this week

LOCKDOWN RULES page 381 • **ESKETAMINE** page 382 • **NEW HEALTH SECRETARY** page 384

RCP

The Queen meets Jane Dacre, the then president of the Royal College of Physicians, during a visit to mark the college's 500th anniversary in 2018

Medical royal colleges pay tribute to Queen

UK medical royal colleges have paid tribute to Queen Elizabeth II after the country's longest serving monarch died, aged 96.

The Royal College of Physicians of London was among those to pay tribute to her service over a 70 year reign. The college noted that as its "visitor"—the equivalent of a patron—the Queen visited its Regent's Park headquarters three times. The first visit was in 1964 for the building's opening, and she returned in 1986 to open nearby refurbished terraced houses that now accommodate RCP departments and other medical organisations. Most recently the Queen visited in 2018 to mark the RCP's 500th anniversary, when she stood alongside a portrait of Henry VIII, who agreed to the founding of the RCP in 1518.

Books of condolence were opened at the RCP's sites in London and Liverpool.

Andrew Goddard, RCP president, said, "We have been honoured to have Her Majesty the Queen as our visitor for more than 70 years. Many of our members work in hospitals the Queen visited during her long reign, some of which bear her name, and they will no doubt reflect on the interest she showed in their work, the support she gave to our NHS, and the joy she brought to those colleagues and patients fortunate enough to meet her. She was much loved by many in the RCP and will be greatly missed."

Helen Stokes-Lampard, chair of the Academy of Medical Royal Colleges, said, "The Queen was an extraordinary woman, and we are indebted to her for the leadership and good sense she showed throughout her reign. Her concern for the health and wellbeing of all people was obvious and heartfelt—not least through her patronage of many medical royal colleges, which are united in offering their condolences to the royal family."

Clare Gerada, president of the Royal College of General Practitioners, said, "The Queen dedicated her life to public services. As a GP from the Commonwealth, I, like many others, saw her as our figurehead, and we will never forget her."

Philip Banfield, BMA council chair, said, "Many will not have known life without Her Majesty as our head of state. During her stewardship of her nation there has been substantial social and political change around the world. Her role in this will never be forgotten."

Gareth Iacobucci, *The BMJ*

Cite this as: *BMJ* 2022;378:o2196

BIG PICTURE, p 386

LATEST ONLINE

- Doctors call for report of new "tomato flu" outbreak in India to be retracted
- Consultant caught by undercover police making plan to abuse girl is struck off
- Texas judge rules against Obamacare coverage of HIV prevention drugs on religious grounds

SEVEN DAYS IN

Assisted dying legislation receives widespread support in Scotland

KEN JACK/GETTYIMAGES

A bill to legalise assisted dying in Scotland is to be introduced in its parliament, after a public consultation showed overwhelming support for the measure. Just over three quarters (76%) of the 14 038 responses received were fully supportive of proposals to enable terminally ill, mentally competent adults to receive help to end their lives.

Liam McArthur (left), the Liberal Democrat member of the Scottish parliament who drew up the proposals, now plans to formally introduce a bill, which he hopes will make Scotland the first part of the UK to legalise assisted dying.

Under the proposals, a terminally ill person who wanted to end their life would have to sign a declaration in the presence of two independent witnesses. The declaration would have to be approved by two doctors who are satisfied that the patient is terminally ill, has the capacity to make such a decision, and has done so voluntarily. A 14 day period may be built in for reconsideration after medical approval is given.

Although the bill attracted widespread support, some medical organisations, including the BMA, the Royal College of Physicians and Surgeons of Glasgow, and the Scottish Partnership for Palliative Care, registered a neutral position.

Bryan Christie, Edinburgh **Cite this as:** *BMJ* 2022;378:o2205

Malaria

Vaccine booster dose shows high efficacy

A booster dose of a malaria vaccine developed at the University of Oxford showed 80% efficacy in the higher dose adjuvant group and 70% in the lower dose adjuvant group, over 12 months of follow-up. Phase 2 trial results from 409 children in Burkina Faso have been published in *Lancet Infectious Diseases*. The children had previously had a three dose regimen of the vaccine. No serious adverse events related to the vaccine were noted.

Polio

State declares emergency after virus in wastewater

New York's governor, Kathy Hochul, declared a disaster in the state on 9 September after its health department detected poliovirus in wastewater samples from areas in and around New York City. A single case of paralytic polio was identified in a young unvaccinated man living in Rockland County, north of the city, on 21 July. The New York State Department of Health said that he had contracted the virus through local transmission. Polio was declared eradicated in the US in 1979, owing to high vaccination rates against the virus.

Learning disabilities

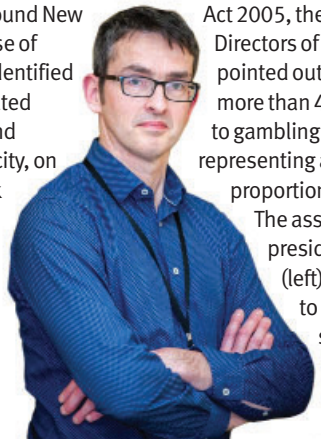
CQC ranks four services in Cornwall inadequate

The Care Quality Commission inspected four services run by Spectrum (Devon and Cornwall Autistic Community Trust) and rated all of them inadequate. Three of the services—Silverdale, Trelawney House, and Carrick, which offer residential care for people with learning disabilities or autism—were short staffed and relied on agencies to fill most of the hours on their rotas, the regulator said.

Gambling

Public health directors highlight link to suicide

Ahead of the government's long awaited review of the Gambling Act 2005, the Association of Directors of Public Health pointed out that each year more than 400 lives are lost to gambling in England alone, representing a considerable proportion of suicides.



The association's vice president, Greg Fell (left), urged ministers to commit to sustainable funding of public health measures to tackle gambling harms and tighten regulation. "Like with tobacco, this industry must be regulated properly to minimise—and ultimately put a stop to—the significant proportion of suicides that are currently caused by gambling," he said.

Measles

Hundreds of children die in Zimbabwe outbreak

Almost 700 children have died in Zimbabwe in a rapidly accelerating measles outbreak, officials have reported. The health ministry reported that deaths had reached 698 by 4 September, up from less than a quarter of that a fortnight earlier. Health officials told the *Telegraph* that they were alarmed by both the speed of the spread and the high fatality rate. The outbreak is understood to have spread among church congregations that have rejected vaccinations on religious grounds.

Prescribing

Opioids are the most prescribed addictive drug

Opioid drugs were the most frequently prescribed dependence forming medicines in England in 2021-22, totalling 39.6 million items at a cost of £307m. A report from the NHS Business Services Authority showed that the total cost of opioid drugs had decreased by 26.7% since 2015-16, from £419m. Female patients aged 55-59 were the most likely group to have dependence forming medicines prescribed, and England's most deprived areas had the highest number of patients with prescriptions for such drugs.

Dementia drug prescribing fell during pandemic

From March 2020 to June 2022, during the covid pandemic, an estimated 2.36 million more antidepressant prescription items were issued than expected, on the basis of historical trends. However, the NHS Business Services Authority's report said that this was not a statistically significant increase for the period. An estimated 1.01 million fewer drugs were issued for dementia prescription items than expected when compared with historical trends, a statistically significant decrease for the period.

MEDICINE

Pakistan floods

WHO airlifts medical supplies as crisis escalates

On 9 September WHO airlifted two shipments of emergency medical supplies and equipment to Karachi, Pakistan, in response to critical shortages in the country, which has been ravaged by the most extensive floods in recent history. The shipments contain 15.6 tonnes of cholera kits, water, and medical tents. The supplies were delivered with the support of the government of Dubai and the aid hub the International Humanitarian City, which established an air bridge linking the United Arab Emirates and Pakistan.

