



Review

The socio-economic implications of the coronavirus pandemic (COVID-19): A review



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ABSTRACT

The COVID-19 pandemic has resulted in over 4.3 million confirmed cases and over 290,000 deaths globally. It has also sparked fears of an impending economic crisis and recession. Social distancing, self-isolation and travel restrictions have led to a reduced workforce across all economic sectors and caused many jobs to be lost. Schools have closed down, and the need for commodities and manufactured products has decreased. In contrast, the need for medical supplies has significantly increased. The food sector is also facing increased demand due to panic-buying and stockpiling of food products. In response to this global outbreak, we summarise the socio-economic effects of COVID-19 on individual aspects of the world economy.

1. Introduction

Labelled as a black swan event [1] and likened to the economic scene of World War Two [2], the outbreak of COVID-19 (the disease caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)) has had a detrimental effect on global healthcare systems with a ripple effect on every aspect of human life as we know it. Sohrabi et al. highlighted the extent of the outbreak with the World Health Organisation (WHO) declaring the COVID-19 outbreak as a global emergency on January 30, 2020 [3]. In a response to 'flatten the curve' [4], governments have enforced border shutdowns, travel restrictions and quarantine [5,6] in countries which constitute the world's largest economies, sparking fears of an impending economic crisis and recession [7]. In an attempt to understand the turmoil effect on the economy, we summarise the effect of COVID-19 on individual aspects of the world economy, focusing on **primary sectors** which include industries involved in the extraction of raw materials, **secondary sectors** involved in the production of finished products and **tertiary sectors** including all service provision industries.

2. Primary sectors

2.1. Agriculture

The resilience of the agricultural sector has been tested by the COVID-19 outbreak. A global crash in demand from hotels and restaurants has seen prices of agricultural commodities drop by 20% [8]. Countries around the world have imposed a number of protective measures to contain the exponentially increasing spread. This includes social distancing, avoiding unnecessary travel, and a ban on congregations. Advice on self-isolation upon contact with suspected carriers of the virus is likely to impact the number of available inspectors and delivery staff critical to ensuring verification and transportation of products. This will have pronounced implications for perishable goods such as meat and vegetables. Furthermore, markets have gone a step further by shutting down floor trading which has impacted the ability to exchange commodities. The Chicago Mercantile Exchange is a recent example [9]. 'Panic buying' is further complicating shortages beyond supermarket shelves. The American Veterinary Medical Association

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(AVMA) have expressed concern over low levels of animal pharmaceuticals from several large drug suppliers [10].

2.2. Petroleum & oil

During a meeting at the Organisation of the Petroleum Exporting Countries (OPEC) in Vienna on March 6th, a refusal by Russia to slash oil production triggered Saudi Arabia to retaliate with extraordinary discounts to buyers and a threat to pump more crude [11]. Saudi, regarded as the de facto leader of OPEC, increased its provision of oil by 25% compared to February – taking production volume to an unprecedented level. This caused the steepest one-day price crash seen in nearly 30 years – On March 23rd, Brent Crude dropped by 24% from \$34/barrel [12] to stand at \$25.70 [13]. Although a deceleration in the number of COVID-related deaths has caused some stabilisation of oil prices, there is still much uncertainty.

On the background of a viral outbreak already dampening the demand for oil, this oil-price war is predicted to have grave implications for the global economy. In more ordinary times, cheap oil may have functioned as an advantage for economies. However, savings on petrol are unlikely to be redirected into more spending as populations are instructed to practise social distancing and the working class are uncertain about job security. Furthermore, any increase to consumer activity is likely to be outweighed by damage caused to populations reliant on revenue from other forms of energy such as Shale gas [14]. Economic modelling from Imperial College's Centre for Climate Finance and Investment has suggested 'Carbon Dividends'. A £50/tonne of CO2 tax could be channelled into UK households in order to stimulate consumer spending whilst keeping oil prices at the same level as February 2020 [15]. However, this relies on turbulence between Saudi Arabia and Russia, thus should not be considered sustainable for the long-term.

3. Secondary sectors

3.1. Manufacturing industry

A survey conducted by the British Plastics Federation (BPF) explored how COVID-19 is impacting manufacturing businesses in the United Kingdom (UK). Over 80% of respondents anticipated a decline in turnover over the next 2 quarters, with 98% admitting concern about the negative impact of the pandemic on business operations [16]. Importation issues and staffing deficiencies stood out as the key concerns for businesses due to disruption to supply chains and self-isolation policies. Indeed, for many roles within a manufacturing company, 'working from home' is not a viable option. As the UK is adopting similar protective measures to the rest of the world, and due to the global overlap of supply chains, we can expect these anxieties to transcend borders. The Chemical Industry is predicted to reduce its global production by 1.2%, the worst growth for the sector since the 2008 financial crash [17]. Major chemical manufacturing companies such as BASF who were in the process of upscaling production in China have had to delay their activities, contributing to a slowdown in predicted growth [17,18].

4. Tertiary sectors

4.1. Education

COVID-19 has affected all levels of the education system, from pre-school to tertiary education. Different countries have introduced

various policies, ranging from complete closure in Germany and Italy [19] to targeted closure in the United Kingdom for all but the children of workers in key industries [20]. Additionally, over 100 countries have imposed a nationwide closure of educational facilities. UNESCO estimates that close to 900 million learners have been affected by the closure of educational institutions (Fig. 1) [21].

Whilst the intention of these closures is to prevent spread of the virus within institutions and prevent carriage to vulnerable individuals, these closures have had widespread socioeconomic implications.

COVID-19 has had an impact on social mobility whereby schools are no longer able to provide free school meals for children from low-income families, social isolation and school dropout rates. It has also had a significant impact on childcare costs for families with young children. Additionally, there exists a wide disparity amongst populations with a higher income who are able to access technology that can ensure education continues digitally during social isolation. In Dubai, 13,900 people have signed a petition to decrease independent school fees by 30% as parents struggle to source these funds amidst recent pay cuts reaching as high as 50%, and high costs of living. Furthermore, parents are being asked to provide schools with confidential information such as bank statements and profit and loss company statements [22].

The impact of long-term school closure is yet to be seen. However a study by Chen et al. [23] of a one week closure of schools in Taiwan during the 2009 H1N1 outbreak found that 27% of families could not go to work with 18% losing income as a direct result. A study by the Brookings Institution [24], modelling closures in major US cities and nationwide, suggested that there would be a median cost of \$142 per student per week. This led to an estimate that a four-week closure of New York City would result in an economic cost of \$1.1bn and that a nationwide closure for 12 weeks would cost 1% of GDP. Furthermore, this study looks at the direct impact of closures on the children of healthcare workers with an estimated 6–19% of healthcare workforce hours lost. An estimate in the UK suggested that protracted closures could cost 3% of UK GDP [25]. However, Wren-Lewis [26] posits a view that this impact will be short-lived as its cause is known and defined and therefore will have a clear endpoint, unlike a normal economic recession.

COVID-19 has also influenced the tertiary sector. As well as the impact on undergraduate education [27], the most significant impact is on the postgraduate research community with research into many non-COVID related topics being placed on hold. In the United Kingdom, the national funding body for health research has halted all non-COVID research in order to allow clinically trained staff who are normally on academic secondments to return to the frontline [28]. In the United States, similar action has been taken by the National Institute for Health to shut down all non-critical research in order to free up staff and resources for 'mission-critical' research [29]. Outside of the healthcare research setting, several institutions have put research in fields such as the humanities and social sciences on hold with Harvard University closing all laboratories in the Faculty of Arts and Sciences [30].

Additionally, concerns have been raised regarding the number of scientific conferences that have been cancelled or postponed [31]. These conferences are the key to scientific research in many disciplines, allowing dissemination of research as well as providing networking opportunities for collaboration and job-seeking. Many conferences have moved online, however these 'virtual conferences' are often not as amenable to networking and informal means of scientific communication.

