



Kaunas University of Technology
Faculty of Social Sciences, Arts and Humanities

Covid-19 Management and Risk Communication in Sweden and Lithuania

Master's Final Degree Project

Gabrielė Ivanauskaitė

Project author

Assoc. prof. Aistė Balžekienė

Supervisor

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Dr. Florian Rabitz

Reviewer

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Kaunas University of Technology
Faculty of Social Sciences, Arts and Humanities
Gabrielė Ivanauskaitė

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Summary

Covid-19 outbreak could be described as the most relevant issue nowadays. Worldwide spread of infectious diseases, so-called pandemics, is definitely a risk for humanity and other spheres, such as economics, politics, environment, society. A risk of infectious diseases is identified in *The Global Risk Landscape 2019-2020* as a societal risk. A successful governance of global health risks is one of the key element in ensuring further well-being for humans and environment. An important knowledge basis for Covid-19 risk, such as guidelines and models for management, communication and etc., can be received from risk science. 'Risk' is the key concept in Covid-19 pandemic, and the relevance of risk science in the context of this pandemic is undoubtable. Covid-19 pandemic influences many spheres over the world, so it should be seen as a comprehensive phenomenon which involves a risk. The scientific problem of the project is different approaches of Covid-19 risk governance and communication in Sweden and Lithuania. The object of the research is Covid-19 risk governance in Sweden and Lithuania. Master Final project aims to analyse Covid-19 management and risk communication in Sweden and Lithuania applying Risk Governance Framework. Tasks to reach the aim are: 1. To analyse theoretical aspects of a risk, governance and communication of infectious diseases; 2. To analyse theoretical aspects of pandemics and Covid-19 management and risk communication; 3. To describe, explain and ground methodology applying Risk Governance Framework for Covid-19 risk; 4. To analyse Covid-19 risk in Sweden and Lithuania according to Risk Governance Framework; 5. To reveal the differences between Lithuania and Sweden in terms of Covid-19 perception, management and communication. An analysis of scientific literature is used in theoretical part in order to reveal relevant aspects of a risk, global health, infectious diseases, risk governance of infectious diseases and other related information. Secondary data analysis (scientific information, statistics, surveys, media, reports) is used in empirical part in order to analyse Covid-19 using Risk Governance Framework. The theoretical part examines a risk concept, other risk-related concepts such as systemic risk, which includes complexity, uncertainty and ambiguity, a global health system with political and non-political actors involved. Infectious diseases, their history, types, governance and communication are also analysed. It concludes with the analyses of pandemics, Covid-19 management and communication. The research methodology part explains and applies Risk Governance Framework to Covid-19 risk. The empirical part analyses Covid-19 risk governance in Sweden and Lithuania using the Framework: pre-assessment, appraisal, characterization and evaluation, management, risk communication. It concludes with Covid-19 risk application to the risk society theory and summarizing key findings. A risk is highly complex phenomenon, which can be external, manufactured, voluntary, involuntary, natural, socially constructed and etc. As a contrast to simple risks, there are systemic risks, for example, Covid-19 risk. Simple, complicated and complex infectious disease threats and five different governance approaches exist. The most important

elements in a pandemic management and communication are planning, appropriate governance and risk communication. Several factors determined Covid-19 crisis, and it is suggested to respond to the crisis comprehensively by using Risk Governance Framework. Risk Governance Framework is a comprehensive approach to analyse a risk, it involves five main parts. Having analysed Covid-19 risk in Sweden and Lithuania, it could be stated that it is difficult task to assess preparedness to deal with the pandemic, and the risk of infectious diseases could be assessed as a tolerable risk. Theoretically, Covid-19 decision-making and management should include different strategies, core-periphery governance and as low as reasonably practicable (ALARP) principle. Risk communication was highly important horizontal aspect in Covid-19 governance, but it was not necessarily proper. Health care systems in Sweden and Lithuania are quite advanced in general context, but Sweden focused on mitigation, and Lithuania focused on suppression during the first wave. This determined different management approaches: relatively soft science-based Covid-19 management with individual responsibilities in Sweden and strict Covid-19 management based on involuntary suppression measures in Lithuania. Risk communication had a major role in Sweden since the management was mostly based on recommendations, and risk communication by mass media was not proper in Lithuania. Although Lithuania was assessed higher in the terms of security, both countries were among the safest countries in September 2020.

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Santrauka

Covid-19 protrūkis gali būti apibūdintas kaip pati svarbiausia problema šiomis dienomis. Pasaulinio masto infekcinių ligų paplitimas, taip vadinamos pandemijos, neabejotinai yra rizika žmonijai ir kitoms sferoms, tokioms kaip ekonomika, politika, aplinka, visuomenė. Infekcinių ligų rizika yra identifikuojama *The Global Risk Landscape 2019-2020* kaip socialinė rizika. Sėkminga globalių sveikatos rizikų valdysena yra vienas iš esminių elementų užtikrinant tolimesnę gerovę žmonėms ir aplinkai. Svarbus žinių pagrindas Covid-19 rizikai, toks kaip nurodymai ir valdymo, komunikacijos modeliai ir tt., gali būti gautos iš rizikos mokslo. „Rizika“ yra esminė sąvoka Covid-19 pandemijoje, ir rizikos mokslo svarba šiame kontekste yra neabejotina. Covid-19 pandemija paveikia daug sferų pasaulyje, taigi ji turi būti matoma kaip visapusiškas reiškinys, kuris apima riziką. Probleminis projekto klausimas yra skirtingos Covid-19 rizikos valdysenos ir komunikacijos prieigos Švedijoje ir Lietuvoje. Tyrimo objektas yra Covid-19 rizikos valdysena Švedijoje ir Lietuvoje. Magistro Baigiamasis projektas siekia analizuoti Covid-19 valdymą ir rizikos komunikaciją Švedijoje ir Lietuvoje taikant Rizikos Valdysenos Sistemą. Uždaviniai tikslui pasiekti yra: 1. Analizuoti rizikos, infekcinių ligų valdysenos teorinius aspektus; 2. Analizuoti pandemijų, Covid-19 valdymo ir rizikos komunikacijos teorinius aspektus; 3. Apibūdinti, paaiškinti ir pagrįsti metodologiją taikant Rizikos Valdysenos Sistemą Covid-19 rizikai; 4. Analizuoti Covid-19 riziką Švedijoje ir Lietuvoje pagal Rizikos Valdysenos Sistemą; 5. Atskleisti skirtumus tarp Švedijos ir Lietuvos Covid-19 suvokimo, valdymo ir komunikacijos požiūriu. Mokslinės literatūros analizė naudojama teorinėje dalyje siekiant atskleisti svarbius rizikos, globalios sveikatos, infekcinių ligų, infekcinių ligų valdysenos aspektus ir kitą susijusią informaciją. Antrinių duomenų analizė (mokslinė informacija, statistikos, apklausos, žiniasklaida, ataskaitos) naudojama empirinėje dalyje siekiant analizuoti Covid-19 naudojant Rizikos Valdysenos Sistemą. Teorinė dalis nagrinėja rizikos sampratą, kitus su rizika susijusias sąvokas kaip sisteminę riziką, kuri apima kompleksiskumą, neapibrėžtumą ir dviprasmiškumą, globalios sveikatos sistemą su įtrauktas politiniais ir nepolitiniais aktoriais. Taip pat analizuojamos infekcinės ligos, jų istorija, tipai, valdymas ir komunikacija. Ji baigiasi pandemijų, Covid-19 valdymo ir komunikacijos analizėmis. Tyrimo metodologijos dalis paaiškina ir pritaiko Rizikos Valdysenos Sistemą Covid-19 rizikai. Empirinė dalis analizuoja Covid-19 rizikos valdyseną Švedijoje ir Lietuvoje naudojant Sistemą: pirminis vertinimas, vertinimas, charakterizavimas ir įvertinimas, valdymas, rizikos komunikacija. Ji baigiasi Covid-19 rizikos pritaikymu rizikos visuomenės teorijai ir esminių duomenų apibendrinimu. Rizika yra labai kompleksinis reiškinys, kuris gali būti išorinis, dirbtinis, savanoriškas, nesavanoriškas, natūralus, socialiai sukonstruotas ir tt. Kaip priešingybė paprastoms rizikos, yra sisteminės rizikos, pavyzdžiui, Covid-19 rizika. Egzistuoja paprastos, komplikotos ir kompleksinės infekcinių ligų grėsmės ir penkios skirtingos valdysenos prieigos. Svarbiausi elementai pandemijos valdyme ir komunikacijoje yra planavimas, tinkama valdysena ir rizikos komunikacija.

Keletas faktorių nulėmė Covid-19 pandemiją ir yra siūloma reaguoti į krizę visapusiškai naudojant Rizikos Valdysenos Sistemą. Rizikos Valdysenos Sistema yra visapusiškai prieinama analizuoti riziką, ji apima penkias pagrindines dalis. Išanalizavus Covid-19 riziką Švedijoje ir Lietuvoje, galima teigti, kad įvertinti pasiruošimą susidoroti su pandemija yra sunki užduotis, ir infekcinių ligų rizika gali būti vertinama kaip toleruotina rizika. Teoriškai, Covid-19 sprendimų priėmimas ir valdymas turėtų apimti skirtingas strategijas, centro-pakraščio valdyseną ir mažinimo, kiek tai yra pagrįstai tikslinga (ALARP) principą. Rizikos komunikacija buvo labai svarbus horizontalus aspektas Covid-19 valdysenoje, bet ji buvo nebūtinai tinkama. Sveikatos apsaugos sistemos Švedijoje ir Lietuvoje yra gana pažengusios bendram kontekste, bet Švedija koncentravosi į sumažinimą, o Lietuva – į nuslopinimą per pirmąją bangą. Tai nulėmė skirtingas valdymo priemones: santykinai švelnus mokslu grįstas Covid-19 valdymas su individualia atsakomybėmis Švedijoje ir griežtas Covid-19 valdymas grįstas nesavavariškais slopinimo priemonėmis Lietuvoje. Rizikos komunikacija turėjo svarbų vaidmenį Švedijoje, kadangi valdymas buvo daugiausiai grįstas rekomendacijomis, o žiniasklaidos rizikos komunikacija buvo netinkama. Nors Lietuva buvo įvertinta aukščiau saugumo požiūriu, abidvi šalys buvo tarp saugiausių 2020-ųjų rugsėjį.

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Introduction

The relevance of the topic. Worldwide spread of infectious diseases, so-called pandemics, is definitely a risk for humanity and other spheres, such as economics, politics, environment, society. A risk of infectious diseases is identified in *The Global Risk Landscape 2019-2020* as a societal risk (The World Economic Forum, 2020). A successful governance of global health risks is one of the key element in ensuring further well-being for humans and environment.

Coronavirus (Covid-19) infection has caused a global crisis, and just after three months from the first case, infection has spread around the world. Covid-19 pandemic announced by WHO has affected more than 110 countries. It is the object of interest of society, media, politics and medicine. (Mitkutė, Guzevičius & Krasauskaitė, 2020) Covid-19 causes more deaths than other causes including malaria, road traffic accidents, suicides, HIV/AIDS daily. (United Nations [UN] Development Programme, 2020).

Covid-19 can become the main cause of death in the future. This crisis has impact not only on health, but also on politics, economics and society. For example, human development index, as estimated, will decrease dramatically particularly due to education gaps and economic containment. (UN Development Programme, 2020) Covid-19 is systemic crisis which requires comprehensive response from policymakers, healthcare sector and public.

An important knowledge basis for Covid-19 risk, such as guidelines and models for management, communication and etc., can be received from risk science. 'Risk' is the key concept in Covid-19 pandemic, and the relevance of risk science in the context of this pandemic is undoubtable. Covid-19 pandemic influences many spheres over the world, so it should be seen as a comprehensive phenomenon which involves a risk. (Aven, Boudier, 2020)

The novelty of the topic. Coronavirus (Covid-19) infection is viral respiratory disease, caused by severe acute respiratory syndrome coronavirus 2, SARS-CoV-2, and spreads through airborne or contact. Since the first outbreak in Wuhan in December 2019 in China, infection has spread globally, and when there were more than 118000 cases, World Health Organization has announced Covid-19 pandemic. It has influenced more than 110 states. (Mitkutė, Guzevičius & Krasauskaitė, 2020) Since the topic is very recent and proper Covid-19 management and risk communication can help fight the disease, there is a need for more comprehensive researches on Covid-19.

Sweden diverged from other countries in terms of Covid-19 pandemic management. While other countries focused on suppression measures and quarantines, Swedish approach was described as soft and irresponsible by international media. (Nygren, Oloffson, 2020) Due to an absence of strict and controlling regulation, a lot of countries marvelled and criticized the Swedish management. (Kavaliunas, Ocaya, Mumper, Lindfeldt & Kyhlstedt, 2020, p. 3) Lithuania is chosen as a contrary for Sweden in order to highlight Sweden's difference. Although Lithuania is in the same geopolitical region as Sweden, these neighbour states managed the risk differently.

The scientific problem of the research. The scientific problem of the project is different approaches of Covid-19 risk governance and communication in Sweden and Lithuania.

The object of the research. Covid-19 risk governance in Sweden and Lithuania.

The aim of the research. To analyse Covid-19 management and risk communication in Sweden and Lithuania applying Risk Governance Framework.

Tasks to reach the aim:

- To analyse theoretical aspects of the risk, governance and communication of infectious diseases;
- To analyse theoretical aspects of pandemics and Covid-19 management and risk communication;
- To describe, explain and ground methodology applying Risk Governance Framework for Covid-19 risk;
- To analyse Covid-19 risk in Sweden and Lithuania according to Risk Governance Framework;
- To reveal the differences between Lithuania and Sweden in terms of Covid-19 perception, management and communication.

The methods of the research. An analysis of scientific literature is used in theoretical part in order to reveal relevant aspects of a risk, global health, infectious diseases, risk governance of infectious diseases and other related information. Secondary data analysis (scientific information, statistics, surveys, media, reports) is used in empirical part in order to analyse Covid-19 using Risk Governance Framework.

The structure of the project. The Master Final project consists of summaries in Lithuanian and English, introduction, theoretical, methodological and empirical parts, conclusions, recommendations list of references and information sources. The project begins with the theoretical part, which describes theoretical material needed to cover the topic properly. Methodological part involves the methodology used in the research, Risk Governance Framework. The empirical part aims to analyse Covid-19 risk in Sweden and Lithuania.

1. Theoretical aspects of risk phenomena and governance of infectious diseases

The theoretical part is dedicated to the analysis of risk and related concepts, risk-related phenomena, infectious diseases, pandemics, their governance, management and communication. This part is divided into three subchapters, each subchapter has sections. An analysis of scientific literature covers relevant theoretical aspects, which are important for Covid-19 risk.

1.1. Risk concepts and risk-related phenomena

Relevant risk conceptions, aspects of risk management and global health governance and the role of political institutions in global health are presented this chapter of the theoretical part. This information is important to Covid-19 pandemic and risk of infectious diseases.

1.1.1. Risk and related concepts

The worldwide spread of infectious diseases, so-called pandemics, is definitely a risk for humanity and other spheres, such as economics, politics, environment. Risk of infectious diseases is identified in *The Global Risk Landscape* as a societal risk (The World Economic Forum, 2020). A risk itself is a complicated phenomenon, and its perception can vary from a very simple explanation of definition to a more sophisticated analysis according to a risk governance framework. So, firstly it is important to define “risk” and related concept.

Nowadays, the term “risk” is so prevalent in a daily life, people use this concept when they want to emphasize dangerous, negative or even hurtful consequences that may happen. People use this concept without major considerations in multiple contexts, so it is interesting to find how risk is defined by experts.

First of all, there are two types of risk – objective risk and perceived risk. Objective risk is objects, that are “known” by experts. Perceived risk is feeling about future events, which often are very different. There were efforts to justify risk in scientific manner in 1983: risk is a probability that a particular negative event happens at a particular time, and it is a consequence of particular event. According to a statistical theory, risk as a probability corresponds to all the formal laws of probabilities combinations. (Adams, 2001) Nowadays, this concept has become old-fashioned, risk should be perceived as complex phenomenon, especially in social sciences.

As mentioned above, risk is a complex, multiple phenomenon, which holds a lot of definitions. Risk is found in different disciplines, from natural science to social science. The focus is on a relation between the phenomenon and negative, undesirable consequences. A phenomenon which has at least one negative or undesirable outcome is considered as risk. *Society for Risk Analysis* suggests seven definitions of a risk, including simple ones, for example, that risk is possibility of an unfortunate occurrence, and more sophisticated ones, for example, that risk is an uncertainty and severity of the consequences of an activity with respect to something that humans value. (Society for Risk Analysis Glossary [SRA Glossary], 2018)

One of risk definitions is that risk is- a combination of a probability of an event and its consequences. The term “risk” is usually used only when there is a probability of negative consequences. In some

cases, risk emerges due to a deviation from an expected result or a probability of an event. (Lietuvos Respublikos Vidaus reikalų ministerija [VRM], 2005)

According to sociologist Britt-Marie Drottz-Sjöberg (cited in Balžekienė, 2009), risk can be interpreted as:

- Physical feature of dangerous technology;
- Socially created, emphasizing that risk identification, evaluation and perception cannot be distinguished from values.

The first attitude is common in natural sciences, the second – in social science, where the aim is to analyse social aspects of risk perception. Risk perception – intuitive evaluation of dangers emerged from technologies, the keywords are subjective, intuitive evaluation, according to Slovic. (cited in Balžekienė, 2009) This determines a society's reaction to it: whether a technology will be accepted or rejected by a society and its further development abilities. (Balžekienė, 2009)

Five different definitions of “risk” are provided by Boholm, Moller & Hansson (2016):

- “an unwanted event that may or may not occur”
- “the cause of an unwanted event that may or may not occur”
- “probability of an unwanted event that may or may not occur”
- “the statistical expectation value of an unwanted event that may or may not occur”
- “the fact that a decision is made under conditions of known probabilities” (Boholm, Moller, Hansson, 2016, p. 321)

The opposite concepts to “risk” are “safety” and “security”, however, they share just a few common features. For example, these three concepts are organized around potential uncertain adversity and have the same so called “threat-asset” structure. Also, they are the objects of cognition and communication. Risk and safety are usually conceived of as a location, and such terms associations like economy and finance connect risk with security. (Boholm, Moller, Hansson, 2016).

Risk is not a purely negative concept, it involves a balance between profit and loss. It is related to a degree of uncertainty. According to Adams (cited in Smith, 2013), if there is no uncertainty – the outcome of an event is known – there is no risk. Smith (2013) suggests such a formula of a risk:

Risk = Hazard probability x Elements at risk x Vulnerability (Smith, 2013, p. 71)

There is a need to distinguish the concepts “risk”, “threat” and “danger”. Although both “risk” and “threat” define danger, they are not the same, they are used as different terms in sociological risk theory. The difference is suggested by sociologist A. Giddens. (cited in Balžekienė, 2009) Risk describes threats, which are actively assessed considering the future's possibilities. Risk should be a lever to normalize and manage the future, however, both terms describe a probability of negative effects of a particular event. (Balžekienė, 2009)

As it can be seen from the formula above, risk and hazard are two different concepts. Hazard refers to an object which could potentially cause harm, and it becomes a risk only when there is an exposure. So, consider all hazards as risks is incorrect. While risk is an action, where harm appears from a hazard, risk measures the likelihood of this. For instance, a shark as a hazard cannot cause harm to particular individual, if there is no exposure: – that particular individual does not go near the ocean.

The issues arise when an identification of hazards, the first step of a risk assessment, is presented as risk assessment. However, an identification of hazards is confused with risk assessment quite often. (Bernstein, 2018)

Nowadays the concept “risk” has become an integral part of a society. In other words, it is an object of sociology, not only of exact sciences, where “risk” is a probability of an unwanted event. This perception does not include uncertainty and possibility of a human error. So, according to Giddens (cited in Balžekienė, 2009), there are two types of risk in social science:

- External type of risk emerges due to nature, stability of traditions. It emerges due to nature forces mostly;
- Manufactured type of risk is called as man-made risk, and it is being related with technologies. This term defines technological and ecological risks caused by anthropological reasons.

Speaking about manufactured risks, Giddens (cited in Balžekienė, 2009) wrote, that people started worrying less about natural risks, i.e. what nature can do to us, but more about what they have done to the nature, and it is a transition from the dominance of external risks to manufactured risks. (Balžekienė, 2009) People’s evaluation of a risk is strongly related to risk perception. Regarding to perception, Smith (2013) categorizes risks in two types:

- Involuntary risks refer to risks that occur without people’s prior knowledge or consent. They are often external environmental risks, such as earthquakes;
- Voluntary risks refer to the activities that people choose to do or take, they are usually acceptable to people and controllable. For example, driving a car or smoking. They can be controlled by human behaviour/choice or government actions.

Involuntary risks often mingle with voluntary risks, so the distinction is not always visible. Also, voluntary risks are not equally accepted by the whole community, it depends on what benefits it provides (how beneficial risk is perceived by particular individual). So, when specifying the level of risk acceptability and tolerability, it needs to be emphasized to whom the risk is acceptable and tolerable. (Smith, 2013)

All the definitions of concept “risk” are similar, some emphasize a negative effect or an event, other focus on risky decision, that is made considering the negative effect. The risk of infectious diseases (pandemics) can fit in the frame of risk concepts. Considering the type of risk, infectious diseases like Covid-19 are external and involuntary risks, but the consequences of them, for example, environmental pollution with masks and other hygiene items, which can be considered as ecological risk, are manufactured risks. They are involuntary risks, but some decisions can be voluntary, for example, not to get vaccinated, to go out or do not wear masks. However, governments try to reduce risks of diseases by making safety measures mandatory.

The prevalence of risks could be based on risk society theory. The theory is highly applicable in nowadays Covid-19 pandemic context. The main idea of risk society theory by U. Beck (1992), which gained a lot of attention, is that a risk and a danger do not longer fit into the frame of time and space, they are transmitted to the future, they overcome social classes limits and states borders. There is no “culprit”, who is responsible for a risk, to compensate damages caused by a risk become problematic; the ability of modern societal institutions to define and control threats is questionable. The main features of risk society are that risks and threats are socially distributed, knowledge is theoretical and

scientific, the aim of society's development is the elimination of a risk, ethos is security, the basis of social unity is anxiety, and the structure of society is individualism. (Rinkevičius, 2002)

Risk society and world risk society is described as an emergence of new risks that could not be controlled by the state and nationally. Society 'behind the modern' was a classical and old industrial society that is replaced by the new risk society or the world risk society, global risk society. A. Giddens explained that society 'behind the modern' is 'the other modernity'. Living in a risk society refers to an encounter with such risks that did not emerge in previous ages. Ecological risks, climate change, population growth, social inequalities and poverty, crime, terrorism are several examples of a risk society, and Giddens especially emphasized global warming and genetically modified organisms. Generally, risk society is consequences of wealth and poverty, and it can be explained through war and terror, economic globalization and neo-liberalism, state and sovereignty. (Kovačević, Kovačević, 2017)

There are not only simple risks, but risks that involves a lot of hazards and other elements. Covid-19 is such risk as it includes several risks: risk for human health, risk for environment, risk for finance system and economics. In other words, this risk affects the whole global system. It is called systemic risk. According to Klinke & Renn (2006), systemic risk includes four or less elements:

1. Complexity – it is a difficulty to identify and quantify casual links among potential candidates and specific negative effect. Adverse consequences relationship is not obvious and directly observable (may be delay effect) – this is nonlinear risks. (Klinke, Renn, 2006). In other words, complex risk has a few causes and negative effects.

Complexity is described as difficulties to identify the cause of adverse effects. For example, the disruption of interconnected system as electricity grids or the Internet is complex risk. (International Risk Governance Council [IRGC], 2017)

2. Uncertainty – these are components as statistical variance, measurement error, ignorance and indecision, which have one common feature – uncertainty, which reduces confidence in estimated cause and effect chain. If knowledge base is missing or the effect is uncertain, the risk involves high degree of uncertainty. (Klinke, Renn, 2006) In other word, uncertainty refers to difficulty to predict consequences.

A lack of scientific or technical data, clarity or quality data could be understood as uncertainty. It is also related to level of confidence. Example is uncertain potential impacts of developments in biotechnology. (IRGC, 2017)

3. Ambiguity – it is variability of legitimate interpretations grounded on identical data or assessments. Ambiguity refers to differences to interpret situation. Even simple risks can hold ambiguity, but usually ambiguous risks are complex and uncertain risks. (Klinke, Renn, 2006)

Ambiguity is different perspectives on the risks, its likelihood and severity of negative outcomes. They are risks, where controversies can emerge. For example, economic, ethical issues, food industry. (IRGC, 2017)

4. Ripple effects – these are secondary and tertiary consequences regarding time and space, which exceed domestic regulations and policies. (Klinke, Renn, 2006) They are effects that emerge after some time.

Systemic risks do not only cause negative consequences to human health and the environment, but also have secondary and tertiary effects, they are found in larger context of societal, economic and political fields. (Klinke, Renn, 2006) Systemic risk is also being related with finance and economics. For example, Smaga (2014) has written that the concept of “systemic risk” often emphasizes concerns about a large part of financial system or number of financial institutions and disruption of performance of them and its functions, such as financial intermediation. In this case, the key element is transmission of disturbances among elements in the system, which may have negative impacts on economy. (Smaga, 2014) Such conception can be applied to other systemic risks as well.

