CUMBRE CIENTÍFICA DE LA ASAMBLEA GENERAL DE LAS NACIONES UNIDAS 2022 – SSUNGA77

Sesión del Grupo Ad Hoc Modelización de Enfermedades Infecciosas (RITS):

Multidisciplinary science and scientific advising for public decision making. Lessons from the COVID-19 pandemic

5/10 de 10 a 12HS (ARG)

Convenors

Erik Ruuth, M.D., PH.D., Ass. Prof.

IMiBio

Scientific Coordinator

Puerto Iguazú, Misiones

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I am interested in the impact on Health of Biodiversity and climate change, and how to mitigate and heal changes. In other words, I see HEALTH as a wide concept that involves all our entire environment going from the organic to inorganic and how they interact.

The translation of scientific findings to animal and human health as well as the ecosystem homeostasis. How to conserve and to restore adequately our forests. How to decipher the play of actors in biological systems and the dynamics of these systems. Equally, it is of my interest how to generate large and small sustainable production systems, how to create adequate reforestation systems, and how to make live side-by-side small producers and large industries.

Erik Ruuth, M.D., PH.D., Ass. Prof. is a medical doctor with a Ph.D. in immunology and an adjunct professor in cell and molecular biology at Umeå University. After completing a postdoc at Hôpital Necker Enfants Malades in Paris, France, Erik made a career within the pharmaceutical industry

covering areas ranging from basic industrial research to the molecular activities of new active principles, discoveries of mechanisms of action, preclinical development phases, pharmacokinetic toxicology, clinical registry studies, for authorities such as the FDA and EMA, ranging from PhI to III and post-marketing studies (PhIV). He assumed a number of responsibilities, as head of global research projects, head of EU therapeutic areas for anti-infectives, respiratory system and central nervous system products, head of development programs, expert in global products, project leader global research leader and leader of different types from PhI to PhIII clinical trials. As a consultant, ER has worked for the Ministry of Science and Technology of Argentina, for the National Cancer Institute in a large breast cancer project, consultant for the pharmaceutical and biotechnology industry. He is currently senior scientific advisor at the Madariaga Hospital in Posadas (Misiones), Principal Investigator at the Faculty of Medicine of the Catholic University of Misiones and Scientific Coordinator of the Misiones Institute for Biodiversity.

Erik Ruuth, M.D., PH.D., Ass. Prof., es médico, tiene un doctorado (Ph.D.) en inmunología y es profesor adjunto en biología celular y molecular de la Universidad de Umeå. Su formación académica posgrado se efectuó en el conjunto de laboratorios que más tarde formaría el Laboratorio de Molecular de Infecciones de Suecia donde se efectuó parte del trabajo del Premio Nobel del año 2020. Luego de haber efectuado un postdoc en el Hôpital Necker Enfants Malades en Paris, Francia, Erik hizo una carrera dentro de la industria farmacéutica que abarcando áreas que van desde la investigación básica industrial de las actividades moleculares de nuevos principios activos, descubrimientos de mecanismos de acción, fases de desarrollo preclínico, farmacocinética toxicología, estudios de registro clínico, para autoridades como la FDA y la EMA, de PhI a III y estudios pos-marketing de PhIV. Asumió una serie de responsabilidades, como jefe de proyectos globales de investigación, jefe de áreas terapéuticas de la UE para anti-infectivos, productos del sistema respiratorio y del sistema nervioso central, jefe de programas de desarrollo, experto en productos globales, líder de proyectos de investigación global y líder de diferentes tipos de ensayos clínicos PhI, PhII y PhIII. Cómo consultor, ER ha trabajado para el Ministerio de Ciencia y Tecnología de Argentina, para el National Cancer Institute en un gran proyecto de cáncer de mama, consultor para la industria farmacéutica y biotecnológica. Actualmente es asesor científico senior del Hospital Madariaga en Posadas (Misiones) y del Instituto Misionero de Biodiversidad.

