Fonds Wetenschappelijk Onderzoek – Vlaanderen

Results second special call projects COVID-19

28/10/2020

Project number	Promotor(s)	Title	Research institution	Allocated budget
G0G8320N	**Kris Boudt** Steven Vanduffel Gert Peersman Rudi Vander Vennet Koen Schoors	Belgian Economy Today: A high-frequency data aggregation and visualisation platform for adequate and timely economic analysis	UGent, VUB	249.500 EUR
In turbulent Covid-19 times, we experience shocks that have an immediate impact on the financial situation of economic actors. Tracking these changes with accounting data, monthly surveys or quarterly macro-economic data leads to numbers that are neither timely nor accurate: they are not detailed enough and published with a release lag. The solution is a digital platform called Belgian Economy Today. The platform **aggregates, distributes and visualizes in an automated and structured way the high-frequency information** embedded in the corporate and governmental big data sets registering electronic payments, electricity consumption, mobility, savings behaviour and the media reporting **about the economy**. Our Belgian Economy Today platform provides three types of functionality: • First, it is a data **aggregation and distribution hub**. It aggregates from the various sources the relevant data and makes them available in a convenient data format for further economic analysis. • Second, it is a **visual analytics platform** that lets users dynamically discover how the current data deviates from its behavior in normal times. • Third, it is a **communication platform** where economic analysts can exchange their data and discuss their model results and interpretations. For each functionality, we develop the data science techniques and the end-user tool to make the platform adequate and timely for analysing the Belgian economy.				
G0H3220N	**Benedicte De Winter** Annemieke Smet Kevin Ariën Aline Verstraeten Surbhi Malhotra	Mucin isoform-microbiome crosstalk shaping the course of COVID-19: a help in patient stratification?	ITG, UAntwerpen	227.342 EUR

	Koen Vercauteren			
Infection with SARS-CoV-2 mostly leads to a mild self-limiting respiratory tract illness, however, some patients develop severe progressive pneumonia, multiorgan failure, and death. This project **aims to determine factors that dictate the course of COVID19 beyond cytokines**. We have prior data that specific aberrantly expressed mucins, triggered by SARS-CoV-2, regulate ACE2 expression and affect lung barrier integrity. Such mucin alterations are clinically relevant as excessive mucin production is seen in severe COVID-19 illness obstructing the respiratory tract and complicating recovery. Here, we will first identify differentially expressed mucin isoforms in COVID-19 patients exhibiting the entire spectrum of disease severity. Thereafter, therapeutics currently used for COVID-19 will be screened for their ability to reduce mucin abundance. As mucin expression is also a critical factor in microbiome homeostasis and dysbiosis might modulate COVID-19 severity, this project secondly aims to map the microbiome associated with different degrees of disease severity. Unravelling mucin isoform-microbiome interactions that shape the course of SARS-CoV-2 infection will lead to the future identification of those patients who are in danger of progressing to severe disease. This project will also improve the choice for an appropriate treatment as well as the time frame of treatment options once infection occurs.				
G0G6620N	**Vera Hoorens** Eliane Deschrijver Rana Charafeddine Geert Verbeke Geert Molenberghs	The more you tell me how and why to avoid spreading COVID-19, the more I feel I can spare myself the trouble. Enhancing compliance with measures against COVID-19 by counteracting side-effects of appeals for preventive behaviour.	KU Leuven, Sciensano, UGent, UHasselt	87.380 EUR
To curb the toll of COVID-19, citizens need to massively comply with precautionary measures. Once a vaccine will be available that compliance will mostly consist of getting vaccinated. Until then, it consists of things like wearing a mouth mask and social distancing. Since the start of the first COVID-19 outbreak in Belgium, however, our country has witnessed a decline of people's motivation to show those behaviours. Why have some people not followed the rules? Why have other people lost the motivation that they once had? Why has the relaxation of rules entailed more violations of remaining ones? Several explanations have been suggested, but arguably the most fundamental cause has been ignored: biases in risk perception (such as comparative optimism) and the ironic inflation of those biases by precisely those appeals meant to motivate people to follow precautionary rules. We will in a longitudinal study on representative samples in regions of Belgium differently affected by COVID-19 show **how differences in risk perception between regions and changes in it over time are associated with differences and changes in the motivation to follow precautionary rules**. We will through an experiment on a representative sample show which media messages enhance those biases and which messages reduce them. Our project will thus yield specific and readily applicable solutions to achieve an urgently needed better compliance with precautionary measures.				
G0H4420N	**Piet Maes** Guy Baele Bruno Verhasselt Sebastiaan Theuns	Inter- and intra-community mapping of SARS-CoV-2 spread by combining whole-genome sequencing, phylogeographical analysis and movement traces.	KU Leuven, UGent	235.000 EUR
Since the introduction of SARS-CoV-2, the virus has been spreading very rapidly and has caused severe respiratory pathology around the world. A pandemic ensued within a short time. The virus originated from a zoonotic event, where likely a bat or even a pangolin was carrying the virus and infected a human by animal-to-human transmission. This means that the virus is still seeking an optimal fit with its new host, the human. This is, for example, illustrated by a still suboptimal binding between the human ACE2-receptor and the receptor-binding domain of the viral spike protein. This evolutionary pressure drives mutations				