WHO has flown 15.6 tonnes of medical supplies to Karachi

Regulation

Former Morecambe Bay Trust urologist struck off

A former consultant urologist at the University Hospitals of Morecambe Bay Trust has been struck off for lack of insight and failing to remedy poor professional performance. Kavinder Madhra was one of six consultant urologists at the trust in 2016 when a Royal College of Surgeons report found a dysfunctional surgical team, allegations of bullying and racism, and a risk to patient safety. The six included Peter Duffy, who reported concerns in 2015 before resigning.

Private practice

Most doctors feel more stressed since pandemic

Over half (55%) of doctors working in private practice report increased stress and anxiety levels since the pandemic, found a survey by the Medical Defence Union and the *Independent Practitioner Today* journal. In the poll of 261 practitioners 45% reported feeling stressed and anxious weekly, 31% said they often went to work not feeling fit or well, and 62% had undertaken additional services to support the NHS during the pandemic.

Energy costs

Cap proposals "must provide relief" to NHS trusts

NHS leaders welcomed the announcement that NHS trusts would be included in the energy costs support package announced by the prime minister, Liz Truss, to tackle the rising cost of energy bills. Saffron Cordery, interim chief executive of NHS Providers, said that it was "essential" to give public service providers the same support as businesses and charities, adding, "Trusts need more detail about how the equivalent energy price guarantee will apply to them."

Satisfaction survey

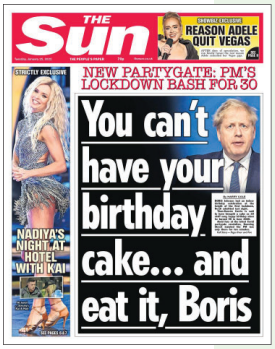
Public calls for more staff and money for the NHS

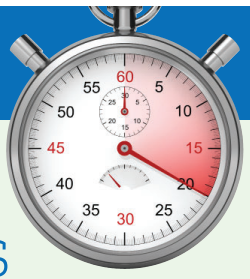
The UK public wants a better, adequately staffed NHS backed by more funding—not a departure from the current service model, a survey by the Health Foundation has found. Ipsos MORI polled 2068 adults from 26 May to 1 June. The public's top priorities were improving waiting times for routine services (38%), tackling workload pressures (36%), and increasing staff numbers (36%).

Cite this as: *BMJ* 2022;378:o2209

E-CIGS

In the US the e-cigarette maker Juul Labs has agreed to pay nearly $440m (£377m) to settle an investigation by 33 states into the marketing of its products





SIXTY SECONDS ON . . . LOCKDOWN RULE BREAKERS

WHO WERE THE WORST OFFENDERS?

Politicians and their advisers must be up there. Under Boris Johnson, No 10 seemed to host more parties during lockdown than most people do in "normal" times, a day trip by the PM's aide Dominic Cummings did more to promote Barnard Castle than decades of tourism campaigns, and health secretary Matt Hancock and pandemic modeller Neil Ferguson were hardly role models.

HMMM. IS THIS A MALE THING?

Previous surveys have shown women were far more likely to wear a mask than men. Some researchers and commentators have suggested this was because men are less altruistic than women. Not even being more likely than women to get seriously ill and die was enough to encourage some men to don masks. Studies also found that men were less likely to comply with handwashing and other hygiene recommendations.

ARE MEN ALWAYS THE VILLAINS?

No. A report published on 6 September from the University of York and funded by the Nuffield Foundation found that women were nearly twice as likely as men to break laws prohibiting meeting with others indoors.

REBEL WOMEN?

Women were not "wilfully non-compliant," the report says. In many instances they broke the law for caring purposes, such as enlisting grandparents to help with childcare or meeting with other mothers for support. Women were bearing the brunt of balancing childcare and home schooling with work by "forming 'bubbles' out of necessity before it was officially allowed."

WHAT ABOUT THE NEW HEALTH SECRETARY FOR ENGLAND?

It's true Thérèse Coffey likes to party. Before the pandemic, she was notorious for hosting late night "karaoke sessions" in her Commons office. During lockdown, her Department for Work and Pensions team apparently had several boozy gatherings, but the karaoke machine was unplugged.

THAT'S SOMETHING, I SUPPOSE

Singing was considered seriously risky,so at least she heeded Johnson's advice and followed "good solid British common sense," even if the rules may have been bent.

Ingrid Torjesen, *The BMJ*

Cite this as: *BMJ* 2022;378:o2199

ESKETAMINE
NICE's appraisal was unfair, appeal panel rules

The decision by NICE not to recommend esketamine nasal spray for treatment resistant depression was unfair because its appraisal did not explain fully how the uncertainties in the evidence were taken into account in the decision making, an independent appeal panel has ruled.

NICE draft guidance published in January 2020 did not recommend esketamine and said the drug should not be made available on the NHS because of uncertainties over its clinical efficacy and cost effectiveness. After two consultations, NICE maintained its view in the final appraisal document published in May.

In June esketamine's manufacturer, Janssen, and the Royal College of Psychiatrists appealed against the decision, arguing that NICE had acted unfairly and exceeded its powers in not recommending the treatment and that the decision was unreasonable in light of the evidence submitted. They said the final draft guidance did not provide sufficient explanation as to precisely how the uncertainties about mental health clinical trials had been taken into account.

We are disappointed in the decision not to recommend its use on the NHS
Royal College of Psychiatrists

Nine specific points were raised in the appeal, but only one was upheld.

Appeal panel

The panel was satisfied that NICE had taken into account the clinical uncertainties inherent in clinical trials to treat mental illness as well as the difficulties in designing, recruiting to, and interpreting results of trials in this area. It was also satisfied, from verbal evidence presented, that the committee had also considered whether or not these uncertainties were solvable.

However, the panel agreed that the final appraisal document did not provide sufficient explanation as to how those uncertainties had been taken into account by NICE and that as a result it had failed to act fairly.

The appraisal committee must now reconvene to deal with this point and to explain which uncertainties in clinical trials relating to mental illness were, in its opinion, potentially solvable and those that were not. The appeal panel believes this might help inform future clinical trial design for treatment resistant depression.

The appraisal committee is not bound to change its recommendation, but NICE has confirmed that it will reconvene next month to discuss the appeal panel's decision.

Esketamine is an N-methyl-D-aspartate receptor antagonist that is administered as a nasal spray for people with treatment resistant depression, defined as a major

Consultant surgeon wins whistleblower case against CQC

A consultant orthopaedic surgeon has won a whistleblowing case against the Care Quality Commission, which sacked him as a part time specialist adviser in surgery after he raised patient safety concerns.

A Manchester employment tribunal held that Shyam Kumar, who has worked as a surgeon with University Hospitals of Morecambe Bay Trust since 2011, was sacked from the CQC as a result of whistleblowing disclosures he made.

These were mainly made to Mike Zeiderman, the CQC's national professional adviser for surgical services, and raised a range of problems, including a failure to tackle whistleblowers' concerns and unsafe methods, including a lack of specialist inspectors.

Other matters that Kumar raised included the use of some non-consultant grade doctors at the trust without supervision. A group of consultants had decided the matter should be raised with the trust's medical director. The matters were later investigated internally and externally, with findings that supported the concerns. A Royal College of Surgeons review highlighted concerns in 26 of 46 cases that were investigated.

SHYAM KUMAR, WHO HELD A SECONDMENT CONTRACT WITH THE HEALTH REGULATOR CQC FROM 2014 UNTIL HE WAS "DISENGAGED" IN FEBRUARY 2019, WAS SUPPORTED BY THE BMA IN BRINGING THE CLAIM

Inspection

In November 2018 the CQC inspected the trust. During a focus group meeting, a non-consultant grade doctor, previously an outspoken critic of Kumar, made allegations about his probity. After Kumar wrote to him setting out his concerns and proposing steps for resolution, the doctor told Kim Wood, a local CQC inspector, that he felt bullied and intimidated.

After a telephone call between Wood and Zeiderman, in which she said she was concerned that Kumar was using his position to bully and intimidate, Zeiderman decided to terminate his contract.

