

comment

“Why have doctors needed to be ‘woken up’ to threat of air pollution?” **RICHARD SMITH**

“I can only empathise with younger doctors’ current unhappiness” **DAVID OLIVER**

“Will our patients be harmed by this sudden bank holiday?” **HELEN SALISBURY**

CRITICAL THINKING Matt Morgan

An ordinary death

The palliative care physician and author Kathryn Mannix described the death of Queen Elizabeth II sadly and beautifully on Twitter last week. She wrote about how the Queen’s gradual adaptation to frailty in recent years, involving less travel and more rest, was an inherent part of mortality—or “ordinary dying,” as she put it. While media outlets have concentrated on the dramatic moment of the Queen’s death, Mannix pulls us away from the screens to consider the process behind the event.

In the intensive care unit we increasingly meet frail, older patients who have been referred to us for multiorgan support for “reversible” problems. These may include severe infections, support after major bowel surgery, or serious strokes. We are asked to consider the event of the patient’s illness as something that could be fixed with drugs, machines, nursing care, and, most importantly, time.

And often they are right. The problem may indeed have a fix. The event may pass. These punctuated incidents, these isolated catastrophes, may have a solution. But this is to look only at the event, not the process behind it.

This focus is partly the fault of those of us working in the deep technology of the ICU. We have long concentrated on numbers, physiology, and looking for reversible problems.

However, as we gain a better appreciation of survivorship, we are moving away from framing our patients’ health problems as events and towards understanding them as processes. The narrative of the journey towards the ICU is often more important than the signal event that knocked on our door.

Like Mannix’s specialty of palliative care, ICU is one of the few medical specialties that feature the

word “care” in their name. But as well as caring for the patients and families, we need to care about the process leading to an event. When considering patients’ best interests, we need to ensure that fixing one event in this case can lead to good.

Even in the face of frailty, a good life is still possible as an aim. As Mannix says, “At the end of life, we can still enjoy love, and peace, and companions.”

Let’s keep that as our goal, rather than just seeking to fix single events.

Matt Morgan, consultant in intensive care medicine, Western Australia
mmorgan@bmj.com
Twitter @dr_mattmorgan
[Cite this as: *BMJ* 2022;378:o2242](#)

The patient’s journey towards the ICU is often more important than the event that knocked on our door



OPINION Richard Smith

The neglect of air pollution by medicine reflects a wider failure

The public, doctors, and politicians need to be better informed

I begin with a confession. When I became the chair of the UK Health Alliance on Climate Change (UKHACC), I learnt that much of the work of the alliance was concerned with the harmful effects of air pollution. At the same time, I realised that despite being an editor at *The BMJ* for 25 years and working on non-communicable disease for eight years I knew remarkably little about air pollution. I wrote an article about “waking up” to air pollution, and recently I read that a “Cancer breakthrough is a ‘wake-up’ call on danger of air pollution.” My failure, I now recognise, is a wider failure of medicine. Why have we needed to be “woken up?”

Think of the tens of thousands of consultations that take place every day with patients with respiratory problems. Every one of those patients will be asked about smoking, but few will be asked about air pollution. The failure has, I hypothesise, two causes: doctors don't know as much about air pollution as they do about the harms of smoking; and they think that people can't do anything about air

pollution, or the air they breathe. Both causes are remediable.

The breakthrough—or development, as I prefer to call it—is evidence on how air pollution may cause lung cancer. We have long known it causes lung cancer, including in those who have never smoked. The new evidence is that PM_{2.5} (fine particulate matter found in polluted air), rather than causing mutations in cells that lead to cancer, switches on mutations already present. This mechanism may be important in other cancers with carcinogens other than air pollution. The findings were presented recently in Paris at the conference of the European Society for Medical Oncology.

Largely ignored

The new finding is “a wake-up call on the impact of pollution on human health,” said Charles Swanton, a professor from the Francis Crick Institute in London and one of the authors of the finding. Swanton went on to suggest what has kept doctors asleep about air pollution: “Air pollution is associated with lung cancer,



Australian Aboriginals are right, health of land and people are indivisible

but people have largely ignored it because the mechanisms behind it were unclear.” This seems implausible to me: medicine is full of diseases and treatments where we don't know the mechanism, but they are not ignored.

The BBC journalist reporting the story writes, “The idea of taking a cancer-blocking pill if you live in a heavily polluted area is not completely fanciful.” The pill will be many years off (and may never appear at all), but to start dosing people rather than lowering the lethal levels of air pollution seems to be completely the wrong response. Having written that, I reflect that every day I take a preventive polypill to reduce my blood pressure and risk of cardiovascular disease, and if I lived the life of an indigenous person in the South Seas I would not need such a pill. But, then again, reversing air pollution should be easier than reversing centuries of “development” (a word I can't use comfortably).

ACUTE PERSPECTIVE David Oliver

No wonder training grade doctors are unhappy



Being a junior doctor has never been an easy gig. When I started I worked for nine years in 10 hospitals in seven towns, never staying in one place longer than a year. We did brutal “1 in 3” and “1 in 4” rotas, including 36 or 80 hour continuous on-call shifts. We got only a third of the base pay rate for each hour over the first 40. Just as now, we had professional exams but, worse, the lack of run-through training or matched training numbers meant we could get stuck at one grade waiting for jobs—not least consultant jobs with ridiculous competition.

We often received little induction, structured supervision, or appraisal and pastoral support. Any talk about wellbeing was patchy, in what was quite a macho “get on with it” culture, and teaching styles often bordered on bullying. I get fed up hearing how much easier it was back then, from people who weren't there. However, I wouldn't for a moment trade with younger doctors now. I can only empathise with their unhappiness.

I'll happily defend the importance of rotational training to expose trainees to a

range of clinical settings and hospital types. And I completely support increased emphasis on early experience of generalism—after all, modern day patients in most disciplines have multiple conditions requiring broad skills in managing comorbidities.

But there are many reasons why the current set-up is causing such unrest. For a start, students are finishing university with tens of thousands of pounds of debt. My generation had free university education, with student grants for living expenses. Second, the professional exams doctors must take cost hundreds of pounds. These often have high failure rates and are disproportionately expensive for international graduates. Portfolios for appraisal also cost hundreds, as do courses that doctors feel obliged to take to get through exams and to bolster their applications for training rotations. Remember, these are young people working in a national public service that relies heavily on their labour, yet they pay through the nose for the privilege.