that allows us to closely follow the evolution of the virus. Our research question in this project proposal is **how does this new coronavirus spread among the population both at micro level (e.g. in a school, or hospital) and at macro level (nationwide)?** We propose to study the spatial distribution of Belgian SARS-CoV-2 clusters by a combination of full-length sequencing and phylodynamic analysis to assess how the spatio-temporal distribution of Belgian clusters evolved during the lockdown in March and April, during the release of these measures in May and June, and from the past summer period (June to August). Furthermore, we aim to investigate new positive cases during the next 12 months in a near real-time fashion to describe the evolution of the circulation dynamics through time and assess the impact of COVID19 measures on spatial transmission over time.				
G0G7220N	**Dimitri Mortelmans** Jorik Vergauwen Piet Bracke	The strengths of intergenerational ties in the COVID-19 pandemic: a comparative study	UAntwerpen, UGent	118.000 EUR
During the 2020 pandemic, experts have referred to the "changing" or even "detrimental" impact of the recent lockdowns on family relations. Most claims were based on anecdotal evidence or, at best, at small-scale non-representative ad hoc surveys. This study will gain **insights in intergenerational relationships** drawing on nationally representative samples in a European comparative perspective. The topic of intergenerational relationships deserves close attention as the need for self-isolation has been higher for elderly during the virus outbreak. At the same time, older people strongly depend on interpersonal exchanges since relatives are crucial in their social network, support supply and well-being. Hence, **the elderly may face a double adversity: the impact of infection and, indirectly, the greater hindrances of social confinement.** This research aims to assess the changing vulnerabilities in family relations in the light of the 2020 pandemic. The important question arises whether intergenerational relationships are strengthened or weakened and how family characteristics play their role in this process. The project studies three aspects: intergenerational contact, informal support and well-being. In particular, it targets the impact of gender, household composition and socio-economic status. Using the COVID-19-tailored SHARE survey data for 50 000 Europeans aged 50+ collected in 27 countries, the study also addresses the heterogeneity in policy and social contexts.				
G0G9820N	**Ingmar Nopens** Christel Faes Jan Baetens Mattias Desmet Ellen Van De Vijver Marc Van Meirvenne Thomas Nuyens	Balancing socio-economic and public health impact of COVID-19 for its sustainable control and mitigation (SOPHIA)	KU Leuven, UGent, UHasselt	250.000 EUR
Given the uncertainty about the further development of the COVID-19 pandemic, decision makers urgently need to **balance the immediate public health impact of the virus and the – yet uninvestigated - psychological and socio-economic impacts of the mitigation measures that were imposed to safeguard our health care system**. Just as the spread of COVID-19 itself, these effects are spatially heterogeneous and scale dependent, hence the need to study the intertwined psychological and socio-economic impacts at multiple spatial scales. To better understand the spatial heterogeneity of these effects, the inverse question is equally important: how does the socio-economic condition of a region affect both the virus spread and the impact of the measures? We will consider data on suicides, use of psychofarmaca, absenteeism due to psychological suffering, burnouts,... Since analysis of these data by the responsible governmental agencies lags at least one year, we will collect raw data and conduct (geostatistical) data analyses in relation to spatio-temporal variation in the measures to support decision-making on further control and mitigation strategies. We will use available socio-economic data at a high spatial resolution to				