Systemic risk evaluation includes not only the two classical components – extent of damage and probability of occurrence – but also a lot of others. Klinke & Renn (2006) provide these criteria:

- Extent of damage – classical component, which describes negative effects in units, for instance, deaths, injuries, loss;
- Probability of occurrence – also classical component, refers to estimation of relative frequency of an event;
- Incertitude – it involves different uncertainty components;
- Ubiquity – geographical dispersion of possible damage;
- Persistency – temporal extension of possible damage;
- Reversibility – it refers to possibility to restore something to previous, undamaged situation (potential restoration);
- Delay effect – time period or log time of latency between primary event and actual consequences of it;
- Violation of equity – inadequacy between the ones who gets benefits and the ones who takes the risk;
- Potential of mobilization – violation of individual and other interests and values, which causes social conflicts, by individuals or groups who feel injured by the risk consequences. (Klinke, Renn, 2006)

Renn & Klinke (2013) have also indicated that such collectively relevant risks as global environmental or health threats include characteristics of a systemic risk: 1) complexity, when it is difficult to identify and quantify relations between potential causes and adverse effects, the risk has probabilistic non-linear relationship between these elements. Complex risk is not directly observable as it may have feedback loops, long delay periods, different variations and etc.; 2) scientific uncertainty, when scientific knowledge is limited or non-existed, it is hard to assess the probability and the impact of the risk. Scientific uncertainty often comes from complexity, incompletely, and human knowledge is always incomplete. Uncertain events can only be predicted; key characteristics of scientific uncertainty are: variability, inferential effects, indeterminacy, system boundaries, ignorance; and 3) Socio-political ambiguity, when the risk is ambivalent, has several interpretation and perspectives, it is characterized as ambiguous. As more information about the risk reduces scientific uncertainty, it may not reduce socio-political ambiguity. (Renn, Klinke, 2013)

Related concepts to “risk” and “systemic risk” are “risk assessment”, “risk perception”, “risk analysis”, “risk management”, “risk characterization” and “risk communication”. According to Society for Risk Analysis, risk assessment refers to a systematic process that allows to perceive the nature of a risk, to express the risk using available knowledge. (SRA Glossary, 2018)

Risk assessment – process, when probability of a risk and consequences are expressed by exact value. Various variable, which correspond with a method of risk assessment, can be used for it, such as expenses, benefit and subject’s interests. (VRM, 2005). There will be presented risk of infectious diseases assessment by World Economic Forum, which corresponds with this definition (it includes impact and likelihood assessment measured by numbers).

According to Smith (2013), there are three steps of risk assessment:

- The identification of hazards;
- The estimation of the likelihood (probability) of the occurrence of hazardous event;
- The evaluation of the social consequences i.e. what is estimated loss. (Smith, 2013, p. 75)

This process is complex since there is a need to understand the magnitude of an event. The same event can have different extent of the consequences, for example, avalanches. If the consequences would be the same every time, the risks there assessed by only calculating the frequency (probability). But consequences are different, so risk is probability x loss. (Smith, 2013, p. 75)

Risk perception is a process of collecting, selecting and interpreting signals about uncertain impacts of events, activities, or technologies. (Renn, Klinke, 2016) These signals are from:

- Direct experience – witnessing an event;
- Indirect experience – knowing information from others or elsewhere.

A risk cannot be perceived by human senses objectively, as people use mental models, psychological mechanisms, which are influenced by social and cultural context, media reports, peer influence and other communication means. Perceptions are images of real phenomena, and they can differ depending on the type of a risk, the risk and social contexts, the personality of a specific individual. Other factors, which allow to determine seriousness and acceptability of the risk, are knowledge, experience, values, emotions, attitudes. Perceptions are crucial to motivate individuals to avoid, ignore, adapt to, mitigate or take actions. (Renn, Klinke, 2016)

For example, management of Covid-19 risk and public policies depend on perceptions as well. It is useful to apply complex research models, to use qualitative and quantitative research methods while researching risk perceptions. They would help to reveal both initial structure of perceptions and external factors such as an influence of media, civil society, political processes. (Balžekienė, 2009) The definition which summarizes and repeats information provided by Klinke & Renn is that risk perception refers to individual’s subjective judgmental, appraisal of a risk. (SRA Glossary, 2018) Risk analysis is broad concept, it includes the whole process of risk assessment, perception, management, communication and etc. Risk analysis appears in multiple contexts: public or private sectors, at national, regional, global or local levels. According to *Society for Risk Analysis*, it shares the same definition as risk assessment. (SRA Glossary, 2018)

Risk analysis – a systemic usage of information trying to identify sources and to assess a risk. Risk analysis creates a basis for risk assessment, risk management and risk acceptance. Information includes actual data, theoretical analysis, authoritative opinions and subjects' interest. Risk analysis is mandatory process for each organization, which seeks security, but processes of security management should be directed to factors which have critical meaning. Otherwise, there is a big ability of a failure. (VRM, 2005) Features of risk analysis:

- Safety policies, tasks and actions should reflect organization's tasks;
 - Introduced safety measures should correspond with organization's culture;
 - Obvious leadership's support and attention is necessary;
 - Good understanding of safety requirements, risk analysis and risk management is necessary;
 - Effective explaining of safety concept to leaders and employees is necessary;
 - Information about safety policies and standards should be distributed to all the employees and contractors;
 - It is necessary to ensure education and trainings;
 - Comprehensive and well-balanced assessment system, which allows to assess functionality of information safety management and take suggestions about improvements, is necessary.
- (VRM, 2005)

Even these features are of organization's risk analysis, they could be applied to state level risks, such as pandemics. Government's departments, ministries should analyse the risk and coordinate their actions in order to implement effective risk management.

Risk management – coordinated actions, which seek to manage and control a risk. Usually risk management involves risk analysis, risk supervision, risk acceptance and informing about a risk. (VRM, 2005) According to *Society for Risk analysis*, risk management refers to activities (actions) to handle a risk. These activities can be prevention, mitigation, adaption, sharing (SRA Glossary, 2018) *Risk characterization (risk description)* – a structural statement of the risk (qualitative or/and quantitative picture) that usually includes: risk sources, causes, events, consequences, uncertainty representations/measurements, knowledge for making judgements (SRA Glossary, 2018)

Society for Risk Analysis describes *risk communication* as a process of exchanging and sharing of risk-related information, knowledge and data between/among various target groups, for instance, regulators, consumers, stakeholders, media, general public. (SRA Glossary, 2018) The aim of risk messages is to reduce the possibility (likelihood) of occurrence of crisis in the long perspective. Nowadays effective and responsible risk communication allows to develop working relationships among stakeholders and public. (Infanti, Sixsmith & Barry, 2013)

1.1.2. Risk management and global health governance

Alam (2016) has distinguished five main steps of risk management that also are used in healthcare:

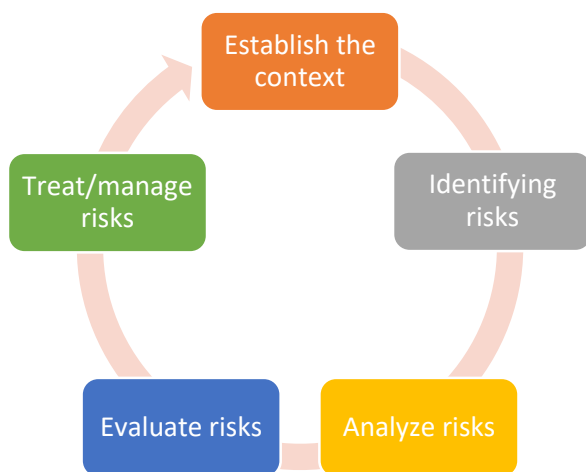


Fig. 1. Steps in risk management (Made by the author according to Alam, 2016)

UK Government (2017) have distinguished three core elements for effective risk management:

Table 1. Three core elements of risk management (Made by the author according UK Government, 2017)

	Activities/measures
Building blocks	Creation of positive risk management behaviours and culture; implementation of roles and responsibility; communication of risk information; creation of risk capability (training for risk practitioners)
Routine processes	Identification of risks (and who is responsible of management); process of addressing risks (establishment of tolerance, contingency arrangements); reviewing, monitoring and reporting
Periodic activities	Scanning the horizon (environment); building risk maturity; learning lessons; peer reviews; exploiting data and data analytics, building and testing resilience framework and etc.

Kaplan & Mikes (2012) have suggested to categorize risks for risk management. This categorization is named a new framework. The article was published in business section, but it could be applied to public risks such as global health as well. Table below describes categories and provides management strategies for each of them:

Table 2. Three categories for risk management in business (made by the author according to Kaplan & Mikes, 2012)

	Category I: Preventable risks	Category II: Strategy risks	Category III: External risks
Description	Internal risks, arising from within the organization; These are unauthorized, illegal, unethical, incorrect, inappropriate actions; Controlled and should be eliminated or avoided as	Voluntarily accepted risks; They are not undesirable; They are taken as they are expected to bring benefits; They include credit risks, research and development activities.	Arise from outside the company; Uncontrollable by company; These include natural and political disasters, major macroeconomic shifts; Cannot be prevented.

	they have no strategic benefits.		
Management	A zone of tolerance for some of these risks as completely elimination would be too costly; Active prevention: monitoring, guiding; Rules-based compliance approach.	Risk-management system to reduce the probability of risk occurrence; Improving company's ability to manage such risk and not to prevent from higher-risk, higher-reward.	Management should focus on identification and mitigation of the impact; Open and explicit risks discussion approach.

It is important to emphasize that risk management often includes trade-offs between cost and benefits to reduce a risk. It is a choice of a level of a tolerable risk. (SRA, 2018) An essential part of risk management is to decide which strategy (activities) to use. In order to do this, a risk need to be characterized. This is also relevant to global health risks.

Classical risk class model according to Greek Mythology suggested by Klinke & Renn (2006) could be used for characterization, when a risk has to be allocated to one of six risk classes. The classes depend on probability and extent of damage. According to the authors, the knowledge base is provided by this characterization, so politicians decision-makers have guidance for selecting management measures for each class. These three management strategies are being related with systemic risks, particularly uncertainty, complexity and ambiguity. (Klinke, Renn, 2006).
Management strategies:

1. Science-based for risk classes Sword of Damocles and Cyclops;
2. Precautionary for risk classes Pythia and Pandora's Box;
3. Discursive for risk classes Cassandra and Medusa. (Klinke, Renn, 2006).

According to Adams (2001), risk management – a big business. An authoritative formal sector, this is experts' management, involves government, business and industry. Risk management provides jobs for insurance experts, doctors, drivers, engineers, policemen, IT specialists and others. The work of this sector is obvious: it involves juridical activities and investigations, law, legal acts, security trainings, traffic regulations. Risk management could be compare to fence that locks the gates. A lot of people work in order to mitigate risks. (Adam, 2001) Covid-19 management provides work for several sectors. First of all, public – governments, public healthcare specialists, doctors. Private sector can be involved as well, for example, private health care. Communication specialists are needed for risk communication.

A risk has to be characterized and evaluated for risk management, especially systemic risks. One of the suitable manner – to use previously mentioned risk classification model according Greek Mythology by Klinke & Renn (Klinke, Renn, 2006). It includes six classes: *risk class Sword of Damocles*, *risk class Cyclops*, *risk class Pythia*, *risk class Pandora's Box*, *risk class Cassandra*, *risk class Medusa*. Each class has a mythological description applied to risks, and the main aim of the risk classification is to determine in which area – normal, intermediate or intolerable – the risk is located. Risk classes according the Greek mythology are:

- Sword of Damocles. According to the myth, Damocles had to eat his meal under very sharp sword, which was hung above his head, at the king's house. This myth implies the possibility of fatal consequences, but the probability of its occurrence is low;

- Cyclops. This class involves risks with uncertain likelihood and high impact. Cyclops were giants with only one eye, so they could see only one side of reality, and this refers to one perspective on the risk;
- Pythia. When both the probability of an occurrence and the extent of a damage are uncertain, the risk is in the class Pythia. Pythia was a blind oracle, who intoxicated herself with gases, but her predictions were uncertain;
- Pandora’s box – the myth says that it is a mysterious box brought to earth by Pandora. This box contains evils, but if the box is closed, the evils stays in it. The myth refers to uncertain risks, which cause damage only after ubiquitous diffusion;
- Cassandra. The probability of an occurrence and the extent of a damage are high and relatively well-known, but the risk is ignored. Like Cassandra’s prediction about Trojan, which was not taken seriously;
- Medusa. Medusa was one of the imaginary Gorgon, Geeks feared her as she turns everything into stones. The risk has low probability of an occurrence and extent of a damage, but people fear of it without a valid basis. (Klinke, Renn, 2006)

This determination let to decide which effective measures should be taken to manage the risk. (Klinke, Renn, 2004) Table below summarizes management strategies:

Table 3. Overview of management strategies (Klinke, Renn, 2004, p. 7)

Management	Risk class	Extent of damage	Probability of occurrence	Strategies for action
Science-based	Damocles Cyclops	High High	Low Uncertain	Reduction of disaster potential; Ascertaining probability; Increasing resilience; Preventing surprises; Emergency management
Precautionary	Pythia Pandora	Uncertain Uncertain	Uncertain Uncertain	Implementation of precautionary principles; Development of substitutes; Improvement of knowledge; Reduction and containment; Emergency management
Discursive	Cassandra Medusa	High Low	High Low	Consciousness-building; Confidence-building; Public participation; Risk communication; Contingency management

There are many concepts of a global health. Some global health definitions emphasize such types of health problems as communicable diseases; but the key is to understand international transmission of health risks. A global health governance refers to a management of organized social response to health problems at the global level. A governance of global health requires an involvement of different actors. According to Frenk & Moon (2013), there are four key functions (see table 4) need to be ensured in global health governance. These functions also need to be divided among various actors in more clearly manner in order to implement an effective governance. (Frenk, Moon, 2013)

Table 4. Key functions of global health governance (Frenk, Moon, 2013, p. 940)

Function	Sub-functions
Production of global public goods	Research and development, standards and guidelines, comparative evidence and analysis
Management of externalities across countries	Surveillance and information sharing, coordination for preparedness and response
Mobilization of global solidarity	Development of financing, technical cooperation, humanitarian assistance, agency for the dispossessed
Stewardship	Convening for negotiation and consensus building, priority and rule settings, evaluation for mutual accountability, cross-sector health advocacy

1.1.3. The role of political and other institutions in global health system and risk management

A global health system involves a lot of actors, and their role is to improve health regarding rules and norms, which establish relationships. The core of a global health system consists of political institutions: national governments, health ministries, departments, agencies, bilateral development cooperation agencies. Other important actor is World Health Organization (WHO). WHO is a central to the system, and this organization is created on the universal membership of all recognized sovereign states; this feature makes WHO unique actor in the system. Other actors are United Nations, multilateral agencies with health components, civil society organizations, multinational corporations, foundations, academic institutions, hybrid organizations, initiatives, fund, donors and agencies. One of the core feature of global health system is that it is influenced by other policymakers. For example, World Trade Organization regulates pharmaceuticals. Moreover, as global health system involves many actors, the three main challenges to global health management exist: the sovereignty challenge, the sectoral challenge and the accountability challenge. (Frenk, Moon, 2013) Back to the actors in global health system, they can be divided into groups:

Table 5. Actors and institutions in global health system (Made by the author according to Frenk & Moon, 2013)

	Examples
National governments	Ministries of health, ministries of foreign affairs, bilateral developments cooperation agencies
United Nation systems	WHO, UNICEF, United Nations Population Fund, Joint United Nations Programs on HIV/AIDS
Multilateral development banks	World Bank (health and other social services), Regional development banks
Global health initiatives (hybrids)	Global Funds to fight AIDS, Tuberculosis and Malaria, GAVI Alliance, UNITAID
Philanthropic organizations	Bill and Melinda Gates Foundation (global health), Rockefeller Foundation (all sectors), Wellcome Trust
Global civil society organizations and non-governmental organizations	Doctors without Borders, Oxfam International, CARE International
Private industry	Pharmaceutical companies (global market)
Professional associations	World Medical Association
Academic institutions	Postsecondary educational institutions for health professionals

According to Zakus, Bhattacharyya & Wei (2015), a health care system and its management include these participants:

- Ministries of health and other ministries at national and regional levels;
- Insurance organizations;
- Public enterprises;
- Private sector actors;
- Professional unions, groups;
- Voluntary organizations;
- Health education institutions and organizations;
- Public participants;
- International actors such as WHO, UN, World Bank, agencies, foundation, donors, partnerships, NGO and etc. (Zakus, Bhattacharyya & Wei, 2015)

Nowadays, a global health and security are linked together, so many institutions are involved in the management process. For instance, in February, 2014, an agenda for global health security was introduced by many institutions: federal agencies in the US (Department of Health and Human Services, Defence, State and Agriculture, the Centres for Disease Control and Prevention and others), partners such as World Health Organization, World Organization for Animal Health, Food and Agriculture Organization of the United Nations and 30 countries. The main objective of *Global Health Security Agenda* is to improve global capabilities to respond to infectious diseases outbreaks. As *Global Health Security* has identified, their vision is a safe and secure world from such threats as infectious diseases, whether it would be mitigation, preventions or rapid detection. (Quinn, Kumar, 2014)

As indicated, World Health Organization has a major role in global health governance. WHO is described as authority, which directs and coordinates international health work, but due to growing number of partnerships, WHO has a dual governance role:

- WHO as an active member of the partnership in its own right;
 - WHO as a board member with responsibilities for the governance of the partnership itself.
- (World Health Organization [WHO], 2015, p. 7)

A health governance is strategic priority for WHO; these priorities include positioning and promoting health, working on non-communicable diseases, implementing universal health coverage and etc. Moreover, there is *International Health Regulations* introduced by WHO in 2005, which provide the key measures in order to achieve collective health security. (WHO, 2015) Effective risk management should be also divided inside the government. There are certain roles which should be implemented by government's actors:

Table 6. Risk management in government (Made by the author according to UK Government, 2017)

	Role (with regards to risk)
Ministers	Setting direction against political imperatives; articulating high-level attention to them
Accounting Officers	Setting a proper tone from the top for managing the risk
The Board/Senior Executive Team	Supporting Accounting Officer, leading role in assessing and managing the risk

The Audit and Risk Assurance Committee	Supporting the board and Accounting Officer; review of comprehensiveness and reliability of assurances on risk management.
Managers – 1 st line	Active daily management and identification of risks; rapid announcements on them
The Risk Management Function – 2 nd line	Supporting and facilitating management: building capability, defining risk management practices and framework
Internal Audit – 3 rd line	Providing objective assurance of effectiveness of risk management; sharing good practices

1.2. Key aspects, risk governance and risk communication of infectious diseases

There are presented relevant infectious diseases information in this section of the theoretical part: key aspects, risk governance and risk communication of these type of diseases. It could be directly applied to Covid-19 risk.

1.2.1. Key aspects of infectious diseases

Infectious diseases – diseases caused by microorganisms called pathogens. Pathogens can be bacteria, viruses and fungi. Infectious diseases can be transmitted in several manners, including skin contact, bodily fluids, inhaling particles and etc. An immune system protects from infectious diseases, but some pathogens are more powerful than the system. While some pathogens are ineffective, other transmit toxins and inflammatory substances. Infectious diseases could be very harmful and resistant to treatment. Covid-19 is infectious disease caused by a virus, other well-known viral infections are the common cold, Zika virus, Ebola, Influenza (flu) and etc. (Felman, 2020)

Infectious diseases are also called transmissible or communicable diseases. Infectivity itself is the ability pathogens to enter, survive and multiply, while infectiousness describes the ability to transmit diseases. Hygiene is the most effective manner to prevent transmission of infectious diseases. For instance, respiratory infectious diseases such as Covid-19 is commonly transmitted through aerosolized droplets. Prevention and mitigation of spread of infectious diseases include recognition of different characteristics of different diseases and recognition the effects of small-world network. These networks refer to the elimination of infected hubs; the main focus should be on prevention of transmission in these hubs. (Kumar, Damodar, Ravikanth & Vijayakumar, 2012)

Kenis, Schol, Kraaij-Dirkzwager & Timen (2019) have distinguish three types of infectious disease threats. According to them, governance responses should depend on these types.

Table 7. Three types of infectious disease threats (Made by the author according to Kenis, Schol, Kraaij-Dirkzwager & Timen, 2019)

Type of infectious disease threat	Description
Simple	Level of knowledge is high, level of perception and scope are low; available protocols can be repeated as effective crisis response
Complicated	Level of perception is low; level of knowledge and scope are high; sufficient available knowledge about cause of disease and response approach; threat is uncertain and additional expertise is required for effective response

Complex	Lack of knowledge; high level of perception; combination of these leads to risk with multiple uncertainties; limited or unavailable protocols; specific governance is needed
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Infectious diseases that cross international boundaries are called pandemics. In order to name a disease a pandemic, it must be infectious. There were a lot of pandemics in the history, from smallpox and tuberculosis to HIV/AIDS and H1N1. Historical pandemics include different types of Plague, Black Death, number of Smallpox cases, Cholera pandemics, Influenza. (Samal, 2014) For example, four novel Influenza pandemics occurred in the past century. Influenza has a variable nature of genetic materials, and the immune system is not resistant to modifications. As a result, there are “seasonal Influenza” – annual epidemics. (Saunders-Hastings, Krewski, 2016) Moreover, there is a seasonal cycle of respiratory viral disease such as severe acute respiratory syndrome coronavirus (SARS-CoV), Influenza and etc., especially in winter season, according to epidemiological studies. (Moriyama, Hugentobler, & Iwasaki, 2020). Historical pandemics can be summarized in a table (emphasizing Influenza)

Table 8. History of pandemics (Made by the author according to Samal, 2014, Saunders-Hastings & Krewski, 2016)

Pandemic	Type(s)	Year(s)/Century
Plague	Plague of Athens, Antonine Plague, Plague of Cyprian, Burbonic Plague, Third Pandemic	430 BC, 165-180, 252-256, 541-750, 19 th century
Black Death	Black Death	14 th century
Smallpox	Smallpox	1518, 1520, 1618-1619, 1770, 1780-1782, 1837-1838
Cholera	Cholera Pandemics, Outbreak of Cholera	1816-1826, 1829-1851, 1854-1860, 1863-1875, 1866, 1881-1896, 1899-1923, 1962-1966
Influenza	Russian flu	1889-1890
	Spanish flu (H1N1)	1918-1919
	Asian flu (H2N2)	1957-1958
	Hong Kong flu (H3N2)	1968-1969
	Swine flu (H1N1)	2009

Nowadays, globalization determines the quick spread of infectious diseases, pandemics as people can easily travel and move from one place to another much faster. Influenza pandemics and current reports of infectious diseases show that three factors – poverty, inequality and social determinants of health care – influence the spread of infectious diseases. Moreover, health disparities and inequalities can contribute to morbidity and mortality. Different studies have found that there is not enough recognition of health inequalities and too little attention to disadvantage populations. For example, there are a research which shows which populations were the most vulnerable to H1N1 due to health inequalities. (Quinn, Kumar, 2014) These key results could be used as guidelines for policy makers and health care workers during Covid-19 pandemic.

Table 9. The most vulnerable populations during H1N1 pandemic. (Quinn, Kumar, 2014, p. 266)

Key results	
Measure	At higher risk of disease
Geographic and living situation	All minorities
Larger household size	Spanish-speaking Hispanics
Work-related inability to social distance	Spanish-speaking Hispanics
Difficulty accessing individual day-care	African Americans, Spanish-speaking Hispanics
Difficulty avoiding public transportation	All minorities
Prevalence of chronic disease (susceptibility of complications)	African American marginally higher
Difficulty accessing health care	Spanish-speaking Hispanics
Discrimination when accessing health care	All minorities
Higher incidence of influenza-like illness (ILI) was associated with greater inability to social distance at work and greater number of children at home	
Latinos had significantly higher ILI incidence associated with these determinants	
Absence of workplace policies (sick levels) contributed to ILI cases	

More and more literature focuses on relationship between social determinants of health and infectious diseases. Social determinants are poverty, race, physical environment, ethnicity, social marginalization and etc., and infectious diseases are Influenza, tuberculosis, malaria, Ebola and others. World Health Organization’s Commission on the Social Determinants of Health has announced a plan for addressing complex web of determinants that can influence health inequalities and infectious diseases and has define infectious diseases as “proxy for poverty and disadvantage” with increased risk factors for disadvantaged populations. (Quinn, Kumar, 2014)

1.2.2. Risk governance of infectious diseases

Risk governance is a wide term, which includes the application of governance principles, identification, assessment, management and communication of risk. It focuses on how relevant information related to risk is collected, analysed, communicated, and how risk is managed. (SRA, 2018)

Risk governance is integrated approach, which refers to dealing with public risks, for example, systemic ones, which include complexity, uncertainty and ambiguity. It is a very broad concept, and this concept involves many actors – individual, institutional, private, public, formal and informal. Both institutional structure and policy process that seek to regulate, reduce and control risk refer to risk governance. Risk assessment, monitoring, public risk management institutions, political regulatory agencies participate in risk governance. General and comprehensive conceptualization of procedures is needed to understand risk governance. It incorporates experts, stakeholders and public involvement. (Renn, Klinke, 2013) In other words, risk governance is all the process of risk management, policies and etc. which includes a lot of actors.

