>95% likely) to recover. The 'trick' is to identify the 40%, and to get them tested asap; and then get those testing positive safely isolated, for their own protection. A group of academic experts at the University of Edinburgh, have provided their advice to the U.K. Government, the report still to be peer-reviewed (as reported in the Independent, May 5, 2020).

The U.K. is an old country with a high proportion of older people. Countries with a lower proportion of elderly people should have an easier job of 'pool testing' the most vulnerable, though clearly one should not minimize the job in any situation. The efficacy of the testing process is likewise an important element in any plague containment process, including the current one, since it is appropriately called the novel or new coronavirus (SARS was a previous variant). Each requires a test specific to its genetic composition. False positives skew the results, but with perhaps less disastrous results than its corollary of false negatives. A large proportion of false negatives renders the whole process not just redundant but downright dangerous, by lulling those tested into a sense of false security, thus potentially infecting others, before the incorrect assessment is rectified (if ever). Some of the present testing results have been reported as extremely misleading, for not just scientific reasons but, equally dangerous, for procedural reasons, of incorrect test-taking. (Estimates have suggested that some 15% of results may provide false negative outcomes, for example -NPR, Procop G, 2020)

None of this needs to be emphasized in a simplified pedagogic model geared to children, for fear of contributing to their anxiety, and child psychologists are recommended to oversee the access and deployment of any such model, for different age cohorts. For adults, all of the caveats inherent in the model, as 'tweeked' for different user groups, should be underlined, quantified and stressed, if the model is to be of optimal use for others, esp. administrators, professionals, and academics, in their respective fields.

'TANK' The conceptualization of the 'tank' is intended to conjure up the image of far more intensive observation of those enclosed, with the object of concentrating those in greatest need of further testing, intervention and treatment, in a place with facilities to handle those enclosed. At the same time the physically closed nature of the tank should help to protect those in the outside, (the 'pool' inhabitants,) from higher risks of infection from those already infected.

Thus the "tank" element of this admittedly simplified pedagogic model may serve to cover the multitude of health and medical systems, into which persons thought to be infected are placed. We usually think of hospitals, health centers, and specialized parts thereof: in particular, in extremis, of the Intensive care units charged with the responsibility of keeping patients alive. We might also want to treat more or less closed institutions, like prisons, old-age and nursing homes etc., as potential 'tanks', if the concentration of plague cases is demonstrated quantitatively through testing, to warrant it. Certainly, in Ontario and Quebec, the most populous provinces in Canada, the 'tank' approach towards long-term care facilities for the elderly and otherwise vulnerable, would have alerted the appropriate medical authorities to the severity of the pandemic casualties, far sooner than actually occurred, with, potentially, a consequent reduction in severe cases and the thousands of lives lost.

In 'pools' of physically, financially and/or medically under-resourced groups, visits by professional health care workers to those considered infected, but with no facilities available to accommodate them, might be the closest surrogate to a physical 'tank', such as a hospital. However, the concept remains intact and potentially valuable. Within such pools temporary and provisional 'tanks' of medical facilities can be set

up, to provide more intensive and more extensive medical care. Clearly this last category could be considered both most at risk, since the health care provided would in all likelihood be less regular, comprehensive, technically sophisticated, or intense; but of equal or greater concern, the likelihood of infected persons acting as mini "hot spots" for the spread of the disease would be greater, the greater the social/physical interaction of the infected person, within the 'pool'. As far back as Biblical times, lepers were generally enclosed in a 'leper colony', a quasi-prison intended not to cure the infected person so much as reducing the incidence of disease spread. We can therefore see the on-going 'double-function' nature of any enclosed space, or "tank", in providing not just potential treatment, but also serving to protect those still hopefully uninfected (our "ocean", or in a more advanced stage of the process, our "pool"). The PRC publicized its construction of 'instant hospitals' within the Wuhan district, which appears to have been the original pool of infections. With dramatically less National Government initiative, a provisional medical tent was set up in Central Park, New York City, (New York Post, April9, 2020), by the non-profit relief 'Samaritan's Purse', to help deal with the 'spill-over' of cases, from the emergency department at Mount Sinai Brooklyn Hospital – part of the formal health system which, swamped as it was, was unable to manage.

As with all elements of the above model, breaking up the various stages allows not just a cursory understanding of interconnected processes: it can also serve to allow those most concerned with the processes contained in each stage, to expand that element in the whole model. This is perhaps most easily understood in the 'tank' stage, since the medical and health systems are often considered the center of potential help, in controlling disease. But this current epidemic has focused much greater interest than ever before on the role of research, medical, bio-medical and other, which is working in collaboration, more or less, with the medical system. Likewise, the pharmaceutical industry is hugely involved in the potential and actual development and provision of drugs, which might help in treating the disease; and as an end-goal in providing a vaccine to forestall the disease before its onset. Similarly, the provision of PPE's, such as masks, gowns and gloves, and more sophisticated and costly items, such as oxygen equipment, and as a potential final measure, the use of medical ventilators, for the mortally sick, is a vital part of the process in keeping the medical and health system operation (our 'tank') functioning. In a more complex and sophisticated model each of these can be visually represented as input elements into the central 'tank' element.
The simplified model thus lends itself to both telescoping and 'microscoping' each element, as required or desired by the user.

In the interests of simplicity, not shown in the model is the potentially continuous loop dimension of the medical interventions which may (or may not) be available at the 'tank' stage. One can reasonably expect that, the wealthier and better resourced both the facility and its patients, the greater both the extensity and intensity of the medical procedures followed at this stage. (The same could also be expected at the 'pool' stage, but perhaps with a lower sense of urgency by those in charge).

'**BUCKET**' is deliberately employed as a vulgar but familiar illustrative term, to depict fatalities, almost but not quite the end of the road, for each individual. It is plagiarized from the old English executioner's adage of "kicking the bucket", referring to withdrawal of the final physical support for the doomed person, leading to his quick death; considered an apt term in the present context.

In the context of plagues, not excluding our current, the spillover potential is the most germane when considering the 'bucket' metaphor. In many pool locations, even in so-called "rich" locations such as the U.S., and in one of the cities normally considered one of its richest -New York, disposal of the dead has become a worsening problem, since the funeral system has been literally 'swamped' by the extra-ordinary bottleneck of corpses to be buried, due to the current pandemic. It has been reported to be many degrees worse in Guyaquil, a multi-million-person port city on the West coast of Equador, and as its name indicates, an extremely hot location; unfortunately, now also deemed a "hot spot", not just in terms of incidence of both cases, but more highlighted by its dramatic number of fatalities exposed. Bodies have been left in the

streets to decompose, (Washington Post, 2020); offering further cause for risk of other diseases, unrelated biologically to Covid-19 (according to present scientific information). Other out-of-control interment situations around the world abound, and demand not just private but urgent jurisdictional attention -the first steps being recognition, then admission, then quantification of the problem -before practical solutions can be planned and implemented. Ignoring the problem will add a further dimension of disease and additional mortality, caused by this further aspect of 'collateral damage'.

Implications of the Model

"The truth, the whole truth and nothing but the truth'. Regrettably, our model cannot offer any magic-wand panacea for controlling plagues, be they endemic or as is the case now, so manifestly pandemic. One aspect almost covered by a conspiracy of silence, by both the political sphere of so-called leaders, administrators and policy makers, and even by the majority of the scientific and medical community, has been the nature of vaccines and their longevity of effect. Whilst it has remained shrouded in mystery how long any specific vaccine will provide long-term immunity, and to what extent over the whole population, the worse piece of knowledge that is recognized is the gradual deterioration of efficacy of all vaccines: it appears that resistance increases towards them by the viruses targeted, across the board. This 'inconvenient truth', to coin the past President candidate (Al Gore, 2006!) had until very recently, together with the potential breakthrough by Oxford University (2020), not been transparently divulged, and its potentially alarming implications discussed, by any of the groups named above. Just 2 years ago when, at the World Vaccine Congress, over 1,000 vaccine scientists convened in Washington, not one session focused on this issue of vaccine-induced evolution, leading to pathogen resistance. One researcher who has conducted investigations into the less than expected impact of vaccines on resistance by pathogens, suggests that "…researchers are afraid: they're nervous to talk about and call attention to potential evolutionary effects because they fear that doing so might fuel more fear and distrust of vaccines by the public…" (Moyer, 2018). The rate of proliferation of 'miscreant' pathogen genomes is almost beyond human imagination; it is fueled by the by the replication rate of viruses. The same article provides the following gem of information: "Three days after a bird is bitten by a mosquito carrying West Nile virus, one milliliter of its blood contains 100 billion particles, roughly the number of stars in the Milky Way."! The scientific community could have been alerted to this potential hazard some 30 years ago, with the introduction of a new vaccine for whooping cough, recommended by the US Center for Disease Control (NBC News, 2019). It appeared better than the old, but protection waned quickly, and new epidemics for whooping cough ("Bordetella pertussis" in Medical Latinate Jargon) proliferated. By 2001 scientists in the Netherlands had proposed that the resurgence of this plague might be due to the vaccine itself promoting the preferential evolution of parts of the virus which had mutated or not been targeted by the new "acellular" model of vaccine. Longitudinal studies from 2008-2012 backed up that proposition (Ruiting Lan, 2014).

