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The Limits of Knowledge in the COVID-19 Pandemic. Some Prudential Recommendations in Uncertainty Conditions

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Abstract: The knowledge in the context of COVID-19 pandemic must be viewed from the perspective of its purpose: the intention to limit the effects and spread of SARS-CoV-2, respectively to cancel them. In order to increase the level of knowledge we identify some of the possible classifications, based on them allowing a first outline of uncertainty. The purpose of the analysis is to contribute to the clearest possible identification of the known and the unknown, thus creating a more stable cognitive field for effective public health decisions. Given that measures to combat the COVID-19 pandemic along with its effects is one of humanity's priorities, it is useful to clear up some of the issues that are likely to have improper meanings. The identification of each situation that includes significant doses of unknown and the public recognition of the uncertainty represents the condition for the possibility of robust public policies. Indicating the place that each current aspect occupies in one of the four cognitive quadrants is an important cognitive work. The position we adopt is characteristic for cognitive skepticism, trying to indicate some of the knowledge`s limits of and the risks of pseudo-knowledge. The article is a theoretical approach, based on some epistemological principles of critical thinking, the starting point being the belief that knowing what you do not know (to shape the uncertainty as appropriate as possible) is an essential part of the knowledge.

Keywords: *Knowledge; uncertainty; decision; COVID-19; SARS-CoV-2.*

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1. Introduction. A presentation of the problem

Uncertainty is one of the science existences causes, the attempts to increase knowledge being influenced by the ability to identify ignorance. Configuring uncertainty in acceptable margins involves identifying the *unknown known* and limiting the negative impact of the *unknown unknown*. To know what you don`t know, as a form of action against the unknown unknown and to delimit the unknown known, is part of the hard area of knowledge. Assuming what we don`t know and to build our models of action taking into consideration the variations generated by the unknown is an integral part of prudent approaches. We show an appropriate behavior towards the *known unknown* when we take our umbrella, although the chances of rain are only 30%, our decision being based on an assessment of the consequences of rain on our shoes, compared with the comfort reduction which is generated by the unnecessary wearing of the umbrella.

COVID-19 pandemic evolution depends on two essential categories of traits and behaviors: of virus and of society. The characteristics of the virus are related to the science possibility. However, the knowledge of society will remain in the desired area of science for a long time, being an important source of uncertainty. Also, our memories of similar previous events are strongly distorted by "retrospective predictions", meaning by later created explanatory patterns, whose predictive ability couldn`t be verified.

We don`t know the degree of uncertainty of the various variables we use in our predictive models. For example, the place of super-transmitters raises a real question about the value of R. We don`t know what is the role played by the context and personal characteristics in determining such situations. Network theory suggests that centrality matters, but the fact that we cannot deduce a clear rule still puts us in front of the door of scientific knowledge.

The appropriate approach to uncertainty involves its identification, protection against camouflage generated by poorly placed certainties, proper positioning, communication, acceptance, designing public policies according to it. Such a positioning faces a number of significant difficulties. The mass-media tends to promote characters who meet the conditions of good speakers, as they are not always the ones who know well. Speaking well includes projecting more certainty than there actually is. The majority is not willing to recognize competence among those who talk about what they don`t know/we don`t know. In daily mentality, saying that you don`t know is not compatible with the expert status. The problem occurs to a

considerable extent in science as well: who is willing to publish and who is willing to read articles in which the authors present experiments that don`t confirm the hypotheses?

In this whole context, political-scientific distortions occur somehow naturally. Politicians tend to neglect uncertainty. One of the problematic solutions used by politicians is the use of scientific models (and scientists) to exaggerate the real level of knowledge, this being a new form of knowledge politicization. Politicians are influenced by scientific knowledge, which, in return, they influence. Politicians tend to distort the place of uncertainty, either by denying it or using it to support their predetermined directions of action (Saltelli et al., 2020).

The problem of the correct positioning importance in relation to uncertainty in the fight against the COVID-19 pandemic is also addressed by other authors. For example, Salteli et al. (2020) recommends five areas of attention: a) the existing unknown in the initial assumptions; b) the effects of exaggerated trust in knowledge; c) the correct framing of the situation; d) adequate identification of the consequences; e) the risk of neglecting uncertainty.

