The Imperial College mathematical modelling that determined the UK pandemic response

Imperial College modelling: the track record

- Professor Neil Ferguson and his team presented their model for **the 2001 outbreak of foot and mouth disease led to the mass slaughter of over 6 million perfectly healthy cattle, sheep and pigs, as a precautionary measure.** This wiped out hundreds of years of selective breeding and reduced farmers to penury and suicide, **with a cost to the UK economy estimated at £10 billion**.
- A revised analysis of disease transmission suggested that future outbreaks might be controlled by early detection, with only affected animals killed. **Expert opinion was that Ferguson's modelling was 'severely flawed'.**
- **In 2002 they predicted up to 50,000 'mad cow disease' deaths in the UK** from eating beef infected with Bovine Spongiform Encephalopathy (BSE). **Only 170 people died.**
- **In 2005 we had the bird flu outbreak. Ferguson predicted that up to 200 million people could be killed globally.** He arrived at this figure by scaling up from the 1918 Spanish flu outbreak. **The actual worldwide death toll was only 282 people between 2003 and 2009.**
- **In 2009/10 we had the swine flu (H1N1) 'pandemic'. Ferguson predicted that 65,000 people would die in the UK. In reality, 457 people died in the UK.**
- This was the team who were entrusted with the modelling for COVID-19.

(https://www.spectator.co.uk/article/six-questions-that-neil-ferguson-should-be-asked/; https://www.theguardian.com/uk/2001/jun/15/footandmouth)

Neil Ferguson's COVID-19 model

- **The 'reasonable worst case scenario':**
  - **With lockdown etc, 250,000 deaths in Great Britain.**
  - **Without lockdown etc, 500,000 deaths in Great Britain.**
- The model didn't anticipate achieving herd immunity until 81% of the population had been infected, which they calculated from antibodies. This was also wrong, as we shall see.
- **The minutes of SAGE (Scientific Advisory Group for Emergencies),** of which Neil Ferguson is a member, **reveal that no possibilities other than the 'reasonable worst case scenario' were considered.**
- Ferguson's modelling has come in for numerous criticisms relating to bugs in the software, obsolete computer code, flawed assumptions and a far too narrow selection of possible outcomes. The analysis of Ferguson's model was seen by MP Steve Baker, to which he tweeted "As a software engineer, I am appalled." (https://twitter.com/SteveBakerHW/status/1258165810629087232)
- John Ioannidis, Professor in disease prevention at Stanford University: "… some of the major assumptions and estimates that are built in the calculations seem to be substantially inflated."
- As the Danish physicist Neils Bohr once said "It's difficult to make predictions, especially about the future" (Ferguson NF, et al. https://www.imperial.ac.uk/media/imperial-college/medicine/mrc-gida/2020-03-16-COVID19-Report-9.pdf; https://assets.publishing.service.gov.uk/media/5ed129fc86650c76acac3831/S0379_Eleventh_SAGE_meeting_on_Wuhan_Coronavirus__Covid-19__.pdf; https://dailysceptic.org/2020/05/09/second-analysis-of-fergusons-model/; https://www.socratic-method.com/quote-meanings-interpretations/niels-bohr-prediction-is-very-difficult-especially-if-its-about-the-future)

Consequences of the modelling are still coming to light….(2 March 2024)

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Thousands of items of lifesaving medical equipment bought during the Covid pandemic and now languishing in warehouses to be destroyed after the government failed to find a use for them

- MPs and peers have branded plans to destroy the equipment as 'astonishing'
- Those backing the plan say it will cut down on the huge storage costs needed
- The Government said it had tried hard to sell or give away the unused items

By SHAUN WOOLER, HEALTH EDITOR FOR THE MAIL ON SUNDAY
PUBLISHED: 22:12, 2 March 2024 | **UPDATED:** 22:15, 2 March 2024

https://www.dailymail.co.uk/news/article-13149887/thousands-medical-equipment-covid-languishing-destroyed-government-failed.html

- **"The government is planning to destroy thousands of items of lifesaving medical equipment that it bought during the pandemic after failing to find a need for it,** the Mail on Sunday can reveal."
- "MPs and Peers last night branded the scale of waste 'astonishing' and said the disposal of 'such huge volumes' is a 'kick in the teeth to the taxpayer'."
- "…Lord Markham said the 'reserve' of equipment was built up 'in response to shortages in key respiratory equipment' and 'in anticipation of increased demand during the pandemic'."

