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The COVID-19 pandemic: how can risk science help?

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ABSTRACT

This paper reflects on how risk science, with its concepts, principles, approaches, methods and models, can support the actual assessments, communication and handling of the vulnerabilities and risks related to the Coronavirus (Covid-19) pandemic. We highlight the importance of acknowledging uncertainty as a main component of risk, in order to properly characterize and communicate risk, as well as to understand the difference between professional risk judgements and risk perception. We challenge the use of the commonly referred to phrase that the policies adopted are science-based, in a situation like this characterized by fundamental uncertainties about the underlying phenomena and the effects of possible interventions. Arguments are provided for a 'balanced' use of precaution, combined with adaptive management and learning.

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1. Introduction

The current situation related to the Coronavirus pandemic triggers many issues concerning risk and risk science, including how to characterize and communicate the risks, as well as how to handle them. We hear experts and politicians making numerous statements on a daily basis about the magnitude of the risks, using different formats and terms but all highlighting the large uncertainties and the difficulties of being able to make accurate predictions. We experience different countries adopting different policies, from severe lockdown to non-binding public health advice to follow social distancing, all claiming to be science-based and often referring to the precautionary principle but ending up with different strategies to confront the virus. A balance clearly has to be struck between different concerns. Societies are faced with a health crisis, but the implications of societal shutdowns are huge, and, when considering what to do next, the risks related to the Coronavirus pandemic obviously have to be seen in relation to all the relevant aspects – and risks – involved.

The politicians are guided by health experts, physicians, immunologists and others with extensive knowledge on the topic. Other experts provide input on economic and societal impacts. In times of crisis, the balance between these different inputs, however, varies. For instance, we observe that the Coronavirus crisis has brought epidemiological models to the fore. With little time to engage in a lengthy peer-reviewed process, early results have been shared with the policy level. A flow of messages often perceived as contradictory (Van Elsland and O'Hare 2020; Lourenço et al. 2020) is challenging the scientific process. 'Scientific consensus' is difficult to

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reach, and communication becomes particularly challenging to articulate. In this paper, we offer some reflections on how risk science and risk scientists can support the handling of this pandemic and related situations. Previous attempts have shown that pandemic response can benefit from risk studies (Fischhoff et al. 2018). This science provides the current most justified knowledge – represented by concepts, principles, approaches, methods and models for assessing, communicating and handling risk – produced by the risk field. There are a number of issues that can be discussed in relation to risk science and this case; we highlight some of these, selected on the basis of our competencies and what we consider important for improving today's situation.

First, we reflect on how Coronavirus-related risks are currently described and communicated. We point to several areas where enhancements can be made. Then we look into the differences between professional risk judgements and risk perception. We argue that it is essential for the risk communication to understand that laypersons' risk perceptions may capture not only feelings like fear and dread but also conscious judgements of uncertainties, which are not always incorporated in professional characterizations of risk. Finally, we discuss issues related to the relationship between science, policy and politics, as introduced above. We argue that i) current policies based on applications of the precautionary principle are justified as far as they remain proportionate and prudent (Health Council of the Netherlands 2008); and ii) it is critical to public communication that the message is put forward that the role of science is to inform policy and politicians. Science cannot and should not prescribe what decisions to make in the case of risks subject to large uncertainties.

2. Improving the way risk is described and communicated

Literature, both scientific and popular, is rapidly emerging on risk issues associated with the Coronavirus and related matters. In this huge corpus, risk is commonly referred to, described and measured, although it is seldom precisely defined. It is, however, often clear from the context that the authors have in mind a thinking about risk that reflects probabilities and proportions of people with some specific features (e.g. sickness, death). Readers will intuitively get a feel for the message that is being presented. However, from a science point of view, this is not satisfactory. Fundamental concepts need to be precisely defined and interpreted. Failure to do so can seriously hamper the risk communication and the risk handling. Risk science can provide essential help in this regard (e.g. SRA 2015, 2017a, 2017b; Aven 2018a, 2020). To understand risk, we need to clarify the role of uncertainty and knowledge (Lofstedt and Bouder 2017). It is not enough to talk about probabilities and historical data. Think about a study, performed in early March 2020, of the risk related to the number of deaths in the coming months as a result of Coronavirus. The way risk is conceptualized and described could be very important for how the authorities judge the magnitude of the risk, communicate the risk to the public and conclude what to do. With large uncertainties, as in this case, it is clear that accurate predictions cannot be made. Yet such predictions are made, usually based on models of the phenomena studied. However, as the knowledge is weak, the models are based on strong assumptions, which could turn out to be far from reality (Adam 2020). Models to express risk thus need to be used with care, to avoid extreme scenarios being given stronger authority than is justified.