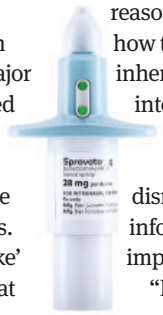
After Kumar objected to the decision being reached without taking account of his reply, he

depressive disorder that has not responded to at least two different treatments in the current episode.

The spray, branded as Spravato, was approved by the US Food and Drug Administration in March 2019 and by the European Commission in December 2019, despite concerns over limited evidence and the risk that patients could misuse or become addicted to the drug.

Advance in treatment

Commenting on the appeal decision, a Royal College of Psychiatrists spokesperson said that the esketamine nasal spray was an advance in the treatment of major depressive disorder that worked in a totally different way from other currently available treatments, affecting glutamate rather than serotonin receptors.



"It rapidly removes the 'brake' on thinking and motivation that depression can cause, creating real potential for patients to feel better and helping them to engage in other forms of treatment such as talking therapies," the spokesperson said.

"We are disappointed in NICE's decision not to recommend its use on the NHS. We believe that with the appropriate safeguards in place it would be an important new treatment option that will continue to only be available to patients privately. The college will keep engaging with NICE to ensure that patients with treatment resistant depression can access as many treatment options as possible, including esketamine."

Janssen said in a statement that it was pleased that one appeal point had been upheld.

The statement said, "As a result of the appeal panel's decision, the appraisal committee will convene to review the FAD [final appraisal document] and must now take all reasonable steps to clearly explain how the uncertainties in the evidence inherent in clinical trials were taken into account in their reasoning and decision making or the extent to which they were or were not disregarded, since these might inform future trial design in this important disease area.

"Despite Janssen succeeding in overturning this important appeal point, Janssen are disappointed that not all appeal points have been upheld. Janssen remains committed to working with NICE to reach a positive resolution, to enable routine access to esketamine nasal spray for eligible patients with TRD in England."

Ingrid Torjesen, *The BMJ*

Cite this as: *BMJ* 2022;378:o2192

KUMAR made no claim for pecuniary losses but sought a declaration in his favour and damages for injury to feelings, for which he was awarded £23 000

was told it was based on only one allegation, obtaining information from the focus group and challenging a colleague in relation to his focus group contribution.

This was "not in line with the expected behaviours and values of a CQC specialist adviser," he was told.

The tribunal found, however, that the emails to Zeiderman where Kumar raised concerns about associate specialists were part of the decision making process and the reasons underpinning the decision to sack him. Kumar's whistleblowing disclosures had a material influence on the decision to sack him, the tribunal held.

Kumar made no claim for pecuniary losses but sought a declaration in his favour and damages for injury to feelings, for which he was awarded £23 000.

The CQC's chief executive, Ian Trenholm, said the regulator accepted the tribunal's findings.

He said, "Since 2019, we have strengthened our processes around the use of specialist advisers and will further be improving procedures for disengagement, including adding a right of appeal process."

Clare Dyer, *The BMJ*

Cite this as: *BMJ* 2022;378:o2187

FIVE MINUTES WITH . . .

Jake Knight

The Bristol based radiographer discusses his passion for the discipline

"Radiography combines a really interesting part of anatomy with really interesting equipment, and there's a lot of physical science behind it. Almost every patient undergoes imaging at some time, and for me radiography seemed like the perfect fit. It doesn't get enough recognition, sadly, and that's something I want to make people recognise—that radiography is its own field.

"We work in different departments, and radiography is a key stage in diagnosis and problem solving. We x ray just about any part of the body for anybody at the hospital who needs it. It could a massive lesion, a chest x ray for a cough, or a severely broken leg.

"Some days I could be scheduled in A&E, theatres, or even GP clinics. We prioritise patients for x rays and make sure that we have enough teams to handle the workload. We make sure that there's a safe space for the patients and the team. We also need to make sure that our staff are looked after, and that's something I really want to push for.

"One of the weirdest things I've seen on an x ray was a patient who tried to spear a potato but accidentally skewered their hand. Also, if you're working in A&E on Halloween weekend, you may end up x raying Jason Bourne, Tinkerbell, or Donkey Kong.

"Knowing how to talk to patients is important. Sometimes they are in our department for less than a minute: we call them through, we do a quick x ray, and they're gone. We have to make them feel like they're not in some sort of factory processing line. We want them to feel that they've had a quality piece of healthcare administered.

WE NEED TO ENSURE OUR STAFF ARE LOOKED AFTER, THAT'S WHAT I WANT TO PUSH FOR

"Our management team is really good. They'll step out of the office and get their hands dirty if things get too busy. They help make our system work, and that's something I want to do in the future. I don't plan on leaving any time soon, however, as I still want to get stuck into the gory stuff.

"You may do as much diagnosis as you can with medical examination, assessment, and pain scales, but to find out what's really wrong with somebody you sometimes need to see what's happening in their body without harming them. That's what radiography is for: it's about seeing the situation that's causing this person their problems and how to use this picture to make them better."

Jake Knight is a band 5 plain film radiographer at Southmead Hospital, Bristol

Melina Zachariou, London **Cite this as: *BMJ* 2022;378:o2185**

NEWS ANALYSIS

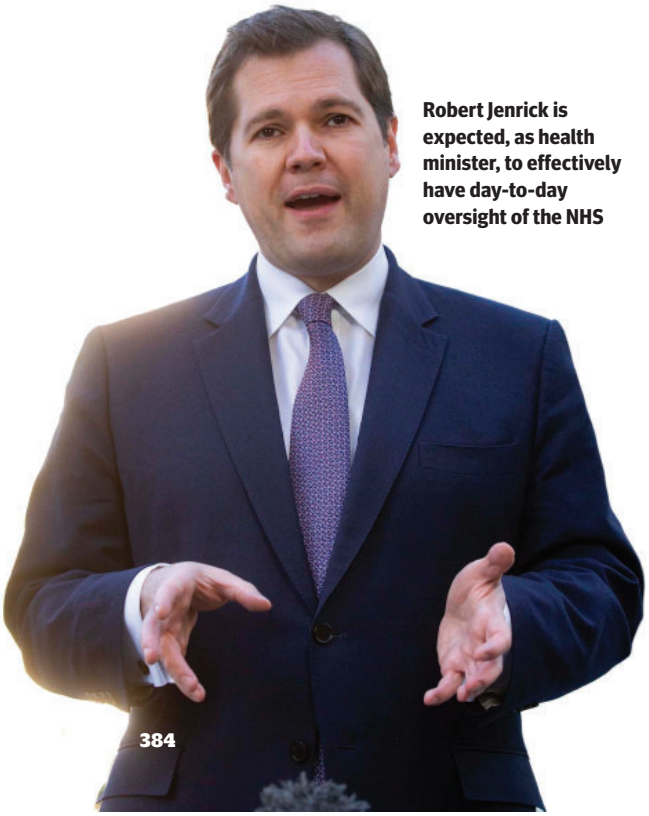
THÉRÈSE COFFEY: **Who is the new health secretary, and what's her plan to fix the NHS?**

England's new health and social care secretary takes office at a time when the health service is in greater crisis than faced by her predecessors and with an overflowing in-tray, as **Jacqui Wise** reports

The new health secretary should avoid tinkering with NHS structures, which is a recipe for wasting time and money Hugh Alderwick

Either health or social care would be enough for most politicians, to accept deputy PM too is very courageous indeed Martin McKee

It is to be hoped that with her dual role she has a better chance than her predecessors of getting an agreed workforce plan over the line Richard Murray



Robert Jenrick is expected, as health minister, to effectively have day-to-day oversight of the NHS

Thérèse Coffey, England's fifth health and social care secretary in five years, faces an unenviable task, with a record 6.84 million people on hospital waiting lists at the end of July and chronic staff shortages that stand at around 132 000 in NHS trusts and 165 000 in adult social care.

