Projects for decisions on the consequences of COVID-19

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In response to the global COVID-19 pandemic, the Research Council of Lithuania, like most European and world research councils, has launched a call for proposals for Lithuanian researchers to implement projects to provide research-based recommendations on the implications of COVID-19. 29 projects on 8 topics are being implemented.

### Diagnosis and Treatment During the Spread of Coronavirus

**Peculiarities of diagnosis and management, including treatment, of acute diseases, genome sequencing, molecular research intended to develop a set of reagents for the detection of the virus directly from samples.**

### Technological Solutions for Public Safety

**Personal protective equipment, technologies for safe teaching and remote working.**

### Public Administration in an Emergency Situation

**Public administration, ensuring of human rights, drafting and legalization of legal acts.**

### Ensuring Mental Health and Well-being

**Psychological problems and access to help; impact of pandemic-related information on mental health, psychological consequences for consumption.**

### Organization of School Education in Quarantine Conditions

**Emotional, social education of a person and a citizen at a distance, changes in the roles and involvement of children, parents, teachers and schools, digital content.**

### Socio-economic Security of Society

**Changes in society and human life: experiencing inequality, changes in thinking and behaviour, stress due to future uncertainty.**

### Strengthening of Economic Resilience

**Impact on the real estate market, financial system, agriculture, small and medium-sized businesses and corporate solvency.**

### Mathematical Models for Managing the Spread of a Pandemic and Predicting its Impact

**Models to analyse the data related to different cases of coronavirus and to predict the spread of the pandemic and scenarios for its management.**

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Diagnosis and Treatment During the Spread of Coronavirus

PECULIARITIES OF DIAGNOSIS AND MANAGEMENT, INCLUDING TREATMENT, OF ACUTE DISEASES, GENOME SEQUENCING, MOLECULAR RESEARCH INTENDED TO DEVELOP A SET OF REAGENTS FOR THE DETECTION OF THE VIRUS DIRECTLY FROM SAMPLES
Effects of the COVID-19 Pandemic on Personal and Public Health and Functioning of Health Care System: Case Study of Circulatory System-Related Diseases in Lithuania

Due to the COVID-19 pandemic, the reduction or temporary suspension of routine diagnostic and treatment procedures has fundamentally changed the health care and treatment options for patients with other diseases, including the largest and most threatening group in Lithuania – patients with cardiovascular diseases. After analysing the impact of the COVID-19 pandemic on the diagnostic and treatment of these patients, it is possible to assess the functioning of the entire health system during the pandemic and create a tool to monitor the consequences of the pandemic – to create a COVID-19 map of circulatory system diseases prevalent in Lithuania. Such an analysis would help to manage health care system resources more efficiently so that diagnostic and treatment services would remain accessible and of high quality both during and after the crisis.

The Guidelines for Diagnostics and Management of the Patients with Acute Myocardial Infarction During COVID-19 Infection

Tactics for the diagnosis and treatment of acute ischemic coronary syndromes have changed – due to the COVID-19 infection, the onset of percutaneous coronary interventions and emergency cardiac care are delayed. How to provide immediate and safe aid when rapid COVID-19 tests are limited and providing professional protection is complicated? What tactics – invasive or conservative – should be followed if a patient may have or has COVID-19? How to diagnose myocardial infarction if markers of the cardiac cell death or COVID-19-induced myocardial injury are detected? In Lithuania, mortality from cardiovascular diseases was one of the highest in Europe even before the pandemic, and COVID-19 infection may become seasonal. It is important to develop rapid diagnostic and differential diagnostic algorithms for patients with acute cardiovascular syndromes and SARS-CoV-2 infection, and form a new logistic tactic for the management and care of patients with myocardial infarction. Using hybrid methodologies that combine distance learning, pair learning and master learning, other healthcare and treatment professionals will be able to get acquainted with the algorithms and new logistical tactics and selection reperfusion strategies suitable for both quarantine and normal conditions.
Covid-19 Infection: Genomic and Clinical Aspects

SARS-CoV-2 genome sequencing studies that have not yet been performed in Lithuania, but are spreading rapidly in the world, help to quickly assess the spread of COVID-19 infection and the clinical aspects, and plan health care measures in case of an epidemic thus reducing the impact of the disease on society. Genome sequencing is important when analysing the gradual progression of the virus, the epidemiology, developing diagnostic bases for virus detection, and looking for a treatment. The team of physicians and biologists aims to evaluate the links between the viral genome, the clinical course of infection, and the immune response elicited in the body by examining the SARS-CoV-2 genome and IgM and IgG class antibodies in COVID-19 patients after recovery. It is hoped that these tests will also contribute to the wider and more systematic use of serological tests for specific antibodies.