The number of deaths due to the Coronavirus in the coming month is not risk. It is an unknown quantity. To talk about risk, we also have to include uncertainty – we do not know today what this number will be. We assess these uncertainties in risk assessments using all relevant knowledge, founded on data, information, models, tests, analysis and argumentation. Probabilities are used to express these uncertainties, but probability is just a tool and has limitations. For example, in the case above, when considering risk related to deaths in early March, analysts could perform a risk assessment establishing a probability for a maximum number of deaths, given the implementation of a specific policy. However, such a probability should be communicated with care, as the knowledge supporting it is rather weak. It is a fundamental risk science insight today that probabilities should always be accompanied by judgements of the knowledge supporting these probabilities. In line with this, the communication of risk could be formulated as follows:

The result of the risk assessment is that the number of deaths is unlikely (less than 5%) to exceed x in the coming month, given the implementation of policy y. This assessment is based on current knowledge on the topic using the best models and data available. There are, however, considerable uncertainties about the underlying phenomena and how the epidemic will develop – many of the assumptions of the models used are subject to large uncertainties. Overall, the knowledge supporting the risk assessment is considered rather weak.

As another example, think about the message that the authorities would like to convey, that you stay safe when following the guidance on how to protect yourself against getting the Coronavirus (washing your hands frequently, maintaining social distancing, etc.). However, understanding what 'safe' here means is not straightforward. Clearly, we would still face some risks. The point is that the probability of you getting the virus when following these guidelines is judged to be very low, and this conclusion is supported by strong knowledge/evidence. We have not yet heard any politician or expert using such words, but, in our view, this type of explanation would strengthen the risk communication. Departing from the 'safe'/'unsafe' approach will also ease communication on fluctuating public health advice, such as whether or not to wear protective face masks.

3. The difference between professional risk judgements and risk perception

Today many people are experiencing stress from the risks related to the Coronavirus. People's risk perception is strongly influenced by repeatedly hearing about cases and deaths. Media stories, death counts and public campaigns that amplify danger may stir emotions and exaggerate the feeling of risk (Slovic 2010), while increasing the availability of negative events (Tversky and Kahneman 1973). Risk science has developed considerable knowledge about how and why this happens (e.g. Slovic 1987; Kahneman 2011). As we easily retrieve from memory a vast number of 'alarms', the conclusion is that the risk is high. The representativeness is not reflected. The Coronavirus hits all the hot buttons: unknown, new and delays in effects, lack of control, and catastrophic potential, often summarized by the two dimensions, newness and dread. The result is that the risk is amplified, and there is a potential for overreaction, which may in turn induce reckless behaviour and harm (e.g. mental health issues and suicides, car accidents when escaping 'danger zones', domestic violence, neglect of other health issues).

Risk science also explains that lay people's risk perception is not only about feelings. It can also capture conscious judgements of uncertainties (Aven 2015, 2018b). History has shown many examples of this, where highly relevant uncertainties were ignored by the professional risk judgements but included in lay people's risk appraisals (for example, in relation to nuclear risk). It is well-documented that traditional, professional perspectives on risk, which are built on probability, historical data and models, have failed to properly reflect the important uncertainty aspects of risk (e.g. Fischhoff 1995; Aven 2011). Contemporary risk science provides clarity on these issues, by showing the importance of knowledge and lack of knowledge when characterizing risk (SRA 2015, 2017a; Aven 2020). The concept of risk includes uncertainties, and people may have good reasons in many cases for questioning issues linked to these uncertainties. If the experts build their risk assessments on a 'narrow' perspective on risk, they may be tempted to downplay such questioning, considering it to be influenced by affects and not the result of conscious judgements of uncertainties and risk.