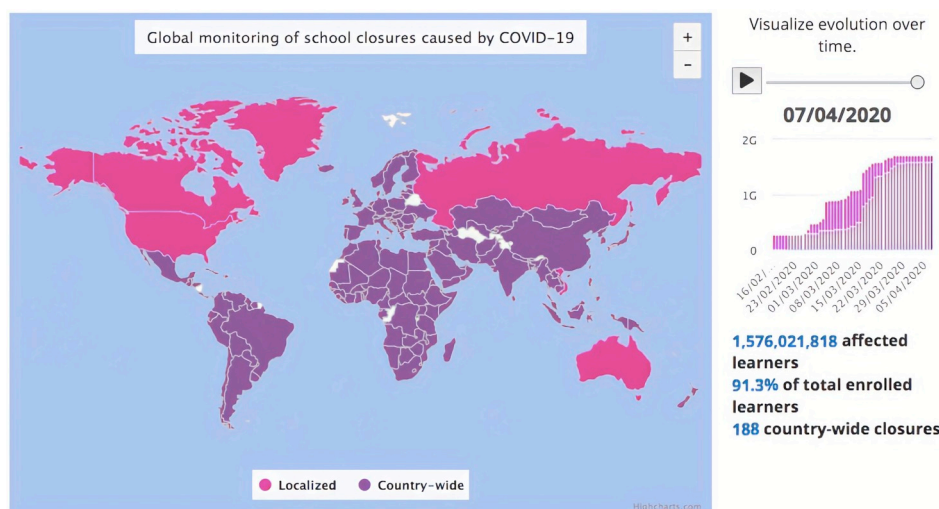


Fig. 1. Global impact of COVID-19 on school closures. Figure produced by UNESCO [21].

4.2. Finance industry

COVID-19 has affected communities, businesses and organisations globally, inadvertently affecting the financial markets and the global economy. Uncoordinated governmental responses and lockdowns have led to a disruption in the supply chain. In China, lockdown restrictions significantly reduced the production of goods from factories, while quarantine and self-isolation policies decreased consumption, demand and utilisation of products and services [32]. As COVID-19 has progressed to affect the rest of the world, China will begin to recover faster than the rest of the countries, strengthening its trade negotiating power against the US. In fact, Chinese companies will be in the advantageous position to acquire their western counterparts, which are greatly dependent and will be inevitably affected by the stock market [15].

In addition to the disruption in the supply chain, the capital market sector has also been affected. In the US, the S&P 500, a stock market index that measures the stock performance of 500 large companies on the US stock exchange, the Dow Jones Industrial Average and the Nasdaq fell dramatically until the US government secured the Coronavirus Aid, Relief, and Economic Security (CARES) Act, with the indexes raising by 7.3% [33], 7.73% [34] and 7.33% [35] respectively [36]. Furthermore, 10-year US Treasury bond yields have dropped to 0.67% [37,38]. In the Asian markets, the same pattern followed with China's Shanghai Composite, Hong Kong's Hang Seng and South Korea's KOSPI, initially dropping then followed by a rise in stocks after governmental support. Japan's Nikkei was up 2.01% [39]. Europe's bond yields mostly declined, reaching market stress hit levels faced in the eurozone crisis of 2011–2012 [40]. Germany's DAX, the UK's FTSE 100 and the Euro Stoxx 50 were all down on March 23rd, but rose significantly after the EU's rescue package was agreed. Gold dropped against the dollar by 0.65% [41].

The decline in global stock markets has festered a volatile environment with critical liquidity levels [42]. To combat these effects, Central banks globally have intervened to ensure liquidity is maintained and mitigate the economic shock, with several leaders embarking on a 'Whatever it takes' approach [7,43]. Professor of Financial Economics, David Miles, from Imperial College London has likened such government spending to the post-Napoleonic, first and second world war eras where public sector liabilities rose greatly. He further explains that bond markets could have difficulties in coping with large scale government bond issuance and that central banks may have to intervene by purchasing these bonds on an unprecedented scale [15].

4.2.1. European response

Europe has pledged a €1.7tn rescue package in an attempt to dampen the economic effects of COVID-19 on the eurozone with contributions from all member states, the UK, as well as countries in the area which do not for part of the European Union (eg. Switzerland) [44].

The European Central Bank (ECB) has announced a €750bn asset-purchase programme with an aim of stabilising and strengthening the Euro through the pandemic. Moreover, the European Commission has collated a €25bn investment fund for the cause and has agreed to a more relaxed policy on budget rules to encourage public spending and the support of affected businesses by their corresponding government [7].

In Germany, the state development bank (KfW) is to provide €500bn in loans to aid companies affected by the pandemic, dubbed the 'biggest post-war aid package' [45]. The Kurzarbeitergeld, a subsidised scheme by the German Federal parliament (the Bundestag), will look to compensate employees who fall ill or are unable to work due to the virus [46,47]. France, Spain and Italy have also promised €345bn, €200bn and €25bn respectively, to help support businesses [44].

4.2.2. UK response

In the UK, Chancellor Rishi Sunak announced a £330bn package of emergency loan guarantees to help those in financial difficulty [48,49]. A further £20bn of fiscal support has been issued in attempts to save UK businesses. The package of measures includes:

- A Coronavirus Job Retention Scheme
- Deferring VAT and Income Tax payments
- A Statutory Sick Pay relief package for SMEs (Small and Medium sized Enterprises)
- A 12-month business rates holiday for all retail, hospitality, leisure and nursery businesses in England
- Small business grant funding of £10,000 for all business in receipt of small business rate relief or rural rate relief
- Grant funding of £25,000 for retail, hospitality and leisure businesses with property with a rateable value between £15,000 and £51,000
- The Coronavirus Business Interruption Loan Scheme offering loans of up to £5 million for SMEs through the British Business Bank
- A new lending facility from the Bank of England to help support liquidity among larger firms, helping them bridge coronavirus disruption to their cash flows through loans
- The HMRC Time To Pay Scheme

The Bank of England has cut interest rates to 0.1 pc, an unprecedented response, in an attempt to dampen the effects of COVID-19 [50] as well as an attempt to maintain the confidence of unnerved investors [15].

On the March 20, 2020, the Chancellor announced that the government will pay up to 80% of the salary of staff (up to £2500 per month) who are kept on by their employer [51] and has vowed to support approximately 3.8 million self-employed individuals with a £9bn support scheme [52].

4.2.3. US response

The US Federal Reserve (the Fed) has recently decreased interest rates by 0.5% in an attempt to soften the blow of the virus on the US Economy [53,54]. On March 23rd, the Fed also announced that it would further aid the market by purchasing \$125bn in bonds. It will also offer a \$300bn lending programme for Main Street businesses as well as ensure that Asset Backed Loan facility which was used in 2008–2009 would be restarted [36]. The Trump administration has managed to secure on the 27th March [55] a \$2 trillion ‘virus-aid package’ the CARES Act [56], to support the economy through these times [57]. This bill is to cover:

- \$1200 to be given to every adult American with an income less than \$75,000 or couples less than \$150,000.
- \$500 for every child under the age of 17
- Increase unemployment compensation by \$600 per week, increase unemployment benefit support by 13 months and extend eligibility to the self-employed and independent contractors
- \$500bn in loans and loan guarantees to be issued by the US Treasury Department to small and large businesses. Businesses who receive such aid are obligated to keep 90% of their employees until September 30, must pay their loans back within five years and are prohibited to issue dividends for up to a year after the full amount of their loan is repaid.
- \$377bn to provide small businesses with loans and grants, \$10bn for emergency grants and \$17bn will also be made available to enable deferral of existing payments.
- Student loan payments to be deferred until 30th September without penalty charges
- Ban on foreclosures of federally backed mortgages until mid-May
- Ban on evictions of tenants in federal housing programmes for four months
- \$25bn in food assistance
- \$100bn for healthcare
- \$45bn to be directed to the Disaster Relief Fund (which includes the supply of protective equipment)
- \$29bn in grants and \$29bn in loans, loan guarantees, excise and fuel tax relief
- \$17bn towards national security
- \$14bn to farmers

4.2.4. China and Japan response

China and Japan took similar action with the People's Bank of China (PBoC) and the Bank of Japan (BoJ) providing the equivalent of \$240bn and \$43bn to maintain bank liquidity, respectively [53,58].