Human Expectations

One of the consequences of our model splitting up the process of dealing with plagues etc., is that it may make us more aware of a change in human expectations with regard to living and dying. In a world where 'pools' and 'tanks' either did not exist, or were not available for the vast majority of the population, expectations for surviving a contemporary catastrophe could be expected to be low. Conversely, the more visible, obvious, available and successful the social and physical construction of pools and tanks, the higher the expectations of an increasingly greater proportion of humanity might become. To magnify this concept further, we could think of splitting the rather general notion of 'expectations' into at least a 3-part graduated set: aspirations, expectations, and entitlements. Each would place different levels of demand, or pressure, on the system as a whole, and each part of the system. One could posit that, in times of very high morbidity, expectations of survival would be low. That probably would have been the case, not just historically, in early plague situations, where medical science and health systems infrastructure were notably absent, but also in times of rampant man-made slaughter, during wars and other internecine conflicts.

To the extent that these situations still exist, we can expect a devaluation of common human life; arguably the greater, the more vulnerable the individual. While gladiator sports, which made public entertainment out of physical pain and death, are considered relics of past civilizations, in recent and current times similar activities have been tolerated and/or encouraged, likewise with the purpose of demoralizing a subject group, and having the ultimate societal purpose of dehumanizing them. In such societies, plague situations could be merely expected to play out the same scenario of more or less total disentitlement, for the subject population, regardless of the resources at the 'pool' and 'tank' (and even the 'bucket' stages of our model.

Spread Control, and Lack Thereof (Leading to Its Consequent 'Spill-Over' Effects)

The 'Ocean' stage would seem an unlikely point at which to conduct any research into spread control. However, pandemics having the unearthly quality of getting humans interacting in ways hitherto unforeseen, we should take this stage into account, in terms of spread potential. That is less easy than it may sound. If we use the 'ocean' classification to demarcate national boundaries, for example the total population in excess of 100 million making up residents of Bangladesh, do we employ what epidemiologists call the 'effective spread rate' for Bangladesh as a whole, or should we (more sensibly?) estimate a different, and probably significantly higher, effective spread rate, for the roughly 1 million Rohingya refugees from Myanmar, not quite but virtually locked at very close quarters into the largest refugee camp in the world? No possibility of the 2-metre social distancing recommendation continuously broadcast in Ontario, within the confines of "Cox's Bazar". A report by the Guardian in the UK graphically reported on the crisis (Guardian, May 15, 2020). The same logic should propel arguments with regard to estimating effective spread rates for one of the richest plague 'oceans' in the world -that of the U.S., where the President had been fond until mid-May, of pointing to low overall per capita incidences of infection, (despite high aggregate numbers, due to its large overall population); but there too, inequalities in effective spread rates between, early on, New York City, and more recently, other "hot spots" like Miami, compared to less affected areas, are arguably as significant as differences in the highly impoverished State of Bangladesh.

Using the ocean-bucket model may serve better to highlight how the present inadequacy of spread control will contribute to a 'spill-over' effect, into the next stage, be it the 'pool' or the 'tank'; each bottleneck situation at the higher level will exacerbate the situation at lower, more intensively investigated and medically intervened stages of virus control (or lack thereof); such that spill-over will ultimately turn into that illustrated graphically and horrifically in previous plague outbreaks in human history. Not paid as much attention as its major successor, the Black Death (see below), the Justinian Plague of 541-544 CE still killed 1/3 of the population of its 'epi-center, Constantinople. By the year 546, it was estimated that close to 100 million people had died, "in Asia, Africa and Europe". (Frith, History, Volume 20 No.2).

In terms of effect on total world population, the deadliest pandemic recorded is still from the Middle Ages: it was known known by various names: 'Bubonic Plague', 'Black Death' and, as recorded within the context of the Old Testament's '10 Plagues', 'Pestilence'. It is recorded as having lasted some 8 years, from 1346-1353 CE. The estimated range of deaths is huge, and the upper limit of the range is recorded as 200 million, which would have made it the deadliest plague recorded to date, in human history. Benedictow (2005) writes that Florence, one of the major cities of Europe at the time, registered 60% of its population as exterminated by the Black Plague, within a few months.

With reference , not just to its rate of "metastatic spread', but also to the time lag between recognition of the epidemic and its original outbreak, the parallel to the progress of the Black Death of the 14th century, and the current 2020 pandemic is strikingly, and one might suggest depressingly, similar: "in the countryside it took about forty days for realization to dawn; in most towns with a few thousand inhabitants, six to seven weeks; in the cities with over 10,000 inhabitants about seven weeks and in the few metropolises with over 100,000 inhabitants, as much as eight weeks." Early reports of the current plague were made by doctors in December, 2019. The machinery of case by case disease recognition and spread, at the universal

level of the current plague in 2020, is actually slower than that which occurred some 660 years ago. For the Black Death, historians provide a wide range of death rate for total population of between 30% and 60%: we might surmise that the vast majority of deaths would have bypassed any stages such as those posited in our model (pool-tank-bucket,) due to lack of reliable information sources, coupled with a lack of relevant medical/epidemiological bodies of knowledge. And yet: quarantine was not just practiced for lepers in Biblical times, but on a much greater and widespread scale, where feasible, by 30-day isolation, later extended to the standard 40-day (i.e. "quarantine") period. (History Today, 2020). The pool concept was definitely something understood, back in what might have been dismissed as the 'Dark Ages." Regrettably remedies were so scarce that chicanery and charlatanism flourished, in lieu of authentic treatments. Ironically, quack 'treatments' abound in the current pandemic, demonstrating that human behavior, in terms of increased decency and honesty, has not kept pace with advances in technology. As reported in …., "People died with such rapidity that proper burial or cremation could not occur, corpses were thrown into large pits and putrefying bodies lay in their homes and in the streets."

Estimates of the number of deaths world-wide from the 14th century plague, range from 50-200 million. By comparison, then, the so-called Great Plague of London was really quite local and in terms of absolute numbers, modest. 100,000 people were estimated to have died. However, the population of London was then estimated as 500,000, so the death rate per capita was one in five. Some degree of social order was imposed, and/or self-imposed: "People were incarcerated in their homes, doors painted with a cross" (opus cited.). The rate of contagion was not dissimilar to that witnessed in the current pandemic, at 7,000 mortalities per week. Far more recent in relative historical terms, the "Spanish Flu" so-called (falsely, in terms of origins), did introduce some medical interventions: isolation and treatment programs were launched, and eventually a flu vaccine discovered and distributed; but not before over 50 million people had been buried (CDC, 2020)-again, with a substantial proportion skipping most if not all of our intermediate, and potentially life-saving stages (the 'bucket' apart, but that has been included not for macabre reasons, but because so many human societies have invariably placed, and still continue to place, extremely high value on the burial rites of passage demarcating life and death

The Spillover Phenomenon

As implied by our simple pedagogic model, one way of assessing the efficacy of any health system is to measure the degree of spillover from each level of plague containment, directly to the earth, the final (and ultimate) container. It would seem that in early stages of human history, the degree of spillover was controlled principally by the virulence of the plague. If we fast-track to the present time, much depends on the jurisdiction ostensibly managing the current plague. That in turn depends, not just on the highly differential resources put at the disposal of plague management by each jurisdiction; but also, on human expectations -both as clients and suppliers, to coin an apt economic differentiation; or perhaps more conventionally in the plague context, as health providers and (potential) beneficiaries. One could posit that early manifestations of plague encountered both severely limited resources to control and/or combat it; and relatively low expectations of human efficacy at that control or combat. Interestingly, we could consider the relationship between resource deployment/management and expectations, as to some extent mutually interdependent, rather than unidirectional. It is suggested that one could be witnessing the playing out of this relationship, both globally, in aggregate, with the (questionable?) benefit of near-global connectivity; and, at the same time, in every jurisdiction; and as is evident in the United States, not just at the national level.

