The Economist

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A grim calculus

The stark choices between life, death and the economy

A grim calculus

Covid-19 presents stark choices between life, death and the economy. They will probably get harder

IMAGINE HAVING two critically ill patients but just one ventilator. That is the choice which could confront hospital staff in New York, Paris and London in the coming weeks, just as it has in Lombardy and Madrid. Triage demands agonising decisions (see Briefing). Medics have to say who will be treated and who must go without: who might live and who will probably die.

The pandemic that is raging across the world heaps one such miserable choice upon another. Should medical resources go to covid-19 patients or those suffering from other diseases? Some unemployment and bankruptcy is a price worth paying, but how much? If extreme social distancing fails to stop the disease, how long should it persist?

The governor of New York, Andrew Cuomo, has declared that "We're not going to put a dollar figure on human life." It was meant as a rallying-cry from a courageous man whose state is overwhelmed. Yet by brushing trade-offs aside, Mr Cuomo was in fact advocating a choice—one that does not begin to reckon with the litany of consequences among his wider community. It sounds hard-hearted but a dollar figure on life, or at least some way of thinking systematically, is precisely what leaders will need if they are to see their way through the harrowing months to come. As in that hospital ward, trade-offs are unavoidable.

Their complexity is growing as more countries are stricken by covid-19. In the week to April 1st the tally of reported cases doubled: it is now nearing 1m. America has logged well over 200,000 cases and has seen 55% more deaths than China. On March 30th President Donald Trump warned of "three weeks like we've never seen before". The strain on America's health system may not peak for some weeks (see United States section). The presidential task-force has predicted that the pandemic will cost at least 100,000-240,000 American lives.

Just now the effort to fight the virus seems all-consuming. India declared a 21-day lockdown starting on March 24th. Having insisted that it was all but immune to a covid-19 outbreak, Russia has ordered a severe lockdown, with the threat of seven years' prison for gross violations of the quarantine. Some 250m Americans have been told to stay at home. Each country is striking a different trade-off—and not all of them make sense.

In India the Modi government decided that its priority was speed. Perhaps as a result it has fatally bungled the shutdown. It did not think about migrant workers who have streamed out of the cities, spreading the disease among themselves and carrying it back to their villages (see Asia section). In addition, the lockdown will be harder to pull off than in rich countries, because the state's capacity is more limited. India is aiming to slow its epidemic, delaying cases to when new treatments are available and its health-care system is better prepared. But hundreds of millions of Indians have few or no savings to fall back on and the state cannot afford to support them month after month. India has a young population, which may help. But it also has crowded slums where distancing and handwashing are hard. If the lockdown cannot be sustained, the disease will start to spread again.

Russia's trade-off is different. Clear, trusted communications have helped ensure that people comply with health measures in countries like Singapore and Taiwan. But Vladimir Putin has been preoccupied with extending his rule and using covid-19 in his propaganda campaign against the West. Now that the virus has struck, he is more concerned with minimising political damage and suppressing information than leading his country out of a crisis. That trade-off suits Mr Putin, but not his people.

America is different, too. Like India, it has shut down its economy, but it is spending heavily to help save businesses from bankruptcy and to support the income of workers who are being laid off in devastating numbers (see United States section).

For two weeks Mr Trump speculated that the cure might be worse than the "problem itself". Putting a dollar figure on life shows he was wrong. Shutting the economy will cause huge economic damage. Models suggest that letting covid-19 burn through the population would do less, but lead to perhaps 1m extra deaths. You can make a full accounting, using the age-adjusted official value of each life saved. This suggests that attempting to mitigate the disease is worth $60,000 to each American household. Some see Mr Trump's formulation itself as mistaken. But that is a comforting delusion. There really is a trade-off, and for America today the cost of a shutdown is far outweighed by the lives saved. However, America is fortunate to be rich. If India's lockdown fails to stop the spread of the disease its choice will, tragically, point the other way.

Wherever you look, covid-19 throws up a miasma of such trade-offs. When Florida and New York take different approaches, that favours innovation and programmes matched to local preferences. But it also risks the mistakes of one state spilling over into others (see Lexington). When China shuts its borders to foreigners almost completely, it stops imported infections but it also hobbles foreign businesses. A huge effort to make and distribute covid-19 vaccines will save lives, but it may affect programmes that protect children against measles and polio.

How should you think about these trade-offs? The first principle is to be systematic. The $60,000 benefit to American households, as in all cost-of-life calculations, is not real cash but an accounting measure that helps compare very different things such as lives, jobs and contending moral and social values in a complex society. The bigger the crisis, the more important such measurements are. When one child is stuck down a well the desire to help without limits will prevail—and so it should. But in a war or a pandemic leaders cannot escape the fact that every course of action will impose vast social and economic costs. To be responsible, you have to stack each against the other.

Hard-headed is not hard-hearted

A second principle is to help those on the losing side of sensible trade-offs. Workers sacked in forced shutdowns deserve extra help; children who no longer get meals at schools need to be given food. Likewise, society must help the young after the pandemic has abated. Although the disease threatens them less severely, most of the burden will fall on them, both today and in the ▸▸

future, as countries pay off their extra borrowing.

