

this week

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“Covid booster will be needed in autumn”

EXCLUSIVE

A covid-19 booster vaccine is likely to be rolled out in the autumn to avoid another winter surge, a government adviser on vaccination has told *The BMJ*.

Speaking on *The BMJ*'s Talk Evidence podcast, Anthony Harnden—acting chair of the Joint Committee on Vaccination and Immunisation, said he believed that the booster would be needed either to protect against a new variant or as a safety net, as the duration of protection is unknown.

Harnden, who assumed the role of JCVI chair when Andrew Pollard, lead investigator on the Oxford/AstraZeneca vaccine, recused himself for the duration of the pandemic, said, “We certainly don't want to see a winter like we've seen this winter. And if we've got new variants circulating and we've got dropping levels of immunity due to the vaccination, then that becomes an imperative to do a booster.” He added the booster could be given to certain vulnerable groups or to the entire population.

“I think we're likely to make a bold decision to recommend a booster dose, even if we haven't got all the evidence of the necessity, just because I think the consequences of not immunising with the

booster dose are so big. If it's proved that it's needed months later it may be too late,” he said.

He suggested that the booster could be rolled out in August or September “rather than later in the year, because of this worry about a large third wave affecting the vulnerable elderly.”

During the interview Harnden also tackled the question of whether the covid-19 vaccine could become an annual vaccination, like the flu programme.

“I suspect it's going to be likely that we're going to require an annual boost for a while,” he said. “It just depends on the length of duration of protection. The virus mutates, [but it] probably doesn't mutate as much or as quickly as the influenza virus, so it's very difficult to predict whether this is going to be an annual vaccine or for how many years.

“But I certainly think it's going to be a booster shot this year.”

The UK has reported more than 4.2 million cases of covid-19 and around 125 000 deaths, most of which occurred in the second half of 2020 and at the beginning of 2021.

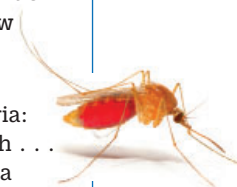
Elisabeth Mahase, *The BMJ*

Cite this as: *BMJ* 2021;372:n664

Andrew Harnden, chair of JCVI, told a *BMJ* podcast that not to offer a booster risked a major winter outbreak

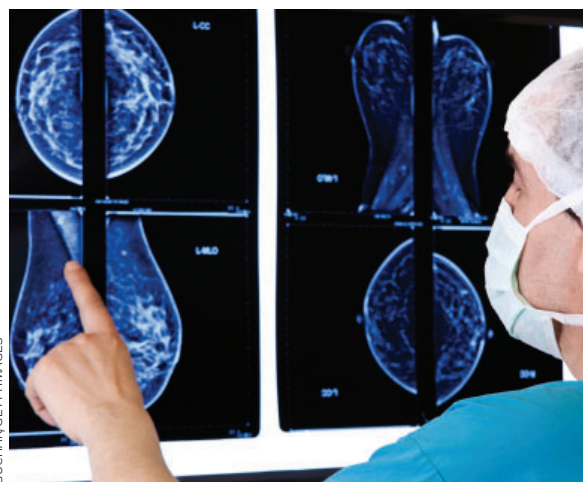
LATEST ONLINE

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- A vaccine against malaria: interview with . . . Richard Bucala



SEVEN DAYS IN

Breast screen before covid vaccine or six weeks after second dose, says guidance



Breast screening appointments should be scheduled to take place before women receive a first dose of covid-19 vaccine or four to six weeks after the second dose when possible, the Drug Safety Research Unit has said.

The advice has been given because of the potential for the swelling of lymph nodes in one armpit (the side of the injection) following vaccination, which could be detected during routine breast screening and cause unnecessary concern.

Lymphadenopathy is a known adverse event of the Moderna and Pfizer-BioNTech vaccines and has been estimated to occur in 11.6% of people receiving their first dose and 16% receiving their second. The swelling usually settles within a few days, but it can cause concern, particularly in patients with a personal or familial history of breast cancer or carriers of the *BRCA* gene mutation.

Saad Shakir, unit director, said, "Following case reports, societies of clinical and breast imaging in the US gave guidance on the effect of covid-19 related axillary lymphadenopathy on breast cancer imaging. These effects were also observed in clinical trials for some of the vaccines." He added that, while there was no evidence from AstraZeneca vaccine trials, a detailed data search had not yet been performed.

Elisabeth Mahase, *The BMJ* Cite this as: *BMJ* 2021;372:n617

Covid-19

NHS vaccine supply will "increase substantially"

Doses of covid-19 vaccine sent to NHS sites will "increase substantially" for the next few weeks, NHS England said. A letter to local system leaders sent on 2 March said, "From 11 March, vaccine supply will increase substantially and be sustained at a higher level for several weeks. Therefore, from the week of 15 March we are now asking systems to plan and support all vaccination centres and local vaccination services to deliver around twice the level of vaccine available in the week of 1 March."

Global survey shows rising vaccine confidence

People's willingness to receive a covid vaccine has increased worldwide to 58%, shows a survey of 13 500 people led by Imperial College London's Institute of Global Health Innovation and YouGov. The poll ran from November to February. In the most recent survey people in the UK were the most willing, with 77% stating that they would take a vaccine if one was available. The populations of France, Japan, and Singapore have consistently remained

among the least willing but have all grown in confidence since November, the report found.

Covax to distribute 237 million doses by May

Covax, the programme to ensure that all countries have access to covid-19 vaccines, announced where 237 million doses of the Oxford-AstraZeneca covid-19 vaccine would be delivered during the first round of its worldwide allocation. It said that Cote d'Ivoire, Ghana, and India had already received doses of the AstraZeneca vaccine made by Serum Institute of India. Colombia became the first country in the Americas to receive vaccines through the initiative after 117 000 doses of the Pfizer-BioNTech vaccine were delivered. Bolivia, El Salvador, and Peru are expected to follow suit.

Students may need testing every three days

The emergence of more transmissible variants of SARS-CoV-2 may mean having to test students every three days to prevent major outbreaks, researchers said. The UK government has advised

universities to test twice a week when some students return to campuses from 8 March. But researchers who modelled the effects of various interventions for controlling transmission said that testing twice a week may not be enough, given the more transmissible Kent variant of the virus. Their preprint paper concluded that strict adherence to testing and self-isolation were the most effective ways to reduce transmission on campuses.

Climate change Government has "no plan" for achieving net zero

The government lacks a coherent plan for achieving net zero greenhouse gas emissions by 2050 despite setting the target in law almost two years ago, MPs on the Commons Public Accounts Committee concluded. Meg Hillier (below), committee chair, said, "Our response to climate change must be as joined up and integrated as the ecosystems we are trying to protect. We must see a clear path

plotted, with interim goals set and reached—it will not do to dump our emissions on poorer countries to hit UK targets. Our new international trade deals [and] the levelling-up agenda—all must fit in the plan to reach net zero."

Learning disabilities

New advice on DNACPR is issued to hospitals

NHS England wrote to doctors and clinical leads to emphasise that it was "unacceptable" for people to have DNACPR (Do Not Attempt CPR) marked on their record just because they had a learning disability or autism. The letter said, "The terms 'learning disability' and 'Down's syndrome' should never be a reason for issuing a DNACPR order or be used to describe the underlying, or only, cause of death. Learning disabilities are not fatal conditions. Every person has individual needs and preferences which must be taken account of, and they should always get good standards and quality of care."