As indicated before, there is *Global Health Security Agenda*, which seeks to reduce threats posed by infectious diseases. However, in order to implement *GHSA* objectives and goals, recommendations and certain measures should be considered. The table below indicates certain objectives and recommendations to achieve them:

Table 10. Recommendations to prevent and mitigate infectious disease outbreaks (Quinn, Kumar, 2014, p. 269)

Goal: detect threats early including detecting, characterizing, and transparently reporting emerging biological threats early through real-time bio-surveillance by	
Objective	Recommendations
Launching, strengthening, and linking global networks for real-time bio-surveillance	<p>Work collaboratively with WHO to build capacity for national health equity surveillance with minimum capacity as defined by WHO;</p> <p>Create an integrated surveillance system capable not only of detecting outbreaks and novel agents early, but also of capturing sociodemographic information of incident cases;</p> <p>Identify and engage socially disadvantaged populations prior to a pandemic and strengthen quantitative and qualitative data systems to foster understanding of the factors affecting them;</p> <p>Consider the use of interdisciplinary teams including anthropologists, sociologists, and demographers along with epidemiologists to contribute to development of such networks and systems;</p> <p>Evaluate the role of marginalized or disadvantaged populations as trained community health aides able to detect unusual events and identify contextual factors that may contribute to disease transmission.</p>
Goal: Prevent avoidable epidemics including naturally occurring outbreaks and intentional or accidental releases by	
Objective	Recommendations
Reducing the number and magnitude of infectious disease outbreaks	<p>Invest in social, epidemiologic, and computational public health research capabilities in low- and lower-middle-income countries to enhance their understanding of social inequalities in disease burden and enable policymaking to reduce these inequalities;</p> <p>Advocate for a change in WHO guidance to specify that pandemic planning must explicitly examine determinants of disparities prior to an actual pandemic and adhere to the Bellagio Group principles for pandemic planning;</p> <p>When possible, examine policy remedies that facilitate ability to social distance for the workforce.</p>
Goal: Respond rapidly and effectively to biological threats of international concern by	
Objective	Recommendations
Improving global access to medical and nonmedical countermeasures during health emergencies	<p>Develop international agreements prior to a pandemic that facilitate timely distribution of vaccine to low-income countries and other countries with substantial socially disadvantaged populations;</p> <p>Engage existing networks of community-based primary care clinics that are effective in providing care for socially disadvantaged populations;</p> <p>Identify socially disadvantaged populations prior to a pandemic and engage them to assess barriers to accessing care and implement feasible changes prior to a pandemic.</p>

Despite capabilities of a prevention and control, infectious communicable diseases remain a threat in today's global world. Typical threats of infectious diseases, such as time of occurrence, duration and development, are not always predictable. These cause a question for governance of infectious diseases: how to optimally prepare for response to an infectious disease threat. There is an ongoing debate on this issue, for example, what coordination and governance arrangement are the best option. Kenis et al. (2019) have argued that type of response to the crisis should depend on type of infectious disease crisis. They have written that there is no single best response, and that not all responses are equally effective in a concrete case. (Kenis et al., 2019)

Effective governance of infectious diseases is required in order to stop, limit or prevent transmission of diseases. This process can require extreme actions and cooperation among national and international actors. If there is a lack of good governance, many challenges can appear, for example, emerge of infectious diseases outbreaks, challenges to social, economic performance and political

legitimacy. Infectious disease, emerging or re-emerging, can harm the social, economic and political functions of society, so the governments are forced to respond to this quickly with costly decisions, despite lack of information. Effective governance of infectious diseases is described as an ability to implement and control necessary decisions. Infectious diseases outbreaks can also reflect lack of effective health care system. (Prescott, 2007)

Kenis et al. (2019) have distinguished five types of governance responses of infectious diseases threats (shared governance, lead organization governance, NAO¹ organization governance, combined lead and NAO governance, core-periphery governance):

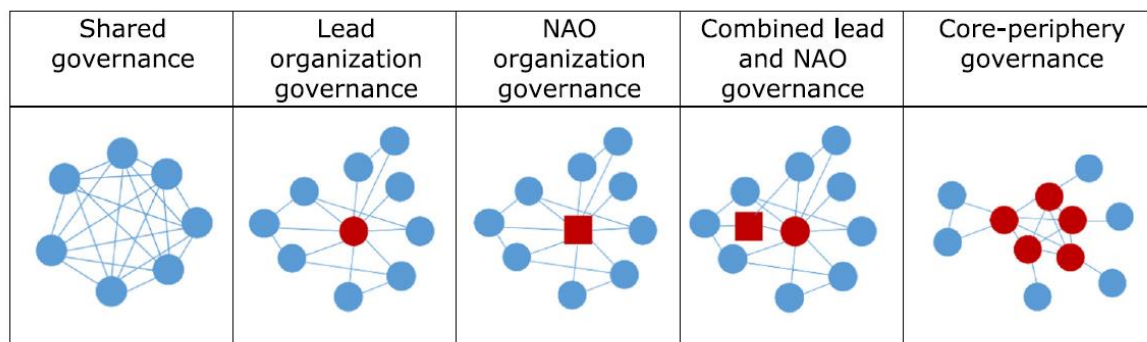


Fig. 2. Governance response to infectious disease threats (Kenis, Schol, Kraaij-Dirkzwager & Timen, 2019, p. 283)

Table below shows the descriptions of governance responses to infectious disease threats and to what type of infectious disease threat it should be applied:

Table 11. Governance response to infectious disease threats (Made by the author according to Kenis et al., 2019)

Governance response to infectious disease threat	Description of governance response	Type of infectious disease threat it should be applied
Shared (member-lead) governance	Networks govern themselves; no need for authority	Simple, for example, outbreak of gastroenteritis, respiratory infections in schools
Lead organization governance	One of the network member is responsible for guiding; Lead organization had a domain of an operation	Complicated, for example, regional or national outbreak of severe gastroenteritis caused by food pathogens, and food products are sold through different supermarket chain
NAO ² governance	Delegated authority to a third entity; “brokered” meaning that network governance belongs to single organization with some divisions of labour	
Combined lead and NAO governance	Lead organization is supported by a NAO; certain tasks are delegated to a third organization	Complex, for example, outbreaks of well-known pathogens which cause
Core-periphery governance	Number of organizations lead a network; different organizations for	

¹ Network administrative organization

² Network administrative organization

	different sphere; they may be part of core network but not necessarily	severe diseases, have societal impact, such as Ebola, measles
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As it can be seen, there are several governance responses, which should be applied to different types of infectious disease threats.

1.2.3. Risk communication of infectious diseases

A lot of definitions of risk communication exist, often risk communication is being related with health risks. Risk communication is understood as an exchange of information about the health risks among individuals, groups and institutions. These risks are caused by various factors: environmental, industrial, agricultural processes, policies and products. Risk communication is a dynamic and interactive process, and it involves different groups, exchanges among them. There is a distinction between risk communication and crisis communication. Risk communication is oriented to potential future harm, it is based on current projects and calculations, while crisis communication is spontaneous and reactive actions, which usually occur in unexpected and emergency situations. (Infanti, Sixsmith & Barry, 2013)

It is important to emphasize that people are not passive recipients, and they do not react to the information “rationally”. Social context, own needs for personal safety, the extent of trust in sources influence peoples’ responses. Even people look for information and use it, they can avoid certain forms of it. Risk communication based on a rational actor model is the best manner for public health. (Alaszewski, 2005) Risk communication is considered as a major part in risk management and risk analysis that goes along with them. For example, development of communication plans and guidance is typical for the governments and health agencies. (Infanti, Sixsmith & Barry, 2013)

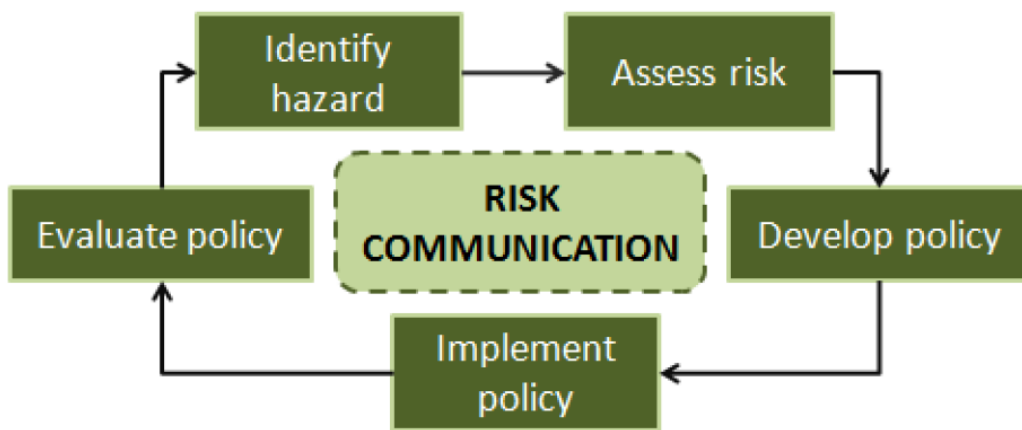


Fig. 3. Risk communication in risk management cycle (Infanti, Sixsmith & Barry, 2013, p. 6)

There are three main steps (activities) in risk communication. These steps are very important in global health risks communication. They are presented in the table of risk communication:

Table 12. Risk communication activities (Dickmann et al., 2016, p. 2)

Risk communication activities	Steps in risk communication
Information	Gathering Assessing Sharing
Communication	Communication (actions: flyers, websites and etc.)

	Key messages/contents Strategy/methods
Coordination	Local Regional National International

Liu & Viens (2020) have identified future research directions for risk and crisis communication. As it could be seen, these directions are related to global health communication:

- Public-driven researches are needed since a lot of crisis and risk communication researches are dedicated to understand how organizations should manage or manage the risks, but not how public manage them; this creates imbalance;
- Interpersonal risk and crisis communication refers to the researches on understanding who communicates to who, when, what messages are transmitted. Risk and crisis communication is not limited to government-to-public, this includes public-to-public, especially nowadays when social media is prevalent;
- Current challenges refer to the researches that analyse practices, current crisis, and not just theory. Current crisis also includes global health risks such as Ebola and Covid-19 pandemics. There is a need for more researches on 21st century risk and crisis communication challenges;
- Inclusive scholarship researches are crisis and risk communication researches that involve more global perspective. For example, public health outbreaks;
- Multiphase scholarship researches are for non-linear risk that analyse crisis development. This would help to understand the nature of the crisis and the impact on risk communication. (Liu, Viens, 2020)

Risk communication is considered as a core competence to respond to infectious disease threats. Effective risk communication is being related with successful risk management of infectious disease, and it allows coherent crisis communication and management. Even though concept ‘risk communication’ has emerged during the early 1970’s, there is still a confusion about risk communication in infectious diseases context. Risk communication refers to complex social, cognitive and psychological researches in a wide variety of areas including behavioural communications, environmental health, health promotion, governance and social marketing (Dickmann et al., 2016, p. 2). However, in the field of public health, risk communication focuses on communicating risk from health authorities to a public. (Dickmann et al., 2016)

Different theoretical and empirical studies of risk communication of communicable diseases were extended in mid-1990’s. Risk communication of infectious diseases is clearly important in this era of rapid changes, globalization. Due to globalization, there are no barriers for transmission of infectious diseases. The need for effective risk communication in the field of public health was highlighted after terrorist attack in USA in 2001 and outbreak of severe acute respiratory syndrome (SARS). Circumstances of these times showed how weak risk communication was toward a public health and communicable diseases. (Infanti, Sixsmith & Barry, 2013)

Nowadays digital media sites are considered as important source of health information. Organizations can communicate information more easily, more diverse, and digital media allows to involve public. According to Gresser-Edelsburg, health organizations must overcome some obstacles to create

credible scientific discourse, for instance, uncertainty, absence of consensus, conflicts of interests, facts/rationality vs. emotions/myths, the medicalization of public health. (Gresser-Edelsburg, 2019, p. 131)

Recent infectious diseases outbreaks have demonstrated how important effective risk communication is in the field of public health is. The question in risk communication is how to present statistical information and visuals effectively. Nowadays, a relevant tool for risk communication of infectious diseases can be online trainings. (Osterheider, 2017)

Dickmann et al. (2016) have suggested a new approach to risk communication in a public health:

- From telling to listening is understanding people's different perceptions and behaviours;
- From information transfer to relationship building is risk communication as not only information transmitter, but also as seekers to build relationships between public and authorities. So, this needs public engagement in risk management;
- From “command and control” to creating supportive environments refers to that people should be allowed to make their own decisions;
- From soloed to coordinated approach refers to that risk communication should integrate and cooperate with different actors and sectors. (Dickmann et al., 2016)

In reality, it is not easy to implement proper risk communication. For instance, in the case of SARS (severe acute respiratory syndrome), the transmission of information was rapid, but information itself was conflicting and confusing. Due to the lack of scientific data on SARS, much information was opinions, guesswork and preliminary results. Various studies have demonstrated that media on SARS was sensationalist, excessive and sometimes inaccurate. Case studies on relationship between mass media and risk communication of infectious diseases such as SARS are needed for the management of future outbreaks. Moreover, SARS has demonstrated that risk communication of infectious diseases has two phases. At first, outbreak is characterized as a frightening threat – for instance, frequent usage of alarming words, pessimistic comments in media, and prognosis that within 2 years every Hong Kong citizen would be infected with SARS. At second phase, risk is presented as geographically or culturally distant, that medical progress will contain the threat. For instance, SARS was presented as dangerous threat in UK at first, but later media suggested that SARS affects Chinese people more often, so the threat was ‘contained’. Such statements encourage stigmatization and discrimination. These phases were also seen in other infectious diseases outbreaks, such as Ebola. (Smith, 2006)

1.3. Pandemics and Covid-19 risk management and communication

There are presented information about pandemics an Covid-19 virus in this section of theoretical part. It includes planning, management and communication.

1.3.1. Pandemics planning, management and communication

Pandemic planning and management are highly important tools as a pandemic itself can cause severe impacts: increased morbidity and mortality, economic damages, behavioural changes, social disruptions, political tensions. A lot of pandemics emerge due to viral diseases from animals, and they can be easily transmitted. So, when a pandemic start, a coordinated response is needed. It should focus on maintaining situational awareness, public health messaging, reduction of transmission,

caring and treating. Nowadays pandemics and epidemics include HIV/AIDS pandemic, SARS pandemic, Swine flu Influenza pandemic, Middle East respiratory syndrome (MERS) epidemic, West Africa Ebola virus disease epidemic, Zika virus pandemic. Moreover, Influenza pathogens are characterized as the most likely to cause a pandemic. (Madhav, 2017)

Infectious diseases can quickly spread around the world nowadays, the outbreaks are influenced by the globalization and air travel. This causes pandemics, for example, 2009 pandemic H1N1 spread into 74 countries in less than four months. So, pandemic planning is vital in order to mitigate the impact, which may be catastrophic, on society. But the issue is that during the extreme situation, decisions are made under uncertain conditions, which are changing, and the prior experience is limited or non-existent. Relevant tools for pandemic planning and response are mathematical and statistical models. Even though they cannot predict the occurrence of pandemics very precisely, they allow to identify a pandemic potential. Models help to synthesize data, improve situational awareness, predict the course of the pandemic, economic and social costs, contribute to planning mitigation strategies. These allow to respond effectively. (Shearer, Moss, McVernon, Ross & McCaw, 2020)

Mansnerus (2013) have also emphasized that mathematical modelling and simulation techniques are tools for predicting the course of an outbreak, testing different mitigation strategies in a pandemic preparedness and planning. Appearance of technologies and use of calculations in governance is called *techne*. Modelling techniques, also known as pre-pandemics narratives, provide future predictions based on past data. Modelling provides data that are impossible to get from direct observation. Pre-pandemic models are defined as models of large extent infectious diseases that help to predict or restrict the transmission of diseases by predicting possible outbreak and testing public health interventions. Also, figures introduced by modelling are easily understandable, and they are perceived as scientifically very robust. Modelling are beneficial tool for pandemic planning as it is based on mathematical, epidemiological and academic nature, and such model-based evidences are useful in decision-making. (Mansnerus, 2013)

However, the challenges of pandemic planning and preparedness are not only technical ones, which can be managed with mathematical models. Socio-political challenges also emerge, such as a proper role of the government and media/public projection of the issue. In pandemic management, political and public relations are vital, despite science-based evidence. For instance, an important component is cultural aspects. So, rational-scientific approach is not enough for effective risk management, socio-political nuances should also be considered. Carney & Bennett (2014) have suggested that pandemic management should involve socio-political mix of science, culture and public perceptions. (Carney, Bennett, 2014)

Nori & Williams (2009) have suggested certain measures to be implemented during major outbreaks. These measures of pandemics management include:

- Communication:
- Professional – ensuring defined communication channels and admitting public health/other emergency communication;
- With patients – informing patients about suggested infection control practices and the pandemic health dangers/directions;

- Patient flow/triage: reception workers should be introduced with selection procedure, patients should avoid nonessential clinic visits and home visits are recommended only for febrile patients;
- Respiratory hygiene: All the time – cough etiquette, hand hygiene after a contact;
- Clinic hygiene: removing all magazines/toys and disinfection of surfaces/door handles;
- Surgical masks for patients: All patients should wear a mask in a clinic during pandemic
- Spatial separation for febrile patients: quarantine is vital;
- Annual influenza immunization and immunization of risk individuals: all the time
- Occupational health and safety:
 - Physical environment – physical barriers between reception workers and patients;
 - Febrile healthcare workers should not be at work;
 - Personal protective equipment (PPE) for health care workers – masks and full PPE for healthcare workers;
 - Immunization for healthcare workers – all the time;
 - Maintaining immunization register – monitoring health care workers for symptoms;
 - Health care workers, who are at risk, should not be working with febrile patients. (Nori, Wiliams, 2009)

Shearer, Moss, McVernon, Ross & McCaw (2020) have written that there is a major gap between a public pandemic response policy and an integration of the results of various methods, moreover, there is a need for decisions model. Such models allow to predict and evaluate different policy options under complicated conditions. A decision model let to integrate the data from analysis tools in order to make proper decision. (Shearer, Moss, McVernon, Ross & McCaw, 2020) The authors have suggested decision support system for an infectious diseases pandemic response in order to form proper and optimal response during pandemics:

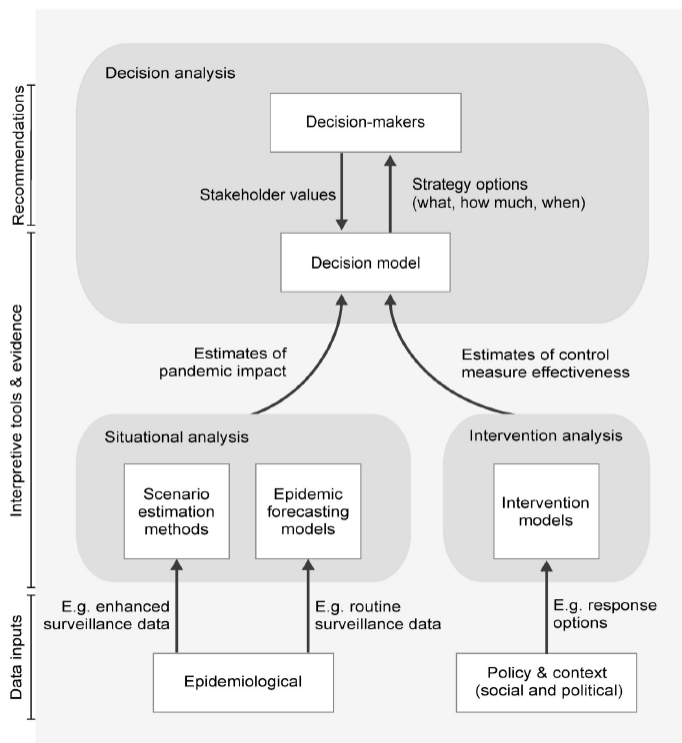


Fig. 4. Decision support system for infectious diseases pandemic response (Shearer, Moss, McVernon, Ross & McCaw, 2020, p. 5)

Pandemic management can be divided into three stages. Different measures should be taken in each stage. There are stages with management measures examples (some measures are used in more than one stage):

- Pre-pandemic period: capacity building, community planning, public health workers' training, simulation exercises, situational awareness;
- Starting period: initial outbreak detection, pathogen characterization, risk communication and community engagement, animal disease control, contact tracing, quarantine and isolation, situational awareness;
- Spread period: global pandemic declaration, risk communication, contact tracing, quarantine and isolation, social distances, capacity deployment, vaccine or antiviral administration, care and treatment, situational awareness. (Madhav, 2017)

Risk and pandemic communication is a highly important horizontal aspect, which should emerge during all the stages of a pandemic management and etc. Pandemic Influenza in 2009 has demonstrated a gap in this sphere – for example, building trust is not as easy to achieve in practice. This Influenza was a “test” for risk and emergency communication, which has shown failures in this sphere. Even though there were some communication tools and guidelines, they were useless and limited due to the scope of a pandemic. Risk communication has failed to build understanding between health care agencies and the public and etc. Examples of unsuitable communication include statement that it is ‘fake pandemic’; after WHO declaration of pandemic end, the new virus have spread to 214 countries. (Abraham, 2011)

Risk communication is an essential part of risk management during pandemics and epidemics. Effective risk communication helps to combat uncertainties and fears, so risk communication plays a major role in a pandemic management. Risk communication is acknowledged as a vital element globally and for individual countries as it saves lives and maintain economic, social and political state. Risk perception is related to risk communication, and the main obstacles for risk communication are lack of human resources and other resources, coordination. Risk communication techniques involve the use of social media and general media, community engagement, interpersonal communication, printed materials, mobile technology and others. All in all, effective risk communication during pandemics is not only needed, but also depends on the relationship among the public, the government and the health system. (Xiang et al., 2017)

Influenza has shown that pandemic communication needs to change over time. A primal communication needs to inform a public about reducing transmission and give advice on a treatment. As pandemic progresses, risk communication needs to involve more complex questions, such as necessity for vaccines and their safety, the need for further vigilance, the quality of public health response, costs, an accountability and others. (Abraham, 2011) Abraham (2011) has distinguished four areas for risk communication development:

- Existing guidelines of outbreak communication should involve communication tools and guidelines for social mobilization and long-term behaviour changes;
- Guidance on how to integrate Internet and social media effectively for public health should be realized;
- Risk communication should include building and maintaining trust with the public during all stages of a pandemic or outbreak;

- Public health communicators should understand and negotiate the political/cultural complexities of a pandemic. (Abraham, 2011)

There is a practice for countries to create a pandemic preparedness plans, which include crisis and pandemic communication. Usually a pandemic preparedness plans also involve medical, epidemiological, psychological and ethical questions. During pandemics, different groups have different concerns and questions that should be covered by risk and pandemic communication. Henrich & Holmes (2011) has done a research on what concern/questions should be addressed by pandemic communication in different groups:

- All participants wanted information about an emerging infectious disease (EID) – for example, what are high-risk groups, how to reduce a probability of getting infected, what places are avoidable, what are hygiene measures, what to do if they become infected;
- All participants wanted information about new vaccines and medicaments – for example, information about vaccination from EID, short-term and long-term side effects, information about the medicaments and their usage;
- General public wanted health information from family doctors and the Internet, family doctors and trusted web sites (WHO and etc.) are perceived as the best sources;
- Health care workers wanted health information via e-mail, online chats and experts in a professional context, e-mails with a detailed information, information by experts that is available for 24 hours and comes from the same source is the most desirable. (Henrich, Holmes, 2011)

During a pandemic, mainstream media itself and politicians are not trusted, so pandemic and risk communication should regard this. Mainstream media is only suitable as a primal source of information. Also, communicators need to understand that people do not assess information the same manner as experts. (Henrich, Holmes, 2011)

1.3.2. Covid-19 management and communication

According to Collins, Florin & Renn (2020), the emergence of Covid-19 pandemic was not unpredictable as a lot of organizations have warned about existing vulnerabilities in a global system that would appear due to infectious disease outbreak. At the beginning of the crisis, policy makers were not paying a lot of attention to Covid-19 management, probably because previous recent outbreaks like SARS and MERS was geographically limited and did not claim a lot of deaths. As a result, rapid transmission of Covid-19 has led to global prevalence of the disease. For example, by mid-April 2020, despite travel and interaction restrictions, 2 million confirmed cases and 150,000 deaths were fixated globally. (Collins, Florin & Renn, 2020)

Rapid spread of Covid-19 (domestically and internationally) has encouraged researches on estimating the pandemic risk, one of the suitable manner is a network analysis. A network analysis is simple, but powerful tool to visualize a pandemic risk through a connectedness among networks and different regions. It is based on available data, and this analysis can help to arrange preparedness plans. So, Tiwari, Chu, Tsang & Chan (2020) have accomplished a research on visualizing Covid-19 pandemic risk through network connectedness in April, 2020. The network analysis has shown that, for example, there was a high connectedness among provinces in China in an early period of the pandemic and that there was an increase in connectedness among Europe, America and other countries in February 20-26 despite relatively low number of confirmed cases. As confirmed cases were growing,

connectedness was also growing. (So, Tiwari, Chu, Tsang & Chan, 2020) So, the increase in connectedness predicts the growth in confirmed cases and vice versa. As a result, the network analysis of Covid-19 can help to manage the risk more effectively as it suggests some predictions in numbers.

Generally speaking, there are six key factors that determine Covid-19 outbreak, according to Collins, Florin & Renn (2020). They are:

- A pace of the disease's spread. Rapid transmission of Covid-19 requires steady response from policy-makers and international cooperation. Moreover, countries with previous pandemic/epidemic experience (for instance, SARS) would benefit from preparedness plans and etc.;
- Global interconnectedness. This factor has huge influence on the transmission of Covid-19: for example, the main hotspots have been fixated near to major airports. There is no doubt that the spread is determined by global networking;
- Health-sector capacity. Covid-19 has an impact on health care resources, such as hospital beds, personal protective equipment (PPE), medications, testing materials, human resources and etc.;
- State capacity. State capacity refers to all the resources in general. It is hard to assess it, but state capacity causes concern in weaker and poorer countries;
- The economic impact of suppression measures. Covid-19 is directly related to the economy, suppression measures, such as an isolation, a quarantine and distancing, influences economic activity. For example, unemployment rates are ten time higher than ever in USA;
- Fragilities by 2008 economic crisis. While many countries still suffer from political, economic and societal consequences of financial crisis, a new crisis – Covid-19 – has emerged. Societal polarization and fragmentation have influence on Covid-19 response and attitudes. Also, the financial crisis had impact on health care and state capacity. (Collins, Florin & Renn, 2020)

SARS-CoV-2 is a causative agent for a new pandemic Covid-19, but coronavirus-associated diseases (SARS, MERS) are not new phenomena. However, due to wide extent of the disease, WHO, a central institution in health care, announced the disease as a public health emergence of international concerns on 30 January 2020. On 11 March 2020, it was declared as a pandemic by WHO. Moreover, WHO regularly updated database of Covid-19 publications. (Balkhair, 2020) Speaking about domestic Covid-19 risk management, health experts, physicians, immunologists and etc. provided advices for politicians in political, economic, social fields in order to achieve better management. (Aven, Boudier, 2020) For instance, one of the organization, who provides a lot of guidance for Covid-19 management, communication and etc., is WHO.