Evidence-based Recommendations for Improving Laboratory Diagnosis and Predicting the Course of COVID-19 Infection

The aim is to provide more knowledge about the nature, diagnosis and treatment of COVID-19 infection. It is being clarified what influence not only well-known factors (age, chronic diseases, etc.) may have on the course of the disease, but also the infection of patients having this virus with other respiratory diseases. An analysis of the relative qualitative concentration of the virus in the samples taken will provide a set of diagnostic reagents that will allow for the virus to be detected directly from the samples. Attempts are also made to detect the virus in other samples of patients or asymptomatic carriers taken from urine, faeces, or blood. The researchers will suggest how to improve the laboratory diagnosis of COVID-19 infection, predict the course of the disease, and add new points to the World Health Organisation’s safety recommendations for laboratory staff working with patient biological material.
Technological Solutions for Public Safety

PERSONAL PROTECTIVE EQUIPMENT, TECHNOLOGIES FOR SAFE TEACHING AND REMOTE WORKING
Preparation and Application of Antibacterial Layers of Copper Particles for Long-term Protective Equipment

**DR. REMIGIJUS IVANAUSKAS**

Most bacteria that get exposed to the surface of copper or its alloys die within a few hours, while on stainless steel or plastic they remain viable for two or more days. This property of copper can be effective in preventing aggressive airborne infections, as well as coronavirus. Layers of copper-saturated materials in protective masks would mechanically stop the entry of bacteria and viruses into the human respiratory tract and effectively destroy them over the entire area of the filter material. Copper particle saturation testing of materials suitable for protective face masks investigates the effect of copper particle concentration and size on the antibacterial properties of modified materials, explains what the production of such face masks would look like using these materials, and provides visual examples of reusable individual face masks.

**PRINCIPAL INVESTIGATOR**

**DR. RIMVYDAS MILAŠIUS**

The lack of personal protective equipment used while trying to stop the aggressive spread of COVID-19 infection has demonstrated the need for a strategic measures production plan to rapidly produce what is vital. Using new technologies, a seamless, close fitting and reusable face mask of a stable textile structure and ergonomic shape with long-lasting antimicrobial and necessary filtration properties is being created. Mask user will be able to wash such a mask or disinfect it at home and wear it for longer than a medical disposable mask. For its production, an analysis of production opportunities in Lithuania is performed. The new technology of the material is being developed in response to the pandemic, its extreme conditions and its potential consequences for health, the economy and the environment, i.e. the need for rapid protection measures, the optimization of production processes and the consideration of the risks of non-recyclable waste.
Public Administration in an Emergency Situation

PUBLIC ADMINISTRATION, ENSURING OF HUMAN RIGHTS, DRAFTING AND LEGALIZATION OF LEGAL ACTS
The outbreak of the COVID-19 virus has become a challenge for public service professionals. National, regional and local governments have formed crisis management policies, taken many, sometimes contradictory and complex decisions, but their implementation has been the responsibility of health and social care professionals working on the front lines. Without additional resources for the execution of a number of new orders, the specialists looked for solutions to provide services and developed individual strategies for overcoming problems. Based on the experience of these specialists, municipal administration employees and municipal politicians, the aim is to find out the effectiveness of the implementation of Lithuanian public policy and to identify the best strategic and operational solutions suitable for responding to the crisis in the future. The results of the study would explain the gaps in the public health and social services sector and help improve emergency management. The research is significant in terms of the application of the theory, and in the context of explaining to what extent, the theory of street-level bureaucracy can be adapted to research in extraordinary situations.