MEDICINE

Obesity

Government announces £100m for obesity services

The government announced £100m in funding for weight management services for the financial year 2021-22. Over £70m will be channelled to weight management services through the NHS and councils to fund initiatives such as access to digital apps, weight management groups or individual coaches, and specialist clinical support. An additional £30m will fund initiatives to help people maintain a healthy weight, including access to the NHS's free 12 week weight loss plan app and marketing campaigns to motivate people to make healthier choices.

Research

Transparency fears rise over new agency

The government's new "high risk, high reward" scientific research agency will not have to comply with normal procurement rules and could be exempt from the Freedom of Information Act. The £800m Advanced Research and Invention Agency (ARIA) will "fund the most inspiring inventors to turn their transformational ideas into new technologies, discoveries, products, and services," the government said. But Ed Miliband, shadow business secretary, warned, "Ministers must not use ARIA as cover for further cronyism."

Child health

Guidance on fabricated illness updated

The Royal College of Paediatrics and Child Health (RCPCH) provided guidance on how to spot and investigate potential cases of fabricated or induced illness (FI) and discuss the findings with parents or caregivers. The guidance, an update on 2009, provides procedures for safeguarding children who present with perplexing

The NHS and local councils will share £70m for weight loss initiatives

presentations or FI and advice on how to minimise harm. It follows a 2018 survey of RCPCH members, which showed 92% (216) recalled seeing at least one perplexing presentation in the past year and 30% had seen more than five.

Young people need accurate advice, says NICE

Children and young people must be provided with clear and accurate information about their health, said NICE draft guidance. Published on 5 March, the guide emphasised the need to give young people advice tailored to their level of maturity and understanding. They and their carers should be warned that some medical information available online may be inaccurate and should be advised where they can access "accurate, credible, and evidence based" information, the guidance added.

Ministers pledge £79m for children's mental health

The government pledged £79m to expand access to mental health services for children and young people. Ministers said young people had been uniquely affected by the pandemic, and NHS research showed one in six may now have a mental health problem, up from one in nine in 2017. Access to community services will be expanded and the number of mental health support teams in schools and colleges will increase from 59 to 400 by April 2023.

Cite this as: *BMJ* 2021;372:n648



TEST AND TRACE

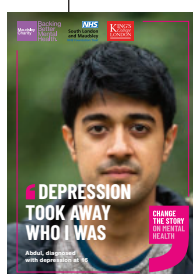
The government's controversial test and trace service will receive an additional

£15bn

in funding in 2021-22, taking the total amount it has received in two years to

£37bn

[Chancellor's budget]



SIXTY SECONDS ON... DOLLY PARTON



WORKING 9 TO 5?

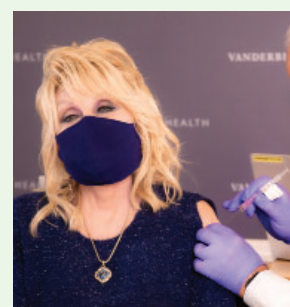
Not in medicine (and certainly not if Jeremy Hunt had had his way). But, while we're not talking seven day working here, the world's favourite country music star has certainly been putting in some overtime recently.

HAS SHE GOT A NEW ALBUM OUT?

No, but she'd probably be number one if we had a vaccine chart. Not content with donating \$1m (£720 000) to Nashville's Vanderbilt University Medical Center, which worked with the drug manufacturer Moderna to develop its successful covid vaccine, the 75 year old singer has now reworked her hit "Jolene" to encourage people to get vaccinated.

DID SHE GIVE IT A MODERNA TWIST?

Of course. Parton posted a clip of her singing "Vaccine, vaccine, vaccine, vaccine / I'm begging of you, please don't hesitate," just before she was given her jab at Vanderbilt—which some Twitter users described as "a taste of her own medicine."



DID HER DONATION GET HER TO NO 1 ON THE VACCINE WAITING LIST?

No. Despite her \$1m, the Queen of Nashville insisted on waiting her turn, telling AP in February, "I'm not going to jump the line just because I could."

A DOLLY MIXTURE?

That's too much. But seasoned listeners may remember that this isn't the first time Parton has remixed "Jolene" for public health purposes. Last April she offered the sage advice, "If you touch him, please go wash your hands."

ANY OTHER DOLLY NEWS?

Well, her Tennessee theme park, Dollywood, is still not allowed to open because of the pandemic. But, given the effectiveness of her public health campaigning, she may be better off keeping it closed permanently and joining the World Health Organization instead. Frankly, if her latest intervention doesn't get everyone rushing to their nearest vaccine clinic, nothing will.

Gareth Iacobucci, *The BMJ*

Cite this as: *BMJ* 2021;372:n647

“Single dose of Pfizer and Oxford vaccines cuts hospital risk by 80% in people over 80”

Both the Pfizer BioNTech and the Oxford AstraZeneca vaccines are highly effective in reducing covid-19 infections and protecting against severe disease in older adults, preliminary data show.

Analysis by Public Health England (PHE), published as a preprint, estimated that a single dose of either vaccine is around 80% effective at preventing hospital admission in people aged over 80, three to four weeks after the first dose. A single dose of the Pfizer vaccine also led to an 85% reduction in deaths from covid-19 in people aged 70 and over, the study suggested. These data are not yet available for the Oxford AstraZeneca vaccine because it was rolled out later.

Mary Ramsay, PHE's head of immunisation, said, “This adds to growing evidence showing that the vaccines are working to reduce infections and save lives. While there remains much more data to follow, this is encouraging, and we are



AMER GHAZAL/ALAMY

increasingly confident that vaccines are making a real difference.”

All adults aged 70 years or older in England (over 7.5 million) were eligible for inclusion in the study, which used a test negative case control design to compare the rate of vaccination in symptomatic people who tested positive for covid-19 with those who tested negative. It also compared hospital admissions and

death rates in people in their 80s who were vaccinated at least two weeks previously with those who were not vaccinated.

Among people aged 70 and over, protection against symptomatic covid-19 after a single dose of the Pfizer vaccine reached 61% (95% confidence interval 51% to 69%) from 28 to 34 days after vaccination and then plateaued.

Protection after two doses of the Pfizer vaccine increased to around 85-90%, but data are not yet available for the Oxford AstraZeneca vaccine.

People aged 80 and over who had one dose of Pfizer's vaccine and still developed symptoms had an additional 43% (33% to 52%) lower risk of emergency hospital admission and an additional 51% (37% to 62%) lower risk of death. Those vaccinated with one dose of the Oxford AstraZeneca vaccine had an additional 37% (3% to 59%) lower risk of emergency hospital admission, but there were insufficient follow-up data to assess mortality.

“Combined with the effect against



Among over 70s protection against symptomatic disease after a single dose of the Oxford AstraZeneca vaccine reached **60%** (95% CI 41% to 73%) from 28 to 34 days and increased to **73%** (27% to 90%) from day 35 onwards

Doctors unlawfully denied girl spinal muscular atrophy drug, judge rules

The failure to take into account the evidence of Sophie's mother was irrational
Lady Justice King

The decision of two consultants to deny a 10 year old girl with type 3 spinal muscular atrophy a potentially life changing drug were “unlawful” and “irrational,” three Court of Appeal judges have ruled.