A third principle is that countries must adapt. The balance of costs and benefits will change as the pandemic unfolds. Lockdowns buy time, an invaluable commodity. When they are lifted, covid-19 will spread again among people who are still susceptible. But societies can prepare in a way that they never did for the first wave, by equipping health systems with more beds, ventilators and staff. They can study new ways to treat the disease and recruit an army of testing and tracing teams to snuff out new clusters. All that lowers the cost of opening up the economy.

Perhaps, though, no new treatments will be found and test-and-trace will fail. By the summer, economies will have suffered double-digit drops in quarterly GDP. People will have endured months indoors, hurting both social cohesion and their mental health. Year-long lockdowns would cost America and the euro zone a third or so of GDP. Markets would tumble and investments be delayed. The capacity of the economy would wither as innovation stalled and skills decayed. Eventually, even if many people are dying, the cost of distancing could outweigh the benefits. That is a side to the trade-offs that nobody is yet ready to admit. ■

Corporate bail-outs

Bottomless Pit, Inc

Bail-outs are inevitable—and toxic. They must be designed to limit taxpayers' losses and preserve dynamism

IN THE PAST month the biggest business handout in history has begun. The goal of helping firms survive temporary lockdowns is sensible, but it is hard not to feel uneasy (see Business). At least $8trn of state loans and goodies have been promised to private firms in America and Europe, roughly equivalent to all their profits over the past two years. Over half a million European firms have applied for payroll subsidies. Some of these handouts will involve grubby choices: Boeing, embroiled in the 737 MAX crashes, might get billions of taxpayer dollars. Broad rescue schemes could also leave a legacy of indebted, ossified firms that impede the eventual recovery. Speed is essential, but governments also need a clearer framework to organise the jumble of schemes, protect taxpayers and preserve the economy's dynamism.

That $8trn is a big number, and includes state and central-bank loans, guarantees and temporary subsidies to keep paying inactive workers. The total running costs of all American and euro-zone non-financial firms (excluding payments to each other) are $13.5trn a year, of which $11.6trn is wages. But there is still no guarantee that this mountain of money can prevent chaos. Firms also need to refinance $4trn of bonds in the next 24 months, and debt markets are still wary about racier borrowers. Carnival, a cruise line, has issued bonds at a crushing 11.5% interest rate. The plethora of support schemes—there are at least ten in America, with different eligibility rules—will baffle some firms and exclude others. A quarter of listed Western firms are heavily indebted, and if those facing slumping demand gorge on state loans they may wreck their balance-sheets. For a few giants the potential losses are so big that they alone could impose a significant burden on the state. Volkswagen says it is burning through $2.2bn of cash every week.

Ideally private investors would swoop in—Warren Buffett is sitting on $125bn of spare funds and Blackstone's funds have $151bn. But the duration of lockdowns is unclear, so they may be reluctant. As a result, alongside widely available cheap state loans, bespoke state bail-outs are starting. America's latest stimulus package earmarks at least $50bn for the airlines and other firms vital for "national security" (Boeing and chums). Germany has loaned $2bn to TUI, a travel firm, and Singapore's sovereign fund, Temasek, has bought more shares in Singapore Airlines.

Such bespoke deals are easy to sign but often go sour. Uncle Sam lost over $10bn on the General Motors rescue of 2009 and the Wall Street bank bail-outs left an especially bitter taste. Negotiations can be hijacked by politicians who want pork or sway over firms' strategies. If bailed-out firms end up indebted and burdened by long-term job guarantees, the economy can become ossified, sapping productivity. And it is unfair to ask well-run firms to compete with state-backed rivals.

What to do? Governments need to offer support for business in an integrated way. There should be blanket offers to all firms of cheap loans and help in paying the wages of inactive staff for three to six months with few strings attached. This is what the $8trn of loans and guarantees mostly try to do, but there are gaps and doubts about how small firms will get cash. One answer is making sure banks have the resources to lend—even if this means suspending their dividends, as Britain did this week. The goal should be to freeze most of the economy temporarily, until the lockdowns ease.

In time, though, more ruthlessness will be necessary. The cost of extending unlimited credit to all firms is unsustainable and the economy must eventually adjust to new circumstances: for example, e-commerce firms need more workers whereas cinemas may never fully recover (see Schumpeter). Assistance beyond six months should be limited to firms that provide essential services—such as telecoms, utilities or payments—or are at the centre of critical industrial supply chains. These firms may be eligible for long-term loans but they must come at a price, in the form of equity stakes for the taxpayer. A rough yardstick is that for every $100 of long-term loans, taxpayers should get $10 of equity. If these firms are already heavily indebted there is no point in crippling them further. Instead, creditors must take a big haircut.

Lastly, governments should not interfere in other ways. There will be populist calls to force airlines to give more legroom, car firms to build electric charging-points and manufacturers to build factories in rustbelts. But bail-outs of individual firms are a bad mechanism for dealing with these issues. The one rule that governments should impose is to ban firms getting bespoke deals from paying cash to shareholders through dividends and buy-backs until state loans are repaid.

This year will see state intervention in business on an unprecedented scale. With luck it will not be remembered as the year in which dynamism and free markets died. ■

The technology industry

Don't waste a good crisis

Big tech firms are thriving. They should seize the moment and detoxify their relations with society

THE PANDEMIC will have many losers, but it already has one clear winner: big tech. The large digital platforms, including Alphabet and Facebook, will come out of the crisis even stronger. They should use this good fortune to reset their sometimes testy relations with their users. Otherwise big government, the other beneficiary of the covid calamity, is likely to do it for them.

