COVID-19

THE CORONA PANDEMIC 2020

NATIONAL AND INTERNATIONAL SITUATION
WHAT WE HAVE LEARNED AND FUTURE PREDICTIONS

BYG 655 IDEAS AND TECHNOLOGIES
FOR SUSTAINABLE CITIES

City- and regional planning
Faculty of Science and Technology
Institute of Safety, Economics and Planning (ISØP)
University of Stavanger (UiS). Norway | www.uis.no

University of
Stavanger

INTRODUCTION

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THE COURSE

This year's 10 study points open Master course "Ideas and technologies for sustainable cities" (BYG 655, UiS) consists of five full day workshops, each covering different themes: Forecasting, Ethics, Climate change, Renewable energy and Notopia. Each time we run this course we try to pick an overarching theme, an umbrella, a case through which the five themes above are dealt with. This year's case has been COVID-19.

The students have been given a written assignment that they have worked with throughout the semester and the research questions asked are:

WHAT DID WE LEARN THAT MAY BE CONTINUED?

HOW CAN WE HENCE IMPROVE THE **HUMAN CONDITION**

AND IMPROVE THE **ENVIRONMENTAL SITUATION**

Comparing attendance since the start of the course in 2017 (9 students) with today's attendance (42+ students), we found it necessary to split students into 9 groups addressing different themes. This was necessary also as a measure to ensure some contact between students during the pandemic to reduce loneliness.

The situation created challenges for us all. Teaching was undertaken digitally because of lack of room capacity in satisfying the new distancing rules at the university. Under the circumstances, the students deserve praise for having managed to persevere and deliver good results. It has been pleasant for us teachers too to see all the friendly faces on the screen.

THE THEMES COVERED

The study done through this course covered 9 themes all shown in full length in this compilation which we will publish. We also intend to organize a Webimar covering the

findings. The 9 group themes were:

HEALTH, HOME, WORK, TRAVEL, SOCIAL, CRIME & SAFETY,

BEHAVIOUR CHANGE, HOUSING, ECONOMICAL CONSIDERATIONS.

THE FINDINGS

As we write this mid-December 2020, the total accumulated global dead from this pandemic is close to 1.6 million human lives. Today it was reported by WHO that 10.000 people have died from the virus during the last 24 hours. The pandemic is still out of control in both Europe and USA and cases are increasing.

The situation is as precarious as it was during the 'first wave' in March/April 2020. In Norway, the situation is comparatively stable, but the total accumulated deaths are 387. Here, nine of ten (91%) that died had a chronic illness, according to the Folkehelseinstituttet (FHI) 22.09.2020[1]. Most of the dead had heart disease (56%), other suffered other organ diseases including lung related illnesses (35%). Dementia (28%), diabetes/obesity (12%) and cancer (11%). Practically all the dead (86%) were over 70 years of age and 96% of the deaths occurred in health institutions.

[1] https://www.fhi.no/nyheter/2020/ni-av-ti-som-dode-med-covid-19-hadde-kronisk-sykdom/

Every day, on average, 150.000 die globally from all kinds of causes[2]. The question is what have we learned from this? And what new habits will come of this? Washing our hands more? Not going to work when we feel ill? Not sneezing without a handkerchief in hand? The annual death toll from lower respiratory communicable infections is 7.000 and another 11.000 from respiratory diseases.

In Norway 900 individuals die from fly during a normal winter. During the particularly bad winter of 2016/2017 more than 1.600 died[3]. This autumn/winter 2020, so far, we have not seen much of the flue basically because people are following the recommended hygiene regulations. Setting this against the 387 Covid-19 deaths in Norway (so far) puts things in perspective.

The document in your possession compiles an overview of current global research - what we know after having experienced COVID-19 during 2020. It is a status report and a discussion about the impact it has had on our behavior and customs. Most of all it is an attempt at trying to see if any of the experiences can help us shape a better future for each other and mankind at large. Below is a list of issues that have been raised:

- Can the health measures introduced also reduce the number of other illnesses in the future, like severe colds, flu, hearth and respiratory problems and deaths caused by them?

- Do people drink more during a pandemic, are suicide rates rising and is loneliness?