SAGE members: with thanks to Dr Clare Craig (Expired: COVID the untold story)

Make-up of SAGE in April 2020

- 6 mathematicians
- 7 epidemiologists
- 1 biochemist
- 1 computer scientist
- 2 artificial intelligence experts
- 1 engineer
- 1 extragalactic astronomer

Experts not represented or consulted:

- Anyone who knew about mass testing (screening)
- The UK National Screening Committee
- The Royal College of Pathologists

Also perhaps immunologists? virologists?

SAGE members' alleged conflicts of interest:
with thanks to Zoe Harcombe

Name	Works for	Role	Conflict	Attended
Sir Patrick Vallance (1)	Government	GCSA	Personal vaccine conflict - £600,000 shareholding in GSK (2)	30/30
Neil Ferguson OBE (3)	Imperial College	Modeller	Imperial is in the vaccine race and receiving £millions from the government (4)	30
Chris Whitty CB (5)	Government	CMO	Long standing connections with LSHTM. Received $46 million from the Gates Foundation while principal investigator at LSHTM (6)	28
Charlotte Watts (7)	Government & LSHTM	CSA for gov department (International Development)	Co-research director at LSHTM (8) – vaccine centre (9)	27
Graham Medley OBE (10)	LSHTM	Modeller	LSHTM - vaccine centre (9)	26
John Edmunds (10)	LSHTM	Modeller	LSHTM - vaccine centre (9) Declared conflicts that partner works for GSK (11)	26
Jonathan Van Tam MBE (12)	Government	Deputy CMO	"Worked in the pharmaceutical and vaccines industries from 2000 (SmithKline Beecham 2000 to 2001, Roche Products Ltd 2001 to 2002 and Sanofi-Pasteur MSD 2002 to 2004)" (12)	26
James Rubin (13)	King's College	Psychology of risk	Co-author of this paper on coercion (14)	26
John Aston (15)	Government	CSA for gov department (Home Office) (statistician)		25
Maria Zambon (16)	Government (PHE) & Imperial (17)	Director of Reference Microbiology for Public Health England (& virologist)	History of institutions she worked for receiving significant funding from vaccine manufacturers, including Sanofi, Novartis, CSL, Baxter and GSK (18). Has previous conflicts – with Neil Ferguson – reported on (19)	25
Dame Angela McLean (20)	Government & Oxford University	CSA for gov department (Ministry of Defence) & Modeller	Professor at Oxford (Ref 20), which is in the vaccine race and receiving £millions from the government (4)	23
Brooke Rogers OBE (21)	King's College	Professor of behavioural science	Co-author of this paper on coercion (14)	22
Peter Horby (22)	Oxford University	Professor of Emerging infectious Diseases	Professor at Oxford, which is in the vaccine race and receiving £millions from the government Founder of Epidemic disease Research Group Oxford (ERGO), funded by Wellcome (22).	21
Steve Powis (23)	Government & University College London	National Medical Director NHS & Professor at UCL	UCL is working with Imperial on its vaccine (24)	21
Sharon Peacock CBE (25)	Government (PHE) & Wellcome Sanger Institute	Director of the Covid-19 Genomics UK (COG-UK) Consortium	The Wellcome Sanger Institute is partnered with Astra Zeneca – the pharmaceutical company in the Oxford vaccine race (26)	20
Carole Mundell (27)	Government & Bath University	CSA for gov department (Foreign & Commonwealth Office)	Professor of Extragalactic Astronomy	19
Sir Jeremy Farrar (28)	Wellcome Trust	Director of the Wellcome Trust since 2013	The Wellcome Trust is heavily involved in vaccines (29) and specifically owns the Sanger Institute (26)	19
Wendy Barclay (30)	Imperial College	Virologist – particular expertise in flu	Imperial is in the vaccine race and receiving £millions from the government (4) Barclay's laboratory "is funded by MRC, BBSRC, the Wellcome Trust and commercial bodies."	18
Andrew Rambaut (31)	Edinburgh University	Prof of molecular evolution	Funding from the Wellcome Sanger Institute (26 & 32)	18
Sir Ian Diamond (33)	Government	The government's national statistician		15