Demand for online services has exploded and the infrastructure behind the internet has proved to be admirably reliable (see Science and Technology). Newcomers such as Slack and Zoom, which help businesses operate remotely, have become household names. And although some tech supply chains are creaking and online advertising spending has dipped, overall the big five firms are seeing surging demand.

Facebook has said that messaging activity has increased by 50% in those countries hit hard by the virus. Amazon is planning to hire 100,000 new staff to keep up with higher e-commerce orders. The big tech firms are also a bastion of financial stability: together Alphabet, Amazon, Apple, Facebook and Microsoft have $570bn of gross cash on their balance-sheets. Shares in these firms have outperformed the market since late January.

Just as the big firms are standing even taller, many of the tech industry's younger, smaller firms are being crushed in the worst slump since the dotcom crash 20 years ago (see Briefing). Even before the coronavirus hit, trouble was brewing in the land of unicorns, as tech startups worth more than $1bn are called. Among many firms catering to consumers, the strategy of growing at all costs, known as "blitzscaling", had turned out to be flawed. Some firms, particularly those stuffed with capital by SoftBank's $100bn Vision Fund, had already started laying off people. All this will make it easier for the big firms to hire the best talent. Collapsing firms could be snapped up by the tech giants.

If that happens, the odds are that regulators will do little or nothing to stop a round of consolidation. In America antitrust investigations against Alphabet, Google's parent, and Facebook have essentially been put on hold, as officials deal with other priorities and refrain from destabilising firms during a crisis. A new federal privacy law seems further away than ever. Even tech sceptics in the European Union want to rethink their approach to regulating artificial intelligence (AI). In an abrupt twist, "surveillance capitalism", as critics call big tech's business practices, is no longer seen as exploitative, but essential to tackle the virus. And no one is complaining about Facebook and Google zealously taking down misinformation about covid-19, and increasingly relying on AI to do so. Yet, before the pandemic, such activity would have triggered howls of outrage over censorship and bias.

In fact, more than ever it is clear that big tech firms act as vital utilities. Therein lies the trap, because almost everywhere other utilities, such as water or electricity, are heavily regulated and have their prices and profits capped. Once this crisis passes, startled citizens and newly emboldened governments could make a push for the state to have similar control over big tech.

The companies seem to sense this danger. Their best defence is to propose a new deal to the citizens of the world. That means clear and verifiable rules on how they publish and moderate content, helping users own, control and profit from their own data; as well as fair treatment of competitors that use their platforms. This approach may even be more profitable in the long run. Today the most valuable firm in America is Microsoft, which has been revived by building a reputation for being trustworthy. It is an example that the other big tech platforms—or digital utilities, as they are about to become known—should follow. ■

Mozambique

Gas, guns and guerrillas

The government's response to a jihadist revolt is cruel and ineffective

MANY KINDS of misfortune make a country prone to conflict; Mozambique has them all. It is poor. FRELIMO, its ruling party, is predatory and corrupt. Much of its vast territory is barely governed at all. It has a recent history of civil war: a 15-year inferno that ended in 1992 and cost perhaps 1m lives, and a milder six-year uprising involving the same rebel group, RENAMO, which formally ended last year. Into this explosive mix, two blazing matches have been tossed: jihadist terror and the discovery of natural gas.

As we report this week, a poorly understood insurgency is spreading in Cabo Delgado, a province in northern Mozambique (see Middle East & Africa section). So far the conflict has killed more than 1,000 people, aid workers estimate, and forced at least 100,000 to flee their homes. Recent weeks have seen some of the boldest attacks yet. Young men with guns and Islamist slogans are not merely burning villages and beheading people. They have also started to capture towns, albeit temporarily, slaughtering government forces and then retreating to the bush.

On March 23rd they briefly overran Mocimboa da Praia, a transport hub near what may be Africa's largest-ever gas project. The huge reserves off the coast of Cabo Delgado have attracted pledges of investment worth tens of billions of dollars from multinational firms. Gas gives Mozambique the hope of a more prosperous future—but also a prize worth fighting over. Already insecurity, as well as covid-19 and low oil prices, are slowing exploration. If Mozambique wants to realise its dream of becoming ▸▸

"Africa's Qatar", it must pacify Cabo Delgado.

To do so it must be honest. The government describes the uprising as a foreign conspiracy to keep the country poor. That is nonsense. Although there are indeed foreign preachers and fighters among the jihadists, the insurgency is mostly local in origin, born of marginalisation. Muslims are a minority in Mozambique, and the largely Muslim north, which is far from the capital, has long been neglected. It is only in the past year that the jihadists there have formally affiliated to Islamic State, and it is not clear that IS supplies it with much besides inspiration.

The government's counter-insurgency tactics are inept, too. It has so far relied on ill-trained conscripts, thuggish police and Russian mercenaries. It has rounded up young men on the flimsiest evidence and beaten or summarily shot them, according to Human Rights Watch, an NGO. Such brutality alienates the population. It has locked up journalists who report on the conflict and threatened aid workers who air grievances. This constricts the flow of accurate information. A better approach would involve properly paid and trained troops, who speak local languages and respect human rights, as well as schemes that deal with the province's poverty and inequality.