[2] https://forskning.no/sykdommer-virus/dette-dor-folk-av-i-verden/1686490

[3] https://www.fhi.no/contentassets/ba9c22c5ff664a94a2b458fd2b5c348b/pressefrokost_presentasjon_10102018.pdf%C2%A0

- Can shifting the start and end of working days a little for a few and only a few days a week, combined with some working from home at times, have a bigger impact on mobility related challenges like congestion and air pollution than toll-road imposed restrictions?

- How will rural versus urban change as regards attractiveness and how will the impact be on prices of property as spacious areas become more health friendly?

- Is there a great rebalancing taking place: working from home fuels rise of the "secondary city", outside or in the outskirts of bigger cities?

- Will the value of a balcony or a rooftop space to escape to increase?

- Will the value of flexible homes making it possible to split spaces up to be able to at times accommodate a home office? Can anybody work from home?

- Can Covid-19 aerosol viruses move through ventilation systems in buildings? If so – what will the impact be in air-tight energy efficient buildings with heat recovery?

- In September 2020 the number of people biking to work were 41% higher than the year before. Can this trend be continued after the pandemic?

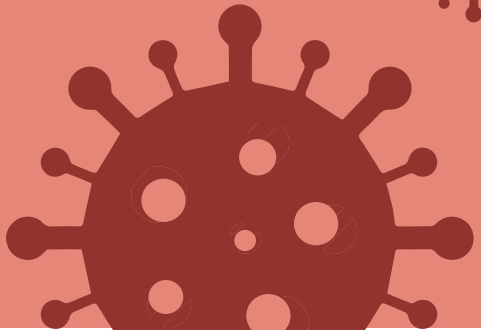
- How can we stop the CO2 emissions plunge from bouncing back after the pandemic?

- Why is it that new research shows emission reductions from traffic during the pandemic where compensated by people firing their not always so clean burning log fires when at home in the home office causing PM 2.5 levels to rise?

BYG655 – Autumn 2020

01.
HEALTH RISK

Askale Wendimu Jibola
Obafemi Owolabi



University of Stavanger

1.1 Introduction

Officially tagged COVID-19 by the World Health Organization and declared a global pandemic on the 11th of March 2020 as a result of the difficulty to mitigate, the high rate of transmission posed and due to its novelty. The pandemic was discovered to be caused by the SARS-CoV-2 virus categorised as an epidemic which was first reported to the World Health Organization (WHO) China office on the 31st of December 2019 after its detection in the 19 million populated Wuhan city, Hubei province of China, which according to authorities who recorded most of the early infected patients as vendors and buyers from the Huanan seafood market (WHO Regional Office for Europe, 2020). Recent studies show the virus can be transmitted through air droplets and contaminated surfaces (Kangqi, et al., 2020). This explains the ease and fast viral transmission of this virus as 2.6 million people were infected in the first 5 months compared to the earlier SARS-CoV-1 reported to have infected about 8100 people in 8 months (Global preparedness Monitoring board, 2019).

The World Health Organization whose responsibility for international public health within the United Nations has been able to backtrack similar 1,483 epidemic-prone disease which includes Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome (MERS), Ebola, Influenza, Yellow Fever and others in 172 countries within 2011 and 2018. The organization has been at the forefront, collaborating with scientists and other health organizations in a bid to facilitate the development of an effective vaccine capable of subduing the highly infectious and rapidly spreading virus that attacks the lower respiratory tract.

The popularly acclaimed vulnerable group are the older people, people with underlying health challenges and people with poor immune systems. However, it is pertinent to mention the selfless dedication of the health workers who as a result of their service and also limited population and resources, should be classified as vulnerable. Although with the increased pace of research and investigation going into developing a vaccine for effective fight against this pandemic, over a hundred vaccines around the world has been announced to be at human trial phase in order to verify the effectiveness and safety.

Alongside the preventive measures strategized to curb the spread in the COVID-19 outbreak, the motivation behind this research work is to investigate how the impact and measure against COVID-19 has affected global health positively and negatively. The questions of the renewable learning experience that can be taken from this as well as ways to improve both the human and environmental conditions will be examined.

