R&D FOR ECONOMIC SECURITY FROM FUTURE PANDEMICS

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Sanjush Dalmia, Isabel Creed, Conor Cooper, Mirte Boot, Kartik Kavi, Tom Blake

These proposals are supported by the CBI, the Association of the British Pharmaceutical Industry, the UK BioIndustry Association and SME4Labour:

"At the CBI's 2022 Annual Conference, the Leader of the Opposition stated that economic stability was a top priority. The pandemic caused real economic instability, and we are seeing its ongoing effects on the health and resilience of Britain's workforce, contributing to labour shortages and inactivity rates. The CBI supports proposals from policymakers whose aim it is to deliver stability by making long-term investments to proactively protect industry from future pandemics, and providing clear support to our world-leading life science sectors."

- **Jordan Cummins, Health Director at the CBI**

"Scientists for Labour are spot-on when they say learnings from the COVID-19 pandemic should be at the centre of the Labour Party's Industrial Strategy. The UK's academic and industrial life sciences community, itself the product of past Labour Governments' industrial strategies, came together during the pandemic to accelerate the development and manufacture of the Oxford-AstraZeneca vaccine, which has now been delivered to more countries around the world than any other vaccine. The Biomedical Catalyst grant funding programme and Innovate UK more broadly was key to building that life sciences capacity in the UK. Launching an additional £100 million Catalyst Competition will help ensure we have a thriving sector to address current health challenges and future public health threats."

- **Steve Bates OBE, CEO of the UK BioIndustry Association (BIA)**

“The life science industry stepped up during the COVID-19 pandemic in an unprecedented way, with a number of safe and highly effective vaccines, as well as essential diagnostics and a number of important treatments. Looking ahead, research and innovation are powerful tools the UK must utilise to help prevent and tackle future pandemics, and the 100 Days Mission provides an important framework and shared ambition as to how industry can work collaboratively with government and system partners to do this. We share the ambition outlined here to improve resilience through pandemic preparedness R&D, which should be incorporated as part of Labour’s broader commitment to raise R&D spending to 3% of GDP. While we’ve got great strengths and enormous potential to grow life sciences in this country, we are falling behind our global competitors when it comes to crucial areas like the use of diagnostics, patient uptake of new medicines, recruitment to clinical trials and pharmaceutical exports. The latest data from the Life Sciences Competitiveness Indicators clearly highlights this and ought to ring alarm bells. For the UK to improve resilience through pandemic preparedness R&D, it is critical that the government takes an urgent look at how to reverse these trends and ensures that the life sciences sector is in a position to drive economic recovery and truly support British life science businesses.”

- **The Association of the British Pharmaceutical Industry**

"According to Simply Business, COVID-19 cost small businesses upwards of £126.6 billion. Future pandemics could cause even greater economic instability and pose a grave threat to British enterprise. SME4Labour endorses these proposals to deliver economic security and build a pro-business, pro-worker economy."

- **SME4Labour**

Executive Summary

- **In line with the Labour Industrial Strategy's goal of improving resilience to extreme risks, Labour should use part of the existing commitment to raise R&D spending to 3% of GDP towards preventing economic instability from future pandemics.**
- COVID-19 caused extensive supply chain disruptions contributing to the ongoing cost-of-living crisis and increased the UK's debt-to-GDP ratio from 80% to 100%.
- Experts expect the frequency of pandemics to increase, potentially with greater severity. As with climate change, the incoming Labour government should act to strengthen business confidence and protect our economy from disruption.
- Like the Biden Administration in the USA, the next Labour government should match its ambitions on pandemic preparedness to its ambitions on climate.
- Pandemic preparedness R&D could minimise the stringency and length of future lockdowns and prevent inflationary supply chain disruptions, protecting businesses and jobs.
- Uniquely severe market failures in private sector pandemic preparedness R&D strongly justify government intervention.
- Work published by BEIS indicates that the average £1 of public R&D spending generates between £1.96 and £2.34 of additional private R&D spending in the long run.
- An incoming Labour government should incentivise private sector R&D investment in pandemic preparedness technologies, including vaccine platforms and broad spectrum antivirals. **To do this, Labour should:**
    - **Use the new Advanced Research and Invention Agency to create inducement prizes, recognition prizes and advanced market commitments.**
    - **Launch an additional annual £100 million Catalyst Competition under UK Research and Innovation (UKRI).**
- **A Labour government should also set out joint funding calls focused on pandemic preparedness from the Medical Research Council, the Engineering and Physical Sciences Council and the Biotechnology and Biological Sciences Council worth £1.2 billion annually for the next 15 years.**
- These policies should be funded via existing funding to cross-UKRI initiatives, Innovate UK, the Medical Research Council, the Engineering and Physical Sciences Council and the Biotechnology and Biological Sciences Council, alongside new funding to UKRI.