The current cost of living crisis means that the standard of living an early career doctor



BARRY JONES/ALAMY

To be fair to Swanton he said, “You cannot ignore climate health. If you want to address human health, you have to address climate health first.” Unfortunately, we have not followed his advice, but he is right. In the West we start from the health of the individual, failing to recognise, as Australian Aboriginals knew, that the health of the land and the people are indivisible. You cannot have healthy people in a sick planet. Health is as much about the planet, places, communities, and relationships as it is about our internal organs.

Let me return to why medicine has neglected the importance of clean air when we long ago recognised the importance of clean water. One reason might be scientific. Richard Doll told me that when looking for the cause of the epidemic of lung cancer he and his colleagues first suspected it was air pollution. If they had done a larger case-control study and looked more at those who had developed cancer when they didn’t smoke, they might have detected the importance of air pollution. It might then have held a place alongside tobacco.

We probably recognised the importance of clean water because polluted water can have immediate, dramatic, and lethal effects. Polluted air takes longer to cause harm, and humans seem programmed to focus on the short, not the long term. Perhaps as well the discrediting of the miasma theory of cholera diverted attention from the importance of clean air.

Roots of neglect

The usual invisibility of current air pollution must contribute to us failing to give it the attention it deserves, but the roots of medicine’s neglect of air pollution must lie with the intertwined factors of the feeling that there is nothing doctors can do about air pollution and failures of education of doctors.

There is advice that doctors can offer to individuals—recognising the importance of polluted air, reducing internal pollution in the home, accessing information on local air pollution, changing travel routes, avoiding particularly poisonous days, and perhaps even contributing to lessening the problem by driving less or not at all—but the needed response is political action at a local, national, and global level. Why not advise patients to write to their MPs and local council calling for action? That makes many doctors feel uncomfortable, but any MPs and local councils will welcome the messages, giving them ammunition to counteract the motoring lobby and other sources of pollution. Unfortunately,

we have trained doctors to feel comfortable with individuals and uncomfortable working on a larger stage, failing to recognise the wider determinants of health.

Rosamund Kissi-Debrah, whose daughter Ella was the first person in the world to have air pollution written on her death certificate despite air pollution killing some seven million people a year globally, recognises the failure in responses to this huge problem. Kissi-Debrah has become a very effective campaigner on air pollution and she sees a “lack of joined-up thinking . . . You can pump all the money you want into the NHS, but unless you clear up the air, more and more people will become ill . . . My concern regarding global health is that every year we churn out the figures—air pollution causes nine million premature deaths—but no one is held accountable.”

We need now a major educational effort with the public, all health professionals, and politicians. Attention to air pollution has picked up dramatically in recent years, but it’s still not a priority for most politicians (although it is for Sadiq Khan, mayor of London). As I recently heard Chris Whitty, chief medical officer for England, say, politicians mostly follow the public rather than vice versa, so think what you can do today to educate yourself and others about air pollution.

Richard Smith, chair, UK Health Alliance on Climate Change

Cite this as: *BMJ* 2022;378:o2214

could afford back in the 1980s and ’90s is unattainable. Many of my peers were able to buy our first property in our 20s, on a senior house officer’s salary, and to have a few decent holidays a year. It’s hard for trainees not to look at conditions in other health services or in other sectors where they could use their skills.

When I was a junior doctor we generally had basic accommodation on hospital grounds or perimeter roads that was free or had token rent. We could park our cars without being charged. And because we hadn’t yet moved to a shift system, despite the hours of full on-call rotas we at least stayed with our own team, week in, week out, with a traditional “firm” structure.

Now teams are fragmented, and it’s possible for someone not to be with their own ward team and supervising consultant for weeks, with the demands of on-call rotas, night shifts, and cross cover. Trainees are also endlessly pressured to fill gaps by rota coordinators. Persistent understaffing begets further disengagement.

We have inflexibility over leave, little advance notice of rotas, and a load of guff about

“resilience.” Of course, resilience is important for dealing with the timeless stresses of medical practice, but it shouldn’t be a smokescreen for short staffing and an unmanageable workload. Staff often have insufficient rest areas, no access to food and drink, and nowhere to park a bike or to shower after riding to work to avoid parking fines. After real terms pay cuts of around 25% for junior doctors since 2008, the final insult is an offer of a 2% rise after two years of practising medicine in a pandemic.

Finally, trainees look to their seniors. Back in the day, at least they knew that after a decade of postgraduate training they could look forward to professional autonomy and security, retirement at 60 on a generous final salary pension, and less time spent on site, out of

hours. They now look at their often demoralised and tired seniors and think, “If this is the pot of gold at the end of the rainbow, is it something I really want?”

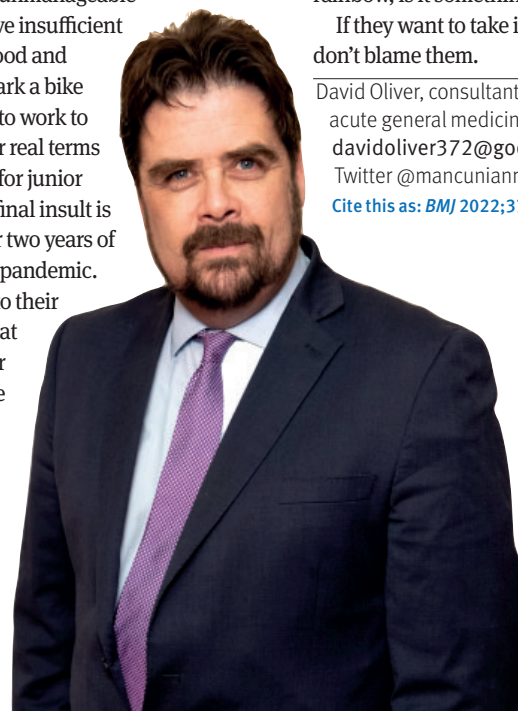
If they want to take industrial action, I don’t blame them.