This will be achieved by outlining the effect of health risks posed to various individuals, vulnerable and invulnerable groups and people with underlying diseases as a result of the preventive measures put in place to address the outbreak escalation and an attempt to breach the gap in useful knowledge, thereby, helping in the effective mitigation and control of the imminent second wave outbreak.

1.1.1 Past Epidemics/Pandemics and their effects on the current Pandemic

The Black Death is an epidemic that plagued Europe in the 1340s, killing more than 20 million people over the course of 5 years. The epidemic is believed to have originated from Asia, spreading through China, India, Persia, Syria and Egypt. As described in the words of Italian poet Giovanni Boccaccio, the transmission of the Black Death which manifested itself as swelling either in the groin or armpit was terrifyingly and indiscriminately contagious. Recent study of the plague established that bacillus named *yersina pestis* is responsible for the Black Death epidemic. Between the years 1918-1919, the Spanish influenza infected about 500 million people, mortality rate was recorded to be between 50 to 100 million.

The most recent experience of epidemic diseases accounted for before the present devastating pandemic, occurred in 2002 when the severe acute respiratory syndrome (SARS-CoV-1) pandemic first hit China resulting in 800 deaths and infected approximately 8000 patients, after which the 2012 Middle East respiratory syndrome (MERS) evolved also leading to about 800 deaths with reported cases of about 2,500 infected patients. In 2014, Ebola broke out and infected about 28,616 people and killed about 11,310 infected patients. Although not enough data was captured in order to forestall and probably neutralize the spread of a similar respiratory disease with great potential of becoming a global pandemic, valuable lessons from the SARS-CoV-1 has however been of great effect in early mitigation of the SARS-CoV-2 virus. Also, most of the preventive measures utilized during the early pandemic events are now being transferred in the fight for mitigating this current ravaging virus.