Leaders from the G20 (Group of 20) expect recovery from the economic crisis to take the form of a ‘V’ shaped curve, with a sharp and short-lived dip, followed by a rapid recovery and economic growth. Mr Angel Gurría, secretary general of the Organisation for Economic Co-operation and Development (OECD), disagrees with these claims, stating that the road to economic recovery is more likely to resemble a ‘U’ shaped curve, with a prolonged period of economic inactivity for years to come [59].

4.3. Healthcare and the pharmaceutical industry

4.3.1. Healthcare

The COVID-19 pandemic has caused an unprecedented challenge for healthcare systems worldwide. In particular, the risk to healthcare workers is one of the greatest vulnerabilities of healthcare systems worldwide. Considering most healthcare workers are unable to work remotely, strategies including the early deployment of viral testing for asymptomatic and/or frontline healthcare staff is imperative [60]. High healthcare costs, shortages of protective equipment including N95 face masks, and low numbers of ICU beds and ventilators have ultimately exposed weaknesses in the delivery of patient care. In the US, there is concern regarding uninsured individuals, who may work in jobs predisposing them to viral infection which may lead to significant financial consequences in the event of illness [61].

4.3.2. Pharmaceutical industry

Profound changes to the dynamics of healthcare are likely to ensue, leading to massive investment into disease prevention infrastructure, and the accelerated digital transformation of healthcare delivery. Nicola et al. have highlighted the change in healthcare policy and clinical management as new evidence emerges [62]. In the US, active pharmaceutical ingredients are imported largely from India (18%) and the EU (26%), while China accounts for 13%. China is also the biggest exporter of medical devices to the US, accounting for 39.3%. Production slow-downs and limitations in supply would inadvertently lead to revenue loss [63]. In the UK, AstraZeneca have indicated that COVID-19 is likely to affect its 2020 revenue growth.

Conversely, opportunities for companies engaged in vaccine and drug development have simultaneously emerged, with US-based companies including Johnson & Johnson, Vir Biotechnology, Novavax and NanoViricides having announced collaborative plans to develop a viral vaccine. A Phase 1 clinical trial evaluating an investigational COVID-19 vaccine is currently underway, and will enroll 45 healthy adult volunteers ages 18–55 years over approximately 6 weeks [64].

4.4. Hospitality, tourism and aviation

4.4.1. Hospitality

The hospitality and travel industry have perhaps been most hard-hit, with hourly workers facing potentially devastating hardships. Marriott International (approximately 174,000 employees) is poised to place tens of thousands of workers on furlough [65]. Hilton Worldwide has also notified lenders on March 5, 2020 that they would be borrowing a precautionary \$1.75bn under a revolving loan to preserve money and to maintain flexibility “in light of uncertainty in the global markets” [66].

Hotel industry revenue per available room in the United States fell 11.6% for the week ending March 7, 2020, whilst in China occupancy rates fell 89% by the end of January 2020. Other United States hotel companies are seeking approximately \$150bn in direct aid for employees due to an unprecedented fall in demand, along with an estimated \$1.5bn loss since mid-February [67]. MGM Resorts International have also announced a temporary suspension in operation at its Las Vegas properties, with casino operations closing on 16th March, followed by hotel operations [68]. Since March 1, 2020, hotel occupancy in Germany decreased by over 36% [69]. Italian cities including Rome have been inadvertently affected with a current occupancy rate of 6%, whilst London remains the most stable with an occupancy rate of approximately 47% [69]. Overall, the COVID-19 crisis has led to international distortions for the hospitality industry, and significant slumps for the European hotel market.

4.4.2. Tourism

The tourism sector is currently one of the hardest-hit by the outbreak of COVID-19, with impacts on both travel supply and demand. As

a direct consequence of COVID-19, The World Travel and Tourism Council has warned that 50 million jobs in the global travel and tourism sector may be at risk [70]. In Europe, the European Tourism Manifesto alliance, encompassing over 50 European public and private organisations from the travel and tourism sector, have highlighted the need to implement urgent measures. These include temporary state aid for the tourism and travel sector from national governments as well as fast and easy access to short- and medium-term loans to overcome liquidity shortages, including funds made available by the EU through the Corona Response Investment Initiative, and fiscal relief [71]. The alliance has also called for the launch of the European Unemployment Reinsurance Scheme [72].

Internationally, Vietnam received approximately 1.45 million Chinese visitors in the first quarter of 2019, dropping by 644,000 in January of 2020. It is estimated that Vietnam's tourist sector will suffer a \$5bn loss should the COVID-19 pandemic extend into the second quarter of 2020 [73]. Moreover, the Philippines is projecting a 0.3–0.7% slowdown in the country's full year GDP [74]. In the United States, restriction of all non-essential travel, US-Canada border closure [75], and the suspension of visa services [76] may accelerate disruption of the American economy. In the UK, many parks are now closing to further enforce social distancing as they have in Italy [77].

4.4.3. Aviation

The travel industry is grappling with an unprecedented wave of cancellations and a significant drop in demand amid strict governmental instructions to implement social distancing and the restriction of unnecessary travel. Globally, border closures are on the rise. In the US, all foreign nationals from China, Iran and certain EU countries are barred from entering [78]. This ban includes anyone who visited these countries within the 14 days prior to their US trip. The UK Foreign Office has also advised UK nationals against all but essential international travel [79]. In Europe, the president of the EU commission has proposed all non-essential travel from outside the EU be suspended for 30 days. Travel suspensions have also been implemented across Asia and Africa [80].

In light of these events, Malaysia Airport reported a 30% decline in international passenger traffic for February [81]. More recently, Airlines for America sought a government bailout encompassing \$25bn in grants, \$25bn in loans, and significant tax relief to ensure survival [82]. UK airlines have also called for an immediate £7.5bn emergency bailout to prevent a widespread shutdown [83]. Ministers in the Netherlands have also reported implementing strategies to ensure the continued operation of Air France-KLM and Amsterdam's Schiphol airport, whilst the Italian Government have been said to be close to taking full control of ailing airline Alitalia.

4.5. Real estate and housing sector

The real estate industry is facing great uncertainty due to COVID-19. At an individual level, social distancing precautions have reduced house views, a key part of the selling process, and both buyers and sellers are having to reconsider their plans. Increasingly, sellers are looking for reassurance regarding the health of potential buyers coming to view properties [84]. Some brokers are offering house tours via Skype and FaceTime to minimise the risk of infection propagation. Brokers around the United States are also asking potential buyers to preregister for viewings in order to gauge their level of interest and likelihood of purchase [85].

Additionally, thousands of workers around the world have been made redundant or have been placed on temporary, unpaid leave of absence. Inevitably this will have a significant impact on individuals' abilities to pay rent, mortgages and various household expenditures. To tackle this, part of the £350bn lifeline the United Kingdom (UK) government has released will be used to allow mortgage lenders to offer a three-month mortgage holiday to those in financial difficulty [49]. The

government has also recommended that buyers and lenders delay negotiations during the lockdown, bringing transactions to a halt [86]. Many are worried that we will face another financial crisis, similar to that of 2008 that will impact confidence in real estate. Banks within the UK have begun to take precautions; high street lenders require up to 40% deposits for a new mortgage to be approved. It is however too early to speculate on the impact of COVID-19; as of yet, the infection has not had a significant impact on the housing market [87,88].