Moderators

Juan Aparicio, PhD

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Dr Aparicio is Principal Investigator with CONICET (National Scientific and Technical Research Council of Argentina), at INENCO, National University of Salta, Argentina.

Dr Aparicio obtained a degree in Physical Sciences and a PhD Doctorate in Natural Sciences, from Faculty of Exact and Natural Sciences, University of Buenos Aires. He subsequently held postdoctoral positions at the Department of Biometrics, Cornell University, New York, and the Research Department, University of Belgrano, Buenos Aires. Before establishing himself in Salta, he was Professor of Science and Technology, Metropolitan University, San Juan, Puerto Rico.

Dr Aparicio's area of work is Population Dynamics and its applications to epidemiology, ecology, and natural resource management, among others. More recently, his efforts have focused on the use of mathematical and computational models applied to the control and prevention of infectious diseases with an emphasis on Dengue and Leishmaniasis.

Gustavo Sibona, PhD

FaMAF (UNC) and IFEG (CONICET)

Professor and Researcher

Argentina

Dr Sibona is Independent Investigator with CONICET (National Scientific and Technical Research Council of Argentina), at Instituto de Física Enrique Gaviola, and Professor at FaMAF, National University of Córdoba, Argentina.

Dr Sibona obtained a degree in Physical Sciences at Instituto Balseiro, and a PhD Doctorate in Physics at University of Córdoba. He subsequently held postdoctoral positions at Augsburg University and at the Max Planck Institute for the Physics of Complex Systems in Dresden, both in Germany.

Dr Sibona's area of work is Population Dynamics and its applications to epidemiology, biology and sociophysics. More recently, his efforts have focused on studying how individuals' mobility impacts in the transport of a certain excitation, as for example a disease (during an epidemic) or knowledge (rumor spreading).

Organizing Committee

Organizing group
Juan P. Aparicio, Gabriel Fabricius, Erik Ruuth, Gustavo Sibona, Ignacio Simoy, Verónica Simoy.

Affiliations:

Juan P. Aparicio. INENCO, CONICET, Universidad Nacional de Salta, Salta, Argentina.

Gabriel Fabricius. INIFTA, Universidad Nacional de La Plata, CONICET, La Plata, Argentina.

Erik Ruuth. IMiBio, Puerto Iguazú, Misiones, Argentina.

Gustavo Sibona. FaMAF, Universidad Nacional de Córdoba e Instituto de Física E. Gaviola, CONICET, Córdoba, Argentina.

Ignacio Simoy. INENCO, CONICET, Universidad Nacional de Salta and Instituto Multidisciplinario sobre Ecosistemas y Desarrollo Sustentable (CIC-UNCPBA) Tandil, Argentina.

Verónica Simoy. Instituto Multidisciplinario sobre Ecosistemas y Desarrollo Sustentable (CIC-UNCPBA), Tandil, Argentina.

Program

10.00 AM Introduction: origin and motivation of the session. Gabriel Fabricius (INIFTA-CONICET-UNLP, La Plata, Argentina).

10.10 AM Modelling to inform strategy and tactics in Australia's COVID-19 response. Jodie Mc Vernon (Doherty Institute, Melbourne, Australia)

10.30 AM The experience with epidemiological indicators to advise decision making during the COVID-19 pandemic in Brazil. Daniel Villela (Fiocruz, Rio de Janeiro, Brazil)

10.50 AM The turning point and end of an expanding epidemic cannot be precisely forecast. Saul Ares (CSIC, Madrid, Spain)

11.10 AM Modeling Covid-19 in Costa Rica: A Multilayer Network Approach. Fabio Sanchez (School of Mathematics-CIMPA, University of Costa Rica, Costa Rica)