David Oliver, consultant in geriatrics and acute general medicine, Berkshire
davidoliver372@googlemail.com

Twitter @mancurianmedic

Cite this as: *BMJ* 2022;378:o2245

I wouldn’t for a moment trade with younger doctors now



Bank holiday blues

Bank holidays are always a bit of a headache in general practice. The demand from patients doesn't go down but is, instead, squeezed into fewer days of the week. Most bank holidays fall on a Monday, and each organisation will have devised its own rules to try to ensure fairness—otherwise, someone who doesn't normally work on that day will miss their extra holiday and feel hard done by.

GPs are used to organising our way around expected holidays, but having one sprung on us at a week's notice is a new challenge that has caused much grief to the GP community. There doesn't seem to have been any national plan, and it was left to each practice to decide individually whether or not to open. We were probably in a lose-lose situation: if we closed we would have been portrayed (again) as lazy; if we remained open we would have been accused of lacking respect.

Some practices book all their appointments on the day they take place, so although they would now face a lot of extra demand on Tuesday, they had no need to cancel booked patients. Emergencies were diverted to the out-of-hours service (which also had to find staff for an extra day at short notice). Other practices mostly work with pre-booked appointments, and they therefore had a harder choice to make. For some there was no

option: although we were advised that there was no statutory entitlement to time off and that this was “a matter for discussion between individuals and their employer,” this is not much help when a large number of your doctors, nurses, and reception staff have young children and the schools are suddenly closed.

In our practice, we opted to close to on-the-day emergencies but to keep our booked appointments, as this was what the doctors and nurse concerned were happy to do. Some patients have already waited as long as two weeks to see their GP, and it seemed unfair to cancel and rebook. We were surprised that only one patient chose to postpone.

Will patients be harmed by this bank holiday? It seems inevitable that some will go longer without the treatment they need, and some will have a delay in the diagnosis of a serious condition. In hospitals, operation lists and clinics have been cancelled, adding to the huge backlog of work for the NHS.

At a time when we have 6.8 million people in the UK waiting for treatment, perhaps whoever made this decision believed that losing another day's worth of work wouldn't really make a difference. But the patients whose appointments have been cancelled may feel otherwise.

Helen Salisbury, GP, Oxford
helen.salisbury@phc.ox.ac.uk
Twitter @HelenRSalisbury
Cite this as: *BMJ* 2022;378:o2262

Having a holiday sprung on us at a week's notice caused much grief to the GP community



LATEST PODCAST



Doctor Informed: What to expect from an inquest

The prospect of coroner's court and an inquest will alarm many doctors, but this latest episode of the Doctor Informed podcast hears how they are often not as bad as many fear. Beth Walker, a former palliative care registrar who now works as an adviser for the Medical Protection Society, joins the podcast to explain the purpose of the court, dispel any myths, and offer advice on getting through the process without panicking.

“What the coroner needs to do is answer four questions and the first three are relatively straightforward. These are who is the deceased, when did they die, and where did they die? But it's the fourth question that for almost all inquests is the main thing, which is how did this patient come by their death? That's not simply saying a myocardial infarction, it's about the run up to their death and anything that might have been relevant or played a part. The care that they received before death would all come under this fourth question.

“The witnesses' answers are directed to the coroner, and the coroner will always ask questions first, and then the barristers of other interested persons can ask questions afterwards of each witness, but it's not a free-for-all. It's very controlled. The coroner is there to answer these four specific questions so if they think that the questions are going beyond that remit, then they will step in. They're very sensitive to the fact that this may be the first and only time that the bereaved family will have an opportunity to ask some of the questions they need to really understand what happened so they may give them a little bit more leeway. Yet, equally, they will step in. I want to reassure anyone listening that it is totally different from any type of court that you've seen on TV or film.”



Listen and subscribe to *The BMJ* podcast on Apple Podcasts, Spotify, and other major podcast apps

Edited by Kelly Brendel, deputy digital content editor, *The BMJ*

Role of mathematical modelling in future pandemic response policy

Christina Pagel and Christian Yates consider what the pandemic has taught us about mathematical modelling in the UK and how it can be used more effectively

Mathematical modelling underpinned much of the advice that the Scientific Advisory Group for Emergencies (SAGE) and others provided to the UK government during the pandemic. Much of the modelling came from the Scientific Pandemic Influenza Group on Modelling (SPI-M), which gives expert advice to the Department of Health and Social Care and the wider UK government on emerging human infectious disease threats. Its members come from a range of UK institutions and their advice is based on infectious disease modelling and epidemiology.²

Modelling from the group has been influential throughout the pandemic, particularly during the first 18 months. For instance, “report 9” by the Imperial College modelling group³ was an important trigger for the UK government’s decision to implement a nationwide lockdown in March 2020. Projections from multiple independent modelling teams also informed the UK’s “roadmap” for release from lockdown in February 2021⁴ and implementation of some further public health mandates under “plan B” measures in December 2021 during the first omicron wave.⁵ Modelling determined the vaccine priority groups in December 2020,⁶ which contributed to the UK’s successful vaccine rollout and consequently saved thousands of lives over the first half of 2021. SPI-M’s work has also been important in evaluating the relative effect of different interventions.

Throughout the pandemic, official modelling efforts have been criticised from many different quarters. Some of that criticism has been understandable—a result of highly publicised projections that never came to pass. Some missteps derived directly from failures of the modelling process to capture reality—use of inaccurate model parameters because of uncertain data; misunderstanding or misinterpretation of the key features of the situations being modelled; and the intrinsic inability of most models to capture important facets of human behaviour. However, much of the criticism modellers have received has been misplaced, a result of fundamental misunderstandings of the purpose of mathematical modelling, what it is capable of, and how its results should be interpreted. These misunderstandings result, in part, from failures in communication.

KEY MESSAGES

- Mathematical modelling is intrinsically difficult given the complexity of relationships between parameters and difficulty quantifying those parameters
- Modelling needs input from a much wider range of sources including domain experts
- Data sharing and communication of results could be improved
- Policy makers and the public often had poor understanding of key concepts such as exponential growth and the limitations of long-term forecasting

Any modelling comes with various uncertainties and assumptions that need to be thought through, examined, and explained

In considering the role of modelling during the pandemic response, the UK covid inquiry needs to consider whether it was based on the right information and how the results were used and communicated. The inquiry might also like to consider whether and how economic modelling could have been part of the SAGE remit.

