

LERU Doctoral Summer School 2-8 July 2023 in Heidelberg

Concepts of intervention science applied to global challenges

Equipping the next generation of scientists with understanding of main concepts and methods of intervention science and applying them to the converging global challenges: climate change, pandemics, and societal injustice

"What starts out as science fiction today may wind up being finished tomorrow as a report."

Norman Mailer



I. Theme

Societies today face multiple and highly interwoven global challenges such as accelerating climate change, antimicrobial resistance, food and water security and safety, pandemics of infectious and non-communicable diseases, and social injustice. Threatening to converge, these global challenges call for the effective and timely transformation of societies worldwide to ensure that we continue to thrive.

Science can massively contribute to tackling these challenges, by discovering, co-designing, and evaluating solutions. While not yet commonplace, a science of intervention is increasingly urgent. The COVID-19 crisis has dramatically demonstrated the scientific success of basic science – with rapid developments of both COVID-19 tests and vaccines – and the failures of real-life deployments of these efficacious technologies. Societies have proven susceptible to division, polarization, political tension, and many individuals have been unable or unwilling to follow intervention and policy prescriptions. A science of intervention can avoid such failures by contributing robust and transferable knowledge on what works and what does not in real-life intervention design and deployment.

The LERU network in general, and Heidelberg University in particular, aim to prepare future scientists and societal leaders to tackle global challenges and facilitate interdisciplinary research, innovation, and communication. In this summer school, we propose to explore a science of intervention, particularly we propose to convey conceptual knowledges of practices and methods to identify intervention need, design interventions, and establish their impact, performance, and social value. The scope of this summer school is framed by the concept of a T-shaped scientist. In this concept, the horizontal bar of "T" represents the breadth of skills, and the vertical bar symbolizes the depth in one area. In this summer school, we will stay on the horizontal bar of "T" and convey broad general knowledge of the methods of intervention science rather than their execution. Equipped with a conceptual understanding of methods and insights on how to choose the methods given a research question, participants can develop expertise further in their research.

The Heidelberg LERU Doctoral Summer School will bring together doctoral students from LERU universities, scientists and scholars of Heidelberg University – from the Heidelberg Institute for Global Health (HIGH), the Interdisciplinary Center for Scientific Computing (IWR), the Heidelberg Institute for Geoinformation Technology (HeiGIT) –, to share expertise and experience with scientific practices of a science of intervention. We will focus on the conceptual understanding of the intervention science methods and discuss them in the context of three major themes – climate change, pandemic prevention, and social injustice – but the summer school will encourage participants to insert case studies and examples beyond these three challenges for discussion.

The three challenges provide many opportunities to understand and discuss the concepts of the methods applied to discover, design, and test interventions. Discussion questions will include the following: What is the need for an intervention, and whose needs are most urgent? How should we approach the design of an intervention, so that it is feasible, viable, and desirable in a particular local context? What methods are applicable to estimate the causal impact of an intervention when it is deployed in real-life? What can we use when we want to elicit the modes and contexts of intervention action?

We will facilitate the discussion of the methodological concepts of the intervention science within context of three global challenges and show how these concepts can be applied in these domains.

Challenge I: climate change

Anthropogenic climate change triggers adverse effects on global ecosystems and human health (Romanello et al. 2021). It has given rise to systemic adverse threats to humanity, manifested through alterations and intensification of extreme weather events, increased sea levels, crop yield failures, and changes in the ecology and distribution of infectious diseases (Kumar et al. 2021). Adding to these existing impacts, the risk of crossing over the climate tipping point is increasing. Reaching this threshold may well happen before average global warming reaches 2°C (Collins et al.) and lead to widespread disruptions in natural and social systems.

The acceleration of climate change and the multifactorial nature of associated impacts emphasize the need for a more proactive and holistic approach to mitigation and adaptation actions. Mitigation interventions aiming to reduce global warming include energy transition to renewable sources, energy-efficient building design and infrastructure, promoting climate-friendly diets, encouraging more active mobility (walking and cycling), and protecting rainforests, which act as critical carbon sinks. These interventions can slow down or even reverse changes in frequency, intensity, and geographical distribution of climate determinants of infectious disease emergence and spread (Rocklöv and Dubrow 2020), nutrition (Romanello et al. 2021), extreme weather events, and heat waves. Adaptation interventions are critical to cope with the current and future climate variability and include the adaptation of the cities and rural areas to heat waves and extreme events (Lin et al. 2021), the transformation of agricultural practices (Harwatt et al. 2020), and a wide range of individual- and household-level behaviour changes.