On top of this, stories of people waiting hours or even days for ambulances regularly hit the headlines. And it's not yet winter, when another covid wave, a bad flu season, and even strikes by doctors are all possible.

"The context for the new health secretary is grim," Hugh Alderwick, director of policy at the Health Foundation, told *The BMJ*. "Health and care services in England are under extraordinary strain, and more people are struggling to get the care they need. The cost-of-living crisis will put even more pressure on people and public services over winter."

Hard worker or party animal?

Coffey, appointed by the new prime minister, Liz Truss, to the dual role of health secretary and deputy prime minister, has become the third person to hold the health and social care post in as many months. She takes over from Steve Barclay, who had only two months in the job.

Coffey is said to have a tireless work ethic and claims that her attention to detail in her previous role as work and pensions secretary was why she had been rewarded with the demanding health job. Nadine Dorries, the former culture secretary, has said that "nothing ever goes wrong" in a department led by Coffey.

However, in her previous role Coffey was heavily criticised for abolishing the £20 a week uplift to universal credit introduced during the pandemic and for falsely claiming that recipients could make the money back by working two extra hours a week. A day later she was condemned further over a leaked video that showed her singing "(I've had) the time of my life" with welfare minister Will Quince at the Tory conference.

In August 2022 she was accused of deliberately attempting to hide the effects of the government's changes to welfare payments by refusing to publish five reports. Stephen Timms, chair of the House of Commons work and pensions select committee, said she had damaged public trust in the department.

Coffey was born in 1971 in Lancashire and has a doctorate in chemistry from University College London. She worked in financial roles for the confectionery company Mars and was selected as candidate in the very safe Tory seat of Suffolk Coastal in 2010.

She is well known as a beer, music, and Liverpool FC loving MP who held late night karaoke sessions in her Commons office. Reports emerged that her staff held karaoke sessions in her office after work during lockdown. Although the Department of Work and Pensions confirmed that alcohol had been consumed by staff, Coffey denied hosting the parties during covid restrictions.

What's her record on abortion?

Coffey's past voting record on abortion has come under scrutiny. A devout Roman Catholic, Coffey said in a Sky news interview after the US Supreme Court overturned the Roe *v* Wade federal right to abortion that she would "prefer that people didn't have abortions but I am not going to condemn people that do." She voted to oppose extending the right to access abortion pills at home, and the British

Pregnancy Advisory Service has described her record on abortion rights as "deeply concerning."

In 2013 Coffey voted against allowing same sex couples to marry and in 2019 voted not to permit same sex marriage in Northern Ireland. A cigar smoker, Coffey has consistently voted against smoking bans. She has also generally voted against measures to prevent climate change.

What will be her priorities?

Coffey has said that her priorities will be "ABCD" (ambulances, backlog, care, and doctors and dentists) and has pledged "to deliver for patients." She is expected to unveil a plan for the health service in the coming weeks.

Most experts and health leaders agree that workforce issues should be an immediate priority and that she must commit herself to delivering the 15 year NHS workforce strategy by the end of 2022, as planned. "It is workforce shortages across the whole system that is the biggest barrier to bringing down waiting lists and providing care sustainably in the long term," said the Royal College of Physicians' president, Andrew Goddard, and president elect, Sarah Clarke.

Philip Banfield, chair of the BMA council, said, "The new health secretary must not only put together a credible plan to retain doctors, including by addressing pay and pensions, but also urgently recruit more staff."

Another pressing issue is that one in eight hospital beds in England are occupied by someone who is medically fit to leave but cannot be discharged because of the unavailability of social care. Coffey is understood to be looking at creating extra capacity for the NHS by paying care homes to free up NHS beds. She is also looking at measures to free up more GP appointments, such as by extending the role of pharmacists.

A long term and properly funded plan for the future of social care is urgently needed. But where the money will come from is unclear, after Truss pledged to cancel the 1.25% health and social care levy that began in April and was expected to yield £12bn a year for the NHS and social care.

Alderwick said, "The new health secretary should avoid tinkering with NHS structures, which is a recipe for wasting time and money, and focus on the major problems facing health services instead. High priority should be chronic staff shortages."

He added, "The health secretary's initial alphabet list of priorities, ABCD, seems to ignore the bigger task of improving the nation's health, not just its health services. Unfair differences in health between more and less deprived areas in England are vast and growing.

"The last government committed to 'levelling up' the country but failed to match the political slogan with the policy changes or investment needed to tackle social and economic drivers of health inequalities. Cross government action is needed, for example to improve living conditions and strengthen social security."

Will she be spread too thinly?

Coffey has been given two hugely demanding roles, which shows how trusted she is by her close friend Truss, and could also indicate that the NHS is a priority for the new cabinet.

"Trust leaders will hope it is an indication of how seriously the new prime minister and her government are taking the multiple, pressing challenges facing mental health, community, acute, and ambulance services," said Saffron Cordery, interim chief executive of NHS Providers.

Coffey will be supported in her health role by Robert Jenrick, who is expected to effectively have day-to-day oversight of the NHS. The former secretary of state for housing, communities, and local government was responsible for a series of highly contentious planning decisions and was eventually sacked from his previous role for intervening to grant planning permission to a Conservative Party donor. He was also criticised for his lack of action in tackling the ongoing problems with dangerous cladding in the wake of the Grenfell tragedy. Quince, Maria Caulfield, and Gillian Keegan complete the junior ministerial line up in the reshuffled health department.

There may be benefits to Coffey holding two important positions. Richard Murray, chief executive of the King's Fund, told *The BMJ*, "While getting an agreed workforce plan for health and care has struggled to get cross government agreement, it is to be hoped that as she simultaneously takes on the role of deputy prime minister the new secretary of state has a better chance than her predecessors of getting this over the line."

On the other hand it could mean that the minister's time is spread too thinly. Martin McKee, professor of European public health at the London School of Hygiene and Tropical Medicine, told *The BMJ*, "Either health or social care would be enough for most politicians, even more so if you have no relevant experience, but to accept the deputy prime minister role seems a very courageous decision indeed."

MARK THOMAS

Coffey must not only put together a credible plan to retain doctors but also urgently recruit more staff
Philip Banfield

Jacqui Wise, Kent

Cite this as: *BMJ* 2022;378:o2193

ENGLISH HOSPITALS face the pressing issue that one in eight beds are occupied by someone who is medically fit to leave but cannot be discharged because of the unavailability of social care

1. **Princess Elizabeth, accompanied by Cecil Wakeley, president of the Royal College of Surgeons, prior to her receiving her certificate of honorary fellowship in December 1951**

2&3. **The Queen unveils a charter during her 2018 visit to the Royal College of Physicians of London to mark the 500th anniversary of the body's founding charter**

ANL/SHUTTERSTOCK; CHRIS JACKSON/PA/ALAMY; RCP

THE BIG PICTURE

Medical world pays tribute to the Queen

Medical royal colleges, charities, and professional associations have joined the country in mourning the death of their patron, Queen Elizabeth II.

The Queen forged strong links within the world of medicine, many created from before she ascended to the throne, including becoming the president of the Student Nurses' Association, now subsumed by the Royal College of Nursing, in 1944, an honorary fellow of the Royal College of Surgeons in 1951, and patron of the charity Diabetes UK in 1952.

She was also a patron of all the royal colleges and societies, as well as of other professional associations such as the BMA, the British Dietetic Association, the British Institute of Radiology, and the Chartered Society of Physiotherapy.

A condolence message from Neil Mortensen, president of the Royal College of Surgeons of England, reflected the sentiment expressed by all who enjoyed the Queen's patronage: "We have been honoured to have Her Majesty the Queen as our visitor [patron]. We offer our sincere thanks for her support over the years, for the college, the profession of surgery, and the NHS. Most importantly, her life of personal dedication to public service will be fondly remembered."

