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Integrated Review: Call for Evidence

For details on the call for evidence, see
https://www.gov.uk/government/publications/integrated-review-call-for-evidence

Submission by Nick Bostrom

1.1 This response particularly focuses on the following inquiry question: (3) "What are the key steps the UK should take to maximise its resilience to natural hazards and malicious threats? How can we build a whole of society approach to tackle these challenges?"

1.2 The Integrated Review and the Covid-19 context provide a unique opportunity to position the UK as a world leader in risk preparedness and responsible innovation, and to give extreme risks the prominence they deserve. The UK must seize the opportunity to learn lessons from Covid-19, by ensuring that we are better prepared for other irregular events, and by pioneering better global resilience to future extreme risks. This submission is focused on biological threats.

1.3 In response to the call for evidence, the following recommendations are made:
1.3.1 Pioneer clinical metagenomics in the NHS, allowing rapid detection and characterisation of novel pathogens;
1.3.2 Transform the UK's approach to pandemic preparedness, including through the development of a robust and scalable pandemic plan that can be adapted to a wide range of biological threat scenarios;
1.3.3 Lead global efforts to reduce risks from dual-use research;
1.3.4 Establish a Biosecurity Leadership Council and appoint a liaison officer to improve coordination between the biosciences and security communities;
1.3.5 Push for domestic and international regulation in DNA synthesis machines;
1.3.6 Prevent and counter the threat of biological weapons from both state and non-state actors, treating them as a security challenge comparable to nuclear weapons in its severity (and long term *more* difficult in its proliferation potential).

1.4 These priorities can be enacted through existing UK establishments and upcoming structures such as the UK ARPA, but delivering on their full potential may be best done through the formation of a new *National Institute for Biological Security* with these priorities as their main focus.

2.1 Pioneer clinical metagenomics in the NHS, allowing rapid detection and characterisation of novel pathogens

2.1.1 Metagenomic sequencing can be leveraged as a 'pathogen blind' diagnostic, allowing for earlier detection and characterisation of novel pathogens. If widely available for use in clinical settings, this technology could enable identification in the first few outbreak cases, greatly improving the chance of containment. It could also offer 'everyday' diagnostic benefit (e.g. pyrexia of unknown origin). While the rollout of this technology has been suggested for US hospitals, it has yet to be adopted. The NHS provides an excellent launchpad to pioneer and develop this capability, and the UK possesses world-leading expertise.

2.1.2 Aim to create an infrastructure that can protect the UK population from any novel pathogen. Horizon technologies could help close this vulnerability, and government institutions, such as UK ARPA, could help to bring them to fruition.

2.1.3 It is recommended that the UK should:

- Deploy metagenomic diagnostics nationwide in the next 5 years;
- Prioritise funding for horizon technologies to provide robust protection against a wide range of pathogens;

2.2 Transform the UK's approach to pandemic preparedness, including through the development of a robust and scalable pandemic plan that can be adapted to a wide-range of biological threat scenarios

2.2.1 Pandemic plans that are specific to a disease (such as influenza) are too narrow in scope to be readily adaptable to the full range of biological threats we may face in future years. Planning is needed for high-consequence events, including a blueprint for upscaling manufacturing capabilities and countermeasures for domestic production.

2.2.2 Take a systems approach. Pandemic preparedness requires many interlocking interventions—institutional and procedural improvements, seamless coordination between actors, investments in continuous monitoring and public health infrastructure, along with technical advances.

2.2.3 It is recommended that the UK should:

- Develop a robust and adaptable pandemic plan which covers a wide range of biological risk scenarios, including plans for rapid situational assessment and response triggers;
- Map out the UKs current infrastructure, particularly considering how existing facilities and institutions could be quickly adapted for a rapid health system response. Countermeasure production and domestic manufacturing of essentials should also be considered.
- Adopt a systems engineering approach to better integrate processes for continual biosecurity.