How mathematical modelling informs policy

Mathematical modelling provides a framework in which we can formalise our assumptions about the processes we are trying to capture (eg, disease spread and impact), build them into a simplified representation of reality, and simulate forward in time to suggest what might happen in the future under different policy options.^{22,23} Modelling is also extremely useful in understanding the underlying situation when we have incomplete or missing data,^{24,25} and can shed light on what has happened in the past when the picture is murky, such as the effect of different public health mitigations.²⁴

Epidemiological modelling is more akin to science than to pure mathematics. The process involves iteratively building models, making predictions, comparing these predictions to observations, and then refining the models. Through this repetitive process modellers can build accurate, detailed, and robust representations of reality, which can then be used to speculate about what will happen in hitherto unseen scenarios. Most applications of mathematical modelling allow for many repeats of this cycle over periods of weeks, months, or even years. By contrast, synthesising appropriate data to populate and fine tune models in real time during a pandemic is an almost unique challenge in applied mathematics.²

Any modelling comes with various uncertainties and assumptions that need to be thought through, examined, and explained.²⁶ Substantial errors in any area can derail the usefulness of the model, and, if not understood and recognised, cause harm. In the context of a rapidly evolving pandemic this is even more important. Good mathematical modelling must be transparent about all the sources of uncertainty (table) and provide sufficient detail to outsiders (including policy makers) to assess the model outputs.

SPI-M modelling during the pandemic has been admirably transparent about key assumptions and parameter estimates and has typically encompassed a range of scenarios. The models have incorporated inherent variability and highlighted many of the problems associated with unknown future events. Structural details of the SPI-M modelling are usually available in academic papers. Nonetheless, this transparency has not been sufficient to prevent mistakes or criticism. What then are the key questions around the role of modelling that the public inquiry should address?

Expert input was sometimes too narrow

As described above, model building is iterative. The structure of the model and its input parameters are continuously refined in light of the latest evidence and understanding about the dynamics of the disease and its spread. Perhaps the biggest threat to the usefulness of the models is when important information or knowledge relating to the dynamics is held by experts who are not connected to the modelling community, including the public.²⁷ The modelling related to care homes during the covid-19 pandemic represents perhaps the most important cautionary tale.

Older and sicker populations were known early on to be at much higher risk of severe illness and death from covid-19. Modellers on SPI-M quickly understood that elderly people, and particularly those in care homes, were at high risk should they catch coronavirus. The need for protection of care home residents was also well appreciated, yet surprisingly the words “care homes” appear only twice in SAGE minutes during the first five months of the pandemic.²⁸ Modellers were given access to the excellent hospital surveillance dataset at the start of the pandemic,²⁹ but there was poor understanding of some of the important factors required for models to appropriately represent social care settings and thereby protect care homes. Experts on the care sector identified the intersecting factors of an extremely vulnerable population living in shared accommodation, frequent contact with friends and relatives in the community, the discharge of potentially sick patients from hospitals, the lack of personal protective equipment, and low paid staff as particular system vulnerabilities. Many of these issues, however, did not seem to be anticipated or explicitly taken into account by the modellers.

Although mathematical modellers could not be expected to have a prior understanding of the details of the social care sector, they should have realised that they might be unaware of important factors and needed to seek relevant expertise. Once the vulnerability of care homes became clearer to modellers, their specific features were successfully incorporated into models which then (albeit with hindsight) highlighted the high numbers of deaths if mitigations were not adequate.^{30 31}

Modelling subgroups convened by government should draw on as much diverse expertise as possible. Learning could be drawn from published literature on interdisciplinary working³⁴ in disaster response³⁵⁻³⁷ and adapted to the UK situation. The mechanisms for ensuring interdisciplinary working must be in place and documented before a pandemic hits and should be agnostic to the nature of the pandemic or to the personal experience and networks of lead experts at the time.

The modelling related to care homes during the pandemic represents perhaps the most important cautionary tale

Wider data sharing

The information used to build, refine, and characterise models of infectious disease might include raw data on the spread of the disease (numbers of cases, hospital admissions, deaths, etc), data on the parameters that feed into models (transmissibility, severity, incubation period, etc), assumptions underlying model structure (is there a long pre-infectious “exposed period”, etc), and the outputs of models (predictions of case numbers, hospital admission, etc). Retrospectively, some SPI-M members identified a problem with data accessibility (particularly for raw data and parameters). Some groups had access to better quality data that were not shared with all modelling groups. And initially, there was only limited data sharing across countries, reducing the learning possible from others’ earlier experience. The importance of international data sharing has been shown repeatedly. A good example is the dissemination of genomic data on new SARS-CoV-2 variants through the Global Initiative on Sharing Avian Influenza Data (GISAID).³⁹

The initial lack of data sharing could have contributed to mistakes made early on in the pandemic. In March 2020, for example, SPI-M overestimated the doubling time of the UK epidemic. Although some of the modelling groups were generating more accurate values, the overestimate of 5-7 days was given to SAGE.⁴⁰ The true doubling time was more likely to be around three days (as estimated in minutes from 25 March 2020, a week later).⁴¹ As a result, Patrick Vallance, the chief scientific adviser, would claim we were “maybe four weeks or so behind [Italy] in terms of the scale of the outbreak” when in fact the UK was more like two weeks behind.^{42 43} This may have contributed to the UK’s significant delay in taking measures to suppress the pandemic.⁴⁴

SPI-M has since instituted more robust methods of model averaging. These were used, for example, to come up with consensus views on estimates of the reproduction number and growth rates of the disease. However, it is not clear that problems with sharing of other data sources required to construct effective models have been resolved (for instance individual level data on infections, hospital admissions, and deaths; international data).