1.0 Introduction

COVID-19 has caused extensive supply chain disruptions contributing to the ongoing cost-of-living crisis[1], led to £310 billion in extra government spending[2] and resulted in an increase in the UK's debt-to-GDP ratio from 80% to 100%.[3]

Countries with a higher GDP per capita than the UK[4] and more trained doctors per capita than the UK[5] experienced similar increases in debt-to-GDP ratio.

Far from a "once in a lifetime" event, multiple high-profile epidemics have emerged in the last few decades - HIV, SARS, avian flu, swine flu, MERS, Ebola, COVID-19 and monkeypox. Experts expect the frequency of epidemics and pandemics to increase significantly due to climate change and increasing globalisation.[6]

As Labour positions itself as the party of security, fiscal responsibility and economic stability, it has set out an industrial strategy promising to improve resilience to extreme risks which have "low probability but high impact".[7]

The Cabinet Office publishes a National Risk Register, identifying and prioritising between the extreme risks that Britain faces. Pandemics have been at the top of this register since 2008.[8] Unfortunately, successive governments failed to act on this risk, worsening the economic insecurity caused by COVID-19.

Elsewhere, institutions are now taking the twin threat of climate change and pandemics seriously. The new International Monetary Fund Resilience and Sustainability Trust[9] focuses on climate change and pandemic preparedness, while the Biden Administration is following up on its climate change commitments with an aim to spend £88.2 billion across 5 years on

[1] Institute for Government, 2022. https://www.instituteforgovernment.org.uk/explainers/cost-living-crisis
[2] Commons Library, 2022. https://commonslibrary.parliament.uk/research-briefings/cbp-9309/
[3] Institute for Fiscal Studies, 2021. https://ifs.org.uk/taxlab/taxlab-key-questions/how-did-covid-affect-government-revenues-spending-borrowing-and-debt
[4] World Bank, 2020. https://data.worldbank.org/indicator/GC.DOD.TOTL.GD.ZS?locations=FR-AU-CA-US&most_recent_year_desc=true
[5] World Bank, 2020. https://data.worldbank.org/indicator/GC.DOD.TOTL.GD.ZS?locations=FR-BE&most_recent_year_desc=true
[6] Marani et al, 2021. Proceedings of the National Academy of Sciences. https://doi.org/10.1073/pnas.2105482118
[7] The Labour Party, 2022. Prosperity Through Partnership: Labour's Industrial Strategy.
[8] Cabinet Office, 2008. https://www.gov.uk/government/publications/national-risk-register-of-civil-emergencies
[9] IMF, 2022. https://www.imf.org/en/Topics/Resilience-and-Sustainability-Trust

pandemic preparedness.[10] To avoid repeating the mistakes of past governments, the next Labour government should similarly match its ambitions on climate when it comes to pandemic preparedness.

Labour has promised to increase combined public and private R&D spending to 3% of GDP by 2030. Building on the industrial strategy's promises to improve resilience to extreme risks, this brief outlines key ideas on the importance of preparing for future pandemics, and discusses how Labour could leverage the strengths of Britain's life sciences sector to cost-effectively improve economic security from future pandemics through R&D.

There are two major reasons to expect the benefits of targeting R&D spending at pandemic preparedness to outweigh opportunity costs:

1) The COVID-19 pandemic has had a catastrophic, ongoing impact on the British economy. Pandemic preparedness R&D could mitigate potentially worse impacts of future pandemics by minimising the length and stringency of lockdowns and preventing inflationary supply chain disruptions.
2) Pandemic preparedness R&D in the life sciences sector is affected by uniquely severe market failures, so government intervention is more strongly justified than in other sectors. This is discussed in more detail in section 1.2.