1.1.2 International Situation Summary

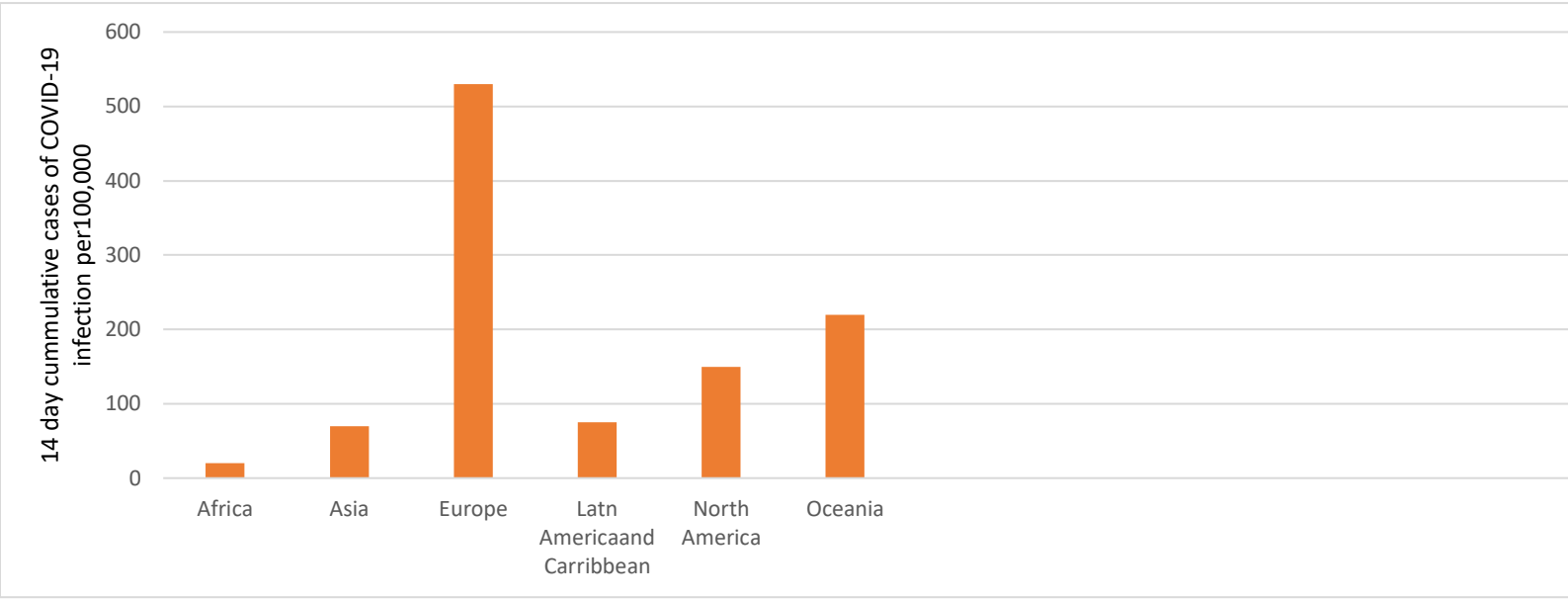


Figure 1.1: Number of cumulative infections in 14 days for 100,000 inhabitants by continent. (European Centre for Disease Prevention and Control, 2020).

The European Centre for Disease Prevention and Control took a survey detailing the infected inhabitants by continent with Europe emerging as the continent that is most infected.
According to the World Health Organization (WHO) in April 2020, most countries focused on increasing the rate of identification, testing and treatment of severely infected patients with 1.7 million people infected globally and over 85,000 COVID-19 related deaths, while the clinical case fatality estimation was over 3%, increasing with age and escalating to approximately 15% or higher in patients above 80 years of age (World Health Organization, 2020).
As at November 2020, 46 million people have been infected, with 1.2 million recorded COVID-19 related deaths globally. The World Health Organisation (WHO) on 3rd of November, 2020 reported new cases of over 3.3 million globally with Europe and America accounting for 46% while the United States of America, India and France has consistently reported the highest number of new cases between October and November 2020 (World Health Organization, 2020).

1.1.3 Lockdown measures and their effects

Exceptional and unusual control measures taken in China and other affected countries includes travel restrictions, initially extended to regions that are greatly affected and then further advanced to total lockdown by different countries. The internal control and preventive measures employed to mitigate viral transmission, although not fully adhered to, are measures learnt over

decades in the fight against past pandemics. These measures which include regular washing of the hands, use of hand sanitizers, regulated mobility, use of face masks and social distancing have according to surveys not been fully adhered to as a result of inaccurate information and knowledge of the virus.

However, in conjunction with fixing the information gap by utilizing the media as a tool for effective dissemination, authorities are also enforcing these control and preventive measures by stationing officials at locations and transportation mediums for effective adherence. To further extend the effect of these measures on human health, regulation on mobility has been linked to cause change in diet and ultimately obesity which happens to make the contraction of the virus more severe. Also, the use of hand sanitizers and regular use of soaps or solvent to wash the hands has been reported by some individuals to cause swelling of the outermost layer of the skin and skin infections among other health threatening diseases (Cristina, Mara, Liliana, Luiza, & Marius, 2020).

This however, has not stopped the dissemination of inaccurate information about the virus which has led to an unnecessary global panic. This is evident in the panic buying experienced globally at the onset of the pandemic where customers engaged in surplus buying as the human survival instinct kicked in. In addition to this, grocery stores, food retailers and companies were caught off guard, thereby leading to early and unexpected depletion of supplies and food.

The lockdown doesn't apply to health workers and they're experiencing so many challenges as a result of caring for individuals and risking their well-being, their challenges are not accurately documented and projected. It is quite unfortunate that the health workers' mortality rate due to infection, suicide and cardiac arrest is being grossly underplayed. The situation such as seen in Italy's health sector which has a record of the highest mortality rate of health workers was researched on, the intensity of COVID-19 infection, the recruitment of old and retired doctors due to shortage of staffs and inadequate personal protective equipment (PPE) was attributed to be the cause of this increased mortality rate.

This situation however, doesn't make a lot of governments around the world tighten health measures and it can be seen through the prediction and occurrence of a second wave taking ground. Countries like France, Germany and Norway have retreated to the lockdown control measure in order to mitigate the rate of transmission. Although global projection forecasts an increase in total mortality rate and decrease in compliance with the social distancing measure,

however, the use of facemasks, access to more health resources like ICU beds and ventilators are projected to be on the rise.