Neighbours, especially South Africa, the biggest regional power, and Tanzania, which borders Cabo Delgado, should press the Mozambican government to behave better. They should also share intelligence with it. Right now they are preoccupied by covid-19, but the insurgency will probably outlast the pandemic. A summit about Islamist violence scheduled for May should go ahead, albeit virtually. Western countries should tell Mozambique to let aid agencies and journalists do their jobs.

Things don't have to fall apart

Energy firms, which include giants such as ExxonMobil and Total, could do more as well. They have sought to cocoon themselves from the violence by hiring private-security firms. That is not enough. Their projects will remain insecure unless they can show that the benefits of their investments flow to ordinary Mozambicans, not just the FRELIMO elite. If Mozambique were to fall apart again, it would be a tragedy. If jihadism were to take root, it could spread to neighbouring countries, as it has in the Sahel. Mozambique, and Africa, deserve better. ■

Oil and geopolitics

The Rosneft riddle

Vladimir Putin's favourite oil firm dumps its Venezuelan assets on Russian taxpayers

ROSNEFT is responsible for 40% of Russia's oil output, but it is much more than just another oil firm. A large chunk of its shares are owned by the Russian state. Its boss, Igor Sechin, is one of Vladimir Putin's closest henchmen. A former spook, like the Russian president, he has been at the big man's side since the 1990s. In 2004-06 Rosneft gobbled up the remains of Yukos, Russia's largest private oil firm, which was dismembered after its boss challenged Mr Putin. Since then Rosneft has been both a tool of Kremlin power and a driver of policy in its own right. Bear this in mind when trying to make sense of the announcement, on March 28th, that it has sold all its Venezuelan assets to an unnamed Russian government entity.

For years the Kremlin has propped up Venezuela's dictatorship, first under Hugo Chávez, then under his protégé, Nicolás Maduro. Russia has supplied loans, weapons and, lately, mercenaries to keep the regime in power, largely to annoy the United States. America, like many democracies, does not recognise the election-stealing Mr Maduro as Venezuela's president, and has slapped severe sanctions on his country. Last week it unsealed indictments of Mr Maduro and his cronies for alleged drug-trafficking (see Americas section). Mr Sechin calculates that, if America supports democracies in Russia's backyard, Russia should support despots in America's.

Rosneft's role in all this has been to practise bare-knuckle petropolitics. It has traded Venezuelan oil to help Mr Maduro get around American sanctions. Rosneft lent his government $6.5bn in 2014-18, to be repaid in oil. At the end of last year it was still owed at least $800m, though the figures are murky.

Thanks to a low oil price, sanctions and the Maduro regime's spectacular corruption and ineptitude, Venezuela is in no position to repay all its debts. But this is not too much of a problem for Rosneft, since it can dump its Venezuelan assets on to Russian taxpayers. They will no doubt be delighted to hear that they have paid for this with 9.6% of Rosneft's own shares (worth more than $4bn), thus reducing their stake to just over 40%. The deal gives Mr Sechin ever tighter control of the firm. Minority shareholders, including BP and Qatar's sovereign-wealth fund, which each hold just under 20%, have yet to comment.

The main aim of the deal, it seems, is to help Rosneft escape the consequences of doing business with a pariah. Over the past two months America has penalised the company's trading arms for handling Venezuelan oil. These sanctions are global in scope and affect its customers, too. Sinochem International, the trading arm of a Chinese state-owned refinery, has rejected Rosneft's oil. The Kremlin's solution is to distance Rosneft from Venezuela while reassuring the Venezuelan kleptocracy that it still has Russia's backing. "I received a message from brother president Vladimir Putin who ratified his comprehensive strategic support for all areas of our [relationship]," tweeted Mr Maduro.

These shenanigans come at a turbulent time in the oil markets. The price of crude has fallen by half in the past month, as covid-19 has crushed demand and Saudi Arabia has opened its taps to punish Russia for refusing to extend an OPEC deal to curb production. The Kremlin would like cheap oil to drive American shale producers, whose costs are higher, out of business. This is a risky game. Russia has alienated the Saudis, who might draw closer to America as a result. Rosneft can survive oil at $25 a barrel. But under Russian law the royalties it pays to the Russian state fall sharply as the oil price slides. As covid-19 spreads in Russia, Mr Putin will have to draw on the country's reserves to help ordinary people cope. Mr Sechin's sleight of hand has solved a problem for Rosneft, but not for Russia. ■

Hard choices

WASHINGTON, DC

The costs of inaction in the face of covid-19 are currently greater than the costs of action. But doing less may, some day, make sense

"WE HAVE NO choice," said President Donald Trump on March 30th, after announcing that federal guidelines on social distancing would remain in force until the end of April. "Modelling...shows the peak in fatalities will not arrive for another two weeks. The same modelling also shows that, by very vigorously following these guidelines, we could save more than 1 million American lives."

Epidemiological models are not the only reason why many countries around the world, and many states in America, are now in some form of lockdown. That China, where the outbreak started, pursued such a policy with an abandon never seen before, and subsequently reported spectacular falls in the rate of new infections, is doubtless another reason. So are the grim scenes from countries where the spread of the virus was not interrupted early enough. By April 1st Italy had seen almost four times as many deaths as China.

