The Immunity Capital

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Abstract

This paper is inspired by a thesis on "immune capital" by Kathryn Olivarius. We suggest that the biological capital, which immunity capital is part of, should be considered as an additional component of the life-course experience of individuals, together with the traditional Bourdieu's social, economic and cultural capitals that drive their lives. Building upon this concept, we consider the relationships between science, society and policy-making in the course of the pandemic. We suggest that we need to 'reframe problems so that their ethical dimensions are brought to light' (Jasanoff), with a request for humility extended to political leaders, to 'look beyond science' in search for ethical solutions. The present pandemic plays out—and is integral to—the acceleration of the rate of change, Pope Francis' peculiar word "rapidification", i.e. a vortex involving technoscience, policy and the new media.

Keywords: COVID-19, Pandemics, Embodiment, Rapidification, Media.

1. COVID-19: Nomothetic or Idiographic?

COVID-19 has accelerated our understanding of how science works and how it relates to political decision making. From a methodological point of view, we can consider the history of the epidemic in the light of the (probably obsolete) dichotomy between *nomothetic* and *idiographic* disciplines. Consider the—still largely fragmentary—causal reconstruction of the origins of COVID-19, or the issues related to immunity: it is very difficult to recognise "covering laws" here, like those valid in other fields of biology, while we more often have to resort to narratives. The latter include randomized experiments on the effectiveness of vaccines, longitudinal follow-up studies, smaller investigations on the immunological response to the virus or to vaccines, etc. There is no single modality to establish causality in such narratives. Indeed, let us consider the reconstruction involving relationships with wilderness, trade in live animals, bats as coronavirus reservoirs, intermediate animals such as pangolins, and finally the spillover to humans. In this

Argumenta 7, 1 (2021): 109-116
ISSN 2465-2334

DOI 10.14275/2465-2334/202113.vin

circumstantial chain, the key element is the identification of a very similar sequence between the RNA of the bat-hosted virus, that of the pangolin and that of the human virus. The reference to a covering law lies in the theory of evolution in its neo-Darwinian version, in which evolution occurs by mutation and selection. But everything else in the narrative is "idiographic"—that is, local, historical, contextual, circumstantial—though some recurring patterns are identifiable. Such narratives can be used only partially for prediction; some are stronger, such as randomized trials or well-designed longitudinal studies demonstrating the effectiveness of vaccines, but others (particularly on the origin of the disease) can be used for future prediction in an indirect and incomplete way.

Let's consider immunity. What is nomothetic about it? We suggest the general principles of immunology, which nevertheless constitute a theoretical framework of reference rather than a "covering-law". Here, too, the prevailing element is narrative, proceeding by trial and error: we can measure immunoglobulins (IgM, IgG, IgA, etc.), but we do not know exactly how long immunity lasts or what degree of protection it provides. What is even more important than "humoral" immunity (from circulating antibodies) is the other form of immunity, the cellular one linked to T lymphocytes. Everything we know originates from cumulative systematic observations and repeated attempts, not really from covering laws as the philosophy of science has theorised in the past for other branches of sciences.

To explain what we mean by the interaction of the covering laws (nomothetic) and the idiographic components we can refer to the great medical historian Mirko Grmek, who coined the term "pathocenosis" to describe the relationship between human diseases and the surrounding environment in its historical determinations (Grmek 1969). These relationships are largely based on the role of the immune system and the combination of mutation and selection (and this is the nomothetic part). The fact that an infectious disease can cause a pandemic depends on two main conditions: the state of immunological susceptibility to infection of the entire population (a condition that occurs, for example, when a virus is new to humans) and the aetiological agent's ability to transmit itself efficiently from one person to another (and this is the idiographic, i.e. circumstantial, part). The emergence of a new virus or bacterium is not a rare occurrence, but is part of normal evolutionary processes. The ability to infect new animal species, including humans, gives these mutated viruses or bacteria a selective advantage as they are able to expand into new ecological niches. The impact of a pandemic on the population depends on the spread rate, the severity of the clinical picture, and the lethality rate. The spread rate is measured by a basic reproduction index (indicated by R_0), i.e. the average number of people infected (secondary cases), in a population that is fully susceptible to every single contagious case. The index is directly proportional to the duration of contagiousness of the infected person and the frequency of contacts during which other people are exposed to the infection. It is therefore understandable why social distancing measures are effective by reducing one of the parameters of R_0. Several infectious agents, even common ones, have a very high reproduction index under conditions of complete susceptibility of the population. For example, for measles it is usually estimated that an average of 12-18 secondary cases occur for each primary case (Guerra, Bolotin, Lim, Heffernan, Deeks, Li, Crowcroft 2017). However, for most circulating infections, the majority of the population has now developed immunity, both because people have already contracted the infection or because they have been vaccinated against it. The proportion of people immune to a specific infection in the population is a hindrance to the spread of the infection, as every immune person—even if exposed to infection—is supposed not to infect anyone else. When the proportion of immune persons in a population is so high that it does not allow for epidemic spread, it is said that the population has developed "herd immunity" (a questionable term: humans are not a herd, that is they have a much more complex social structure, mobility, and autonomy than animals). Most of the determinants and characteristics of the spread of the infection in a population seem to be circumstantial, non-deterministic and local.

