Biosecurity Inquiry - Response to The Joint Committee call for written evidence from Security Lancaster (SL)\textsuperscript{1}, Lancaster University.

Biosecurity risk is multi-dimensional: the combination of technical, social and environmental elements aggregate, influence and interact with various data rich and data poor systems. Lancaster University’s response to the Biosecurity Inquiry call for evidence therefore reflects an interdisciplinary, data centric approach, from research conducted at Lancaster University relevant to the call. Our focus is on questions concerning the main drivers of biosecurity risks and recommendations to support future preparedness.

1. Main drivers of biosecurity risks to human health in the UK, including from pandemics and emerging infectious diseases

Lancaster researchers have identified three main drivers of biosecurity risk to human health, each underpinned by the challenge (despite the ‘fusion model’) of understanding and promoting human health as part of an integrated social, cultural and environmental ecosystem. These drivers concern (a) mobilities, (b) social media and communications, and (c) measuring and responding to disease risk.

**Mobility vectors** are one of the main drivers of biosecurity risks to human health. Work in Lancaster University’s Centre for Mobilities Research (CeMoRe), highlights the importance of complex relational social patterns of movement. This means people move for work, family, friends, in alignment with various different logics and demands on their presence. These movement patterns are not just driven by individuals’ choices, they are also infrastructurally and culturally embedded. Where, when, who and how people work, shop, meet and interact have become enmeshed with mobility systems,

\textsuperscript{1} Security Lancaster researches socio-technical security, addressing sociological, behavioral and legal considerations along with addressing technical threats across the software, network, and systems. Unlike, contemporary approaches that address security for specific technologies and applications, SL research advocates a broader approach where the attributes of integrity, confidentiality, privacy and availability are addressed at a technology/application-agnostic level of data flows. SL’s abstract “data-centric” approach to security furthermore enables better utilization of advanced Machine Learning techniques to correlate threats across social and technical dimensions to result in an integrated threat analysis.
which have a re-enforcing effect that often lock people into certain relational patterns of movement. Relational also means that mobilities, mobility capital and mobility burdens, are not equally distributed, so poverty, ethnicity, disabilities, health and gender can lock people deeper into disadvantageous mobility patterns. Biosecurity risks, such as the COVID virus, travel along these vectors in ways that impact unequally on populations, making it more difficult for some to adhere to public health protection guidance, thereby increasing risks. Future planning must take account of ‘work arounds’ mobility restrictions, either by choice or necessity. Improved understanding of mobility drivers, relational mobility patterns and realistic alternatives are crucial to future risk reduction and management.

CeMoRe’s research into risk communication also reveals that an assumption of a ‘deficit model’ in the public’s perception of risk is misguided. **Social and cultural vectors of information propagation and sense-making**, including on social media could inform more dialogic models of risk communication. In crisis informatics, such dialogic approaches have proven to be highly effective in increasing the resilience of communities and enabled ‘netcentric’ or networked disaster risk governance that involves communities.

A key area for attention in terms of public communications is vaccine hesitancy, currently listed as one of the WHO’s ten global health threats. Contemporary vaccine hesitancy is often linked to the spread of anti-vaccination views and misinformation online, particularly on social media, and responses to COVID vaccination efforts will inevitably be influenced by anti-vax communications. Lancaster’s **ESRC funded Centre for Corpus Approaches to Social Science** project, Quo VaDis, is investigating vaccine hesitancy that is, in large part, the result of views that are reflected and constructed in public discourse. Cutting-edge techniques for large-scale computer-aided linguistic analysis are being deployed to study billions of words of contemporary and historical data from social media platforms, the UK press, and Parliament. The project notes that while vaccine hesitancy has a long history, the rapid, self-organising manner in which anti-vaccination views are shared and amplified online across geographical boundaries, poses unprecedented challenges, occurring in a complex interaction with media reports, policy discussions, and public health campaigns. Findings will inform initiatives aimed at counteracting the claims and tactics that are driving down vaccination rates, which would be highly relevant to pandemic preparedness.

**Measuring and responding to disease risk.** An important feature of disease outbreaks is that due to evolution of the pathogen, and changes in human habits and mobility, no two outbreaks are ever guaranteed to behave the same. This means that policy founded on understanding of previous outbreaks is not guaranteed to be optimal for tomorrow’s epidemic. This was certainly true of COVID-19, where early assumptions of how the disease would spread based on knowledge of H1N1 pandemic influenza (2009) provided little help on the rate of spread and severity of COVID-19 cases. The capacity to build rapidly quantitative models of disease spread to gain
epidemiological intelligence early in an outbreak is key. The COVID-19 outbreak has highlighted a wide capability gap in the statistical tools which allow accurate calibration of such models at the local authority scale, commensurate with the most basic unit of disease control. Lancaster researchers are working to improve this situation, building on experience of modelling livestock disease as a biosecurity risk together with an understanding of human behaviour through epidemiological studies in Europe, North America, Africa, and Asia. By developing these tools, we will be able to respond more rapidly to future outbreaks, providing key information to help health professionals in local and national hospitals and the community to better recognise the presence of symptoms in their localities, aiding early detection to reduce further disease spread. Moreover, improved data analytics specific to geographic areas in the UK (for example, risk for the establishment of the tiger mosquito in the South of England), including remote sensing surveillance of ecosystems, and linking institutional and community (through social media), veterinary and health data, will enable us to signal early warnings of new clusters of disease in a more general sense, from food-borne bacterial zoonoses such as salmonellosis and campylobacteriosis to incursions of species-specific viral diseases such as influenza and COVID-19.