1.1 Future Pandemics Could Be Even Worse

Prior to the COVID-19 pandemic, SARS-COV-1, the virus which caused the SARS pandemic of 2002-2004, and MERS, which caused the MERS epidemic of 2012, had been extensively studied.[11] This helped us develop vaccines more rapidly for SARS-COV-2, the closely related virus which caused the COVID-19 pandemic.

Analysis by the UK Vaccines Network concluded that the most likely cause of a pandemic is a virus which has never been seen before, also known as 'Disease X'.[12] Without sufficient investment for R&D to protect us from existing viruses which pose the greatest pandemic risk, it is likely that next time a new virus emerges, we will not have years of research on related viruses to help us. This could slow down the development of treatments and vaccines, delaying economic recovery.

COVID-19 had low mortality amongst the middle aged and young adults, and very low mortality amongst children.[13] This is not the case for all infectious diseases. Notably, in the

[10] The White House, 2022. https://www.whitehouse.gov/briefing-room/statements-releases/2022/03/28/fact-sheet-the-biden-administrations-historic-investment-in-pandemic-preparedness-and-biodefense-in-the-fy-2023-presidents-budget/
[11] Nature, 2020. https://www.nature.com/articles/d41586-020-03626-1
[12] Noad et al, 2019. Vaccine. https://doi.org/10.1016/j.vaccine.2019.09.009
[13] UK Health Security Agency, 2022. https://www.gov.uk/government/publications/covid-19-reported-sars-cov-2-deaths-in-england/covid-19-confirmed-deaths-in-england-report

Spanish flu pandemic of 1918-20, the mortality rate was highest for young adults.[14] Future pandemics with higher mortality rates for economically active adults or children could pose different challenges to a Labour government compared to the COVID-19 pandemic.

Future pandemic viruses could also be deadlier and spread more quickly than SARS-COV-2. This means future pandemics could cause more economic damage and instability than COVID-19.

1.2 Market Failures in Pandemic Preparedness R&D are Uniquely Severe

Although private R&D investment in free markets is recognised to be suboptimal across sectors,[15] market failures in life sciences R&D are especially severe due to:

- High up-front R&D costs
- High risks of R&D failure
- Difficulties in internalising benefits of private R&D[16]

Therefore, compared to other sectors, government intervention is more strongly justified in the life sciences, which undertakes a majority of private pandemic preparedness R&D.

Amongst market failures in life sciences R&D, market failures are particularly severe for pandemic preparedness.[17] This is because for some pandemic preparedness products, there is insufficient sustained demand outside pandemics.

1.3 Return on Investment

The return-on-investment (ROI) of medical research is high.[18] The ROI of pandemic preparedness R&D is likely to be higher still, by protecting British businesses from the economic impacts of longer and stricter future lockdowns, and mitigating supply chain disruptions which risk causing inflation.

Spillover benefits of pandemic preparedness R&D outside pandemics are likely and will further increase ROI. These are discussed on page 9.

[14] Gagnon et al, 2013. PLoS One. https://doi.org/10.1371/journal.pone.0069586
[15] BEIS, 2020. The relationship between public and private R&D funding.
[16] Ipsos Mori, 2016. The Biomedical Catalyst: An Evaluation Report. https://www.ukri.org/publications/the-biomedical-catalyst-an-evaluation-report/
[17] Monrad et al, 2021. npj Vaccines. https://doi.org/10.1038/s41541-021-00290-y
[18] Grant and Buxton, 2018. BMJ Open. https://doi.org/10.1136/bmjopen-2018-022131

1.4 Improving the Competitiveness of the British Life Sciences Sector

According to the Life Sciences Competitiveness Indicators (LSCIs), government expenditure on life sciences R&D as a proportion of GDP places the UK in 6th place out of 10.[19]

The life sciences sector undertakes a majority of private pandemic preparedness R&D. Analysis from the Business, Energy and Industrial Department indicates that the average £1 of public R&D spending in the UK generates between £1.96 and £2.34 of additional private R&D spending in the long run.[20] Targeting R&D spending to pandemic preparedness will help to improve the UK's performance on LSCIs and help British life science businesses to go on to receive private R&D investment.