Alison Shepherd, *The BMJ* Cite this as: *BMJ* 2022;378:o2212

EDITORIAL

A "proper" workforce strategy

Plans must be comprehensive, agile, and transparent

In its report published on 25 July 2022, the Health and Social Care Select Committee outlined how the NHS and social care in England are "facing the greatest workforce crisis in their history."[1] The government has promised a "proper" long term workforce plan,[2] but there are contradictory accounts of whether this plan will include current and projected workforce numbers, and whether these numbers will ever be made public. We argue it should include five key components.

First, plans need to reflect trends in demand for health and social care and account for changing health needs over time, including projections of population characteristics, disease epidemiology, and healthcare use.[3 4] Estimates of demand should be informed by local service delivery plans. Although some think tanks and researchers have produced models of future demand,[5 6] no official projections are publicly available.

Two decade timeline

As training pathways for GPs and hospital consultants range from eight to 16 years, a timeline of up to 20 years must be considered. A major challenge will be managing the needs of the baby boomer generation: the number of people aged over 85 years is expected to nearly double to 3.1 million by the mid-2040s.[7]

Second, a "stocks and flows" supply model is needed that maps career pathways of healthcare professionals, including training, recruitment, and retention.[3 4] Workforce planners need to anticipate the impact of longer careers on attrition rates and trends in part time working, informed by data about why staff leave their roles, including exit interviews.[8]

Third, workforce planning must simulate the effect of alterations to terms and conditions. This requires understanding how responsive people are to changes in reimbursement, pensions, and scope for flexible working when deciding whether and how many hours they will work. Healthcare staff are responsive to wages, but less so than staff in other industries.[9] Employers may also respond to changes in wages, perhaps by reducing people's working hours or moving staff to zero hour contracts, as has been seen in the social care sector.[10] Changes to working conditions, such as more flexible working, may be more successful at attracting and retaining health and social care staff.[11]

STEFAN ROUSSEAU/PA/ALAMY

Changes to working conditions may be more successful at attracting staff

Fourth, evidence on "endogenous" changes in working practices needs to be incorporated into planning. These include models of integrated care, the switching of roles and responsibilities among staff groups, and the development of new technologies. This is particularly important in primary care. Workforce planning should model the productivity implications of different combinations of staff and capture opportunities for health technologies to perform tasks conventionally done by people—for example, use of artificial intelligence in radiology[12] and ophthalmology.[13]

Finally, the influence of "exogenous" factors on the workforce needs to be considered, as people weigh up their options about where to work. UK-wide regulatory and professional standards mean that constituent countries share a common pool of healthcare staff, but emerging differences in terms and conditions are creating an increasingly competitive internal healthcare labour market.[3] Stricter immigration controls may make the UK less attractive to international medical and nursing graduates.

Staff also have the option of working for the private sector: at least one provider in London offers consultant salaries that are three to five times higher than NHS salaries.[15] Among lower paid staff such as carers and healthcare assistants even small differences in terms and conditions compared with those in sectors such as hospitality or retail will affect staff retention.

Better managed

While incorporating all of these components may be ambitious, strategic workforce planning has the potential to ensure that workforce supply is better managed. Importantly, each component should be considered at national, regional, and local service levels to reflect differences in access to staff. In addition, plans must be agile enough to manage the risk of over and under supply of specific staff groups through the promotion of generalist skills among the whole workforce.[17]

Despite support from more than 100 stakeholders in health and social care,[18] parliament has three times voted against a statutory requirement to publish regular independent analyses of current and future workforce needs. Irrespective of where the responsibility for NHS and social care workforce planning lies, analyses must be conducted in a transparent and inclusive manner to ensure they are fit for purpose.

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EDITORIAL

Inflation Reduction Act and US drug pricing

The Biden administration's landmark legislation will help millions afford vital treatments

The Inflation Reduction Act, which President Biden signed into US law on 16 August 2022, contains bold measures to tackle climate change and reduce prescription drug costs.[1] The drug measures comprise three major reforms to Medicare—the federal health insurance programme for people aged 65 years and older.

First, starting in 2026, the federal government must negotiate with manufacturers a reasonable price for selected brand name drugs taking account of factors such as comparative safety and effectiveness and development costs. Initially, negotiated prices will be limited to 10 of the highest spend prescription drugs dispensed by pharmacies, rising by 2029 to 20 of the highest spend drugs, including treatments that must be given by clinicians. Other restrictions narrow the eligible pool of drugs still further, including the requirement that small molecule and biological medicines have been approved for at least seven and 11 years, respectively. However, the federal government was not allowed to negotiate prices before the Act.

Second, manufacturers will be required to provide rebates to the federal government for most drugs with prices rising faster than the rate of inflation. The rebate will equal the number of units of the drug used multiplied by the amount the price exceeds the inflation adjusted price.

Third, the act implements long championed changes to the benefit for pharmacy dispensed drugs. In 2025, a $2000 (£1700) cap will be placed on patients' annual out-of-pocket spending. Insurance companies administering the benefit will cover 60% of any additional drug costs, the federal government will cover 20%, and drug manufacturers will contribute 20%. Finally, the Act will limit growth of insurance premiums, eliminate out-of-pocket costs for vaccines, place a $35 a month out-of-pocket cap on insulin products, and expand eligibility for the low income subsidy covering some drug costs.

RICH PEDRONCELLI/AP/SHUTTERSTOCK

Negotiations will save the US government over $100m between 2026 and 2029

Long overdue

With millions of older Americans struggling to afford their medications, these reforms are long overdue. Currently, some Medicare beneficiaries spend over $10 000 annually for a single drug,[2] and an alarming number of beneficiaries fail to collect their first prescription for a new treatment. The consequence of such medication non-adherence can be serious: a recent meta-analysis found that people aged 50 years or older with good adherence to medications had 21% lower mortality than those with poor adherence.[5]

Although the Act's restrictions on price negotiations have caused concern, negotiating the price of eligible drugs will still have an important impact. In 2019, the 10 highest spend, pharmacy dispensed drugs accounted for 16% of net spending on all pharmacy dispensed drugs, while the 10 highest spend, clinician administered drugs accounted for 40% of net spending on all such drugs.[6]

The Congressional Budget Office (CBO) estimates that these negotiations will save the US government over $100m between 2026 and 2029.[8]

The inflationary rebate, meanwhile, will curb rampant price increases currently plaguing Medicare. The CBO reported that the inflation adjusted net price of a fixed basket of pharmacist dispensed brand name drugs increased 6.3% annually from 2010 to 2017.[10]

More broadly, enactment of the Inflation Reduction Act represents a rare, stinging loss for the pharmaceutical industry. The Pharmaceutical and Research Manufacturers of America (PhRMA), the Biotechnology Innovation Organisation (BIO), and individual drug companies spent over $187m lobbying against reform in the first half of 2022.[13] Despite this, congressional Democrats stood firm, buoyed by data suggesting that about 75% of Americans supported the Act's drug pricing provisions.[17] PhRMA, BIO, and their members are likely to try to stop the Act's implementation through litigation, but the merits of any possible arguments are weak.[18]

Ultimately, the Act is an important advance for healthcare in the US and should be celebrated as such. More reform is needed, however, including expanding the number and range of drugs eligible for price negotiation, restraining launch prices for new drugs,[19] and extending inflationary rebates and insulin price caps to both privately insured and uninsured Americans. Knowledge that change is possible can serve as a catalyst for these reforms.

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COVID UNANSWERED QUESTIONS

Is covid-19 settling into a pattern?

SARS-CoV-2 is here to stay, with an increasing array of questions for science and medicine. In the first of a new series on Covid Unanswered Questions, ***The BMJ*** asks about our current understanding of waves and variants—and what they might mean for "living with the virus"

Is covid settling into a pattern?

"It appears that there are two to three waves a year, each caused by new variants," says Atsushi Sakuraba, professor of medicine at the University of Chicago. "Considering the nature of SARS-CoV-2, which is an RNA virus that mutates over time, this pattern is likely to stay."