Sources of uncertainty that affect accuracy of modelling scenarios

Features of epidemiological models		Features of real life	
Model structure	Model parameters	Inherent randomness	Context fundamentally changes
<p>Does the model accurately capture key dynamics of disease spread? For example:</p> <ul style="list-style-type: none"> • Age differences • Regional differences • Vaccination differences • Hospital, school, and care home spread • Symptomatic and asymptomatic spread • Incubation period <p>How well does the model capture public behaviour?</p> <ul style="list-style-type: none"> • Current models typically do not do this well. The impact of interventions is often incorporated as a blanket reduction in exposure 	<p>Estimates of things that are measurable but uncertain, particularly early in pandemic or with new variant, eg</p> <ul style="list-style-type: none"> • Transmissibility, severity, likelihood of showing symptoms • Effectiveness of vaccines in preventing infection and severe illness <p>Elements that are inherently uncertain, eg</p> <ul style="list-style-type: none"> • Effectiveness of interventions (eg, masks, working from home, social distancing) • Public behaviour over and above public health measures (eg, cancelling plans, reducing contacts) 	<p>Even if a model has perfect structure and parameters the future is not determined. For instance, a chance event might lead to a superspreading event or no onward infections. At a larger scale, unexpected events (weather disasters, political protests, etc) might create conditions for a superspreading event accelerating spread or, conversely, reduce transmission.</p> <p>Teams normally deal with this uncertainty by running stochastic models thousands of times and reporting the central outcome and the range of possible outcomes seen in different realisations.</p>	<p>Slightly different from inherent randomness, is if the situation fundamentally changes over the timescale of prediction.</p> <p>For instance, projections are run for six months with best current knowledge, but a new variant emerges and spreads, or new policy is brought in or measures are dropped. Any such event that fundamentally changes the context of the disease will render previous predictions invalid.</p> <p>Modellers try to deal with this (and uncertainties within the model) by considering various scenarios (different policies, different variants, different behaviour), but reality often does something different again.</p>

QUESTIONS FOR THE PUBLIC INQUIRY

- How can we ensure all the right disciplines and perspectives are included in the modelling efforts?
- How can data be generated and shared within and between modelling groups to sustain a more egalitarian and robust modelling environment?
- Would better public communication of modelling processes and underlying assumptions improve usefulness, and how can this communication be resourced?
- How helpful were pandemic projections looking a year or more ahead?

Communicating the modelling

Open and clear communication of the outputs of disease transmission models (and the entire modelling process) is vital to support policy decisions and increase the public's understanding of, and desire to abide by, rules that are informed by such models. This does not necessarily mean that modellers should advocate for specific policies, but they do need to explain what the models can and can't be used for, and why. Some SPI-M scientists recognised the importance of public communication but understandably said that they did not have the time to engage fully, given that their energies were devoted to refining and running models.³³

As a simple example, poor public understanding of exponential growth has been shown to hinder implementation of effective strategies to control infectious disease.⁴⁸ People who find it hard to accurately estimate the speed of disease spread also find it difficult to see the importance of disease control mitigations and are less likely to implement or observe them.

Pandemic policy making differs from normal time policy making in several ways. Firstly, the need for rapid action leaves less time for a proper assessment of the available evidence, adding uncertainty to the modelling and making it hard to communicate the nuances behind modelling results to policy makers. Conversely, the high visibility of much of the scientific evidence during the covid pandemic may have meant policy makers felt under increased public scrutiny and therefore under greater pressure to make evidence based decisions.

Another challenge is that the lack of context surrounding model results means they are open to misinterpretation by the media or exploitation. Good modelling practice is to present a range of scenarios for different combinations of parameter values, including reasonable worst case scenarios. These worst case scenarios often generate the most startling projections and consequently capture the news headlines. This can lead to accusations of doom mongering and distrust in future model predictions when these scenarios do not then play out in reality.

A third problem arising from inadequate communication surrounding official modelling is that it leaves a media vacuum, which will necessarily be filled by other academic or amateur modelling efforts. For example, just over a week after the Imperial College modelling group published report 9, a group of modellers at the University of Oxford set out their results in a preprint.⁵⁰ Using a simplistic model, they proposed that the UK's epidemic has "already led to the accumulation of significant levels of herd immunity." The article was distributed to the media through a commercial public relations company.

As a result of their successful media strategy, the "Oxford model" was presented with the same credibility as the Imperial model,⁵¹ despite the modelling being of very different quality. Although many scientists openly challenged the headline results from the Oxford model,⁵² their voices were largely drowned out in the media furor.

The media coverage catapulted the authors to a prominent position from which they were able to influence government policy.⁵³

Communication of modelling is challenging at the best of times and made harder in a pandemic. But this does not mean modellers should not try. Ideally, the authoritative voice on the work should come from the modellers themselves. We need to train modellers to convey the nuances of the model results and their assumptions to a general audience—for example by producing lay summaries that they or well briefed intermediaries, such as experts from the UK Health Security Agency or Royal Society of Public Health, can use to engage with journalists to reduce the chances of misrepresentation. This additional work of communication must be adequately resourced. Decision makers should also receive basic training in how mathematical models inform policy, what questions to ask of modellers, and what the potential pitfalls are.

Finally, in order to sustain trust, modelling undertaken for the government should be made publicly available as soon as possible so that the results and the underlying assumptions of the models can be appropriately scrutinised. Modellers should not also feel restricted to model only those scenarios suggested to them by the government. Even if models are communicated perfectly, their use by other parties is not wholly (or often even largely) within the modellers' control.

Risks of projecting too far ahead

Many SPI-M projections extended for four to six months⁵⁴ and some for a year ahead or more.⁵⁵ Fundamental shifts in the dynamics of the pandemic within that timeframe can render the projections redundant, as we have seen several times with the emergence of new variants or changes in government policy. For instance, the projections in February 2021 that went up to April 2022, assumed no new variants and no vaccine waning.⁵⁵ In fact, four new dominant variants have arisen since then (delta and omicron sub variants BA.1, BA.2 and BA.4/5) and vaccine waning has been an important factor.

The problem in presenting projections over such a long timeframe is that they can instil a false sense of certainty. Moving to a shorter timeframe of about four months would avoid this and might encourage policy makers to incorporate more uncertainty and anticipated reassessments into their plans and communication.

Other disciplines such as operational research or financial risk management have established methods that can incorporate the risk of rare, but potentially momentous events into decision making (eg, conditional value at risk strategies⁵⁶). Another approach would be to incorporate these into the long term modelling framework.

Conclusions

Modelling has undoubtedly provided valuable input into the policies designed to tackle coronavirus, including the March 2020 lockdown. On the other hand, government has sometimes ignored modelling projections, such as when it decided not to impose stricter measures in September 2020, despite SAGE's suggestions that doing so could halt the early exponential growth in cases.⁵⁷ With better communication, more openness to dialogue with other communities, and improved data sharing, epidemiological modelling could more successfully support the UK response to this and future pandemics.