The Heidelberg LERU Doctoral Summer School will explore how the different methodological concepts of a science of intervention can contribute to the social transformations, including structural and behavioural changes, needed to mitigate and adapt to the effects of climate change. We will invite the participants to propose interventions, and then jointly discuss possible methods to discover, design, and test these interventions. We will encourage interdisciplinary thinking, for example, asking questions such as “How can network science elucidate the transmission of intervention impact across physical and social networks?” We will show the participants what methods can be used to establish intervention effectiveness in terms of mitigation and adaption outcomes. For example, we will convey the concepts of the methods applied to design and evaluate passive cooling technologies to help vulnerable people protect themselves against extreme heat.

Challenge II: pandemic prevention

Emerging infectious diseases pose another global threat to human health and economies worldwide (Bernstein et al. 2022). The COVID-19 crisis, unfortunately, has proven that contemporary global societies are highly susceptible and unprepared to effectively and cohesively manage global outbreaks. Infectious disease pandemic prevention and preparedness present important tasks for global societies. Non-communicable diseases such as obesity (Hepatology 2021) and diabetes (Singer et al. 2022) are other ongoing ‘pandemics’, causing considerable disease burdens and often interacting in important ways with infectious diseases (Chikowore et al. 2021).

The Heidelberg LERU Doctoral Summer School will introduce how the methods of intervention science can support evidence-based decision-making to prevent existing and future pandemics of communicable and non-communicable diseases. We will explore, for example, the examples of design and testing interventions to change the human structures and behaviours that lead to zoonotic spillover of viruses.

Challenge III: social injustice

Climate change, communicable and non-communicable diseases, and other societal threats (such as food and water crises) will affect vulnerable and marginalized populations particularly severely (Aschner et al. 2021; Ziegler et al. 2017). It is thus imperative to design interventions so that they are responsive to the needs and preferences of vulnerable and marginalized populations. It is also important to measure the distributions of intervention impacts across important social dimensions – and to judge the normative meaning of unequal distributions.

The Heidelberg LERU Doctoral Summer School will discuss how interventions relate to the existing distributions of opportunities in societies, and what these distributions mean for intervention impact and value. We will also explore the methods of design research to ensure that interventions are viable and desirable for particular groups of vulnerable people, such as migrants and refugees, older adults, and the physically or cognitively impaired. The instructors of the Heidelberg LERU Doctoral Summer School will focus on the concepts of the intervention science methods using the example of interventions applied in the fields of these three societal challenges. At the same time, they will encourage the participants to “bring their own challenges” and to think about the methods which could be applied to design and evaluate potential solutions. Further, we will facilitate group work with an expert functioning as a mentor providing the participants with opportunities to communicate with the experts and network.

II. Location

Heidelberg University

Heidelberg University, officially the Ruprecht Karl University of Heidelberg, was founded in 1386 and is Germany's oldest university. Heidelberg is a German Excellence University and occupies top positions in international rankings. A central component of its strategy is the concept of the Comprehensive University, with researchers working across disciplinary boundaries to solve some of society's most pressing problems. The thematic and methodological foci of HIGH, IWR and HeiGIT are key components of this strategy.

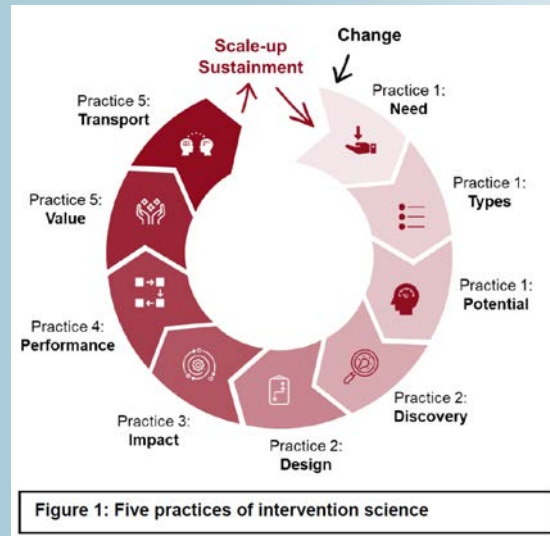
Heidelberg City

Heidelberg is a city in southwest Germany, situated on the river Neckar and surrounded by mountains. It provides plenty of opportunities for social, cultural and outdoor activities. It also boasts several strategies and structures addressing major societal challenges, such as an innovative mobility concept, scientific engagements with citizens and university scholars, and an emerging living lab.



III. Objectives

The Heidelberg LERU Doctoral Summer School is designed to offer early career scientists an overview and insight into the methods of intervention science giving examples from the domains of climate change, pandemic prevention, and social injustice. We will focus on the conceptual understanding of the methods within five related practices of a science of intervention: (i) identifying need, (ii) creating design, (iii) establishing impact, (iv) elucidating performance, and (v) determining value (Figure 1).



