

OMS-DPP workshop 2026: Abstracts

Monday 21st September

Session 1: *Welcome and workshop overview*

Christophe Fraser and the Oxford Martin School Digital Pandemic Preparedness Team will introduce themselves, the work conducted so far, the aims of the workshop, and their plans for future work.

Younjung Kim Postdoctoral researcher, Department of Statistics, Pandemic Sciences Institute and Oxford Martin School, University of Oxford

Privacy-preserving epidemiological inference from digital exposure-history data

Exposure-history data collected from digital contact-tracing applications hold immense potential for rapid, scalable epidemiological inference in future pandemics. In this presentation, I will introduce a Bayesian decentralised framework we developed to infer underlying transmission dynamics from digital exposure-history data while protecting user privacy, using the serial-interval distribution as an example. I will also discuss the key factors that will influence this inference during the future deployment of these applications.

Jamie Webb Postdoctoral researcher in Ethics and Infectious Diseases, Ethox and Oxford Martin School, University of Oxford

A platform approach to ethics for digital pandemic preparedness

This work puts forward a novel proposal: a platform approach to digital pandemic ethics. This would be analogous to the Oxford-AstraZeneca vaccine development (UKRI 2026), which brought a covid-19 vaccine to market in record time, based on over a decade of prior viral vector platform research. Whilst the ethics of the next pandemic cannot be predicted, we can prepare the capacity to reason ethically under pandemic conditions. A platform ethics approach to digital pandemic preparedness would build structures for ethical reflection, public deliberation, and institutional decision-making that can support a rapid ethics response from day one of the next pandemic.

Michael Parker Director of Ethox Centre and Professor of Bioethics, Nuffield Department of Population Health, and Oxford Martin School, University of Oxford

Situating the ethics of digital pandemic preparedness in the context of ethics of pandemic preparedness, response and prevention more broadly

What are the most important ethical considerations presented by the development and deployment of digital pandemic preparedness and how are these to be understood in the context of pandemic ethics more broadly. In this presentation I will briefly map out some additional specifically digital ethical questions to those addressed by Jamie in his talk and will also introduce the range of topics that are being researched by the ethics team at the Ethox Centre and the Pandemic Sciences Institute. Whilst doing so, the presentation will reflect on the connectedness of questions of digital pandemic ethics and those arising elsewhere.

Thomas Rawson *Senior researcher in health analytics and modelling, Leverhulme centre for demographic science, and Oxford Martin School, University of Oxford*

Infectious disease and demography

The populations of Europe are rapidly skewing older in their age composition. In England specifically the old-age dependency ratio is forecast to increase from 31% in 2023 to 47% by 2074. The health implications of this demographic shift are immense, and it is not yet understood how it will change aspects of pandemic preparedness. In this talk, Thomas Rawson summarises research into the anticipated impacts on future pandemics.

Melinda Mills *Director, Leverhulme Centre for Demographic Science, OxPop, University of Oxford*

If you build it, will they come? Lessons from public participation from digital and health projects

Digital pandemic preparedness often starts with the technology: can a platform, credential, data pipeline or app be built, scaled and made interoperable? But technical readiness does not guarantee public participation. This talk focuses on what makes people join, comply, share data and continue to engage. Drawing on work during COVID-19, the UK's Our Future Health cohort (N=2.5 Million in 18 months) and our 2026 digital National Conversation project (N=85K in 3 months), we outline common factors. Key aspects include: trust, transparency, perceived purpose and benefit, ease of participation and equity. The talk also touches upon representativity, who does not participate and the consequences. I conclude by briefly introducing our recent related €8 Million EU Horizon Project PANDAI: Pandemics AI Consortium, to predict, prepare, detect and respond to pandemics with AI.

Luca Ferretti *Research Fellow at the Pandemic Sciences Institute and Oxford Martin School, University of Oxford*

Opportunities for epidemiological insights from app data

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Session 2: UKHSA-led session

Leanne Cummings *Director of Products and Services for Government Digital Service*

Building Digital Resilience: Government Capabilities and Preparedness for Future Crisis

How can government build and maintain digital capabilities that are ready to scale in times of crisis? How can trusted digital platforms, communications tools and shared infrastructure help strengthen national resilience? This talk will share perspectives from the Government Digital Service on the lessons learned from recent emergencies and the role of digital public infrastructure in supporting future preparedness.

Steven Riley *Director General and Chief Data Officer, UK Health Security Agency (UKHSA)*

Preparing for the Next Pandemic: Prioritising Digital Technology Interventions

This session will provide an overview of the DHSC Pandemic Preparedness Strategy, and UK Health Security Agency's Centre of Pandemic Preparedness' Mission. Delegates will then participate in a pandemic scenario-based exercise, working in thematic breakout groups to assess key challenges and opportunities for digital technology interventions.