Imelda Hughes, a consultant paediatric neurologist at Manchester University Hospitals Trust, and Mariacristina Scoto, a consultant in neuromuscular translational research at Great Ormond Street Hospital for Children Trust, decided Sophie Basma did not meet the criteria for treatment.

The drug nusinersin (Spinraza), which has a list price of £450 000 for the first year and £225 000 for subsequent years but is supplied to the NHS at a discount, is the only potentially disease modifying treatment available in the UK for Sophie's condition. NICE guidance in October 2019 stated it should be provided to patients provided that seven criteria were satisfied. It was accepted that Sophie satisfied six of the criteria.

The consultants concluded she was unable to satisfy the seventh criterion that she could walk

five steps unaided in the 12 months before she became entitled to be considered for the drug.

Judicial review

Her mother, Sara Basma, took judicial review proceedings against the trusts and when the claim was dismissed, Basma took it to the Court of Appeal.

The court heard Sophie had not had a formal assessment of her walking ability within the 12 months to October 2019. At her last physiotherapy assessment, in February 2018, she was recorded as walking four steps unaided.

Her mother protested that Sophie had walked at least five steps unaided within the period but was unable to produce a video.

When Hughes told Basma her daughter was ineligible for the drug, she sought a second opinion from Scoto, who recorded, “I have explained that for Sophie to access the drug there must be a formal documentation of her ability to walk.” Scoto referred the case to the NHS England clinical panel, giving examples of Sophie walking at least five steps on several occasions. The panel decided she was ineligible.

Scoto wrote again to the



symptomatic disease, this indicates that a single dose of either vaccine is around 80% effective at preventing hospital admissions and a single dose of the Pfizer vaccine is 85% effective at preventing death with covid-19," the paper said. The authors added that there was "a clear effect of the vaccines against the UK variant of concern."

"Positive news"

Deborah Dunn-Walters, chair of the British Society for Immunology's covid-19 and immunology taskforce, said, "These findings are particularly welcome news because the participants were all aged 70 and over. The fact that vaccination is effective in significantly reducing symptomatic cases, hospital admissions, and deaths from covid-19 in this older age group is positive news."

Paul Hunter, professor in medicine at the University of East Anglia, said, "The main conclusions from this paper are that the two vaccines currently in use in the UK appear to be equally effective at preventing infection in older people. Of perhaps even greater importance is that even if people get a symptomatic infection they are still less likely to need to be admitted to hospital and less likely to die."

Gareth Iacobucci, *The BMJ*
Cite this as: *BMJ* 2021;372:n612

panel, including further evidence from Sophie's family and teachers. She wrote, "As a clinician I would consider it possible this child could have walked unaided some time beyond her assessment in February 2018."

"Not sufficient evidence"

The panel concluded there was "not sufficient objective and clinical evidence" to change its original advice.

Giving judgment, Lady Justice King said, "I have concluded that decisions made by each of the doctors were both 'unlawful' and 'irrational.'" She said these were the terms used in judicial review cases and

she realised such terms would be "professionally hurtful and upsetting to doctors such as Dr Hughes and Dr Scoto who are experts in their highly professional fields."

She added, "The failure of both to take into account the evidence of Sophie's mother in respect of Sophie's ability to walk from time to time when there was no clinical evidence available was irrational."

The judge ordered the trusts to reconsider in the light of the judgment together with evidence submitted by Basma.

Clare Dyer, *The BMJ*
Cite this as: *BMJ* 2021;372:n641



We are increasingly confident that vaccines are making a real difference

Mary Ramsay



These findings are particularly welcome news because the participants were all aged 70 and over

Deborah Dunn-Walters

Highest covid death rates in states with most overweight populations

Covid death rates are 10 times higher in countries where more than half of the adult population is overweight, a report from the World Obesity Foundation has found.

The report analysed mortality data from Johns Hopkins University and the WHO Global Health Observatory data on obesity. Of the 2.5 million covid-19 deaths reported by the end of last month, 2.2 million were in countries where over half the population is classified as overweight—defined as a body mass index above 25.

Linear correlations

Taking data from more than 160 countries, the report found linear correlations between covid-19 mortality and the proportion of adults that are overweight. There is not a single example of a country with less than 40% of the population overweight that has high death rates (over 10 per 100 000), the report said. Similarly, no country with a death rate over 100 per 100 000 had less than 50% of its population overweight.

Vietnam, for example, had the lowest death rate from covid-19 in the world (0.04 per 100 000) and the second lowest levels of population overweight at 18.3%. The UK has the third highest death rate globally (184 deaths per 100 000) and the fourth highest prevalence of overweight at 63.7%. The US has the next highest death rate at 152.49 deaths per 100 000 and has 67.9% of the population overweight.

A small number of countries seem to run against

the trend including New Zealand, Australia, and several Gulf states, where prevalence of overweight among adults is high, but reported deaths from covid-19 are low. The report said this was likely to be due to national responses to the pandemic, including border controls.

The authors acknowledged that the age structure of a country, as well as its relative wealth and reporting capacity, has an impact on cases, hospital admissions, and deaths, but said the findings seem to be independent of these factors.

Overweight populations are more susceptible to respiratory diseases generally. During the MERS and H1N1 influenza epidemics, for example, worse outcomes were linked to excess body weight.

"Pandemic waiting to happen"

Tim Lobstein, the report's author, said, "We now know that an overweight population is the next pandemic waiting to happen. Look at countries like Japan and South Korea where they have very low levels of covid-19 deaths as well as very low levels of adult obesity. They have prioritised public health across a range of measures, including population weight, and it has paid off in the pandemic."

Tedros Adhanom (left), director general of WHO, said, "The report must act as a wake-up call to governments globally. Investment in public health and coordinated, international action to tackle the root causes of obesity is one of the best ways for countries to build resilience in health systems post-pandemic: we urge all countries to seize this moment."

Jacqui Wise, London
Cite this as: *BMJ* 2021;372:n623



DATA: of the 2.5 million covid-19 deaths reported by the end of last month, 2.2 million were in countries where over half the population is classified as overweight

NHS Test and Trace had no impact on pandemic, say MPs

England's Test and Trace service failed to deliver its central promise to avoid a second national lockdown and there is no clear evidence whether its "unimaginable" costs have been justified, MPs have concluded.

The damning report from the House of Commons Public Accounts Committee says that NHS Test and Trace must "wean itself off its persistent reliance on consultants and temporary staff." In early February it was still employing around 2500 consultants at an average daily rate of £1000 with some paid £6624 a day.

Meg Hillier, the committee chair, said, "Despite the unimaginable resources thrown at this project, NHS Test and Trace cannot point to a measurable difference to the progress of the pandemic, and the promise on which this huge expense was justified—avoiding another lockdown—has been broken, twice."

The service, led by Dido Harding, was set up last May with a budget of £22bn and has since been allocated a further £15bn.

FOR THE BILLIONS OF POUNDS SPENT WE NEED TO SEE A TOP CLASS LEGACY SYSTEM
MEG HILLIER

Hillier said, "For the billions of pounds spent we need to see a top class legacy system. British taxpayers cannot be treated like a cash machine. We need to see a clear plan and costs better controlled."

The UK's testing capacity rose from around 100 000 a day in May 2020 to more than 800 000 a day in January 2021. But the report points out that the percentage of laboratory capacity used in November and December remained under 65%. And even then the target to turn around all tests in face-to-face settings in 24 hours was never met.