11.30 AM Discussion

Abstract

During the current COVID-19 pandemic, and especially at the early times facing the emergency, scientists were called to duty to confront the pandemic on two fronts: the technical and the decision-making fronts. Science was well prepared and organized for the first task: COVID-19 diagnosis tests were developed very fast, together with new and enhanced antiviruses protective equipment, starting the development of several vaccines with different technologies in record time. In public policy advising matters, the science contribution is not so clear and it is difficult to measure. A probable factor contributing to this problem is that emerging natural problems are not divided into disciplines and subdisciplines, as science is. Epidemics are phenomena that exceed the union of disciplines since many of their difficulties stem from intricacies in the region of knowledge where the disciplines fade out, a sort of nobody's land. In addition to the need for an interdisciplinary approach, fast communication between scientists, the public health system and the government is required. The meeting proposes to examine different experiences that occurred during the COVID-19 pandemic and the possibilities and difficulties to integrate into decision processes seeking to discover the forms in which interdisciplinary efforts can be articulated and promoted worldwide.

Speakers

Gabriel Fabricius, PhD

INIFTA-CONICET / UNLP

Researcher / Professor

Argentina

Gabriel Fabricius is a PhD in Physics, Researcher at INIFTA-CONICET (National Council for Scientific and Technical Research) and Professor at the Faculty of Exact Sciences at the National University of La Plata, Argentina. Throughout his career he has studied various systems in the fields of Condensed Matter Physics, Statistical Mechanics and Complex Systems through the development of mathematical models and computer simulations. Over the past 15 years, Gabriel's activity has been focused on the interdisciplinary study of the transmission of infectious diseases. He has participated in the development of models to evaluate the impact of various vaccine strategies to control whooping cough. Since 2020 he has been studying the transmission process of

COVID-19 in Argentina. He is a member of the ad-hoc group for Modelling Infectious Diseases of the Translational Health Research Network (RITS-CONICET, https://rits.conicet.gov.ar/modelizacion-de-enfermedades-infecciosas) and of the subcommittee of Vaccinology of the Argentine Association of Microbiology (AAM).

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Jodie McVernon

The Peter Doherty Institute for Infection and Immunity

Professor and Director of Doherty Epidemiology

Australia

Professor Jodie McVernon is a public health physician and epidemiologist. She has extensive expertise in clinical vaccine trials, epidemiologic studies and mathematical modelling of infectious diseases, gained in Oxford, London and Melbourne. For the past 15 years she has been building capacity in infectious diseases modelling in Australia to inform immunization and pandemic preparedness policy. She has led nationally distributed networks of modellers informing responses to the 2009 H1N1 influenza pandemic and the current COVID-19 pandemic.

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Daniel A.M. Villela, PhD

Oswaldo Cruz Foundation

Research Scientist

Daniel A.M. Villela is a Research Scientist at the Oswaldo Cruz Foundation and currently serves as coordinator of the Scientific Computing Program (PROCC / FIOCRUZ). He is a professor and the deputy coordinator of the Program of Epidemiology at the National School of Public Health, where he teaches courses and supervises graduate students. He obtained a master's degree from the Federal University of Rio de Janeiro in 1998 and a Ph.D. from Columbia University in 2005. He has experience in mathematical modeling, with particular interest in mathematical modeling and quantitative methods in Epidemiology and Ecology of important data for public health, among the topics of interest: vector-borne diseases (malaria, arbovirus) and SARS-CoV-2 infections; models of dynamics of vector populations, with attention to seasonal, climatic and spatial effects; Coordinator of the MIDAS Latin America Network. Member of the editorial board of the PLOS Global Health, and Experimental Results journal.

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Saúl Ares

Spanish National Center for Biotechnology (CNB) - CSIC

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Saul Ares is a researcher at the Spanish National Center for Biotechnology. His research focuses in applying methods from mathematics and physics to biological problems, more specifically being interested in biological pattern formation, that governs key processes in embryonic development of animals and plants. Since 2020 he has applied his experience in nonlinear dynamical systems and statistical physics to epidemiology, helping to bring into attention the limits (and strengths) of epidemiological modelling or how to use information on demographic structure and social contacts in a population to design efficient vaccination strategies. During these last two years he has had a strong presence in the media, helping to bring to the public scientific analysis of the epidemiological situation at each moment. From his Twitter account @omeuxeito he offered daily analysis of the situation in Madrid.