Various SAGE members had potential research, employment or personal interests in:

- Waiting for the vaccines
- Employment in the pharmaceutical industry
- Employment in the vaccine industry
- Employment by the government
- Keeping the pandemic going to get more research funding
- Coercion

(https://www.zoeharcombe.com/2020/11/sage-conflicts-of-interest/)

Apparently, Boris had also been dubious

(https://www.telegraph.co.uk/news/2023/12/06/boris-johnson-holds-back-tears-2020-covid-inquiry/; https://hansard.parliament.uk/commons/2022-01-18/debates/AB251DCA-8088-485C-BF49-3999C4EE9AC5/Covid-19ForecastingAndModelling)

- At the COVID Enquiry, Boris reported that the government was slow to respond to Covid because **worst-case scenario modelling for BSE (mad cow disease) and swine flu had turned out to be wrong in the past.**
- He said: “I do remember the BSE scare and I remember the immense destruction that it did to the agricultural sector in this country and the way that all turned out.”
- Yet the Prime Minister’s spokesman said: “We have considered the full range of scientific opinion throughout the course of this pandemic and we will continue to do so.”

Problems with the IC mathematical modelling

- Ignoring pre-existing immunity
- Ignoring any capability of the immune system to cope with COVID-19
- Use of antibodies rather than T cells to calculate the infection ratio
- Assuming everyone has the same susceptibility to the virus
- Assuming that everyone would be mixing randomly in the community
- Assuming that people would not voluntarily (i.e. not through coercion or change in the law) alter their behaviour as a result of the virus
- Ignoring the seasonality of COVID-19
- Testing conclusions using other models
- The real world – using data from other respiratory pandemics or the early experience in China as the basis for the model.

Factors missed from the modelling: pre-existing immunity

- Public health responses around the world, including in the UK, were predicated on the assumption that the virus was novel and entered the human population with no pre-existing immunity before the pandemic (https://www.cdc.gov/coronavirus/2019-ncov/hcp/planning-scenarios.html).
- **But it wasn't a novel virus, due to its genetic coronavirus lineage.**
- **Cross-reactivity was quickly demonstrated by the many studies carried out in 2020.**
- **As we have seen, up to half the population were estimated to have cross-reactive immunity which would probably have helped prevent against severe COVID.**

Eventually Imperial College had to concede that pre-existing immunity does exist

- **Imperial College's own study** (Kundu et al):
- This fails to state the date that samples were taken, which is unusual. However, it is likely to have been late 2020 and early 2021, since the paper was first submitted to the journal in August 2021 and finally published in 2022.
- By 2022, it was arguably too late to be of interest or relevance since COVID was essentially over.
- "We observe higher frequencies of cross-reactive (p = 0.0139), and nucleocapsid-specific (p = 0.0355) IL-2-secreting memory T cells in contacts who remained PCR-negative despite exposure (n = 26), when compared with those who convert to PCR-positive (n = 26)….
- **"Our results are thus consistent with pre-existing…cross-reactive memory T cells protecting SARS-CoV-2-naïve contacts from infection….".**
- **Was the Imperial College model revised as a result? No**

(Kundu R, et al. Cross-reactive memory T cells associate with protection against SARS-CoV-2 infection in COVID-19 contacts. Nat Commun 13, 80 (2022))

Factors missed from the modelling:

- The immune system: **The modelling failed to incorporate any aspect of the immune system.** This appears to indicate that the modellers believed that our immune systems would not protect us in any way from COVID, quite apart from any pre-existing immunity.
- We will shortly see that **a healthy immune system can cope with COVID** very well and herd immunity could indeed be achieved much earlier.
- Transmission: Ferguson's model also assumed that everyone would be **mixing randomly** in the community. This is not the case, as people tend to mix in specific groups.
- Susceptibility: Ferguson's model assumed that **everyone has the same susceptibility to the virus.** It quickly became clear that the elderly and those with underlying conditions were far more susceptible, as might be expected.