President Trump may not have been as crazy as he was presented to be, when he suggested the cases in the US seemed to be out of control, simply because the great United States of America were so much better at testing, than heretofore, or than elsewhere in the world. He was, (perhaps unwittingly and probably unconsciously), admitting that one or more of his containers had filled up; and rather than admitting to such spillover, and hence, reducing further the public trust in the system as a whole, he reflected that it might be

wiser to put a brake on the case-testing. Naturally, he would not have wanted to point to deficiencies in the rest of the health system, so it was considered by him more astute to gamble on people's credulity, and lie (or joke, as he later claimed). However, had he liked reading better, or been more on top of developments in the world's most precipitous crisis (or both), he would have been able to point to the research in Scotland, home to his golf course. At the University of Edinburgh, it was suggested by researchers (some time ago, in the compressed time-space of the Covid-19 crisis! i.e. Medrxiv.org, May 2020), that 60% of the population were not in urgent need of testing, since they had a very high probability of recovery. It followed, then, their argument logically went, that in time of potential spillovers, such as at the outset of the plague, until the present time, it would make very good epidemiological sense to concentrate scarce resources towards focusing attention on the 40% most at risk (40% applying in the UK, but maybe a different percentage elsewhere). This percentage of the total 'pool' (in terms of our model) consisted of the most inherently vulnerable, i.e. the elderly and sick (roughly 20%); but in addition, their caregivers (which the Scottish research team labelled 'shielders'). As before, they had come up with no magic wand, but it was still an invaluable suggestion, based on empirical observation and reasoning, and still implicitly using an ocean/pool/tank spillover containment approach.

The Ocean-Bucket Model and the Specter of Eugenics

The converse approach is implied by what has been exposed as the Canadian process. Dr. Samir Sinha, a geriatrician at Mount Sinai and University Health Network Hospitals in Toronto, went on record with the following statement:

> "More than 80 per cent of Canada's deaths have occurred in seniors' homes, where just 1 per cent of Canadians live." (quoted in 'Canada's Hidden Shame': Zoomer, 2020).

Of (16) OECD countries investigated, Canada had the dubious honor of being worst, in its job of protecting its elders (Medical Press, 2020). It would perhaps be too cynical to contemplate that this was a pre-meditated policy, to get rid of the segment of its population which sucked up most of its health resources, and conversely had least in terms of productive, income-, and tax-producing years still to live (a Sparta-like strategy, but focusing on the extreme end of the age spectrum, rather than the extreme beginning!) (Andrews, 2018). That is the model for 'life insurance' (mislabeled': actually, the payout sum in the -highly predictable- event of death); providing also a basis for much early welfare economics modelling, where remaining productive lives provide a surrogate for the value of the societal benefits of saving a life, in the context of limited resources (Hicks, 1939).

One could be tempted to widen the 'eugenic approach' to include significant disparities between other groups in society, in particular ethnic/racial groups. Turning the eugenic philosophy on its head, it would be possible to posit "systemic bias" against protecting certain groups from any major disease, including the current pandemic, but not excluding other causes of disease and premature death: opiate addiction has been identified as having increased substantially during the last 6 months of Coronavirus, suggesting collateral damage -even, or more likely, especially, in wealthier societies (Silva and Kelly, AJMC, 2020) It will be a miracle (possibly science-based), if the majority of the victims of Covid-19, both directly (through Coronavirus infection and death) or indirectly (through many indirect results, such as famine and loss of resources available for other plagues, diseases and other health issues,) do not end up being members of the racial and ethnic groups which the eugenics 'philosophy' pronounced as inferior, and not worth keeping alive. Eugenics had its political heyday in Nazi Germany, culminating in the Holocaust: the well-managed, mass-production extermination of Jews, Gypsies, homosexuals, and other groups deemed a danger to the maintaining the purity of the 'Aryan Race' (there were very few Africans and Asians available in Germany at the time). The 'philosophy' of Eugenics has been experiencing something of a comeback, during this crisis period, together with time-honored conspiracy theories, all purporting to unravel the mysteries of the plague. One is tempted to say "plus ca change, plus ca reste la meme chose": similar pseudo-explanations

have been resorted to in every major calamity (dating back at least to the Athens Plague, before the Christian Era); and they gain traction in particular during a natural disaster as unpredictable and omnipotent as a pandemic such as that in 2020. By replacing rational thinking and new empirical investigation, with already preformulated pat answers, they purport to help the gullible, in emotionally dealing with the dread of what remains for most still a deadly unknown.

Truth, Trust and Power in Pandemics

It can be said that truth is a potential casualty in all crises. Those who might be considered responsible for a crisis, or accountable for actions to manage that crisis situation, may well have something to hide. A plague situation is an example, writ large, of just such a crisis situation. Are there any guidelines by which to measure, or if not measure, at least to make propositions for leadership behavior, at the highest levels of government, for the pedagogic purposes of our simplified model?

One proposition might be, that the more authoritarian the leadership, the more the temptation to conceal, partially or totally, the scope and severity, or in extreme cases even the very existence of the plague, together with its spread through the population pool for which the leader is responsible. A recent example was provided by the leadership in Iran, the Supreme Leader Ayatollah Ali Khamenei calling the plague "a hoax, a conspiracy from the country's enemies" at the same time that "the regime tried to cover up the number of fatalities, until cellphone videos appeared that showed bodies being hurriedly buried ", in order to avoid exposing the leadership's deception (McKenna, CBC Report, March 24, 2020).

It could be posited conversely, that Democratic leaders, on the other hand, ultimately have little alternative than to accept and expose the reality of the crisis, lest they are held accountable for lax leadership, by their electorate. Even leaders in democracies, with authoritarian orientations, must finally accede to some degree of responsibility, or face the price of loss of office; unless s/he is able to deflect blame effectively on to other parties (preferably foreign). The incumbent president of the U.S., despite his office providing him with prime responsibility for leading the most powerful economy in the world, and one which purports to espouse democratic principles as a cornerstone of its polis, appears increasingly to have expended much of his energy engaged in responsibility deflection practices, or finding others to blame for his highly questionable efficacy in managing the pandemic crisis in his country, or the socio-political crisis of BLM, plus the economic crisis, of massive unemployment and recession, all of which were arguably triggered by the nature-based plague, for which natural disaster the country was manifestly ill-prepared.

The President of Brazil is likewise the leader of a democratically elected political system. His behavior has also pointed towards the authoritarian use of his power, by initially denying the existence of the crisis,; and, when many persons in medical positions refused to be silenced, to downplay its magnitude, and to blame incompetence among high-level staff, firing one Health Minister, and then forcing the resignation of his successor, when they started to provide a more accurate account of the disease and the ineptitude of response, at the highest level. Brazil has now been reported to have among the highest numbers of infections in the world.

The quantification of crucial data, such as number of confirmed cases, and number of confirmed deaths, becomes a major factor, in the presentation of the reality, or partial reality, or total misrepresentation, both in the initial stages, then throughout the process of any plague. In legal terminology, partial and total misrepresentation may be innocent, borne of ignorance, i.e. incomplete data collection (given an emergency situation, this can always be presented as a plausible explanation); or, in a more sinister and Machiavellian vein, the misrepresentation may be 'ab-used' by political leaders to either cover up their incompetence in dealing with the crisis, or even worse, denying its existence altogether. The last script was followed initially by, among several others (e.g. the presidents of Nicaragua and Belorussia) 3 major world political figures: the Presidents of China, of Russia, and of Brazil. In each of the 2 latter cases, gradually a more realistic

quantification of those infected in their respective pools of over 100 million and over 200 million persons respectively, has been exposed, via daily global updated data collected and presented by, inter alia, Johns Hopkins University. (2020). The more closed and closely censored information system in China maintains a large question mark, both over its volume of cases and deaths. In that arguably antediluvian manner, the President may conveniently absolve himself and his administration, from closer scrutiny, either domestically or internationally.