Fabio Sanchez, PhD

Cornell University

New York, USA

Fabio Sánchez has a Ph.D. in Biological Mathematics from Cornell University in New York. Currently, he works as a teacher and researcher at the School of Mathematics-CIMPA, University of Costa Rica. His research interests lie in the modelling of infectious diseases, with a greater emphasis on those that are transmitted by vectors such as: dengue, chikungunya and Zika. To model this dynamics, nonlinear differential equation systems are used. These predictive models are used to study the spread of this type of diseases in a population. In addition, with these models, prevention and/or control strategies can be developed for public health officials.

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Abstracts

Introduction: origin and motivation of the session. G. Fabricius
I will make a brief introduction commenting on some activities carried out during the COVID19 pandemic. In particular, the monitoring of the epidemic in Argentina performed by the Infectious Diseases Modelling Network during 2020, and the series of "Interdisciplinary Dialogues around the COVID-19 pandemic", conducted within the framework of the Network for Translational Research in Health (https://rits.conicet.gov.ar/) during 2021. Some of the questions and concerns that emerged from those activities motivated the organization of the present session.

Modelling to inform strategy and tactics in Australia's COVID-19 response. J. Mc Vernon
The Western Pacific Region was unique globally in its experience of the COVID-19 pandemic, with many island nations including Australia using strict border controls to delay entry of the virus over an extended period. This initial phase of 'anticipation' was followed by a strong suppression strategy achieved through active case and contact management, supported by stringent social restrictions as required. Effective 'elimination' was sustained through most subnational jurisdictions through to mid 2021, at which point 'vaccination' provided a pathway to reconnecting within and beyond national borders. Importation of the highly transmissible Omicron variant rapidly transitioned Australia's COVID-19 epidemic from low to high prevalence, although burden was substantively mitigated by high prior vaccine coverage. By late 2022, high 'saturation' of infection and vaccination coverage had been achieved, making the population relatively resilient to the emergence of BA4/5. This presentation will review the role of modelling in guiding strategic policy decision making within and between these four stages of Australia's pandemic response.

The experience with epidemiological indicators to advise decision making during the COVID-19 pandemic in Brazil. D. Villela
Brazil collected records of COVID-19 cases into national surveillance databases during the pandemic. From the start, there was a need to establish good epidemiological indicators to advise decision-making oriented to mitigate the pandemic's impact. This talk will discuss lessons learned during the process. Attention will be given to highlighting indicators that convey the incidence of severe cases, the impact of policies, including vaccination, challenges involving the volume of data, and periods with missing notification data.

The turning point and end of an expanding epidemic cannot be precisely forecast. S. Ares
Certain generic features of epidemics are well-illustrated by mathematical models, which can be remarkably good at reproducing empirical data through suitably chosen parameters. However, this does not assure a good job anticipating the forthcoming stages of the process. The future of ongoing epidemics is so sensitive to parameter values that predictions are only meaningful within a narrow time window and in probabilistic terms, much as what we are used to in weather forecasts. Epidemic spread is characterized by exponentially growing dynamics, which are intrinsically unpredictable. The time at which the growth in the number of infected individuals halts and starts decreasing cannot be calculated with certainty before the turning point is actually attained; neither can the end of the epidemic after the turning point. There is a short horizon for reliable prediction, followed by a dispersion of the possible trajectories that grows extremely fast. However, these shortcomings do not render epidemiological models useless: short term predictions can be valuable and, moreover, models are an effective tool to compare scenarios and design action strategies.

Modeling Covid-19 in Costa Rica: A Multilayer Network Approach. F. Sánchez

During the 2020 Covid-19 pandemic in Costa Rica, different groups developed modelling techniques to understand the transmission dynamics of the disease. The modelling team, EpiMEC, developed deterministic models early in the pandemic to provide insight into the early disease dynamics. During the same period, the team developed a multilayer network model that allowed for more flexibility and included preventive measures and interventions from health authorities in the country. The model provided information for decision-makers in the country during the pandemic in Costa Rica.