4.6. Sports industry

COVID-19 is having a substantial impact on sporting schedules as some of the world's largest sporting events come to view in 2020. Football's much anticipated Euro 2020 tournament has been postponed for 12 months while play-offs have been postponed till June 2020 at the earliest [89]. The international Olympic committee was committed to staging the Tokyo 2020 Olympics this summer without delay. However, they have now made the decision to postpone the games to 2021, a decision that is supported by athletes and their respective nations [89–91]. In a similar vein, the Australian Formula one Grand Prix has been postponed with Bahrain and Vietnam opting to cancel their fixtures until further notice [89]. These are but a few examples; golf, tennis, athletics, basketball, rugby, cycling, boxing, snooker and ice-skating fixtures have all faced cancellations and delays in an attempt to curb the spread of disease. Inevitably this will have a significant financial burden, the gravity of which has yet to come to light [89].

4.7. Information technology, media, research & development

With the WHO raising COVID-19's status to a pandemic, 35 companies and academic institutions are racing to develop an effective vaccine. Four potential vaccines are currently being tested on animals with the biotech firm Moderna entering human trials imminently [92]. The Coalition for Epidemic Preparedness Innovations (CEPI), is leading various efforts to finance and coordinate COVID-19 vaccine development [92]. They have announced a \$4.4m partnership fund with Novavax and University of Oxford to develop a viable solution [92]. The Gates Foundation, Wellcome and Mastercard have also committed \$125m to find new treatments for COVID-19 [93].

Social distancing precautions are paramount to the containment effort. Additionally, COVID-19 has left several hospitals in turmoil, having reached maximal capacity. As a result, various countries are turning towards technological solutions, to care for patients and at the same time, minimise the risk of person to person transmission. In various cities across China, tele-response bots powered by fifth-generation wireless networks are being utilised that allow health care staff to communicate with patients, monitor their health and deliver medical supplies [94]. Drones that deliver medication and work-from-home apps are also being adopted. Automation of services has been a major goal for China. COVID-19 has helped to accelerate uptake and has taken them one step closer to this goal [94].

The demand for respiratory ventilators has skyrocketed due to the outbreak of COVID-19. However, it is clear that the current supply across the United States and Europe does not meet demand. It is estimated that the USA has 160,000 ventilators [95]. This is 580,000 short of what would be required in a severe pandemic [95]. Governments around the world are attempting to buy ventilators. In the United Kingdom, the prime minister has asked companies such as Rolls Royce and Dyson to divert their manufacturing power to medical supplies [95]. However, industry leaders have stated that this is easier said than done as many of these companies do not produce medical equipment such as ventilators. In addition to this, production of ventilators requires strict regulation and testing to ensure their safety which can be a lengthy process [95].

4.8. Food sector

The food sector, including food distribution and retailing, has been put under strain as a result of people panic-buying and stockpiling food [96]. This has led to increased concerns about shortages of food products such as long-life milk, pasta, rice and tinned vegetables. Panic-buying has resulted in an increase of £1bn worth of food in UK homes [97]. This high demand on food products has also affected online food delivery. Companies are struggling with excessive bookings, with deliveries arriving late or not at all [98]. Moreover, food banks have also been affected by panic-buying and food stockpiling as donations have reduced. Concerns about food running out also means that vulnerable populations who can not afford to stockpile, may not find food [99,100].

In response to these concerns, the UK government has made efforts to provide certain populations with food parcels and free meals to collect and take home. These populations include high-risk vulnerable individuals such as the elderly who have no support network, and school children of low-income families [101–103].

The UK government has also reduced restrictions on delivery hours for retailers in order to allow stores to restock with basic food products. Furthermore, the British Retail Consortium (BRC) has reassured the public that despite low inventory of certain food products in local stores, there are no such shortages of food. Similar statements have been made by the US Food and Drug Administration (FDA) [104,105].

In addition, despite reassurance by the government, stores have made drastic changes by restricting the amount of each product that an individual can buy, providing more than 30,000 new jobs to meet the high pressure of restocking shelves, and setting special shopping hours for the elderly, vulnerable populations and NHS staff. Further changes being implemented include a decrease in the range of products being made by manufacturers, with the aim of focusing on products that are in greater need [106].

Independent supermarkets have also been affected by the high demand on food products. Measures implemented by these local stores include free delivery of food products to customers to avoid panic-buying, putting restrictions on the number of customers allowed in at any given time to avoid overcrowding, and expanding on the number of suppliers whom they buy their products from to avoid food shortage [107].

Although supermarkets have seen a huge demand on food products, restaurants and cafes have been forced to close. As a result, many of these stores are at risk of permanent closure and many of their employees have lost their jobs. The impact of COVID-19 on the food industry has forced Leon, a UK fast-food chain, to change its business model; 65 of its restaurants were said to turn into shops that sell refrigerated ready-meal-type plastic pouches [108].

5. Social impact

5.1. Family dynamics: domestic violence & home video-gaming

Lockdown and social distancing measures to prevent spread of COVID-19 have heightened fears of increasing levels of domestic violence, which includes physical, emotional and sexual abuse [109].

Refuge, one of the UK's domestic abuse charities, has reported a 25% increase in calls made to its helpline since lockdown measures were announced [110].

The concentrated time spent in lockdown means that vulnerable people are more exposed to abuse and it is more difficult for them to seek help. In response to increasing concern, the UK government has published guidelines on how to recognise domestic abuse, how to report it and where, with a list of all the services available [111].

In addition, a significant impact of the COVID-19 pandemic has been seen within the video-gaming industry. With many individuals self-isolating and/or remaining home under strict governmental

regulations, online gaming has seen the emergence of record numbers of players, which has facilitated a boost in revenue for many companies [112]. Conversely, negative impacts include cancellation of the annual and major trade event E3 2020, alongside the rescheduling and/or cancellation of popular Esport leagues [113].

6. Conclusion

With fears of a new recession and financial collapse, times like these call for resilient and strong leadership in healthcare, business, government and wider society. Immediate relief measures need to be implemented and adjusted for those that may fall through the cracks. Medium and longer term planning is needed to re-balance and re-energise the economy following this crisis. A broad socioeconomic development plan including sector by sector plans and an ecosystem that encourages entrepreneurship is also needed so that those with robust and sustainable business models can flourish. It is prudent that governments and financial institutions constantly re-assess and re-evaluate the state of play and ensure that the 'whatever it takes' promise is truly delivered.

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The data in this review is not sensitive in nature and is accessible in the public domain. The data is therefore available and not of a confidential nature.

Declaration of competing interest

No conflicts of interest.

References

- [1] Resilient leadership responding to COVID-19 | deloitte insights, [Internet]. [cited 2020 Mar 20]. Available from: <https://www2.deloitte.com/global/en/insights/economy/covid-19/heart-of-resilient-leadership-responding-to-covid-19.html>.
- [2] [Internet], Reuters. ECB Asset Purchase Programme Boosts Euro, The Guardian, 2020 Mar 19 [cited 2020 Mar 20]; Available from: <https://www.theguardian.com/world/2020/mar/19/ecb-asset-purchase-programme-boosts-euro>.
- [3] C. Sohrabi, Z. Alsafi, N. O'Neill, M. Khan, A. Kerwan, A. Al-Jabir, et al., World Health Organization declares global emergency: a review of the 2019 novel coronavirus (COVID-19), *Int. J. Surg.* 76 (2020 Apr) 71–76.
- [4] AB Avi Loeb, Flattening the COVID-19 curves, [Internet]. Scientific American Blog Network, [cited 2020 Mar 20]. Available from: <https://blogs.scientificamerican>.