2. Conceptual clarifications

When we refer to the virus that underlies this pandemic, we use the formula: SARS-CoV-2. The disease caused by the virus (along with its endemic/pandemic spread) we mention as COVID-19. We use the qualitative approach of probability, talking about the ***risk*** in the case of probabilities that bring negative effects on humans and about the ***chance*** in the case of probabilities with positive effects.

Regarding the classification of the transmission ways of SARS-CoV-2, we mostly resort to the classification proposed by Luca Ferretti et al.: a) transmission from symptomatic persons; b) transmission from pre-symptomatic persons; c) transmission from asymptomatic persons; d) transmission through other environments (Ferretti et al., 2020). Regarding each one`s pathways contribution to the maintenance of the epidemic chain (we also consider the data indicated by the mentioned authors: transmission from symptomatic persons (Rs) = 0.8; transmission from pre-symptomatic persons (Rp) = 0.9; transmission from asymptomatic persons (Ra) = 0.1; transmission through other media (Re) = 0.2), respectively at the reproduction rate (considering $R_0 = 2$), we believe that the estimates require a resettlement by reference to the specifics of each state/community.

3. The four possible cognitive positions in front of COVID 19

Uncertainty doesn`t have an equal density in all its areas. We suggest the uncertainty`s areas of variation, respectively of knowledge, starting from the knowledge classification made by Donald Rumsfeld: "… there are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns - the ones we don't know we don't know." (Rumsfeld, 2002).

The clarification/classification based on the four possible cognitive quadrants supports the increase of understanding level of the situation where we find ourselves:

(1) ***The known known*** - *is what we correctly know.* It can be especially identified through the observed effects of our interventions, placed on the experiment`s structure. For the medical area, the reference level is usually the scientific evidence. However, a current feature of the COVID-19 pandemic is the low level of scientific evidence, that is, the known known. However, the situation is constantly changing in favor of this cognitive quadrant.

(2) The unknown known - is *what we think we know, without actually knowing.* It is the unknown wrongly considered known. The unknown is generated mainly by epistemic arrogance, which leads us to believe that we know more than we actually know. Given the extremely large number of scientific articles published in an extremely short period of time, without them being passed through the peer review filter and the necessary checks in time, the scope of this field is significant in the case of COVID-19. The risk of amplification beyond the reasonable limits of this area is very high in the case of systems resistant to critical approach and peer review. Political authoritarianism (inability to dialogue), medical neo-feudalism (lack of collegial approaches) and state censorship of information are three examples of models that worsen the situation. Given that the fight against COVID 19 pandemic involves assuming a state of emergency or alert, based on granting quasi-discretionary powers to several people, the negative effects of epistemic arrogance are doubled by political success interest, interfering the effects of additional errors. Public policies characterized by a lack of transparency emphasize the weight of this cognitive position in the case of citizens in the moment they assert certainties that aren`t supported by evidence.

(3) The known unknown - is *what we know we don`t know*. It`s facilitated by cognitive modesty, respectively cognitive skepticism. Some of the variables that are part of this cognitive field: a) the total number of infected people; b) appropriate therapeutic approaches for severe patients; c) all the variables of a vaccine; subsequent spread of the virus; d) the impact of the COVID 19 pandemic on the economy. Public identification and indication of the unknown known is an integral part of a public policy based on trust in citizens and respect for the right of information. Unfortunately, only a few countries have such an approach, New Zealand being an example of good practice (Ministry of Health [MOH], 2020).

(4) The unknown unknown - is *what we don`t not know we do not know*. It represents extreme uncertainty. Our fear of the unknown determines the proposal of interpretive theories considering that *a theoretical model* is better than *no model*. However, inadequate theoretical models carry with them the risk of camouflaging the unknown. If we fail to realize the cognitive limits specific to humanity in this context, we risk missing prudential measures, which could be more effective than the behaviors generated by trusting false theories. At least, in the case of some citizens, the presentation of the unknown dose may prove effective. However, the reaction of the population as a whole to such an approach is unknown.

In its initial form, the approach proposed by Donald Rumsfeld is a part of the well-known recovery reflex specific to cats (the ability to always land on their feet) practiced by politicians, often resorting to the error of attribution. But, using this model of analysis in the preamble of decisions, can change the perspective. In question it`s an analyzing tool for uncertainty that characterizes political and medical decisions. Under discussion aren`t the health policies characteristic decisions, but major political decisions, having as main motivation medical reasons.