This summer school aims to accentuate the benefits of integrating methods from different disciplines into a coherent and practical logic of intervention science, with statistical methods from epidemiology and computer science, qualitative methods from ethnography, creative methods from design research, and causal methods from medicine and economics. The school will equip the participants with a coherent conceptual framework of intervention science. Further, we aim to contribute to the soft skills – or “meta skills” – of the participants focusing on the development of a research idea, the crafting of methods and approaches to achieve research objectives, and the art of pitching ideas to position the research for competitive funding applications. In the mornings, we will cover theory and the concepts of the methods. For practical, interactive discussions, group work and networking, we will devote the afternoons of each of the five days of this summer school to practical sessions: (i) work in small groups with the summer school instructors discussing the methodological concepts and their potential application to one of the three societal challenges; and (ii) jointly work on a research idea and pitch for potential interventions and methods to study them to tackle the most pressing societal challenge.

IV. Expected learning outcomes

Once the students have successfully participated in the Heidelberg LERU Doctoral Summer School they will be able to:

- Understand and recall practices of intervention science (to identify need, create designs, establish impact, quantify performance)
- Understand the advantages and disadvantages of several methods of intervention science
- Select particular methods within these practices for the scientific study of interventions
- Work within an interdisciplinary scientific team to identify opportunities for intervention design and testing
- Pitch a research idea to distinguish their study from others.

The active and interactive work during the summer school will produce concrete starting points for scientific studies of interventions addressing major societal challenges. During these sessions, which will follow the theoretical and methodological morning sessions, the participants will be asked to (i) think and develop a research idea for a potential intervention, (ii) select at least one intervention science method, (iii) identify the most important advantages and the most important disadvantages of the methods. Together, the summer school participants and instructors will also work on a research study idea, pitching it in different formats and practice their pitch to an audience.

V. Participant requirements

Candidates for the summer school are nominated by their home institutions. This summer school does not restrict the scientific field of the participants and welcomes applicants from a broad range of disciplines. The participants should be advanced in their doctoral project and have a strong motivation for a science of real-life interventions. Candidates must be available for the entire duration of the summer school. As all sessions will be conducted in English, and fluency in both spoken and written English is required.

The target number of participants is 46.

VI. Schedule

Summer school program: **2 – 8 July 2023. Heidelberg University**, Heidelberg, Germany

Prior to the course week, we will engage participants by offering preparatory readings for each of the five practices of intervention science (Figure 1).

Time	Event	Program Partners & Venue
Sunday, 2 July 2023		
18:00 - 21:00	<i>Opening Dinner and Introductions</i>	Till Bärnighausen Marina Treskova Christine Neumann Venue for dinner: Marsilius-Arkaden, Im Neuenheimer Feld 130.1, 69120 Heidelberg
Monday, 3 July: Identifying need		
8:30 - 9:00	<i>Registration and beverages</i>	Mathematikon, Common Room, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
9:00 - 10:00	Introduction, motivation, background of intervention science and framework of the school This session will motivate – with global and European statistics and case studies – an intervention research agenda to address the three societal challenges that are thematic foci of this LERU Summer School: climate change, pandemic prevention, and social injustice. We will provide theoretical and historical background on the three challenges and discuss their relevance for the European Union in its global role with students. We will also introduce an overarching logic of intervention research and the five practices that this summer school will cover.	Till Bärnighausen Marina Treskova Christine Neumann Mathematikon, Conference Room, Room 5/104, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg

Time	Event	Program Partners
Monday, 3 July: Identifying need		
10:00 – 11:30	Practice 1: Methods to estimate intervention and policy needs We will introduce major methods of identifying need from epidemiology, analytics, demography, and the survey sciences. In particular, we will cover real-life approaches to representative sampling in large population-based research studies, major metrics of needs, and dynamic needs nowcasting and forecasting. We will also introduce a selection of important existing resources that provide public access to data that can be used for needs estimation.	Ina Danquah, Joacim Rocklöv Mathematikon, Conference Room, Room 5/104, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
11:30 – 12:00	Coffee Break & Networking	Mathematikon, Common Room, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
12:00 – 13:00	Practice 1: Geographic identification of needs and crowdsourcing This session will introduce the geographical identification of needs, which are critical for resource allocation, as well as intervention targeting and tailoring. We will introduce particular methods innovations in their technical and analytical foundations to measure need – including for climate change adaptation; pandemic prevention; and social and humanitarian action. Innovations will include needs-assessment via satellite images, sensors and wearables, crowdsourcing and citizen science.	Alexander Zipf Mathematikon, Conference Room, Room 5/104, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
13:00 – 14:30	<i>Lunch</i>	BräuStadel Mathematikon, Berliner Str. 41, 69120 Heidelberg
14:30 – 15:15	Meta-skills I: The development of research ideas and the art of pitching research In this session, we will introduce concepts from grant writing, competitive analysis, and marketing to support participants in identifying, challenging, and developing research ideas. The session will also feature the major principles that are used globally to evaluate research – such as impact, significance, innovation, rigor, team and structural environment. This session aims to give participants practical skills to develop a research pitch and proposal.	Christine Neumann Till Bärnighausen Mathematikon, Conference Room, Room 5/104, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
15:15 – 15:45	<i>Coffee break and Networking</i>	Mathematikon, Common Room, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg

Time	Event	Program Partners
Monday 3 July: Identifying need		
15:45 – 16:45	Group work on developing research ideas for interventions to address a societal challenge In this session, we will form small teams of participants to develop a research idea and program on interventions to address an important societal challenge. In this first session, the focus of the group work will be on the particular need that the intervention will address and the population that will benefit from the intervention – and how we could quantify the need and size of the target population of the intervention.	Facilitators: Christine Neumann Till Bärnighausen Marina Treskova Joacim Rocklöv
16:45 – 17:00	Short Q&A and wrap-up	All, Joacim Rocklöv Alexander Zipf Till Bärnighausen
17:00 – 21:00	<i>Hike on the Philosophers' Way in the mountains of Heidelberg and dinner</i>	Restaurant Schnookeloch Haspelgasse 8 69117 Heidelberg
Tuesday, 4 July: Creation and design		
9:00 – 10:30	Practice 2: The tenets of design research This session will introduce the tenets of design research, including a focus on humans in their holistic and multiple needs, empathy, expansive thinking and creation, experimentation and iteration. The session will also cover the intellectual origins of design research and three stages that can help organize research for intervention design – inspiration, ideation, and implementation.	Shannon McMahon Vera Araújo-Soares Mathematikon, Conference Room, Room 5/104, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
10:30 – 11:00	<i>Coffee break and Networking</i>	Mathematikon, Common Room, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
11:00 – 12:00	Practice 2: Methods of design research: inspiration This session will introduce a number of concrete methods that can be used in the inspiration phase of design research – including participant observation, diary studies, mental model diagrams, Kano analysis, task analysis, focus groups and in-depth interviews. We will provide both essential methods and steps for the selected methods, as well as examples of successful applications of these methods in larger intervention research projects	Shannon McMahon Mathematikon, Conference Room, Room 5/104, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg

Time	Event	Program Partners
Tuesday, 4 July: Creation and design		
12:00 - 13:00	Practice 2: Methods of design research: ideation and implementation This session will cover a number of concrete methods that can be used in the ideation phase of design research – such as, horizon scanning, mind mapping, body storming, speed dating and swimlanes –, as well as in the implementation phase of design research – such as, parallel prototyping, iterative prototyping, pilot and feasibility studies. We will provide both essential methods and steps for the selected methods, as well as examples of successful applications of these methods in larger intervention research projects.	Mark Donald Reñosa Mathematikon, Conference Room, Room 5/104, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
13:00 - 14:30	<i>Lunch</i>	BräuStadel Mathematikon, Berliner Str. 41, 69120 Heidelberg
14:30 - 15:30	Meta-skills II: Pitching methods In this session, we will describe the basic principles that are used in science to evaluate methods, such as rigor, novelty, feasibility, and value for money. We will also discuss how intervention researchers can ensure that their methods pitches – in proposals, presentations, and discussions – are seen to excel in meeting these principles.	Shannon McMahon Ina Danquah Mathematikon, Conference Room, Room 5/104, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
15:30 - 16:00	<i>Coffee break and Networking</i>	Mathematikon, Common Room, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
16:00 - 17:00	Group work on research idea and methods (design) In this session, participants will continue to work in their groups, honing the pitch of their core intervention research idea, as well as starting to develop methods to achieve the research objectives that operationalize their intervention idea. The focus will be on design research methods for intervention creation.	Facilitators: Shannon McMahon Mark Donald Reñosa Marina Treskova Vera Araújo-Soares Mathematikon, Conference Room, Room 5/104, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
17:00 - 17:15	Short Q&A and wrap-up	All, Shannon McMahon Mark Donald Reñosa Vera Araújo-Soares
<i>Tentative:</i> 17:30 - 21:30	<i>Science-Event „LERU meets the Interdisciplinary Center for Scientific Computing“ discussing science over food and drinks</i>	Atrium & Foyer Mathematikon, Im Neuenheimer Feld 205, 69120 Heidelberg