- [com/observations/flattening-the-covid-19-curves/](https://www.bbc.com/observations/flattening-the-covid-19-curves/).
- [5] Coronavirus: travel restrictions, border shutdowns by country | Coronavirus pandemic News, Al Jazeera, [Internet]. [cited 2020 Mar 20]. Available from: <https://www.aljazeera.com/news/2020/03/coronavirus-travel-restrictions-border-shutdowns-country-200318091505922.html>.
 - [6] Guidance on social distancing for everyone in the UK, [Internet]. GOV.UK. [cited 2020 Mar 22]. Available from: <https://www.gov.uk/government/publications/covid-19-guidance-on-social-distancing-and-for-vulnerable-people/guidance-on-social-distancing-for-everyone-in-the-uk-and-protecting-older-people-and-vulnerable-adults>.
 - [7] T. Buck, M. Arnold, G. Chazan, C. Cookson, Coronavirus declared a pandemic as fears of economic crisis mount, [Internet], [cited 2020 Mar 19]. Available from: <https://www.ft.com/content/d72f1e54-6396-11ea-b3f3-fe4680ea68b5>.
 - [8] Prices of agricultural commodities drop 20% post COVID-19 outbreak - rediff Realtime News, [Internet]. [cited 2020 Mar 20]. Available from: https://realtime.rediff.com/news/india/Prices-of-agricultural-commodities-drop-20-post-COVID-19-outbreak/955078599584b749?src=interim_alsoreadimage.
 - [9] [Internet], CME Closing Trading Floors Indefinitely amid Coronavirus Concerns, Crain's Chicago Business, 2020 [cited 2020 Mar 23]. Available from: <https://www.chicagobusiness.com/finance-banking/cme-closing-trading-floors-indefinitely-amid-coronavirus-concerns>.
 - [10] COVID-19, [Internet]. American Veterinary Medical Association, [cited 2020 Mar 20]. Available from: <https://www.avma.org/resources-tools/animal-health-and-welfare/covid-19>.
 - [11] OPEC's pact with Russia falls apart, sending oil into tailspin. Reuters, [Internet], [cited 2020 Mar 23]; Available from: <https://www.reuters.com/article/us-opec-meeting-idUSKBN20T0Y2>.
 - [12] Oil prices, stocks plunge after Saudi Arabia stuns world with massive discounts, [Internet]. NPR.org. [cited 2020 Mar 23]. Available from: <https://www.npr.org/2020/03/08/813439501/saudi-arabia-stuns-world-with-massive-discount-in-oil-sold-to-asia-europe-and-u->.
 - [13] GmbH finanzen net, "There is no escape": stocks, oil, and bitcoin plunge as US lawmakers fight over coronavirus rescue package | Markets Insider, [Internet]. markets.businessinsider.com. [cited 2020 Mar 23]. Available from: <https://markets.businessinsider.com/news/stocks/no-escape-stocks-oil-bitcoin-plunge-senate-argues-coronavirus-bill-2020-3-1029021850>.
 - [14] Breakeven oil prices underscore shale's impact on the market, [Internet]. [cited 2020 Mar 23]. Available from: <https://www.dallasfed.org/443/research/economics/2019/0521>.
 - [15] The economic impact of coronavirus: analysis from imperial experts | imperial news | imperial College London, [Internet]. Imperial News, [cited 2020 Apr 6]. Available from: <https://www.imperial.ac.uk/news/196514/the-economic-impact-coronavirus-analysis-from/>.
 - [16] Plastics trade body publishes first study of coronavirus impact on UK manufacturing, [Internet]. [cited 2020 Mar 20]. Available from: <https://www.bpf.co.uk/article/plastics-trade-body-publishes-first-study-of-coronavirus-impact-1602.aspx>.
 - [17] COVID-19 is coming for the chemical industry in 2020, BASF frets | IndustryWeek, [Internet]. [cited 2020 Mar 20]. Available from: <https://www.industryweek.com/supply-chain/planning-forecasting/article/21125045/covid19-is-coming-for-the-chemical-industry-in-2020-basf-frets>.
 - [18] S. Knieps, Will COVID-19 turn Germany's export-oriented economy into a weakness? [Internet], [cited 2020 Mar 23]. Available from: <https://www.euractiv.com/section/economy-jobs/news/will-covid-19-turn-germanys-export-oriented-economy-into-a-weakness/>.
 - [19] Unterricht an bayerischen Schulen wird eingestellt, [Internet]. Bayerisches Staatsministerium für Unterricht und Kultus, [cited 2020 Mar 20]. Available from: <https://www.km.bayern.de/allgemein/meldung/6901/unterricht-an-bayerischen-schulen-wird-eingestellt.html>.
 - [20] Guidance for schools, childcare providers, colleges and local authorities in England on maintaining educational provision, [Internet]. GOV.UK. [cited 2020 Mar 20]. Available from: <https://www.gov.uk/government/publications/coronavirus-covid-19-maintaining-educational-provision/guidance-for-schools-colleges-and-local-authorities-on-maintaining-educational-provision>.
 - [21] <https://plus.google.com/+UNESCO>. COVID-19 [Internet], Educational Disruption and Response, UNESCO, 2020 [cited 2020 Mar 20]. Available from: <https://en.unesco.org/themes/education-emergencies/coronavirus-school-closures>.
 - [22] [Internet], Expats in Dubai Call for Cut in Their Children's School Fees, Ft.com, 2020 [cited 8 April 2020]. Available from: <https://www.ft.com/content/c9f83ca9-9107-436f-864b-da1b7e28f56f>.
 - [23] Social and economic impact of school closure resulting from pandemic influenza A/H1N1, J. Infect. 62 (3) (2011) [Internet], [cited 2020 Mar 20]. Available from: [https://www.journalofinfection.com/article/S0163-4453\(11\)00008-9/fulltext](https://www.journalofinfection.com/article/S0163-4453(11)00008-9/fulltext).
 - [24] 0930_school_closure.presentation.pdf [Internet]. [cited 2020 Mar 20]. Available from: https://www.brookings.edu/wp-content/uploads/2016/06/0930_school_closure.presentation.pdf.
 - [25] M.R. Keogh-Brown, S. Wren-Lewis, W.J. Edmunds, P. Beutels, R.D. Smith, The possible macroeconomic impact on the UK of an influenza pandemic, Health Econ. 19 (11) (2010) 1345–1360.
 - [26] Economics in the time of COVID-19 | VOX, CEPR policy portal, [Internet]. [cited 2020 Mar 20]. Available from: <https://voxeu.org/content/economics-time-covid-19>.
 - [27] Z. Alsafi, A-R Abbas, A Hassan, MA Ali, The coronavirus (COVID-19) pandemic: Adaptations in medical education, Int. J.Surg. 78 (2020) 64–65.