It`s a form of medical criteria entry into the political sphere. The identification of each situation that includes unknown significant doses and the public recognition of uncertainty (Daase & Lessler, 2007) constitute the condition for the possibility of robust public policies. Indicating the place that each current aspect occupies in one of the four cognitive quadrants is an important cognitive work.

4. Limits of correct testing for the presence/absence of SARS-CoV-2

4.1. Definition and identification criteria

From the perspective of the fight against the COVID-19 pandemic, if we exclude vaccination, then the main problem is to limit the spread of SARS-CoV-2 by identifying and isolating infected citizens. From a procedural point of view, we can consider that the population of a country is divided into the following groups:

- ***Infected citizens.*** The classification must start with them because the definition is made from the perspective of infection, the second group being defined apophatically, by the absence of infection. They can be divided into the following categories of citizens: a) who have the infection; b) who had the infection; c) who had the infection and were re-infected.
- ***Uninfected citizens.***

This first classification concerns the distribution of citizens in the two classes where we have intuitive access. Theoretically, we can assume that division into the two categories exhausts the universe of discourse, adequately describing the reality`s structure. The attempt to translate the theoretical model into reality shows that we should reserve a space for the unknown. For example, if we would try to make a picture of one or another present moment, we could discover an area of uncertainty, represented by the category of those who just face the risk of being infected, their distribution in one of the two categories depending of the evolution in time of some variables.

We suggest that we don`t know if a gray area is possible (or if it`s impossible), located in the interval between uninfected and infected, the situation being dependent, for example, on the infected citizen`s definition, the limits of technical possibilities for detecting the presence of SARS- CoV-2, individual reactions to the presence of the virus. We notice here that the difficulties come from different plans: conceptual (definition), technological (ability to identify), biological (variation of individual reactions). An additional meaning will be contoured in the section where we discuss the effects of vaccines.

From the perspective of our current capacity to know the reality, the classification can have the following categories:

- Citizens known to be infected and who are infected
- Citizens who aren`t considered infected and are not infected
- Citizens considered positive for SARS-CoV-2 but not infected (false positive)
- Infected citizens who aren`t known to be infected:
  - They haven`t been tested
  - False negatives.

The indexation of infected citizens must also be organized into several categories:

- Knowledge by institutions
- Knowledge only by those infected. If we consider that all the results of positive tests become known by the authorities, then this category is limited to those infected suspicion that they could have be infected.
- Knowledge by third parties.

As we can see, the distribution of knowledge indicates both the need for different levels of intervention and existing knowledge gaps at each level.

A classification from the point of view of SARS-CoV-2 virus infection indicates the following situation: a) Citizens with COVID-19 disease (symptomatic or pre-symptomatic) and b) asymptomatic citizens/healthy carriers.

Like all classifications, they tend to project the image of greater clarity than actually exists.

4.2. Identification`s limits based on testing

The main problem of epidemiological approaches is the correct establishment of the membership group for each citizen and the isolation of the uninfected apart from the infected ones. The operational criterion is the use of the negative definition: the set of uninfected is defined by excluding: (a) citizens who are infected; (b) citizens who were infected but are no longer infected. The main tool used to perform this separation is testing, in its two forms: virus-oriented (detecting the virus in the body) and antibody-oriented (detecting "traces" of the virus in the immune system). The correct definition of the membership group is therefore dependent on the effectiveness of testing. So, it`s obvious that, in the analysis of the testing efficiency used in the fight against the COVID-19 pandemic, we must take into consideration the characteristics and limitations of the tests. Because virus-oriented testing has a significantly higher degree of efficacy than antibody-oriented testing, we will focus on the former, understanding that the effects found are amplified in the case of the latter.

In the case of virus-oriented tests, the standard is real-time polymerase chain reaction (RT PCR). As we will see, from a technical perspective the purpose of using RT PCR tests is to identify a) the presence of SARS-CoV-2; b) the absence of SARS-CoV-2. Although there seems to be no difference between the two of this, from a practical perspective there is a significant difference, which we will indicate below.