1.2 Theory

1.2.1 Background Study

Most times, due to occurrence of big events over time, we humans tend to be forecasters of the future based on previous events (Philip & Dan, 2015). Therefore, if the predictions of history and science are to be utilized as pointers, pandemics will continue to occur, thereby rendering it to be highly predictable. However, as a result of its infrequent recurrence, the exact prediction of future occurrence can be inaccurate. Take for instance, the pandemic outbreaks in 1918–1919, 1957, 1968 and 2009 as benchmarks for imminent predictions is considered not enough to attain accuracy in forecasting (World Health Organization., 2011).
COVID-19 is the latest threat that has recently brought the global economy in all its defence and technological fortification to its knees.

The SARS-CoV-2 virus according to analysis, belongs to the β-corona virus cluster and it is the third coronavirus subsequent to SARS and MERS (Chen, Liu, & Guo, 2020). With symptoms reported among infected individuals to be respiratory related diseases, it is however pertinent to mention that these are mutual symptoms with Severe Acute Respiratory Syndrome (SARS-CoV-1) first detected in the last days of February 2003 which also originated from China and advanced into four other countries (Global preparedness Monitoring board, 2019).

Although the health authorities in the affected countries and World Health Organization (WHO) were able to curb the upsurge in outbreak with mostly similar strategies and approaches which are also being applied to the presently lethal and health ravaging SARS-CoV-2 on the basis of their effect and also the means by which they are transmitted. Despite similar conclusions drawn in respect to the means of transmission, respiratory disease consequences on health and safety measures taken in response to the emergence of earlier diseases like influenza, SARS and MERS, emphasized that COVID-19 is a novel virus that possesses its own unique attributes (Chen, Liu, & Guo, 2020).

This report was also supported by a research analysis of the virus obtaining 272 coronavirus genetic sequences from different locations proving that the virus is indeed a novel virus in

comparison to the SARS-CoV-2 (Wei, Wei, Xiaofang, & Junjie, 2020). For instance, upsurge in the number of COVID-19 severe cases and mortality rate compared with earlier diseases of similar symptoms has been recorded to be higher, save for the influenza which spread faster than COVID-19 with reasons still unascertained (Chen, Liu, & Guo, 2020).

Reports from the World Health Organization however did not confirm precisely if there are truly any animal carriers of this novel coronavirus, according to a detailed sequence analysis carried out by (Wei J. et al), the conclusion drawn from the analysis suggests that the virus may be a composition of bat coronavirus and an unidentified coronavirus (Wei, Wei, Xiaofang, & Junjie, 2020).

1.2.2 Health Risks for Different Vulnerable Groups

1.2.2.1 Potential health risks for healthcare workers

COVID-19 has a potential high risk for front-line health care workers considering it is a relatively new virus and due to this when performing emergency care, they may not identify the proper self-protection method. During the COVID-19 pandemic outbreak, there was severe acute respiratory syndrome. Therefore, it was important for front-line health care workers to have a good understanding of the virus's spreading system and adequate protection method.

	Front/line health care workers (n = 99 795)	General community (n = 2 035 395)
Country		
UK	85.4%	93.9%
USA	14.6%	6.1%
Age, years	42(33-53)	44(33-56)
<25	4 - 5%	4 – 7%
25 – 34	24.7%	19.2%
35 – 44	25.1%	21.5%
45 -54	23.6%	19.5%
55 – 64	17.5%	16.2%

≥65	3.9%	13.1%
Missing data for age	1.1%	5.7%
Sex		
Male	17.0%	37.0%
Female	83.0%	63.0%
Race or ethnic origin		
Non-Hispanic white	88.2%	92.5%
Hispanic or Latin	1.1%	0.5%
Black	1.2%	0.6%
Asian	4.4%	2.2%
More than one or other	2.4%	2.9%
Missing data for race or ethnic origin or prefer not to say	2.7%	1.3%

Table 1.1: Baseline characteristics of front-line health care workers compared with the general community (Long H Nguyen, 2020)

In a survey carried out in the US and UK to compare frontline health care workers with the general community in relation to the possibility of possessing at least one COVID-19 symptoms. In the UK, 85.4% of the frontline healthcare workers disclosed at least one symptom in relation to COVID-19 while 93.9% of the general community reported at least a symptom of COVID-19 (Long H Nguyen, 2020). These groups were further divided based on their age, sex and race or ethnicity in Table 1 above. In the same context, the United States survey also observed 14.6% frontline healthcare workers reported at least one symptom of COVID-19 while 6.1% of the general community disclosed at least a symptom related to COVID-19 (Long H Nguyen, 2020).