2. **Recommendations to support the Government in domestic preparedness against biosecurity risks**

Digital track and trace promises some traction on complex mobility patterns. However, in a climate of public distrust caused by the increasing datafication of everyday life, and the commodification and exploitation of data for corporate and political purposes, people have many negative experiences of how their data is used. Digital literacy is growing, but there is little ambition on the side of technology developers (including NHSX) to support transparency. Instead, there are appeals to the public to trust the agencies to manage data ethically. People have lost this trust, and a way to address this is to increase design ambitions for truly and accountably ethical technologies.

Data in the digital world is immutable. Unfortunately, we often tend to focus more on data in motion and less on the long-term storage of data. As multiple social media and governmental service breaches have amply highlighted, correlating data to profile for either “use or abuse” scenarios is often just a matter of developments in data analytics and technologies. A seemingly invulnerable RSA crypto-protected database becomes an open door as quantum computing technologies become viable. We fundamentally lack technology-invariant solutions and the imperative need to think of such issues is urgent if risk management in biosecurity (and other security applications) is to be successful.
This could be a significant game changing opportunity for both biosecurity and the
closer cyber security field. Top-down approaches to track and trace the movement of
individuals, ‘wastes’ the collective intelligence on why these movements are taking
place, where people will go next, and more. In a properly anonymized way, with
transparent explanation to those participating, such collective intelligence could be
leveraged to train machine learning and develop better tracking tools that people are
willing to trust, because they can understand how their data is being collected, stored
and used. This requires a trusted long-term storage facility, which is separate from
institutional, economic and government interests. For this reason, Security Lancaster is
proposing to develop a neutral, trusted community-accessible threats data repository
TIDE-H (Threat Intelligence Data Exchange Hub).

3. The extent to which the Government’s planning for pandemics in the 2015
Strategic Defence & Security Review, the subsequent National Security Capability
Review and the 2018 Biosecurity Strategy helped in guiding that preparedness

Within the 2018 Biosecurity Strategy, the four pillars of the cross- Government
biosecurity response (understanding current and future biological risks, preventing
biological risks from emerging, detection, and reliable characterisation, reporting and
response) do not, in our view, take sufficient account of the role of social and cultural
factors. Lancaster University’s research indicates that these need far greater
consideration within each pillar; a key question that requires addressing now, in
advance of future risks emerging, is how different communities understand and
manifest biological risks – and how these understandings interact with specific
identities (age, sexualities, ethnicities, (dis)abilities, gender identities) and social
behaviours. These characteristics, social and cultural factors have all shown themselves
to be relevant in detecting and responding to COVID-19.

Further exploration of gaps and potential opportunities in the use of big data (and open
data) in surveillance systems offer an important way forward. If biosecurity is accepted
as a data centric security challenge, many lessons can be learned from other fields. At
minimum, informed citizen consent is required, which must be underpinned by ethical
assessments, transparency and respect for fundamental rights. This is more readily
attainable by focusing on localised, dialogic communications and data, which can be
coordinated nationally where needed2.

In our view, local initiatives and interventions are not sufficiently supported by the
current strategies to address biosecurity risks. As the COVID pandemic has progressed,

2 The Home Office Forensic and Biometric Ethics group is a source for collaboration and advice in this
field.
partnerships between Lancaster, Manchester and Liverpool University researchers and regional Directors of Public Health in the North West Modelling Collaborative have highlighted the utility of regional data modelling for local interventions to manage and prevent further spread of the pandemic. This way of working is critical, yet there appears to be a gap in methods capability sufficient for future preparedness. Improved methods for obtaining local scale data require stronger strategic and policy support. This could then lead to funding for model development and software tools that would allow local health surveillance partnerships to put together a model more effectively at the outset of an outbreak.

**Professor Corinne May-Chahal**, Co-Director, Security Lancaster  
**Dame Sue Black**, Professor and Pro-Vice Chancellor for Engagement  
**Professor Monika Buscher**, Centre for Mobilities Research  
**Dr. Christopher Jewell**, Senior Lecturer in Epidemiology, Lancaster Medical School  
**Dr. Sherry Kothari**, Director, Health Innovation Campus  
**Dr. Luigi Sedda**, Lecturer in Spatial Epidemiology, Lancaster Medical School  
**Professor Elena Semino**, Director, Centre for Corpus Approaches to Social Science  
**Professor Neeraj Suri**, Co-Director, Security Lancaster