Session 3: UKHSA-led break-out groups

Breakout-groups to explore possible digital public health responses to a simulated outbreak. Bringing together our collective multi-disciplinary expertise, we will discuss in detail the potential opportunities and challenges for a variety of tools at three pandemic phases: emergence, containment and mitigation.

Tuesday 22nd September

Session 4: *Global perspectives on potential and challenges for digital tools*

Randy Marsden *former project lead of Exposure Notifications at Apple*

The Triangle of Trust: Lessons from GAEN for the Next Pandemic

On 20 May 2020, Apple and Google jointly released the Google/Apple Exposure Notification (GAEN) system, enabling public health authorities to use Bluetooth-enabled smartphones to notify people of possible exposure to COVID-19. Designed to preserve privacy while operating across iOS and Android, GAEN was adopted by more than 70 jurisdictions and voluntarily enabled by hundreds of millions of users.

Drawing on first-hand experience leading the initiative at Apple, this talk will trace GAEN's evolution from an urgent idea to a global public-health platform. Central to that story is the "triangle of trust" required among Apple and Google, public health authorities, and individual users. Each depended on—and bore responsibilities to—the other two. The talk will examine how that trust was established, where it was tested, and how challenges involving adoption, measurement, and integration with existing health systems were addressed.

Finally, the talk will consider what GAEN teaches us about digital pandemic preparedness: what technical infrastructure, governance frameworks, and public-private relationships should be established before the next crisis, and what role major technology platforms should—and should not—play.

Jason Bay, *National University of Singapore; TraceTogether (Singapore)*

TraceTogether: Reflections on the future of Digital Contact Tracing Apps

TraceTogether was the first national-scale contact-tracing app, and saw ubiquitous usage in Singapore during the COVID pandemic. This talk gives an insider's history of the programme, how its design and implementation choices -- its centralised, proprietary design and use of physical tokens to complement mobile apps -- were informed and shaped by its social milieu, and reflections on what lessons we can take as we imagine the future of digital contact tracing apps.

Maria van Kerkhove Director, Department of Epidemic and Pandemic Management, WHO Health Emergencies Programme

Learnings and challenges from COVID-19, mpox, Ebola and more: how can digital public health tools help us to prevent and respond quicker for future events

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Session 5: *Ethical, efficient and responsible decision-making*

Devi Sridhar (online), Global Public Health, University of Edinburgh, UK

A decision-making tree for policy responses to a pathogen with pandemic potential

Policy responses should be based on the known characteristics of an emerging pathogen with pandemic potential and the tools available to tackle it, rather than on specific known pathogens.

In response to the COVID-19 pandemic, many governments have launched after action reviews and pandemic preparedness exercises to document lessons learned, as well as the steps needed to prepare for the next pathogen with pandemic potential. Many nations are taking steps to strengthen their domestic architecture for governance of pandemics and other large-scale outbreaks.

In the USA, the Global Health Security Act passed by Congress has led to the creation of a pandemic office in the White House, and on 1 August 2023 the US Department of State launched a new Bureau for Global Health Security and Diplomacy (which co-author Rebecca Katz has supported as a senior advisor). In Scotland, the government has appointed a Standing Committee on Pandemics (which D.S. is a member of) to monitor ongoing threats and to provide advice to government agencies on how best to respond. Australia, Botswana, Democratic Republic of the Congo, Egypt, Gabon, Kenya, Mauritania, Namibia, the Philippines, Sierra Leone, South Sudan, Sudan, and Zimbabwe are all reorganizing to establish national public health institutes in order to better coordinate disease surveillance and response. These efforts are in parallel to a plethora of research studies being conducted by academics around the world, including new studies on pandemic influenza, intensified efforts to identify zoonotic spillover risks, and studies designed to better understand the linkages between climate change and pandemic risks.

Stephen John *Philosophy of Public Health, University of Cambridge, UK*

Pandemic policymaking, multiple perspectives and unexpected consequences: lessons from school closures

One key, but often forgotten, aspect of Covid policies was school closures. In this talk, I note two features of school closures - that they were, to a large extent, unanticipated, and that decisions about reopening were highly disorganised. I suggest that at least some of these problems could have been avoided by a more pluralist approach to policymaking. In the final part, I discuss some implications for thinking about issues around digital governance.