1.5 Protecting the Most Vulnerable and Levelling Up

The impact of the COVID-19 pandemic followed a well-studied "socioeconomic gradient", with worse outcomes for people living in deprived areas, for black and minority ethnic communities and for individuals with pre-existing health conditions.[21] The impacts of almost all diseases follow a similar socioeconomic gradient[22] and the impacts of future pandemics are likely to do the same.

COVID-19 also deepened inequalities between the North and South of England and future pandemics may do the same.[23] Targeting R&D spending towards pandemic preparedness will protect the most vulnerable members of society, preventing regional inequalities from widening further and furthering the Levelling Up agenda.

1.6 Electoral Consequences of Pandemics

Political science indicates that economic downturns and recessions reduce the vote share of incumbent parties.[24]

Following a return to government in 2025, potential economic downturns resulting from future pandemics could reduce Labour's vote share at subsequent elections, similar to the effects of the Global Financial Crisis on the previous Labour government.

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[19] Office for Life Sciences, 2022. https://www.gov.uk/government/publications/life-science-sector-data-2022/life-science-competitiveness-indicators-2022

[20] BEIS, 2020. The relationship between public and private R&D funding.

[21] Health Foundation, 2020. Build Back Fairer: The COVID-19 Marmot Review. https://www.health.org.uk/publications/build-back-fairer-the-covid-19-marmot-review

[22] Marmot Review, 2010. Fair Society Healthy Lives (The Marmot Review) Institute of Health Equity. https://www.instituteofhealthequity.org/resources-reports/fair-society-healthy-lives-the-marmot-review

[23] The Guardian, 2020. Covid deepens south and north of England inequalities, study finds. https://www.theguardian.com/inequality/2020/dec/07/covid-deepens-south-and-north-of-england-inequalities-study-finds

[24] IPPR, 2012. Elections in Hard Times. https://www.ippr.org/juncture-item/elections-in-hard-times

1.7 Biodefence and National Security

While naturally arising viruses pose the risk of a worse pandemic than COVID-19, this risk is also posed by viruses released accidentally or deployed intentionally by a rogue state or terrorist group.

At a time of war in Europe, investments in pandemic preparedness R&D will improve Britain's biodefence capabilities.

1.8 Britain's International Reputation and Soft Power

Establishing Britain as a world leader in pandemic preparedness R&D would help repair Britain's international reputation and enable a Labour government to benefit from British soft power abroad.

1.9 Panic-and-neglect cycles

Pandemic preparedness R&D has faced a historical panic-and-neglect cycle.[25] Investment has risen after epidemics have started, when investment is likely to be the least cost-effective, and fallen in the years between epidemics, when investment is likely to be most cost-effective.

This may be in part due to the 'preparedness paradox'.[26] When policymakers are looking to improve efficiency, they may be misled into reducing funding for interventions against risks that seem small or unlikely, when in fact these risks are small and unlikely due to the interventions, and become larger and likelier following the cuts.

It may be appropriate to view pandemic preparedness investments as an insurance mechanism against an extreme outcome, although significant spillover benefits are likely and discussed on page 9.

For maximal cost-effectiveness, a Labour government must avoid falling victim to the preparedness paradox, and make proactive, long-term investments in this area.

[25] Head et al, 2020. The Lancet. https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(20)30357-0/fulltext
[26] Kottke, 2020. https://kottke.org/20/03/the-paradox-of-preparation

2.0 Policy Recommendations

Labour has committed to increasing public and private R&D spending to 3% of GDP by 2030. A significant proportion should focus on priority technologies likely to improve economic security from pandemics.