Problems with the modelling: using antibodies to gauge the infection ratio

- Another Imperial College modelling mistake was pointed out by Dr Mike Yeadon:
- The modellers would be able to determine what percentage of the population had so far been infected by surveying the proportion who had SARS-CoV-2 antibodies in the blood. But as we will shortly see, antibodies are of limited utility in gauging anything, with a substantial proportion of people producing no antibodies at all, particularly in mild or asymptomatic infection. It is T cells that do the heavy lifting for SARS-CoV-2.
- As a 2021 study pointed out: "Epidemiological data [and presumably mathematical modelling] relying only on the detection of SARS-CoV-2 antibodies may lead to a substantial underestimation of prior exposure to the virus". Equally, because those who tend to produce antibodies are those who are more seriously ill the infection fatality ratio (IFR) will be far too high, as was indeed the case.
- In 2020, when SAGE was estimating an IFR close to 1%, a Ioannidis study showed that the global IFR was in fact 0.15-0.2%.
- Yeadon suggests that SAGE had too many mathematicians and no one with the right experience to interpret the data coming in from fieldwork.

(https://dailysceptic.org/2020/10/16/what-sage-got-wrong/; Gallais F, et al. Intrafamilial Exposure to SARS-CoV-2 Associated with Cellular Immune Response without Seroconversion, France. Emerg Infect Dis. 2021 Jan;27(1):113–21); Ioannidis JPA. Global perspective of COVID-19 epidemiology for a full-cycle pandemic. Eur J Clin Invest. 2020 Dec;50(12):e13423)

Testing modelling conclusions using other models: the Gompertz Curve

- The Gompertz curve is a mathematical model for a time series, most often used in population biology to predict the behaviour of micro-organisms.
- Viral spread is typically very rapid initially; at the beginning of a wave, there are many susceptible hosts and the virus is easily passed on. Towards the end of a wave, viral spread slows as the virus struggles to find more susceptible hosts. It gradually fades out altogether. This means that infections and deaths can be minutely predicted from formulae based on prior information.
- Using the Gompertz Curve, a team showed that the growth of the COVID epidemic "did not follow an exponential growth law even in the very first days, but instead its growth is slowing down exponentially with time" and hence fits the Gompertz function. (Levitt M, et al. Predicting the Trajectory of Any COVID19 Epidemic From the Best Straight Line. medRxiv [Preprint]. 2020 Jun 30:2020.06.26.20140814) Note: still a pre-print
- No interest was ever shown in this paper by the authorities, although a number of other studies confirmed that the COVID wave trajectory followed a Gompertz function, particularly in respect to predicting mortality – see next slide.
- There are other similar models which have all shown some utility in predicting the COVID trajectory, unlike the Imperial College model.

Some of the studies showing the usefulness of the Gompertz curve in predicting COVID trajectory

- Reddy T, et al. Short-term real-time prediction of total number of reported COVID-19 cases and deaths in South Africa: a data driven approach. BMC Med Res Methodol. 2021 Jan 11;21(1):15;
- Pelinovsky E, et al. Gompertz model in COVID-19 spreading simulation. Chaos Solitons Fractals. 2022 Jan;154:111699;
- Lounis M, et al. Predictive models for COVID-19 cases, deaths and recoveries in Algeria. Results Phys. 2021 Sep 23:104845;
- Canals M, et al. COVID-19 in Chile: The usefulness of simple epidemic models in practice. Medwave. 2021 Feb 12;21(1):e8119;
- Lutz Z, et al. Age-specific regional characteristics of COVID-19 mortality in 2021]. Orv Hetil. 2023 Apr 30;164(17):643-650;
- Zonta F, Levitt M. Virus spread on a scale-free network reproduces the Gompertz growth observed in isolated COVID-19 outbreaks. Adv Biol Regul. 2022 Dec;86:100915;
- Garcia-Vicuña D, et al. Hospital preparedness during epidemics using simulation: the case of COVID-19. Cent Eur J Oper Res. 2022;30(1):213-249
- Hu J, et al. Modeling and staged assessments of the controllability of spread for repeated outbreaks of COVID-19. Nonlinear Dyn. 2021;106(2):1411-1424
- Conde-Gutiérrez RA, et al.. Comparison of an artificial neural network and Gompertz model for predicting the dynamics of deaths from COVID-19 in México. Nonlinear Dyn. 2021;104(4):4655-4669.
- Català M, et al. Empirical model for short-time prediction of COVID-19 spreading. PLoS Comput Biol. 2020 Dec 9;16(12):e1008431
- Nakano T, Ikeda Y. Novel Indicator to Ascertain the Status and Trend of COVID-19 Spread: Modeling Study. J Med Internet Res. 2020 Nov 30;22(11):e20144
- Attanayake AMCH, et al. Phenomenological Modelling of COVID-19 Epidemics in Sri Lanka, Italy, the United States, and Hebei Province of China. Comput Math Methods Med. 2020 Oct 18;2020:6397063