Policy decisions in a crisis response directly influence regions' recovery capacities, and as Covid-19 risk holds a lot of uncertainties, lessons, scientific insights and allegories from all the field of studies are needed. Trusted and holistic data are required by decision-makers to form policy responses, while society needs proper risk communication. One of the challenge in Covid-19 risk is how to respond the crisis for government. (Trump, Linkov, 2020) Collins, Florin & Renn (2020) have suggested to respond to Covid-19 crisis through five key elements. These elements are distinguished from *International Risk Governance Council (IRGC) Risk Governance Framework*:

Table 13. Covid-19 risk response through IRGC Risk Governance Framework (Made by the author according to Collins, Florin & Renn, 2020)

Technical assessment	This is an identification of Covid-19 hazards, exposures and vulnerabilities using previous coronaviruses characteristics. Moreover, newly emerged researches of SARS-CoV-2 help to shape epidemiological models and management strategies., although there are obstacles from scientific uncertainties to secondary and tertiary effects.
Risk perception	This consists of scientific assessments and public opinions, concerns, preferences. Latter have impact on personal protective behaviours, which is central in Covid-19 response. Public perceptions can be influenced by cognitive basis, anxiety, media, exponential growth, previous experiences
Risk evaluation	This is relevant for decision-making, and it is based on a scientific assessment and a perception. In the case of Covid-19, policy-makers' evaluation does not always coincide with scientific consensus. The differences in evaluating risk, which lead to different management, are also seen among countries, although most of them have taken the strictest measures.
Risk management	A management is directly related to evaluations and perceptions, and generally speaking, political management focuses on suppression and containment despite epidemiological uncertainty in the case of Covid-19. Covid-19 management refers to interventions into multiple sectors with force, however, there are negotiations about what is acceptable (such as tracing apps). Secondary and tertiary effects need to be managed as well.
Risk communication	This is key to effective risk governance, especially in rapid transmission crisis like Covid-19. Evidence-based management requires risk communication between scientists and policymakers, and legitimacy and durability of management strategies – between policymakers and public. Covid-19 communication poses many challenges, and failures in Covid-19 communication are costly, like in Chinese case, where information was suppressed, and in US case, where scientific advice was ignored.

As Covid-19 pandemic has impact on health, business, education, trade and tourism sectors, so all-of-society response is needed. (Mash, 2020) Study of 12 historical pandemics has shown that negative economic consequences of pandemics lasted for about 40 years, moreover, they were worse than consequences of wars. (Collins, Florin & Renn, 2020) Covid-19 management is concurrent with pandemic prevention and control, many recommendations (individual and state level) are released. For instance, Jamil et. al. (2020) have suggested to follow these control strategies at the state level:

- Trace the contacts of the disease;
- Social and physical distance;
- Quarantine of Covid-19 cases and suspected individuals;
- Travel limitations (Jamil et. al., 2020)

It is also recommended to implement the strictest measures in order to stop the spread of the virus, which progresses quickly and causes severe conditions. These recommendations for states include:

- To restrict movement to other countries and cities, especially where are the hubs;
- To close states' borders, airports, trains and buses stations, to restrict public transportation
- To cancel mass gathering events;
- To transfer education process to virtual education spaces, to work from home if possible;
- To isolate people who has arrived from high-risk countries or have a contact with those people for 14 days. (Mitkutė, Guzevičius & Krasauskaitė, 2020)

As mentioned, infectious diseases management, such as Covid-19 management, involves public participation. Active public engagement can much contribute to disease prevention and control. It is recommended to implement these measures:

- Regularly washing hands for 20 seconds, especially after visit to a bathroom, sneezing, before and after eating and etc., using hand sanitizer;
- People should avoid touching the face and nose with uncleaned hands;
- Avoiding contact with a febrile or coughing person, keeping 2 metres distance;
- Social distancing, staying at home, not meeting with groups of people;
- Self-isolation in the case of contact with sick person or if someone is being tested, confirmed case;
- Coughing or sneezing into an elbow or a tissue, washing hands after;
- Not sharing items with other people (towels, cell-phone, food, books and etc.);
- Closing lid while flushing toilet;
- Disinfecting surfaces which are frequently touched;
- Surgical masks are not useful for non-suspected and non-infected people. (Mash, 2020)

However, some countries have chosen to introduce mandatory surgical masks for all people as a measure to manage Covid-19. So, a lot depends from political actors, certain policies and decision-making in management. Generally speaking, pandemic management itself is recommendations and its implementation (or not) through policy-making. Also, individuals have a major role in pandemic management.

In Covid-19 communication, so-called scientific consensus is hard to reach, so communication becomes a challenge. (Aven, Boudier, 2020). A large extent of information on Covid-19 creates some issues: difficulties to follow all updates for society and emerge of disinformation and fake news. The latter causes health anxiety and panic behaviour, and these result in, for example, xenophobia and unnecessary visits to doctors. People look for information on Covid-19 that is easily understandable, and this information could come from untrusted sources and are not necessarily accurate (Mohamad, Azlan, 2020)

Malecki, Keating & Safdar (2020) have suggested to use five communication strategies for Covid-19 risk communication:

Table 14. Communication strategies during Covid-19 pandemic (Malecki, Keating & Safdar, 2020)

Communication strategy	Explanation	Examples
Plan carefully	Establish communication goals, for example, to convince people to wear face masks	Then provide data for decision-making: statistics, facts, experiences
Accept the public as a partner	Ask about patients' concerns, fears, responds	Then respond with facts and empathy/advices
Be transparent and honest	Build trust with acknowledging the uncertainty	Recognize if answer is unknown, provide with sources
Speak with compassion	Be empathetic and acknowledge the uncertainty	Communicate the message that Covid-19 is challenge for everyone and etc.
Evaluate and reassess strategies	Constantly update and assess new information	Develop and provide new messages, use relatable language

Covid-19 global health crisis has influenced communication with patients and their relatives; the challenges are created by isolation and social distance. Increased risk of traumatic stress symptoms, anxiety and stress are noticeable in the groups of relatives of critically ill patients, so both communication skills and clinical skills are valuable in medical field. Moreover, Covid-19 communication and mental support are very important not only for those relatives, but also for families in complete isolation and health care workers. Marra et. al. (2020) have distinguished several factors, which are important in effective clinical communication:

- Verbal communication;
- Non-verbal communication;
- Psychological support for health care workers;
- Reassurance, spiritual support, end-of-life care;
- Comprehensive care including listening to families, showing empathy, providing information. (Marra et. al., 2020)

Principles of effective risk communication, developed in 20th century, may provide scientific basis for responding and communicating Covid-19. Risk communication involves communication strategies to respond to global health challenges, such as global pandemics, and it is called crisis communication. Nowadays social media is a relevant resource for both risk and crisis communication as it allows to spread information quickly and to reach a large number of people. However, social media can also be a barrier as disinformation can be easily released on this media. Social media provides opportunities to access trusted and reliable information from clinicians, but also it increases chances to encounter with conflicting, false news and messages. Although social media poses some threats, it has a lot of benefits in Covid-19 communication. (Malecki, Keating & Safdar, 2020)

Chesser, Ham & Woods (2020) have accomplished a research on how Covid-19 information reaches students. This research confirms the importance of social media and the Internet in risk communication, especially in young population, as a majority of students identified these sources when they were asked about Covid-19 information. To the question “Where have you heard the most information about Covid-19?”, 39% of students responded the Internet, 39% - social media, 11% - TV and radio. Students also identified online new sources as information channels in everyday life, including websites for TV news (21%), Facebook (15%) and local or national news websites (13%). Moreover, the mean for the statement “I am sick and tired of hearing about Covid-19”, when 1 – not tired, 5 – very tired, was 2,65 (not really/neutral). (Chesser, Ham & Woods 2020)

Researches on Covid-19 published in medical journals are useful for communication among scientific communities, but not for general communities. Also, a huge extent of Covid-19 information published by WHO via their website and Massive Open Online Courses organized by the organization are useful for English speakers only, so local governments should ensure information flows in native languages. Layman terms, storytelling, simple infographics, metaphors can be taken as communication strategies to present scientific terminologies and findings. It is recommended to collaborate with journalists, social media influencers and public content makers during Covid-19, to spread clear and persuasive messages. This helps to prevent public anxiety, fake news and inappropriate behaviours. (Mohamad, Azlan, 2020)

Risk communication depend on risk perception, and risk perception involves two key components, hazard and outrage. (Malecki, Keating & Safdar, 2020) There are some measures to address both hazard and outrage. Addressing outrage requires a personal involvement, so information about addressing outrage should be communicated clearly for a person to take actions:

- For addressing hazard:
 - Use message channels such as social media, news, press, personal communication;
 - Know audience (fears, needs, misinformation, knowledge, cultural beliefs);
 - Provide known facts such as diseases, symptoms, mechanism, risk factors, local information;
- For addressing outrage:
 - Guide on personal actions: personal prevention, common responsibility, information sources;
 - Expert strategies: answer the question: what are the experts doing to mitigate the risk;
 - Acknowledge uncertainty and fear with honesty, gratitude, empathy and clarity. (Malecki, Keating & Safdar, 2020)

Risk communication on Covid-19 should also involve people with disabilities. According to The *United Nations Children's Fund (UNICEF)*, there are approximately 15% children and adults with disabilities in the world, and they may experience difficulties accessing information, care, support, be at higher risk of exposure or secondary effects. To manage Covid-19 risk effectively, communication need to include this specific group. There are four main directions how to communicate to people with disabilities:

- Provide information in multiple and accessible forms. This is needed for people with visual, hearing and intellectual disabilities. Information should be provided in written, oral and visual forms, such as braille, large prints, easy-to-read versions, text with pictures and diagrams, accessible web contents. This also helps for children and youth, people from minorities, migrants, people with low literacy, refugees;
- Use the communication channels for youth with disabilities. Communicating through education an early childhood development programmes may not reach youth with disabilities as they often do not involve in these activities. Communication channels and strategies should be developed with certain organizations;
- Engage people with disabilities in Covid-19 response. These people could be engaged in information campaigns, in combating fake news, xenophobia, stigma and discrimination. Including the question of people with disabilities engagement in situation analysis, assessment and response, for instance, inviting person with disability to the local media to promote Covid-19 information;
- Provide disability inclusive messages Use respectful terminology i.e. people with disabilities, not disabled people, include images of both gender people with disabilities in visual content, apply activities to people with disabilities (for example, to adapt hand washing games for children with disabilities), fight the myths, such as belief that people with disabilities are responsible for virus spread, in messages. (UNICEF, 2020)

Having analysed theoretical aspects of the risk of infectious diseases in multiple manners, it emerges that the risk is highly complex phenomenon with different management and governance. The risk of infectious diseases can be described as a health risk as well as societal risk. Such complex risks should be analysed with a proper methodology.

2. Research methodology

The research methodology is relevant part in this Thesis as it explains the basis of the research. This research is based on IRGC Risk Governance Framework, and this Framework is introduced and explained by dividing this chapter into two sections. Besides, it aims to explain not only Framework itself, but also an application of the Framework to Covid-19 analysis.

2.1 Introducing Risk Governance Framework

The primal question is how to define concept *governance* itself. According to *Society for Risk Analysis Glossary*, governance is processes, actions, traditions and institutions by which authority is exercised. They are used as tools for decision-making and implementation. (SRA Glossary, 2018) Governance is wider concept than management; a management is a part of governance. As it can be seen from the theoretical part, global health governance, for example, involves many actors, different activities, and it is not only about policy at a state level. As indicated before, risk governance is simply an adjustment of governance principles to risk processes (identification, assessment, management, communication). It involves actors, processes, conventions, rules and mechanism, which are needed for decision-making and management. (SRA Glossary, 2018)

According to Klinke & Renn (2013), risk governance can be described as an integral concept on the issue of dealing with complex, uncertain and ambiguous risks. As mentioned, governance itself is a wide scope concept, and risk governance includes a) institutional structure b) policy process. This process is guiding and restraining of risk-related common activities by groups, a society, an international community. (Renn, Klinke, 2013) Moreover, the process of governing risks confronts some challenges, such as: a lack of proper methods, approaches, protocols to assess and manage the same risk in different countries, organizations and groups, inappropriate assessment of risk benefits and costs, misunderstandings in secondary consequences and interconnections of specific risk, decision-making under difficult, rapidly changing conditions with high degree of uncertainty and a lack of information and etc. Now, when relevant reminders about risk governance are made and challenges of risk governance are presented, Risk Governance Framework should be introduced.

Risk Governance Framework is a holistic and multidisciplinary approach to a risk. The scientific knowledge about the risk is provided in societal context, so it is helpful in decision-making and management processes. Risk Governance Framework is suitable to deal with systemic (complex, uncertain, ambiguous) risks, management of potential negative consequences of the risk. It enables to identify existing gaps in risk governance process, to apply the most suitable management and communication strategies based on evidence and social values. (IRGC, 2017)

There are several risk governance frameworks. For example, the one suggested by Renn & Klinke (2013) is shaped like a cycle, and it is slightly different than the one proposed by *International Risk Governance Council*. But they both have the same core, and differences are not fundamental. The core consists of five parts:

1. Pre-estimation/ pre-assessment;
2. Risk appraisal/ interdisciplinary risk estimation;
3. Characterization and evaluation/ risk evaluation;
4. Risk management;
5. Cross-cutting aspects/ Communication deliberation involvement.

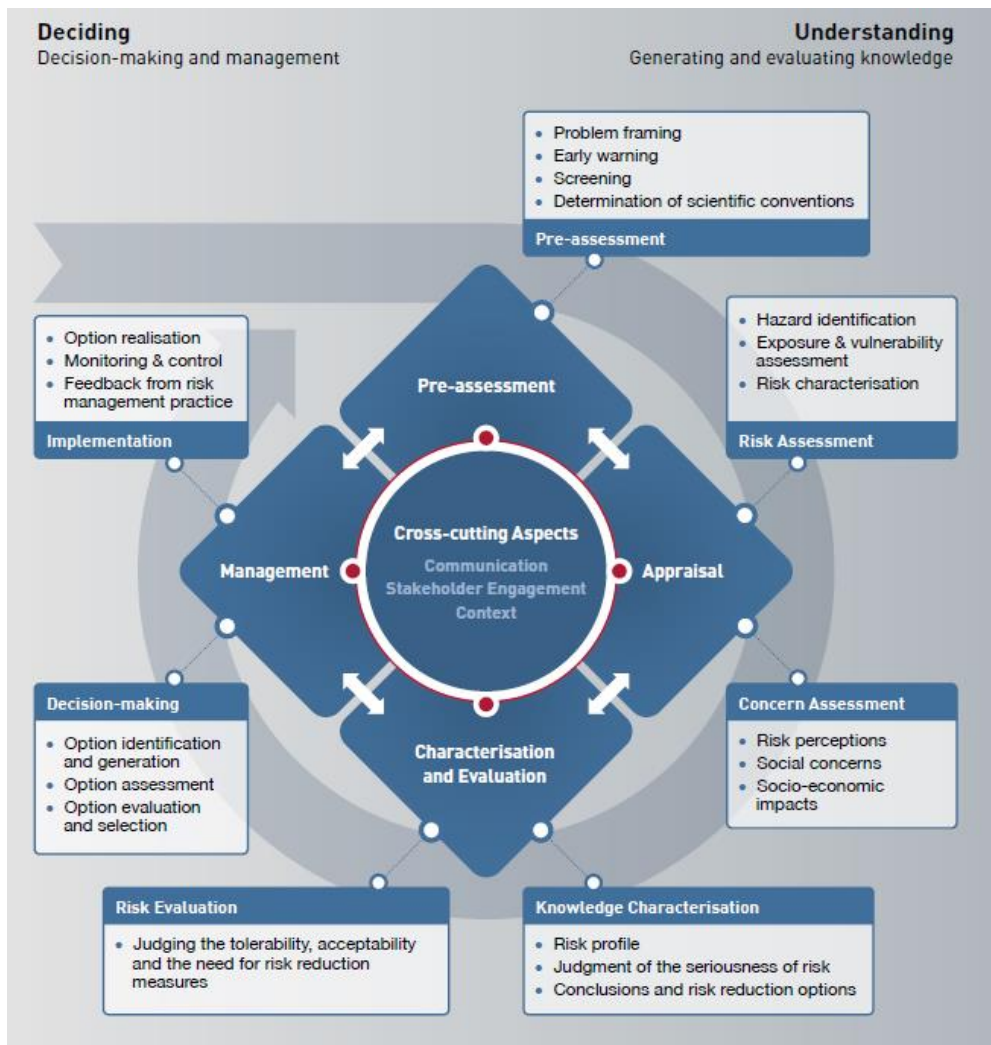


Fig. 5. IRGC Risk Governance Framework (IRGC, 2017, p. 10)

Risk Governance Framework is a tool for risk analysis. It is important to say, that the classical one, which consist of three elements, risk assessment, management and communication, has been acknowledged as too narrow, focused only on regulatory bodies. It does not cover all the actors and processes in risk governing. (Renn, Klinke, 2013)

Risk Governance Framework by *International Risk Governance Council* is used for comprehensive analysis of Covid-19 risk. The IRGC Framework draws guidelines for an identification and risk handling – framing, assessing, evaluating, managing and communicating. It is especially suitable for systemic – complex, uncertain and/or ambiguous – risks. It consists of:

- Pre-assessment is an identification and framing;
- Appraisal is an assessment of technical and perceived aspects of a risk. This part is divided into:
 - Risk assessment is objective dimension that involves facts, statistics and/or other data;
 - Concern assessment is subjective dimension that involves opinion surveys, concerns, level of society’s anxiety;
- Characterization and evaluation are judgements about the risk and its management. This part is divided into:
 - Knowledge characterization is risk characterization based on an appraisal;

- Risk evaluation is value based evaluation, based on objective and subjective data. It includes discusses about risk acceptability and tolerability;
- Risk management is decision-making and implementation of risk management options. This part is divided into:
 - Decision-making is discussion of a proper risk management strategy and related aspects;
 - Implementation is discussion of actions taken to deal with the risk;
 - Cross-cutting aspects (context, communication and/or stakeholders involvement) are horizontal aspects of the risk. (IRGC, 2020)

The first stage of IRGC Risk Governance Framework is pre-assessment. Pre-assessment is a stage before the actual assessment, so it is broad and contextual. Risk assessment is an actual assessment of the risk, that is comprehensive. It involves not only technical knowledge (political, economic and social), but also concern assessment (how people feel about the risk). Risk characterization and evaluation is third stage, where complex, uncertain, ambiguous risk is being characterized on available knowledge, and then level of the acceptability is identified. All these stages lead to risk management – decision-making and implementation. Also, the Framework also involves cross-cutting aspects, which is crucial in risk governance. (IRGC, 2017)

2.2 Explaining and applying Risk Governance Framework to Covid-19 risk analysis in Sweden and Lithuania

Having introduced IRGC Risk Governance Framework, it is useful to explain each stage in more detailed manner: What information should be provided in each stage? What message should be conveyed in each stage? What questions should be addressed in each stage? Finally, what information about Covid-19 will be covered in each stage?

Speaking about Covid-19 analysis, the matrix and the table present the course of the research:

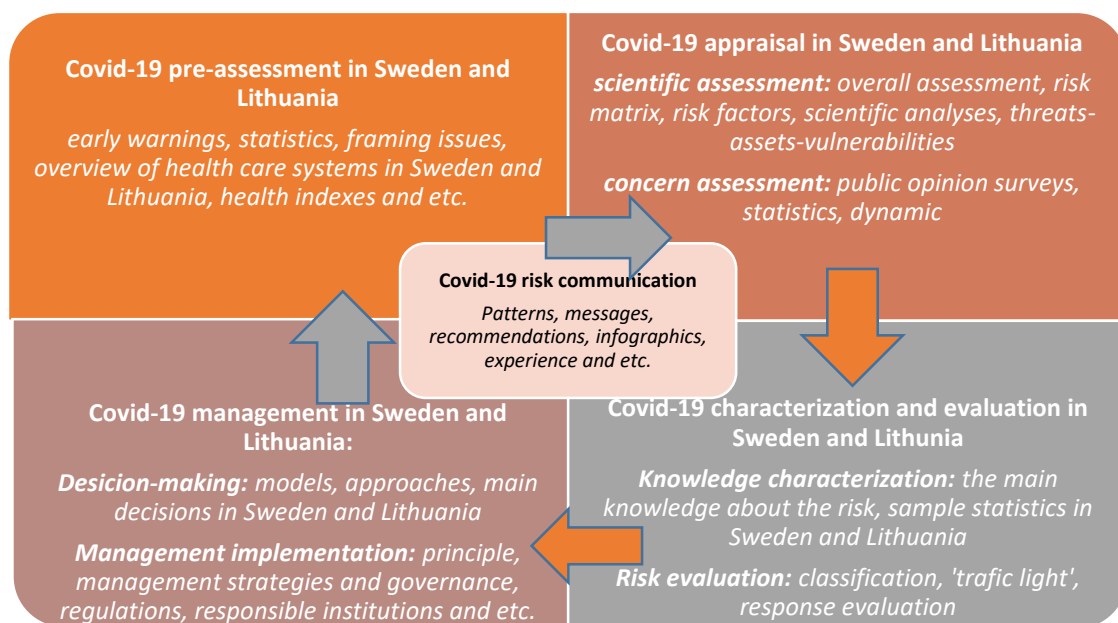


Fig. 6. Application of Risk Governance Framework for Covid-19 risk analysis: research stages (Made by the author, 2020)

Table 15. The structure of Covid-19 Risk Governance Framework research (Made by the author, 2020)

Risk Governance Framework element	Research questions	Data sources
Pre-assessment	What are the early signs of the pandemic and etc., preparedness to cope with pandemics in Sweden and Lithuania?	Health systems indexes in Sweden and Lithuania: <i>Country Health Profiles 2019, GHS, e-SPAR, Epidemics Ready Score</i>
Appraisal	What are the theoretical assessment and tolerability of the risk of infectious diseases, Covid-19 risk factors, threats, vulnerabilities and assessments in Sweden and Lithuania, public attitudes and opinions?	<i>World Economic Forum and The Global Risk Landscape 2019-2020, Centers for Disease Control and Prevention, European Centre for Diseases Prevention and Control, Covid-19 Regional Safety Assessment, scientific sources (articles), expert's judgements and assessments, Eurobarometer 2020, Ipsos</i>
Characterization and evaluation	What are the main characteristics of Covid-19 as a disease and as a risk, the main statistics, evaluations and its criteria?	Scientific sources (articles), <i>Georank, Korona STOP, Forbes, Greek mythology classification, 'traffic lights' model</i>
Management	What are the theoretical guidelines of decision-making and management, management and decision-making in Sweden and Lithuania?	Scientific sources (articles, <i>European Observatory on Health Systems and Policies</i> and etc.)
Communication	What are the importance and role of Covid-19 risk communication, the structure of communication, the main recommendations?	Scientific sources (articles, <i>European Observatory on Health Systems and Policies</i>), official websites of health institutions, visualizations

Pre-assessment

IRGC Risk Governance Framework starts with pre-assessment, which refers to framing the risk, early warnings and preparation for dealing with the risk. Various actors and stakeholders can be involved at this stage in order to draw various perspectives, opportunities and potential strategies on the risk. Pre-assessment explains different perspectives and issues on the risk and provides basis for dealing with it. Pre-assessment can convey these messages: 1) different problems that can be associated with the risk and/or 2) various indicators that can help to address the risk. (IRGC, 2017) According to Renn & Klinke (2013), pre-estimation, also known as pre-assessment, begins with screening of an objects i.e. looking for risk-related features. The following activity is framing, which focuses on an interpretation of the risk in social and political context, i.e. putting the risk in proper frame in order to conceptualize it. (Renn, Klinke, 2013) Pre-assessment is also called risk framing, and it refers to primal assessment of a risk issue, which identifies problems and scope in further analysis. (SRA Glossary, 2018)

As the aim of this Thesis is to analyse Covid-19 risk using this Framework, it is important to establish relation between the Framework and Covid-19 risk. Covid-19 risk is systemic risk, and Risk Governance Framework is easily applicable to the risk. Moreover, these type of research is useful for

managers, as they help to research the risk, and for scientific community, as they allow to assess the risk comprehensively and to systemize knowledge about it. Speaking about Covid-19 risk, there are covered early warnings (statistics, facts) of the risk and preparation to handle it. First of all, Covid-19 pre-assessment in Sweden and Lithuania aims to provide some facts and statistics which help to assess the seriousness of the disease. Second, potential of health care systems in Sweden and Lithuania is analysed. Various reports and online data are used in order to cover pre-assessment in these countries.

Risk appraisal

A risk is assessed comprehensively in this stage, and knowledge about a risk is provided in risk appraisal. Risk appraisal is divided into: 1) risk assessment – risk's factual, measurable and physical characteristics are assessed in this assessment. It defines a probability of an occurrence, negative consequences, considers hazards, assets and vulnerabilities and 2) concern assessment – different opinions and concerns about the risk are assessed in concern assessment. It is about risk perception. (IRGC, 2017) Renn & Klinke (2013) called this stage as interdisciplinary risk estimation, which refers to scientific assessment of the risk to health and environment, related concern assessment and social, economic implications. (Renn, Klinke, 2013)

Risk assessment

In risk assessment, the risk is considered to have two dimensions: 1) source of the risk, which is the risk agent (hazard) that has potential to cause harm 2) impact of the risk, which considers assets (risk absorbing system), which may be vulnerable to a risk agent. Risk assessment is a composition of a likelihood of potential harm and an impact of potential harm. Risk assessment considers hazards, assets and vulnerabilities. (IRGC, 2017) Moreover, the risk could be placed into risk matrix to assess the level of a tolerability. There are three tolerability levels in risk matrix, acceptable (green), tolerable (yellow) and intolerable (red). Renn & Klinke (2013) have described risk assessment as experts' natural and technical estimation of the physical harm potentially caused by a risk source. (Renn, Klinke, 2013)

Scientific Covid-19 assessment begins this risk assessment in a broad context – data from *World Economic Forum* and *Global Risk Landscape 2019* (World Economic Forum, 2019) are provided in order to assess the risk of infectious diseases theoretically and objective. Then this theoretical risk is put into the risk matrix in order to assess overall tolerability of the risk of infectious diseases. After this, there are presented relevant information for Covid-19 assessment with the focus on Sweden and Lithuania. Finally, there are threats, assets and vulnerabilities of Covid-19 risk.

Concern assessment

Concern assessment is an important stage of IRGC Framework, which includes values and socio-emotional issues. It considers people's past experiences, risk perceptions and value-based concerns, and these elements determine cultural and social ambiguity, attitudes and behaviours. It is difficult to assess the risk objectively for people, so it is important to raise situational awareness. (IRGC,2017) Concern assessment allows to understand social responses better and to address the issue more properly. Concern assessment is experts' identification and analysis of issues that are being related to the risk by society and individuals (Renn, Klinke, 2013)

Covid-19 concern assessment in Sweden and Lithuania aims to provide relevant surveys and data in order to assess and compare concerns between these two countries. Although the data from Sweden and Lithuania are different regarding survey type, it is possible to create an overall image about the public attitudes in these countries. Moreover, concern assessment is highly helpful in Covid-19 evaluation.