This would improve economic resilience to future pandemics and help deliver on the G7 100 Days Mission to respond to future pandemic threats.[27]

Key technologies with potential for cost-effectively improving pandemic preparedness include, but are not limited to:

- Vaccine platforms[28] and vaccines for prototype viruses[29]
- Broad spectrum antivirals[30]
- Needle-free vaccines such as microneedle patches[31], nasal vaccines[32] and oral vaccines[29]
- Metagenomic wastewater sequencing[33]
- Minimally invasive diagnostics[29]
- Point-of-care diagnostics and clinical metagenomics[34]
- Next-generation personal protective equipment[29]
- Reduction of indoor virus transmission, via better air filtration or low wavelength light[35]
- Improvements in laboratory safety[29]
- Attribution tools for genetically modified viruses[36]

This list is adapted to the UK-specific context from the Apollo Program for Biodefense report, published by Bipartisan Commission on Biodefense.[29]

R&D investments should be directed away from higher risk forms of research, such as gain-of-function research[37] and the collection of new viral samples from wildlife.[38]

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[27] Cabinet Office, 2021. 100 Days Mission to Respond to Future Pandemic Threats. https://www.gov.uk/government/publications/100-days-mission-to-respond-to-future-pandemic-threats
[28] Monrad et al, 2021. npj Vaccines. https://doi.org/10.1038/s41541-021-00290-y
[29] Bipartisan Commission on Biodefense, 2021. https://biodefensecommission.org/reports/the-apollo-program-for-biodefense-winning-the-race-against-biological-threats/
[30] Adalja, A., Inglesby, T., 2019. https://doi.org/10.1080/14787210.2019.1635009
[31] Prausnitz, 2017. https://doi.org/10.1146/annurev-chembioeng-060816-101514
[32] Yusuf and Kett, 2016. https://www.tandfonline.com/doi/full/10.1080/21645515.2016.1239668
[33] Nucleic Acid Observatory Consortium, 2021. https://doi.org/10.48550/arXiv.2108.02678
[34] Chiu and Miller, 2019. Clinical metagenomics. https://doi.org/10.1038/s41576-019-0113-7
[35] Blatchley et al, 2022. https://doi.org/10.1080/10643389.2022.2084315
[36] Alley et al, 2020. https://doi.org/10.1038/s41467-020-19612-0
[37] Parker, 2016. Pandemics and Dual-Use Research. https://doi.org/10.1057/978-1-349-95145-1_13
[38] Esvelt, 2021. The Washington Post. https://www.washingtonpost.com/opinions/2021/10/07/manipulating-viruses-risking-pandemics-is-too-dangerous-its-time-stop/

Investment in pandemic preparedness R&D is likely to offer significant spillover benefits. For example, BioNTech is now applying the mRNA technology used for COVID-19 vaccines to develop new cancer treatments.[39] Other examples include:

- Vaccine platforms and nasal vaccines could lead to better vaccines for diseases such as seasonal influenza, which costs hospitals in England £100 million per year,[40] but imposes further economic costs via productivity losses.
- Point-of-care diagnostics and clinical metagenomics could allow doctors to use better targeted antibiotics, reducing the burden of antibiotic resistance.
- Sterilisation using low wavelength light could be used in healthcare to reduce hospital acquired infections, which currently costs Britain £774 million per year.[41]

Under a Labour government, the Department of Business, Energy and Industrial Strategy should take a range of approaches to solve market failures in pandemic preparedness R&D, leveraging Britain's leading public and private life sciences sectors for economic security.

The Biden Administration in the USA has requested £88.2 billion across 5 years for pandemic preparedness,[42] of which 52 billion is focused on government R&D spending, amounting to 0.05% of 2019 US GDP annually.[43]

To match this proportion of government spending on pandemic preparedness R&D, a Labour government would need to spend £1.4 billion on pandemic preparedness R&D annually,[44] but this remains a fraction of the additional £310 billion spent over the course of the COVID-19 pandemic.

2.1 Incentivising Private R&D Spending for Pandemic Preparedness

A range of policy instruments are available to incentivise R&D investment. Although there is little empirical evidence comparing the effectiveness of policy instruments,[45] recommended instruments have been selected because they may be most suitable to ensure that additional R&D is highly targeted towards pandemic preparedness, where market failures are most severe.