Mass rapid testing was supposed to be a game changer, but confusion persists over why and how it should be used, the report says. It calls for clearer guidance and targets and says any plans should take account of the accuracy and purpose of rapid tests and how to manage the risks associated with false reassurance.

The committee said it welcomed the increasing collaboration with local councils but questioned why this had not happened earlier. It also was concerned by a lack of engagement with head teachers and education stakeholders in the rollout of rapid testing in schools.

Jacqui Wise, London
Cite this as: *BMJ* 2021;372:n663

NEWS ANALYSIS

NHS pensions: what do changes to the lifetime allowance mean?

What's happened to NHS pensions?
Nothing has happened to NHS pensions specifically. But like all pensions they will be affected by an announcement, made by the chancellor, Rishi Sunak, in the budget on 3 March, that the lifetime allowance will remain at £1 073 100 until April 2026.

What is the lifetime allowance?
It is a limit on the amount of pension benefit that can be taken without triggering an extra tax charge. Most pension benefits count towards the lifetime allowance.

What effect will freezing the lifetime allowance have?
In the simplest terms it means that, over time, high earners are now more likely to exceed the limit and pay tax on their pension. The rate of tax payable on any excess above the allowance depends on how your pension benefits are paid.

For members of the NHS pension scheme this money will normally be paid as part of your annual pension "income." This means you will be taxed at a rate of 25% on anything over the £1 073 100 limit. NHS Pensions will deduct this tax charge from your pension

before it's paid to you. So, as Rachael Hall, principal partner at Sandringham Medical, explains, your pension will still grow once you've exceeded the cap, but it will grow with a tax charge on it.

The £1.07m limit sounds like a lot
As a total, it does—but Graham Crossley, head of technical business development at Quilter Financial Advisers, explains that doctors don't actually have that amount of money. For example, if you were a member of the 1995 NHS pension scheme with an annual pension of £46 656 (with a lump sum of three times that amount) it would be the equivalent of the lifetime allowance limit, he says.

Who will be hit by the freeze, and how much will they lose?
It's difficult to be precise, as everyone's situation will be different. To give some idea, however, Crossley says if you'd accrued an annual pension of £50 500 the tax charge would see that pension cut to around £49 500 a year.

What would have happened if the allowance hadn't been frozen?
Crossley explains that, if the lifetime

Consultants and salaried GPs unhappy at proposed 1% pay rise

The BMA has described a proposed 1% pay rise for consultants and salaried GPs working in England as a dereliction of the government's moral duty to the NHS workforce.

The Department of Health and Social Care (DHSC) made the proposal in evidence it submitted on 4 March to the Review Body on Doctors' and Dentists' Remuneration

(DDRB) for the 2021-22 pay round.

The review body gathers evidence from the government, the BMA, and other interested parties before making recommendations on pay rises. This year it will make recommendations for consultants and salaried GPs.

In its evidence, the health department said

that when the budget for the NHS was set by the government, a pay award of 1% for NHS staff had been assumed. "Anything higher would require reprioritisation," it said.

Chaand Nagpaul, BMA chair, said in response to the offer, "This is a dereliction of the government's moral duty and obligation to a workforce that is



allowance had continued to follow inflation, projections from the Office for Budget Responsibility show that by 2025-26 “it would have gone up to £1 162 300. But because it hasn’t, there is now going to be £89 200 less allowance.”

? Will this change affect the workforce?

Very possibly. Crossley says that the last time the lifetime allowance changed he saw doctors, especially GPs, “leaving in their droves” because they were worried about worse changes to come, and it’s very possible that this will happen again.

“People retired early so that they didn’t get caught by potentially more punitive tax regimes,” he says. “We also saw a lot of people retiring and then returning to work—so that they could ‘lock in’ the current tax regime—but they often returned on fewer sessions than they were doing before.

“The third thing we saw a lot was doctors simply emigrating for better pay elsewhere. As soon as you start making these sorts of changes doctors think, ‘What else might happen in this session of parliament?’”

Hall says that, for some older consultants who have been putting off retirement and have built up a relatively large pension, this latest change could be “the straw that broke the camel’s back.” She adds, “We’ve got a workforce who have been running themselves into the ground for a sustained period of time, and we

have to take that into consideration. People are exhausted, and may want to bring their retirement plans forward.”

? How has the BMA reacted?

It has said that freezing the lifetime allowance is a tax that will disproportionately affect doctors. Vishal Sharma, chair of the BMA pensions committee, calls the move “a bad decision [that] is creating the perfect storm, forcing an exhausted workforce—many of whom are already planning to work fewer hours—to make very tough decisions such as working fewer hours or leaving the NHS long before they would naturally retire.”

The BMA has repeatedly called on the government to find a way of mitigating against large pension taxation bills for doctors to avoid them having to leave the NHS, says Sharma.

? What should I do now?

Hall says that doctors should not feel driven out of the NHS pension schemes as benefits do not stop growing above this level, despite the charge. “However, it will be advantageous for some people to bring forward retirement plans, especially if they have been putting them off.”

Crossley advises doctors not to react impulsively by leaving the NHS pension scheme. “It still offers great value for money compared to the private sector; it’s just not as great as it used to be,” he says.

He adds that, if doctors are nearing the end of their career, the benefits



that have accrued through the pension scheme, even with the lifetime allowance charge, far outweigh the cost of any taxation that would be paid if the money was taken as income.

The scheme also provides valuable benefits, such as death in service benefits and ill health retirement pension. But Crossley adds that everyone’s position will be different and that doctors should seek specialist financial advice if they have concerns.

This bad decision is creating the perfect storm, forcing an exhausted workforce to make very tough decisions

Vishal Sharma

? I’m a trainee—should I just quit?

No! Crossley says he hasn’t met one young doctor for whom it would make sense not to be in the pension scheme. It’s still a good pension scheme, he says—it’s just not as good as the pension that doctors who have already retired seem to have achieved.

Hall adds, “You’ve got your whole career ahead of you, you can’t focus on the lifetime allowance. It may not exist by the time you get to retirement. The most important thing is that you build a pension. Everyone needs something to live off in retirement.”

Abi Rimmer, *The BMJ*

Cite this as: *BMJ* 2021;372:n660



MARK THOMAS

keeping the NHS on its feet and patients alive.” He called on the review body to demonstrate that it was independent of the government and to acknowledge the need for a fair pay uplift that “recognises the efforts made and personal risks

doctors have taken during this pandemic.”

The BMA, the Royal College of Nursing, the Royal College of Midwives, and Unison have written an open letter to the chancellor, Rishi Sunak, expressing their dismay at the pay

This is a dereliction of the government’s moral duty and obligation

Chaand Nagpaul

offer and asking him to reconsider. They said that the offer “fails to provide staff who have been on the very frontline of the pandemic the fair pay deal they need. Our members, already exhausted and distressed, are also expected to go on caring for the millions of patients on waiting

lists, coping with a huge backlog of treatment as well as caring for those with covid-19.”

On 9 March Simon Stevens, chief executive of NHS England, told MPs on the Health and Social Care Committee that in the 2018 long term plan NHS salaries were budgeted to increase by 2.1% this year.

Stevens said, “That was approaching two years ago, so things have changed. But at the time, the working assumption was that there would be

available 2.1% for the costs of the agenda for change pay group in 2022, together with the overhang from the 2021 elements of the multi-year agenda for change pay deals.”

