Research questions for covid-19

Epidemiology
What is the proportion of infections that are asymptomatic and how do they contribute to transmission (serology and epidemiology)?
What data flows are required to manage the epidemic longer term?
What is required across case testing, contact testing and well-planned sampling to get national coverage and accurate figures on spread?

Immunology and serology
Immunology: (i) what is the antibody response, how variable is it, who gets it and how long does it last for, (ii) why do some people progress to the more severe disease and what are the mechanisms (immunology, genomics and clinical science) and (iii) is there evidence of antibody-induced enhancement and, if so, what are the implications?
Is there cross protection from infection with other coronaviruses? (epidemiology, serology, immunology)?
What is required to use serology to understand (i) the proportion of population who have had disease (ii) how long immunity lasts and who gets it (iii) the proportion of disease that is asymptomatic (iv) any distinction between seropositivity and immunity?

Virology
Where else does the virus go in the body and what effects does that have?
Is there any evidence of entry into the central nervous system?
How important is gastrointestinal tract involvement?
Is there important myocardial involvement?
Is mutation going to cause a problem with either enhanced pathogenicity or immune escape (genomics, clinical science, immunology)?
How important is viral load in determining the outcome in individuals?
What do we know about susceptibilities in the virus itself?
What more do we need to know about survival of the virus in the environment?

Clinical/healthcare management
What can we learn from unusual presentations of severe disease (e.g., in younger patients or otherwise healthy people)?
What is the role of comorbidities?
Can genomics help to predict outcomes, progression to severe disease and treatment options?
What do we know about pregnancy and vertical transmission risks?
How important is nosocomial and other healthcare acquired infection and how can it best be managed?
What are the clinical markers of severe disease/at risk/ICU patients’ need and how can these be used in practice (clinical science, genomics)?

Do healthcare spaces need to be reconfigured to stop spread?

What is the role of robotics in healthcare management?

What are the overall health impacts (mental and physical) of the measures imposed to reduce the epidemic in the UK?

**Treatments and preventative measures**

What do we know about the virus and its susceptibilities?

Can we identify targets for drug treatments?

Which existing drugs might have an effect and how should they be used in clinical trials?

Which vaccines can be fast tracked through to clinical testing and how can we make that happen (regulation, science funding, manufacturing, trial design)?

What other treatment options should be explored (e.g., neutralising antibodies, immune serum, siRNA, experimental approaches with live virus) and what funding calls and links to companies will be needed?

**Data Science and Engineering**

How can data science help inform all aspects of managing the epidemic?

How can data flows be rapidly improved? How best to share data across research, government and industry to allow secure collaboration?

How can we best capture high quality data without burdening front line staff?

How can we learn from international data?

How can data science help rapid evaluation of clinical information and trial data in real time?

How can engineering help reconfigure clinical spaces to reduce nosocomial spread?

How can robotics help?

How can spatial mapping help contain outbreaks and manage the longer-term control of the epidemic?

What data are required to inform agile local planning and responses (e.g. in relation to ICU capacity) and to monitor effects of interventions and relaxing of measures?

How could a system of contact tracing that does not rely only on manual tracing (e.g. phone/App based to detect close contacts quickly) improve outcomes?

What are the unintended consequences of releasing data and how does it influence behaviour?
Policy responses

What lessons can be learned from other countries experiences?

What information should inform decision-making about emerging from lock-down?

Behavioural science

What interventions are most effective at delivering short, medium and longer term behavioural change, and how does this differ across groups?

How can we promote high uptake of the flu vaccine among those over 70 and in at-risk groups for next flu season?

How can we best help people adhere to, and monitor adherence to, advice about shielding, household isolation and social distancing, hygiene and use of PPE, considering regional and demographic variation?

How should we monitor and minimise any harm associated with these behaviours (psychological, physical, social, educational, economic)?

Do we understand the unique challenges that key workers and others involved in the response will experience, and how to mitigate the impact of these?

How do people cope in a crisis and what influences the effectiveness of those coping mechanisms?

Is the assumption that people will behave in a more altruistic way in a crisis still supported?

How can co-operative and altruistic behaviours among the public be harnessed to ensure that help is channelled to those who need it most in ways that interface with, compliment and do not compromise civil contingency responders?

What role can volunteers play through the crisis? How will they behave and influence the behaviour of others? How can they be best recruited, managed and engaged with to maximise their impact?

What prompts people to volunteer and is it specific to the current crisis (i.e. having more time)? What differences are we seeing, by region, socio-economic group etc, in volunteering activity?

What influence do different policies and social, geographic and institutional contexts have on social connectivity and the parameters of models used to inform decision-making about future impacts?

Can we understand, predict, prevent and mitigate adverse public reactions to civil contingency messages, responses and measures, including stockpiling, social tension and conflict with the police?

What is the best way to communicate the Government’s plan and all it entails to members of the public in order to build trust and promote behaviour change?