Risk characterization and evaluation

Risk evaluation is the process of determining the level of the risk acceptability and deciding of suitable measures and decisions to manage it. Knowledge characterization of the risk can help to evaluate it. (IRGC, 2017)

Knowledge characterization

Specific risk has different aspects (dimensions), which need to be consider, that has influence on risk assessment and management. Knowledge from risk appraisal stage is relevant in knowledge characterization. Knowledge characterization may help in risk governance, risk management and stakeholders' participation. The risk can be characterized as 1) simple 2) complex 3) uncertain 4) ambiguous or combination of that. Risk management of simple risks is straightforward and does not causes controversies, otherwise, risk management of complex, uncertain and ambiguous risks requires different assessment, evaluation and management regarding risk perceptions and values. Knowledge characterization of these risks can change during the process of governance. (IRGC, 2017)

Covid-19 knowledge characterization aims to systemize available data about Covid-19 risk and provide basic clinical characteristics of the disease. It also examines Covid-19 as a systemic risk regarding the information from the theoretical chapter. Second, Covid-19 knowledge characterization shortly provides Covid-19 sample statistics in Sweden and Lithuania: the numbers, mortality and other basic statistics until 1 December 2020.

Risk evaluation

Risk evaluation is a basis for risk management, it is a judgement of a risk acceptability level. It should combine risk scientific assessment and concern assessment, societal values, economic interests and political considerations. There are three categories in risk evaluation:

1. Acceptable – unnecessary risk reduction;
2. Tolerable – risk is taken because of benefits, but proper reduction measures should be applied;
3. Intolerable – there are no reduction measures, so the risk should be avoided. (IRGC, 2017)

“Traffic lights” model is risk evaluation regarding societal acceptability. This model is about probability versus expected impacts. It is controversial to decide in which area the risk is found, the tolerability depends on knowledge sources. So, it is crucial to consider both scientific and concern assessments. (Renn, Klinke, 2013) Risk evaluation includes social, economic, political, technical or strategic judgements and choices. (IRGC, 2017)

Covid-19 risk evaluation seeks to demonstrate the variability of the risk evaluation among different countries according to different criteria. Covid-19 evaluation provides guidelines for the management and may help to understand decision-making. Firstly, Covid-19 risk is classified in the Greek mythology model according to Renn & Klinke. Secondly, the risk is characterized in “traffic light”

model. There are also provided criteria for Covid-19 response evaluation and evaluations in Sweden and Lithuania.

Risk management

Risk management is a process, where decisions about proper measures to handle the risk are made. During risk management, a specific strategy need to be implemented. Risk management should consider actors involved in the process, impacts of the risk reduction, cost and benefits (trade-offs), effectiveness of the management and etc. (IRGC, 2017)

Decision-making

A classical decision theory involves six main steps: 1) an identification of general risk management options 2) an assessment and 3) an evaluation of these options 4) an election of proper risk management options 5) an implementation of these options and 6) monitoring of its performance. (Renn, Klinke, 2013) Decisions about risk management strategy need to be made in this stage. There are four main strategies regarding type of risk:

Table 16. Risk management strategies regarding a type of risk (Made by the author according to IRGC, 2017 and Renn & Klinke, 2013)

Type of risk	Strategy (ies)	Examples
Simple	Routine-based	Law, regulations, risk benefit analysis, risk reduction
Complex	Risk-informed; Robustness-focused	Scientific models, scenario construction, avoidance, reduction, building stronger capacity, improving coping capacity, etc.
Uncertain	Precaution-based; Resilience-focused	Avoiding exposures, reducing vulnerabilities of the risk-absorbing, preparing to cope with unexpected events, containment, ALARP (as low as reasonably practicable), BACT (best available control technology), etc.
Ambiguous	Discoursed-based	Building tolerance, confidence, resolving conflicts, risk communication, social (participatory) discourse

There are provided theoretical guidelines for Covid-19 decision-making regarding the type of risk in Covid-19 decision-making. Also, there are analysed decision-making processes in Sweden and Lithuania: strategies, main decisions and experiences. Decision-making is an integral part of a management, so it is highly related to management implementation.

Risk management implementation

Risk management implementation refers to the implementation of selected measures, monitoring their effectiveness and reviewing decisions. Some conditions must be presented for effective risk management implementation. They are a proper authority or leadership, an internal and external communication, attention to potential organizational changes, clear definition of responsibilities, roles, incentives, distribution of sources. It is important to emphasize that assessment and management need to be reconsider if conditions have changed. (IRGC, 2017)

Complexity, scientific uncertainty and socio-political ambiguity cause different challenges for risk management implementation, and, as a systemic risk is usually a mix of these features, applying strategies could be confusing. Renn & Klinke (2013) have overviewed management strategies according to risk characteristics: 1) risk-informed management for highly complex, but low on

uncertainty and ambiguity risks. This type of management refers to expanding risk assessment by scientific methods, deciding on safety goals, using cost-effectiveness methods, monitoring and evaluating results; 2) precaution-based management for highly uncertain, but low on ambiguity risks. This type of management refers to implementing precautionary and resilience-building strategies, decreasing vulnerabilities, containment, diversification and monitoring; 3) discourse-based management for highly ambiguous and no matters high or low on uncertainty risks. This type of management refers to involving stakeholders and the public, raising awareness among them, finding legitimate procedures to justify decisions. (Renn, Klinke, 2013)

Covid-19 management implementation aims to cover theoretical management of the disease and to analyse Covid-19 management implementation using various sources in selected countries. Covid-19 management implementation not only analyses the process of Covid-19 management in Sweden and Lithuania, but also aims to reveal the differences between the countries' approaches. It is important to emphasize that decision-making and management implementation are highly related and similar to each other.

Cross-cutting aspects – risk communication

Open and transparent risk communication has a crucial role in IRGC Risk Governance Framework. It is a horizontal aspect, which is prevalent in every stage. If there is no appropriate information i.e. communication, it is difficult to cover these stages. Risk communication refers to exchanging and sharing risk-related information among various groups, including scientists, politicians, regulators, industry, consumers and general society. Appropriate risk communication is a highly relevant in risk governance, it is internal and external. Internal risk communication allows to build common understanding between assessors and risk managers, while external risk communication allows to understand the risk and the basis of its management to general public and stakeholders. Moreover, stakeholders could understand their role in risk governance. (IRGC, 2017) The whole effectiveness and legitimacy of risk governance depends on the quality of risk communication and deliberation. Risk communication and deliberation should address the challenges caused by complexity, scientific uncertainty and socio-political ambiguity. (Renn, Klinke, 2013)

Covid-19 risk communication section aims to cover the main patterns of Covid-19 risk communication: to emphasize the importance of it, to provide some relevant information, visualizations and experience. It aims to reveal the role of risk communication in Covid-19 management in Sweden and Lithuania, to emphasize the differences. Analysed information about Covid-19 communication are mostly from official websites.

3. Covid-19 risk governance analysis in Sweden and Lithuania

This chapter focuses on analysing and comparing Covid-19 risk governance in Sweden and Lithuania using IRGC Risk Governance Framework. The aim of this chapter includes to reveal the differences in Covid-19 risk governance in Sweden and Lithuania. It also aims to cover all the stages of the Framework in terms of Covid-19 risk in these countries. IRGC approach allows to examine the risk comprehensively; it is highly suitable for systemic risks as Covid-19.

3.1. Covid-19 pre-assessment in Sweden and Lithuania

The first early warning of a pandemic might be a fact, that outbreaks of infectious diseases have emerged during the history periodically. For example, there were few outbreaks emerged due to more than twenty infectious pathogens (H1N1, MERS and etc.) over the past decade, according to WHO. (Balkhair, 2020) This is a sign that global health system and policy should be strengthened. However, the first actual warning of Covid-19 pandemic was the numbers of cases in different regions: the very first Covid-19 outbreak was detected December, 2019 in Wuhan, China, and the number of infected individuals was almost 45 thousand by 30 January; Even larger Covid-19 outbreaks were fixated in USA, Italy, Spain, Germany, France and Iran by the end of April, 2020. According to data of the end of April, 2020, the largest numbers of infected individuals were detected in USA (29%), Italy (8.9%) and Spain (9.5%). (Mitkutė, Guzevičius & Krasauskaitė, 2020).

Also, there were other warnings, such as mortality rates and rapid spread of the disease, which indicated the risk. Specific tools and methods, such as preparedness plans, network analysis and epidemiological researches and observations, could and should be used to predict further events in risk assessment and in pre-assessment. Since Covid-19 symptoms are similar to flu and common cold symptoms, the risk could be interpreted as simple health risk. As it is mentioned in the theoretical part, there is a seasonal cycle of respiratory illnesses, especially in winter months. Regarding Covid-19 characteristics, the risk can be put into the frames of seasonal diseases. This is especially relevant in regions, where climate is changing (for example, Middle East, North Europe). Due to this, it may be difficult to evaluate the risk objectively, as people can confuse Covid-19 virus with other similar diseases. Besides, Covid-19 can be associated with other risk, for example, economic and environmental. As a result, these can cause an issue in framing the risk.

This is common pre-assessment for all countries, in order to assess each country preparedness, it is needed to look into that country's indexes and statistics. First of all, it is useful to look in Sweden's health system indexes to assess their preparedness to cope with Covid-19. According Sweden Health Profile 2019, Sweden spent 11% of GDP to health care in 2017, and it is higher percentage than EU average (9,8%). Sweden is one of the leaders in this field. It is important to notice, that majority of health spending is publicly funded. Comparing to EU average, Sweden has higher numbers of both doctors and nurses per 1000 population. The issues in accessing health care emerge in remote and rural areas due to decentralization of Swedish health system, so the government allocated 100 million euros to improve access to it in 2018. Mortality rates from preventable and treatable diseases and causes are low, vaccination rates are high among children, but not among elderly, and hospitals in Sweden provide high-quality health care. However, Sweden has less hospital beds per 1000 population than EU average, and waiting time for health services, especially in remote areas, remains an issue. Also, there is a low usage of health services in Sweden, both inpatient and outpatient. All in

all, the performance of health system in Sweden is evaluated well with high-quality care and high cost. (European Observatory on Health Systems and Policies, 2019)

Lithuania, otherwise, spent only 6.5% of GDP to health care in 2017, i.e. less than EU average. This is noticeably less percentage than in most countries. Two-thirds of health spending is publicly funded. Comparing to EU average, Lithuania has higher number of doctors, but slightly lower number of nurses per 1000 population. Lithuania characterizes good general accessibility to health care, there are low unmet medical needs by population. Otherwise than Sweden, where health care system focuses on outpatient care, Lithuania's health care system is hospital-centric. As a result, Lithuania has one of the highest number of hospital beds in EU, 30% higher than EU average. Lithuania has very high mortality rates from preventable and treatable diseases and causes, average vaccination rates, and quality of health and primary care could be improved. However, there are efforts to cope with health workforce imbalance, shortage and consumption of alcohol and tobacco. There is a high usage of health care services in Lithuania, both inpatient and outpatient. All in all, the main problems in Lithuania are mortality from preventable and treatable causes, especially heart and cardiovascular diseases, tuberculosis, alcohol consumption, mental health, and these issues aggravate health system in Lithuania. (European Observatory on Health Systems and Policies, 2019)

Also, preparedness to cope with health risks could be assessed by *Global Health Index (GHS)*. *GHS* measures capabilities to deal with infectious diseases threats. (Lafortune, 2020) In other word, *GHS* is comprehensive index of health security, that aims to show preparedness to cope with epidemics and pandemics. It involves 195 countries. According to this Index, Sweden is in 7th place with 72.1 (Sweden is among most prepared countries), and Lithuania is in 33rd place with 55.0 (Lithuania is among more prepared countries). (Center for Health Security, 2019) It is important to emphasize that Index vary among different categories.

Other health system measurement is *Electronic State Parties Self-Assessment Annual Reporting Tool (e-SPAR)*. It aims to evaluate countries capacities to detect, assess, notify, report and respond to public health risks. It consists of 24 indicators and 13 capacities. According to the 2019 data, Sweden's capacities average is 93% while Lithuania's – 83%. Europe average is 75%, global average – 64%. There are no challenges indicated in Sweden, while the main challenges are laboratory, risk communication and points of entry in Lithuania. (WHO, 2019)

Speaking about particularly about infectious diseases and epidemics/pandemics, there is *Prevent Epidemics Ready Score*, which measures country's abilities to prevent, stop and detect health threats. This score includes seven factors: 1) National Legislation, Policy and Financing 2) National Laboratory System 3) Real-time Surveillance 4) Workforce Development 5) Preparedness 6) Emergency Response Operations and 7) Risk communication. According to this map, Sweden is in the category 'Pending', and Lithuania is in the category 'Work to do'. As a result, it is possible to assume that neither Sweden nor Lithuania are fully prepared to cope with Covid-19. (Prevent Epidemics, 2020)

Overall, state-level preparedness to deal with health risks seems to be quite advanced in both Sweden and Lithuania (however, Sweden's health indexes are better), but it does not cover the whole pre-assessment stage, especially assessing specific health risk. Kavaliūnas et. al. have accomplished an overview of analyses, which assess and describe Covid-19 data. This has shown that analyses done

in Sweden are not done in Lithuania. (Kavaliūnas, 2020) Vice-chairwoman of medical workers' movement of Lithuania J. Sejonienė has indicated that there is a need to assess current situation, resources and abilities in the country in order to prepare for Covid-19 second wave. (Čiužaitė, 2020) Moreover, *Covid-19 Security Index* for Lithuania was still not available in the beginning of the pandemic. At this time (April, 2020), it was available for 43 countries, including Sweden. However, Sweden has fallen into category "poor Covid-19 performers, good on GHS". So, there is no correlation between *Covid-19 Security Index* and *GHS*. (Lafortune, 2020)

Covid-19 planning tools prepared by Imperial College London were publicly available, and it provides such beneficial tools as hospital planner, which was highly useful in Covid-19 pre-assessment. (Kavaliūnas, 2020) Still, to assess preparedness to cope with Covid-19 is a difficult task. Data and statistics on the issue change rapidly, the situation is unpredictable. Although it is possible to assess countries' overall health system, it remains unclear how to measure countries' preparedness. (Lafortune, 2020)

3.2. Covid-19 appraisal in Sweden and Lithuania

Risk appraisal, also known as interdisciplinary risk estimation, consists of natural/technical assessment and, in contrast to traditional regulation models, social/economic assessment. (Renn, Klinke, 2013). As a result, Covid-19 appraisal involves both scientific (objective) assessment and concern (subjective) assessment. The tense is present or past regarding the event.

3.2.1. Covid-19 scientific assessment in Sweden and Lithuania

Rapid and massive spread of infectious diseases – uncontrolled spread of infectious diseases caused by bacteria, viruses, parasites or fungi (for instance as a result of resistance to antibiotics, antivirals and other treatments) leading to widespread fatalities and economic disruption. (World Economic Forum, 2020, p. 87) *World Economic Forum* defines risk of infectious disease as societal risk and reflects it in *The Global Risk Landscape 2019-2020* with other worldwide risks. This risk is assessed with the likelihood less than average (2.84) and the impact above average (3.68). It is in 10th place in terms of the impact. This is confirmed by the newest event - the impact of nowadays' pandemic, Covid-19 virus, is a quite large risk for both human and environment well-being, however, this risk could be partly managed with public policies, medical help and security requirements.

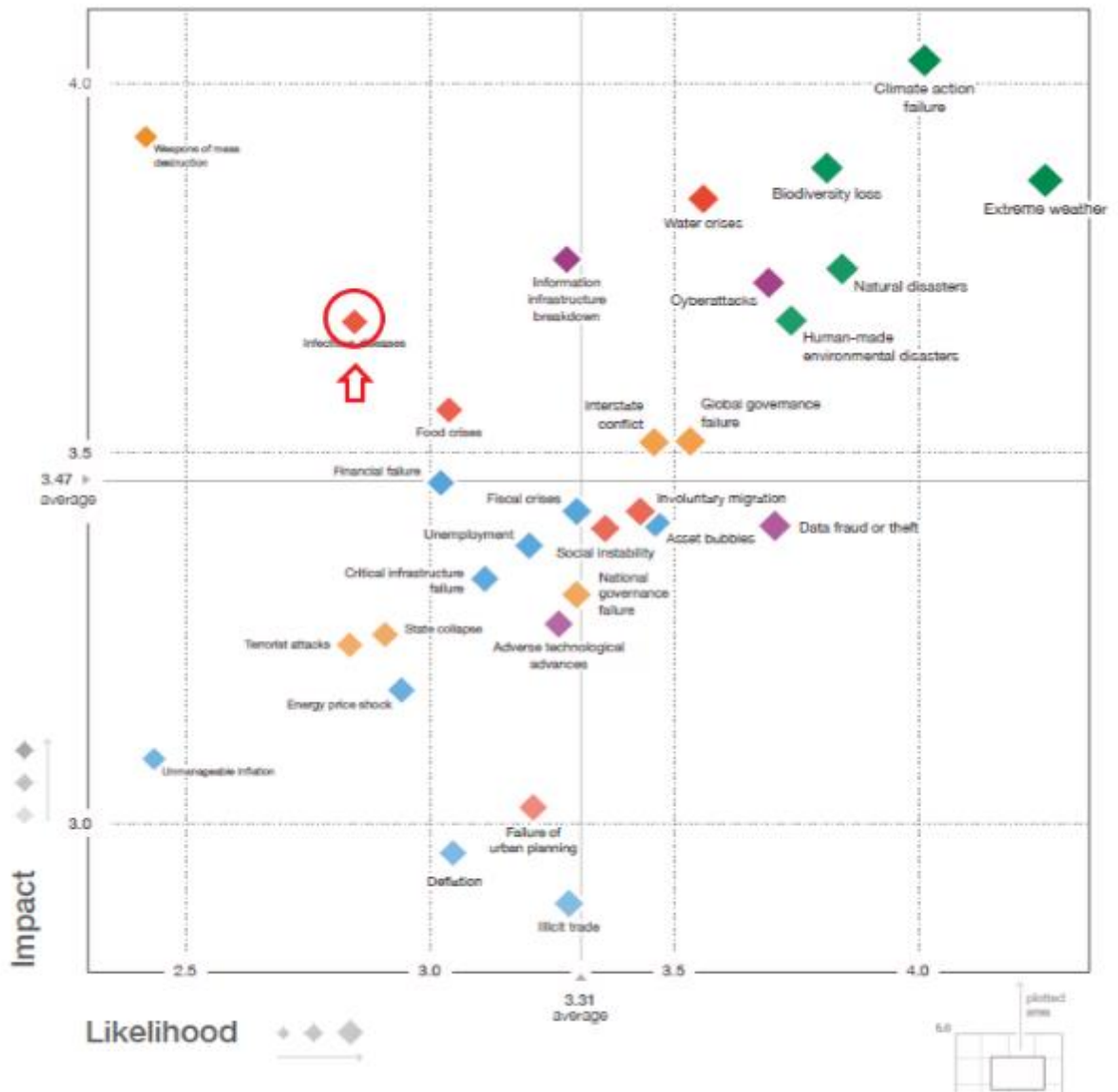


Fig. 7. The risk of infectious diseases in Global Risk Landscape 2019-2020 (World Economic Forum, 2020, p. 2)

The risk of infectious diseases was assessed among top 5 global risk in terms of impact in previous year as well – 4th place in 2007, 5th place in 2008, 2nd place in 2015. (World Economic Forum, 2020) *World Economic Forum* (2020) has also assessed that rapid and massive spread of infectious diseases is mostly connected with such global risks as 1) global governance failure, 2) water crisis and 3) social instability. Spread of infectious diseases is found in 30th place in terms of risk for doing business in global assessment, in 25th place in both Sweden’s and Lithuania’s assessments. However, neither multi-stakeholders nor global shapers assessed that the risk of infectious diseases would increase in 2020. According to *Global Risks Perception Survey*, the risk of infectious diseases is assessed higher in terms of both the likelihood and the impact among non-business respondents, females and respondents older than 40 years. (World Economic Forum, 2020) Regarding *The Global Risk Landscape 2019*, the risk of infectious diseases could be presented in a risk matrix. Theoretically, it is likely that the risk of infectious diseases could be found at this point:

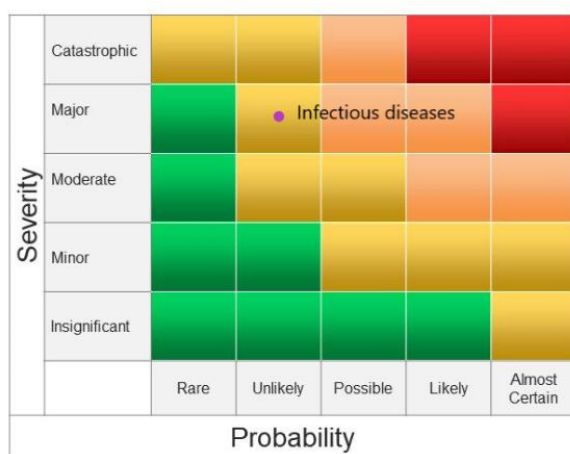


Fig. 8. The risk of infectious diseases in a risk matrix (Made by the author using the matrix from Slide Team, 2020)

However, such an attribution to a risk matrix is only theoretical regarding The Global Risk Landscape 2019. It is not necessarily precise, and it is only a supplement for the context and pre-assessment, and it enriches scientific assessment with objective knowledge. According to the matrix, the risk is tolerable.

In order to assess Covid-19 risk properly, it is needed to know potential risk factors. *Centers for Disease Control and Prevention* indicated these potential risk factors: 1) age 2) race/ethnicity 3) gender 4) some medical conditions 5) the use of certain medications 6) poverty and crowding 7) certain occupations 8) pregnancy. Also, it is needed to assess Covid-19 epidemiology, including: 1) identifying the source of the outbreak 2) Monitoring and tracking the disease 3) Studying the disease 4) developing guidelines to slow the spread of the disease and reduce impact. Moreover, both Sweden and Lithuania fall in the category of high risk, and it is recommended to avoid travelling to them (*Centers for Disease Control and Prevention, 2020*) *European Centre for Disease Prevention and Control* introduced epidemiological criteria to assess Covid-19 epidemiological situation in different countries. Regarding this epidemiological assessment, both Sweden and Lithuania are in the category of serious concerns. Neither Sweden nor Lithuania is among countries with stable epidemiological situation. (*European Centre for Disease Prevention and Control, 2020*)

The main indexes in assessing capabilities to cope with Covid-19 pandemic are: the number of beds of *Intensive Care Unit* (ICUs), the scope of hospitalization due to Covid-19 and reproduction number R , which shows whether cases are increasing or decreasing, what is high number and low number. During the first wave, Lithuania did not provide any data on these concerns: how much beds of reanimation and intensive therapy were? How much of them were available? How much Covid-19 patients were being treated in them? Was there a possibility to increase the number of beds if necessary? How much people with Covid-19 needed a medical help? What was R in Lithuania? Sweden, otherwise, provided data on these concerns (*Kavaliūnas, 2020*)

As a result, Sweden is a lot more prepared to assess Covid-19 risk objectively. While there was a lack of epidemiological researches in Lithuania, Sweden was doing analyses in this sphere. There were four main institutions, which provided a lot of Covid-19 updates, data and trends in Sweden:

- The Public Health Agency of Sweden;

- The National Board of Health and Welfare of Sweden;
- The Swedish Intensive Care Register;
- Statistics Sweden. (Kavaliūnas, Ocaya, Mumper, Lindfeldt, Kyhlstedt, 2020, p. 4)

For example, The Public Health Agency of Sweden accomplished these main analyses during the first wave:

- Weekly reports on every Friday included an overview of situation in the country and globally, an introduction of main tendencies in data monitoring, analyses of various indexes: the scope of testing, the number of new cases, distribution among genders and ages, place, mortality, ICUs situation;
- Instantaneous reproduction number R was regularly renewed;
- Infection mortality index was 0,1% among people under 69, among older 4,3%;
- Risk to be infected among different occupation: the highest risk to be infected were among taxi drivers, higher risk was among restaurants and coffees workers, public transportation workers. Education workers did not have higher risk than other workers;
- Demographical data analysis showed that the highest number of confirmed cases was among Turks, Ethiopians, Somalis, Chileans, Iraqis. The highest mortality was among Suomi in Sweden. Age median among dead people with Covid-19 – 84 years old;
- Situation among school-age children and comparison among countries: common number of confirmed cases among 1-19 years old children in Sweden during spring did not differ from Finland's, although schools in Finland were closed, and education institutions in Sweden were working. Severe cases were very rare in both countries, there was no deaths;
- Peak days and assessment of infected people: regarding mathematical modelling results, peak day was 8 April 2020 in Stockholm region during the first wave. 26% of region population might get infected until 1st of May;
- Epidemic curve and situation in regions: situation were being analysed separately in regions;
- The impact of the closure of schools to health system showed if education institutions were closed, it would be extremely difficult for regions during the pandemic;
- Preparedness for autumn, pandemic development scenarios/ simulations were an introduction of possible epidemic development regarding a current situation, speculative scenarios, subsidiary guidelines for institutions activity planning;
- Additional analyses included prevalence research in Stockholm in March and April, planning of health care needs, prognosis for summer in spring;
- Risk and age of severe cases and consequences: while age increases, risk of severe consequences increases. It was recommended to limit physical contact and stay home for those older than 70 years with clinical risk factors. (Kavaliūnas, 2020)

National Boars of Health and Welfare has also accomplished these main analyses:

- Descriptive statistics of deaths included percentages and living places of dead people from Covid-19 with additional diseases;
- Additional analyses included the impact to accessibility for odontology, mental health, early diagnosis, consultative and other services, the impact for oncology. (Kavaliūnas, 2020)

In addition to this, Civil Protection and Preparedness Authority communicates Covid-19 information via website *krisinformation.se* (emergency information from Swedish authorities). (Kavaliūnas et al., 2020) Differently from *Centers for Disease Control and Prevention*, this website stated that,

regarding global situation and the number of cases in other European countries, the risk of general spread of Covid-19 in Sweden is assessed as moderate by The Public Health Agency of Sweden. However, the risk of discovering Covid-19 in Sweden is assessed as very high. (Emergency Information from Swedish authorities, 2020)