The truth or accuracy of the “ocean” is relatively uncontentious -census figures are if not 100% exact, reasonably accurate. The world as a whole contains roughly 8 billion humans alive, as of date of writing, of which the PRC (People’s Republic of China) has the largest national population of roughly 1.4 billion, India a close second, at over 1.2 billion. Together they make up roughly one third of the world’s total population. Each could be arguably considered an ocean of potentially infected humans in need of investigation, in their own right. The model is flexible enough to provide a framework for both that approach, where the ‘pool’ is reserved for smaller portions of each population, by State, City etc.; and in addition, and as a separate exercise, for the model to be employed in aggregate at the global level, to depict the ocean as representing the global population of 8 billion in its entirety. Both have the valuable characteristic of starting on fairly ‘safe’ statistical ground, since in ambitious modelling such as that envisaged, the old adage of ‘GIGO’ (garbage data in, garbage results out) is particularly germane.

This unfortunately allows and requires us to segue into the less safe waters, of quantifying the smaller entities, which have been labelled ‘pools’, pre- and post-testing, in our model. One way of depicting this stage is to split the total pool (e.g. the Province of Ontario, within the federal Nation State of Canada), into many mini-pools (each testing center possibly representing a pool). As might not have been expected, given the state of preparedness of most urban centers in a rich country such as Canada, and with a health infrastructure considered more than adequate for most circumstances, even a mid-size city like Toronto has shown the difficulty of testing its entire population fast enough, to detect all infected persons, in order to isolate and treat those found to be infected. Toronto and its environs “account for more than three-quarters of active Covid-19 cases in Ontario, but only half the province’s population…” (CMAJ News, May 27, 2020). The Province as a whole reported 6,600 cases, but the vast majority of persons still need to be tested, and according to the Globe and Mail, (and the repeated urgings of its Premier), testing facilities are working substantially below capacity. (Globe and Mail, April 26, 2020, and CityNews, May 24, 2020). The truth of the unpreparedness of Canada as a whole, and of some provinces in particular, took time to be publicized by the political leadership. Trust in situations such as that which has unfolded over the year 2020 could reasonably be compared to what has occurred in earlier plagues, e.g. the medieval European Black Death (Britannica, 2020.)

The early lack of essential supplies, such as PPE, plus the re-agent necessary to conduct the test for virus, seems to have been compounded, if not caused by, the buying up of as many supplies as were globally available, by the one country acutely aware of the potential consequences of the disease, since it originated there. At the outset, in late December and early January, the PRC was in the unique position of being able to quantify its urgent need for medical supplies for the unfolding epidemic, as it shut down the region of 50 million, in itself a population larger than Canada’s entire population, and also the vast majority (215) of the rest of the world’s sovereign States (excluding the Roman See) (Worldometer, 2020). This provided the PRC with 2 options: 1/ to divulge the truth to the rest of the world, so that the rest of humanity could prepare itself as best it could; or to suppress the truth for as long as feasible, and thereby take advantage of its “first mover’s” strategy of monopolizing the world’s resources of essential medical supplies.

China appeared to choose the latter course. Thus, virtually all other countries were caught ‘with their pants down’ to coin a colloquial expression. A couple of months later, when due to whistleblowing, China was forced to acknowledge the outbreak of the plague there, countries such as Canada were scrambling to quantify at least approximately their shortage of vital equipment, and to seek supplies in the world market,

including from excess supplies in China, in order to set about its catch-up process. However, the time lag in disclosure to the rest of the world population, could be said to have caused a significant surge of cases at the preliminary 'pool' stage of screening, for the remaining non-Chinese, 85% of the world.

In terms of trust, the behavior of China, first in concealing the outbreak and punishing/'disappearing' those doctors who exposed it, and then in cornering the bulk of the global market for PPE, would each be considered in legalistic terms to be a breach of trust. Whether or not the U.S. succeeds in its threat to "punish" China for its conduct is not germane to the thrust of our argument here. Regardless of potential financial compensation, or imposition of punitive sanctions, what China has lost in psychological terms could potentially be considered far more valuable and possibly long-lasting. It is the loss of trust of a large proportion of the world, and especially its more democratic nations. It is possible to argue that, once trust is lost, it is hard to regain. However, it is likewise possible to argue that, in the world of global 'realpolitik', China has little to gain by pursuing more honest and trustworthy policies. Growing manifestations of Its increasing power may well act as a more effective counterweight to any expectation by weaker nations of China's interest in truth, honesty or magnanimity.

Kids, Truth and Trust

Since the pedagogic potential of this model has been stressed, we return to the impact of a plague such as Covid-19 on the psyche and emotional/intellectual development of children. In present circumstances are kids entitled to the truth? If they discover they have been told untruths, by those in authority, including health practitioners, teachers and government officials, how much will this affect their relationships to community and society? However, in the special case of relationship with parents and family, on whom they might have depended, for a relationship of trust heretofore, there is likely to be more at stake. In a more general sense, those in authority can be considered in many societies to have a greater responsibility to provide the truth, the greater the dependence of those under their authority. This might be a common social ethic, with regard to truth and trust.

In not just the particular case of children, but also in the case of other dependents, such as the elderly and incapacitated), one might hope that a higher bar of honesty be felt by those in authority, including medical staff and caregivers, but especially the primary caregiver,

Kids often grow up realizing that they have not been told the truth. Fairy stories abound, in most societies; ancestral 'tall stories', legends and myths. Eventually the kids treated to such stories discover that they are not true, or only contain some truth, (i.e. the truth has been stretched for the convenience of the story, either as entertainment, or as illustration of a moral principle such as generosity or charity, which the story-teller wants to point to, as 'the moral' to be learnt). A widespread story is often linked to the celebration rites of a religious festival, perhaps the most famous being Father Christmas, or Santa Claus, whose principal task is to bring gifts for children at the festive season, and with it 'good cheer'. Although later in life the children will discover there is no such person as Father Christmas, not many people are sufficiently outraged at this lie, perpetrated on successive generations of children, to make it illegal or a criminal offence. Many might argue that children benefit from distinguishing 'fairy stories' from real life, and hence this is part of their cognitive and moral development (Kohlberg, 1958). One could thus posit an end point in our spectrum of truths and untruths as harmless, or possibly even 'benevolent' and perhaps 'beneficial'. If a diseased person has an infinitesimal chance of recovery, what is the correct response of those in charge of his medical condition? What if the person is a child?

In the case of plagues, it may be difficult to conceal from children beyond an early threshold of understanding, that something is not right, that their world and that of their family and the rest of the community with which they are familiar, has changed. They are expected to follow new rules restricting behavior, movement and contact with others. Explanations may be more or less forthcoming, honest, or

clear. We come to the thorny issue skirted above: what is 'good' for the child to know? How much of the truth will help a child understand, be prepared for his/her reality, optimize his/her chances of survival, and that of her/his family and others held dear? We might use the umbrella expression 'shades of truth', like an artist's color palette, to depict the moral and intellectual spectrum presented.

In one sense, the answer is simple: the truth is "we don't know". This is not just true for our parents, caregivers or teachers, if we are still young children. It is equally true, but in a potentially far more comprehensive way, for people with greater knowledge, responsibility and authority, e.g. scientists, medical officers, politicians, heads of State, and the like. The major potential difference between the (unrealistically labelled) blissful ignorance of the young child, and the 'knowledgeable' caregiver or other authority figure, is that the latter is more or less aware of the dimensions of what s/he does not know -something like the 'perimeters of knowledge' which exist, around any particular topic or problem, such as our current multifaceted crisis, sparked by the pandemic, but clearly not restricted to it, or even to health issues sparked by the outbreak, like famine, opioid crises, loss of control of other illnesses, diseases and plagues, etc. A major area which has demanded the attention of all political leaders is the tug-of-war between the immediate exigencies of health, and the continuing, underlying demands of the economy, including 're-booting' industries which have precipitously shrunk, e.g. tourism, hospitality and restaurants. Interwoven with that basic supply-side issue, is the need to re-boot employment, or if that is impossible, (appreciated since the time of Keynes (1936), and F.D. Roosevelt's New Deal, to still find ways to keep hundreds of millions of un- or under-employed people with the continued wherewithal of survival -to feed, clothe, shelter and care for themselves and their dependents. Like a huge and elusively elastic jigsaw puzzle, some pieces start to fit together, whilst, in the way of science, both natural and social, other pieces fragment into yet more smaller parts, in need of researching and then fitting into the whole.

A major difference then, between earlier plagues in the history of humankind, and our current pandemic, is that some part of humanity, at least, is increasingly aware of what we don't know, and is to some extent prepared, intellectually, economically, technologically, emotionally and morally, to delve into that unknown, in an attempt, never seen heretofore in the history of humankind, in order to place this plague under human control -not, as in the worst plague histories of the past, leaving it to mere providence, or the beneficence or indifference of some existent or non-existent deity.