Time	Event	Program Partners
Wednesday, 5 July: Establishing impact		
9:00 - 10:30	Practice 3: Experimental study designs This session will introduce the basic tenets of causal inference and experimental designs. It will also introduce major experimental study types, such as parallel-arm, stepped-wedge, and adaptive trials.	Aditi Bunker Mathematikon, Conference Room, Room 5/104, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
10:30 - 11:00	<i>Coffee break and Networking</i>	Mathematikon, Common Room, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
11:00 - 12:00	Practice 3: Quasi-experimental study designs This session will cover quasi-experimental designs for causal inference using observational data – regression discontinuity, interrupted time series, instrumental variable analysis, and two-way fixed-effects analysis. It will provide a basic theoretical foundation, intuition, and conceptual understanding. It will also demonstrate the use and value of quasi-experimental in several concrete intervention studies.	Till Bärnighausen Marina Treskova Mathematikon, Conference Room, Room 5/104, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg¹
12:00 - 13:00	Practice 3: Novel developments in (quasi-)experimental study designs This session will cover recent developments in (quasi-) experimental designs that are likely to shape future causal studies for intervention research. Examples of such innovations include approaches to identify effect heterogeneity by combining causal and machine-learning methods, such as causal forests in quasi-experiments and factorial-designs with very high numbers of factors in experiments. It will also examine the opportunities of trials in novel contexts, including online and virtual-reality trials.	Till Bärnighausen Mathematikon, Conference Room, Room 5/104, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
13:00 - 14:30	<i>Lunch</i>	Mathematikon, Common Room, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
14:30 - 15:30	Meta-skills III: Pitching the team and research structures In this session, we will describe the basic principles that are used in science to evaluate investigators, investigator teams, and research institutions and environments, such as scientific excellence, scientific impact, education background, scientific leadership track record, and social engagement. We will discuss how intervention researchers can ensure that they and their teams and institutions are maximally strongly featured in proposals, presentations, and discussions.	Aditi Bunker, Manuela De Allegri, Joacim Rocklöv Mathematikon, Conference Room, Room 5/104, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
15:30 - 16:00	<i>Coffee break and Networking</i>	Mathematikon, Common Room, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg

Time	Event	Program Partners
Wednesday, 5 July: Establishing impact		
16:00 – 17:00	Group work on research methods (impact) In this session, participants will continue to work in their groups, expanding on the methods that will achieve the research objectives that operationalize their intervention idea. The focus will be on methods to establish the impact of their intervention in a real-life context.	Facilitators: Aditi Bunker Manuela De Allegri Marina Treskova Christine Neumann Joacim Rocklöv Mathematikon, Conference Room, Room 5/104, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
17:00 – 17:15	Short Q&A and Wrap-up	All, Aditi Bunker Marina Treskova Joacim Rocklöv
17:15 – 21:00	<i>Visit to Heidelberg's old town and castle, dinner</i>	Schlosshotel Molkenkur Klingenteichstraße 31, 69117 Heidelberg
Thursday, 6 July: Elucidating performance		
9:00 – 10:30	Practice 4: Implementation science principles and methods This session will cover the tenets of implementation science as well as several of the important theoretical frameworks that have shaped the field of implementation science in the past decades. The session will also discuss how we design implementation research, such that it is maximally rigorous and useful for practice and policy.	Michel Wensing Mathematikon, Conference Room, Room 5/104, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
10:30 – 11:00	<i>Coffee break and Networking</i>	Mathematikon, Common Room, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
11:00 – 12:00	Practice 4: Mixed methods performance evaluation The session will introduce a framework to conceive the interactions between quantitative and qualitative research methods in the service of a larger intervention research agenda. The session will outline theories and component methods of mixed-methods performance or process evaluations. It will also cover concrete approaches to triangulate and integrate research findings generated with methods from disparate epistemic traditions and scientific disciplines.	Claudia Denkinger Mathematikon, Conference Room, Room 5/104, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg

Time	Event	Program Partners
Thursday, 6 July: Elucidating Performance		
12:00 – 13:00	Practice 5: Methods of economic evaluation of interventions This session will introduce basic approaches of economic evaluation of interventions, including standard cost-effectiveness and cost-benefit analyses. The session will also discuss how we can quantify resources and costs in empirical intervention research, and it will cover a range of recent debates and innovations in economic evaluations of interventions. These include approaches to integrate normative stances, equity, into economic evaluations, as well as how to capture broader societal consequences of an intervention, such as downstream impacts on thriving lives, economic productivity and social functioning.	Manuela De Allegri Mathematikon, Conference Room, Room 5/104, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
13:00 – 14:30	<i>Lunch</i>	BräuStadel Mathematikon, Berliner Str. 41, 69120 Heidelberg
14:30 – 15:30	Meta-skills IV: What can scientists learn from entrepreneurs? Many aspects of intervention research are similar to entrepreneurial activities. Scientists need to identify scientific “market” opportunities and “blue oceans” where truly novel research insights are possible. They also need to pitch their scientific themes, ideas, objectives and methods to funders, peers and society for funding and publication. Finally, they need to assemble and lead teams – often across many disciplines – and motivate strong concerted effort in the pursuit of new knowledge, and manage cash flows and a variety of stakeholders in the execution of scientific plans. We will introduce a range of leadership, managerial, and entrepreneurial skills that can boost success in the pursuit of new knowledge and social impact.	Bartosz Kajdas, hei_Innovation Christine Neumann Mathematikon, Conference Room, Room 5/104, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
15:30 – 16:00	<i>Coffee break and Networking</i>	Mathematikon, Common Room, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
16:00 – 17:00	Group work on research methods (performance and transport) In this session, participants will continue to work in their groups, expanding on the methods that will achieve the research objectives that operationalize their intervention idea. The focus will be on methods to elucidate the performance and economic value of their intervention. The groups will also work on the final presentation pitching their intervention idea, research objectives, methods, team and structures to all participants and faculty.	Facilitators: Claudia Denking Michel Wensing Christine Neumann Mark Donald Reñosa Mathematikon, Conference Room, Room 5/104, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg

Time	Event	Program Partners
Thursday, 6 July: Elucidating impact		
17:00 - 17:15	Short Q&A and wrap-up	Claudia Denkinger Michel Wensing Christine Neumann
<i>Tentative: 18:00 - 22:00</i>	<i>HGS MathComp Boardgame Night with pizza</i>	Mathematikon, Common Room, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
Friday, 7 July: Closing Session		
9:00 - 10:00	Practice 5: Transportability studies In this session, we will explain the logic and details of two major methods streams that can elucidate the potential transfer of research findings and interventions across communities and countries. The first research stream is transportability studies, which provide a quantitative framework for estimating effect sizes in contexts where strong causal impact studies have not taken place. The second stream is the qualitative and creative science of adjusting and adapting interventions for a novel implementation context. These research streams represent a scientific contribution to scalability and sustainment of novel interventions.	Stefan Kohler Mathematikon, Conference Room, Room 5/104, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
10:00 - 11:00	Practice 5: Model-based projections of intervention effects This session will cover simulation models to predict intervention effects and impact in the long run and at scale. This science can powerfully support intervention research at two stages: in the initial examination of an intervention idea and in the scaling and sustainment of an intervention that has been rigorously tested in an impact study. The session will introduce basic modeling approaches as well as multiple examples from climate change and pandemic prevention research.	Joacim Rocklöv, Vera Araújo-Soares Mathematikon, Conference Room, Room 5/104, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
11:00 - 11:30	<i>Coffee break and Networking</i>	Mathematikon, Common Room, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg

Time	Event	Program Partners
Friday, 7 July: Closing Session		
11:30 - 13:00	Group presentations I In this session, the participant groups will pitch their intervention and research ideas and approaches to all participants and faculty, who will challenge and feedback.	All, Review Board: Till Bärnighausen Joacim Rocklöv Claudia Denkinge Alexander Zipf Michel Wensing Stefan Kohler Christine Neumann Mathematikon, Conference Room, Room 5/104, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
13:00 - 14:30	<i>Lunch</i>	BräuStadel Mathematikon, Berliner Str. 41, 69120 Heidelberg
14:30 - 16:00	Group presentations II In this session, the participant groups will pitch their intervention and research ideas and approaches to all participants and faculty, who will challenge and feedback.	All Review Board: Till Bärnighausen Joacim Rocklöv Claudia Denkinge Alexander Zipf Michel Wensing Stefan Kohler Christine Neumann Mathematikon, Conference Room, Room 5/104, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
16:00 - 16:30	Closing session	David Bogle Till Bärnighausen Joacim Rocklöv Claudia Denkinge Mathematikon, Conference Room, Room 5/104, 5th Floor, Im Neuenheimer Feld 205, 69120 Heidelberg
18:00	<i>Closing dinner</i>	All Hotel Goldener Falke, Am Marktplatz, Hauptstraße 204, 69117 Heidelberg

VII. Faculty curricula vitarum



Prof. Dr. Manuela De Allegri

Manuela De Allegri focuses on evaluating interventions and systems reforms for population and planetary health. Her research spans economic, performance and impact evaluation. Her areas of expertise include healthcare financing, payment, organization and regulation. Through the systematic application of a mixed methods approaches, Manuela combines quantitative and qualitative methods of data collection and analysis to all of her work. At the moment, Manuela serves as Commissioner on the Lancet Commission Financing Primary Health Care. She is also active as advisor to both the Evidence and Knowledge Group of the Partnership for Maternal, Newborn, and Child Health and the Alliance for Health Policy and Systems Research, where she supports a research program on responsiveness and accountability of health insurance.