From the research carried out in early March of 2020 (The Lancet, 2020), 33,000 health workers were already infected in China while 20 percent of the total health workers in Italy were either

infected or dead as a result of contracting the virus while on duty. Also, the tragic dilemma of choosing to use the limited resources available to non-critical patients over watching several patients die could result in psychological and physical exhaustion of the health workers. For instance, a physician in France reportedly committed suicide after a diagnosis of being infected (StraitsTimes, 2020). How does this then pose a threat to people's health at large? Well, similar events to this have been trending from different parts of the world as the first responders are paying the ultimate price of death in the line of duty. In extreme cases, the risks health care workers are exposed to can also be traced to limited protective and health care resources available to effectively cater for affected patients, thereby resulting in resources being managed in the process of which they get infected by the virus and ultimately spread the disease to their family members. In the same manner, several physicians were also reported to have died from exhaustion and cardiac arrest mainly as a result of shock and stress.

Figure 2 below shows the frequency and average age of health worker's mortality over several countries across the globe. Although the virus outbreak originated from China, it is interesting to see Italy mortality rate of Health workers leading the other countries. This can however be attributed to various reasons ranging from the intensity of COVID-19 outbreak in Italy, recruitment of retired doctors as a result of insufficient workforce and shortage of personal protective equipment (PPE).

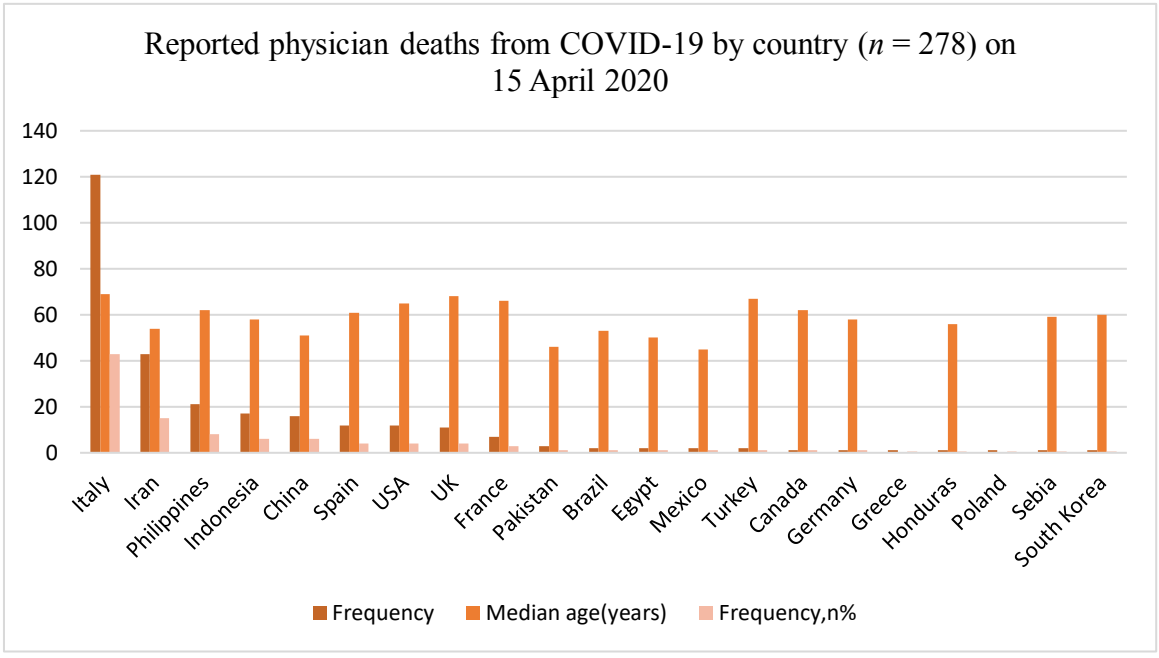


Figure 1.2: Physician death from COVID-19 by country (The Author(s), 2020)