Session 6: Future requirements and opportunities, motivated by past experiences

Wolfgang Emmerich Zuhlke (*NHS COVID-19 app*), *Computer Science, University College London*

Providing a Digital Contact Tracing service in the first week of a Pandemic

Based on our experience with the NHS Covid-19 contact tracing app that we developed for England and Wales, I outline a vision for a digital contact tracing service that international public health organisations can roll out a national digital contact tracing service within the first week of a pandemic being declared. I describe the underlying exposure measurement and notification primitives that need to be provided by mobile phone operating systems, most notably Android and iOS. These primitives can then be relied upon in a kernel contact tracing service. This contact tracing service should be in continuous use in one or several test beds to ensure that it takes advantage of technological advances and is ready for rapid scale out. Then national public health agencies will be able to obtain it under a suitable open-source software license. They can then deploy this kernel contact tracing service in their preferred cloud hosting environments and integrate it with the digital services of their national testing infrastructure and extend and evolve continuously to adapt to their national needs.

Justus Benzler *Epidemiologist, Robert Koch Institute, Germany (Corona-Warn-App)*

Future Requirements and Opportunities for Universal and Frequent Testing - motivated by the German experience with the (imperfect) integration of lab- and community-based testing into an exposure notification app infrastructure

In a future pandemic, frequent population-wide testing may again become an important component of pandemic control. Suitable diagnostic methods for the detection of the pandemic pathogen can

be expected to exist already or to become available rapidly, ranging from sophisticated laboratory diagnostics to simple rapid tests for decentralized use and self-testing. Pandemic preparedness needs to address not only the availability of tests, but also the infrastructure capable of integrating testing at population scale.

The German COVID-19 experience illustrates both the potential and the limitations of rapidly scaling testing infrastructure. Three increasingly decentralized “testing worlds” emerged: established laboratory testing, tens of thousands of community testing sites, and ultimately self-testing in millions of homes, schools, workplaces, and other settings. While testing scaled enormously, its digital integration became progressively weaker as testing moved away from established institutions.

Germany’s Corona-Warn-App demonstrated how professionally performed tests could become trusted digital events: Tests could be registered before results became available, verified results returned digitally, and positive results were used — with prior user consent — to trigger exposure notification. Self-tests, however, remained largely invisible to this infrastructure because their performance and results could not be reliably verified.

Future pandemic preparedness should treat laboratory, community, and self-testing as different access points to a common digital testing infrastructure. A common infrastructure could allow a single trusted test event to support (1) informing the tested person, (2) exposure notification, (3) epidemiological surveillance, (4) test logistics, (5) reimbursement of testing sites, and (6) optional proof to third parties — through separate, purpose-specific and privacy-preserving data flows.

Vittoria Colizza Founding Director of the Sorbonne Université Modeling Outbreaks Center; Director of Research at INSERM and Sorbonne Université, Paris, France

From mobility traces to epidemic-relevant behaviour: lessons for pandemic preparedness

Mobile devices have become powerful sensors of human activity at population scale. Mobility traces from these devices have long been used to understand how epidemics spread across space. COVID-19 opened a new dimension: these digital traces became a real-time window into how populations reorganize their interactions and adapt their behaviour as an epidemic unfolds, while also revealing the limits of what movement alone can tell us. I will discuss how mobility traces can be used to reconstruct dynamic social mixing, reveal behavioural adaptation and its limits, and ultimately help move from observing behaviour during a crisis to anticipating it. These lessons point towards digital infrastructures that can make behavioural dynamics an integral part of future pandemic preparedness.

*Samir Bhatt Machine Learning and Public Health, University of Copenhagen, Denmark and
Statistics and Public Health, Imperial College London, UK*

AI in Infectious Disease: An overview

In this talk, I will introduce the core principles underlying the major applications of AI in infectious disease and biology. I will survey the field's principal areas, highlighting the methods that enabled recent advances, their practical applications and limitations, and examples from my own work. I will conclude by discussing the rise of agentic AI and its application within the Global Pathogen Analysis Platform.

Session 7: Global and pathogenic variation in requirements

Njenga Kariuki (online), Global Health, Washington State University, USA

Digital pandemic preparedness in LMICs: Perspectives from the Global South

Authors: Eric Osoro, MD, PhD, Isaac Ngere, MD, PhD, M. Kariuki Njenga, DVM, PhD
Kenya Medical Research Institute (KEMRI), Nairobi, Kenya; Washington State University Global Health–Kenya, Nairobi, Kenya; and Paul G. Allen School for Global Health, Washington State University, Pullman, Washington, USA

Digital innovation in low- and middle-income countries (LMICs) has advanced through necessity, drawing on mobile-phone access, community networks, open-source platforms and experience gained from recurrent epidemics to create surveillance approaches that extend beyond health facilities. These investments now generate substantial volumes of human, animal, laboratory and environmental data. Their value, however, remains constrained by disease-specific platforms, incompatible identifiers, duplicated reporting and financing arrangements that favor short-term deployment over national ownership, leaving many countries data-rich but still struggling to convert signals into timely decisions.