The power of the models has been that they capture what has just been seen in these countries and provide a quantitative picture of what may be seen tomorrow—or in alternative tomorrows. They have both made clear how bad things could get and offered some sense of the respite which different interventions can offer. Faced with experts saying, quietly but with good evidence, that a lockdown will save umpty-hundred-thousand lives, it is hard for a politician to answer "At what cost?"

What is more, when the epidemiologists reply "Not our department", the economists to whom the buck then passes are not necessarily much more help. Estimates of the costs of the interventions now in place are all large, but they vary widely (see Finance section). A proper assessment requires knowing how well the measures will work, how long they will last and how they will be ended—thus returning the question to the realm of public-health policy.

But as time goes on, "at what cost" will become easier to voice, and harder to duck. "We have no choice" will no longer be enough; as the disruptive effects of social-distancing measures and lockdowns mount there will be hard choices to make, and they will need to be justified economically as well as in terms of public health. How is that to be done?

Epidemiological models come in two types. The first seeks to capture the basic mechanisms by which diseases spread in a set of interlinked equations. In the classic version of this approach each person is considered either susceptible, exposed, infectious or recovered from the disease. The number in each group evolves with the numbers in one or more of the other groups according to strict mathematical rules (see chart 1 on next page). In simple versions of such models the population is uniform; in more elaborate versions, such as the one from Imperial College London, which has influenced policy in Britain and elsewhere, the population is subdivided by age, gender, occupation and so on.

The second type of model makes no claim to capture the underlying dynamics. They are instead based on what is essentially a sophisticated form of moving average, predicting things about next week ▸▸

→ Also in this section

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(such as how many new infections there will be) based mostly on what happened this week, a little bit on what happened last week, and a smidgen on what happened before that. This approach is used to forecast the course of epidemics such as the seasonal flu, using patterns seen in epidemics that have already run their course to predict what will come next. Over the short term they can work pretty well, providing more actionable insights than mechanistic models. Over the long term they remain, at best, a work in progress.

All the models are beset by insufficient data when faced with covid-19. There is still a lot of uncertainty about how much transmission occurs in different age groups and how infectious people can be before they have symptoms; that makes the links between the different equations in the mechanistic models hard to define properly. Statistical models lack the data from previous epidemics that make them reliable when staying a few steps ahead of the flu.

Obedient to controlling hands

This causes problems. The Dutch started expanding their intensive-care capacity on the basis of a model which, until March 19th, expected intensive-care stays to last ten days. Having seen what was happening in hospitals, the modellers lengthened that to 23 days, and the authorities worry about running out of beds by April 6th. Unsettling news; but better known in advance than discovered the day before.

If more data improve models, so does allowing people to look under their bonnets. The Dutch have published the details of the model they are using; so has New Zealand. As well as allowing for expert critique, it is a valuable way of building up public trust.

As models become more important and more scrutinised, discrepancies between their purported results will become apparent. One way to deal with divergence is to bring together the results of various different but comparable models. In Britain, the government convened a committee of modelling experts who weighed the collective wisdom from various models of the covid-19 epidemic. America's task force for the epidemic recently held a meeting of modelling experts to assess the range of their results.

Another way to try to get at the combined expertise of the field is simply to ask the practitioners. Nicholas Reich of the University of Massachusetts, Amherst, and his colleague Thomas McAndrew have used a questionnaire to ask a panel of experts on epidemics, including many who make models, how they expect the pandemic to evolve. This sounds crude compared with differential equations and statistical regressions, but in some ways it is more sophisticated. Asked what they were basing their responses on, the experts said it was about one-third the results of specific models and about two-thirds experience and intuition. This offers a way to take the models seriously, but not literally, by systematically tapping the tacit knowledge of those who work with them.

In studies run over the course of two flu seasons, such a panel of experts was consistently better at predicting what was coming over the next few weeks than the best computational models. Unfortunately, like their models, the experts have not seen a covid outbreak before, which calls the value of their experience into at least a little doubt. But it is interesting, given Mr Trump's commitment to just another month of social distancing, that they do not expect a peak in the American epidemic until May (see chart 2 on next page).

Though the models differ in various respects, the sort of action taken on their advice has so far been pretty similar around the world. This does not mean the resultant policies have been wise; the way that India implemented its lockdown seems all but certain to have exacerbated the already devastating threat that covid-19 poses there. And there are some outliers, such as the Netherlands and, particularly, Sweden, where policies are notably less strict than in neighbouring countries.

Attempts to argue that the costs of such action could be far greater than the cost of letting the disease run its course have, on the other hand, failed to gain much traction. When looking for intellectual support, their proponents have turned not to epidemiologists but to analyses by scholars in other fields, such as Richard Epstein, a lawyer at the Hoover Institute at Stanford, and Philip Thomas, a professor of risk management at the University of Bristol. These did not convince many experts.

April is the cruellest month

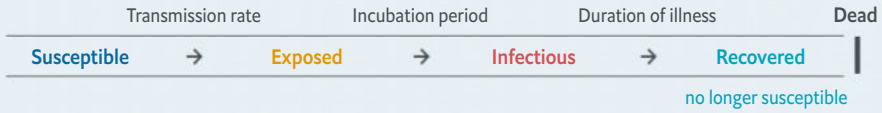
Even if they had, it might have been in vain. The argument for zeal in the struggle against covid-19 goes beyond economic logic. It depends on a more primal politics of survival; hence the frequent comparison with total war. Even as he talked of saving a million lives, Mr Trump had to warn America of 100,000 to 200,000 deaths—estimates that easily outstrip the number of American troops lost in Vietnam. To have continued along a far worse trajectory would have been all but impossible.