Christina Pagel, professor of operational research, Clinical Operational Research Unit, University College London c.pagel@ucl.ac.uk

Christian A Yates, senior lecturer in mathematical biology, University of Bath

Cite this as: *BMJ* 2022;378:e070615

Saved bed days: the ultimate currency

The NHS's single minded pursuit of admission avoidance risks ignoring other important outcomes

Reducing hospital bed days is currently the ultimate currency in healthcare. Large amounts of money seem to increasingly be diverted from tried and tested workforces into new services, new jobs, and new technology to prevent patients being admitted to hospital. Some of these ideas could work well, while others have the potential to be a catastrophe, but what unites them all is a focus on a single outcome: saving bed days in the acute hospital.

In my research, I've been modelling the work of district nurses. Everyone knows that we don't have enough of them, with England losing just under 50% from 2010 to 2017. The research has thrown up some interesting incidental findings, particularly how a plethora of new community services have increased these nurses' workload.

I started to dig into one new service that seems to be creating extra work for community teams: virtual wards. In some places, these have been established for a number of years and offer a short term alternative to a hospital bed. Like many good ideas, virtual wards have been scaled up owing to covid using a variety of approaches.

Looking at the often cited local work justifying the implementation of virtual wards, the primary outcome they assess is mostly saved bed days. Other research takes a more considered look, primarily by evaluating clinical outcomes, with a secondary outcome of saved bed days, but also by describing more comprehensive models of care. These types of services include the resourcing of community specialists and use of the multidisciplinary team. None of the papers I've reviewed looked at the impact of introducing these new services on the existing workforce, particularly when new admission avoidance services draw resources from already overstretched community workforces.

I was contacted recently by a community nursing team who, in addition to their normal caseload of



LUCAS BARIOLLE/TAFF/GETTY IMAGES

Is good quality care possible in the community if the infrastructure to provide it is not there?

people needing nursing and end of life care in the community, were now expected to support urgent response, a discharge to assess service, virtual wards, frailty teams, and direct referrals from the ambulance service for lower category calls. They were also expected to respond to the alerts of the more recently deployed and much lauded digital monitoring in places such as care homes or virtual wards, which often do not offer 24/7 provision.

Light on evidence and resources

Many of these initiatives seem light on detail, evidence, and resources, and other similarly motivated ideas are still being put forward. At the start of this year, for example, Sajid Javid, England's then secretary of state for health and social care, announced plans to nationalise general practice with the aim of reducing the use of hospital beds but did not say how. It's a common thread.

Admission avoidance is not in itself a bad thing. If people want to stay at home and the services are available in the community, then it seems like a win-win. The question is, is good quality care still possible in the community if the infrastructure to provide it is not there? Anecdotally, the provision of services often seems patchy at best. We have seen through our modelling work how new services where the needs of patients are poorly understood can increase workloads for existing workers and have unintended consequences in terms of risk, for example, by spreading an already stretched workforce even

more thinly, leaving important clinical work undone.

The scaling up of virtual wards is not the first time an innovation has been launched on the NHS without a workforce impact assessment. Indeed, neglecting to do one seems to be the norm. Unremitting demand for hospital care inevitably makes people look for fast solutions. A workforce crisis, austerity, and the pandemic have not been kind to the NHS or social care, with workers under extreme pressure. However, adding to their workload by starting up partially resourced services without fully understanding their impact or purpose is likely only to add to that burden.

A workforce model that values volume of provision over managing complexity or, rather, most hands for least money, has seen frontline expertise leak from the system as healthcare professionals become dissatisfied. As a researcher, I have undertaken numerous evaluations of projects or services where the desired outcome was admission avoidance—and, to a lesser extent, safety, quality, or a satisfied workforce. In the NHS, success is measured by the efficient use of resources, instead of patient outcomes or staff experience. It's the result of classical general management thinking, which was introduced in the 1980s along with the internal market. While other sectors have cottoned on to its limitations, such as the lack of humanistic workforce planning and a focus on process instead of outcomes, those who make healthcare policy decisions have yet to shift their thinking.

Health and social care need to modernise and to become more humanistic in their policies and their approach to the workforce. Implementing large scale change without considering how it may affect staff is not feasible if we want to improve retention. The NHS needs a workforce equipped to recover from the pandemic and respond to the challenges of caring for a 21st century population, not more management thinking from the 1980s.

Alison Leary, professor of healthcare and workforce modelling, London South Bank University
Cite this as: *BMJ* 2022;378:o1686

LETTERS Selected from rapid responses on bmj.com

LETTER OF THE WEEK

Monkeypox: patients, clinicians, and the need for shared responsibility



Patel and colleagues show that monkeypox can cause severe symptoms, especially among patients living with HIV (Research, 20-27 August). The images of the lesions reproduced in the article are disturbing but necessary to understand fully the severity of the disease, which is often described as typically causing mild symptoms.

This article was made possible by the participation of patients who consented to their clinical information being published. These patients understand the shared responsibility to help patients and healthcare workers stop the spread of monkeypox. A new ethic is a necessary condition to explain risks to the public and equip vulnerable groups with the tools they need to make healthier choices.

The history of HIV/AIDS is marked by numerous mistakes, but it also featured a highly effective alliance around public health matters, including the development of an extensive network of support between patients and activists and the doctors and nurses providing care.

Monkeypox demands that we face some salient choices which cannot be reduced to merely ensuring a vaccine. Other challenges include treatment access, information, and healthcare quality. Incorporating patients' perspectives can refine and improve policy makers' and clinicians' responsiveness to, and effectiveness in dealing with, the challenge that monkeypox represents.

Medical professionals' collaboration with patients is a fruitful way to accomplish public health messaging given the many layers of interconnectedness and negotiated social meanings; these are seldom captured by traditional quantitative methods or in clinician-patient relationships. This shared responsibility should be central to future initiatives.

In a paradigm where public health is driven by cost-benefit analysis and systematic review of policies, policy makers, care givers, and funding institutions should encourage the development of approaches based on collaborative work between patients and medical professionals. A shared responsibility is an opportunity for effective public health messaging and communication to educate, vaccinate, and protect.