 - [28] DHSC issues guidance on the impact of COVID-19 on research funded or supported by NIHR, [Internet]. [cited 2020 Mar 21]. Available from: <https://www.nihr.ac.uk/news/dhsc-issues-guidance-on-the-impact-on-covid-19-on-research-funded-or-supported-by-nihr/24469>.
 - [29] [Internet], NIH Shifts Non-mission-critical Laboratory Operations to Minimal Maintenance Phase, National Institutes of Health (NIH), 2020 [cited 2020 Mar 21]. Available from: <https://www.nih.gov/news-events/news-releases/nih-shifts-non-mission-critical-laboratory-operations-minimal-maintenance-phase>.
 - [30] Coronavirus (COVID-19), [Internet]. Harvard University, [cited 2020 Mar 21]. Available from: <https://www.harvard.edu/coronavirus>.
 - [31] C. Impey, Coronavirus: social distancing is delaying vital scientific research, [Internet]. The Conversation, [cited 2020 Mar 21]. Available from: <http://theconversation.com/coronavirus-social-distancing-is-delaying-vital-scientific-research-133689>.
 - [32] C.-W. Yap, China's factories struggle to resume operations after virus shutdown, [Internet], Wall St. J. (2020 Feb 8) [cited 2020 Mar 20]; Available from: <https://www.wsj.com/articles/chinas-factories-struggle-to-resume-operations-after-virus-shutdown-11581157800>.
 - [33] SPX | S&P 500 index, MarketWatch [Internet]. [cited 2020 Apr 7]. Available from: <https://www.marketwatch.com/investing/index/spx>.
 - [34] DJIA | Dow Jones industrial average, MarketWatch [Internet]. [cited 2020 Apr 7]. Available from: <https://www.marketwatch.com/investing/index/djia>.
 - [35] COMP | NASDAQ composite index, MarketWatch [Internet]. [cited 2020 Apr 7]. Available from: <https://www.marketwatch.com/investing/index/comp>.
 - [36] I.B. Daily, Dow Jones Today, Stocks Drop: Fed Stimulus; New York, California Lockdown; NYSE Floor Closes, [Internet] Investor's Business Daily, 2020 [cited 2020 Mar 23]. Available from: <https://www.investors.com/market-trend/stock-market-today/dow-jones-today-futures-slide-fed-stimulus-impasse-new-york-california-lockdown-nyse-floor-closes/>.
 - [37] 10 Year Treasury rate, [Internet]. [cited 2020 Apr 7]. Available from: https://ycharts.com/indicators/10_year_treasury_rate.
 - [38] Smith YL. Elliot, 10-year Yield Dives below 0.7% after Fed Announces Unlimited Asset Purchases, [Internet] CNBC, 2020 [cited 2020 Mar 23]. Available from: <https://www.cnbc.com/2020/03/23/treasury-yields-fall-as-coronavirus-cases-rise-relief-bill-stalls.html>.
 - [39] N225 18,950.18 373.88 2.01% : Nikkei 225 - yahoo finance, [Internet]. [cited 2020 Apr 7]. Available from: <https://finance.yahoo.com/quote/%5EN225/?guccounter=1>.
 - [40] Stocks sink 12% amid COVID-19 pandemic | time, [Internet]. [cited 2020 Mar 20]. Available from: <https://time.com/5803847/coronavirus-stocks-fall/>.
 - [41] XAU/USD (gold/USD dollar), [Internet]. [cited 2020 Apr 7]. Available from: <https://www.fxstreet.com/rates-charts/xauusd>.
 - [42] The economic impact of COVID-19 | Deloitte Insights, [Internet]. [cited 2020 Mar 19]. Available from: <https://www2.deloitte.com/global/en/insights/economy/covid-19/economic-impact-covid-19.html>.
 - [43] Mitigating the COVID economic crisis: Act fast and do whatever it takes | VOX, CEPR policy portal, [Internet]. [cited 2020 Mar 20]. Available from: <https://voxeu.org/content/mitigating-covid-economic-crisis-act-fast-and-do-whatever-it-takes>.
 - [44] Europe's economic rescue packages worth combined €1.7tn, World news | The Guardian [Internet]. [cited 2020 Mar 20]. Available from: <https://www.theguardian.com/world/2020/mar/19/europes-economic-rescue-packages-worth-combined-17tn>.
 - [45] Germany unleashes biggest post-war aid package against virus, [Internet]. CNA, [cited 2020 Mar 20]. Available from: <https://www.channelnewsasia.com/news/business/germany-unleashes-biggest-post-war-aid-package-coronavirus-12536540>.
 - [46] COVID-19 update: Germany to give easier access to state-funded short-time working allowance | orrick - global employment law group - JDSupra, [Internet]. [cited 2020 Mar 20]. Available from: <https://www.jdsupra.com/legalnews/covid-19-update-germany-to-give-easier-36702/>.
 - [47] Kurzarbeitergeld: Übersicht - bundesagentur für Arbeit, [Internet]. [cited 2020 Mar 20]. Available from: <https://www.arbeitsagentur.de/unternehmen/finanziell/kurzarbeitergeld-uebersicht-kurzarbeitergeldformen>.
 - [48] Support for those affected by COVID-19, [Internet]. GOV.UK. [cited 2020 Mar 19]. Available from: <https://www.gov.uk/government/publications/support-for-those-affected-by-covid-19/support-for-those-affected-by-covid-19>.
 - [49] [Internet], Chancellor Unveils £350bn Lifeline for Economy, BBC News, 2020 Mar 17 [cited 2020 Mar 20]; Available from: <https://www.bbc.com/news/business-51935467>.
 - [50] L. Harding, L. Ashworth, Markets Climb Higher after Bank of England Goes 'all in' with Further Interest Rate Cut – Live Updates, [Internet] The Telegraph, 2020 Mar 19 [cited 2020 Mar 19]; Available from: <https://www.telegraph.co.uk/business/2020/03/19/markets-live-latest-news-pound-euro-fse-100/>.
 - [51] [Internet], UK to Pay Wages for Workers Facing Job Losses, BBC News, 2020 Mar 20 [cited 2020 Mar 22]; Available from: <https://www.bbc.com/news/business-51982005>.
 - [52] Rigby B. Coronavirus: Billions set aside to help the UK economy - now comes the hard part [Internet]. Sky News. Sky; 2020 [cited 2020Apr18]. Available from: <https://news.sky.com/story/coronavirus-billions-set-aside-to-help-the-uk-economy-now-comes-the-hard-part-11964304>.
 - [53] Banking and capital markets: implications of COVID-19 | deloitte insights, [Internet]. [cited 2020 Mar 20]. Available from: <https://www2.deloitte.com/global/en/insights/economy/covid-19/banking-and-capital-markets-impact-covid-19.html>.
 - [54] J. Smialek, Fed Official Says Central Bankers Are Aligned in Coronavirus Response, [Internet] The New York Times, 2020 Mar 5 [cited 2020 Mar 20];