In the literature, the two characteristics are separately highlighted, through an indicator called *the limit of detection* (LOD). Two test variables are used to identify the limits of detection: *sensitivity* and *specificity*. Because *the limits of detection* depend on both the characteristics of the measuring instrument and other variables, such as where the samples are collected, the

time of collection (relative to the stage of infection), the correctness of the collection, etc., the literature analyzes the two variables in two different ways (Saah & Hoover, 1997):

- *Analytical* - refers to the performance level of the device in terms of sensitivity and specificity, indicating the reference standards.

- *Diagnosis* - refers to the ability to establish the clinical diagnosis of patients using the test in question.

In this context, the meaning of the two variables is the following one:

a) Specificity:

- From an ***analytical*** point of view, the specificity is the ability to correctly identify SARS-CoV-2, without confusing it with other viruses/other substances.

- From the point of view of ***clinical diagnosis***, ***the specificity*** indicates the percentage of people who don`t have the virus and are indicated as negative by testing. In other words, it`s the ability to correctly identify the presence of SARS-CoV-2 through a test. Specificity indicates the ratio of correct positive results. The effect of exceeding the detections limits in the case of the specificity of a test is the *false positive results*: patients who don`t have the virus but the test indicates its presence.

b) Sensitivity:

- From an ***analytical*** point of view is the ability to identify SARS-CoV-2 in the lowest dose of the substance.

- From the point of view of ***clinical diagnosis***, ***sensitivity*** represents the percentage of people who have the virus and are identified as positive through testing. In other words, it`s the ability to correctly identify the ***absence*** of SARS-CoV-2 through a test. Sensitivity indicates the number of correct negative results. The effect of exceeding the limits of detection in the case of the sensitivity of a test is the *false negative results*: patients who have the SARS-CoV-2 virus but the test can`t identify it.

The causes that can lead to such identification errors are multiple, depending on the characteristics of the test devices, those of the tests, the method of collection, the stages of infection of the body with SARS-CoV2, the place of testing. The multitude of risks that can affect test results is the subject of research (Tahamtan & Ardebili, 2020), in an attempt by the scientific community to reduce its magnitude. The contribution of the technical characteristics of the devices used is important, the effective

solution being public indication of these limits and reporting to them in practice (e.g.: Foundation for Innovative New Diagnostics, 2020).

Some examples can give us an insight of issues related to the accuracy of using RT PCR for testing:

- Positive identification rate when SARS-CoV-2 is present depending on where the sample is collected: between 73% for nasal collection; 61.3% for throat harvesting and 88.9% for sputum harvesting (Yang et al., 2020), these being maximum levels.
- Radiologists reported for 36 cases diagnosed with SARS-CoV-2 pneumonia a sensitivity of 97% for pulmonary CT and 84% for RT PCR (Long et al., 2020).

In overall estimation, based on a useful simplification for understanding the problem, in the first part of the pandemic we can consider that:

- False negative results had a probability between 10% and 30% (West, Montori & Sampathkumar 2020) (in other words, the sensitivity of the test is between 90% and 70%).
- False positive results had a probability of approx. 5% (test specificity is about 95%).

Even if further technological developments have significantly reduced the error limits, an intuitive access to the nature of this problem can be obtained by applying these percentages to the number of tests performed in a community or even by a state. The more tests the exercise considers, the more visible the magnitude of the problem. This exercise also has certain limitations, derived from the characteristics of pre-testing of test technologies: because they have not been verified on very large batches, the level of how much the error rates respect the law of large number is unknown. In addition, there is an additional condition: the calculation of probabilities must take into account the repetition of tests.

An overall understanding of detection limits problem can be provided by the discussions about reinfection, some of them being explained by the margins of error of false negative and false positive results (Prinzi, 2020). For example, if a citizen was identified as a false positive, followed by his correct indication as negative and after a period is contaminated, being tested correctly positive, the overall perspective may suggest reinfection.

The effects of the two variants of failing the adequacy of the test results to reality:

a) False negative results are the most important in terms of consequences. The inability to correctly identify SARS-CoV-2 carriers is a significant epidemiological hazard. The danger is amplified by the false sense of security provided by the test result.

b) False positive results. The risks associated with false-positive tests depend on the *public policy adopted in the case of positive citizens*. If the public policy provides for the compulsory hospitalization of citizens tested positive for SARS-CoV-2, this being done in health facilities where there are already infected citizens, the risk of a false positive citizen SARS-CoV-2 to be infected is one considerable. The risk is generated by the exposure to an environment and to people with much higher transmission potential than the one offered by the previous conditions, where the person carried out his activity. It`s enough to note the share of employees (who use protection measures) infected in such a healthcare unit like that, to have a perspective on this risk (Rotilă, Palade & Lungu, 2020). Also, false positive results can generate a false picture of the percentage of asymptomatic citizens.