Epidemiology is described as identification of risk factors and groups in order to make proper health policy decisions. In addition to epidemiological analyses, The Public Health Agency of Sweden also accomplished analysis, which showed that major part of health care workers would have to stay home with children if schools were closed. This would be a challenge for a health care system. However, there are a lot of prognoses, only several indexes and no serious situational analysis in Lithuania. As a result, it can be seen that scientific analyses allow to assess the risk objectively in Sweden. Otherwise, there was one major index in Lithuania – the number of cases. It is not relevant to count cases when people do not need medical help in hospitals. So, broadly speaking, Lithuania had a one index, that was a mortality. (Kavaliūnas, 2020)

There were only few indexes, and serious analyses of situation were not likely to be done, according to dr. Kavaliūnas. (Kavaliūnas, 2020) So, to find data about objective scientific Covid-19 assessment in Lithuania is a challenge, it seems that there was no proper Covid-19 assessment in Lithuania. The main sources in Lithuania were Ministry of Health of the Republic of Lithuania website, where the main information about limitations, numbers and etc. could be found, and the media. For example, the article on Covid-19 assessment issue was published on 27 October, 2020. (Čiužaitė, 2020)

According to the article, both medical experts and politicians agreed that the government did not manage Covid-19 data properly. According to director of the centre of communicable diseases and AIDS prof. S. Čaplinskas, there was a lack of Covid-19 data or they were non-existent, and it was doubtful that people managing these data were capable of doing this. Moreover, it was forbidden for the centre to publish Covid-19 data. So, the assumption is that Covid-19 assessment, management and communication were political matter, according to political expert doc. V. Dubliauskas. Politicians indicated that there was a lack of dialogue between the government and medical workers. This posed the challenges in assessing Covid-19 as only basic numbers were available. (Čiužaitė, 2020)

According to Covid-19 Regional Safety Assessment, Sweden was in 65th place, and Lithuania was in 29th place in December 2020 in Europe. This ranking considered quarantine efficiency, government efficiency of risk management, monitoring and detecting, Covid-19 health care readiness, Covid-19 region resiliency, Covid-19 emergency preparedness. (Deep Knowledge Group, 2020) Although separate Covid-19 assessment differed among countries regarding demographical and ethical situation, it is possible to draw an identification of hazards (threats, assets, vulnerabilities) based on information presented in the theoretical part and scientific assessment. It is important to emphasize that threats for environment and economy may be beneficial for human health. The scheme systemizes previous information and presents relevant data:

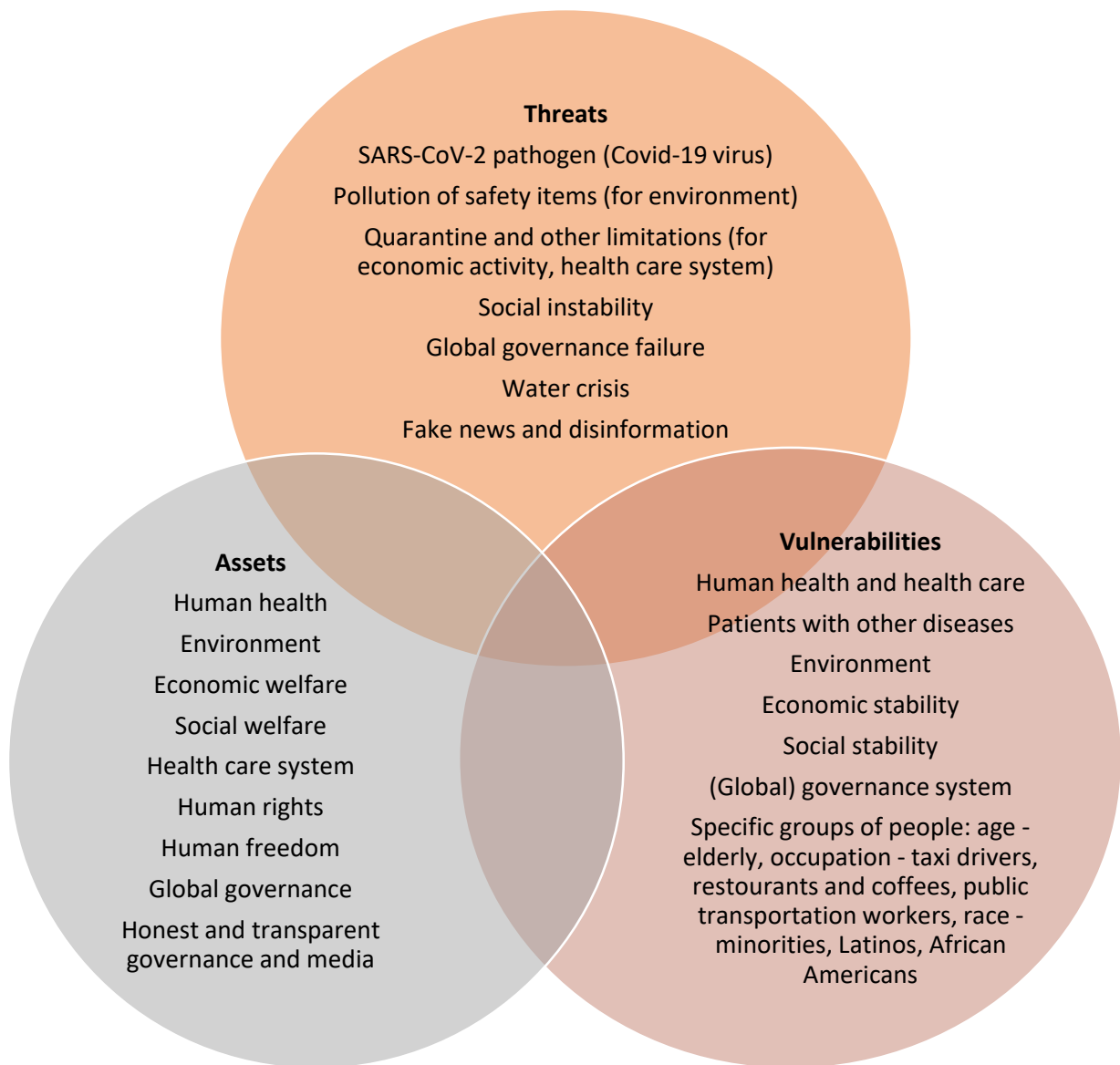


Fig. 9. Vulnerability assessment of Covid-19 pandemic (Made by the author, 2020)

3.2.2. Covid-19 concern assessment in Sweden and Lithuania

European Union and Covid-19

A public opinion survey of public opinions and attitudes toward EU policy in times of Covid-19 by the European Parliament was accomplished in the period of 11 June 2020 – 29 June 2020. According to the survey, 51% people in Sweden totally agreed or tended to agree with a statement that EU should have more competences to respond to Covid-19, while in Lithuania the number is even bigger – 68%. The major part of people in Sweden indicated that EU has proper financial means to cope with the consequences of Covid-19, while most people in Lithuania believed that EU should have greater financial measures to cope with them. The major part – 50% of population – in Sweden wanted that EU budget would be spent on public health, while major part – 54% of population - in Lithuania wanted that the budget would be spent on economic recovery and new opportunities in business. (Eurobarometer, 2020)

Trust and other aspects

Sweden

Speaking about trust in Sweden, survey of 3-10 March 2020 showed that the most trusted institution/authority in Sweden was health care – total number of trust was 59%. Trust in political institutions regarding Covid-19 pandemic response: 48% in the Public Health Agency of Sweden, 44% in Swedish Civil Contingencies Agency, 37% in Ministry of Foreign Affairs, 32% in the government. (Statista, 2020) In addition to this, data from 10-15 April 2020 showed that health care in Sweden are highly trusted – 50%, and trust in the government was 37%, in hospitals – 44%, in the health sector – 27%. (Helsingen et. al.)

A survey on 26 June 2020 showed that the confidence in Sweden's management of Covid-19 decreased to 45%, compared to 63% in April, and that trust in the main actors coping with the pandemic decreases. The number remains stable since the decrease. (Ipsos, 2020) However, the data in Sweden posted in September 2020 indicated that trust in the government's actions to cope with Covid-19 increases: 6 of 10 people trusted government strategy, the number is 62%. (Eurobarometer, 2020) According to the data from the report of November-December 2020, 56% of respondents trusted Swedish strategy. Moreover, 58% of Sweden's population believed that public health and economic interests are well balanced. (Eurobarometer, 2020) Statistics published in 27 July 2020 by Ipsos showed that 85% of Sweden's population supported mitigation when 72% supported re-engagement in responding to Covid-19. (Ipsos, 2020)

Lithuania

Now, the relevant public opinion surveys in Lithuania are overviewed. A survey by Spinter survey on 18 May 2020 – 17 May 2020 showed that 45% of Lithuania's population felt the financial consequences of Covid-19. Moreover, a survey by Luminor Bank in May showed 42% of respondents assessed their financial situation as not good enough. In the period of 5-13 June 2020 Vilmorus accomplished a survey which showed that 58,8% of Lithuania's population was satisfied with the government's action to cope with the pandemic, while 26.6% - not. Trust in the media is the lowest since 1998, according to Vilmorus survey in June 2020. Only 30,7% of respondents said they trusted the media, while 29,1% - not. (Eurobarometer, 2020)

Concerns and anxiety

Sweden

According to the survey by Helsingen et. al., the main concerns in Sweden were health threats for the population (58%), threat of repercussion for the country (56%) and postponed treatment for other diseases (56%). Other concerns include personal health (12%), health of family (21%), worries about personal economy (30%) and country's economy (42%). (Helsingen et. al.)

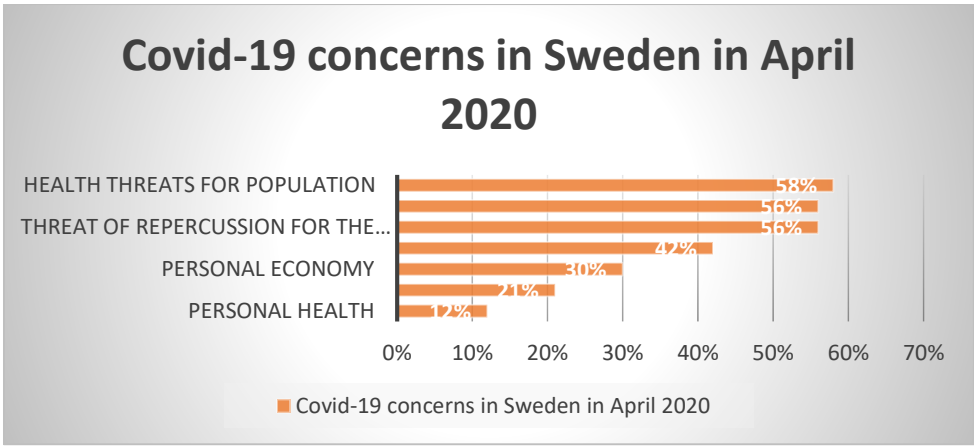


Fig. 10. Covid-19 concerns in Sweden in April 2020 (Made by the author according to Helsinger et. al., 2020)

According to a survey accomplished in June 2020, there was a decrease in worries about the consequences of the pandemic in Sweden from 46% to 43%. 1/5 of Sweden’s population worried about their incomes in the next year. (Ipsos, 2020) Generally, worries about Covid-19 itself is decreasing: statistics published in September 2020 showed that 27% of population was concerned about coronavirus and 22% in October 2020. (Ipsos, 2020) But general worries about the future increased by 8% and reached 50%. (Eurobarometer, 2020)

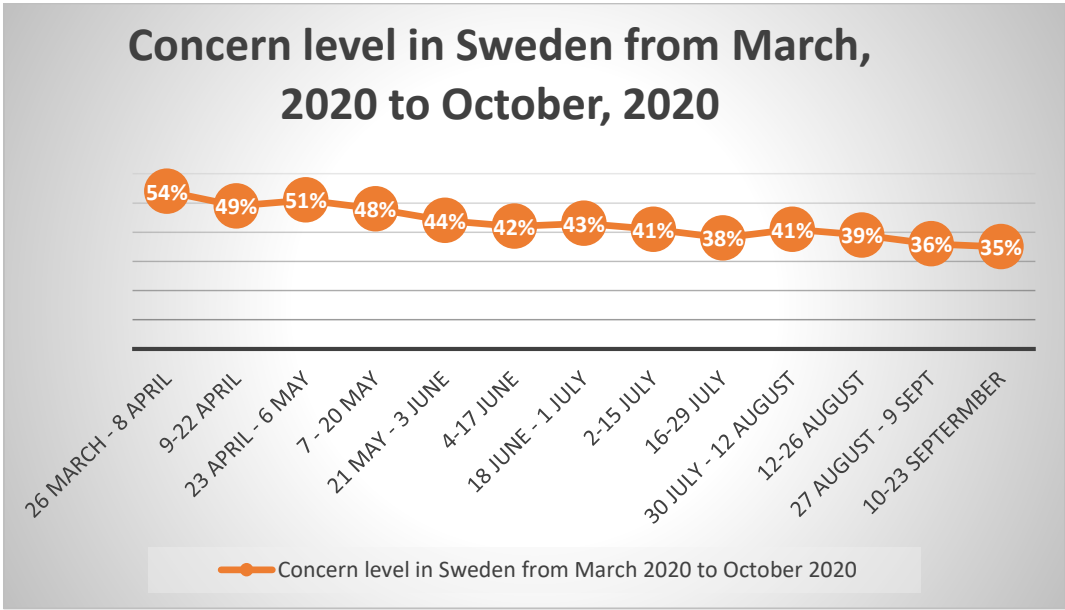


Fig. 11. Percentage of concerned people of Covid-19 in Sweden (Made by the author according to Eurobarometer, 2020)

Lithuania

People in Lithuania were mainly concerned about the spread of the virus in Europe (78%) and globally (72%), global economy (70%), uncertainties about origin of the virus and control (64%) and a lack of vaccine (61%), according to a survey conducted in the beginning of the pandemic, in March. Moreover, quarantine and social distancing measures were assessed positively by 42% respondents, and the government’s actions toward the crisis was also assessed positively in April 2020. Moreover,

65% of respondents in Lithuania assessed European Parliament’s decisions affected their lives in May. (Eurobarometer, 2020)

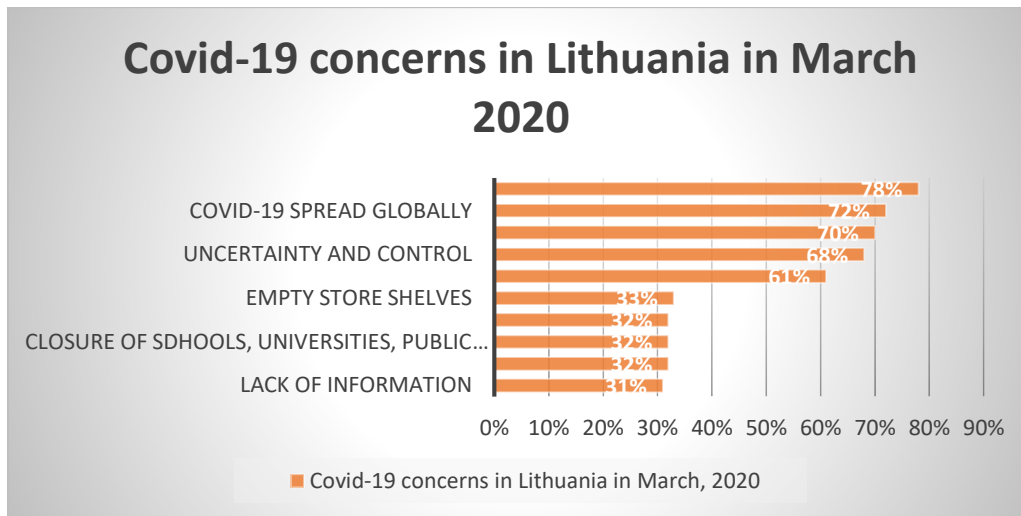


Fig. 12. Covid-19 concerns in Lithuania in March 2020 in percentage (Made by the author according to Eurobarometer, 2020)

The new data posted in October 2020 showed that Covid-19 pandemic has affected majority of Lithuanians: 93% of population felt anxious about their own or family’s well-being, the survey also indicated that 61% of Lithuanians felt that their anxiety level increased, 18% - that the level increased significantly, 43% - that their concerns slightly increased, and 39% - that their anxiety level remains the same. The most popular concerns were the health of loved ones, financial insecurity (reduced incomes, savings, potential unemployment), personal health. (Eurobarometer, 2020)

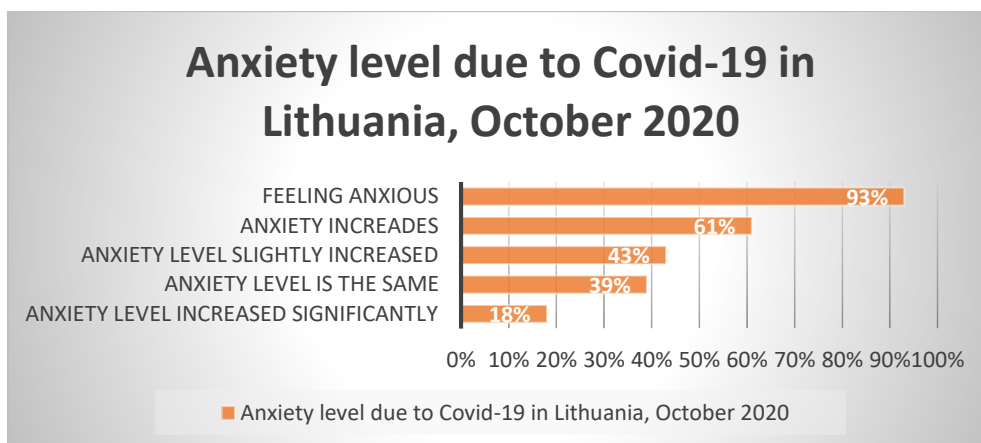


Fig. 13. The anxiety levels due to Covid-19 in Lithuania according to the report of October 2020 (Made by the author according to Eurobarometer, 2020)

Public support for vaccines

Sweden

Support for vaccination against Covid-19 tended to decrease: statistics on 1st of September indicated that 67% of Sweden’s population would likely to get vaccinated from Covid-19 (Ipsos, 2020) while

33% refuses. In the mid-September, the number of those who would take vaccine was 57%. The number tended to decrease, and it was 54% on October 2020. (Eurobarometer, 2020) Most of those who refuses to get vaccinated indicated worries about side effects and the uncertainty about effectiveness. According to the data from the report of November-December 2020, 61% would get vaccinated and 25% would not. (Eurobarometer, 2020)

Lithuania

The media article published in 25 October 2020 stated that, according to the survey (sample size – 1000), 42,9% of respondents would get vaccinated, 42,5% would not, and 14,7% had no opinion. Meanwhile Lithuanian Government said that the aim would be to vaccinate 70% of population, and that the vaccination would be voluntary. (BNS, 2020) 16,6% out of 42,9% (those who would get vaccinated) stated that they would definitely get vaccinated, and 26,6% would probably get vaccinated. 24,4% out of 42,5% (those who would not get vaccinated) ensured that they would definitely not get vaccinated, and 18,2% out of 42,5% would probably not get vaccinated. (Eurobarometer, 2020)

3.3. Covid-19 characterization and evaluation in Sweden and Lithuania

This section aims to cover the topic of Covid-19 knowledge characterization and Covid-19 evaluation regarding concern assessments in Sweden and Lithuania. Also, it suggests criteria for comprehensive response evaluation.

3.3.1. Covid-19 knowledge characterization

Covid-19 is infectious disease caused by SARS-CoV-2 pathogen. It is a respiratory disease from coronavirus diseases family, three out of seven species can cause complicated infections: SARS-CoV, MERS-CoV, SARS-CoV-2. Covid-19 spreads through airborne or contact, and the virus potentially damages lungs, heart, intestine, brain or kidneys. There is no specific treatment for Covid-19, so the treatment is symptomatic and oxygen therapy is applied. Patients with severe symptoms are hospitalized, artificial lungs ventilation or treatment with plasma of recovered person are applied. (Mitkutė, Guzevičius & Krasauskaitė, 2020) Balkhair (2020) has indicate that emergence of Covid-19 is related to pneumonia linked to sea food market in Wuhan, China, (Balkhair, 2020)

American Thoracic Society (2020) have indicated that SARS-CoV-2 is single-stranded RNA possibly emerged from bats or pangolins. It spreads from a person to a person via respiratory droplets. There are several symptoms and different percentages of patients with them: cough – 50-80%, fever- 85%, fatigue – 69,9%, dyspnoea – 20-40%, upper respiratory infection (URI) symptoms – 15%, gastrointestinal (GI) symptoms – 10%. (American Thoracic Society ,2020) According to Mash (2020), most common symptoms are fever – 83%, cough – 82%, difficulty breathing – 31%, fatigue and myalgia – 11%. 90% patients have more than a one symptom. (Mash, 2020) Covid-19 can be mild, moderate, serious, severe/extreme. In ~80% cases illness is mild or moderate, in ~14% cases illness can become serious and in ~6% cases severe or extreme. (Kritz, Huang, 2020)

Covid-19 risk is an external and involuntary health risk, but its management may cause manufactured risks for politics, economics, the environment and the society. For example, global governance failure

is a geopolitical risk, but it may be associated with the risk of infectious diseases. Such additional risks come from primal external risk of infectious diseases and the management of these risks. Looking from business perspective, Covid-19 risk is also external risk, although it may be considered as strategy risk in some additional spheres. Covid-19 risk is highly comprehensive risk, which needs multidimensional approach.

Regarding the types of infectious disease threats, Covid-19 risk is a complex threat. There is a lack of knowledge not only about the disease itself, but also about its impacts, treatment and consequences. Risk perception is high, and it can be seen from strict management measures and concerns. Due to this characteristics, a lot of uncertainties emerge, primarily uncertainties in governance process, different attitudes to risk management.

As a result, Covid-19 risk can be characterized as a systemic risk with a high degree of complexity, uncertainty and ambiguity. As Covid-19 risk depends on a lot of factors, it has impacts on several spheres, and it is hard to establish particular relations among them, the risk is complex. Uncertainty refers to a low predictability of the disease and medical uncertainties. Ambiguity implies different opinions about disease itself and vaccination, and that the disease's symptoms are similar to flu or cold symptoms. The main Covid-19 characteristics are systemized in the table:

Table 17. The main Covid-19 characteristics (Made by the author)

Characteristic	Covid-19 feature
Pathogen	SARS-CoV-2
Transmission	Airborne, contact, droplets, bodily fluids
Origin	Wuhan, China possibly from sea market, bats or pangolins
Treatment	Symptomatic, lungs ventilation, plasma, cold medicines
Symptoms (most common)	Myalgia, fatigue, fever, cough, dyspnoea
Risk factors	Age, race, additional diseases, some medications, certain occupations, smoking and etc.
Vaccination	Currently not available, causes controversy
Type of disease	Infectious, respiratory and viral; can be mild, moderate, serious, sever/extreme
Type of infectious disease threat	Complex
Type of risk	Primarily external and involuntary, systemic, complex, uncertain and ambiguous

According to the statistics on 1 December 2020, overall number of Covid-19 cases was 243 128, overall number of active cases was 51 505, overall number of recovered people was 184 943, and overall number of deaths was 6 681 in Sweden. (Georank, 2020) The information published on 1 December 2020 stated that overall number of Covid-19 cases was 62 515, the number of recovered people was 15 077, the number of new cases confirmed on the previous day was 1 187, and overall number of deaths was 515 in Lithuania. (Korona STOP, 2020).