Prof. Dr. Dr. Till Bärnighausen

Till Bärnighausen focuses on identifying, designing and testing novel interventions and policies to boost population and planetary health in many communities and countries worldwide. He is an expert in experimental and quasi-experimental and has long and deep expertise leading large research programs in Africa, USA, Asia and Europe. Till has been principal investigator on grants from many large funders, such as the US National Institutes of Health, the European Union, the European Commission, the German National Science Foundation, the German Ministry of Education and Research, the Alexander von Humboldt Foundation, Wellcome, Volkswagen Foundation, Else-Kröner Fresenius Foundation, and Bill & Melinda Gates Foundation, as well as UNAIDS, World Bank and WHO. He is Alexander von Humboldt Professor of Global Health and Director of the Heidelberg Institute of Global Health (HIGH) at Heidelberg University, Research Fellow at the Harvard Center for Population and Development Studies, and Senior Faculty at the Africa Health Research Institute.



Dr. Aditi Bunker

Aditi Bunker focuses on creating and evaluating interventions and policies to reduce the impact of climate change on human health. Using experimental and quasi-experimental designs, she conducts large-scale causal impact evaluations on interventions in the housing, urban design, infrastructure and food sectors to identify how they affect outcomes, including infectious diseases, food security, and economic productivity. She uses novel approaches to co-design technology-based solutions for populations including growth hacking, citizen science, and hackathons. Aditi is a research lead on grants funded by the European Union, the German National Science Foundation, and Wellcome. She leads a climate change intervention research programme at Heidelberg University and is a visiting scientist at Harvard Chan C-CHANGE.



Prof. Dr. Ina Danquah

Ina Danquah focuses on insight and interventions to boost sustainable nutrition in Africa and globally. For the past 10 years, her research has characterized the dietary behavior of sub-Saharan African populations under transition, and establishing their diet-disease relationships, specifically for adiposity and metabolic health. In addition, Ina aims at determining the interrelations between all forms of malnutrition, infectious diseases and cardio-metabolic health among African populations in their country of origin and among African migrants in Europe. Importantly, Ina quantifies the sustainability of diets in rural and urban sub-Saharan Africa. These sustainability features comprise healthfulness, affordability, cultural acceptability, and climate-friendliness/climate-resilience. Ina has been principal investigator and research lead on grants funded by the German National Science Foundation (DFG), Leibniz Foundation, Robert Bosch Foundation, the German Diabetes Foundation, and is leading the DFG Research Unit on Climate Change and Health. She is the Robert Bosch Junior Professor in Sustainability Science at Heidelberg University.

**Prof. Dr. Claudia Denkinge**

Claudia Denkinge is a physician and infectious disease specialist and researcher with a focus on diagnostic tests relevant to population and planetary health. Claudia is principal investigator on large grants from the US National Institutes of Health, German National Science Foundation, German Ministry of Education and Research, and many science foundations. Claudia is an expert in infectious disease epidemiology, design research for diagnostic tests, and intervention research to boost the effectiveness of screening and diagnostic functions in health systems worldwide. Claudia leads the Division of Infectious Diseases and Tropical Medicine at Heidelberg University Hospital.

**Dr. Stefan Kohler**

Stefan Kohler is a physician and economist. His research focuses on measuring the resources needed to implement new policies and interventions in global communities, and on identifying the long-term social and economic impacts of health and innovations in health systems, as well as the impact of aging and multimorbidity on a range of functional and social outcomes. Stefan has led health economics and implementation science work in Africa (Eswatini, Tanzania and Mozambique) and Europe. Stefan leads a research group on economics and global health at Heidelberg University.