5. Clarifications on possible relationships between deaths and SARS-CoV-2

The most important variable in assessing the SARS-CoV-2 social impact of is mortality caused by this virus. For the correct understanding of this variable, we consider that following definitions are required:

a) Deaths due to SARS-CoV-2. These are deaths caused by pathological changes of SARS-CoV-2. They can also be described as deaths due to the associated symptoms of SARS-CoV-2. If the situation seems clear for patients who die while being infected, things are not the same for the conditions that cause death "at long distance".

b) Deaths with SARS-CoV-2. There are cases where patients have pre-existing pathologies that cause their death, but they have also been infected with SARS-CoV-2. The root cause is the underlying disease, but a contribution from COVID-19 can`t be excluded. Because of this, in some cases the delimitation between "because" and "with" is often difficult to do, the situation including a dose of uncertainty.

c) Deaths due to the fight against COVID-19 pandemic. Represents the multitude of patients for whom the difficult access to hospital or lack of drugs or medical supplies, caused by the fight against COVID 19, generates the impossibility of effective treatment (defined by reference to the situation before the COVID 19 pandemic), causing their death. Given the fact that some measures to combat COVID19 pandemic

fall into an area of excess, their respective deaths are part of the avoidable category. From a practical point of view, however, we must note that a large part of such situations is discovered retrospectively, at the time of decision-making they being in an area of uncertainty.

In some situation, there is no clear separation between the three categories. The construction of additional categories could help to clarify the problem.

c.1) Patients with pre-existing pathologies and COVID 19. These are patients who have comorbidities, but also show symptoms associated with SARS-CoV-2. From the perspective of the cause of death we can talk about multi-causal competition, being difficult to isolate a (single) effective cause.

c.2) Patients who weren`t previously infected with SARS-CoV-2, but who become infected in specific COVID 19 pandemic control procedures. Some examples:

c.2.1. "Isolation" in pre-hospital (prior to hospitalization) during the waiting period for SARS-CoV-2 test results. There are patients who come to the hospital with other pathologies but the justified (but sometimes inadequately organized) precautions of the hospital lead to testing all patients before hospitalization.

c.2.2 Patients incorrectly declared positive for SARS-CoV-2 (example: those in the margin of error of the test). They, once hospitalized, have a very high risk of becoming infected by patients who are correctly identified as SARS-CoV-2 positive.

Public discourse and institutional approaches (institutional approaches that determine public discourse) are marked by confusion between the first two categories. We can`t exclude the possibility that this approach may be intentional, one of the possible causal explanations being the efficiency of the public social isolation campaign. At the same time, we believe that an additional category needs to be taken into consideration:

d) Deaths due to COVID 19. This category should include both deaths caused by SARS-CoV-2 as well as deaths caused by limited measures against COVID 19. In other words, this category is a combination of category no. 1 and some dimensions of categories no. 3 and no. 5. However, this category should exclude preventable deaths caused by excessive measures.

The enumeration of these categories refers to the ideal identification of an optimal point of restriction level, respectively of establishing the balance between restriction and relaxation measures. However, the difference between theory and practice can be significant, especially when

we analyze previous measures based on subsequent data, unknown at the time of decision-making.

5.1. Precautions also come with risks

From the perspective of epidemiological (meaning social) interest, the rule that applies is: *It`s better to mistake an uninfected citizen with an infected one than to confuse an infected one with an uninfected one*. The public interest in this case is in obvious contradiction with the individual interest, the public benefit generating significant individual costs on the citizens tested incorrectly positive. The costs borne by these citizens are influenced by the extent of ignorance. If these citizens are mandatory hospitalized, having comorbidities from the known class as significantly higher risk generators of death in case of contamination, individual costs can reach the maximum level possible, some of these citizens ending up paying with their lives such a policy.