Testing modelling conclusions: other models

- The actuarial control cycle, amongst other things, tests models against emerging evidence. It should be an automatic self-calibration system. As Nick Hudson of PANDA Uncut pointed out, in commercial settings, failing to employ the control cycle after so few predictions came true would likely result in the responsible actuary facing some very difficult questions. He believes that not only was it as if the control cycle had never been invented; the models used were not merely incorrectly calibrated but wholly inappropriate for application to the Covid phenomenon. (https://pandauncut.substack.com/p/actuarial-and-statistical-problems)
- An investigation of 7 global COVID-19 forecasting models (not including Imperial College's) showed that the models gave a median absolute percent error of 7-13% at six weeks, reflecting surprisingly good performance despite the complexities of modelling human behavioural responses and government interventions. (Friedman J, et al. Predictive performance of international COVID-19 mortality forecasting models. Nat Commun. 2021 May 10;12(1):2609)

Factors missed from the modelling: the real world

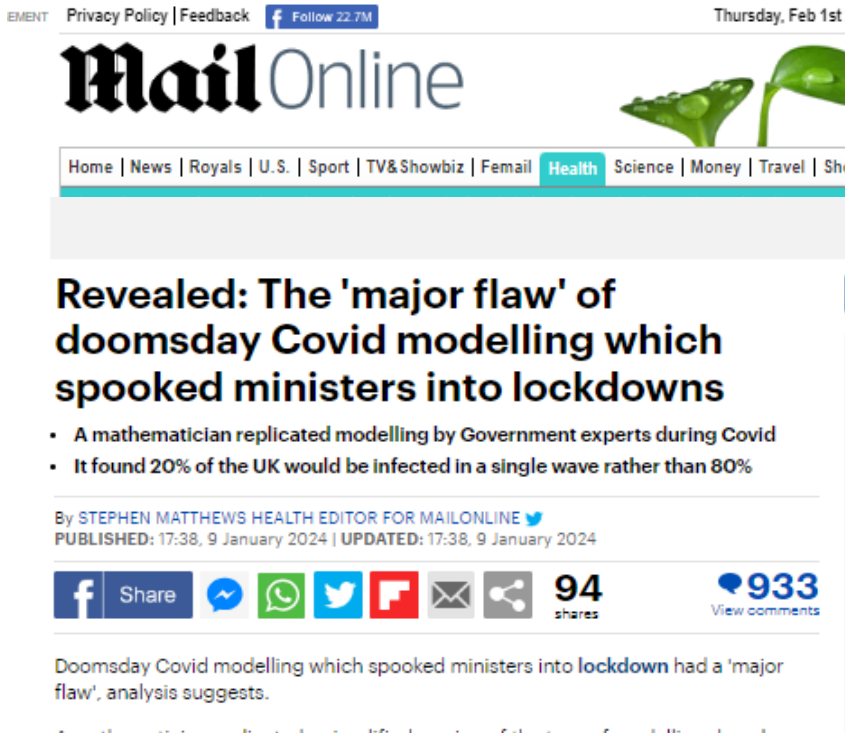
- Interestingly, **Chris Whitty**, in oral evidence to the House of Commons Health and Social Care Committee on **26 March 2020**, was asked **the overall prevalence rate for COVID** in Hubei province (containing Wuhan) in China? He replied: "…**the reported proportion is probably somewhere under 20%. That contrasts with our reasonable worst-case scenario that 80% of people could get infected.**" (https://committees.parliament.uk/oralevidence/113/default/)
- In **May 2020, Professor John Ioannidis analysed 23 seroprevalence studies and estimated the actual mortality rate for those aged <70 to be 0.00-0.23%,** i.e. considerably less than Imperial College's estimate. (Ioannidis JPM, https://www.medrxiv.org/content/10.1101/2020.05.13.20101253v2.full.pdf) Note: still a preprint.
- A more reasonable model might have been real world deaths from seasonal influenza viruses, which is based on actual data. **Influenza infects 5–15% of the human population each year, resulting in c500,000 deaths worldwide.** (Stöhr K. Influenza--WHO cares. Lancet Infect Dis. 2002 Sep;2(9):517).
  - **This is with no government-imposed mitigation measures whatsoever.**
  - **Note that Ferguson predicted 500,000 deaths in Great Britain alone, if there were no mitigation measures.** It seems unlikely given the global flu deaths.