**Dr. Shannon McMahon**

Shannon A. McMahon-Roessle is a global health scientist trained in qualitative and quantitative research methods. Shannon's team examines the interplay of health interventions and local contexts to learn how people make decisions related to careseeking for their health. The team then draws upon these insights to better design, implement and holistically evaluate health interventions. Methodologically, Shannon places an emphasis on advancing qualitative and design techniques. Her team has developed or advanced techniques including epistemic interviewing, researcher debriefings and document reviews. Shannon also enjoys pulling from approaches that are relatively underused in public health research, but have proven insightful in other fields such as journaling, Kano models, bodystorming and artefact-driven dialogue. Shannon teaches courses on qualitative methods, mixed methods research, public health anthropology, and academic writing. Along with disseminating information to fellow scientists via academic publications, she also seeks to engage policymakers and to reach lay audiences via information briefs, blogs, newspaper op-eds and media commentaries

**Christine Neumann**

Christine Neumann is science manager and leader. Her current work focusses on health promotion and prevention. She manages large research and implementation projects on adolescent health in Africa and multimorbidity in Europe. Prior to joining Heidelberg University, she worked for over ten years in various positions in Brussels at the Permanent Representation of Germany and Austria and at CSR Europe. She also worked for EIT Health and Atlantis Healthcare, leading, evaluating, and supporting innovation and entrepreneurial projects, and prevention and patient support programs.

**Prof. Dr. Vera Araújo-Soares**

Vera is a Professor for Prevention of Cardiovascular and Metabolic Diseases at the Center for Preventive Medicine and Digital Health of the Medical Faculty Mannheim of Heidelberg University. She focuses on behavior change in research, health psychology, public health and clinical settings and has specific expertise in translational behavioural health research. More specifically in developing evidence-based interventions focusing on self-care and self-management of chronic conditions (e.g. pain or obesity) as well as on the promotion of healthy behaviours (e.g. healthy diet and physical activity). This research is theoretically grounded, applied, interdisciplinary and multi-methodological and has been funded by major funders such as the UK NIHR and the Medical Research Council. She is also part of the advisory committee of the Royal Netherlands Academy of Arts and Sciences (KNAW) on Planetary Health.

**Prof. Dr. Joacim Rocklöv**

Joacim Rocklöv focuses on research to boost our understanding of the causes and consequences of climate change. He is a data scientist, mathematical modeller and epidemiologist who works in interdisciplinary team. Joacim has led large research programs on One Health, planetary health, and infectious diseases, funded by the many major science funders and foundation. Joacim is the Alexander von Humboldt Professor for AI in climate change and infectious disease research at Heidelberg University and leads a large research group that is active in Africa, Asia and Europe.

**Dr. Marina Treskova**

Marina Treskova is a health economist, epidemiologist, biologist and mathematical modeler who focuses on climate change and population health. In her research, she utilizes different models and methods of intervention science to explore effective and cost-effective ways to prevent the emergence and re-emergence of infectious diseases. She has evaluated major public health interventions in Asia and Europe, such as vaccination and cancer screening. Her domain expertise spans vector-borne and zoonotic diseases, zoonotic pathogen spillover from reservoir host animals to humans and domestic animals, and global infectious disease prevention policies and interventions. She evaluates interventions that go beyond conventional public health and target disease emergence at the source, such as upstream prevention policies, mosquito-bite control, and nature-based solutions.

**Prof. Dr. Michel Wensing**

Michel Wensing is a sociologist and implementation scientist, who focuses on primary healthcare and implementation science in health. His research methods include mixed-methods performance evaluation, qualitative research, randomized controlled trials, and network studies. He has led large research projects on the implementation of clinical guidelines, the organization of ambulatory healthcare, and patients' perspectives on healthcare. Michel is Professor and Deputy Director of the Department of General and Health Services Research at Heidelberg University. He also heads the master of science in health services research and implementation science at Heidelberg University.

**Prof. Dr. Alexander Zipf**

Alexander Zipf is a geographer and computer scientist. He focuses his research on identifying global humanitarian and health needs and opportunities for improved intervention design, targeting and tailoring using spatial methods. He also leads research on digital interventions and crowdsourcing to boost human resilience against extreme heat and environmental pollution and to change behaviors for improved planetary health. Alexander is chair of GIScience (Geoinformatics) and director of the Heidelberg Institute for Geoinformation Technology at Heidelberg University.

VIII. Names and contact details of the organizing team

Organizers and instructors:

- Prof. Dr. Bernhard Eitel
- Dr. Michael Winckler
- Prof. Dr. Dr. Till Bärnighausen
- Prof. Dr. Joacim Rocklöv
- Prof. Dr. Manuela De Allegri
- Prof. Dr. Alexander Zipf
- PD. Dr. Claudia Denking
- Dr. Aditi Bunker
- Dr. Shannon McMahon
- Christine Neumann
- Prof. Dr. Vera Araújo-Soares
- Dr. Ina Danquah
- Dr. Marina Treskova
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