Chris Hopson, the chief executive of NHS Providers, described the recommendations as a disappointment “not just for the NHS workforce, but for trust leaders who also support a higher rise for their hardworking staff.”

Abi Rimmer, *The BMJ*

Cite this as: *BMJ* 2021;372:n646

THE BIG PICTURE

Paying the price: women doctors on the pandemic

In the week that the BMA revealed that female doctors have taken on extra—often unpaid—work during the pandemic, to the detriment of their wellbeing, women from the Royal Blackburn Teaching Hospital sat for portraits as they shared their covid experiences to mark International Women's Day.

In a recent BMA survey, doctors were asked whether in January they had worked extra hours above their contractual requirements. Of the 4182 women who responded, 27% (compared to 23% of men) said they had worked extra unpaid hours and 15% (7% of men) of those who did work longer said they had felt under “significant” pressure to do so.

The survey also showed that 44% (of 4495) of women and 35% (of 3236) of men reported experiencing depression, anxiety, stress, burnout, or distress related to their work.

Abi Rimmer, *The BMJ* [Cite this as: BMJ 2021;372:n658](#)

1. Mable Ng, 25, pharmacist
2. Georgina Robertson, 46, A&E consultant
3. Maxine Sharples, 36, paramedic
4. Zebun Nissa, 42, doctor
5. Priscilla Manuel, 44, matron
6. Rahila Dusu, 33, junior doctor
7. Voirrey Quilliam, 25, speech and language therapist





HANNAH MCKAY/REUTERS

Vitamin D and covid-19

Benefits are possible but evidence is sparse, indirect, and inconclusive

The pandemic has led to many unfounded and exaggerated claims about possible treatments. One high profile controversy has been the role of vitamin D in the prevention and management of covid-19,^{1,2} so the National Institute for Health and Care Excellence (NICE), Public Health England, and the Scientific Advisory Committee on Nutrition rapid guideline is timely.³

The joint guidance concludes that there is little good evidence on vitamin D and covid-19, highlights the need for further research, and supports existing government advice that adults and children in the UK should take 10 µg (400 IU) a day between October and March, to optimise musculoskeletal health. It also recommends that certain populations, such as minority ethnic groups, consider taking vitamin D throughout the year.

What's the evidence?

Vitamin D supplementation of 10–25 µg a day has a modest protective effect against acute respiratory infections,⁴ but research on a direct effect in covid-19 is sparse. The NICE review⁵ included one small randomised controlled trial of vitamin D as treatment,⁶ no trials of vitamin D as prevention, and 12 observational studies investigating associations between serum vitamin D concentrations and incidence or treatment of covid-19. The one small (n=76) low quality trial from Spain reported significantly reduced disease severity among patients given high dose vitamin D during their hospital admission.⁶



It's important that people are not falsely reassured by vitamin D supplements

Two further trials not included in the NICE review reported conflicting findings. A single oral dose of 5000 µg of vitamin D₃ did not influence length of stay among Brazilian patients with severe covid-19 (n=240).⁷ In a smaller trial from India, however, (n=40) patients with mild or asymptomatic covid-19 were more likely to test negative at 21 days following daily vitamin D supplementation starting at 1500 µg.⁸

Observational evidence is also inconsistent. Some, but not all, studies report an association between vitamin D deficiency and greater incidence or severity of SARS-CoV-2 infection.⁹ The extent of uncontrolled confounding by age,¹⁰ ethnicity,¹¹ genetic heterogeneity,¹² and obesity^{13 14} varies among studies, however, and probably accounts for at least some of the observed associations.

Though direct evidence of a link between vitamin D levels and covid-19 incidence or outcomes is lacking, indirect evidence of an immunomodulatory role of vitamin D in respiratory infections exists. Other indirect evidence includes the similarity of the risk factors for both vitamin D deficiency and severe covid-19: older age, obesity, and minority ethnicity, also, the correlation between seasonal decline of serum concentrations of vitamin D and higher burden of covid-19 in high latitude countries.¹⁵ Taken

together, existing evidence supports a compelling case for further research.

Implications for guidance

UK guidance recommending 10 µg a day of vitamin D has been in existence for a while, but adherence is not guaranteed. Raising awareness of the relevance of vitamin D to musculoskeletal health is therefore appropriate, particularly during pandemic restrictions on movement. Evidence for a role in covid-19 remains suggestive only, but people may choose to take the recommended dose on the precautionary principle that it does no harm, may be beneficial, and improves bone health.

Vulnerable groups in particular need guidance on how to obtain vitamin D. Healthcare professionals can direct people at high risk to free NHS provision¹⁶ and eligible women and children to the Healthy Start scheme (<https://www.healthystart.nhs.uk/>).

It's important that people are not falsely reassured by vitamin D supplements, and guidance must stress the importance of hand hygiene, face coverings, physical distancing, and vaccination against covid-19 in culturally and linguistically appropriate campaigns through local community groups.

Further trials evaluating vitamin D supplements in the prevention and management of covid-19 are now justified, with particular attention to different doses, baseline vitamin D levels of participants, and effects on different population subgroups and in different settings, including hospitals. Ongoing trials such as Covit¹⁷ and Coronavit (NCT04579640), which compares three different doses, will help inform future guidance.

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● ANALYSIS, p 403

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Vaccine hesitancy among minority groups

Tackling low vaccination rates in some communities requires engagement, understanding, and trust

With mass covid-19 vaccination efforts under way in many countries, including the UK, we need to understand and redress the disparities in its uptake. In a UK survey in December 2020, vaccine hesitancy was highest among black, Bangladeshi, and Pakistani populations compared with people from a white ethnic background.⁵

Even more worryingly, data up to 15 January 2021 show substantially lower rates of covid-19 vaccinations among over 80s in ethnic minority (white people 42.5%, black people 20.5%) and deprived communities (least deprived 44.7%, most deprived 37.9%) in England.⁶ Similarly, data from an NHS trust show lower covid-19 vaccination rates among ethnic minority healthcare workers (70.9% in white workers v 58.5% in South Asian and 36.8% in black workers; $P<0.001$ for both).⁷

These disparities have serious implications. The pandemic continues to have a disproportionate effect on people from ethnic minorities, with higher covid-19 morbidity and mortality and greater adverse socioeconomic consequences.¹⁰ Without an effective vaccination strategy to mitigate the risks, the situation will worsen. Moreover, the differential uptake will further exacerbate pre-existing health inequalities and marginalisation of ethnic minority groups.

Vaccine hesitancy, characterised by uncertainty and ambivalence about vaccination, is a legitimate viewpoint, underscoring the failure of effective public health messaging.

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NATHAN STIRK/GETTY IMAGES

The legitimate concerns and information needs of ethnic minority communities must not be ignored

People who are hesitant can still be convinced of the vaccines' safety, efficacy, and necessity,¹¹ and, most importantly, they are not "anti-vaxxers."

The most common reasons for hesitancy are concerns about side effects and the long term effects on health,² and lack of trust in vaccines, particularly among black respondents.⁵ Some have capitalised on these concerns to spread misinformation,¹¹ adding to the historical mistrust of government and public health bodies that runs deep in some ethnic minority groups.