The above has deliberately put a positive spin on the human search into truth, via scientific and medical research. The following recent report reminds us of the power of authoritarian leadership to reverse course, almost as though they were attempting to re-create the dystopia of Orwell's '1984' (opus cited): the Iranian Head of State, in mid-July, adjusted his figures for predictions of Covid-19 casualties, to 30 million, ('or maybe 35 million'), in addition to the adjusted estimate of current casualties, from the number reported, of 270,000, to 25 million (a 100-fold increase!). The total population of Iran is approximately 81 million. President Hassan Rouhani is therefore tacitly admitting that virtually his whole ocean of population will succumb to the Plague, via the apocalyptic estimates cited above. (Time, 2020). It is hard to know how a citizenry responds to such a message, especially when just a few months before, the leadership's message was casting in doubt the very existence of a major virus problem in Iran. We must leave to another paper all the other shades of truth-untruth, from authoritarian and democratic leaders, which for the purposes of brevity we have omitted here. Instead, we return to the more positive perspective of the potential role of the younger generation in the survival of humanity, below.

A PATH OR MULTIPLE PATHS FORWARD?

It would have been difficult to predict that the spreading of a virus, precipitous as it has been, could have precipitated such a cataclysm of social disruption, and 'lifted the garbage lid off' from so many inequities, within the health field, within the distribution of the basic necessities of life, like food, water and shelter, and the marginalization if not downright exclusion of huge proportions of the human population, on the

basis of color, creed, sexual orientation, mental health, and the list goes on. We have sometimes touched on some of these issues in the paper, but have not done justice to the exposures laid bare.

Having made that admission, we return to our principal focus: which is the potential role of rational, but simplified models of decision-making, to help trace progress, or otherwise, in the evolution of this (and past, and subsequent) plagues.

Research: Playing the Numbers Game of Multiple Paths

What might have seemed feasible at the outset of the current pandemic, in terms of a plain and singular path forward, now (presently just 6-7 months into its progress), seems to have morphed into a 32-lane highway, to extend the metaphor. Each lane may potentially converge and diverge multiple times, as was evident in the research revolving round President Trump's neat but erroneous cure-all plan of adopting the anti-malaria drug hydroxychloroquine, (which, has been found not just ineffective in treating the current virus, but actually toxic: the latest available update from the FDA, of July 1, 2020, on Covid-19 and this drug, provides a recent review of safety issues, and "includes reports of serious heart rhythm problems and other safety issues, including blood and lymph system disorders, kidney injuries, and liver problems and failure."), - In plain language then, while some plans may in fact work in complementary fashion, whilst others will be mutually exclusive, it is probable that the majority will need to be consigned to the garbage heap. That is the nature of research, especially when conducted, as now, under the most extreme pressure of a crisis situation. It does not need to be further undermined by duplicity from political, or business or any other leaders involved in the process.

Given humanity's constant of scarcity of resources, the most rational thinking available will be needed to make, then to implement, a strategic decision model, which will need to be re-assessed on a constant basis, with the aid of the largest computers deciphering and digesting the myriad new data which is now being communicated daily, via the inputs of hundreds of millions of smart phone transmissions. The contact-tracing already put into place by China has provided its huge population with a major head-start in its potential to contain Covid-19 spread. Its cost is loss of privacy. The concern is that, once a police state has set up real-time access to its entire population, they are all potentially captive to constant surveillance, for as long as the State determines. In this respect the present pandemic has created a new order, some might say reverberating Huxley's Brave New World (Huxley, 1932), which once created, humanity may be unable to reverse.

History can still be reviewed to help in humanity's putative attempts at planning. From such a review, we may come to the conclusion that plagues, whether endemic, epidemic or pandemic, are regularly redoutable, slippery, and notoriously sneaky, despite 21st century advances in scientific research (Institut Pasteur, 2014). The vaccine nay-sayers may correctly point to the existence and recurrence to this day of the Athens Plague, Bubonic Plague (primarily now in Madagascar!), Cholera -over 500 deaths in various parts of Congo, during the past 12 months (ECDC 2020), tuberculosis -10 million cases worldwide in 2018, and some 1.5 million deaths, which figures are still double those of our current pandemic! (WHO 2020); the many variants of influenza, which despite vaccine still produce about 1 billion cases per year (about 12% of the entire global population), and an estimate of mortality ranging from 290,000 to 650,000. (Hopkinsmedicine, 2020) -to name just a few. For this reason, if for no another, it behooves a researcher not to use the singular, but, like all rational investors and gamblers, to play the game of probability, in any decision-making and strategic model, and to remain not averse to the hedging of one's bets. Unfortunately, human beings, even scientists the caliber of Einstein, in deciphering Relativity (Einstein, 1951) could not be omniscient; in today's dilemma none is able to follow every different path discovered. An enormous advantage, however, that this, our generation of humanity has, over previous generations in history, who were also plagued with similar, or worse epidemics, is that our individual memories, and intellectual capacities, especially in regard to multifaceted calculations, have become so much more collective, and

potentially communal and accessible, via the computing and connectivity revolution. 'Hundreds of organizations' are working on treatments (Hopkinsmedicine, 2020), and close to 200 vaccines are in various stages of trial, as of end of June (NPR, 2020.) Thus, in the political realm of human endeavor, Senor Bolsonaro, President of Brazil, responsible as he is for the lives of nearly 1/4 billion human beings, no longer needs to act as if in a one-horse race, with the horse already proven lame (hydroxychloroquine may have had the dubious honor of being President Trump's horse, but has been proven ineffective and possibly harmful, in a number of studies -e.g. FDA, 2020, opus cited). As an individual Bolsonero can choose to be cavalier as a chevalier, with his own life, by comparing Covid-19 as he has, to the 'sniffles'. However, now that he has been (as of early July) actually diagnosed with the current plague, his planned path for recovery could be advantageously changed from a package of tissues, or a couple of asprins, or even a drug already disproven, to the embracing of the most recent advances in treatment, however uncertain these admittedly are. Heads of State, as potential leaders, can still choose to be effective role models, even in crisis. In fact, their role is magnified, for better or worse, in both human and nature-based calamities, such as the current coronavirus pandemic.

Rigorous rational and uncorrupted thinking is probably much easier to understand in theory, than it is to implement in practice. Take the 2 cases of what are considered by many scientists to be the greatest potential sources of human salvation from our current plague: in the short term (3-30 months) a new and dependably efficacious treatment, or set of treatments; and in the longer term (6-60 months), a new vaccine. The parallel of gambling, specifically that of horseracing, is quite illustrative. Dozens if not hundreds of both treatment and vaccine candidates have already 'joined the field'; some with greater promise of success than others. However, the problem is not just that of high-quality scientific research. That in itself approximates very closely to the horse race, but with infinitely greater stakes. The probability models of mathematics, created for horseracing and developed at Berkeley, might be salutary in this context (Ali, 1998)!

The human world population is now some 10,000 times greater than that of Athens, the epicenter of our earlier human plague catastrophe; (-but within the drama of the Covid-19 crisis, we as humans would be foolish to ignore completely the other both immediate and long-term global crisis of climate change, with implications to our other global stakeholders, such as trees, tree ants, insects and fish!), We humans must formulate policy/policies, be they based on collaboration, competition or consensus, driven by political 'leaders', scientists, the pharmaceutical industry, the supranational institutions such as the WHO and/or the UN, or the totality of human recipients, via referenda; or some concoction of all, as appears to be the chaotic case at time of writing. The policy/policies need to come to grips with making strategic decisions among a number of unpalatable policy options:

Policy, Strategy and Rational Decision-Making: Market vs Government Rationing

How many project candidates does one allow to proceed?

Who decides, and on what basis?

How is funding arranged and managed for next stages, including the manufacture and distribution of vaccine?

Who, or which organizations, will be providing funds for next stages, especially final testing, manufacture and distribution?

Who, or which organizations, public or private, national or international, will decide on pricing of the vaccine(s)?

Who, or which organizations, as above, will decide on quantity (ies) of vaccine manufactured, and the prioritizing of its distribution?

While it might seem ethically clear that the entire global human population should be equally entitled to access to the vaccine, that position shirks the awful responsibility of producing, distributing, and finally effectively and efficiently administering a vaccine, or vaccines, even assuming that the necessary tests of its or their effectiveness have been uncorrupted, scrupulously undertaken, and passed.