What is more, a government trying to privilege the health of its economy over the health of its citizenry would in all likelihood end up with neither. In the absence of mandated mitigation policies, many people would nonetheless reduce the time they spend out of the home working and consuming in order to limit their exposure

Seer's succour 1

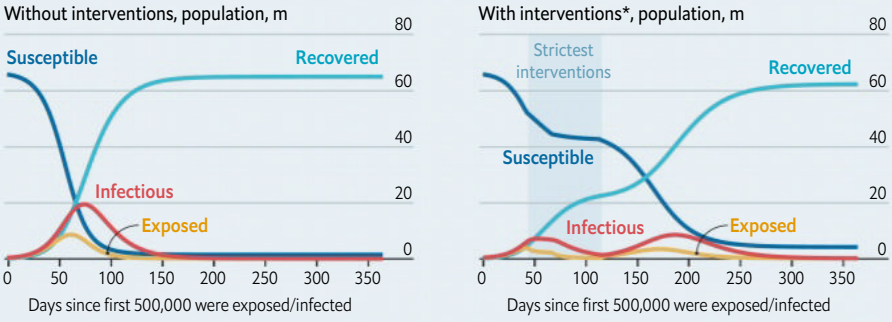
How a SEIR model shows what's to come

One of the most established ways of modelling epidemics divides the population into four groups: those susceptible to infection (S), exposed to the virus (E), infectious (I) or recovered (R)—a category which also, oddly, includes the dead. Conditions are then set for how people move from one group to the next and thus how the groups change in size over time



Model of a covid-like epidemic in Britain

To begin with the population is entirely susceptible. As some susceptibles are exposed, that number sinks and the exposed number grows, with the number of the infectious following close behind. In the lef-hand panel there is no intervention; the infected number sinks back down until the whole population is recovered. On the right, interventions lower the rate at which the susceptible population shrinks. When the interventions are lifted, exposure picks back up, creating a second rise in the infectious



Sources: Institute for Disease Modelling; *The Economist*

*Interventions end ten weeks after reaching strictest level

to the virus. (Cinemas in South Korea, where the epidemic seems more or less under control, have not been closed by the government—but they are still short of customers.) There would be effects on production, too, with many firms hard put to continue business as usual as some workers fell ill (as is happening in health care today) and others stayed away (as isn't).

This is one reason why, in the acute phase of the epidemic, a comparison of costs and benefits comes down clearly on the side of action along the lines being taken in many countries. The economy takes a big hit—but it would take a hit from the disease too. What is more, saving lives is not just good for the people concerned, their friends and family, their employers and their compatriots' sense of national worth. It has substantial economic benefits.

Michael Greenstone and Vishan Nigam, both of the University of Chicago, have studied a model of America's covid-19 epidemic in which, if the government took no action, over 3m would die. If fairly minimal social distancing is put in place, that total drops by 1.7m. Leaving the death toll at 1.5m makes that a tragically underpowered response. But it still brings huge economic benefits. Age-adjusted estimates of the value of the lives saved, such as those used when assessing the benefits of environmental regulations, make those 1.7m people worth about $8trn: nearly 40% of GDP.

Those sceptical of the costs of current policies argue that they, too, want to save lives. The models used to forecast GDP on the basis of leading indicators such as surveys of sentiment, unemployment claims and construction starts are no better prepared for covid-19 than epidemiological models are, and their conclusions should be appropriately salinated. But even if predictions of annualised GDP losses of 30% over the first half of the year in some hard-hit economies prove wide of the mark, the abrupt slowdown will be unprecedented.

Lost business activity will mean lost incomes and bankrupt firms and households. That will entail not just widespread misery, but ill health and death. Some sceptics of mitigation efforts, like George Loewenstein, an economist at Carnegie Mellon University, in Pittsburgh, draw an analogy to the "deaths of despair"—from suicide and alcohol and drug abuse—in regions and demographic groups which have suffered from declining economic fortunes in recent decades.

The general belief that increases in GDP are good for people's health—which is true up to a point, though not straightforwardly so in rich countries—definitely suggests that an economic contraction will increase the burden of disease. And there is good reason to worry both about the mental-health effects of lockdown (see International section) and the likelihood that it will lead to higher levels of domestic abuse. But detailed research on the health effects of downturns suggests that they are not nearly so negative as you might think, especially when it comes to death. Counter-intuitive as it may be, the economic evidence indicates that mortality is procyclical: it rises in periods of economic growth and declines during downturns.

And the profit and loss

A study of economic activity and mortality in Europe between 1970 and 2007 found that a 1% increase in unemployment was associated with a 0.79% rise in suicides among people under the age of 65 and a comparable rise in deaths from homicide, but a decline in traffic deaths of 1.39% and effectively no change in mortality from all causes (see chart 3 on next page). A study published in 2000 by Christopher Ruhm, now at the University of Virginia, found that in America a 1% rise in unemployment was associated with a 1.3% increase in suicides, but a decline in cardiovascular deaths of 0.5%, in road deaths of 3.0%, and in deaths from all causes of 0.5%. In the Great Depression, the biggest downturn in both output and employment America has ever witnessed, overall mortality fell.