Systemic racism

Trust is eroded by systemic racism and discrimination,¹⁰ previous unethical research in black populations,¹³ under-representation of minorities in vaccine trials,⁹ and negative experiences within a culturally insensitive healthcare system.¹⁰ Residential segregation, a form of systemic racism, affects health and access to health resources in multiple ways, creating conditions that amplify mistrust.¹⁰ Segregation is rising in Europe, and in the UK the Bangladeshi and Pakistani communities are the most segregated.¹⁴ Ethnicity intersects with socioeconomic status and educational attainment, accentuating the effects.^{10 14} Access barriers may also aggravate the disparities in uptake.

Trust could be established by funding and supporting trusted community and primary care led

vaccination efforts. Engaging community groups, champions, and faith leaders, and resourcing targeted, culturally competent interventions would also help reduce vaccine hesitancy.¹⁵ For example, assuaging doubts regarding the religious acceptability of vaccines will require consistent non-stigmatising messages, co-designed, shared, and endorsed by people within the community, including health professionals and faith leaders.^{9 16}

Communication

Prioritising vulnerable members of minority communities, in particular healthcare workers, for covid-19 vaccination and recognising their roles as trusted sources of information could reduce the perceptions of risk of covid-19 vaccines among people from ethnic minorities. Such communications can be made more effective by providing educational resources in multiple languages.¹⁷ Vaccination could be made more convenient and accessible through measures such as providing transport, particularly for people who work in lower paid public facing roles,¹⁷ and using places of worship as vaccination sites.¹⁸

The legitimate concerns and information needs of ethnic minority communities must not be ignored, or, worse still, labelled as "irrational" or "conspiracy theories." We need to engage, listen with respect, communicate effectively, and offer practical support to those who have yet to make up their minds about the vaccine. Covid-19 vaccination is one of the most important public health programmes in the history of the NHS. Tackling vaccine hesitancy and ensuring that vaccination coverage is high enough to lead to herd immunity are essential for its success.¹⁹

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INVESTIGATION

The EMA covid-19 data leak, and what it tells us about mRNA instability

Leaked documents show that some early commercial batches of Pfizer-BioNTech's covid-19 vaccine had lower than expected levels of intact mRNA, prompting wider questions about how to assess this novel vaccine platform, writes **Serena Tinari**

As it conducted its analysis of the Pfizer-BioNTech covid-19 vaccine in December, the European Medicines Agency (EMA) was the victim of a cyberattack. More than 40 megabytes of classified information from the agency's review were published on the dark web, and several journalists—including from *The BMJ*—and academics worldwide were sent copies of the leaks. They came from anonymous email accounts and most efforts to interact with the senders were unsuccessful. None of the senders revealed their identity, and the EMA says it is pursuing a criminal investigation.

The BMJ has reviewed the documents, which show that regulators had major concerns over unexpectedly low quantities of intact mRNA in batches of the vaccine developed for commercial production.

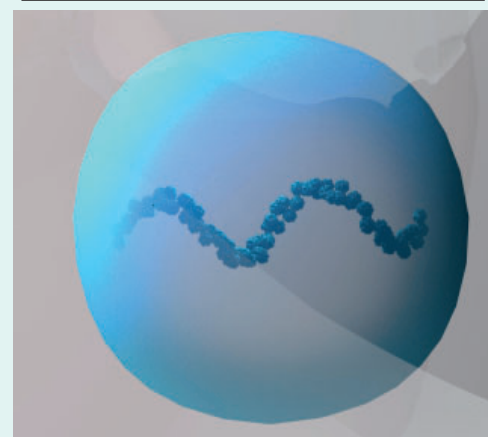
EMA scientists tasked with ensuring manufacturing quality—the chemistry, manufacturing, and control aspects of Pfizer's submission to the EMA—worried

about “truncated and modified mRNA species present in the finished product.” Among the many files leaked to *The BMJ*, an email dated 23 November by a high ranking EMA official outlined a raft of issues. In short, commercial manufacturing was not producing vaccines to the specifications expected, and regulators were unsure of the implications. EMA responded by filing two “major objections” with Pfizer, along with a host of other questions it wanted addressed.

The email identified “a significant difference in % RNA integrity/truncated species” between the clinical batches and proposed commercial batches—from around 78% to 55%. The root cause was unknown and the impact of this loss of RNA integrity on safety and efficacy of the vaccine was “yet to be defined,” the email said.

Ultimately, on 21 December, EMA authorised Pfizer-BioNTech's vaccine. The agency's public assessment report, a technical document published on its website, noted, “the quality of this medicinal product,

LIPID NANOPARTICLES—WHERE DO THEY GO AND WHAT DO THEY DO?



submitted in the emergency context of the current (covid-19) pandemic, is considered to be sufficiently consistent and acceptable.”

It's unclear how the agency's concerns were satisfied. According to one of the leaked emails dated 25 November, positive news had come from an undisclosed source in the US, “The latest lots indicate that % intact RNA are back at around 70-75%, which leaves us cautiously optimistic that additional data could address the issue,” the email said.

A near miss?

It's also unclear whether the events in November constitute a near miss in the commercial manufacturing of mRNA vaccines. EMA says the leaked information was partially doctored, explaining in a statement that “while individual emails are authentic, data from different users were selected and aggregated, screenshots from multiple folders and mailboxes have been created, and additional titles were added by the perpetrators.”

But the documents offer the broader medical community a chance to reflect on the complexities of quality assurance for novel mRNA vaccines, which include everything from the quantification and integrity of mRNA and carrier lipids to measuring the distribution of particle sizes and encapsulation efficiency. Of particular concern is RNA instability, one of the most important variables relevant to all mRNA vaccines that has thus far received scant attention in the clinical community. It is an issue relevant not just to Pfizer-BioNTech's vaccine but also to those produced by Moderna, CureVac, and others, as well as a “second generation” mRNA vaccine being pursued by Imperial College London.



Conceived three decades ago, RNA based therapeutics have long inspired imaginations for their theoretical potential to transform cells of the body into “an on-demand drug factory.” But despite heavy investment by the biotech industry, bench-to-bedside translation was constantly hindered by the fragility of mRNA.

Over the years, researchers attempted to resolve intrinsic instability by encapsulating mRNA in nanocarriers made of polymers, lipids, or inorganic materials. Lipid nanoparticles (LNPs) were chosen by Moderna, Pfizer-BioNTech, CureVac, and Imperial College London for their covid-19 vaccines. This has attracted the attention of specialists in the field of pharmaceutical biotechnology, some of whom have raised concerns about further unknowns.

In a rapid response posted on *bmj.com*, JW Ulm, a gene therapy specialist who has published on tissue targeting of therapeutic vectors, raised concerns about the biodistribution of LNPs, “At present, relatively little has been reported on the tissue localisation of the LNPs used to encase the SARS-CoV-2 spike protein-encoding messenger RNA, and it is

vital to have more specific information on precisely where the liposomal nanoparticles are going after injection.”

It is an unknown whether Ulm’s worries could have implications for vaccine safety.

Ulm told *The BMJ*, “Pfizer-BioNTech and Moderna did a remarkable job of rapidly scaling up manufacturing of such a novel system in swift fashion, which is genuinely a landmark technological achievement. However, pharmacokinetic studies, with independent laboratory confirmation, are essential to ascertain potential cytotoxicity and macroscopic toxicity, especially given the likelihood of booster injections over months or years, since the tissue trafficking patterns of the mRNA vaccine payload will determine which cells and tissues are killed by cytotoxic T-cells in each round.” Given the variation in LNP formulations, it is unclear how relevant previous animal experiments are to answering this question.