Marco Scalvini, lecturer, University of London

Cite this as: [BMJ 2022;378:o2221](#)

LACK OF ABORTION RIGHTS IN THE UK

Destigmatise sexual healthcare

Clare Murphy of the British Pregnancy Advisory Service notes that "decriminalisation is not enough if you don't have the healthcare services" (Abortion Rights, 20-27 August).

These healthcare services extend to contraception. The 1967 Family Planning Act might have decriminalised contraception regardless of marital status, but, given that a fifth of the population is not satisfied with their contraceptive provision, we have not optimised services.

Before the pandemic, a survey of providers found that 63% of respondents were having to turn patients away because demand outstripped services. With over half of sexual health services closed for some time during the pandemic, the challenge of meeting demand is unlikely to have improved, and sexual health services provide 38% of contraception services.

If we want to improve access to abortion, we must continue to work to destigmatise all of sexual healthcare and remember that abortion and contraception are not "women's healthcare." They are simply healthcare.

Holly Harrison-Reid, non-trainee grade junior doctor, Manchester

Cite this as: [BMJ 2022;378:o2204](#)

REGULATION OF NON-SURGICAL COSMETIC PROCEDURES

Profit over public health

Jeremy Hunt's committee has recommended a licensing regime for non-surgical cosmetic procedures in the light of an unacceptably high rate of complications after treatments by non-medical practitioners (This Week, 6-13 August).

Nothing has changed in this area of bad practice, and Hunt is not optimistic that legislation will become a government priority. One important reason for this longstanding inaction has been overlooked: government finance. Most non-surgical procedures carried out by doctors and nurses do not attract VAT when a medical diagnosis has been reached before treatment—this does not apply to non-medical practitioners who cannot claim to be offering medical treatments. This is much like the government's failure to implement recommendations for the obesity pandemic—standing up to the food and drinks industry would also have seriously dented government revenue.

So long as the government prioritises profit over public health, the health and wellbeing of the nation will always be compromised.

Samantha J Robson, medical director, Temple Clinic, Aberdeen

Cite this as: [BMJ 2022;378:o2191](#)

THE BMJ AND UNSUBSTANTIATED PRESS RELEASES

Decision to stop reporting possible misinformation is valid

The BMJ's decision to stop reporting on unsubstantiated press releases is important as it pre-empts government excuses for not exercising control over the press on the specious ground of public order (Editor's Choice, 30 July).

This initiative will be tested by the evolving international public health emergency of monkeypox, given that WHO recognised a "massive infodemic" during the covid-19 pandemic. This bred fake news and conspiracy theories, largely harmless but sometimes life threatening.

Efforts have been made to educate the public and caution them against misinformation, which has the following features: vague sources; poor spelling, grammar, punctuation, and use of language; messages that trigger strong emotions; reported by only one source; fake media accounts; requests for the reader to share the information.

Readers must think about who stands to gain from people believing extraordinary claims, and should consult fact checking websites to see if the claim had already been debunked.

Lakhiram Murmu, medical superintendent; Sushimta Murmu, assistant professor psychiatry, Faridabad

Cite this as: [BMJ 2022;378:o2131](#)

OBITUARIES

Sara Baxter

Consultant anaesthetist
South Tees Hospitals
NHS Foundation Trust
(b 1962; q St Mary's
Hospital Medical School,
London, 1986; FRCA), died
in June 2022. The date and
cause of death are subject
to an inquest



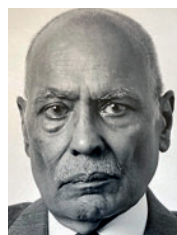
Sara Baxter started her anaesthetic training in 1991. She worked in London, Sussex, and the West Midlands and returned to Middlesbrough in 2000 to take up her consultant post at what later became the James Cook University Hospital. She was an intensive care consultant until 2006, before moving full time to anaesthetics. Sara was forever buying cakes for her colleagues, and bought fancy theatre hats, personalised scrubs, or mugs as gifts for them, purely for the enjoyment of giving. Afflicted by bipolar disorder for many years, she leaves her mother, Patty; two brothers and their families; an uncle and his wife; and cousins.

Marianne Horsley

Cite this as: [BMJ 2022;378:o2168](#)

Rajindra Singh Gill

GP (b 1934; q King George
Medical College, Lucknow,
India, 1958; DObst RCOG),
died from pneumonia on
18 December 2021



Rajindra Singh Gill ("Raj") was a much loved general practitioner working in Nuneaton for over 45 years. Born in Lahore, Raj was the first doctor in his family. As a young doctor, he met his future wife, Kuljit, shortly after she qualified in medicine. They moved to the UK in 1961. Raj worked in several junior doctor roles across the country—from the Isle of Wight to Durham. He chose not to pursue a hospital career. Instead, Raj and Kuljit decided to settle into life in general practice in 1968. They built a state of the art general practice in Nuneaton and were stalwarts of the local and medical community. Predeceased by Kuljit in 2006, Raj leaves a son and a daughter.

Tina Gill, Narjit Gill, Angela Bhan

Cite this as: [BMJ 2022;378:o1830](#)

Finian Peter Houlihan

Consultant otologist
(b 1942; q University
College Dublin, Ireland,
1967), died from
complications of peripheral
vascular disease and
carcinoma of the prostate
on 1 January 2022



Finian Peter Houlihan ("Fin") spent his intern year at Ardkeen Hospital in Waterford and completed a bachelors degree in anthropology and anatomy. His surgical training continued in Dublin and Belfast. Fin returned to Waterford (initially as a consultant to the glass factory), while developing a broad ear, nose, and throat medical practice. He spent a year at Stanford and undertook posts in Bahrain and Saudi Arabia before applying for a consultant job in Torquay. He continued running his busy clinical practice into his early 70s. Predeceased by his wife, Ada, only a few months previously, he leaves four children, three daughters in law, and two brothers and their families.

Christian Potter

Cite this as: [BMJ 2022;378:o2169](#)

John Sydney Jenkins

Professor of clinical
endocrinology (b 1923;
q Cambridge/London,
1948; MD, FRCP), died
from old age on 7 January
2022



John Sydney Jenkins was a junior doctor at the Brompton and St Bartholomew's hospitals. He completed research as a British Empire cancer fellow with George Thorn at Harvard and returned to St George's as consultant endocrinologist with a focus on the pituitary gland. His research interests revolved around vasopressin, with numerous publications. He was a longstanding editor of *Clinical Endocrinology* and president of the endocrinology section of the Royal Society of Medicine. He had a particular interest in music and wrote a book, *Mozart and the English Connection*, and several articles on the castrati. Predeceased by his wife, Shelagh, he died at home and leaves his brother; four children, two of whom are doctors; and six grandchildren, one of whom is a medical student.