Some research suggests that the procyclical link between strong economic growth and higher mortality has weakened in recent decades. But that is a long way from finding that it has reversed. What is more, the effects of downturns on health seem contingent on policy. Work published by the OECD, a group of mostly rich countries, found that some worsening health outcomes seen in the aftermath of the financial crisis were due not to the downturn, but to the reductions in healthcare provision that came about as a result of the government austerity which went with it. Increased spending on programmes that help people get jobs, on the other hand, seems to reduce the effect of unemployment on suicides. The fact that some of the people now arguing that the exorbitant costs of decisive action against covid-19 will lead to poorer public health in the future were, after the financial crisis, supporters of an austerity which had the same effect is not without its irony.

But if the argument that the cure might be worse than the disease has not held up so far, the story still has a long way to go. The huge costs of shutting down a significant fraction of the economy will increase with time. And as the death rates plateau and then fall back, the trade-offs—in terms of economics, public health, social solidarity and stability and more—that come with lockdowns, the closure of bars, pubs and restaurants, shuttered football clubs and cabin fever will become harder to calculate.

It is then that both politicians and the public are likely to begin to see things differently. David Ropeik, a risk-perception consultant, says that people's willingness to abide by restrictions depends both on their sense of self-preservation and on a

sense of altruism. As their perception of the risks the disease poses both to themselves and others begins to fall, seclusion will irk them more.

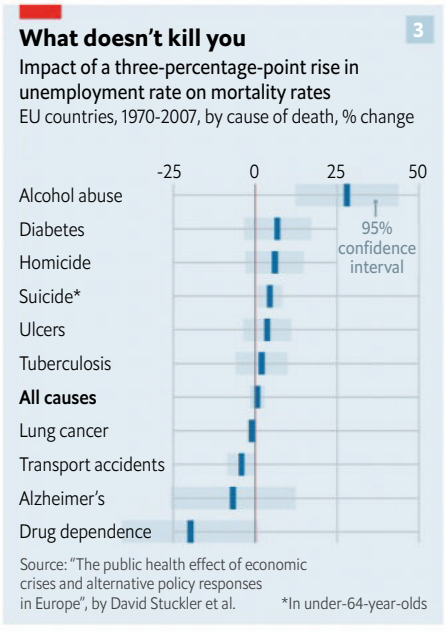
It is also at this point that one can expect calls to restart the economy to become clamorous. In Germany, where the curve of the disease has started to flatten, Armin Laschet, the premier of North Rhine-Westphalia, Germany's largest and second-most-covid-afflicted state, has said it should no longer be out of bounds to talk about an exit strategy. Angela Merkel, the chancellor—a role Mr Laschet is keen to inherit—said on March 26th there should be no discussion of such things until the doubling time for the number of cases in the country had stretched beyond ten days. When she was speaking, it was four days. Now it is close to eight.

When the restrictions are lessened it will not be a simple matter of "declaring victory and going home", the strategy for getting out of the Vietnam war advocated by Senator Richard Russell. One of the fundamental predictions of the mechanistic models is that to put an epidemic firmly behind you, you have to get rid of the susceptible part of the population. Vaccination can bring that about. Making it harder for the disease to spread, as social distancing does, leaves the susceptible population just as vulnerable to getting exposed and infected as it was before when restrictions are lifted.

This does not mean that countries have to continue in lockdown until there is a vaccine. It means that when they relax constraints, they must have a plan. The rudiments of such a plan would be to ease the pressure step by step, not all at once, and to put in place a programme for picking up new cases and people who have been in contact with them as quickly as possible. How countries trace cases will depend, in part, on how low they were able to get the level of the virus in the population and how able, or inclined, they are to erode their citizens' privacy. How they relax constraints will depend to some extent on modelling.

Cécile Viboud of America's National Institutes of Health argues that if you can make mechanistic models sufficiently fine-grained they will help you understand the effectiveness of different social-distancing measures. That sounds like the sort of knowledge that governments considering which restrictions to loosen, or tighten back up, might find valuable. The ability to compare the outcomes in countries following different strategies could also help. David Spiegelhalter, a statistician at the University of Cambridge, says the differences between Norway, which is conforming to the lockdowns seen in most of the rest of Europe, and Sweden, which is not, provide a "fantastic experiment" with which to probe the various models.

But the fact that it is possible to build things like how much time particular types of people spend in the pub into models does not necessarily mean that the models will represent the world better as a result. For what they say on such subjects to be trustworthy the new parameters on pubs and such like must be calibrated against the real world; and the more parameters are in play, the harder that is. People can change so many behaviours in response to restrictions imposed and removed that the uncertainties will "balloon" over time, says Mr Reich.



The human engine waits

Some will see this as a reason to push ahead with calibration and other improvements. Others may see it as a reason to put off the risks associated with letting the virus out of the bag for as long as possible. Longer restrictions would give governments more time to put in place measures for testing people and tracking contacts. If they force many companies into bankruptcy, they will give others time to find workarounds and new types of automation that make the restrictions less onerous as time goes by.