Each new variant's dominance—usually from increased transmissibility or from mutations that help it to partially evade immunity and allow reinfection—comes from outcompeting existing variants and brings a surge of infections, aided by the easing of restrictions and waning vaccine immunity (fig 1).

Lawrence Young, a virologist at the University of Warwick says, "We're getting plateaus [peaks in case numbers] in between waves of infection, and the set point for those plateaus is a little bit higher each time, as the virus is changing.

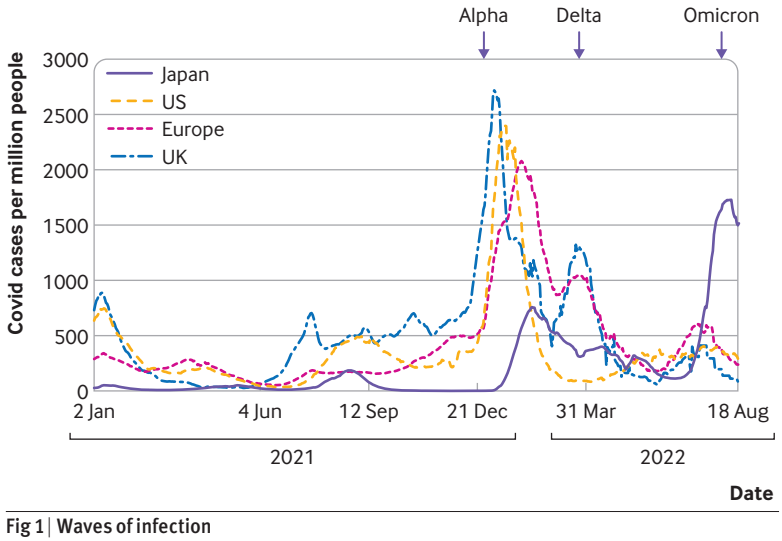
"What we're seeing at the moment is essentially the evolution of this virus in real time. We're seeing these waves of infection with the different variants that just outcompete their predecessors."

Are there regional patterns?

Some countries, such as New Zealand and Japan, have seen extremely sharp rises followed by sharp falls, when compared with other countries. These countries maintained comparatively very low numbers of infections thanks to a combination of strong policies,

We're seeing the evolution of this virus in real time
Lawrence Young

The virus is mopping up any pockets of susceptibility still around
Joël Mossong



OUR WORLD IN DATA

Fig 1 | **Waves of infection**

Omicron's supremacy makes it unlikely any once dominant variant will be able to re-enter the ring

such as border closures, and high public adherence to measures for over a year before easing restrictions.

What mattered for those countries, says Joël Mossong, an epidemiologist at the Luxembourg Health Directorate, is not the new variants' transmissibility as such but rather the state of population immunity.

"The reason why they sweep through is that they can really find people who have not been infected yet or who have been infected a long time ago," he explains. "And they're able to avoid or to evade the pre-existing immunity, either from vaccine or from previous infection, that was based on a previous variant." All existing covid-19 vaccines are based on the original "wild-type" strain.

Will these patterns continue?

Young says, "As long as these variants keep being selected for increased transmissibility and immune evasion, particularly to the current vaccine protection, then we're going to continue to see this type of pattern around the world. But it does depend on the variants and where you are."

We can expect the wave pattern to continue over the next few years, he adds, unless we become more proactive about mitigations or our vaccines adapt.

Mossong says, "It looks like there are [new] variants sweeping through every three months . . . but it also looks like each successive wave is going to be smaller. It really seems to me that the virus is mopping up any pockets of susceptibility that are still around in the population."

There's a lot of immunity in the population now, he says, since most people have been vaccinated, but also resulting from "natural" virus exposure, since most people have also been infected previously. "Infectious diseases are very much like bushfires," he says. "People are the equivalent of trees that haven't been burned yet."

What happened to the previous variants—and could they come back?

Sakuraba explains, "The old variants are still detected in small numbers but likely won't become dominant, as the majority of the world are now vaccinated with vaccines that are effective against those."

With the supremacy of the omicron family (fig 2), it's unlikely that any previously dominant variant would

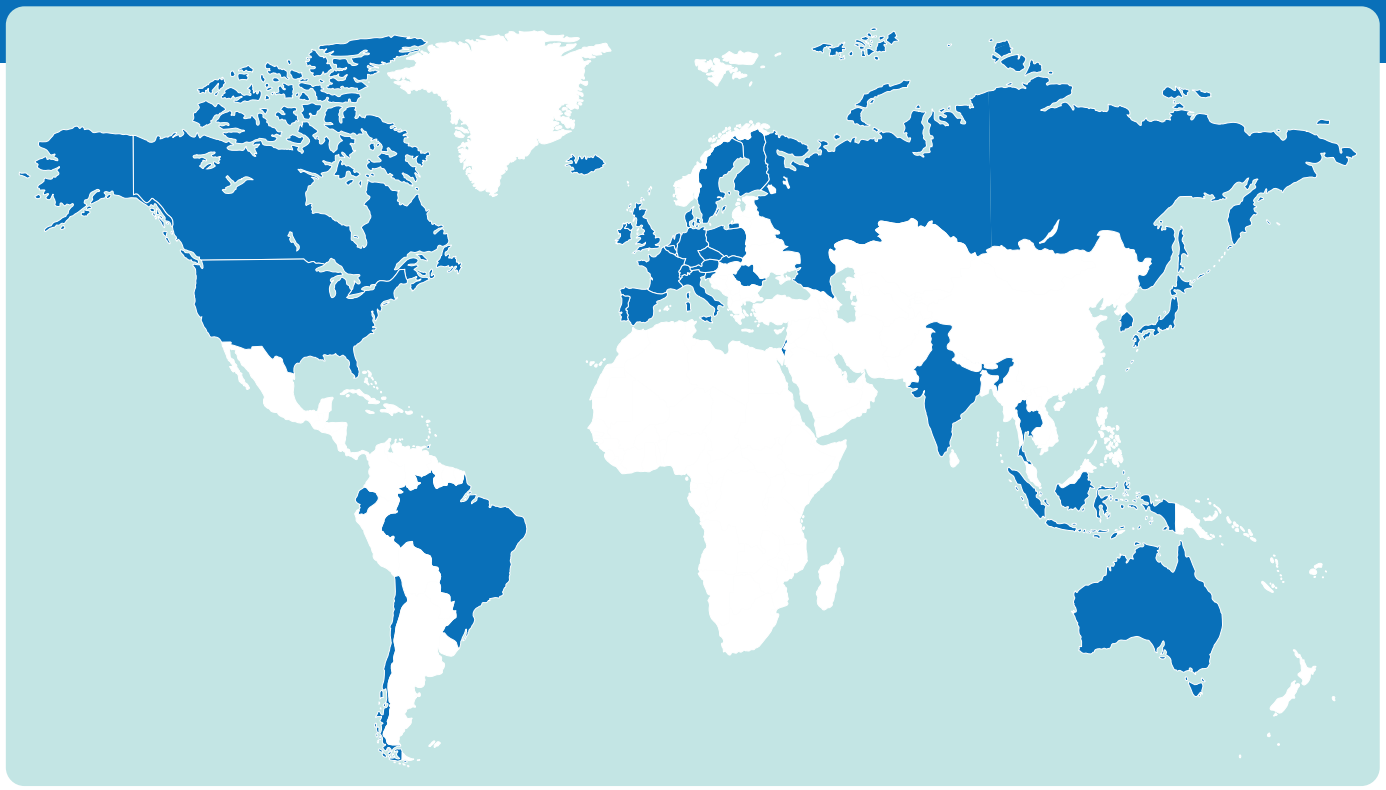


Fig 2 | Share of SARS-CoV-2 sequences that are the omicron variant (dark shaded areas), 15 August 2022

be able to re-enter the ring. Mossong says that any previous variant would have a hard time re-establishing dominance or even getting a foothold. "It's vaccines, really, that killed them," he says. "That really built up a big immunity against them. I think it's unlikely that one of these will come back."