Kenya illustrates both the progress achieved and the integration still required. Establishment of the Zoonotic Disease Unit in 2012 created a permanent mechanism for coordinating surveillance at the human-animal interface, while introduction of the mobile phone-based *Kenya Animal Biosurveillance System* in 2017 strengthened near-real-time reporting of diseases in domestic animals and wildlife. Within the human-health sector, *mDharura* extended event-based surveillance into communities and health facilities; together, these platforms operate alongside DHIS2, KenyaEMR and the electronic

Community Health Information System, providing a foundation for Kenya's emerging national Health Information Exchange.

This experience demonstrates that the next phase of digital pandemic preparedness must prioritize integration, ensuring that multisectoral signals enter defined pathways for verification, risk classification, escalation and response. Locally governed AI can support this transition by synthesizing evidence and applying approved guidance. Public health officers must, however, retain authority and accountability for final decisions. Digital preparedness should therefore be judged by whether countries detect threats earlier, verify them faster and act while containment remains possible. Achieving these outcomes will depend on sustained country ownership, connected systems and investment in the institutions, workforce and governance arrangements that convert information into action.

Katherine Littler, Global Health ethics and governance, WHO Geneva, Switzerland

Building ethical digital public health tools for public health emergencies: addressing governance challenges

Digital technologies are rapidly transforming global health research by expanding the scale, variety, and immediacy of data collection. In addition to traditional clinical, genomic, and public health data, digital ecosystems now generate vast quantities of real-time information via other means including smartphones, social media platforms, internet activity, consumer technologies, and artificial intelligence systems. While these developments offer unprecedented opportunities for scientific discovery, disease surveillance, and public health innovation in public health emergencies, they also expose significant ethical and governance challenges.

This talk will examine the extent to which existing ethical and regulatory frameworks address these challenges and discuss some of the types of oversight mechanisms being developed to promote responsible and equitable digital innovation, paying particular attention to data sovereignty, pathogen and data sharing, and inequities between high-income countries and low- and middle-income countries.

Wednesday 23rd September

Session 8: *The potential of data, and the challenges of collecting and sharing it*

Simon Cauchemez *Institut Pasteur, France*

Characterizing transmission from digital household studies

Tbc

Navjot Kalra *Director of CEPI Digital*

Intelligence for Value: People, Process and Technology for Crisis-Ready Intelligence Sharing

COVID-19 suggested that the binding constraint on sharing intelligence in an emergency is rarely the absence of data or of tools. Data existed, and platforms were built at remarkable speed. What repeatedly slowed the movement of insight was human and procedural: unclear decision rights, data-sharing agreements negotiated under time pressure, definitions that diverged between agencies, analysts positioned at a distance from the decisions their work informed, and institutional trust that had to be established rather than drawn upon. These constraints are socio-technical, and better platforms alone do not resolve them.

This talk introduces Intelligence for Value (IFV), a socio-technical framework developed through doctoral research on embedding business intelligence into a publicly funded health system and now applied to epidemic and pandemic preparedness. IFV treats intelligence as the joint product of leadership and sponsorship, governance and decision rights, workforce capability and culture, and technical infrastructure. Its diagnostic value lies in making visible which of these domains is genuinely the limiting factor for a given organisation or consortium, rather than defaulting to the assumption that the gap is technological.

Applied to crisis intelligence sharing, the framework resolves three practical questions. People: who holds authority to interpret and act, how analytic literacy is distributed beyond specialist teams, and how trust across epidemiological, clinical, regulatory and technology communities is built before it is needed. On process: pre-negotiated sharing agreements and standing governance forums that can be escalated rather than convened from scratch, agreed definitions and metric ownership across partners, and feedback loops connecting insight to decision and back to

evaluation. On technology: interoperable core data structures, privacy-preserving analytics, and interfaces designed with decision-makers rather than delivered to them.

The preparedness argument follows. Surge capability in intelligence cannot be improvised, because the components that fail under pressure are relational and procedural and take years to establish. An organization's routine intelligence function is therefore its preparedness function. If countermeasure timelines are to compress toward the 100 Days Mission, the sharing capability supporting them must already be in place. The talk closes by offering IFV as one input to the community-led blueprint, a maturity lens partners can apply to themselves, and puts a question to the panel: are trade-offs between utility, privacy and speed better settled in advance by design, or judged in the moment?