The threat posed by COVID-19 has increased the workload of front-line professionals and the risk of adverse consequences for their mental health. There are no psychological services being organized for professionals working in extreme conditions. This gap is also illustrated by the Law on the Practical Activity of Psychologists, which has not been approved by the Seimas for ten years now. After the implementation of the project, its results will have applied (new legal acts will be drafted and enacted, the law will be supplemented), practical (a model of mental health care services will be developed, which will act as guidelines for dealing with emergency situations) and scientific (model of mental health care provision will be developed) value. Lithuanian specialists must feel psychological comfort when performing vital tasks. The package of the project “Organizational, economic and legal preconditions for optimizing psychological support for professionals working in emergency situations” submitted to the Seimas of the Republic of Lithuania will become research-based regulation, ensuring that employees receive psychological counselling in a timely manner.
Evaluation of Legal, Policy and Economic Responses in Times of Crisis: Balancing Public Security and Human Rights

International and regional organizations recognize that the COVID-19 pandemic has highlighted the lack of adequate legal regulation and effective management of such situations, and gaps in financial decision-making. Assessment of the state decisions and their consequences from legal, governance and economic perspective will cover evaluation of the legal framework for emergency management, the effectiveness and financing of public policy, and the identification of gaps and deficiencies, and result in development of a model for more effective management of emergency situations. The results will allow for better preparation for future crises, ensuring the protection of human rights, compliance of state decisions with the requirements of the Constitution, international law and best public governance practices, and reducing the risk of legal disputes over damages caused to natural and legal persons by state decisions.

Response to the COVID-19 Pandemic in Lithuania and other EU Member States: an Impact on Public Policy and the Management of the Emergency Situation

Using insights from EU integration, public policy and administration, and other disciplines, research is being conducted on the response of EU member states to the COVID-19 pandemic, the adequacy and effectiveness of public policy measures in Lithuania, and the emergency management process in the country. The analysis will allow to assess the flexibility of the Lithuanian authorities to adapt to the rapidly changing situation, the use of opportunities for cooperation with relevant stakeholders and other lessons from this crisis. In order to properly prepare for possible systemic threats and increase the resilience of Lithuanian authorities, an optimal model with public governance recommendations for the management of similar crises in the future is being developed.
Ensuring Mental Health and Well-being

PSYCHOLOGICAL PROBLEMS AND ACCESS TO HELP, IMPACT OF PANDEMIC-RELATED INFORMATION ON MENTAL HEALTH, PSYCHOLOGICAL CONSEQUENCES FOR CONSUMPTION
Information related to the COVID-19 pandemic can affect psychological state of an individual. While information is necessary to adequately assess the situation, but it can also either reduce unfounded fears or do the opposite by actually increasing them. mHealth technologies will be developed and validated for monitoring of mental health problems arising from the COVID-19 and the possible impact of pandemic-related communication on the mental health will be assessed. This will allow to assess the effect of media, information sources and content on mental health sequelae. The study is conducted by an interdisciplinary team of researchers in the fields of communication, psychology, behavioural medicine, and epidemiology, along with IT professionals.

The current project aims to analyse the psychological impact of the pandemic on adolescents and adults, including healthcare workers from the perspective of stress responses and resilience. There is a growing worldwide concern about the psychosocial impact of the COVID-19 pandemic. The pandemic is associated with multiple stressors, such as fear about the health of a loved one, insecurity about the future, stress associated with job-difficulties, or unemployment among the others. The current project aims to analyse the psychological impact of the pandemic on adolescents and adults, including healthcare workers from the perspective of stress responses and resilience. The current project will deliver recommendations that will be targeted towards mitigating the negative effects of the pandemic on mental health and well-being. Furthermore, the project will contribute to an evidence-based response planning to the pandemic.
During the COVID-19 pandemic, healthcare and pharmaceutical professionals have to work in high-risk conditions. They deal with complex ethical and professional problems, tackle issues related to the organization of work, face losses and increased threat to their own lives and health. The study aims to assess the psychological well-being of these specialists, the challenges related to the organisation of work and the need for assistance during the pandemic. The results will be used to plan measures to reduce the potential negative consequences for the psychological well-being and health of healthcare and pharmaceutical professionals. On the basis of them, it is planned to prepare recommendations for individual groups of employees and the administration, as well as guidelines for the Government regarding the protection of mental health of health care workers and pharmacists, prevention of occupational burnout and ensuring the availability of assistance.