3.3.2. Covid-19 evaluation in Sweden and Lithuania

External and involuntary risks, which come from natural hazards, are usually classified as Cyclops. Natural risks as earthquakes, volcanic eruptions, floods do not include many of human factors, so the likelihood is uncertain, and the impact is high. Appearance of infectious diseases may also be found in this class. (Klinke, Renn, 2004)

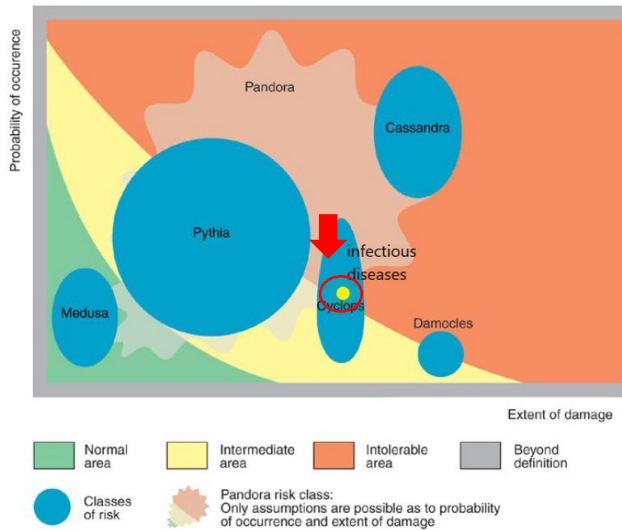


Fig. 14. Infectious diseases in Greek mythology risk model (Renn & Klinke, 2006)

Covid-19 evaluation is strongly related to Covid-19 perception and concern assessment. It is difficult to compare concern assessment in Sweden and Lithuania since the surveys are different, and there is more new information about Sweden. Still, it seems that the virus threatens most of countries, so the risk is taken seriously, although the tolerability can vary between yellow and orange zones:

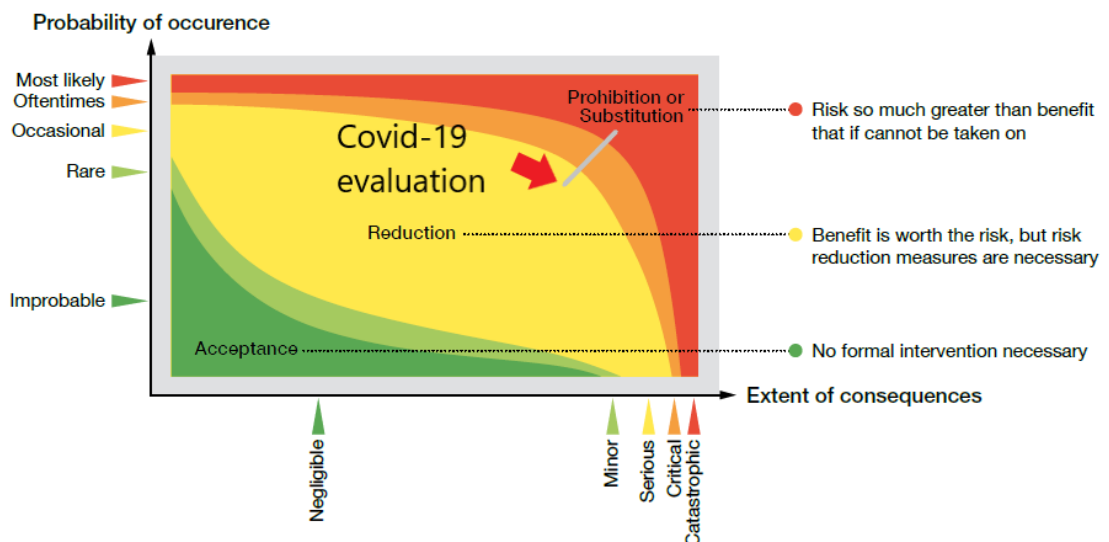


Fig. 15. Covid-19 evaluation (Made by the author using the model from IRGC, 2017)

People do not tend to evaluate a risks objectively, so Covid-19 risk is likely to be evaluated in orange transition zone, between tolerability and intolerability. Risk reduction measures are definitely needed,

but some benefits could make the risk worth taking. In evaluating and perceiving the risk, it is important to consider the impacts:

- Health/social impacts, especially in the most vulnerable countries;
- Economic impacts, which vary depending on specialization of specific sectors such as a tourism:
- Restrictions on movement and social distancing mostly affected travel activities (for example, tourism) and direct contact service providers (for example, hairdressers);
- Only takeaway and online sales could prevent the bankruptcy of most retailers, cinemas and restaurants;
- Containment policies and the decrease in investments also affected non-essential businesses;
- Manufacturing sectors were less affected by lockdowns, although producers of transport equipment had to stop their activity as necessary cooperation among countries and supply were impossible;
- Fiscal impacts, which refer to long-term consequences due to increased expenditures and decreased revenues. (The Organization for Economic Co-operation and Development [OECD], 2020)

As Fisher, Teo & Nabarro (2020) have written, numbers of Covid-19 cases are used to judge and evaluate performance of national responses to Covid-19 pandemic, but the numbers are an unreliable indicator for it. Instead of this, it is needed to consider numerous factors: resources, capabilities to perform other health services, socioeconomic stability, protection and support for vulnerable groups, leadership and communication and etc. Basically, it is possible to distinguish seven blocks for national performance:

- Ability to detect and destroy transmission chains:
- Percentage of cases detected using contact tracing;
- Compliance of the communities with governmental health regulations;
- Testing and related numbers;
- Ability to minimize deaths and severe cases:
- Deaths numbers for population;
- Ventilator capacities for population;
- Minimize Covid-19 cases in hospitals:
- Personal protective equipment availability;
- Infections related to a health care;
- Fiscal support:
- Programs for people in isolation or quarantine;
- Programs for people and companies threatened by social restrictions;
- Maintenance of food and medicine supply chains;
- Protection of vulnerable/neglected groups;
- Maintenance of other health services:
- Essential services should not be reduced;
- Non-essential services should be restored as soon as possible. (Fisher, Teo, Nabarro, 2020)

During the first wave, different countries evaluated Covid-19 risk differently depending on many factors, so interval of Covid-19 risk evaluation fluctuated among tolerability, transition between

tolerability and intolerability and intolerability. Besides, it worth mentioning that the Covid-19 risk could be evaluated otherwise than ‘Cyclops’ based on concern assessment. Regarding Covid-19 concern assessment, people in Sweden were not highly concerned about Covid-19, so the risk may be evaluated as tolerable. It is difficult to evaluate the risk in Lithuania, but it was possibly found in orange transition zone since a lot of people in Lithuania feared Covid-19. According to Forbes article, Lithuania was evaluated in 42nd place in terms of safety, while Sweden was evaluated in 49th place in September 2020. (Koetsier, 2020)

3.4. Covid-19 management in Sweden and Lithuania

This chapter is divided into decision-making and management implementation. Although the pandemic is ongoing phenomenon, this chapter focuses on analysing the experience of Covid-19 management, so the tense is past, except for several cases.

3.4.1. Covid-19 decision-making in Sweden and Lithuania

Covid-19 decision-making could be interpreted in different perspectives. According Geek mythology risk classes, Covid-19 risk is classified as Cyclops, which leads to science-based management, combination of risk-based and precautionary strategies. This includes decreasing disaster potential, ascertaining probability, building resilience, preventing unexpected events and emergency management (Klinke, Renn, 2006) Regarding Covid-19 risk characteristics, complexity, scientific uncertainty and socio-political ambiguity, it can be assumed that decision-making and management should include risk-informed, robustness-focused, precaution-based, resilience-focused and discourse-based strategies. (Renn, Klinke, 2013) Regarding a type of infectious disease threat, complex, the most effective and timely response governance is core-periphery governance, when the management and decision-making i.e. the network is divided among different subgroups (for a health, education, safety, policies). (Kenis et. al., 2019)

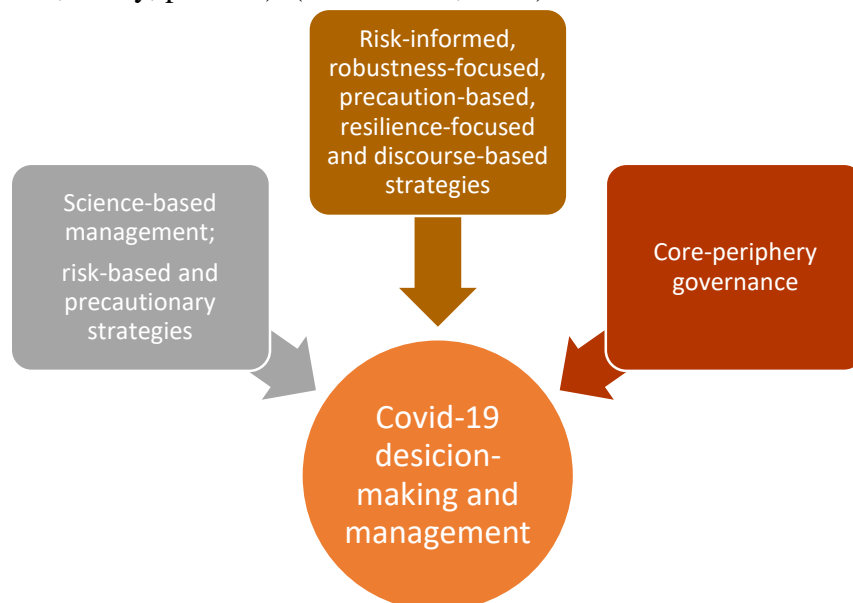


Fig. 16. Proposed decision-making and management for Covid-19 pandemic (Made by the author, 2020)

Covid-19 pandemic can be considered as a test for many spheres – political leadership, national and international health care system, social health services, solidarity. The management and decision-making is the measures to assess the results of this test. There are two main strategies in Covid-19

decision-making process. It is relevant to understand that both policies have their own challenges. Two approaches are:

- Mitigation, where the focus is on slowing epidemic spread – reducing peak health care demand, protecting high-risk people. It does not necessarily mean stopping the spread;
- Suppression, where the focus is on reversing epidemic growth, reducing the number of cases to low levels, maintaining the situation unclear. (Kavaliunas et. al., 2020)

There are contingency plans for a pandemic influenza at national, regional and local levels in Sweden. The aim of these plans are to limit the spread of the infection and to reduce negative consequences caused by a pandemic. These plans can be applied to other outbreaks, such as Covid-19, as well. The main institution responsible for preparedness, coordination, communication and etc. is The Public Health Agency of Sweden. At international level, Sweden cooperates with World Health Organization, European Union and European Centre for Disease Prevention and Control. (European Observatory on Health Systems and Policies, 2020) At state level, health care governance and decision-making in Sweden are based on three levels:

- At national level, the government is responsible for policies, legislation and governance of national agencies, the Public Health Agency of Sweden (PHA) and the National Board of Health and Welfare (NBHW);
- At region level, 21 regions have responsibilities for health care;
- At local level, 290 municipalities provide care to elderly and disabled. (Kavaliunas et. al., 2020)

Covid-19 decision-making in Sweden focused on mitigation, i.e. slowing the pandemic, but not stopping, during the first wave. The main decisions, which led to less invasive response than in many countries, were:

- No general lockdown;
- Physical distances were mandatory in bars, restaurants and at events, strongly recommended in public spaces;
- Visits to nursing facilities were forbidden;
- Kindergartens and schools for children up to 16 were opened;
- Education for older children was conducted remotely;
- No enforced quarantine for infected households and demographical regions. (Ludvigsson, 2020)

It is relevant to emphasize that the decision-making process in Sweden was based on independent government agencies' advices how to limit the spread of Covid-19. Decisions as not to close schools were based on scientific assessments. For example, there were no scientific evidence that schools closure would have a major impact on preventing the virus, so it was agreed that this would not be a meaningful measure to Sweden. All the decisions adopted in Sweden aimed to limit the spread of the virus in Sweden, ensure provision of health care resources, reduce the impact of critical services, reduce the effects on society and economics, ease people's concerns by risk communication measures. Overall, the decision-making and management in Sweden were based on right measures at the right time approach, voluntary actions and recommendations. (Sweden Sverige, 2020)

Swedish Covid-19 decision-making and management were different from many countries, although the main aim is the same: to reduce transmission of the virus. The difference was that Sweden did not only focus on reducing the transmission, but also on maintaining physical activity, important social functions, satisfying children's needs. As a result, such decisions as not to close schools and most workplace and not to send police on streets to check one's errands were criticized and marvelled by many countries. Sweden's decision-making can be described as evidence-based, science-based as Sweden based its decision on scientific analyses. Moreover, it is important to understand that evaluating the strategy and decision-making should also include such factors as disruption of health care and education systems due to lockdowns, mental health risks, violence, crimes, violation of human rights, unemployment, business. (Kavaliunas et. al., 2020)

Generally, Swedish health promotion strategy is based on individuals and their self-management in the time of epidemiological risks and crisis, it assumes that people are able to make risk-informed, risk-minimizing, risk-managing and corrects decisions. The role of citizens' engagement is essential as an individual is a unit of decision-making process. However, Covid-19 decision-making process in Sweden was criticized for not only softness and a lack of regulations compared to other countries, but also for several additional things. For example, there were protests from opposition parties after Swedish government suggested temporary changes in constitution that would allow to implement fast and extensive adjustments in order to deal with the pandemic in April, 2020. As a result, this proposition was reframed that the parliament approval was requested while making these decisions. Moreover, an editor of Sweden's largest morning newspaper, P. Wolodarski, criticized the government decisions as well. According to him, The Public Health Agency had a stronger position during swine flu pandemic: Swedish government widely showed that the decision-making was evidence-based regarding experts' assessments. (Nygren, Oloffson, 2020)

Lithuania also had a pandemic response plan before Covid-19 outbreak, but it was specifically applied to a pandemic flu. Covid-19 decision-making in Lithuania was based on the Law on the Prevention and Control of Communicable Diseases in Humans. (European Observatory on Health Systems and Policies, 2020) According to the Constitution of the Republic of Lithuania, a legislation of law is the parliament's responsibility, and the government arranges and provides law projects for the parliament to consider. (Lietuvos Respublikos Konstitucija, 1992) There are 14 ministries in Lithuania, and health responsibilities is dedicated to Ministry of Health (MOH). MOH works in many areas: personal health care, society's health care and etc. It has many working parties and committees. Besides, there still are a lot of orders by the Minister of Health related to Covid-19 management. (Lietuvos Respublikos sveikatos apsaugos ministerija [SAM], 2020)

Generally, Covid-19 decision making and management is highly political in Lithuania: as it is seen from previous stages, there is a gap in scientific assessment field, and Covid-19 response is led by the government. (European Observatory on Health Systems and Policies, 2020) The main decisions during the first wave of Covid-19 were:

- National quarantine with a lockdown since 16 March 2020 to 17 June 2020;
- A closure of national borders, educational institutions;
- Limitations on inter-city public transportation, planned health services, export of certain measures;
- an introduction of physical distancing;

- Prohibitions to provide certain face-to-face services;
- An introduction of workplace requirements. (European Observatory on Health Systems and Policies, 2020)

A hand disinfection provision for clients at supermarkets became required on 24 March 2020. Speaking about facemasks, they were recommended at first, but on 10 April 2020, they became mandatory in all the public places. (European Observatory on Health Systems and Policies, 2020) Restaurants, bars, cinemas and etc. were closed, social gatherings, events and sport activities were banned. Medical services could only be provided remotely. The period between the first quarantine and the second one was dynamic. Strict quarantine measures were gradually mitigated since 15 April 2020 (events are written in order from the earliest to the latest): non-food stores with a separate direct enter from the outside started working, exams for a motorcycle license were allowed, gardening supplies could be sold in outside markets, shops were no longer required to have the outside entrance, hairdressers, nail salons, outdoor cafes, libraries, museums started working, some kindergartens were partially opened, leisure activities were allowed. These are only few examples of quarantine facilitation. Basically, there were two transition stages. (European Observatory on Health Systems and Policies, 2020)

The report, which analysed the decision-making during Covid-19 crisis in Lithuania, was published in October 2020. According to this report, there were limiting and regulating decisions approved by the government, and the regulating decisions were rapidly approved without consulting with the society and evaluating the effect. The gaps in law-making partially determined defects in regulating policies by State institutions, that is, the decision-making process. The government should follow the main principles in the decision-making during extreme situations, which were announced by Organization for Economic Co-operation and Development (OECD): regulations could be accepted by accelerating procedures, but the assessment before and after (*ex ante and ex post*) are necessary, regulations should be proportional to the risk level and etc. However, all the law projects were published without consulting with the society and effect assessments. Decisions without consulting with the society, effect assessment and the end data of validity were accepted not only during quarantine, but also after the end of quarantine. As a result, there was a lack of significant decisions and systemic attitude, especially in economic field. Also, the instructions of the decision-making in the future were provided with the emphasizing the relevance of deregulation processes in the report. (Lietuvos Laisvosios Rinkos Institutas [LLRI], 2020)

In the period of the second wave, a second quarantine was announced on 7 November 2020 and should be cancelled on 29 November. This quarantine was softer as decisions were not so strict compared to the first quarantine. For example, cultural, leisure, entertainment services and events were prohibited, restaurants, bars and cafes could only provide takeaway and delivery food, but pre-schools and kindergartens worked as usual, essential health services could be provided, and certain services including dental services, a care for pregnant women, vaccination services were maintained. (European Observatory on Health Systems and Policies, 2020) The most relevant decisions and limitations during the second quarantine were:

- Public places: only groups up to 5 people, facemasks were mandatory for people older than 6 years old with some exceptions;

- Restaurants, bars, cafes, nightclubs, cultural, leisure, entertainment services and etc. were closed, only takeaway food;
- Shops and other services had to ensure proper distance, events were forbidden;
- Limitations on travels, movement, borders;
- Kindergartens and primary schools were working, upper education was organized remotely, it was also recommended to work remotely;
- Essential health services were provided with some limitation and etc. (Budreikienė, 20020)

Having analysed Covid-19 decision-making in Sweden and Lithuania during the first wave, it emerged that the countries had different Covid-19 perceptions and decisions. While Sweden followed relatively soft and scientific Covid-19 decision-making model, Lithuania implemented relatively strict and quite reckless Covid-19 decisions. Previous Covid-19 management experience may indicate the future directions. More information about Covid-19 management implementation in these countries is presented in the following section.

3.4.2. Covid-19 management implementation in Sweden and Lithuania

As it is seen from a risk matrix, the overall probability of infectious diseases is unlikely (even though one is happening now), and the severity is major. Considering people-environment-assets-reputation (PEAR) model, risk affects people, environment, assets and reputation – all the four elements. Such risk assessment is relevant for proper risk management, and this risk falls into area tolerable if ALARP, as low as reasonably practicable. This principle should be applied in Covid-19 management. ALARP principle refers to a balance between costs, benefits, difficulties and etc. an identification of possible risk reduction measures and determination about them are required in ALARP. (RedRisks, 2020) It assumes that there are all types of risks: acceptable, tolerable and intolerable. Intolerable risks should be addressed, and tolerable risks should be managed using the ALARP. This principle states that the risks should be reduced as far as is feasible within wider economic and social framework. (Smith, 2013, p. 69) In other words, a risk is acceptable based on mitigation, there is a need for costs-benefits analysis. Besides, if looking from a business perspective, ALARP principle is similar to a management of strategy risks.

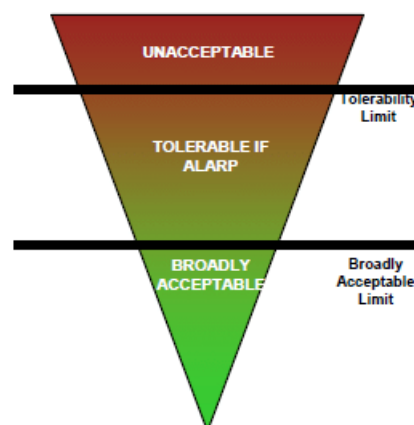


Fig. 17. ALARP principle (RedRisks, 2020)

In Sweden, pandemic influenza preparedness plans provided essential knowledge for Covid-19 management implementation, and they were being followed to manage the pandemic. (European Observatory on Health Systems and Policies, 2020) Overall management of communicable disease

control (development of a disease, recommendations, effectiveness) such as Covid-19 was dedicated to The Public Health Agency of Sweden (PHA). However, the main responsibilities of managing Covid-19 were dedicated to previously mentioned health agencies The Public Health Agency of Sweden (PHA) and The National Board of Health and Welfare (NBHW) In addition to PHA and NBHW, the main actors included the Civil Contingencies Agency and the government. (Ludvigsson, 2020) Generally, Covid-19 decision-making and management implementation responsibilities were divided among these institutions and agencies: The Public Health Agency of Sweden, The Ministry of Foreign Affairs, The National Board of Health and Welfare, The Swedish Civil Contingencies Agency, The Swedish Medical Products Agency and regional institutions. (European Observatory on Health Systems and Policies, 2020)

Sweden was managing Covid-19 pandemic differently from other countries and the governments during the first wave: the whole decision-making process was less restricted compared to other countries as there was no lockdown, schools, restaurants, gyms, shops were open and events up to 49 people were allowed, although higher and upper education was conducted via distance learning, the borders were not completely closed. The management was based on individual responsibility: information, instructions and self-protection techniques were provided daily via Sweden's website and press conferences by state epidemiologist A. Tegnell, Prime Minister S. Lovfen and other political representatives. The government tried to avoid strict citizen's rights restriction, so the role of citizens, citizens' engagement was being highly emphasized. As a result, Sweden's unexpected risk management approach for Covid-19 was described as soft and irresponsible by international media at the end of March, 2020. (Nygren, Oloffson, 2020)

It can be seen that Sweden's Covid-19 decision-making and management itself was formed regarding ALARP and epidemiological situational analyses, as proposed in the theoretical pandemic decision-making model: Covid-19 management implementation was based on the close partnership between the government and the society with mutual trust and responsibilities given to individuals, and voluntary measures (recommendations). Sweden's management aimed not only to reduce transmission of the virus, but also to maintain important societal functions. This approach was described as scarifying (elderly) citizens in order to gain herd immunity. Despite that, this policy achieved lower mortality rates than in UK, Spain and Belgium in Sweden, although they were higher than in other Nordic countries, according to the data of 27 September 2020. (Kavaliunas et. al., 2020)

Although Sweden's response to Covid-19 was relatively moderate compared to other countries during the first wave, a lot of measures were implemented for reducing and preventing the spread of the disease, ensuring availability of sufficient health services and reducing the impact on critical services, addressing public concerns and etc. Financial aid package to mitigate economic impact was adopted as well. Even legislative amendments that empowered the government to make quick decisions during Covid-19 was approved by the parliament. (European Observatory on Health Systems and Policies, 2020). Still, Swedish approach can be defined as trust-based. (Kianzad, Minssen, 2020) Having analysed Swedish Covid-19 response strategy, it is possible to draw key elements of Covid-19 management implementation in Sweden:

- Management based on expert judgements and citizens' responsibility;
- Trust in recommendations and scientific, biomedical infection control techniques;
- Pandemic planning and responses were based on scientific and medical knowledge;

- The role of bio politics: self-government, self-regulation, individual responsibility to avoid risks and follow the health agencies;
- Recommendations rather than prohibitions, trust in people, ‘governing of conduct’. (Nygren, Oloffson, 2020)

Moreover, Covid-19 management in Sweden was also unique as the main responsibility in the management is dedicated to experts, not politicians. Politicians are responsible for secondary consequences such as unemployment and support for business. (Kavaliunas et. al., 2020) Although Sweden’s strategy to manage Covid-19 may be evaluated as too soft, the fact was that Sweden focused on mitigation, not suppression in decision-making process and management. As a result, a complete lockdown was avoided, and the focus was on protecting elderly and risk groups. Although this approach was widely criticized, only 0.8% of population was infected and only 0.06% of population died by 1 September 2020. As mentioned, the numbers were lower than in some European countries with general lockdowns. (Ludvigsson, 2020)

The effectiveness of voluntary measures and recommendations is directly related with people’s trust in the strategy. In order to achieve good results with voluntary-based approach, the level of trust has to be high. According to the article published in 29 April 2020, the general level of trust in Swedish policy towards Covid-19 was above 70%. Moreover, trust tended to increase among older people. (Wengstrom, 2020) General trust in political institutions was relatively high in Sweden, so the principle of responsibility was applied in the risk and crisis management. For example, 2/3 of Sweden population said they had stopped travelling, using public transportation and meeting people since March 2020. (Sweden Sverige, 2020) According to the article published in 3 September 2020, the trust in the strategy and in politicians including opposition decreased in Sweden, the trust in state’s authorities also decreased a little bit, the trust in health authorities and The Public Health Agency remained stable. 2/3 of Swedish population trusted in the state epidemiologist A. Tegnell. (The Local, 2020) All in all, it seems that Swedish voluntary pandemic response attained societal approval during the first wave, according to the data of 10-15 April 2020. More than 2/3 of Swedish population (89%) said they followed health recommendations, 78% agreed that implemented decisions are scientific based, more than half (66%) agreed with not closing schools. (Helsing et. al., 2020)

Although it may seem that there was too little or no regulation in Sweden, this statement was not correct. Despite of recommendations to keep a personal distance, to stay home with respiratory symptoms, not to travel and etc., some prohibitions occurred: public gatherings up to 50 people was allowed since 11 March 2020, unnecessary travels to Sweden were prohibited, no drinking or ordering at the bar was allowed (only table service) since 25 March 2020, and visits to care house were prohibited since 30 March 2020. As mentioned, there was no involuntary quarantine, but people were expected to follow recommendations. (European Observatory on Health Systems and Policies, 2020) Unnecessary travels to Sweden were prohibited from non-EU countries (it does not apply to EU countries and Switzerland), gathering more than 50 people were banned, only table service was allowed, and the maximum number of people at one table was 8 since 3 November 2020. Also, only seated places were allowed at concerts, and the quarantine that prohibited to sell alcohol after 10 pm in bars, restaurants and nightclubs was announced. (The Capital of Scandinavia, 2020)

Looking back at the history of Sweden's pandemics management, the country's management of H1N1 pandemic i.e. swine flu differed from other countries as well. During swine flu pandemic, the major role was dedicated to vaccination. Due to early vaccination, the vaccination coverage was highest among all countries. The focus was on resources as well as communication to protect risk group, main societal functions, and factors as people's solidarity, trust in institutions and health care system, communication had a major role in successful management. Although vaccination from Covid-19 was not available, the management of the pandemics could be considered to be based on solidarity, trust, accountability, expert authorities. (Nygren, Oloffson, 2020)

As Covid-19 decision-making was based on certain Law in Lithuania, there was no need for emergency legislation in management implementation, and amendments were made only in the sphere of social guarantees for medical workers. Institutions in Covis-19 decision-making and management implementation were:

- The leading institution was the government;
- National Emergency Situation Centre;
- Government Emergency Commission;
- Ministry of Health (MOH) with Minister of Health as a head of National Emergency Operations;
- Special government committee for emergency management coordination announced by Prime Minister on 25 March 2020. (European Observatory on Health Systems and Policies, 2020).

Having announced quarantine in March 2020 in Lithuania, Lithuanian Government provided the rights of limiting personal movement, economic activity, provision of public and administrative services and etc. to the commission of extreme situation. Part of people and economic subjects had to stop their activities, others had to highly limit their activity. This was done by following the Law on the Prevention and Control of Communicable Diseases in Humans and the Law of Civil Security. However, as mentioned before, certain law-making principles, which help to avoid uncertainty and new risks decisions even in extreme situation, exist. There was a lot of sources of uncertainty during Covid-19 crisis, so the government's actions, decision-making and management implementation should not cause even more damage. (LLRI, 2020)

Covid-19 prevention measures were mandatory, not only recommended, during whole transition period and even after the end of quarantine, and they were strict. For example, facemasks were mandatory all the time since the beginning of quarantine with minor changes in requirements. Overall, Covid-19 decision-making and management in Lithuania were based on suppression rather than mitigation, i.e. people's freedom was highly limited. The decision-making process could not be described as science-based so far as there was a lack of epidemiological researches and rationality, it seemed that many decisions were made regarding emotions and other countries' experiences. Policy makers should consult with groups that consist of experts (LLRI, 2020), but management implementation was political and strict based on involuntary actions, which caused society's dissatisfaction, in Lithuania.