James Wilson philosophy, ethics and public health policy, University College London, UK

Public health ethics, policy, and digital public health tools: how much, and what kinds of data should be collected? Exploring the trade-offs between maximising population health, ensuring equity, respecting individual privacy, and maintaining trust.

This talk draws on the author's experience of providing ethics advice on both iterations of the NHS Covid-19 App, including contributing to a set of ethical principles for such apps. I argue that public trust is a requirement for effectiveness of digital public health tools, where they require individuals to take active steps such as downloading (and using an app). As a result, the ethical problem posed by designers of digital public health tools is complex. Trustworthiness is necessary, but not sufficient for maintaining trust: the extent to which a tool is compatible with publics' reasonable expectations also matters. I propose an approach to incorporating reasonable expectations into public health ethics analyses of digital tools, which draws both on my own research and the National Data Guardian's framework for assessing public benefit.

Session 9: *Behavioural and social considerations, and ways to measure impacts*

Ben Cowling (online), *Epidemiology and Public Health, Hong Kong University, Hong Kong*

Behavioral responses to public health measures, pandemic fatigue, and risk compensation

In a series of behavioral surveys, we examined how the population of Hong Kong responded to public-health measures across phases of the COVID-19 pandemic. We identified rapid adoption of masking, physical distancing and hygiene that helped suppress transmission. Subsequent waves, however, were marked by pandemic fatigue, with declining risk perception and adherence despite ongoing threats. After citywide vaccine rollout in early 2021 there was evidence of risk compensation with immediate and sustained reductions in protective behaviours, especially social distancing, that varied by epidemic phase. These findings highlight the need to anticipate behavioural erosion when combining pharmaceutical and non-pharmaceutical interventions in future pandemics.

Helen Ward *Public Health, Imperial College London, UK*

The use of digital public health tools and remote testing in pandemic preparedness: lessons from the REACT study

The REal-time Assessment of Community Transmission (REACT) Study took was launched in May 2020 to provide timely estimates of the community prevalence and distribution of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection (REACT-1, 19 rounds of data collection from May 2020 to March 2022) and SARS-CoV-2 IgG antibodies (REACT-2, 6 rounds from June 2020 to May 2021). Random cross-sectional samples of individuals on the NHS patient list were invited to participate by letter and directed to an online portal to register and consent. Participants in REACT-1 were sent a kit for a self-obtained nose and throat swab which was then transported to a central laboratory for testing. Participants in REACT-2 were sent a self-test lateral flow immunoassay (LFIA) kit and asked to report the result along with a photograph of the device for checking. Participants in both studies were directed to a website to complete detailed surveys covering socio-demographics, households, symptoms and relevant behaviours. Over the two years, 4.3 million individuals took part in REACT.

In this talk I will reflect on key lessons, including

1. Advantages of bio-behavioural surveillance at scale across the population
2. The acceptability and utility of self- sampling and self-testing
3. Key role of public involvement in design and development
4. Role of antibody self-testing in rapidly assessing the impact of vaccination
5. Potential of pandemic-ready cohorts for rapid surveillance of new threats

6. Potential for use of other digital tools in cohorts (remote monitoring, tracking, link to interventions/ contact tracing)
7. Challenges of participation bias for research inclusion
8. The importance of including follow-up to quantify medium- and long-term impacts of a pandemic on health and well-being

The REACT Cohort has been established to include 3.2 million participants who consented to routine health data linkage and/or consent to recontact for research, a major resource of future pandemic research and response.

Ciro Cattuto ISI Foundation, Italy

Measuring human social networks with wearable devices: lessons from SocioPatterns and the road ahead

Digital technologies have transformed our ability to measure human social behavior, opening new avenues for computational social science, infectious-disease epidemiology, and public health. This talk will focus on the SocioPatterns experience in using wearable sensors to measure close-range human proximity as an important dimension of social behavior. We will discuss the evolution and state of the art of measurement technology, and lessons learned from deployments in diverse real-world settings, including schools, hospitals, households, and low-resource communities. We will illustrate the complex features of time-resolved proximity networks and how they can be modeled, discuss their applications to infectious-disease epidemiology, and consider future directions for wearable sensing and their potential role in pandemic preparedness.

Session 10: *What next?*

Please do stay to the end and join us for this final session where we will discuss in practical detail what should happen next, both within the Oxford Martin School programme and beyond. We will identify key gaps and priorities and refine plans for writing a community-led Blueprint for Digital Pandemic Preparedness. Your feedback and perspectives will be extremely valuable for shaping the future of this area. Should there be another Digital Pandemic Preparedness workshop in 2027?