Eleanor Riley, professor of immunology and infectious disease at the University of Edinburgh, says that in hindsight "the alpha and beta variants really weren't that infectious—although they seemed like a lot of infections at the time—compared with how easily omicron, and delta before it, spread." At that time there were no vaccines or waning immunity.

"In order to come back and take over from omicron, they would have to be really totally different immunologically," she tells *The BMJ*. "And I'm not sure that would be enough, immunologically, to counteract the fact that they're actually not that infectious compared with the two out in front."

One exception could be people who are immunocompromised or immunosuppressed, who could be harbouring multiple infections from different variants or sub-lineages, say Young and Mossong. That could be an evolutionary opportunity for swapping genes—for instance, there were fears in the media about "deltacron" in March 2022.

A preprint posted on 2 July from researchers at Yale University described a 60 year old immunocompromised patient harbouring a prior variant, B.1.517, since November 2020. The researchers say that it evolved at twice the rate of wild-type SARS-CoV-2, thanks to the patient's lack of immunity. The lead author, Nathan Grubaugh, told the journal *Science* that some of the viruses circulating in the patient today might be qualified as new variants if they were found in the community.

The alpha and beta variants really weren't that infectious
Eleanor Riley

Do you have a "Covid Unanswered Question"? Email mlooi@bmj.com, and we'll try to cover it in a future instalment of this series

Will all future variants come from omicron?

At the time of writing, omicron is the only variant on the World Health Organization's list of "variants of concern," although it is further stratified into seven omicron "subvariants under monitoring": BA.4, BA.5, BA.2.12.1, BA.2.9.1, BA.2.11, BA.2.13, and BA.2.75.

"BA.5 is probably the worst version of the virus we've seen so far in terms of its infectiousness and its ability for immune escape," says Young, although he thinks that it will probably reach its peak "very soon…Then I anticipate that we'll have a plateau, and then there'll be another variant—omicron or not, we don't know—that pops up over the September-October period.

"The biggest fear is that something's going to come from the leftfield [as the existing variants and subvariants look to outcompete each other]: another non-omicron variant that is even better adapted to infection and to immune evasion."

This will depend on where a new variant emerges and what evolutionary advantages it has, in terms of speed of transmission and immune evasion, as well as the immune situation of the immediate population it finds itself in.

To cite some past examples, one study this year suggested that in New York City the gamma variant spread better in some areas—some of which had been hit hard in the first wave of the pandemic—with higher levels of pre-existing immunity. And BA.5 drove up hospital admissions in Portugal (which has high levels of vaccination but also high numbers of elderly people) but not in South Africa. This may be due to a younger demographic but also to prior immunity from high exposure to SARS-CoV-2 early in the pandemic.

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BMJ INVESTIGATION

Stealing from the tobacco playbook, fossil fuel companies pour money into elite US universities

Paul Thacker examines how oil and gas companies have funded research to try to weaken messages on climate change and protect their interests

At the turn of the century, a fresh crop of research centres to confront global warming began popping up at prestigious American universities. Promising a sustainable solution to the carbon and climate change problem, Princeton launched the Carbon Mitigation Initiative in 2000.

Two similar programmes followed at Stanford: the Program on Energy and Sustainable Development (2001) and the Global Climate and Energy Project (2002). Massachusetts Institute of Technology's (MIT) Energy Initiative emerged in 2006, and University of California, Berkeley's Energy Biosciences Institute in 2007. Each initiative grew professorships and scientific research to tackle the climate change crisis caused by the burning of fossil fuels.

Ironically, the seeds for these academic centres were planted by fossil fuel companies. The obvious conflicts of interest—oil and gas companies funding research to end fossil fuel use—have caused researchers to cry foul and question whether the oil and gas industry—or any industry for that matter—can really be trusted to finance its own death.

Repeating history

The fossil fuel industry's financing of universities echoes a scheme started by tobacco companies in the 1950s. Digging through records made public through lawsuits, Harvard historian Allan M Brandt found that tobacco companies resolved to "demand more science, not less" as a public relations strategy to counter research showing smoking was harmful. In what he describes as "a public relations master stroke," industry's plan involved capturing academics by becoming a primary funder of biomedical research, as "offering funds directly to university-based scientists would enlist their support and dependence. Moreover, it would have the added benefit of making academic institutions 'partners' with the tobacco industry in its moment of crisis."

In 1954, tobacco companies announced the creation of the Tobacco Industry Research Committee, a purportedly independent research group that funded university scientists to study the health effects of smoking. In reality, the committee was run by the public relations company Hill and Knowlton, with a board of academic advisers carefully chosen by this same PR company, which also vetted any research grants.

Some documents confirm that energy companies had similar goals in mind when they began throwing money at elite American universities. After learning from Exxon scientists that governments would regulate oil and gas companies to halt global warming, the French fossil fuel industry began funding studies on carbon uptake by oceans at Columbia University in the early 1990s, research that could make climate change seem less alarming.They also began placing engineers at MIT and other institutions to monitor scientific work.

In 1998, the American Petroleum Institute, the largest US trade association for the oil and gas industry, laid out a plan to defeat government action on climate change through a multimillion dollar programme, to be enacted over several years. Part of this plan was to create a centre with a board of climate scientists that would have the mission of advancing scientific uncertainty. "The center will be funded at a level that will permit it to succeed, including funding for research contracts."

When this proposed policy leaked to the media, the American Petroleum Institute denied implementing it. But two years later, in 2000, British Petroleum and Ford motor company donated a combined $20m to Princeton to launch the first major programme at an American university to tackle climate change. In 2020, Princeton extended its partnership with ExxonMobil to advance new forms of research on carbon capture technology, which attempts to collect the carbon dioxide released when fossil fuels are burnt and then store it underground.

ExxonMobil declined to say how much money it had given Princeton, as did Princeton. A Princeton spokesperson told *The BMJ* that the university has authorised a process to dissociate itself from fossil fuel companies that engage in climate disinformation campaigns.

In 2000 BP and Ford donated a combined $20m to Princeton for the first major programme at a US university to tackle climate change

A Climate Strike protest at Princeton University in September 2019

Stanford's Doerr School of Sustainability was backed by a $1.1bn gift from a venture capitalist

Stanford students have demanded that the university stop accepting research money from energy interests

Free of fossil fuel funding

In March last year, students at Stanford sent the university's president a letter that highlighted the fossil fuel industry's decades of deception on climate change and demanded that the university stop accepting research money from energy interests. "More recently, the fossil fuel industry realized that it could no longer support climate denial while maintaining credibility, so its denial strategy shifted to framing itself as the solution to climate change," the students wrote in the student newspaper *Stanford Daily*.

In their complaint, the students cited multiple Stanford programmes, including the Global Climate and Energy Project and Precourt Institute for Energy, that were started and funded by oil and gas companies such as ExxonMobil, Shell, and Total. "Stanford has accepted tens of millions of dollars from fossil fuel companies to conduct research since 2011," the students wrote, citing Stanford's database on research funds.

Hundreds of Stanford students, alumni, faculty, and staff began signing a separate open letter early this year calling on Stanford's Doerr School of Sustainability to refuse fossil fuel funds. Backed with a $1.1bn gift from venture capitalist John Doerr, it will be Stanford's first new school in 70 years, and it will eventually swallow other Stanford centres financed with fossil fuel money, such as the Natural Gas Institute.

"There's a lot of this rationalisation that not all fossil fuel companies are bad," says Celina Scott-Buechler, a Stanford graduate student who signed the open letter. She points out that many of the high profile scientists who signed come from Stanford's medical school, where the culture is more aware of industry influence and supportive of research transparency.

Before she went to Stanford, Scott-Buechler worked for several years on climate change policy for a US senator and witnessed fossil fuel companies highlighting their funding of universities when asking congressional staff to change climate bills and water them down. "MIT and Stanford were the two that I saw the most frequently [cited] to say, 'We are working on solutions. We're committed to climate action.'"