Regulators and manufacturers contacted by *The BMJ* for this article did not wish to address any of the questions raised by Ulm’s rapid response.

RNA instability is one of the biggest hurdles for researchers developing nucleic acid based vaccines. It is the primary reason for the technology’s stringent cold chain requirements and has been addressed by encapsulating the mRNA in lipid nanoparticles (box).

“The complete, intact mRNA molecule is essential to its potency as a vaccine,” professor of biopharmaceutics Daan J.A. Crommelin and colleagues wrote in a review article in *The Journal of Pharmaceutical Sciences* late last year. “Even a minor degradation reaction, anywhere along a mRNA strand, can severely slow or stop proper translation performance of that strand and thus result in the incomplete expression of the target antigen.”

Crommelin and colleagues note that specific regulatory guidance for mRNA based vaccines has yet to be developed, and *The BMJ*’s attempts to clarify current standards were unsuccessful.

Transparency and confidentiality

The BMJ asked Pfizer, Moderna, and CureVac, as well as several regulators, what percentage mRNA integrity they consider acceptable for covid-19 vaccines. None offered any specifics.

The Medicines and Healthcare products Regulatory Agency, the UK’s regulator, acknowledged the lack of a specified percentage RNA integrity, but declined to provide further detail. “The specification limit acceptance criteria are commercially confidential,” the agency said in an email.

The US Food and Drug Administration (FDA) directed *The BMJ* to its guidance documents and its review of Pfizer’s vaccine, but none of these specify the percentage RNA the agency is requiring. Asked to comment, the regulator said, “information that you

RNA instability is one of the biggest hurdles for researchers developing nucleic acid based vaccines

seek that is not addressed in the FDA Review Memorandum should be directed to Pfizer.”

In subsequent correspondence, FDA, EMA, and Canadian government department Health Canada all stated that specific information related to the acceptability criteria is confidential.

EMA did acknowledge, however, that vaccine efficacy depends on the presence of suitable amounts of intact mRNA. In the case of the commercial batches that first raised alarm bells, the agency told *The BMJ* that the levels of truncated mRNA “and the amounts of a potential protein produced by the truncated mRNA would be too low to constitute a safety risk.” EMA did not comment on how truncated mRNA might affect efficacy. The issue was satisfactorily addressed, the agency underlined, when further information was supplied by the manufacturer.

Health Canada told *The BMJ* that Pfizer had conducted investigations into the root cause of reduced integrity in the commercial vaccine batches, and “changes were made in their processes to ensure that the integrity was improved and brought in line with what was seen for clinical trial batches.” Health Canada said the three agencies subsequently determined that “there was no concern with the RNA integrity or any other product specifications.”

Correspondence in the leaked documents suggests that FDA, Health Canada, and EMA were aligned on clinically qualified specifications of percentage mRNA integrity. Health Canada has confirmed to *The BMJ* that regulators “have worked together to

align those requirements,” but all agencies declined to share with *The BMJ* any specifics on grounds that such information was commercially sensitive.

Pfizer also declined to comment on what percentage mRNA integrity it is aiming for, nor would it address questions about the cause of the unexpectedly low percentage mRNA integrity in certain batches, leaving open the question of whether it could happen again. Pfizer stressed, “Each batch of vaccines is tested by the official medicinal control laboratory—the Paul Ehrlich Institute in Germany—before final product release. As a result, the quality of all vaccine doses that are placed on the market in Europe has been double tested to ensure compliance with the specifications agreed upon with the regulatory authorities.”

Moderna’s chief corporate affairs officer Ray Jordan declined to respond to any of *The BMJ*’s questions, stating, “At this point, Moderna will not be offering additional commentary on these topics.”

CureVac, whose mRNA vaccine was submitted for EMA’s “rolling review” in February, told *The BMJ* that “it is too soon to give details.”

The shortage of information may reflect the lack of certainty, even among regulators, about how to assess the evidence fully for this novel technology. Professor Crommelin told *The BMJ* that, “For small, low molecular weight products, the active pharmaceutical ingredient integrity is typically close to 100%.”

But for mRNA vaccines? “Experience with mRNA integrity is limited.”

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PANDEMIC

How the lessons of previous epidemics helped successful countries fight covid-19

The coronavirus surprised the West, but the experience of Ebola, MERS, and SARS had given several Asian and African nations systems to mitigate its severity. Experts explain what Hong Kong, Liberia, Saudi Arabia, Singapore, and Taiwan learnt and how it made a difference



Taiwan—Central coordination

Wui-Chiang Lee

After the painful experience of SARS in 2003, the Taiwanese government realised its Centers for Disease Control (CDC) and the Communicable Disease Control Act (CDCA) had been insufficient to respond to large scale contagious diseases effectively and efficiently. The containment strategies of central and local government had been uncoordinated, and preparedness in some hospitals was inadequate.

In response, the government undertook a fundamental reorganisation of the CDC, recruiting experts in infection control and public health,

and establishing a unit charged with collecting and analysing infection information. A team of 30 physicians was put in place to look at emerging diseases.

The government also amended the CDCA, establishing an ad hoc Central Epidemic Command Center (CECC) that would coordinate ministries, public and private organisations, and information and logistics at

The CECC gave a press briefing on each new case's route of infection and the individual's health status



Hong Kong—Scars of past epidemics

Gabriel M Leung

East Asia's response to covid-19 seems to have been exceptional so far. This is—at least partly—a result of the many lessons learnt and innovations derived from the region's decades-long experience with outbreaks of novel, directly transmissible respiratory pathogens. These include the 1957 “Asian” and 1968 “Hong Kong” influenza pandemics, the first occasion of A(H5N1) influenza jumping the species barrier from birds into humans in 1997, and the A(H7N9) in 2013 around the Yangtze River Delta. The 2002-03 SARS epidemic left the most indelible mark.

The sociological imprints left by these outbreaks have cumulatively boosted people's adherence to, and even demand for, the public health and social measures that have proved so critical to controlling covid-19. This is all the more remarkable in Hong Kong, given the large deficit of trust in government following massive social unrest in 2019.

After SARS, the Hong Kong government adopted a clearly defined, tiered command structure to prepare for and respond to future outbreaks, and consolidated all health protection functions under a new centralised agency. In parallel, massive investment has gone into research preparedness, with dialogue between the scientific and policy making communities in real time. Ever more stringent border restrictions have been adopted, and quarantine arrangements for both imported and local patients have improved to the extent that the *Wall Street Journal* found them to be the best in the world.





SACHALALITA/SHUTTERSTOCK

Saudi Arabia—Drive-through screening and vaccine development

Bandar Al Knawy

The outbreak of MERS in 2012 resulted in hundreds of deaths and spread to 27 countries. Its emergence in the Kingdom of Saudi Arabia triggered transformational changes in its healthcare system. This proved critical in launching a prompt response to covid-19.

The MERS outbreak highlighted that delays in identifying cases and improper triage in emergency departments were the main risks for nosocomial outbreaks. In response to a MERS outbreak in our tertiary hospital in 2015, we introduced a triaging process whereby patients

were directed into two physically independent pathways according to the presence or not of respiratory symptoms. The screening system comprised drive-through booths where patients undertook a 60 second questionnaire. The system showed 100% sensitivity in detecting patients with MERS (later confirmed by polymerase chain reaction testing) and helped reduce transmission in the hospital.