- Available from: <https://www.nytimes.com/2020/03/05/business/economy/fed-rate-cut-coronavirus.html>.
- [55] Related bills - S.3548 - 354116th congress (2019-2020): CARES Act | Congress.gov | library of congress, [Internet]. [cited 2020 Apr 7]. Available from: <https://www.congress.gov/bills/116th-congress/senate-bill/3548/related-bills>.
 - [56] The anatomy of the \$2 trillion COVID-19 stimulus bill - visual capitalist, [Internet]. [cited 2020 Apr 7]. Available from: <https://www.visualcapitalist.com/the-anatomy-of-the-2-trillion-covid-19-stimulus-bill/>.
 - [57] Who gets what from the \$2 trillion US virus aid package, USA News | Al Jazeera [Internet]. [cited 2020 Apr 6]. Available from: <https://www.aljazeera.com/ajimpact/2-trillion-virus-aid-package-200325144213604.html>.
 - [58] Bank of Japan pumps \$43b in liquidity, largest amount since 2008, Economy News & Top Stories - The Straits Times [Internet]. [cited 2020 Apr 6]. Available from: <https://www.straitstimes.com/business/economy/bank-of-japan-pumps-43b-in-liquidity-largest-amount-since-2008>.
 - [59] Jack SPC. Simon, Global Economy Will Suffer for 'years to Come', [Internet] BBC News, 2020 Mar 23 [cited 2020 Mar 23]; Available from: <https://www.bbc.com/news/business-52000219>.
 - [60] J.H. Tanne, E. Hayasaki, M. Zastrow, P. Pulla, P. Smith, A.G. Rada, Covid-19: How Doctors and Healthcare Systems Are Tackling Coronavirus Worldwide, [Internet] BMJ, 2020 Mar 18 [cited 2020 Mar 20];368. Available from: <https://www.bmj.com/content/368/bmj.m1090>.
 - [61] [Internet], Mar 16 JTP, 2020. What Issues Will Uninsured People Face with Testing and Treatment for COVID-19? The Henry J. Kaiser Family Foundation, 2020 [cited 2020 Mar 20]. Available from: <https://www.kff.org/uninsured/fact-sheet/what-issues-will-uninsured-people-face-with-testing-and-treatment-for-covid-19/>.
 - [62] M Nicola, N O'Neill, C Sohrabi, M Khan, M Agha, R Agha, Evidence Based Management Guideline for the COVID-19 Pandemic - Review article, Int J Surg (2020), <https://doi.org/10.1016/j.ijsu.2020.04.001>.
 - [63] COVID-19 USA: coronavirus outbreak measures and effect on the US, [Internet]. [cited 2020 Mar 20]. Available from: <https://www.pharmaceutical-technology.com/features/coronavirus-affected-countries-usa-covid-19-measures-impact-pharma-hotel-tourism-medical/>.
 - [64] [Internet], NIH Clinical Trial of Investigational Vaccine for COVID-19 Begins, National Institutes of Health (NIH), 2020 [cited 2020 Mar 20]. Available from: <https://www.nih.gov/news-events/news-releases/nih-clinical-trial-investigational-vaccine-covid-19-begins>.
 - [65] Marriott furloughs tens of thousands of employees due to coronavirus, [Internet]. usatoday, [cited 2020 Mar 20]. Available from: <https://www.usatoday.com/story/money/2020/03/17/marriott-furloughs-layoffs-coronavirus-covid-19/5068070002/>.
 - [66] [Internet], Hotels Chains Maneuver to Deal with Coronavirus Gut Punch, Skift, 2020 [cited 2020 Mar 20]. Available from: <https://skift.com/2020/03/18/hotels-chains-maneuver-to-deal-with-coronavirus-gut-punch/>.
 - [67] Airbnb, Hotels seek US government aid as demand flattens, [Internet]. [cited 2020 Mar 20]. Available from: https://uk.news.yahoo.com/airbnb-hotels-seek-us-government-172429553.html?guccounter=1&guce_referrer=aHR0cHM6Ly9jb25zZW50LnlnhaG9vLmNvbS88&guce_referrer_sig=AQAAACZRVvUSdl8yqD6uLCzjwgPt7XCCtMraSnOk6lAtxj4SWgWhXMr4rizzq7LTkeApX3xbRoQwNY4T2U7cs1rdUK1DjYjwHYPJ6E_CCo_YKLtTjg1vGBUIESTjYJ6wGm_w5FxnqL3vYkww3ORZQ-ckAngQQEuBYUhWsnfIKUQfBa.
 - [68] H. Net, MGM Resorts international statement on temporary closure of Las Vegas properties, [Internet]. Hospitality Net, [cited 2020 Mar 20]. Available from: <https://www.hospitalitynet.org/news/4097568.html>.
 - [69] H. Net, Coronavirus hits German hotel industry hard: more than every-3-guests stay away, [Internet]. Hospitality Net, [cited 2020 Mar 20]. Available from: <https://www.hospitalitynet.org/performance/4097569.html>.
 - [70] This is how coronavirus could affect the travel and tourism industry, [Internet]. World Economic Forum, [cited 2020 Mar 20]. Available from: <https://www.weforum.org/agenda/2020/03/world-travel-coronavirus-covid19-jobs-pandemic-tourism-aviation/>.
 - [71] Amy, European tourism sector demands urgent supportive measures to reduce devastating impact of COVID-19 [internet]. Hotel-online, [cited 2020 Mar 20]. Available from: https://www.hotel-online.com/press_releases/release/european-tourism-sector-demands-urgent-supportive-measures-to-reduce-devastating-impact-of-covid-19/.
 - [72] Tourism alliance demands measures to reduce COVID-19 impact, The Budapest Business Journal on the web | bbj.hu, [Internet]. [cited 2020 Mar 20]. Available from: <https://bbj.hu/coronavirus/tourism-alliance-demands-measures-to-reduce-covid-19-impact-179888>.
 - [73] V. Times, Vietnam's Tourism Sector Could Lose US\$ 5bln Due to COVID 19, [Internet] Vietnam Times, 2020 [cited 2020 Mar 20]. Available from: <https://vietnamtimes.org.vn/vietnams-tourism-sector-could-lose-us-5bln-due-to-covid-19-17829.html>.
 - [74] COVID-19 outbreak expected to impact on the local economy; DOH bracing for local transmission, OneNews.PH [Internet]. [cited 2020 Mar 20]. Available from: <https://onenews.ph/covid-19-outbreak-expected-to-impact-on-the-local-economy-doh-bracing-for-local-transmission>.
 - [75] [Internet], US-Canada Border to Close amid Virus Crisis, BBC News, 2020 Mar 18 [cited 2020 Mar 20]; Available from: <https://www.bbc.com/news/world-us-canada-51949243>.
 - [76] [Internet], Status of U.S. Consular Operations in Mexico in Light of COVID-19, U.S. Embassy & Consulates in Mexico, 2020 [cited 2020 Mar 20]. Available from: <https://mx.usembassy.gov/status-of-u-s-consular-operations-in-mexico-in-light-of-covid-19/>.
 - [77] [Internet], Parks Closing as Areas Urge Tourists to Stay Away, BBC News, 2020 Mar 22 [cited 2020 Mar 22]; Available from: <https://www.bbc.com/news/uk-england-51995092>.
 - [78] Coronavirus travel bans: countries impose travel restrictions, [Internet]. usatoday, [cited 2020 Mar 20]. Available from: <https://www.usatoday.com/story/travel/news/2020/03/17/coronavirus-travel-bans-countries-impose-travel-restrictions/5058513002/>.
 - [79] [Internet], Britons Urged to Avoid Non-essential Travel Abroad, BBC News, 2020 Mar 17 [cited 2020 Mar 20]; Available from: <https://www.bbc.com/news/uk-51924405>.
 - [80] Coronavirus travel updates: which countries have restrictions and FCO warnings in place? Travel | The Guardian [Internet]. [cited 2020 Mar 20]. Available from: <https://www.theguardian.com/travel/2020/mar/19/coronavirus-travel-updates-which-countries-have-restrictions-and-fco-warnings-in-place>.
 - [81] Commentary: COVID-19, the biggest crisis ever for Singapore's aviation industry and Singapore Airlines, CNA [Internet]. [cited 2020 Mar 20]. Available from: <https://www.channelnewsasia.com/news/commentary/covid-19-coronavirus-airline-sia-flight-air-travel-industry-cut-12542996>.
 - [82] [Internet], U.S. Airlines Seek \$50 Billion Coronavirus Bailout to Avoid Collapse, Reuters, 2020 Mar 16 [cited 2020 Mar 20]; Available from: <https://in.reuters.com/article/uk-health-coronavirus-usa-aviation-idINKBN21337Q>.
 - [83] UK airlines call for multibillion bailout to survive Covid-19 crisis, World news | The Guardian [Internet]. [cited 2020 Mar 20]. Available from: <https://www.theguardian.com/world/2020/mar/15/uk-airlines-call-for-multibillion-bailout-to-survive-covid-19-crisis>.
 - [84] J. Pickford, Coronavirus fears hit UK property market as viewings dry up, [Internet], [cited 2020 Mar 20]. Available from: <https://www.ft.com/content/e30ccb84-6799-11ea-800d-da70cffe4d3>.
 - [85] How coronavirus has affected real estate, The New York Times [Internet]. [cited 2020 Mar 20]. Available from: <https://www.nytimes.com/2020/03/17/realestate/how-coronavirus-has-affected-real-estate.html>.
 - [86] What should I do if I am selling a house during the coronavirus outbreak? The latest property advice, [Internet]. [cited 2020 Apr 7]. Available from: <https://www.telegraph.co.uk/property/uk/should-do-selling-house-coronavirus-outbreak-latest-property/>.
 - [87] Coronavirus: UK mortgage market goes into partial lockdown, BBC News [Internet]. [cited 2020 Apr 7]. Available from: <https://www.bbc.co.uk/news/business-52106119#>.
 - [88] House prices: could house prices crash over coronavirus? | Express.co.uk, [Internet]. [cited 2020 Mar 20]. Available from: <https://www.express.co.uk/life-style/property/1254712/house-prices-crash-coronavirus-could-house-prices-go-down-fall>.
 - [89] Coronavirus: sport-by-sport look at the global impact of COVID-19 | the Independent, [Internet]. [cited 2020 Mar 20]. Available from: <https://www.independent.co.uk/sport/sport-football-basketball-rugby-olympics-cancelled-coronavirus-impact-around-the-world-a9398186.html>.
 - [90] [Internet], UEFA.com. UEFA EURO, UEFA.com, 2020 [cited 2020 Mar 20]. Available from: <https://www.uefa.com/uefaeuro-2020/>.
 - [91] Tokyo Olympics postponed to 2021 due to coronavirus pandemic, Sport | The Guardian [Internet]. [cited 2020 Apr 7]. Available from: <https://www.theguardian.com/sport/2020/mar/24/tokyo-olympics-to-be-postponed-to-2021-due-to-coronavirus-pandemic>.
 - [92] When will a coronavirus vaccine be ready? World news | The Guardian [Internet]. [cited 2020 Mar 20]. Available from: <https://www.theguardian.com/world/2020/mar/18/when-will-a-coronavirus-vaccine-be-ready>.
 - [93] Gates foundation, Wellcome, mastercard commit \$125 million to COVID-19 drugs - business insider, [Internet]. [cited 2020 Mar 20]. Available from: <https://www.businessinsider.com/gates-foundation-wellcome-mastercard-commit-125-million-to-covid-19-drugs-2020-3?r=US&IR=T>.
 - [94] Coronavirus pushes robots to front lines of China's hospitals, The Japan Times [Internet]. [cited 2020 Mar 20]. Available from: <https://www.japantimes.co.jp/news/2020/02/07/business/tech/coronavirus-robots-china-hospitals/#.XnRD-ZP7RmB>.
 - [95] Coronavirus: ventilator rush faces regulatory and logistical obstacles, [Internet]. [cited 2020 Mar 20]. Available from: <https://www.nbcnews.com/news/world/coronavirus-ventilator-rush-faces-regulatory-logistical-obstacles-n1161651>.
 - [96] MPs in plea to government over UK's Covid-19 stockpiling, World news | The Guardian [Internet]. [cited 2020 Mar 23]. Available from: <https://www.theguardian.com/world/2020/mar/21/mps-plea-government-uk-covid-19-stockpiling-coronavirus>.
 - [97] S. Jack, What Are Shops Doing about Stockpiling? [Internet] BBC News, 2020 Mar 22 [cited 2020 Mar 23]; Available from: <https://www.bbc.com/news/business-51737030>.
 - [98] S. Jack, Online Shopping Website Ocado Suspends Service, [Internet] BBC News, 2020 Mar 18 [cited 2020 Mar 23]; Available from: <https://www.bbc.com/news/business-51941987>.
 - [99] [Internet], Stockpiling 'will Hit Vulnerable', Food Bank Warns, BBC News, 2020 Mar 13 [cited 2020 Mar 23]; Available from: <https://www.bbc.com/news/uk-england-beds-bucks-herts-51856592>.
 - [100] [Internet], Food Bank Shortage Blamed on Coronavirus Panic, BBC News, 2020 Mar 13 [cited 2020 Mar 23]; Available from: <https://www.bbc.com/news/uk-england-london-51837892>.
 - [101] Food parcels coming for vulnerable individuals, [Internet]. BBC News, [cited 2020 Mar 23]. Available from: <https://www.bbc.com/news/uk-politics-51995298/coronavirus-minister-urges-food-shoppers-to-be-considerate>.