6. The confusion between no sign of disease and sign of no disease

6.1. No sign of a virus should not be confused with a sign of no virus

One of the SARS-CoV-2 testing risks is the confusion between ***no sign of a virus and a sign of no virus***. The error is to interpret a negative test for SARS-CoV-2 as *a sign of no virus*, when its significance is in fact *no sign of a virus*. In other words, instead of *no sign of a virus* (the correct meaning of the negative test) we come to consider the test as *a sign of no virus*. Therefore, this risk is obvious in the case of false negative results. In practice, the error occurs, for example, when the test result is accepted despite the symptomatic picture or the epidemiological investigation (which may show, for example, the systematic exposure of a person to SARS-CoV-2).

6.2. Is the concept of healthy carrier justified?

Another risk exists in the case of positive tests, taking the following form: to confuse *the positive at SARS-CoV-2* with the existence of COVID-19. Which means deducing from the presence of the virus the certainty of the disease. We must remember that SARS-CoV-2 associated symptoms that are showing signs of disease are a possibility (a risk), not a certainty. If we assume that the test result correctly indicates SARS-CoV-2 infection, then the most visible example is healthy carriers. Assuming the side effects of a treatment against COVID 19 in the absence of symptomatic picture is one of the examples that illustrate the error.

To what extent is the healthy - carrier phrase justified in the case of SARS-CoV-2? As far as we know, the presence of the virus belongs to the

pathological field, this being sufficient, in principle, to mark the equality between the existence of SARS-CoV-2 and the absence of health. The way we define the state of health, respectively of disease, however, can change the perspective. We will start by first indicating the discrete area of uncertainty in the definition of a healthy person. An image of the situation is provided by another recommendation from the theory of knowledge: *no sign of illness does not mean a sign of no illness*. In question are both the natural limits of medicine (we can`t rule out the possibility of the presence of diseases that are not yet accompanied by detectable symptoms or changes in the results of tests we can perform) and the impossibility of creating a system for assessing the health condition located in the area of absolute certainty. Which means that the definition of health includes an area of uncertainty, which it camouflages by the way it`s defined: we consider a person to be healthy if he shows no signs of illness. This definition doesn`t exclude the possibility of the pathological, but differentiates between the presence and absence of signs regarding its existence. The solution is probabilistic, considering that the absence of signs of disease has a very high probability of meaning the absence of disease. By moving from the very high probability of health condition to its certainty, we camouflage discrete areas of uncertainty.

The opposite situation is also admitted: the presence of signs that are generally considered to be a disease such as identifying the existence of bacteria or viruses in the body may **not** lead to the belief that the disease exists? It seems so, and examples of this can be identified. The oscillations of certain categories of microbes, in certain contexts, between the status of saprophytes and that of pathogens, further complicate the clarity of definitions.

Separating the approach based on the perspective of infectious diseases from the perspective of infectious diseases could provide an acceptable solution, based on suspending the need for rigorous definition. From an epidemiological point of view, the use of the phrase *healthy carrier* or *asymptomatic infected* is justified, the possibility of identifying those at risk of transmitting the virus being discussed.

7. Is there a clear separation between infected and uninfected?

To illustrate some of the problem we will start by saying that it`s still unclear if we should use the following differentiation:

- *SARS-CoV-2 infected* - designates people who have been infected with SARS-CoV-2 and have specific COVID symptoms 19.

- *SARS-CoV-2 carrier* - designates people who have been infected with SARS-CoV-2 but don`t have the specific/associated symptoms of COVID 19. They are so-called *healthy carriers*, those people showing no signs of infection.

The problem is generated by the difference between the individual and the social interest visible in the *case of healthy carriers*: from the perspective of individual interest, the contamination with SARS-CoV-2 is without consequences on oneself, counting the absence of symptoms/impairment of the body, meanwhile from the social interest point of view, the risk that such people pose to others (the risk of infecting others) and the place that the person may occupy in the epidemic chain matter. The asymmetry of the two interests and the consequences on the individual (restriction of freedom) and on society (the obligation to bear the costs associated with the isolation of these people) is a specific of infectious-contagious diseases.

As a principle, the restriction of freedoms must be proportionate to the risk level. Given the lack of the possibility to fully assess both the consequences of the mass infection of the population with SARS-CoV-2 and the consequences of the fight against the COVID 19 pandemic, we are in a dynamic situation, in which approaches tend to change quite rapidly, including from the perspective of how to define healthy carriers, respectively of restricting the rights associated with the fight against the COVID pandemic 19.