The aim of the interdisciplinary study is to investigate how the stress caused by the COVID-19 pandemic and the economic crisis will affect consumption decisions and influence the Lithuanian economy, and to examine what communication strategies would help authorities and businesses to effectively tackle these changes. Experimental methods of cognitive psychology are used to study how stress affects behaviour - decision-making, consumption and behavioural patterns, - which can be hardly detected using only traditional sociological research methods. These data and data published by the Department of Statistics are used to model the impact of the pandemic on consumption and the impact of changes in consumer behaviour on the respective economic sectors. Based on the results of the experiment and the obtained statistical models, recommendations will be provided on how to formulate reports in different economic and epidemic scenarios, taking into account the general mood and expectations of the population.
Organization of School Education in Quarantine Conditions

EMOTIONAL, SOCIAL EDUCATION OF A PERSON AND A CITIZEN AT A DISTANCE, CHANGES IN THE ROLES AND INVOLVEMENT OF CHILDREN, PARENTS, TEACHERS AND SCHOOLS, DIGITAL CONTENT
The experience of distance learning in the context of the COVID-19 pandemic has led to a review of teachers’ digital competences, available digital content, infrastructure and the need for cooperation between educational institutions. While no one expected or planned for the situation to be the way it was, many people were forced to work and study remotely, using their computers. Some schools adapted to it overnight, others managed to be fully prepared within a couple of weeks, and some failed. The unique 2020 experience is an opportunity to conduct a detailed study of the scenarios chosen by Lithuanian schools in the field of education and to determine what led to success and what led to failure. When asking questions – such as, “how did foreign countries behave and did they succeed?”, “what steps must the school take in order to succeed in organizing distance learning in the future, if need be, and in ensuring the quality of the learning process?” – the aim is to make recommendations to schools and other institutions involved in the teaching process.

Due to the change in the educational process caused by COVID-19 pandemic and having moved it from the immediate medium to a distant one, the roles, interactions, engagements, as well as the environment, content and nature of the individuals involved in the education process, i.e., children, parents and teachers, has inevitably changed as well. It is an unparalleled experience that provides the researchers in the fields of education, psychology, social work, sociology and medicine with an opportunity to comprehensively analyse the educational challenges to the educational process itself and its participants and examine the threats and opportunities posed to physical and mental health, safety and learning success of pre-school and children in grades 1–8. The research conducted is important in identifying threats and anticipating solutions and opportunities for the future application and development of distance education.
Socio-economic Security of Society

Changes in Society and Human Life:
Experiencing Inequality, Changes in Thinking and Behaviour, Stress Due to Future Uncertainty
During crises, the most vulnerable groups in society and people experiencing social exclusion suffer the most. The crisis has also hit the middle class hard, and social inequality is deepening. A modified survey of the social inequality module of the International Social Survey Programme was selected for the study to determine the extent of inequality as a consequence of the COVID-19 pandemic, meaning the data obtained will be compared with 45 countries of the world where national surveys of this module are conducted. In Lithuania, this study was conducted for the first time during the economic crisis of 2010. The data collected now will allow to compare the effects of the two crises and changes that have taken place throughout the decade. The analysis covers experiences of inequality, economic insecurity, tax fairness, social mobility and trust, government effectiveness in social policy, social conflict, and other topics. Also included is something that is relevant in the face of the pandemic—the understanding of the possible threats that the pandemic poses, assessment of management institutions and measures, impact on an individual’s employment and income, lifestyle changes, assessment of the country’s life prospects after the pandemic, and more.
Social Policy Responses to the Consequences of the COVID-19 Crisis: Analysis of the Unemployment and Poverty Situation, International Experience and Recommendations for Lithuania

A group of researchers in economics, social policy, mathematics and public administration was brought together to study the complex socio-economic consequences of COVID-19. The aim is to find out how the economic crisis caused by the virus has affected the employment and income of the population, to what extent have the newly introduced social policy measures responded to the new challenges and what is their long-term impact on the development of the welfare state. When assessing the crisis mitigation package, Lithuanian and international public policy documents, official statistics and original data collected during the project are analysed. Based on the analysis, alternative scenarios for Lithuania and recommendations for the improvement of the welfare state are being developed so that it would be an effective protection of the income of the population during crises and an automatic stabilizer of the economy. The results of the project will include proposals for the improvement of specific legislations and administrative procedures.