The severity of the clinical picture is another important parameter regarding the relevance of the pandemic and its spread. Infections characterised by a severe clinical picture are more easily detected and, if the contagiousness is limited to the period of time in which the symptoms occur, they are easier to intercept. These aspects may explain why some infections cause pandemics and others only epidemics, which remain circumscribed. The SARS epidemic of 2003, for example, was more contained than the current spread of COVID-19: the R_0 was similar, but the mortality rate was significantly higher (9-16%), and above all, the highest infection rate was found in the second week after the onset of symptoms. These characteristics facilitated the identification of cases and the isolation of people exposed to the infection (their contacts), leading to the eradication of the epidemic before it spread broadly such as COVID-19. Once again, this was circumstantial rather than depending on nomothetic explanations.

Indeed, every epidemic has its own characteristics, linked to the type of aetiological agent, the harm it induces and the way it is transmitted, so it is difficult to derive countermeasures from one epidemic to another and predict their course by analogy. The behaviour of different pathogens can be estimated by constructing mathematical models that simulate the conditions of infection transmission, produce possible spread scenarios and offer the possibility of evaluating the effect of specific countermeasures (Saltelli, Bammer, Bruno, Charters, Di Fiore, Didier, Nelson Espeland, Kay, Lo Piano, Mayo, Pielke, Portaluri, Porter, Puy, Rafols, Ravetz, Reinert, Sarewitz, Stark, Stirling, van der Sluijs, Vineis 2020). So the history of the spread of each epidemic or pandemic has a nomothetic component, in the sense that it can be interpreted in the light of the virus' mutations, its adaptation to the host and the latter's immune response. But the overall narrative has many more "idiographic" elements, linked to chance (for example the appearance of the right mutation at the right time), and to the geographical and historical context. The term *pathocenosis* encompasses these aspects as well as the unstable balance between different diseases in a population; the pathocenosis is constantly in a condition of precarious balance or imbalance. It should be noted that the human (or animal) response to microbial aggression also leads to a constant instability of the immune system, which is subject to continuous recombinations of its genetic material for the production of antibodies corresponding to new environmental antigens.

2. Immunocapital

The term immunity has acquired metaphorical meanings in addition to the scientific meaning. Communities respond to threats through responses that Roberto Esposito called "immune", playing on the link between "immunitas/communitas" (latin for immunity/community) (Esposito 2015). Immune reactions, according to Esposito, are a common way in which human communities respond to external and internal threats: not only disease, but also economic crises, migration and so on. In fact, Esposito's metaphor is not only a social and philosophical concept, but has become a reality in certain historical periods as we suggest below.

An eloquent case of an intertwining of a scientific and a social use of the word immunity is that of yellow fever in New Orleans, as described in Kathryn Olivarius' PhD thesis at Oxford University (Kofler and Baylis 2020, Olivarius 2016). For much of the nineteenth century, the inhabitants of New Orleans were divided between those who were "acclimated" to the risk of yellow fever and everyone else. The former could marry, work and even, if they were slaves, alter their market value. Many young people organised "parties" in order to become infected and increase their market value, especially among immigrants. That choice was much more dangerous than today, because yellow fever was a terrible disease, with very serious symptoms and a 50% lethality rate.

According to Olivarius, yellow fever gave rise to a new social stratification, and in this sense the researcher coined the term "immuno-capital", which adds to the categories proposed by Pierre Bourdieu: economic, social and cultural capital. In this same direction, within the European network "Lifepath" (Vineis et al. 2020), some of us proposed a fourth type of capital, the biological one, which has not yet been given enough thought. What Bourdieu omits, in fact, is precisely the biological component, even if it is partly contained in his idea of "habitus" (consisting of bodily aspects such as posture and accent, and more abstract mental characteristics such as patterns of perception and classification).