infer relationships among the spacedependent parameters in the spatial COVID-19 model, the observed local spread of the virus and the psychological and socio-economic response on the measures. At the smallest spatial scales, this will require geostatistical methods.				
G0H0420N	**Ann Nowé** Niel Hens Malaika Brengman Timothy Desmet	Policy support for managing the COVID pandemic through artificial intelligence	UHasselt, VUB	248.450 EUR
In recent years, epidemiological modeling has made important progress, and now provides us with a variety of models ranging from the high-level compartmental models, meta-population models, network models to fine-grained individual-based models. Such models allow for simulations which can be combined with advanced optimization approaches **using artificial intelligence in order to identify suitable prevention and containment measures**. In this project we will extend state-of-the-art Reinforcement Learning techniques, which have been shown to outperform the currently used techniques by epidemiologists to come up with prevention and containment measures. Our approach will take into account different factors of uncertainty, both of the epidemic as well as human factors. Hereby, taking into account different criteria, such as health factors (e.g. hospital load and death counts), but also economic and social impact. We allow for multi-criteria optimization, such that policy makers can trade-off different aspects. We also pay attention to the communication of the outcome of the learning process to the user, by building upon research on explainable reinforcement learning. The research will form **the basis for a valuable tool for decision makers when confronted with a pandemic such as COVID-19**, even when information on epidemics only gradually becomes available.				
G0H4520N	**Benson Ogunjimi** Philippe Beutels Samuel Coenen Pierre Van Damme Kris Laukens Pieter Meysman Kevin Arien Koen Vercauteren Eva Lion	Celluloepidemiology: generating and modeling SARS-COV-2 specific T-cell responses on a population level for more accurate interventions in public health	ITG, UAntwerpen	234.750 EUR
Mathematical simulation models have become indispensable tools for forecasting and studying the effectiveness of intervention strategies such as lockdowns and screening during the SARS-CoV-2 pandemic. Estimation of key modeling quantities uses the serological footprint of an infection on the host. However, although depending on the type of assay, SARS-CoV-2 antibody titers were frequently not found in young and/or asymptomatic individuals and were shown to wane after a relatively short period, especially in asymptomatic individuals. In contrast, T-cells have been found in different situations – also without antibodies being present – ranging from convalescent asymptomatic to mild SARS-CoV-2 patients and their household members, thereby indicating that **T-cells offer more sensitivity to detect past exposure to SARS-CoV-2** than the detection of antibodies can. In this project, we will gather on a **population level T-cell and antibody SARS-CoV-2 specific data** from different well-described cohorts including 300 individuals (and 200 household members) who have had proven covid-19 infection > 3 months earlier, 100 general practitioners, 100 hospital workers, 500 randomly selected individuals and 75 pre-covid-era PBMC/sera. This data				