What will be the short-, medium- and long-term impact of the wider social changes required on, for example, crime, the legal system and education?

How can social distancing and social cohesion be maintained if the distancing measures need to be extended?

How do you address privacy concerns when gathering data, for example, collecting data with apps.
How has (and will) the public respond to changes in policy as we come out of the lock-down?

**National Recovery & Transformation**

What are the impacts of policy on different institutions (schools, universities, workplaces) and across space (cities v rural areas) and how will that influence their ability to recover?

How will society and the economy differ after the epidemic and how can policy change the economy and society in positive ways?

How has the economy and society changed through the use of technology & new ways of working, etc?

How can we make better decisions when dealing with uncertainty and dynamic complexity, particularly when under pressure?

Can we avoid unintended consequences as we exit the lock-down and recover?

How can decision making be best co-ordinated across different institutional contexts and levels – i.e. UK v national v regional v local?

What novel risks are emerging, for example, related to online engagement?

**Business and Employment**

How do features of the labour-market influence patterns of infection?

How has the epidemic influenced different sectors, size of business and the self-employed and what have the wider economic and social impacts been? How effectively will different sectors, business models and supply chains respond?

How does the economic impact of the epidemic and the prospect for recovery differ across places and social characteristics such as gender, age, skill-levels, local government-support etc?

How have Government support measures influenced the behaviour of different types of firms (i.e. by size and sector) and what new measures might be needed?

What types of jobs are being lost, and what is the impact on different people and their skills?

How will the crisis influence different peoples’ ability to find work and transition into new occupations? Will older workers return to the labour market?

Which new behaviours and working practices will remain and which should we encourage (i.e. working from home, less travel, etc.)?

What can managers and workers to do maintain positive psychological states?

What are the longer-term implications of working from home and how does this differ across social groups?
Psychological and Societal resilience

What is the impact of social isolation and how does it differ across groups, particularly vulnerable groups (including those with low levels of digital skills)?

How do people react to new threats, (predictable stages?) and how does it differ across individual and groups in ways that mediate the effectiveness of policy and communications?

How well-equipped are community, charity and voluntary sectors in terms of their resources, capacity and know-how to respond quickly to emergency community needs (i.e. civil resilience work). How quickly could they be mobilised to support emergency needs and what would they require to do so?

What is the impact on vulnerable people and families (financially vulnerable, domestic abuse, parental conflict, children in care, family breakdown and neglect).

What is the impact on offending, homelessness, drug & alcohol abuse?

How effectively has the social safety net been? What difference have recent changes made?

What factors determine community resilience? What determines a loss of that resilience and behaviours such as panic buying and stock-piling?

How inclusive are new forms of social connection and which social groups are being excluded and why? How can they be made more inclusive?

What is the impact of the crisis on educational outcomes? And how does that differ across groups, and interventions, particularly for the most vulnerable young people?

How has the influence of the epidemic and responses differed by gender? For example, do caring responsibilities lead to differences in labour market participation (entry and exist) etc?

Security & Justice

What narratives are being promoted by foreign states and violent extremist groups? Are they being used to exploit the crisis to harm the UK or malignly influence our politics?

What misinformation, fake news and conspiracy theories are circulating and why?
What can be done to increase the influence of accurate information and reduce the harm of misinformation?

What are the risks to public disorder (in the UK and elsewhere) and how can they be mitigated?

What is the impact of the crisis on different kinds of crime and crime rates? For example, its impact on domestic abuse, gang-related crime, fraud or online cybercrime?

How has home-working changed security culture, compliance and risk? What improves home-working cybersecurity?
What is the impact on the legal system of changes in employment, welfare benefits, family breakdown or housing disputes?

How has the epidemic changed how people access justice (and their enforcement of rights)?

What communications methods and media are most effective to communicate about rights to legal support and access to justice?

How have new powers in the UK and internationally influenced civil liberties? Are safeguards working and what are the likely longer-term impacts?

What have been the impacts on prisons, probation and the courts?

Environment

What are the environmental impacts/benefits of behaviour change due to the epidemic (e.g. greenhouse gas emissions; particulates and other pollutants) including any potential changes during recovery? What are these impacts/benefits at local, national and global scales?

What other organisms can the virus infect and are there potential wildlife reservoirs? Are there closely-related coronaviruses circulating in other natural environment host species? To help understand the potential for re-emergence, how may the virus move through and reside in the environment (natural and built)?

What is the potential for environmental virology to develop different measures of community-level virus prevalence, such as analysis of waste water? How can such techniques be used to measure the temporal and spatial spread of the virus?

Has the chemical loading to the environment (e.g. disinfectant, pharmacological) changed as a result of the pandemic? If so, is there any impact on ecosystem function and services, and is there a solution for recovery?

Do environmental factors exacerbate or diminish the impact of the virus and the severity of the disease?

How has social distancing changed people’s perception of the environment and their relationship with the environment, following the epidemic?