Rachel Grace, Paul Jenkins

Cite this as: [BMJ 2022;378:o2170](#)

Alan Lee

Consultant psychiatrist
(b 1947; q Newcastle,
1976; MA Camb,
FRCPsych), died from a
cerebrovascular accident
on 23 June 2022



Alan Lee qualified in medicine by a circuitous route. Having obtained a scholarship to Cambridge in mathematics, he changed to philosophy and psychology and then became a probation officer in County Durham, before entering Newcastle medical school, where he qualified in 1976. After junior hospital appointments, he trained in psychiatry at the Maudsley Hospital, where he conducted a landmark long term study of depressive illness. He was editor of *Advances in Psychiatric Treatment* and a book editor of the *British Journal of Psychiatry*. He was an honorary senior lecturer at Nottingham Medical School and a postgraduate trainer and examiner. He was an honorary adviser to Samaritans and Nottingham Relate. Alan leaves his wife, Helen (née Meade), an adult psychodynamic psychotherapist and former nurse.

Helen Lee

Cite this as: [BMJ 2022;378:o2171](#)

Anthony Robin Maisey

GP (b 1945; q Liverpool,
1969; OStJ, MSc, DRCOG,
DCH, FRCGP), died from
sepsis and endocarditis on
18 August 2022



Anthony Robin Maisey ("Tony") was a GP held in high regard by colleagues and patients at the Cross Keys Practice, Princes Risborough. He completed an MSc in research and evaluation at Luton University, continued to teach juniors and the wider community, and was awarded the Schering award. He was lead partner for fundholding and chairman of the county fundholding group, and he helped the practice win the Innovations in Practice award and regional winner of the BMA organisational award. He was a non-executive director with Buckingham Health Authority, county surgeon and chief examiner for the St John Ambulance Brigade, and collaborative researcher with the public health resource unit in Oxford. Tony died peacefully at home and leaves his wife, Margaret; three children; and 10 grandchildren.

Peter Doyle

Cite this as: [BMJ 2022;378:o2172](#)

Colin Blakemore

Neuroscientist who explored the symbiotic relation between art and science

Colin Brian Blakemore (b 1944; graduated BMedSci, Cambridge, 1965; PhD, FRS, FMedSci, honFRCP, honFRSM, honFRSB, honFBPhS, MAE), died from motor neuron disease on 27 June 2022

Colin Blakemore made an outstanding contribution to understanding of vision and neural plasticity—how brain cells reorganise themselves in response to the environment after birth and even in adulthood.

Controversy

Blakemore was a prominent target for animal rights activists but vowed that he would not be silenced. He later insisted: “The consequences of bowing to the threat of violence were unthinkable.” Over 20 years his commitment was unwavering despite letter bombs, letters laced with razor blades, and death threats.

Public debate about animal research sometimes featured libels reprinted by some newspapers as if they were fact. In 1987 Blakemore became the first researcher to win redress over a libel from the Press Complaints Commission. He did not sue the *Sunday Mirror* because if he had lost he would have had to pay his costs and most of the defendants’—perhaps way beyond a professorial salary.

In 1994 Blakemore became the first scientist to use a Research Defence Society

libel fund. He was granted an injunction preventing Vernon Coleman, a one time GP, from publishing his home address. An animal rights campaigner and medical columnist of the *People*, Coleman had written several articles against Blakemore.

For many years, defending animal research was largely restricted to a few people. Many other researchers stayed behind laboratory walls at the behest of their universities, playing into the hands of the activists, who alleged that their silence indicated guilt.

Government departments were also reportedly duplicitous. In *Animal Warfare: The Story of the Animal Liberation Front*, David Henshaw noted that several scientists had spoken about the “shameless betrayal by government bodies who reneged on research projects out of a combination of embarrassment over lurid publicity and outward cowardice in the face of bomb threats.”

Frustrated by lack of establishment support, Blakemore became chief executive of the Medical Research Council (MRC) in 2003. He was at the forefront of an initiative in 2005 in which more than 500 leading academics, including three Nobel laureates, 190 fellows of the Royal Society and medical royal colleges, and more than 250 academic professors, endorsed the need for animal research in the absence of effective non-animal models.

Science and art

In 2007 Blakemore returned to Oxford as professor of neuroscience and supernumerary fellow at Magdalen College. In 2012 he became the first professor of neuroscience and philosophy at the School of Advanced Study, University of London, where he directed the Centre for the Study of the Senses.

He became part of a team exploring the symbiotic relation between art and science. His collaborators included not only scientists and philosophers, but designers, galleries, chefs (including Heston Blumenthal), and artists (including David Hockney, who painted him). As a young man, Blakemore had contemplated a career in art.

Born in Stratford-upon-Avon in 1944, Blakemore was the only son of Cedric Norman Blakemore, a TV repair engineer, and Beryl (née Smith), he was the first in the family to go to university. The *Times* reported him saying that his parents had the most “gratifying hands-off” approach. “They were mystified when I joined a record library and filled the house with Bruckner and Shostakovich. I had a hunger for culture and making a better world, very common in the post-war Attlee years.”

Blakemore was the youngest BBC Radio 4 Reith lecturer, thanks to a rare gift for elucidating the complex with elegance. His passion for public engagement prompted nearly a thousand broadcasts, including the 13 part BBC TV series *The Mind Machine* and a Royal Institution Christmas lecture. He also wrote several popular books and chaired the British Association for the Advancement of Science.

Knighted in 2014, Blakemore also called for science to be embedded at the heart of government through a department of science with a Cabinet seat.

In 2007 he suggested that the MRC and the Motor Neurone Disease Association should jointly fund fellowships for young clinicians. He went on to speak at and host association events until 2018. In 2021 he was himself diagnosed with motor neuron disease.

Predeceased by his wife, Andrée, this year, Blakemore leaves three children.

John Illman, London

Cite this as: *BMJ* 2022;378:o1910



Blakemore was a prominent target for animal rights activists

DAVID HARTLEY/SHUTTERSTOCK