Edinburgh University reassessment of the Imperial College model

- **Government pandemic measures would cause more deaths, not fewer; essentially, herd immunity could have saved more lives than lockdown**
- This was because the virus was able to spread faster to vulnerable people once lockdown measures were introduced than if some level of immunity had been allowed to build in the young.
- An Edinburgh University study reassessed the Imperial College modelling and showed that in fact school closures would increase deaths by between 80,000 and 95,000, while social distancing of everyone, rather than just the over-70s, could cost between 149,000 and 178,000 lives, although this would be postponed until the second and subsequent waves.
- The authors highlight the government trade-off of protecting the NHS in the short term ('flattening the curve'), rather than save lives throughout the whole epidemic.
- Neil Ferguson's original paper did contain figures showing the dangers of closing schools and blanket social distancing but apparently experts did not notice them. Professor Graeme Ackland said he had talked to members of SAGE and SPI-M but they hadn't seen these figures.

(Rice K, et al. Effect of school closures on mortality from coronavirus disease 2019: old and new predictions. BMJ. 2020 Oct 7;371:m3588; https://www.telegraph.co.uk/news/2020/10/07/herd-immunity-could-have-saved-lives-lockdown-study-suggests/)

And a University of Birmingham analysis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Revealed: The 'major flaw' of doomsday Covid modelling which spooked ministers into lockdowns

- A mathematician replicated modelling by Government experts during Covid
- It found 20% of the UK would be infected in a single wave rather than 80%

By STEPHEN MATTHEWS HEALTH EDITOR FOR MAILONLINE
PUBLISHED: 17:38, 9 January 2024 | UPDATED: 17:38, 9 January 2024

Share 94 shares 933 View comments

Doomsday Covid modelling which spooked ministers into lockdown had a 'major flaw', analysis suggests.

https://www.dailymail.co.uk/health/article-12943563/Major-flaw-doomsday-Covid-modelling.html

- **The authors used a model accounting for the fact that different people have a different number of contacts.**
- They found that **only c20% of the UK population would be infected in a single wave**
- “models used during the pandemic…were too inaccurate to be relied upon”, Dr Johnson said. He wants more research to address this **'major flaw'** in preparation for future epidemics.
- **'This is what the Covid inquiry should be looking at, rather than focusing on scandal and WhatsApp messages.’**

A scientist's viewpoint on mathematical modelling

- **In essence: although it uses scientific methods, mathematical modelling is not science because it is heavily dependent on assumptions which are subjective.**
- 'Models contain several elements that lay people associate with science—they were heavy on math, produced by academics, published in peer-reviewed journals, and included several graphs and references to the literature. In short, they look like science. However, those elements do not make something science.'
- Pandemic models are not scientific findings; they are ideas about what might happen under various scenarios or conditions. If "following the science" refers to basing policy on models, then government policy is only science based insofar as presented models are considered science.
- Why the models are not science:
  - 'Presented models are not (and perhaps, cannot be) tested against experience in a controlled manner. Without such controls or testing against experience, it is difficult to hold models accountable. Accountability, in the form of testability, falsifiability, or independent assessment/reproduction of results, for example, is a commonly viewed characteristic of science. Models are theoretical.'
  - 'The assumptions that scaffold pandemic models are often known to be dynamic and susceptible to all kinds of difficult to predict social forces, unlike assumptions in physics that refer to what, to some extent, are thought to be stabile features of the natural world.'
  - 'Furthermore, unlike physics, presented pandemic models seem to be developed for reasons of decision making and not to support efforts to test in empirical study. '