Bourdieu does not fully consider the ways in which the three types of capital he describes all have—in different and synergistic ways—an impact on the body and health condition of the subject. Income, culture and social capital, both separately and together, are capable of changing life paths towards better or worse health. There is indeed a mutual relationship between the three types of capital and "biological capital": a congenital (e.g. cognitive) birth defect can severely affect access to culture, social capital and income; and, conversely, a low capital of each of the three types strongly influences the subject's state of health in its biographical development. Social class influences the posture, the demeanour, the physical appearance of the person, and this in turn "condemns" them to a certain class membership (which was especially true in the past, when for example the "low" classes in England were also physically shorter than the "high" classes). Our proposal (Vineis et al. 2020) is therefore that together with biography (*bios*) we consider, in close interaction with it, the biology (*zoe*) of people.

The biological capital includes the immune capital. To return to the New Orleans example, in 60 years over 150,000 people died in 22 epidemic waves in the capital of Louisiana. Insurers were reluctant to cover those who were "not acclimated" (a phenomenon that has not yet occurred for COVID-19). Other typical aspects of American society at the time were accentuated by the epidemic: for example, slave traders claimed that slavery had the advantage of "distancing" rich whites from black slaves, even though the disease was transmitted by mosquitoes (but exposure to mosquitoes was much more frequent in slums). White people could stay at home, slaves moved around to work in the fields and were therefore more exposed to disease—another analogy with today's situation. These marked class differences, according to Olivarius, meant that at that time those in power had little interest in implementing prevention and containment measures. Even today, social differences are marked by COVID-19 infection and mortality rates (although much less so than then): in the British OpenSafely study, COVID-19 mortality rates were found to be more than twice as high in people living in more "deprived" areas compared to rich areas (Williamson et al. 2020).

3. Science and Politics

Let us examine more in depth the complex relationship between science and political decision making. An emblematic case is that of the recent "immunity licences", based on serological tests, which became famous for a very short period of time in 2020 (at least in Italy) and then proved to be impracticable. The hope was that the measurement of immunoglobulins could release from isolation, allow people to continue working, the elderly to feel protected, and everyone to go on holiday. But the sensitivity of the tests was low, the antibodies measured were not "neutralising" against the virus and the temporal relationships with the clinical history of the disease were very uncertain. So no licence. Beyond the scientific inconsistency of the proposal (and the practical problems that came with it: it was not possible to test the entire population at a given time), the immunity licence is an example of the many amplifications of pre-existing problems that emerged with COVID-19. These include social inequalities, access to treatment, the right to health, ethical dilemmas (do we save everyone? protect the elderly? protect the economy?), the conflict between small businesses and multinationals, national selfishness towards solidarity, and top-down interventions vs. individual responsibility. More recently the introduction of the "green pass" has raised similar discussions, though it is a completely different case compared with the immunity licences: the green pass is an instrument—based on nudging—to obtain that people have access to essential services and a normal life by inducing the majority to get vaccinated.

It is undeniable that political power uses science and technology to avoid taking a stance on complex issues (Saltelli, Bammer, Bruno, Charters, Di Fiore, Didier, Nelson Espeland, Kay, Lo Piano, Mayo, Pielke, Portaluri, Porter, Puy, Rafols, Ravetz, Reinert, Sarewitz, Stark, Stirling, van der Sluijs, Vineis 2020). Consider the case of Rt, at the centre of press debates and political decisions—a sort of barometer of the trend of the epidemic and of the effectiveness of containment interventions (note that R_0 measures the virus' transmissibility in a completely susceptible population, Rt in a population in which at least some people have become immune). Rt has certain technical characteristics that cannot be ignored if one wants to interpret it correctly: (a) Rt is based only on symptomatic cases; (b) Rt is subject to random fluctuations if the cases are limited in number, and this should be taken into account by associating a statistical confidence interval to it. Politics and the media have largely ignored the intrinsic technical characteristics of Rt, leading to erroneous inferences.