Without wishing to adopt the role of Jeremiah, it should be obvious that the way ahead is manifestly full of obstructions: political, economic and (the phrase which has come to the fore since the advent of the 'Black Lives Matter' movement), systemic, at more than just a social and cultural level. Given that it will be unfeasible to manufacture, distribute and administer all of some 8 billion vaccines simultaneously, (at least in the short-term future, for the current crisis), how will the process prioritize its final administration to each individual recipient, and on the basis of what criterion, or, more likely, set of criteria?

It is not obvious that the human community, if such a construct exists and is meaningful, will deal with the future of this pandemic any better than it has shown itself to deal with global hunger and, increasingly, thirst. While, over the course of history, richer persons have rarely lacked for food and water, poorer groups have traditionally labored (and died) under that inequity -and to the shame of humanity, not through lack of total resources, but as now, through the practicalities of distribution, and/or, more lamentably, through human indifference. The current situation, however, according to the WFP, is worse than ever before, with those at the point of starvation being exacerbated by the current pandemic, to the extent of an additional 130 million (WFP, 2020) – a figure still far exceeding the number of deaths from the pandemic itself (still below 1 million, at July 20, 2020!)

Whilst free-market economists, and those in politics, academia and business who adhere to their ideology, might argue for the whole system of manufacture, distribution and administration to be left to Adam Smith's notional 'invisible hand', (Smith, 1776), it is conceivable that, were Mr. Smith able to rise from the grave, he might now shout a resounding 'no' to the magic of his invisible hand: Monopolies, monopsonies, hegemonies at both business and government levels, have all torn up the 'level playing field', on which Adam Smith's model was predicated. New, updated thinking cries out to be heard.

It is arguable that, when it comes to health care crises such as pandemics, the usual rules should be set aside, for the welfare (or survival?) of humanity, or a large proportion thereof. The recent exposures of gigantic stock market profits by drug company insiders questions any assumptions along those lines. (New York Times, 2020). Similarly, a recent M.I.T. study, suggested that maintaining the emergency measure by airlines, of keeping middle seats vacant, "reduces risk by 79%.", of contracting the Coronavirus. The converse is clearly equally valid. He noted that, while low, the risk of contracting Covid-19, is a far higher one, than dying through a plane crash. "Delta, JetBlu andSouthwest have chosen to keep middle seats empty, while United and Spirit are filling them." American Airlines is likewise opting for profits over safety, with the same policy. Those three airlines have chosen to take the riskier path, on behalf of their bottom line.

It must be immediately admitted that manufacture, distribution and administration of our hypothetically effective new treatment(s) and vaccine(s), by the 200-odd governments of the world, could be equally as catastrophic as leaving the process to the notional invisible hand, or 'business as usual'. Instead of rationing via prices and markets, individual governments would need to prioritize treatment vs vaccine research, and then subsequently, production, distribution and administration. This would look quite different in countries equipped with well-functioning transport and health infrastructure, as opposed to those without. Crude GDP per capita figures could be misleading. For example, Cuba has a relatively low GDP per capita, but a high-quality health system and viable distribution and administration systems. In Haiti, one sees the worst of

both worlds: low GDP, plus a malfunctioning State apparatus, such that their 3 necessary sub-systems are individually defective, and taken together, deficient in effective co-ordination.

Those two countries have relatively minuscule populations. Clearly China has the largest. It also has the capacity as a one-party authoritarian jurisdiction, to impose policy on its population, at least in the short-term and with the acquiescence of the majority of its 1.3 billion citizens. Having shown itself capable, at least ostensibly, of controlling virus spread, by initially locking down some 50 million people within the infected area, by emergency decree, it soon considered the plague situation safe enough to cautiously open up its economy, with very high compliance in maintaining protective measures, which has been constantly and stringently controlled in real time, by means of smartphone apps and centralized technological surveillance. Most dissidents and potential whistleblowers, e.g. in the health care system, have been ‘disappeared’ -which is one way of maintaining high levels of compliance, again at least in the short to medium term. The incarceration and later death of only one doctor, who had the integrity and courage to reveal the existence of the plague, back in December, weeks before its existence had been officially recognized by the Authorities, was one of the few disappearances which leaked into the internet system, thus causing a public backlash; which promptly precipitated the reversal of policy by the Authorities. The quickly-deceased doctor was miraculously converted, in true Orwellian style, from traitor into a (no longer dangerous) public hero. 6 doctors have now been reported as Coronavirus victims from the same Wuhan Central hospital. According to a Guardian report by Alison Rourke (Guardian, June 2, 2020, “The death of their colleague Li Wenliang in February triggered a national outpouring of grief and rage against the government as he documented his final days on social media.” Orwell’s ‘1984’ (Orwell, 1949) was not only prescient: it also appears to have acted as a blueprint for not only Stalin’s so-called communist system, but also the current system in China, however dystopian that system might seem to the relatively free citizens of, again, relatively open and democratic regimes.

Are there other options? One is to adopt a ‘stoic’ approach, which is not quite the same as the fatalism inherent in the ‘Divine Plan’ approach of major religions, mentioned above. It is however likewise grounded in early writing, this time in the realm of philosophy, as distinct from religion. (Marcus Aurelius,174 CE) We humans are advised, in the writer’s most famous book Meditations, to stoically accept what we cannot change, and plan our own course accordingly. This will save a lot of wasted energy, as well as stress and anxiety. It is possibly valuable advice at the personal, psychological level, and is attributed the honor of giving intellectual respectability to the notion of Stoicism (Crook, 1967, 1995), though it hardly helps to solve a universal policy crisis, except perhaps as a means to encourage personal compliance, without its concomitant of State (or communal) coercion. It is worth noting that the author of ‘Meditations’ was the Emperor of the world’s then greatest power, The Roman Empire, over a span of 20 years. There may be some nice parallels there with the Little Red Book of the sometime venerated China’s Chairman Mao (Mao Tse-tung, 1964).

A final thought on the future plans “Of mice and men” (Steinbeck, 1937). If, in the face of evidence from the present pandemic crisis, the current global institutions, like the WHO and the UN, have proven themselves to be not up to the job of keeping the world a minimally safe place, should we look to another institution/institutions? How would they be authorized, financed and structured? Would their mandate be restricted to Covid-19, to pandemic management, to global disaster management in general, or to global health? This wide scope could even be expanded, possibly including the health of every living organism, as opposed to being restricted to a human perspective, thus enabling it to include under its umbrella the impending but potentially precipitous tipping point of climate-induced catastrophe. And would such institution(s) work better alongside the present institutions, or replace them?

We can only conjecture. Dag Hammarskjold is quoted in a recent article of the Economist (June 20, 2020), which deals with the record and the future of the United Nations and its associated bodies, like the WHO and the IMF. He made the following observation: ‘The UN “was not created to take mankind to heaven,

but to save humanity from hell."' Unfortunately, the institution has become arguably more sycophantic, moribund, corrupt and hence less credible and effective, than during Hammarskjold's tenure as its head, from 1953, until his untimely death by plane crash, in 1961.His unchallenged personal integrity also helped the UN's credibility. This is no longer so.

Despite the Economist's recent admonition, it is worth exploring options -either to replace or to buttress the present set-up. The first takes us back to our pedagogic model. It is followed by an even more radical (some might say fanciful) set of proposals. The two are complementary, rather than mutually exclusive.

'Leave It to The Kids' -The Potential Value Inherent in a Pedagogic Model of Plagues

Leave it to the kids? Making a pedagogic model such as the one proposed, or something similar, universally accessible, in terms not only of internet connectivity, but more importantly, clarity and comprehension, without undue complexity, would have the following unquantifiable advantage. It could multiply the brainpower involved, in thinking of creative solutions, a million-, if not a billion-fold.

The natural corollary to the above would be the creation of one or more apps, in which different scenarios and options and probabilities can be played with, of sizes of pools and tanks, differential rates of recovery per pool, per age cohort, (including themselves, their parents, their grandparents, etc.), according to resources available in that ocean and that pool. Not to be too macabre, apps could include some probability-based expectations of 'spill-over' at each stage of the model, in their particular ocean/pool and possibly even tank. This 'hi-tech' approach would embrace children into the search. It could conceivably convert what has been presented as the gravest crisis in the lives of the young, into something quite different: an ultra-modern version of "the ring-a-ring of roses" alluded to below (Greenaway, 1881), i.e. a game, the solution to which could be offered potentially as fun! Of course, an additional bonus would be providing an intellectually challenging game for relatively uncluttered brains -hence maybe a welcome diversion, not just from enforced isolation, but even from the violence of video games. In addition to the intrinsic motivation that might be harnessed, with a level playing field at the global level, for 3-4 billion children, we might not consider it impossible for monitoring systems to sift out the most promising models for each specific location, and potentially provide some extrinsic motivation (financial reward? One year's free food for the family? Free education? And/or prompt and free treatment for any family member testing positive -twice, because of the high proportion of false positives!