will be used in comparative simulation models and will lead to **a reassessment of several key epidemiological estimates such as herd immunity and the reproduction number R that will significantly inform covid-19 related public health interventions**.				
G0H5520N	**Koen Peeters** Charlotte Gryseels Anne-mieke Vandamme Nico Vandaele Corinne Vandermeulen	Pro-actively addressing the challenges for an effective uptake of COVID-19 vaccination in Belgium: a transdisciplinary approach	ITG, KU Leuven	246.688 EUR
Tackling the current COVID-19 pandemic will require **effective vaccines for individual protection and potential group immunity** to reduce transmission. If vaccines are developed, Belgium will likely face challenges with COVID-19 vaccine uptake. **Heightened antivaccination sentiments are proliferating around the world**. These sentiments are related to 'post-truth' perceptions, i.e. increased skepticism towards science and authorities in general, as well as skepticism specifically towards vaccine safety and effectiveness. Emerging signs of escalating mistrust can be linked to such sentiments and perceptions, compounded with pandemic anxieties and incertitude ('insufficient knowledge') around scientific expertise and the politics of pandemic management. **A strategy is urgently needed to guide Belgian public health authorities on how to promote vaccine acceptance among the population**. This project aims to use an innovative hybrid monitoring tool to assess both on-line and onthe- ground vaccine sentiments qualitatively and quantitatively. Interventions that are responsive to the identified emerging vaccine concerns and controversies will be co-created with community and public health stakeholders and aim to place public health agencies in a position to pro-actively counteract vaccine hesitancy prior to COVID-19 vaccination campaigns in Belgium.				
G0G6120N	**Stefaan Slembrouck** Mieke Vandenbroucke Robert Colebunders Hilde Bastiaens Tina Goethals	Effective information exchange and care orientation in Covid-19-related contact tracing phone calls. An applied sociolinguistic and conversation analytic enquiry into optimizing interactional dynamics and pragmatic awareness.	UAntwerpen, UGent	232.200 EUR
Responding to a number of **urgent problems noted in the area of Covid-19 contact tracing** (reluctance to give information, lack of care orientation, script-dominated talk), this project **analyses and seeks to optimize the interactional functioning of the contact tracing phone call** services coordinated by the Flemish Agency for Health & Care. It combines 4 objectives: (i) **diagnosis of interactional practi**ce in 3 cycles of data collection and analysis (incl. 1 cycle on encounters in other languages than Dutch); (ii) **recommendations for practice, the development of training materials and a recruitment package**; (iii) a pilot implementation followed by an efficacy measurement; and (iv) **societal impact on the general public's support for contact tracing**. The project inserts itself in an applied, interactional sociolinguistic and conversation analytic research tradition on medical encounters and institutional interviewing on sensitive topics. It addresses a current gap in (i) fundamental knowledge about the linguistic interactional dynamics of contact tracing calls as a specific type of institutional encounter and (ii) applied knowledge on how to improve task-oriented efficiency and enhance pragmatic awareness of practitioners as a dimension of professional reflexivity in a currently, important domain of combatting and containing the Covid-19 pandemic. The project benefits from close collaboration between relevant linguistic, medical and ethical expertise.				
G0H3120N	**Hilde Van de Velde** Johan Neyts Kai Dallmeier	Assessing the risk of SARS-CoV-2 infection for pregnancy and as possible cause of birth defects	KU Leuven, VUB	229.180 EUR

Since December 2019, SARS-CoV-2 causing COVID-19 spreads over the globe. Mortality rate is highest among the elderly while people at reproductive age usually experience mild or no symptoms. At current, **data on SARS-CoV-2 infection during pregnancy are limited**. Whereas infection during late trimester pregnancy seems to occur without adverse events, a recent study reported **maternal and neonatal complications if the infection occurs in the early third trimester**. Very little is known about maternal and neonatal outcomes after SARS-Cov-2 infection in the first and second trimester of pregnancy. Moreover, vertical transmission of SARS-CoV-2 during pregnancy is still a controversial issue. The aim of this project is to **investigate (i) whether vertical transmission of SARS-CoV-2 occurs during embryogenesis, and (ii) if/how this causes damage to developing embryos**. To that end, we will investigate the susceptibility of human oocytes and early embryos to SARS-CoV-2 infection and the possible impact on embryonic development in vitro. In addition we will study vertical transmission and consequences of maternal SARS-CoV-2 infection on embryogenesis in a hamster model in vivo. In the hamster model we will also estimate protection from vertical transmission by vaccination or passive serum transfer.