In the spectrum of positions that characterise the relations between science and society, there are some extreme ones such as "denialism", which (despite their differences) is rooted in Romanticism or in radical thinkers like Schmitt. However, today there is a propensity to use science as a surrogate for choices that should be primarily about values, and this is the case both among institutional actors urging actions such as confinement or vaccination and among those resisting the same policies. Privileging science and technology may work fine in an emergency phase, but not in a planning phase where it is essential to explicitly refer to values and, based on these, to bring out predictive scientific models that explore different scenarios. While in the first phase of the epidemic it was understandable to rely entirely on science to find answers, and it was also justifiable to make drastic choices such as lockdowns on the basis of mathematical models—whose assumptions were not completely explicit (see Saltelli, Bammer, Bruno, Charters, Di Fiore, Didier, Nelson Espeland, Kay, Lo Piano, Mayo, Pielke, Portaluri, Porter, Puy, Rafols, Ravetz, Reinert, Sarewitz, Stark, Stirling, van der Sluijs, Vineis 2020)—in the following phases this attitude is no longer acceptable. Now it is really important to clarify the underlying values and to approach science based on those, so as to guide the scientific (reproducible and intersubjective) exploration of the various hypothetical scenarios.

Even during the emergency, in reality, lockdown measures were only necessary in a relative and conditional way, i.e. as tools needed to achieve certain types of (moral and political) goals. It is these goals that are in question in the public debate. Lockdown measures should be defined as "just" rather than necessary, for example because they have made it possible to safeguard the most fragile part of the population (essentially the elderly and the sick), keeping alive the feeling of social solidarity and the intergenerational pact. But now they must be reconsidered in the light of similar and explicit value considerations. Obviously, many questions remain open and should be at the centre of the public debate. At what levels should values enter the debate and the decisions be related to public health? What if disagreement about values occurs? How might trade-offs be established, and who should establish them?

For example, the inversion of the relationship between ethics-politics and science could consist in this: formulating some policy-making scenarios and asking researchers to quantify their consequences, including economic ones. The scenarios could be: (a) a Kantian scenario in which not even a single life is sacrificed (as far as possible); (b) a utilitarian one which calculates the greatest benefit and the least damage for the greatest number of people; (c) a weighted utilitarian one, which gives more importance to the lives of young people, etc. For each of these, it would be up to the modellers to assess the implications in terms of lives lost, intensive therapies, economic degrowth, prospects for future generations, and so on. Note that the political style adopted by Trump, Bolsonaro and to a lesser extent Johnson corresponds to yet another scenario, the ultraliberal individualistic one. Another obvious problem in terms of values, rather than technical issues, is *who* will have access to vaccines (in the face of the tendency of rich countries to hoard them for themselves), which introduces the dimension of equity in political decisions.

It would also appear that the science policy system has not yet metabolized the long list of surprises and front reversal brought about by the pandemic, where the winning and losing countries exchange place with surprising rapidity—all phenomena largely unpredicted by the existing apparatus of prediction and control. The same apparatus that in recent years has become more apt to influence electoral outcomes rather than to predict pandemics: in spite of its expanding technologies, it should perhaps engage in different technologies, those of humility (Tverberg 2021). Jasanoff warns against hubris technologies, such as risk and cost-benefit analysis, that 'show peripheral blindness towards uncertainty and ambiguity'. For her, 'predictive technologies are limited in their capacity to internalise challenges that arise outside their framing assumptions' (Jasanoff 2003). Therefore, the 'binary thinking that frames the future in terms of certain choices between options knowable', cannot deliver us the entire picture and all the answers.

We can raise our awareness of the complexity by acting with *humility*, that is induce a reflexion on what we ignore, and what is uncertain, in order to 'reframe problems so that their ethical dimensions are brought to light'. Jasanoff invites to reflect on vulnerabilities, on winners and losers, and on learning opportunities. A request for humility extended to political leaders, to 'look beyond science' in searching for ethical solutions. The present pandemic plays out—and is integral to—the acceleration of the rate of change, Pope Francis' peculiar word "rapidification", or a vortex involving technoscience, policy and the new media (Pope Francis 2015, Saltelli, Boulanger 2019).

Perhaps the present pandemic has altered our pathocenosis in one important respect: that of the relation between science and policy (Waltner-Toews, Biggeri, De Marchi, Funtowicz, Giampietro, O'Connor, Ravetz, Saltelli, van der Sluijs 2020). Ruling elites can no longer rely on experts for persuading the public that their policies are beneficial, correct, inevitable, and safe. For David Waltner Toews, we have learned that not a single model nor a single policy bears all the solutions, but many models and many policies. The idea of human, animals and viruses as part of a larger set of nested hierarchies enter into collision with previous Cartesian narratives of man as master and owner of nature. The wonders of Cartesian science give us vaccines developed at an unprecedented rate; yet the world is not made of things surrounding us, but of the set of relationships holding all these together (Waltner-Toews, 2020). Will this realization impact our pathocenosis?

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