It is noteworthy that many of the little children's games played, and nursery rhymes sung, to the present day, have their roots in the plagues of history: "ring-a-ring of roses", "sing a song of sixpence", "oranges and lemons" and many others were concocted as pretty simple diversions, which acknowledged, as opposed to denying or camouflaging, the harsh reality of life, amidst earlier plagues, where little was known of their provenance, and just as little, or even less, of cures (Greenaway, 1881). Whilst present-day science can offer some hope of potentially successful treatment and cure, (of the present catastrophe, at least), we of the present generation could also be sufficiently humble to recognize some of what was socially learnt and passed on, to help assimilate into human experience the agony of plagues in previous centuries.

Institutional in Addition to Systemic Change

Much talk has been heard of the need for systemic change, since the outbreak of Covid-19, followed swiftly by the outbreak of Black Lives Matter: particularly in the US, but followed pandemic-like in Canada, Europe and elsewhere. Systemic change is doubtless necessary in specific organizations, particularly in police forces and health systems. However necessary systemic change is, it remains doubtful whether it would be sufficient: even improving the transparency of the systems, and working to change the perspectives of participants, to become more understanding of, and empathetic towards, the social circumstances (or plight) of the majority of its "clientele", would be unlikely to swiftly and radically effect

fundamental change in any society, on the scale intended, or aspired to, according to some of the principal stakeholders. (BAR, 2020; News, Research, YorkU.ca, 2020). For one reason, the fissures revealed by the response to the pandemic are arguably deeper than those institutions, which are charged to provide cohesion to society, are proving capable of mending. The cleavage thus revealed has been increasingly recognized in the US, but perhaps less elsewhere. The commander in chief in the US could be likened, after 6 months of failure in coming to grips with the enormity of his country's existential multi-faceted calamity, to the biblical portrayal of Samson who, blinded, decides to destroy the whole edifice upon which his empire is founded. The President will succeed only in bringing down part. However, observing the slippery downward slope in power of the US world-wide, accompanied by the complementary, scissor-like ascendancy of power by China during the same short period, one can be forgiven for searching around for better ways of the world coming to grips with how to govern itself, with the interests of the whole superseding those of the parts, however the parts are systemically governed. A blueprint is offered below, as the finale to the potential "way ahead". Before that, it may be worth re-examining the implications of the two stances of the two major world powers.

<u>Defiance and Compliance: Don Quixote and Don Presidente</u>

Don Quixote (Miguel de Cervantes, 1605) is famous for his oft-repeated but always abortive attempts at changing the course of events, and/or the forces of Nature, by 'swinging at windmills'. Similarly, State Presidents seem to sometimes feel, or even expect, that Nature is obliged to comply with, or at least to defer to their wishes. Unfortunately for their subjects, Nature always has the last word. As our simple pedagogic model serves to remind us mortals, despite any virtual depiction of reality, we invariably and always end up buried in the earth (or are disposed of in some other way). As the old English aphorism candidly reminds us, our final legacy, our ultimate humble but democratic contribution to humanity, is to help in "kicking up daisies.". (Malaphors, 2019).

What, if anything, can this tell us of, for example, the present predicament, facing all governments, but particularly those with the largest numbers of human beings all, at time of writing, still "alive and kicking"? Should the person(s) in ultimate authority treat their populations as "subjects", and hence subject them to whatever to whatever measures of compliance deemed necessary, on the premise asserted, that this is for their own good? In times of any perceived crisis, be it war between states, civil war, revolution, riots, demonstrations or unlawful congregation; or disasters, humanly triggered, like Chernobyl, or as we have now, a plague, apparently naturally triggered, those in authority have the argument, more or less plausible, that the exigencies of the crisis override all other considerations, such as the niceties of freedoms -of expression, congregation, movement, etc. From this perspective the paramount duty of all citizens is to comply, not just for the individual but for the common good. This would be the rationale behind the measures of the PRC, in locking up some 50 million of its subjects at the outset of the current plague, which measure some liberal democrats might view as draconian, or authoritarian. It is a rational used, with the seeming concurrence of the great majority of the citizens of the Philippines, by the democratically elected President Duterte, who appears to remain popular despite major restrictions/violations of freedoms, especially of any critical comments in the media. (Human Rights Watch, 2020).

Ironically, the quixotic stance of the US President has ignored, or wished away, or been in denial of, the manifest power of the current pandemic to dictate its own terms of combat. Some cases have spilled over directly from the enormous ocean, that is the US, straight into the bucket, or the earth; but most cases have been channeled into the large numbers of pools, where many cases have been left to founder, until tests could be provided and processed, or again, if tanks were not available, the 'cases' would expire before reaching the 'tank', for the possibility of treatment. At every stage, the bucket and the earth were ready for spill-over, from earlier stages. An increasing number of influential people have been attempting to change the public defiant stance of the President, whom they regard as arguably complicit in the soaring numbers

of positively diagnosed cases, now that testing has become more available; and worse, the highest number of deaths directly related to coronavirus, in the world.

The President's defiant stance, was not just oriented quixotically against the 'malignant' behavior of Mother Nature. As the course of events worsened, he looked for other parties to blame, including many in his own Administration and health care system. Defiance of the situation widened into defiance of the advice of his highest medical authorities, the CDC and the Director of the National Institute of Allergy and Infectious Diseases, Dr. Fauci, who has held that top post through many presidential terms, both Republican and Democratic, since 1984.

It is arguable that, just as violence can beget violence, as in gun deaths, so defiance may stimulate a like response. In that case, President Trump's defiant stance may have been complicit in encouraging the stance of defiance against the admonitions of the medical authorities, in flouting the very rules put in place to protect them, such as social distancing, washing of hands, and the most controversial and 'politicized' measure: the wearing of protective face masks in public places. This last has been attacked as violating an individual's freedom of choice. Regrettably for the well-being of 350-odd million people, its leader has still been shown in public, mask-free, until July. (As polls have started to reveal declining popularity, the incumbent has been 'hedging his bets', at last suggesting that masks may be a useful protection for people in close quarters, such as hospitals!)

Alternatives to the Defiance-Compliance Dichotomy

Clearly human responses cannot be simplified into just the duality of defiance vs compliance; in the same way that humans don't just conform to the 'fight or flight' dichotomy considered dominant in the animal kingdom. Courtiers, courtesans and, in the present generation, government bureaucrats will find it convenient in many circumstances to hide their true responses behind the mask of complaisance, which is closely connected with 'pleasantries', and trying to please. Another response could be indifference, which might be seen to emerge as a modus vivendi for large swathes of people, who ironically and cynically might articulate their feelings about the current crisis as being "sick to death" of hearing about it. Resignation is not quite the same, since the respondent may be concerned, but feels s/he has little or no control of either the crisis, or the impact that it has had, or may have, on his/herself and family/community. Whilst the whole spectrum of emotions are important to identify and understand, the compliance-defiance duality may still be convenient from not just a behavioral perspective, but also a political, for highlighting a major dichotomization of respondents, in a time of extreme crisis.

Societal Cleavage and Disruption in Times of Crisis: The Black Lives Matter Eruption, and Demands for Systemic and Institutional Change

While this topic is worthy of a paper in its own right, it does seem necessary to link the defiance discussion above with the sparking of a major social movement, Black Lives Matter, where defiance of police brutality and, indeed, authority, has erupted -not just in hot spots but throughout much of the US, and thence to Canada, the UK, EU and elsewhere. It has come to include the Indigenous communities, frequently left out of the discussion of racial and ethnic inequity and abuse. Acts of defiance have spilt over only infrequently to date, (mid-July, 2020) into major acts of violence, on the part of the demonstrators. However, Amitai Etzioni, a noted sociologist, cautioned that "Violence even by a small minority within a movement is "food for the adversary." (Etzioni, 2020). We are indebted to him for highlighting the relationship between coercion and compliance, in the early evolution of organizational theory (Etzioni, 1961).

A tentative path mapping out major changes in institutions, at a global level (perhaps quixotic, but in a positive light!)