It is essential for the quality of the analysis that the risk assessments are placed in a 'broad' risk framework (Renn 2008), which gives due attention to all aspects of uncertainties and knowledge. Traditional probabilistic risk assessments are not sufficient for adequately studying risk in the case of large uncertainties. Using such a broad framework makes us better able to understand and value lay-people's risk perception.

4. Science and the precautionary principle

Our basic idea of the precautionary principle is this: if the consequences of an activity could be serious and subject to scientific uncertainties, then precautionary measures should be taken, or the activity should not be carried out (SRA 2015). In this Corona case, we are faced with the potential for serious consequences and there are scientific uncertainties – the principle applies. As most countries have referred to this principle in their policies for confronting the Coronavirus, they have found the principle relevant and meaningful. Nonetheless, the principle has been subject to considerable discussion and critique over the years (e.g. Löfstedt and Vogel 2001; Majone 2002; Sandin et al. 2002; Sunstein 2005; Boyer-Kassem 2017; Stefánsson 2019; Aven 2019). The current situation represents an excellent illustration of why this principle makes sense when faced with high risk for which the uncertainties are large and scientific. Accurate models providing accurate predictions are not available. The precautionary principle should be interpreted as a guiding perspective for prudent risk handling, when faced with such uncertainties (Renn 2008; Aven 2020). There is not really an alternative. Because of the uncertainties, science alone cannot lead us to the right decisions. Yet, it is also our view that the principle should be used 'prudently' and with care and that it should be embedded in a scientific approach. There should not be a conflict between the precautionary principle and science. The precautionary principle should be used to stimulate and justify research aiming at reducing the scientific uncertainties, and this is exactly what happens in the Coronavirus case. While we are on lockdown, new knowledge about the virus and pandemic is gained, theoretical as well as empirical. An adaptive risk handling is adopted all over the world, combining precautionary measures and scientific analysis. We cannot see how it is possible to argue that a policy is purely science-based when the consequences are subject to scientific uncertainties. What can be said is that the policy is informed by science. The fact that different countries have come to different policies demonstrates this.

At this stage of the development of the pandemic (early April 2020), there is a discussion in many countries as to when and how to open up key functions of society again. Experts indicate that the risks in relation to the negative effects of shutdown are as least at large as the risks related to the Coronavirus. These types of statements lack, however, a strong rationale. The uncertainties are too large to make accurate estimates and predictions, yet the elected officials have to make decisions (Van Eeten and Bouder 2012). Then, it is important to acknowledge that there is not a scientifically correct answer. Different weights on the uncertainties would lead to different conclusions. Different 'schools' (e.g. economists, health scientists, health bureaucrats) will provide different perspectives, but in the end it is our politicians that need to balance all the different concerns and views and make the difficult decisions. This is a well-known principle of risk management and governance (Renn 2008; SRA 2017a; Aven 2020), which cannot be repeated too often. How we confront the Coronavirus is mainly politics, not science. It is popular to state that we need to base these decisions on data and data analytics. These are buzzwords today. Without reducing the importance of data, information and knowledge, the present authors are glad that the important decisions that politicians must make in the coming months are not mechanized or automatized. They are too complicated to be prescribed by some algorithms. What are needed are broad deliberations of all relevant input, supported by experts, and that is exactly what our politicians have been elected to do.

5. Conclusions

We conclude that risk science represents an important knowledge basis for guiding the use of concepts, principles, approaches, methods and models for assessing, communicating and handling the Coronavirus risk and related situations. We have here looked into some issues and examples. This science is developing, and its societal impact is still rather limited. As discussed in Aven (2020), efforts are needed to strengthen the foundation and practice of this science. The Society for Risk Analysis (SRA) has formulated general goals and strategies to this end (SRA 2018), which we strongly support. The Coronavirus pandemic demonstrates the relevancy of the risk science in many ways, from risk understanding to risk assessment and communication, and risk handling. Risk is a key concept. Then, it is essential that there is a strong science supporting the analyses and management. The opposite is a situation where different application areas start basically from scratch, developing their own concepts, principles, approaches, methods and models. However, risk is a generic term, and all types of applications would benefit from having a generic, fundamental knowledge basis that integrates the insights from all domains and is able to transform this knowledge back to the different applications.

Disclosure statement

No potential conflict of interest was reported by the authors.

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