2.3 Lead global efforts to reduce risks from dual-use research

2.3.1 Advances in biotechnology are lowering the barriers to engineering dangerous pathogens. 'Dual-use research' involves techniques/insights that could be misused by malicious actors or that pose serious risks from laboratory accidents. Governance around such research remains haphazard, creating a significant and growing vulnerability. This is an urgent problem that requires a coordinated global effort, which the UK is well-placed to lead.

2.3.2 It is recommended that the UK should:

- Enhance transparency and accountability around laboratory accidents, establishing a national register of accidents and near-misses (cf. what is done in the airline industry), with particular focus on BSL-3 and BSL-4 labs (e.g. following the model of the Galveston National Laboratory in the US, which keeps a public record of biocontainment accidents in their facilities).
- Facilitate coordination (both nationally and globally) between funders and journals on dual-use research. One aim would be a 'no-undercut' principle where if a funder declines to support research due to security concerns (or a journal declines to publish it), other funders and journals in the group agree to abide by this decision and do not offer support themselves. This avoids people being able to 'shop around' for funding or publication.

2.4 Establish a Biosecurity Leadership Council and appoint a liaison officer to improve coordination between the biosciences and security communities.

2.4.1 Achieving biological security will require a multi-sectoral effort. There is a need to strengthen links between government, academia, civil society, and private industry. There is also a need to strengthen the biosecurity community outside government, and to develop individuals with the right skills to work inside the government.

2.4.2 It is recommended that the UK should:

- Appoint a liaison officer to provide advice and build relationships across Government, law enforcement, intelligence agencies, academic researchers and private sector researchers. This would improve coordination between the biosciences and security communities. Edward You holds such a role in the United States;
- Consider setting up a National Institute for Biological Security, to serve as an interface between sectors, including government, academia, and industry;
- Form a Biosecurity Leadership Council, modelled after the UK Synthetic Biology Leadership Council, which could serve as a central convening point for all UK biosecurity stakeholders;
- Cultivate and grow the biosecurity community through fellowship programs and talent recruitment pipelines, for example modelling the US AAAS and Emerging Leaders in Biosecurity Initiative (ELBI) fellowships.

2.5 Push for domestic and international regulation for DNA synthesis machines.

2.5.1 Gene synthesis companies should be required to adhere to biosecurity guidelines, such as those released by the International Gene Synthesis Consortium, for screening DNA orders for dangerous pathogens. Imported DNA orders should adhere to the same biosecurity screening guidelines. The UK should be a leader in the international community on improving these initiatives and making screening more universal and more robust.

2.5.2 The UK should discreetly push for domestic and international regulation in this area, and for moving towards a system where synthesis is centralised and provided as a service by a few licensed providers, and devices are not sold to anybody who may want to buy one.

2.6 Prevent and counter the threat of biological weapons from both state and non-state actors, treating them as a comparable security challenge to nuclear weapons;

2.6.1 COVID-19 demonstrates UK vulnerability to biological threats. Historically, almost all of these have been naturally arising, but risk of deliberate and accidental misuse of biotechnology are increasing. States have pursued massive bioweapons programs, despite being Biological Weapons Convention signatories (i.e. the tens of thousands strong Soviet Biopreparat program), and terrorist groups have sought to use bioweapons (e.g. Aum Shinrikyo, Al-Qaeda).

2.6.2 Advances in technological capabilities and the ‘democratisation’ of techniques are increasing the pool of actors capable of creating dangerous pathogens.

2.6.3 It is recommended that the UK should:

- Bring bioweapons counter-proliferation efforts into line with nuclear counter-proliferation for diplomatic and security activity;
- Invest in ‘next generation’ microbial forensics (e.g. machine learning methods for genetic engineering attribution);
- Develop social verification/OSINT/other verification technologies (cf. structured transparency);
- Biological Weapons Convention-specific suggestions:
    - Champion a revisit to bioweapons issues and verification; suggest substantive examination & changes for the upcoming 2021 Review conference;
    - Fund Biological Weapons Convention out-of-session exercises and promote contract hires to the Biological Weapons Convention ISU, with a specific focus on increasing awareness and mitigation efforts against larger scale bioweapons scenarios.