8. The risk of considering that what we see is all that exists

This type of risk involves considering that the number of SARS-CoV-2 positive people is equal to the number of people found to be positive for SARS-CoV-2. Meaning, it involves equaling those tested and found positive for SARS-CoV-2 and the total number of SARS-CoV-2 carriers. Such an identity doesn`t exist, being impossible to calculate the real number of infected people.

The attempt to make estimations is based on a series of studies that have very large differences between them. In addition, the results of this type of study must be carefully extrapolated from one community to another, as social and biological variables can lead to significant differences.

9. The risks are asymmetric

Two fundamental asymmetries in front of the risks characterize this pandemic: the differences generated by individual characteristics (age, certain pre-existing diseases, etc.) and the different exposure to the risk of infection.

As expected, the highest level of exposure to the risk of infection occurs in healthcare staff, the cause being easy to explain: health services are accessed by symptomatic SARS-CoV-2 infected citizens. For this reason, hospitals play a large role as a canary in a coal mine, indicating the transmission of the virus to communities. The staff within these units has a structural overexposure, to which are added the dangers arising from organizational errors.

10. The law of unintended consequences *generates additional risks*

The asymmetry of risks is accentuated by public policies based on the compulsory hospitalization of all citizens who have been tested positive for SARS-CoV-2. This approach must be also analyzed from the perspective of the *law of unintended consequences*: in order to avoid the hospitalization of some of the infected citizens, they don`t declare the symptoms, preferring self-medication. Such behavior has two consequences: it increases the risk of death due to late presentation to medical units and prevents the authorities from identifying in a timely manner some areas of the epidemic. The number of deaths due to the fight against the COVID-19 pandemic is also, to some extent, part of the law of unintended consequences. Deaths may be compounded by changes in health for patients who don`t have access to treatment services during this period.

11. The asymmetry of risks is also visible in the costs asymmetry

Social distancing measures generate significant social costs. The distribution of these costs is asymmetric, their burden being unequally placed on the shoulders of citizens. The asymmetric distribution of individual economic costs generated by the measures to combat the COVID 19 pandemic is one of the relevant indicators, both for estimating the impact and for anticipating social unrest. We can consider that placement of citizens in two camps, for and against the continuation of radical measures of social distancing, is also causally shaped by the asymmetric distribution of costs.

12. The fundamental error of attribution

In so far as we consider that the narratives promoted by politicians are the ones that will determine the meaning of things, we can rely on common sense to estimate the general frameworks of political interpretation of the situation: opposition politicians focus on highlighting costs and counterfactual approaches, while the politicians in power oscillate between

the emphasis on the heroic aura of the measures they have taken and the identification/demonization of the guilty ones.

The attitude of power can be largely described by the fundamental error of attribution, which presupposes the individual/group assumption of some results as a success of the fight against COVID-19, without taking into account other variables or the role of hazard. Some examples:

- To consider that a large number of COVID 19 cures was determined by a certain therapeutic conduct, given that the public policy of hospitalization of all infected citizens leads to the situation where approx. 80% of them heal without serious forms of the disease, some of them even without symptoms. If the phenomenon is amplified by administrative procedures such as transfer of severe patients to other health facilities (see the example of some infectious disease hospitals) the probability of such an error increase.
- To consider that the relatively small number of infected citizens (compared to other states), respectively deceased, is the result of public policies adopted at national level. Based on the available data, this seems to be specific to Eastern European countries, being several variables that could explain this situation (compared to Western states):
  - A characteristic of the type of social networks specific to these states. For example, a lower share of social contacts (a lower density of social networks) generated by focusing on the family model.
  - A lower level of citizens' movement, determined both by lower economic resources and by infrastructure underdevelopment state.
  - More effective strategies to avoid others, based on skills developed during the communist period.
  - A more cohesive public health network (even if less equipped).

13. Primum non nocere - First, do no harm

Interventions against COVID 19 pandemic, like any action in the medical area, must have as their first starting point the avoidance of a greater harm that they could generate. In other words, approaches must continually assess the relationship between the harm that the "therapy" generates and the positive effects on the "social body". In the previous sections we have indicated some of the variables that needs to be considered, in order to effectively apply such a prudential measure.