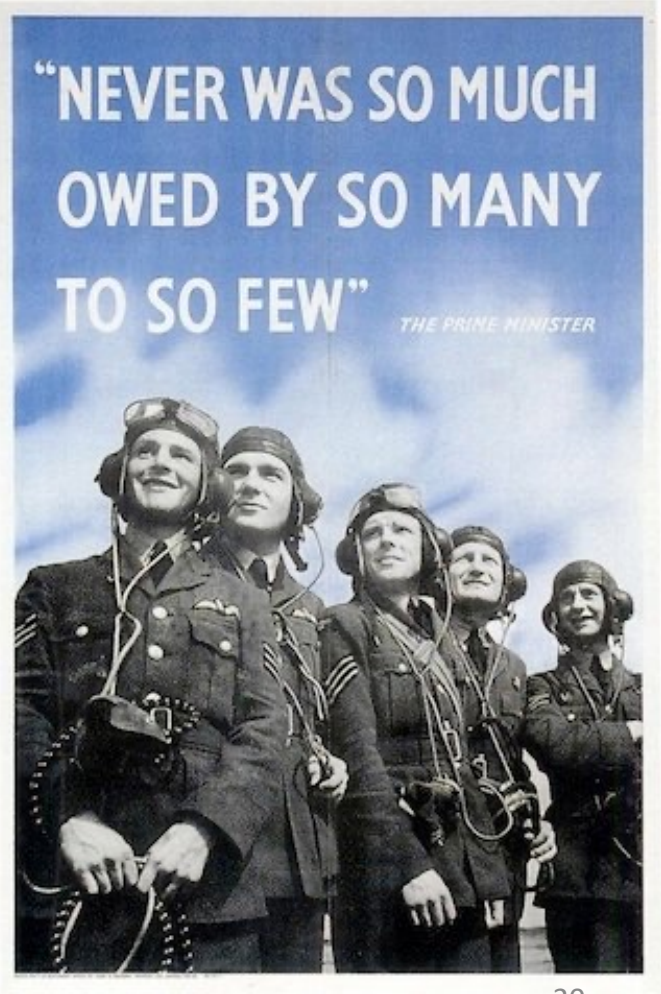
(Mercuri PhD M. Just follow the science: A government response to a pandemic. J Eval Clin Pract. 2020 Dec;26(6):1575-1578)

Ferguson's modelling: the final verdict?

From **Bob Seely MP,** parliamentary debate, January 2022 (paraphrasing Churchill):

- "Thanks to some questionable modelling that was poorly presented and often misrepresented, **never before has so much harm been done to so many by so few, based on so little, questionable, potentially flawed data.**
- **Modelling and forecasts were the ammunition that drove lockdown and created a climate of manipulated fear and I believe that that creation of fear was pretty despicable and pretty unforgivable."**

(https://www.parallelparliament.co.uk/mp/bob-seely/debate/2022-01-18/commons/westminster-hall/covid-19-forecasting-and-modelling; https://onthewight.com/isle-of-wight-mp-highly-critical-of-some-covid-modelling-in-westminster-debate-not-everyone-agreed/)



But we had a perfectly good evidence-based pandemic plan…

- **This evidence base was not mathematical modelling but real world data from influenza epidemics/pandemics.**
- As we have seen, **influenza is a respiratory virus which can be extremely serious. Surely that would have been a good place to start?**
- **Particularly since in October 2019, the first Global Health Security Index ranked the UK second in the world for adequacy of preparedness.** (https://reliefweb.int/report/world/global-health-security-ghs-index-october-2019)
- Influenza pandemic planning in the UK has been based on an assessment of a 'reasonable worst case'. This is derived from the experience and a mathematical analysis of influenza pandemics and seasonal influenza in the 20th century; it is not based on questionable assumptions. (https://assets.publishing.service.gov.uk/media/5a7c4767e5274a2041cf2ee3/dh_131040.pdf)
- The reasonable worst case, based on known patterns of influenza spread, suggests that up to 50 per cent of the population could experience symptoms of pandemic influenza during one or more pandemic waves lasting 15 weeks.
- The nature and severity of symptoms would vary from person to person but up to 2.5% of those with symptoms could die as a result of influenza, assuming no effective treatment was available.