Ben Franta, a Stanford student who is finalising his PhD on the history of climate disinformation, began writing essays about fossil fuel companies' influence in academia several years ago. He claims that professors began criticising him for raising problems and possibly threatening their funding. "We can look at other examples of industries that have funded research related to their products," Franta tells *The BMJ*. "Often the reasons are to obtain the trust of scientists, to paint themselves as part of the solution to the broader public, to keep an eye on what research is being done—even to influence what research gets done, what doesn't get done."

Firms frequently cite universities they fund
Celina Scott-Buechler

People don't want to work in a lab funded by oil
Ben Franta

Stanford did not answer *The BMJ*'s questions and responded with a short statement that it is committed to unbiased research and that the dean of the Doerr School of Sustainability will partner with industry to tackle climate change.

Last June, faculty at the University of California at San Diego proposed a senate resolution requiring restrictions and special disclosures for all University of California research funding provided by the fossil fuel industry, similar to those in place for tobacco. In the past decade, the "growing colonization of university space and other public institutions by energy corporations has been well established," states the resolution. "Millions of dollars have been funneled into supporting industry-friendly research, work whose conclusions sometimes have been pre-determined by funders."

A supporter of the resolution at UC San Diego told *The BMJ* that faculty are now working to get the entire University of California to support system-wide rules that call for transparency on all industry funding, not just for energy companies.

Draw of carbon capture

Many of those calling for their universities to cut ties with the industry cite carbon capture technology research as a prime example of the problem. It permits the notion that fossil fuel consumption can continue unabated, because harmful greenhouse gases are sequestered and locked up underground.

At Stanford, researchers with the Global Climate and Energy Project studied how to lock up carbon as a stable mineral underground and are studying seismic technology to detect when future carbon storage sites might leak. The university also hosts the Stanford Center for Carbon Storage, whose affiliate supporters have included oil and gas companies Chevron, ExxonMobil, Shell, and Schlumberger. For a $100 000 annual membership fee, Stanford offers a host of perks, including attendance at weekly meetings and faculty visits.

When the project shut down in 2019, the university thanked the funders, including ExxonMobil, Schlumberger, General Electric, Toyota, and DuPont. Nonetheless, Stanford built on its fundraising success to launch the Stanford Strategic Energy Alliance in 2018 with $20m from ExxonMobil.

At Berkeley, ExxonMobil scientists collaborate on discovering new materials that enhance carbon capture technology. Last summer, the company and academic team used a Berkeley press statement to announce a new material that could capture more than 90% of carbon dioxide emitted from industrial sources. The statement ended with further promotion for ExxonMobil, detailing the company's $10bn investments in low emission energy and collaboration with more than 80 universities.

When *The BMJ* asked why Berkeley continues to pour money into carbon capture research, a spokesperson said, "The scientists who made and make funding decisions enjoy full academic freedom and were/are clearly not swayed by ExxonMobil's perspectives."

Gas sponsored research launches US fracking boom

Fossil fuel money can serve as much more than an alleged research distraction. In at least one case, fossil fuel funded academics shifted national policy.

In 2011, MIT's Energy Initiative released a report that found natural gas could replace coal by "reducing carbon dioxide emissions, acting as a 'bridge' to a low-carbon future." The report dismissed a study by Cornell researchers that found natural gas was actually more harmful to the climate because of methane leaks. Bolstered by the MIT study, the narrative that "gas was green" took hold in the US. The next year, President Obama referenced the findings in his State of the Union address, and MIT's Ernest Moniz, who oversaw the report, was appointed secretary of energy, kicking off a fracking boom.

Today, we know that report had many flaws. "Natural gas has been portrayed as a bridge to the future," wrote medical experts in a 2020 essay in the *New England Journal of Medicine*. "The data now show that it is only a tether to the past."

In a recent documentary, Moniz refused to discuss the report's flaws or its funding, which he called "transparent." The report's major funder, it turned out, was a non-profit started by the natural gas industry.

Natural gas has been portrayed as a bridge to the future—it's only a tether to the past

In response to questions from *The BMJ*, MIT stated that it stands behind the 2011 paper, adding that gas will continue to serve an important role in helping to deploy and support solar and wind energy sources. However, many experts contacted for this article cite the paper as an example of fossil fuel companies funding research to protect their products, much like tobacco did half a century ago. "It's exactly like that," said Mark Jacobson, from Stanford. "The key is to counter it."

Carbon capture dreams

With so much academic research focused on capturing carbon, how promising is the technology? Last November, Tufts University professor Neva Goodwin co-published an essay arguing that it is the latest ploy by the fossil fuel industry to delay action on climate change. "We have watched mechanical carbon capture methods struggle to demonstrate success, despite US government investments of over $7bn in direct spending and at least a billion more in tax credits," Goodwin wrote.

Academics argue carbon capture is scientifically feasible but does not make economic sense. As evidence, they cite research that has found removing 1 gigaton of carbon dioxide every year—about 3% of global carbon emitted by human activity annually—requires about the same amount of electricity as the US generated in 2020. "There's never, under any circumstances, any benefit of using carbon capture equipment," said Stanford professor of engineering Mark Jacobson in a recent talk. "It's just a tax on low income people because they pay the highest fraction of their income on electricity."

Jacobson also examined the only coal fired energy plant in the US that used carbon capture technology. The equipment cost $1bn and burnt gas to capture the carbon from the coal combustion. Jacobson added that additional carbon had to be burnt to build the machinery and mine the coal, and this does not account for the harms caused by air pollution.

Jacobson describes research in the field as a "smokescreen" that distracts from solutions. "Renewables are the only option," he tells *The BMJ*. "We need to focus on what works." Companies, Jacobson says with a laugh, poured millions of dollars into universities to discover carbon capture technologies that still do not exist today. "That's what they did."

There's never, under any circumstances, any benefit of using carbon capture equipment
Mark Jacobson

Ironically, more than 40 years ago Exxon scientists found that while carbon capture may work technically, it fails economically as the energy required to capture and transport the carbon to underground storage is too expensive.

Back in 1981, Exxon developed an internal report that examined how climate change would affect Exxon's business and "in recognition of the fact that atmospheric CO_2 is a global environmental concern." Reporters discovered this document in 2015.

One section of Exxon's report discusses how the company has few options if the government introduces laws to control carbon dioxide because of the "exorbitant" costs of capturing it during fossil fuel combustion. "Indirect control measures, such as energy conservation or shifting to renewable energy sources, represent the only options that might make sense," Exxon concluded.

In a 1989 internal report that also became public in 2015, a senior Exxon executive explained to the company's board a strategy to counteract awareness of the climate crisis and delay government regulation of greenhouse gases. This strategy called for highlighting scientific uncertainty, emphasising economic costs and efforts to "extend the science" or continue research.

When asked about its internal documents denigrating carbon capture, as well as statements by a former chief executive also disparaging carbon capture and storage, an ExxonMobil spokesperson told *The BMJ* that the company is focused on achieving net zero greenhouse gas emissions with investments in carbon capture and storage, hydrogen, and biofuels. "We fund research at universities and for projects that align with society's net zero ambitions," they wrote, citing collaborations with Stanford, Princeton, and UC Berkeley.

Still, more than 80% of projects attempting to commercialise carbon capture and storage have failed, and MIT closed its carbon capture and sequestration technologies programme in 2016, after none of its several dozen projects had been commercially successful.

Meanwhile the movement on campus against fossil fuel funding is growing. "Young people don't want to work in a lab that is funded by oil companies because these young people want to solve climate change," says Stanford's Franta, who recently joined Oxford University. He said that climate scientists at elite universities have normalised financial relationships with oil and gas companies, and he expects universities to resist efforts to remove the funding. "The universities that do that are going to see their reputations decline," he tells *The BMJ*. "This is going to be an issue that is not going away."

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