- [102] First food parcels delivered to clinically vulnerable people - GOV.UK, [Internet]. [cited 2020 Apr 7]. Available from: <https://www.gov.uk/government/news/first-food-parcels-delivered-to-clinically-vulnerable-people>.
- [103] Coronavirus (COVID-19): free school meals guidance for schools, [Internet]. GOV.UK, [cited 2020 Apr 6]. Available from: <https://www.gov.uk/government/publications/covid-19-free-school-meals-guidance/covid-19-free-school-meals-guidance-for-schools>.
- [104] [Internet], Commissioner O of the. Coronavirus Disease 2019 (COVID-19) Frequently Asked Questions, FDA, 2020 Mar 22 [cited 2020 Mar 23]; Available from: <http://www.fda.gov/emergency-preparedness-and-response/mcm-issues/coronavirus-disease-2019-covid-19-frequently-asked-questions>.
- [105] S. Jack, Supermarkets Urge Shoppers to Stop Stockpiling, [Internet] BBC News, 2020 Mar 15 [cited 2020 Mar 23]; Available from: <https://www.bbc.com/news/business-51883440>.
- [106] 5 things supermarkets want you to know during the COVID-19 pandemic, World Economic Forum [Internet]. [cited 2020 Mar 23]. Available from: <https://www.weforum.org/agenda/2020/03/supermarkets-grocery-coronavirus-covid19-supply/>.
- [107] Coronavirus: what are independent supermarkets doing to help? BBC News [Internet], [cited 2020 Mar 23]. Available from: <https://www.bbc.co.uk/news/uk-england-51947391>.
- [108] SJ Simon Jack, Fast Food Chain Turns its Restaurants into Shops, [Internet] BBC News, 2020 Mar 22 [cited 2020 Mar 23]; Available from: <https://www.bbc.com/news/business-51996773>.
- [109] Coronavirus: domestic abuse calls up 25% since lockdown, charity says, BBC News [Internet]. [cited 2020 Apr 7]. Available from: <https://www.bbc.co.uk/news/uk-52157620>.
- [110] 25% increase in calls to national domestic abuse helpline since lockdown measures began - refuge charity - domestic violence help, [Internet]. [cited 2020 Apr 7]. Available from: <https://www.refuge.org.uk/25-increase-in-calls-to-national-domestic-abuse-helpline-since-lockdown-measures-began/>.
- [111] Domestic abuse: how to get help - GOV.UK, [Internet]. [cited 2020 Apr 7]. Available from: <https://www.gov.uk/guidance/domestic-abuse-how-to-get-help>.
- [112] The world is turning to video games amid coronavirus outbreak, [Internet]. [cited 2020 Apr 7]. Available from: https://finance.yahoo.com/news/coronavirus-world-turning-to-video-games-150704969.html?guccounter=1&guce_referrer=aHR0cHM6Ly9lb3VudDp2ZWZWRpYSS5vcmcv&guce_referrer_sig=AQAAAKXHUFQ3HfK9PeV4LcIWVvEeAu0CkT9qygqOvb0SSB1Iwvamt3OWV3_4SxvDucVgsomxVEDfPFfSzPUTN4pruawSnzGE4YXW8NpkEHpxnJgXnmV2uoXsUxK2K2BAISd9qw7_2jCW82mOrdTq5edbc7Nxd-uPPdaAmm4ahcWbb.
- [113] E. Kent, Coronavirus Outbreak Forces Cancellation of Multiple Esports Events, [Internet] Eurogamer, 2020 [cited 2020 Apr 8]. Available from: <https://www.eurogamer.net/articles/2020-01-30-coronavirus-outbreak-forces-cancellation-of-multiple-esports-events>.