Although Covid-19 decision-making in Lithuania was rapid, management implementation was not so quick. Such Covis-19 management implementation enched uncertainty – for example, in economic

sphere, the attention of the leaders of enterprises was distracted from monitoring market situation to monitoring State institutions' actions and response organization. As mentioned, there were gaps in law-making in Lithuania: high intensity of law-making, frequent acceptance of law in hastiness, an absence of assessment or formal assessment of regulation effects, the lack of transparency and publicity in law-making, low society's engagement. The threat of acceptance of inappropriate measures and damaging human rights and freedoms emerged when decisions were accepted subjectively by political institutions without society's engagement. Majority limiting decisions were transmitted from the level of legislative institution the parliament to the levels of executive institution the government and the Minister of Health. (LLRI, 2020)

On 6 May 2020, during the transition period, the Lithuanian Government announced a strategy for Covid-19 management, which should be implemented over two years. The strategy should be implemented by the government and monitored by the government's Covid-19 Management Committee led by Prime Minister. (European Observatory on Health Systems and Policies, 2020) The main ideas are that the strategy should be assessed and renewed every 6 months, but the whole process of the implementation and coordination will not include medical experts, epidemiologists. The strategy is clearly political matter, although it should consider an epidemiology. Five key principles, which show orientation to suppression, are:

- Protection of high-risk and vulnerable groups;
- Active tracing of Covid-19 cases and quick containment measures;
- Rapid and objective risk information;
- Decision-making based on evidence and facts;
- International cooperation, primarily with European Union. (European Observatory on Health Systems and Policies, 2020)

It seemed that Lithuania had difficulties to follow principles number 3 and 4 during the first wave so far. Moreover, the strategy has four priorities:

- To develop an effective virus response monitoring mechanism (responsibility of MOH);
- To ensure the preparedness of the health system and to improve the physical and mental health of the society (responsibility of MOH);
- To implement quarantine regime conditions, to consider the epidemiological situation in the country (responsibility of MOH);
- To ensure stability of the country's social and economic sectors and application to new conditions (responsibility of the Ministry of Finance). (European Observatory on Health Systems and Policies, 2020)

One of the most important feature of management implementation – it was very strict compared with relative low numbers of Covid-19 cases in the country. It is needed to remember that about 80% people ill with the mild form. For example, in October 2020, there was an article where Lithuanian professor said that majority people will ill with the mild form, and the most relevant medications are paracetamol and ibuprofen. (lrytas.lt, 2020). Although, Lithuania continued to implement strict management. From October 2020, due to increasing number of cases, physical distancing and other measures to prevent transmission, quarantine were renewed. (European Observatory on Health Systems and Policies, 2020) In summary, the main mistakes in the management implementation during the first wave were low society's engagement, a lack of transparency and publicity in law

making, an ignorance of the main principles, huge burdens to economy. In the preparedness of the second wave, the laws should be reconsidered and assessment should appear. (LLRI, 2020)

However, Covid-19 management in Lithuania during the first wave was commended by The Organization for Economic Co-operation and Development (OECD), according to the official publication on 4 June 2020. According to OECD, Lithuania had good opportunities to control the outbreak properly due to specialists in health care system and appropriate infrastructure. Comparing to OECD average, Lithuania had more doctors and slightly less nurses, Lithuania was in the fourth place regarding intensive care unit (ICU) beds among other OECD countries. Minister of Health said that Lithuania reacted to the outbreak and re-organised national and regional health care system rapidly, a testing strategy was successful, and society's behaviour was responsible regarding the conditions of the quarantine. Also, Minister of Health said that there were a lot of proper voluntary initiatives, decision-making process and financing. (SAM, 2020) As it is seen, Covid-19 management in Lithuania is also assessed ambiguously.

3.5. Covid-19 risk communication in Sweden and Lithuania

Risk communication is a horizontal aspect, which is highly useful in risk management and other stages. Overall, risk communication has to be consistence, honest, accurate and two-way. Communication strategies should reach all the ethical, cultural groups, information should be in all the languages and education levels. (Fisher et. al, 2020) Risk communication should address certain questions distinguished by Henrich & Holmes (2011), which raise public concerns. Moreover, people's differences need to be consider as well, as previous studies of risk and crisis communication has shown. (Nygren, Oloffson, 2020) These rules have to be applied in risk communication, for example, health risks as Covid-19 communication. Generally, risk communication is difficult as the attention should be dedicated not only to target audience, socio-demographical and cultural factors, but also to communication tools that are appropriate to form communication messages. (Klebanskaja, Gudaitė, 2013)

In order to avoid disinformation and fake news, risk communication has to emerge from the trusted sources – official institutions, official websites or scientific journals. Different scientific sources may focus on different risk issues. Kuipers, Grieken & Asselt (2018) have conducted a research on how often a particular risk was a topic of an article in a particular scientific journal. The journals are *Risk Analysis (RA)*, *The European Journal of Risk Regulation (EJRR)* and *Journal for Risk Research (JRR)* in the period 1981-2017. The value is expressed in percentages in this quantitative research. (Kuipers, Grieken & Asselt, 2018) The results are the following:

Risk Types per journal

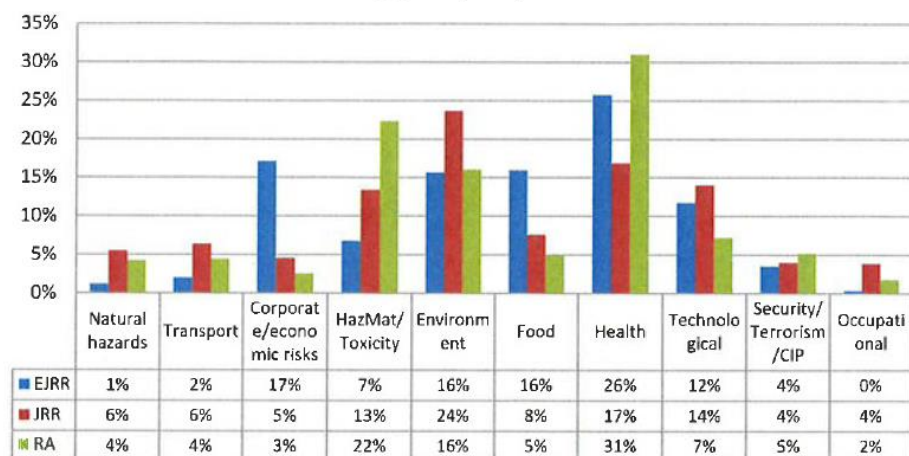


Fig. 18. The frequency of articles about a particular risk in a particular journal (Kuipers, Grieken & Asselt, 2018, p. 5)

A major part of attention was dedicated to the topics related to health, environment, hazardous materials³ and toxicity, less involved food and technological risk, and EJRR dedicated a quite large part of attention to corporate/economic risks. A small part was dedicated to natural hazards; this research confirms that nowadays major concern is related to manufactured (man-made) risks than external (natural) risks in general, and that health risks such as Covid-19 are highly relevant in risk researches and communication.

The examination of Covid-19 risk communication should include descriptive analysis, so the integrative approach from both primary and secondary sources is used to cover this subchapter. As mentioned, Sweden strongly focused on Covid-19 risk communication and recommendation promoting, this is a relevant element in a risk management approach based on individual responsibility. However, Nygren and Oloffson (2020) observed stronger alliance among mass media, the government and experts' authorities in 2009 H1N1 pandemic than in current one. At these times, mass media highly promoted vaccination despite their unknown negative side effects such as chronic diseases. (Nygren, Oloffson, 2020) As no vaccination from Covid-19 existed, Covid-19 management in Sweden was highly based on recommendations, that is, Covid-19 risk communication. As previous stages have shown, people tended to follow these recommendations since they agreed to Swedish strategy. Majority (79%) of Swedes indicated that they received good information from health authorities, according to the data of April 2020. (Helsingen et. al., 2020)

The first aim of Covid-19 risk communication in Sweden was to protect people over 70 years old and to avoid overwhelming the health system. The main communicator in the pandemic was The Public Health Agency (PHA), and the basic recommendations were: hand hygiene, physical distance, staying home when sick, avoidance of unnecessary travels and advices for workplace, public transportation, businesses, sports clubs, associations and etc. to combat the pandemic. Moreover, there were a lot of interviews where PHA representatives emphasized that only evidence-based measures, which were proven to be effective, were implemented in Covid-19 management. For example, hand hygiene was proven to be effective, but other measures as closure of borders was questionable, although they

³ HazMat – hazardous materials

were implemented in many countries. (Kavaliūnas et. al., 2020) Facemasks were not recommended, except for the health care. (Ludvigsson, 2020)

Sweden, like other countries, released Covid-19 recommendations and infographics. For example, this infographic in Sweden was provided by The Public Health Agency of Sweden, and it provided these recommendations: 1) stay home even you a little bit sick 2) avoid close contact for 70 years old and older 3) wash hands often with soap and water 4) avoid social gatherings with large groups 5) maintain distance from others indoor and outdoor 6) avoid unnecessary travels. (Kavaliūnas et. al. 2020)



Fig. 19. Example of infographic in Sweden (Kavaliūnas et. al., 2020, p. 3)

There were a lot of Covid-19 information on different websites in Sweden. For instance, Covid-19 prevention advices were visualized by The Public Health Agency of Sweden. Advices included 1) wash your hands often 2) cough and sneeze into your elbow 3) avoid touching your eyes, mouth and nose 4) stay home if you feel unwell and 5) keep your distance and take personal responsibility. (The Public Health Agency of Sweden, 2020)



Fig. 20. Visualization of Covid-19 prevention advices in Sweden (The Public Health Agency in Sweden, 2020)

Speaking about Covid-19 risk communication as a tool for governance, other important feature of Covid-19 risk communication in Sweden was that communication was not delayed: advices and recommendations on hand hygiene, respiratory etiquette and social distancing were introduced quite early by official institutions, the government and public authorities. A lot of press reports were introduced by them on daily basis during the spring, which focused on giving the instructions of

prevention, promoting social distancing and explaining management. Information of prevention available in 25 languages was published on special crisis website and The Public Health Agency of Sweden website, while information of the government's decisions was published in the government's website. Responsibility of providing information for the public was dedicated to The Swedish Civil Contingencies Agency, and the responsibility for travel advices was dedicated to The Ministry of Foreign Affairs. (European Observatory on Health Systems and Policies, 2020)

Sweden dedicated a lot of attention to communication: there were a national information number, which allowed citizens to call for any information on Covid-19, information campaign on social networks (Facebook, Instagram), television and radio, printed and digital ads. Flyers in different languages were distributed in areas with a low socioeconomic level and to people who are new in Sweden. (European Observatory on Health Systems and Policies, 2020) Current communication messages still promote physical distancing, hand hygiene, staying in home with respiratory symptoms and avoidance of unnecessary visits, social contact and gatherings. (The Capital of Scandinavia, 2020) For example, Swedish Civil Contingencies Agency introduced such flyers:



Fig. 21. Flyers of Covid-19 information for tourists and residents in Sweden (Swedish Civil Contingencies Agency, 2020)

Swedish Covid-19 risk communication differed from Lithuanian Covid-19 risk communication. Although Covid-19 as a State level emergency was firstly recognized on 26 February 2020 in Lithuania, the outbreak was not clearly communicated at the beginning, which might further contribute to the confusion and strict management. The main actors, who had responsibility of publishing guidelines and recommendation on Covid-19 prevention, were Centre for Communicable Diseases and AIDS (CCD) and the Ministry of Health (MOH). Firstly, the focus was on hand hygiene: CCD posted official advices on hand hygiene, and MOH published instruction on it in both written and visual formats. Ministry of Health also focused on publishing official Covid-19 statistics: cases, deaths, testing, etc. Official website for Covid-19 was www.koronastop.lt by the government, there was a national phone line. Ministry of Health in cooperation with other institutions published a lot of recommendations, infographics, official Covid-19 dashboards. (European Observatory on Health Systems and Policies, 2020). Minister of Health identified that Lithuania successfully kept the recommendations. (SAM, 2020) There are several examples of infographics in Lithuania:



Fig. 22. Infographics of instructions on hand hygiene and behaviour in parks and other public places in Lithuania (Lietuvos Respublikos sveikatos apsaugos ministerija, 2020)

The latter infographic included such recommendations: 1) keep safe distance (not shorter than 2m and no longer than 15 minutes) 2) avoid direct physical contact 3) keep coughing and sneezing etiquette and hand hygiene 4) do not gather more than 2 people 5) only one family children can play in playground at the same time 6) wear facemask or respirator, and wear gloves while touching things 7) do not touch the face 8) to is recommended to go outside only if necessary for older people. Besides, other institutions (education institutions, municipalities, organizations) posted infographics as well:



Fig. 23. Examples of infographics in other institutions (Kaunas municipality, 2020, Vilnius university, 2020)

Risk communication process was dynamic and evolving during the first wave in Lithuania, more and stricter recommendations on prevention were being constantly published. Covid-19 risk information was communicated via official government's websites and mass media. Daily briefings from the Head of the National Emergency Situation Centre, the Prime Minister and other relevant Ministers and selected experts were published, and information about Covid-19 from other state agencies had to be confirmed by National Emergency Situation Centre. (European Observatory on Health Systems and

Policies, 2020) Speaking about Covid-19 communication and general public, 94% of Lithuanian respondents indicated online new portals as the main source of Covid-19 information, 87% - social networks, 80% - television and 82% - the government's agencies. (Eurobarometer, 2020)

Since major communicators were official institutions and the media in Lithuania, it is needed to discuss the role of media. According to the scientific publications, one of the most significant power, which can strengthen or weaken risk perception, form risk behaviours and manipulate the society, is media in risk communication. In society, the relevant problems are those arisen by the media. Media has a power to create society's consciousness and cause anxiety about the issues. (Klebanskaja, Gudaitė, 2013) Mass media published numerous articles on Covid-19, and focused on Covid-19 prognoses a lot, according to dr. Kavaliūnas (Kavaliūnas, 2020). The most popular media websites frightened with negative scenarios – for example, with possibly numbers, peaks and possible severity of the disease. There was a need for dialogue with society and open, comprehensive communication. (Kavaliūnas, 2020) Generally, it seemed that official institutions and media chose the tactic of focusing on number of cases and negative prognoses, and this tactic caused even higher concerns and anxiety. This could determine low trust in media in Lithuania. However, media was assessed as a responsible tool by Minister of Health. (SAM, 2020)

Covid-19 risk communication in Lithuania would be difficult to describe as honest, transparent and objective as there was a lack of scientific analyses, clarity about the disease, for example, the number of people needed to be hospitalized and etc. since attention has to be paid to the need of hospitalization, not new cases, which are mild (Kavaliūnas, 2020) and media messages that did not cause anxiety. The same tendencies in risk communication were observed during the previous pandemic, swine flu. Klebanskaja & Gudaitė (2013) have accomplished a research on swine flu communication and have noticed that mass media were constantly informing society about swine flu, but there was a lack of educational material, critical and analytical assessment of situation. At the beginning of the pandemic, media sent frightening, overhyped message with significant focus on vaccines, latter these messages were replaced with political discourse about risk management. This distracted from the risk and threats. The aim of mass media was engagement of attention, not the objectivity. This resulted in imbalanced, subjective perception and promotion of a panic. It was noticed that media has to be more objective back then, but it is likely that media behave the same during this pandemic. (Klebanskaja, Gudaitė, 2013)

3.6. Discussion – application of risk society theory for Covid-19 risk

A risk is the main determinant of social changes in risk society, and the key elements that provide basis for risk society are:

- The presence of humans is threatened by new, manufactured and wide scope risks at global level;
- Globalization has influence on risk society;
- Risk management depends not only on politicians, but also on experts' judgements, scientific knowledge and individual responsibility;
- The role of individualization, when social structures no longer exist;
- Inequality is driven by risk positions. (Nygren, Oloffson, 2020)

Covid-19 pandemic is often being related to risk society. Kravchenko (2020) distinguished three main features of world risk society, which describes Covid-19: delocalization, incalculability and non-

compensability. According to the author, many Covid-19 risks are socially and cultural constructed by fake news and etc. Covid-19 risk highlighted such issues as post-national sense of responsibility, the role of nations in world politics, the need of humanely oriented global system of medical surveillance, national mobilization, political leaders. (Kravchenko, 2020) Covid-19 pandemic could be based on risk society theory, and all the infectious diseases outbreaks could be applied to the theory. Although there were several significant pandemics during history, nowadays pandemics spread rapidly due to globalization, and this refer to social distribution of risks and threats.

In general, Covid-19 risk has many features of risk society: the risk overcomes states' borders, it is difficult to manage the risk by States institutions, the aim is the elimination of the risk and security, anxiety has a significant role in a society, inequality appears due to inequalities in health care system, interconnectedness with global economy determines a wide scope and etc. Besides, Covid-19 pandemic can lead to other crisis as contribution to climate change, global governance failure, water crisis, economic instability. Some of them are also risks in risk society concept. Moreover, Swedish Covid-19 management correlates with U. Beck's risk society. (Nygren, Oloffson, 2020) The tables below summarize Covid-19 statistics in Sweden and Lithuania, which is analysed in this Thesis, according to some comparable measurements and Covid-19 risk governance in Sweden and Lithuania regarding the Framework:

Table 18. Comparison of Covid-19 statistics in Sweden and Lithuania according to some comparable measurements (Made by the author)

Measurement	Sweden	Lithuania
<i>GDP</i> spent to health care	11% (above EU average 9,8%)	6.5% (less than EU average 9,8%)
Doctors per 1 000 population	4.1 (above EU average 3.6)	4.3 (above EU average 3.6)
Nurses per 1 000 population	10.9 (above EU average 8.5)	7.7 (slightly less than EU average 8.5)
Hospital beds per 1 000 population	2.2 (less than EU average 5)	6.6 (above EU average 5)
<i>Global Health Index (GSH)</i>	72.1 – 7 th place	55.0 – 33 rd place
<i>Electronic State Parties Self-Assessment Annual Reporting Tool (e-SPAR)</i>	93% (above EU average 75% and global average 64%)	83% (above EU average 75% and global average 64%)
<i>Prevent Epidemics Ready Score</i>	'Pending'	'Work to do'
The situation of scientific analyses	Various scientific analyses	N/A
Covid-19 Regional Safety Assessment	65 th place in Europe	29 th in Europe
Trust/satisfaction in Covid-19 response strategy	Fluctuates from 63% to 45%	58,8%
Concern/anxiety level	Fluctuates from 54% to 35%	93%
Vaccination level prognosis	Fluctuates from 54% to 67%	42.9%
Covid-19 confirmed cases vs. recovered cases until December	243 128 vs. 184 943	62 515 vs. 15 077
<i>Forbes</i> rates of 100 safest counties for Covid-19	49 th place worldwide	42 nd place worldwide

Table 19. Summary of Covid-19 risk governance in Sweden and Lithuania (Made by the author)

	Worldwide	Sweden	Lithuania
Covid-19 pre-assessment	Early warnings of the pandemic were high morbidity and mortality rates in other countries, the emerge of pandemics during history and etc.; Generally, to assess country's pre-assessment, it is needed to analyse available health indexes	Sweden's health system functionality is high focused on outpatient care, high Global Security Index and other indexes, capabilities to deal with Covid-19 was assessed as low at the beginning	Lithuania's health system functionality is quite high and hospital-centric, good Global Health Index, no information about preparedness to deal with Covid-19
Covid-19 appraisal: scientific assessment and concern assessment	The likelihood of the risk of infectious diseases is assessed less than average, and the impact is assessed above; the risk of infectious diseases is tolerable, there are many threats and vulnerabilities of Covid-19 risk	Covid-19 risk is assessed as causing serious concerns; many scientific analyses to assess the risk objectively; The Public Health Agency of Sweden assess the spread of the virus as moderate; Overall Covid-19 concerns are moderate	Covid-19 risk is assessed as causing serious concerns, a lack of scientific analyses to assess the risk objectively, acknowledgement of gaps by experts, Lithuania is assessed better in terms of safety than Sweden; Overall Covid-19 concerns are high
Covid-19 characterization and evaluation: knowledge characterization and risk evaluation	Covid-19 viral disease is an infectious respiratory disease with respiratory symptoms and common risk factors, the type of infectious disease threat is complex, the risk is systemic; Covid-19 evaluation varies from tolerable to intolerable, 'Cyclops' class, reduction measures are needed, there are many factors of evaluating national response	Regarding concern assessment and management, the risk is not evaluated intolerably, country was found among 100 safest countries in September 2020; Covid-19 numbers in Sweden were greater than in Lithuania, for example, the number of total cases was almost 4 times greater. However, Sweden's population is much larger comparing to Lithuania's.	Regarding concern assessment and management, the risk is evaluated between tolerability and intolerability, country was found among 100 safest countries in September 2020; Covid-19 numbers in Lithuania were smaller comparing to Sweden's numbers.
Covid-19 management: decision-making and management implementation	The decision-making and management should be based on science, precautionary, resilience, robustness principles, discourse and communication (risk-based, risk-informed); governance structure should be core-periphery regarding ALARP, two main strategies available in Covid-19 management: mitigation and suppression	Country focused on mitigation and risk communication during the first wave, decisions were different from other countries', the aim include to preserve social functions, relative soft management based on individual responsibility and recommendations, ALARP, epidemiological situation, experts' management, main managing institutions were The Public Health Agency of Sweden (PHA) and The National Board of Health and Welfare (NBHW); political institutions are responsible for	Country focused on suppression and rapid decision-making, prohibitions during the first wave, decisions were strict and involuntary, mandatory, the process was rapid with absence of society engagement and assessment, gaps in law-making, management implementation was highly political regulated by State institutions, the strategy for Covid-19 management was released during the first wave, response in Covid-19 second wave should be

		Covid-19 secondary consequences	constructed regarding law-making principles
Covid-19 risk communication	Overall, risk communication is difficult, but highly needed horizontal aspect in risk governance; the focus of risk communication and researches includes health risks	As Covid-19 management focused on voluntary actions rather than prohibitions, the country strongly focused on risk communication during the first wave, risk communication was early The main communicator was The Public Health Agency (PHA).	The main communicators were official government's websites, Ministry of Health, mass media; Recommendations became stricter with time, mass media strongly focused on negative prognoses, which caused fear and anxiety

Conclusions

1. A risk is highly complex phenomenon, which can be external, manufactured, voluntary, involuntary, natural, socially constructed and etc. As a contrast to simple risks, there are systemic risks, which involves complexity, uncertainty, ambiguity, such as Covid-19 health risk. There are simple, complicated and complex infectious disease threats and five different governance approaches. Risk communication is essential horizontal aspect in risk governance of infectious diseases that influences risk governance.
2. The most important elements in a pandemic management and communication are planning, which includes mathematical and statistical models and consideration of socio-political contexts, appropriate governance, including safety measures implementation and comprehensive decision-making, and risk communication that involves accurate information, building trust, volatility (flexibility) and addressing concerns. Several factors determined Covid-19 crisis, and it is suggested to respond to the crisis comprehensively by using IRGC Risk Governance Framework. Different communication types and strategies should be used in Covid-19 communication.
3. Risk Governance Framework is a comprehensive approach to analyse a risk, it involves five main parts: pre-assessment, appraisal, characterization and evaluation, management, cross-cutting aspects. This Framework can also be applied to Covid-19 risk analysis and to reveal the main patterns in the governance.
4. Having analysed Covid-19 risk in Sweden and Lithuania, it could be stated that it is difficult task to assess preparedness to deal with the pandemic, and the risk of infectious diseases could be assessed as a tolerable risk, however, Sweden managed Covid-19 risk, which has many threats and vulnerabilities, much proper than Lithuania regarding scientific analyses and management principles. Since there was a lack of scientific analyses, data and communication with society, Sweden appeared to be more prepared to respond to the pandemic properly. Generally, people were more concerned in Lithuania, and this led to stricter Covid-19 evaluation. Theoretically, Covid-19 decision-making and management should include different strategies, core-periphery governance and as low as reasonably practicable (ALARP) principle. Risk communication was highly important horizontal aspect in Covid-19 governance, but it was not necessarily proper and in time.
5. Health care systems in Sweden and Lithuania are quite advanced in general, but this factor did not determine the same management. Sweden focused on mitigation, and Lithuania focused on suppression during the first wave. This determined different management approaches: relatively soft science-based Covid-19 management with individual responsibilities in Sweden and strict Covid-19 management based on involuntary suppression measures in Lithuania. Moreover, Swedish management was comprehensive, and Lithuanian management was mostly political. Risk communication had a major role in Sweden since the management was mostly based on recommendations, communication was not delayed, and the main communicators were official institutions. Existing scientific analyses contributed to appropriate societal informing in Sweden. The main communicators were official institutions and mass media in Lithuania, but risk communication by mass media was not proper and comprehensive. Non-existing scientific analyses conditioned vague societal informing. Although Lithuania was assessed higher in the terms of security, both counties were among the safest countries during the first wave.

Recommendations

For Swedish Government and other official institutions responsible for the governance:

1. Swedish institutions should continue their scientific analyses on Covid-19 and scientific management, but it might consider stricter measures: stricter quarantine if needed, limitation of unnecessary services, such as entertainments.

For Lithuanian Government and other official institutions responsible for the governance:

1. It is recommended to accomplish comprehensive Covid-19 analyses like in Sweden, to implement the main risk management strategies and principles in Covid-19 decision-making and management, it should be based on science, evidences, communication in Lithuania.
2. It would be useful to consider Swedish example in terms of the management, society's engagement, individual responsibility and to focus on mitigation, not suppression in Lithuania. Also essential services, such as medical help and economic functionality of small businesses, should be maintained.
3. Also, medical and other experts should be involved into Covid-19 governance in order to achieve less political and science-based management in Lithuania. They should accomplish and present their scientific analyses, experts' and society's engagement should be prioritized.

For mass media and official institutions responsible for risk communication in Lithuania:

1. There is a need for clarity in Covid-19 communication, so official institutions and mass media should present more precise information on Covid-19 in Lithuania about hospitalization, cases severity, symptoms, demographical and geographical situation of infected people and etc.
2. It is recommended to communicate transparently, honestly and to withdraw frightening communication, which causes concerns and anxiety, for mass media in Lithuania. For example, information about daily number of infected people should be replaced with more precise information like mentioned above, scientific analyses should be easily accessible for the society.
3. Mass media in Lithuania should prevent the spread of fake news and disinformation; they should more cooperate with official institutions and scientists in order to spread accurate information. Such examples could be hospitalization, disease severity, vaccination safety and etc.

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