Changes in Employment in the Lithuanian Labour Market and Measures to Overcome Negative Consequences in the Context of the COVID-19 Pandemic

The changes in the business environment caused by the COVID-19 pandemic have had a particularly severe impact on the labour market, as it has not only had to adapt to demands, but also deal with the objective need to form a system of mitigation of the negative consequences suffered by both the unemployed and the employed, as well as a system of measures to encourage and support their pro-active behaviour. The aim is to assess economic, social and psychological changes in employment, examine the expectations of those who have lost their jobs, and those who are working, with regards to future prospects of the labour market, and evaluate readiness to actively participate in addressing employment issues and other relevant problems. Taking into account the empirical results, recommendations and measures, based on the best scientific and practical experience of Lithuania and foreign countries, are being prepared in cooperation with public administration institutions to mitigate the negative effects and maintain the balance in the labour market in the long run.
Strengthening of Economic Resilience

IMPACT ON THE REAL ESTATE MARKET, FINANCIAL SYSTEM, AGRICULTURE, SMALL AND MEDIUM-SIZED BUSINESSES AND CORPORATE SOLVENCY
Assessing the Most Appropriate Measures for Increasing the Economic Resilience of Lithuanian Agriculture to Reduce the Consequences of the COVID-19

PRINCIPAL INVESTIGATOR
dr. Tomas Baležentis

In order to minimize the consequences of the COVID-19 pandemic on Lithuanian agriculture and ensure its rapid recovery, effective measures with immediate effect are needed. The aim of the project is to identify these measures and, via econometric modelling and simulations, to identify possible scenarios for the impact of these measures and their combinations. The impact of the measures will be assessed in terms of the economic situation taking both agricultural production and trade into account. The application of the results of the study will not only allow the sector to recover more quickly following the crisis caused by COVID-19, but also to better prepare for possible future crises. The stable operation of the Lithuanian agricultural sector would ensure the economic viability of farms, the socio-economic sustainability of rural regions and the supply of Lithuania’s population with locally produced food.

Designing of Business Insolvency Model and its Application for Assessing Implications of COVID-19 in Lithuania

PRINCIPAL INVESTIGATOR
dr. Valdonė Darškuvienė

Every year, about 2000 companies in Lithuania initiate insolvency proceedings. COVID-19 pandemic will have additional negative effects on business, leading to financial distress and insolvency. The consequences of these effects can vary across economic sectors and regions. Research-based findings and recommendations should help the state to ground the support necessary for businesses when dealing with the long-term consequences of COVID-19. The aim is to develop a business insolvency research methodology that would help to examine the impact of pandemic-related crisis on corporate solvency, assess the state business support measures in the short term and anticipate long-term implications for Lithuanian business and employment in vulnerable groups of companies, specific economic sectors and regions.

Model for Assessing the Impact of the COVID-19 Pandemic on the Financial System, Sustainable Economic Growth and the Effectiveness of Consequences Mitigation Measures