The power of will and moral authority, of one solitary female teenager -Greta Thunberg- reminded those willing to listen, (hundreds of millions, as it turned out), of 2 of the most pressing, present-day social constructions of reality (Berger and Luckman, 1960):

> 1/ the dire need of humanity as a whole to treat climate change as the greatest risk to humankind; and
>
> 2/ the ability of young people to think and reason at least as well as, or perhaps more clearly than, the adults presently running our major institutions. (Thunberg, 2019)

This second aspect is the one most germane to the current topic of this paper, although both are arguably highly connected to our most recent dilemma. Bill Gates has gone on record as addressing the necessity of addressing health issues at a global level. He has suggested a huge injection of funds into the present institutions, such as the WHO, to help finance what he sees as a potentially worsening situation of famine and disease. These statements were made early on in 2020, before the scale of the calamity from the current plague had unfolded. However, the US Administration has since then stated it will withdraw its funding contribution to the WHO by $400million, as of next year. which contribution dwarfs, and historically has always dwarfed, the contribution of all other countries, including China. According to David Maxwell, senior Fellow at the FDD (Foundation for Defense of Democracies), the total contribution of the US Government for 2019 was $893million. By contrast, the total contributions of China were $86million, or less than 10% that of the US. (H. McKay, Fox News, 2020). The US President's statement of withdrawal would ipso facto make a non-State entity, the private Gates' Foundation, the chief donor of the WHO, having contributed $531million, or 12% of the total budget of the WHO, in the current 2-year cycle (Devex, 2020). This recent history of politicking by the major powers, amidst the latest global crisis, reminds us starkly of Ms. Thunberg's 2 major insights. It leads to the following potential path forward.

<u>The Possibility Always Exists, of Sidelining the Machinations of the United Nations, and Its Organ the World Health Organization</u>

The suggestion here is the establishment of a new global institution, or cluster of institutions, with 2 fundamental mandates: global health and fast, urgent implementation of climate change. Since it does not seem within the competence and/or the perceived self-interest of global policy makers as presently configured, the question becomes, what other resources can be tapped? One answer would appear to be 3-fold:

> 1/ establishment of a new agency, or 2 twin agencies, with those 2 fundamental mandates; and
>
> 2/ provision of financing which is autonomous from the United Nations -a smallish 3-tiered tax, of perhaps 0.25% of GDP annually from low-income countries, 1% of GDP from medium income countries, and 2% from the richest echelon; all to be sent directly to the agency/ies; and
>
> 3/ creation of a one- or two- tier structure of elected representatives, of young persons only, in addition to professional non-elected expert staff; the purpose of those elected officials being to establish policy and broad strategies, for the new agency/ies.

How young should the representatives be? One returns to the role-model of Ms. Thunberg: if a single assembly were considered not too unwieldy, the age range for representatives might be 13-23. If a 2-tier governing body were considered more organizationally effective, then in the same way that many national governments are modelled, the "lower house" might be made up mostly of a younger cohort, maybe of 12-16 year-olds, while the "upper house" might comprise mostly the 17-23 cohort. Some degree of overlap might help mutual understanding, respect and trust. One would anticipate that the large majority of the

funds would go to financing the projects related to the 2 fundamental missions mentioned above. Some projects would clearly straddle both missions, especially those dealing with optimal food production. It is doubtful that any nation state would show great willingness to cede authority to such institutions, in the same way that they do not accede readily to the requests and urgings of the United Nations and its various organs. Be that as it may. An overarching supranational institution, composed of young elected representatives from across the world, may well provide more moral authority, in addition to sound aggregative reasoning, from a global perspective, than the sectarian approaches of individual nation states. At this divisive stage of world history, one could posit that we have little to lose, and potentially the future of humanity to gain.

CONCLUDING COMMENTS

We return to considering the pedagogic value of this model (or any model similar, and in time more sophisticated than this). What might be its value? Hopefully it might reduce the fear of the unknown, in the minds of all, but particularly those with least bodies of knowledge, with which to arm themselves, i.e. our children. In terms of both intergenerational equity (Lehrer, 2020) and the Sustainability of Planet Earth, (Lehrer, 2002), this would seem an eminently rational policy. However, it is also quite feasible to convert the bare bones into an interactive model, where input figures can be estimated and consequences of outputs computed; e.g. speed of spread per pool, as opposed to effective speed in aggregate. In this way, the model could be presented as a game, and our first generation of "Covid-kids" may spawn substantial awareness of the hitherto somewhat obscure and esoteric discipline of epidemiology, whose origins are generally attributed to John Snow, in his tracing of cholera in London via a 'spot map' (Snow, 1854).

At a more technical level, a model such as this can be adopted by professional/academic scientists, including epidemiologists, who could adapt it to their own needs. Each of the categories of 'ocean', 'pool', 'tank' and 'bucket' could be set up as required. The obvious advantages over the wave approach is that, given some parameters which are quite accurate, like estimates of the 'ocean(s)', of potential 'infectees', it could become fairly visible where bottlenecks and spill-overs can be expected to occur, and reasonably quantified best estimates computed; and perhaps of even greater long-term medical value, an ongoing 'running tab' of how large a proportion of the population in specific 'pools', 'oceans' and the world in total have been treated, with what degree of success, over how long a period of time, and how many should be presumed still at risk. Estimates can perhaps more easily be made and 'massaged' in light of the presumed degree of authenticity or otherwise, of any data provided by political leaders, who may either be ignorant of their jurisdiction's reality, or pursuing their own agenda in providing data, or both. Current published figures seem to take reported figures across the range of 200 nations, with highly diverse claims to accuracy and transparency, at face value (Transparency International, 2019, Johns Hopkins University, 2020). To be fair to research centers such as Johns Hopkins, they do provide the caveat stating "confirmed cases". In the case of Venezuela, as an example from May 28, 2020, these are reported as 1,245, with 11 deaths. The population of Venezuela is close to 30 million. Its health care system is reported as in a state of collapse (The Lancet, 2018). The reported figures would fit better in a fairy story.

Does the basis of our model have any countries whose conduct in the midst of our current pandemic might bear out the model's utility and credibility? One does come to mind -admittedly in a rather lonely minority position for the moment. -whilst the wave model appears to be the standard explicator of the plague's progress. The exception however, Sweden, has to its credit the reputation of being one of the world's most advanced nations, in terms of its social as well as economic and political development. It has not embraced a government-imposed lockdown and the plethora of regulated isolation measures of the vast majority of nations and jurisdictions. Its rationale is not explicitly recognizing the virtue of our model; instead it talks of respect for the good sense of its people, and suggests that they take necessary precautions to safeguard themselves and their loved ones. The result however is, in this "first wave", a far larger incidence per capita,

of confirmed plague cases, and fatalities, than that of its neighboring countries making up Scandinavia - Denmark and Norway, who have adopted the more orthodox approach.

How does Sweden's unorthodox approach implicitly recognize the value of our model? The implicit recognition lies in the expectation that, not only will there almost certainly be a second and maybe a third and fourth wave; but that the plague will potentially continue, until the ocean or pool has been totally drained, in which case the other countries are living in a "fools' paradise", by subscribing to the inherently myopic model of recorded waves of cases and fatalities, concomitant lockdowns and economic havoc. A long-term perspective may help to promote long-term planning for a plague, whose duration no-one knows. A recent article in Foreign Affairs appears to agree with this argument! (Foreign Affairs, May 12, 2020). One further argument which would lend theoretical support to the Swedish approach comes from Sweden's decision to switch the driving side of roads, some decades ago. Instead of accidents and fatalities increasing, as doomsayers predicted, the incidence of both declined, at least for a while! This led to G. Wilde's famous and highly controversial theory of "risk homeostasis" (Wilde, 2014).

Needless to say, the models are not mutually exclusive: they can help to complement one another. Subscribers to both models would be equally expected to maintain the fervent hope that science will provide the 3 major breakthroughs for which the whole world is waiting, with baited breath: a successful long-term treatment, the so-called herd immunity phenomenon slowly bringing spread under control, and ultimately a successful long-term vaccine. Until that time, we may hope for the best, but need to become far more prepared to combat the worst.

Concluding Summary

This paper has, somewhat ambitiously, attempted to trace the history of human plagues through the course of millenia, via our sources of literature, leading us to our current pandemic. A model was proffered, intended to simplify the stages of plagues in general, and thus to act as a potential pedagogic tool, especially focused on children, but hopefully sufficiently elastic to be expanded, as needed, for use by more sophisticated individuals concerned with management of the current plague. Implications of the model were explored, and some different paths forward, for coping with both this and future calamities proffered, via not just systemic but institutional level, focusing on the role of the youngest generations.

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