The risk caused by missing the balance between the measures to combat the COVID pandemic 19 and the negative effects of this fight, has repercussions on four social levels:

a. ***Medical***, represented by morbidity and mortality associated with the fight against the COVID pandemic 19.

b. ***Economic*** - negative effects on the economy and their consequences.

c. ***Social***, represented in particular by:

i. Reducing the purchasing power/impoverishing the population

ii. Restriction of social life - brings with it the redefinition of social.

d. ***Citizens***, represented by the multitude of freedoms that are lost in this process, some of them being lost for good.

14. The one size fits all rule has limited applicability

Contrary to expectations, the number of universal fight procedures against COVID 19 is quite limited. The solutions start from the universal level, the vaccine having this status. Epidemiological isolation is also close to this status, but both the extent of the need for this type of intervention and the solutions to be put into practice have a level of variability (even if a limited one). The efficiency/necessity of social distancing, for example, is proportional to the extent of social agglutination, respectively to the frequency and character of social contacts. The differences between the social values also influence the policies adopted by the different states, the well-being of each society being lived according to the priorities assumed by that society.

15. Ipsa scientia potestas est

The main recommendation we make forces the political area towards a way of approaching that seems to exceed its possibilities: the *evidence-based decision*. This could be the moment of the transition to a new way of doing politics, that is another era. In so far as this happens, it will officially mark the scientists entry into the area of power.

Discovering and recognizing what we don`t know is part of the scientific knowledge. The usefulness of this cognitive position in terms of social policies is not clear, as the degree of tolerance of society towards the unknown is not assessed. The history of the practices of camouflaging the unknown tends to suggest the character of social necessity for such approaches. To the extent that ignorance should lead to a suspension of the decision, this type of unknown is not consistent with social expectations.

Additionally, expecting people who consume their future for the present good to accept the possibility of a significant change in individual well-being (outlined in the consumption horizon) may be unrealistic. Often caught in the short term (partly due to the cancellation of the need for early reporting due to optimistic inoculations in the interest of credit consumption), today's society seems unable to rigorously assess the long-term effectiveness of various policy proposals. We tend to expect hopeful speeches from politicians rather than solutions.

16. Conclusions

It`s not very clear what generates more victims: COVID-19 or our exaggerated reaction to the pandemic. Just as it`s not very clear who causes the death of most patients: SARS-CoV-2 or the exaggerated reaction of the body to this virus. The problem is the uncertainty about the necessary measures, which is the main concern of this article. We must accept that there is a significant dose of the unknown about appropriate interventions, much of which may persist to the end. The solution, insofar as it will occur, may also be due to variables that may remain unknown. This wouldn`t be the first time this has happened, with highly explanatory narratives behind random causes being a possible approach. The pragmatic verification of hypotheses is a specific of science. However, it doesn`t always rule out the possibility that the hypothesis will be confirmed by variables that remain unknown, the appearance of the causal relationship being sufficient to solve the problem. In other words, even if the solution may not have a very clear effective cause in the end, it will admit many convincing narratives for the general public as an explanation.

One of the concerns of this approach is to combat the risks of cognitive bias arising from the inadequate approach to uncertainty, the costs of which are likely to be amplified to the point of paroxysm by the current context. The best solution to fight uncertainty, especially the one generated by the unknown unknown, seems to be *robustness* (Taleb, 2007): the ability to survive unexpected shocks. The principle seems to be applicable to all levels of the human being, and can also be known as a form of resistance to stress. The concepts proposed by Taleb, respectively *antifragility*, *ergodicity* (Taleb, 2012), can be a reference point, like the idea that decision makers must have their skin in the game (Taleb, 2018), assuming common risks. Much of the approaches in this article can be considered to be based on the use of some of Nassim Taleb`s principles in assessing the current situation.

Given the position and evolution of the unknown, the solution for the problem is the Bayesian approach, respectively the continuous updating of the probability of different solutions in the light of the latest evidence. The combination of different approaches efficiency probabilities figures it out to a more complex variant of the Bayesian approach. A form of transposition of this variant is the Swiss Cheese Model (Mackay, 2020), which seems to be an acceptable solution both in hospitals (Noh et al., 2020) and in general framework of fighting the pandemic (Pueyo, 2020). Although the model isn`t ideal, one of the risks being the one of "aligning the holes of the swiss slices" (Perneger, 2020), from the existing data it could being located in the immediate proximity of the maximum limits of knowledge, compared to its current level.

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