The health ministry launched a multi-dimensional research programme for MERS that resulted in important clinical trials in therapeutics and vaccine

development. In collaboration with Oxford University, a MERS vaccine based on a chimpanzee adenovirus vector (ChAdOx1) was developed and tested in phase I trials in Saudi Arabia and the UK, and was found to be well tolerated, with no serious adverse events. A phase II trial is planned with Oxford University, funded by the Coalition for Epidemic Preparedness Innovations. The trials supported the swift development of a ChAdOx1 based vaccine for covid, while also harnessing the genetic similarities between MERS-CoV and SARS-CoV-2.

Liberia—Resilient community health systems

Ben Grant

In 2016, Liberia's ministry of health designed and launched the National Community Health Assistant Program (NCHA), which to date has recruited, trained, and deployed more than 3500 community health workers. These workers are linked to 316 primary care clinics and serve more than 800 000 people in rural and remote communities.

Until 2016, community health services were fragmented, with parallel programmes and little standardisation across the country. The Ebola epidemic of 2014 highlighted significant gaps in the primary healthcare system and brought inequities into sharp focus. The new, harmonised, NCHA programme helped bridge the gaps, ensuring that all communities more than 5 km from a health facility had access to essential lifesaving services, and that no Liberian was out of reach.

Community health workers have laid the foundation for a more resilient primary healthcare system, which includes surveillance, diagnostics, and therapeutic services. During the Ebola outbreak, health workers' relationships with their communities helped address mistrust and stigma surrounding the disease. Conversely, late engagement by community health workers hindered efforts to manage the outbreak.^{6,7} Outsiders sent to affected communities were rejected and their efforts were counterproductive.

As Liberia responds to its second major disease outbreak in five years, community health workers are vital to prevent, detect, and respond to covid-19. When SARS-CoV-2 was detected, health workers were quickly trained, equipped, and deployed to respond at the community level, while being closely linked with health facilities. Training included identifying suspected cases, surveillance, contact tracing, referral protocols, and supporting



UNICEF

Prioritising and investing in community health workers enabled a quick response

patients in home isolation. Based on lessons of the no-touch policy used by community health workers during the Ebola outbreak, protocols were adjusted to keep workers safe as they provided lifesaving screening and treatment for malaria, diarrhoea, pneumonia, and malnutrition and supported access to family planning, immunisations, prenatal care, and facility based delivery.

Prioritising and investing in community health workers enables a quick response to epidemic events, especially in remote and rural areas. For the pandemic response in Liberia, community health workers will continue to be a powerful mechanism for addressing misinformation and vaccine hesitancy, through training and relationship building in their communities. These workers are vital for emergency and everyday service delivery that ensures quality and equitable health services.

a national level in the event of a pandemic. The CECC was quickly activated on 20 January 2020 and put on its highest alert level on 27 February. Immediately it took a series of preventive measures, including tight border control, travel restrictions, precision testing (of people with symptoms, signs of infection, travel to a high risk country, or who had contact history with a suspected case), and organised isolation and quarantine at contracted hotels rather than homes to contain infections.

The CECC also introduced mandatory mask wearing and social distancing, banned the exportation of personal protective equipment, and boosted domestic production of the materials needed to make more. It hosted daily press conferences, and gave a briefing on each new case's route of infection and the individual's health status (while protecting patient privacy).

As a result, Taiwan has had only around 600 positive cases of covid-19.

Singapore—A holistic approach

Alvin Qijia Chua and Sebastian Maurer-Stroh

In response to the 2003 SARS outbreak, the Singapore government built a multi-ministry taskforce to coordinate actions, centralise efforts, and disseminate information about the epidemic. Similar taskforces were set up for the 2009 H1N1 pandemic, the 2016 Zika outbreak, and most recently for covid-19.

After the 2003 epidemic a Disease Outbreak Response System Condition framework was drafted. A five-colour alert system indicates the outbreak situation and provides guidance to the public on actions to prevent and reduce the impact of infections.

This is paired with a timely and accurate surveillance system. During SARS, the ministry of health introduced surveillance measures to integrate epidemiological data and to identify emerging virulent strains more quickly. This initiative included community, laboratory, veterinary, hospital, and external surveillance. An Infectious Disease Alert and Clinical Database system was also set up to pool clinical, laboratory, and contact tracing information.¹² In 2006 this was matched with a live online portal that allowed physicians to submit timely notification of infectious diseases and to access real time information on local and global infectious disease events.

In primary care, physicians have been trained and prepared for infectious disease outbreaks, enabling them to identify and triage high risk patients quickly. Treatments, including medication and vaccinations, are subsidised by the government for patients presenting with respiratory symptoms. During the H1N1 pandemic, many private primary care clinics were activated to facilitate these treatments under the Pandemic Preparedness Clinic scheme.

In 2015 the scheme was updated and the clinics became Public Health Preparedness Clinics (PHPCs) which treated other health problems, such as respiratory issues arising from haze air pollution. These PHPCs were reactivated during the covid-19 pandemic. Currently, patients with respiratory illness pay up to S\$10 (£5.30) for their treatment, and the rest is covered by government subsidy.

Containment measures, such as early detection and isolation of all cases and quarantine of close contacts, were implemented in 2003 to prevent community transmission of SARS. These were implemented again in the H1N1 and covid-19 pandemics.



Legislation passed in April 2020 allows the government to requisition any land, undertaking, or other resource for the purpose of control

Over the years, technology advances have strengthened containment further. SafeEntry, a national digital location check-in system, ensures that individuals visiting public spaces, including workplaces and social venues, have checked into the venue using a QR code. The complementary TraceTogether application or token uses Bluetooth signals exchanged between mobile phones to identify close contacts of a positive case.

Advances in genome sequencing have also helped. In 2003 it took two months for the genome of the SARS index case to be released on public databases, but it took less than two weeks for the first local SARS-CoV-2 genome to be made available in 2020. One year into the covid-19 pandemic, genomes are often released less than a week after sample collection. The National Public Health Laboratory conducts whole genome sequencing and phylogenetic analysis on all cases meeting defined criteria as part of routine laboratory surveillance. This is complemented by other local institutions to ensure the system has surge capacity.

Quarantine facilities during SARS included holiday resorts, and this has been expanded during covid-19 to include Singapore Armed Forces camps, the Singapore EXPO, and Changi Exhibition Centres, and hotels. Legislation passed in April 2020 allows the government to requisition any land, undertaking, or other resource for the purpose of control order. It also provides a legal basis to enforce social distancing measures, such as limiting mass gatherings and holding individuals and business owners accountable for violation with fines, jail, and other penalties.

Following SARS, simulation exercises were organised at public hospitals to rehearse outbreak scenarios and to inform plans to manage outbreaks. National stockpiles of personal protective equipment and essential medicines are maintained for up to six months. A lack of adequate treatment facilities during SARS prompted the building of a specialised infectious disease centre to be mobilised during future outbreaks.

The National Centre for Infectious Diseases, inaugurated in 2019, has 330 beds with integrated clinical, laboratory, and epidemiological functions. It houses a screening centre, isolation and cohort wards, intensive care units, laboratories, imaging facilities, and operating theatres specifically for infectious disease patients. It also has an inbuilt real time location system to track the location of assets and patients, and to aid contact tracing efforts in the event of an outbreak.

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