PRINCIPAL INVESTIGATOR
dr. Rasa Kanapickienė

Sustainable economic growth is even more important on national agendas during the COVID-19 pandemic. Complex measures and actions are needed to mitigate the socio-economic consequences of COVID-19. Political decisions need to be taken swiftly, laws need to be adjusted, and non-traditional financial system rescue measures need to be put in place to minimize the impact of the pandemic on both sustainable economic growth and the functioning of financial markets. The aim is to create a model that would help the Ministry of Finance, the Bank of Lithuania and other actors within the financial system to assess further risks of the COVID-19 pandemic to the financial system, sustainable economic growth, and risk management of institutions dealing with the consequences of COVID-19. The recommendations developed should help to ensure the stability of the financial system and the further development of sustainable finances, thus ensuring a coherent response to climate change.
The negative impact of the economic shock caused by the COVID-19 pandemic on the real estate market is investigated. If real estate prices were to fall below the value of the property, there would be a risk of households refusing to fulfil their financial obligations, thereby increasing the likelihood of a natural person going bankrupt and affecting the sustainable social dimension. By modelling the Lithuanian real estate market and its participants’ behavioural scenarios in the conditions of economic shock and conducting their prognostic study, the aim is to create an econometric tool to help the state maintain a stable real estate market and provide appropriate economic stimulus measures to different economic actors. This should help avoid serious negative consequences for the fiscal stability of the country’s economy and the formation of responsible social policy.

PRINCIPAL INVESTIGATOR

dr. Vaida Pilinkienė

The socio-economic impact of the restrictions introduced during the coronavirus pandemic on enterprises in seven municipalities of Klaipėda region and their employees, and the effectiveness of the measures proposed by the state in reducing the negative economic impact are analysed. A detailed study, situation modelling and assessment of the impact of restrictions and state intervention measures on enterprises in the manufacturing, trade and services sectors will propose a methodology for reducing the economic impact of the restrictions imposed on small and medium-sized enterprises. Optional measures regarding the ex-ante evaluation of public interventions in similar emergencies will also be provided. It is expected that the findings and recommendations of this applied research will be relevant to the whole of Lithuania and will have a long-term application effect in the future when planning similar types of state restrictive and intervention measures for the country’s economy.

PRINCIPAL INVESTIGATOR

dr. Rasa Viederytė

It is assessed how the COVID-19 pandemic has changed the financial indicators of enterprises operating in different economic activities in Lithuania and what is the experiences estimated net economic losses in these sectors. To determine the financial resilience of enterprises and the net economic losses, the national and international data of different economic activities for the period of 2005-2020 is used. Taking into account the macroeconomic indicators, the situation in 2020 is modelled as if the pandemic had not occurred, and the obtained data is compared with the actual indicators affected and caused by the pandemic. The results of the study can be used to assess the financial resistance of Lithuanian businesses to economic shocks, to evaluate losses of different economic activities, anticipate possible scope of economic stimulus measures and provide recommendations on how to improve corporate financial management policies and increase their resilience to economic fluctuations.

PRINCIPAL INVESTIGATOR

dr. Rytis Krušinskas

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PRINCIPAL INVESTIGATOR

dr. Rytis Krušinskas
Mathematical Models for Managing the Spread of a Pandemic and Predicting its Impact

MODELS TO ANALYSE THE DATA RELATED TO DIFFERENT CASES OF CORONAVIRUS AND TO PREDICT THE SPREAD OF THE PANDEMIC AND SCENARIOS FOR ITS MANAGEMENT
After finding the necessary and sufficient conditions for the existence of soliton-like solutions in the studied models of the spread of COVID-19 pandemic, it would be possible to construct transient process control algorithms and provide recommendations for the COVID-19 pandemic management in Lithuania. The aim is to create a stochastization scheme of COVID-19 models forecasting the pandemic’s spread, which would guarantee to limit the values of soliton-like solutions in the given intervals. The latest COVID-19 pandemic models would be used to analyse Lithuanian morbidity data. This study is relevant for solving two major mathematical problems: the problems of the existence of stochastic soliton-like solutions and their control.

Models based on data analysis are being developed for the spread of the COVID-19 epidemic and its socio-economic impact. A mathematically based methodology will be developed for the analysis and assessment of the spread of potential epidemics and their consequences. It has the potential of becoming one of the tools of the state to manage crisis situations caused by epidemics. It is planned to have models of short-term forecasts and long-term scenarios of the spread of the infection in Lithuania and an assessment of the socio-economic impact of COVID-19 based on the unemployment rate, electricity consumption, SODRA and tax contributions, and other publicly available data. In addition, the available data will allow to compare the COVID-19 dissemination trends in Lithuania and other countries.

It is planned to have models of short-term forecasts and long-term scenarios of the spread of the infection in Lithuania and an assessment of the socio-economic impact of COVID-19.