From the rejected pandemic plan

- ‘Planning assumptions are not a prediction of what could happen. A lesson learned from the H1N1 (2009) influenza pandemic was that calling the planning assumptions ‘reasonable’ was not well understood. Many people wrongly thought that it meant this was the likely scenario as no indication was given of how unlikely it was that this scenario would be exceeded.’
- ‘Despite the uncertainty associated with any planning assumptions, it is important to have a consistent basis for planning for a future pandemic response, to be used by local planners and central government alike. This avoids confusion and facilitates integrated preparation.’
- ‘The reasonable worst case scenario (RWC) on which the planning assumptions…are based is reviewed on an annual basis. The RWC should be altered in light of changes to the scientific or wider evidence on which it is based.’

(https://assets.publishing.service.gov.uk/media/5a7c4767e5274a2041cf2ee3/dh_131040.pdf)

More from the rejected pandemic plan: key principles

- ‘Given the uncertainty about the scale, severity and pattern of development of any future pandemic, three key principles should underpin all pandemic preparedness and response activity:
- Precautionary: the response to any new virus should take into account the risk that it could be severe in nature. Plans must therefore be in place for an influenza pandemic with the potential to cause severe symptoms in individuals and widespread disruption to society.
- **‘Proportionality: the response to a pandemic should be no more and no less than necessary in relation to the known risks. Plans therefore need to be in place not only for high impact pandemics, but also for milder scenarios, with the ability to adapt them as new evidence emerges.’**
- Flexibility: there should be a consistent, UK-wide approach to the response to a new pandemic but with local flexibility and agility in the timing of transition from one phase of response to another to take account of local patterns of spread of infection and the different healthcare systems in the four countries.’

(https://assets.publishing.service.gov.uk/media/5a7c4767e5274a2041cf2ee3/dh_131040.pdf)

More from the rejected pandemic plan: key principles continued

‘Pandemic preparedness and response will continue to be:

- Evidence based. **Our pandemic response was evidence-free.**
- Based on best practice in the absence of evidence. **There was plenty of early evidence which was ignored.**
- Based on ethical principles.
- Based on established practice and systems, as far as is possible. **There is no established practice of locking down a population.**
- Across the whole of society.
- Coordinated at local, national and international levels.’

(https://assets.publishing.service.gov.uk/media/5a7c4767e5274a2041cf2ee3/dh_131040.pdf)

Further criticism from the Rt Hon Steve Baker, MP (former software engineer) November 2020 paper

- **'Imperial College modelling**: It was internally inconsistent with non-replicable numbers, didn't use data from the best datasets then available and relied on unpublished model code that only its author understood. There was poor characterisation of statistical uncertainty, non-existent or circular model validation and no code quality processes. The model has over 200 user-specifiable parameters, many of which appear to be guesses. As an example, it assumed individuals hardly vary in their chances of catching COVID; the projected number of infections is far lower if the assumption is modified for non-uniform susceptibility.
- **Lack of cost/benefit analysis**: The quality adjusted life year (QALY) is a standard metric used for analysis of healthcare interventions in the NHS...modelling efforts….appear uninterested in the question of whether non-pharmaceutical…Yet cost/benefit analysis is routine for pharmaceutical interventions and is especially critical for COVID-19 due to the high rate of comorbidities, high average age of the victims and high cost of lockdowns.
- **Silencing of disagreement**: A model that calculated lower herd immunity thresholds was rejected for publication because if people felt less at risk, government intervention might be reduced. Examples are given of journals refusing to publish dissenting views, a Nobel prize winner barred from speaking at an academic conference due to his anti-lockdown views and a rigged BBC Radio 4 debate.'

(https://www.stevebaker.info/wp-content/uploads/2020/11/20201101-Methodological-Issues-in-Epidemiology.pdf)

Modelling summary

- Modelling is not scientific evidence, as it is based upon assumptions that may be flawed.
- Imperial College's track record with respect to epidemic modelling was poor and they never seemed to learn from their mistakes. Despite other modelling being available, this team was entrusted with the COVID modelling by both the UK and the US.
- Imperial College's COVID model predicted as a 'reasonable worst case scenario': 500,000 UK deaths without any mitigation strategy (i.e. lockdown etc) and 250,000 if there was no mitigation strategy.
- SAGE never considered any other possibilities than the 'reasonable worst case scenario' and advised the government accordingly.
- The initial composition of SAGE was not optimal for a respiratory virus pandemic.
- Many problems with the Imperial College modelling have been pointed out, not least, that it bore no relation to the real world.
- The government jettisoned our evidence-based pandemic plan for an 'evidence-free' plan on the basis of the modelling.