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[39] BBC News, 2022. https://www.bbc.co.uk/news/health-63247997
[40] Carrol et al, 2020. https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-020-09553-0
[41] Manoukian et al, 201. https://doi.org/10.1016/j.jhin.2020.12.027
[42] The White House, 2022. https://www.whitehouse.gov/briefing-room/statements-releases/2022/03/28/fact-sheet-the-biden-administrations-historic-investment-in-pandemic-preparedness-and-biodefense-in-the-fy-2023-presidents-budget/
[43] World Bank, 2022. https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?end=2019&locations=US&start=2019
[44] World Bank, 2022. https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?end=2019&locations=GB&start=2019
[45] Martin, 2016. https://doi.org/10.1080/13662716.2016.1146125

"Pull" mechanisms, such as inducement prizes, recognition prizes and advanced market commitments are promising methods to incentivise private sector spending on pandemic preparedness R&D.

Such mechanisms have generated increased private sector R&D spending in other areas. For example, the $1 million Grand Challenge Prize for developing autonomous vehicles offered by the Defense Advanced Research Projects Agency (DARPA) in the USA is estimated to have had a 50:1 leveraging ratio for private sector R&D investment.[46]

With an existing £800 million budget over 4 years and a mandate to take a high-risk, high-reward approach to specific science missions, the new Advanced Research and Invention Agency, itself modelled on DARPA, is well placed to implement such "pull" mechanisms to incentivise private sector pandemic preparedness R&D.

Innovate UK runs competitions such as the Biomedical Catalyst Competition and Energy Catalyst Competition, each of which awards grants for industry-led R&D worth approximately £40 million per year, focused on specific missions.

Evaluation of the Biomedical Catalyst Competition suggests it generates additional private sector R&D investment - successful applicants go on to receive further venture capital funding, leading to £3.99 to £5.09 of private sector R&D investment per £1.00 of government investment.[47]

The Biomedical Catalyst Competition is strongly supported by the UK Bioindustry Association, who were instrumental in its launch and argue that it unlocks additional private sector R&D investment for life science businesses.[48]

A similar one-time competition focused on vaccines for epidemic diseases previously ran as a collaboration between Innovate UK and the Department for Health and Social Care.[49]

For a "push" mechanism to increase private sector investment, a new annual £100 million Catalyst Competition should be launched, focused on priority technologies for pandemic preparedness.

This could be funded via existing funding to Innovate UK, the Medical Research Council (MRC), the Engineering and Physical Sciences Council (EPSC) and the Biotechnology and Biological Sciences Research Council (BBSRC).

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[46] Schroeder, A., 2004. The Application and Administration of Inducement Prizes in Technology.
[47] Ipsos Mori, 2016. The Biomedical Catalyst: An Evaluation Report. https://www.ukri.org/publications/the-biomedical-catalyst-an-evaluation-report/
[48] Bioindustry Association, 2020. The Biomedical Catalyst and a decade of BIA campaigning. https://www.bioindustry.org/news-listing/the-biomedical-catalyst-and-a-decade-of-bia-campaigning.html
[49] Gov.uk, 2021. Competition overview - SBRI - Vaccines for epidemic diseases. https://apply-for-innovation-funding.service.gov.uk/competition/1046/overview

2.2 Direct Public R&D Spending for Pandemic Preparedness

Due to the unique severity of market failures in pandemic preparedness R&D in the life sciences, increased public R&D investment should be aimed at solving this.

UKRI councils currently set out funding calls for specific priority areas, such as antimicrobial resistance.

The Medical Research Council, the Engineering and Physical Sciences Council and the Biotechnology and Biological Sciences Council should set out joint funding calls focused on pandemic preparedness worth £1.2 billion annually for the next 15 years.

This should be funded by increased government funding to UKRI alongside redirecting existing funding for cross-UKRI initiatives, the MRC, the EPSC and the BBSRC.

Work published by BEIS indicates that the average £1 of public R&D spending in the UK generates between £1.96 and £2.34 of additional private R&D spending in the long run.[50] With the severity of market failures in pandemic preparedness R&D, it is plausible that the effects of public R&D spending on private R&D spending will be even greater than in other areas.

Contact Us

If you have further questions about the contents of this report, would like to discuss how the Labour Party could approach pandemic preparedness or would like to get in touch with the author, please email sanjushdalmia[@]gmail.com.

[50] BEIS, 2020. The relationship between public and private R&D funding.