Advocates of keeping things in check for as long as possible can point to a new paper by Sergio Correia, of the Federal Reserve Board, Stephan Luck, of the Federal Reserve Bank of New York, and Emil Verner, of MIT, which takes a city-by-city look at the effects of the flu pandemic of 1918-19 on the American economy. They find that the longer and more zealously a city worked to stem the flu's spread, the better its subsequent economic performance. A new analysis by economists at the University of Wyoming suggests much the same should be true today.

The flu, though, mostly killed workers in their prime, and the service industries which dominate the modern economy may not respond as the manufacturing industries of a century ago. What is more, in some places the pressure to get the economy moving again may be irresistible. According to Goldman Sachs, a bank, Italy's debts could reach 160% of GDP by the end of the year—the sort of number that precedes panics in bond markets. The euro zone could forestall such a crisis by turning Italian debt into liabilities shared all its members—something the European Central Bank is already doing, to a limited extent, by buying Italian bonds. But resistance from Germany and the Netherlands is limiting further movement in that direction. There could come a time when Italy felt forced to relax its restrictions to someone else's schedule rather than leave the euro.

There is also a worry that, the longer the economy is suppressed, the more long-

lasting structural damage is done to it. Workers suffering long bouts of unemployment may find that their skills erode and their connections to the workforce weaken, and that they are less likely to re-enter the labour force and find good work after the downturn has ended. Older workers may be less inclined to move or retrain, and more ready to enter early retirement. Such "scarring" would make the losses from the restrictions on economic life more than just a one-off: they would become a lasting blight. That said, the potential for such scarring can be reduced by programmes designed to get more people back into the labour force.

In the end, just as lockdowns, for all that their virtues were underlined by the modellers' grim visions, spread around the world largely by emulation, they may be lifted in a similar manner. If one country eases restrictions, sees its economy roar back to life and manages to keep the rate at which its still-susceptible population gets infected low, you can be sure that others will follow suit. ■

Medical ethical dilemmas

Triage under trial

When the concept of trade-offs is all too real

IT WAS Dominique-Jean Larrey, a rugged French military surgeon in Napoleon's *Grande Armée*, who came up with the system of triage. On the battlefield Larrey, who tended to the wounded at the battle of Waterloo, had to determine which soliders needed medical attention most urgently, regardless of their military rank. In doing so he came up with the concept of distinguishing between urgent and non-urgent patients. Triage, from the French *trier* ("separate out") remains as useful today as it was in the Napoleonic campaigns.

Yet most doctors today have rarely been in battlefield conditions. The covid-19 pandemic has changed that. In Italy there are reports of doctors weeping in hospital hallways because of the choices they have to make. In America and Europe many doctors are faced with terrible decisions about how to allocate scarce resources such as beds, intensive care, and ventilators. In the Netherlands, for example, hospitals are expected to be at full capacity by April 6th; two patients have already been sent to Germany. In some countries, new guidelines over how to distinguish between patients are being hastily drawn up.

One general solution, proffered by both moral philosophers and physicians, is to make sure that resources—in this case staff, supplies and equipment—are directed to the patients who have the greatest chances of successful treatment, and who have the greatest life expectancy. But beyond such a seemingly simple utilitarian solution lie some brutal decisions.

Take the shortage of ventilators. Many patients hospitalised with covid-19 will need one eventually. Provide it too early, and someone else does without. When it is truly needed, though, it will be needed quickly. A paper in the *New England Journal of Medicine* says that when ventilators are withdrawn from patients dependent on them, they will "die within minutes".

The decision over whether or not to ventilate then becomes a decision between life or death. If a young patient arrives needing a ventilator, and none are available, there is a chance that one will be removed from someone else who is identified as being less likely to survive. In extreme situations, it may even be taken from someone who might survive but who is expected to live for a shorter length of time. Such frameworks do not favour older patients or those with health problems.

Ventilation is actually hard for the body to take. It is difficult for older patients to survive on it for two or three weeks—the length of time it would take for them to recover from covid-19. In ordinary situations, an effort would be made to keep the patient alive until it becomes obviously futile. In some hospitals that is no longer possible.

Italian doctors say that it helps if the framework for distinguishing between patients is decided in advance, and patients and families are properly informed. It also helps if someone else, other than front-line doctors, makes the difficult decisions. That leaves doctors free to appeal a decision if they think it has been made in error. In America many states have strategies for rationing resources; this is performed by a triage officer or committee in a hospital.

In some places, preparation of new triage guidelines is under way. In Canada a framework is being developed and vetted by government lawyers and regulators, according to Ross Upshur, a professor at the Dalla Lana School of Public Health in Toronto. In Britain, the development of guidelines has been painful. The National Institute for Health and Care Excellence, a government body, recommends that decisions about admission to critical care should be made on the basis of the potential for medical benefit. Since issuing that advice it has, though, clarified that a generic frailty index included in its guidelines should not be used for younger people or those with learning disabilities. On April 1st the British Medical Association, the doctors' trade union, stepped into the breach, making clear the trade-offs: "there is no ethically significant difference between decisions to withhold life-sustaining treatment or to withdraw it, other clinically relevant factors being equal."

Whether on the battlefield or in a crowded ICU, humans tend to be inclined to treat others according to need and their chances of survival. That framework seems broadly morally acceptable. Even so, it will involve many heart-wrenching decisions along the way. ■