1.2.2.2 Other vulnerable groups

An important question to adequately classify individuals and groups in order of vulnerability to infection is to be aware whether they fit into the vulnerable or non-vulnerable group based on different parameters. Although at the onset of the pandemic outbreak, various hypotheses were presented, starting with the media dispensing information that it may be possible for all kinds of people to contract the COVID-19 virus. Afterwards, it was also established that people who have poor immune systems, underlying medical conditions and older people aged 85 and above are at a higher risk and more likely to contract the disease.

Other vulnerable groups considered in this research are individuals with underlying illnesses and diseases. Several illnesses and diseases already plaguing the human health prior to the outbreak of SARS-CoV-2 virus has been established to escalate the possibility of contracting this virus and thereby rendering the effect more gruesome.

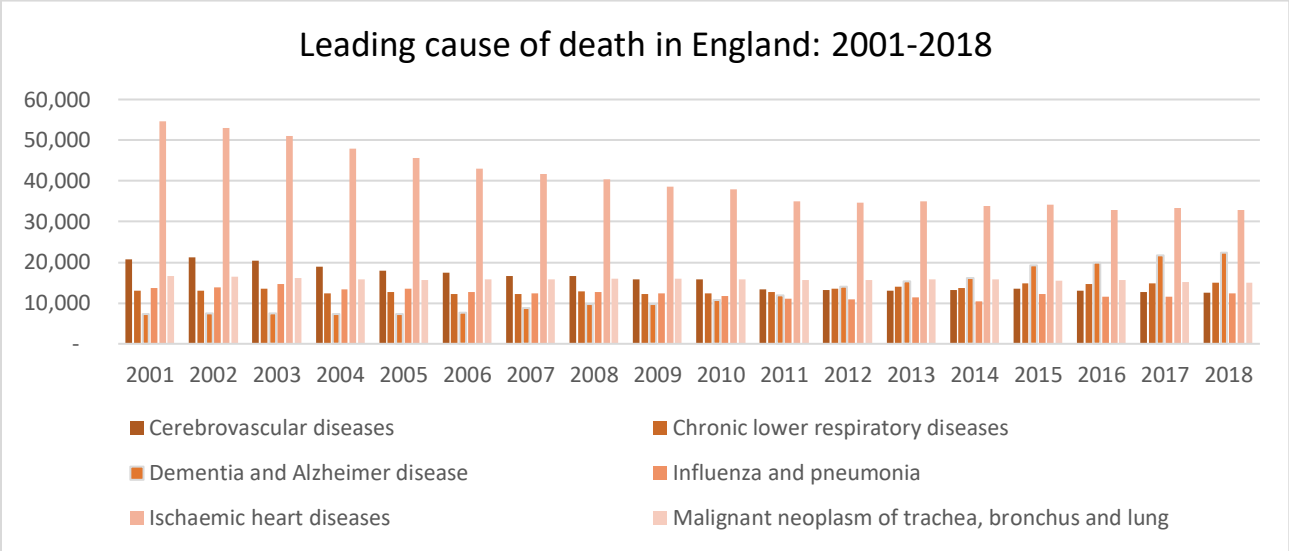


Figure 1.3: Leading cause of death history in England between 2001 and 2018

Examining the relationship between pre-existing health issues and mortality rate, taking England in the United Kingdom as a case study, it was observed that certain pre-existing health issues greatly contribute to mortality rate of COVID-19 infected victims. Figure 3 displays data of the intensity of the existing life-threatening diseases between 2001-2018 in order to reiterate their effect on human health and ultimately their contribution to the mortality rate in England. With heart diseases contributing to a higher percentage in mortality rate, although decreasing over the years with dementia and Alzheimer disease on the rise, and trachea, bronchus and lung

related diseases being stable over the years. This gave proof to the claim that people who already had health challenges are more susceptible to the virus

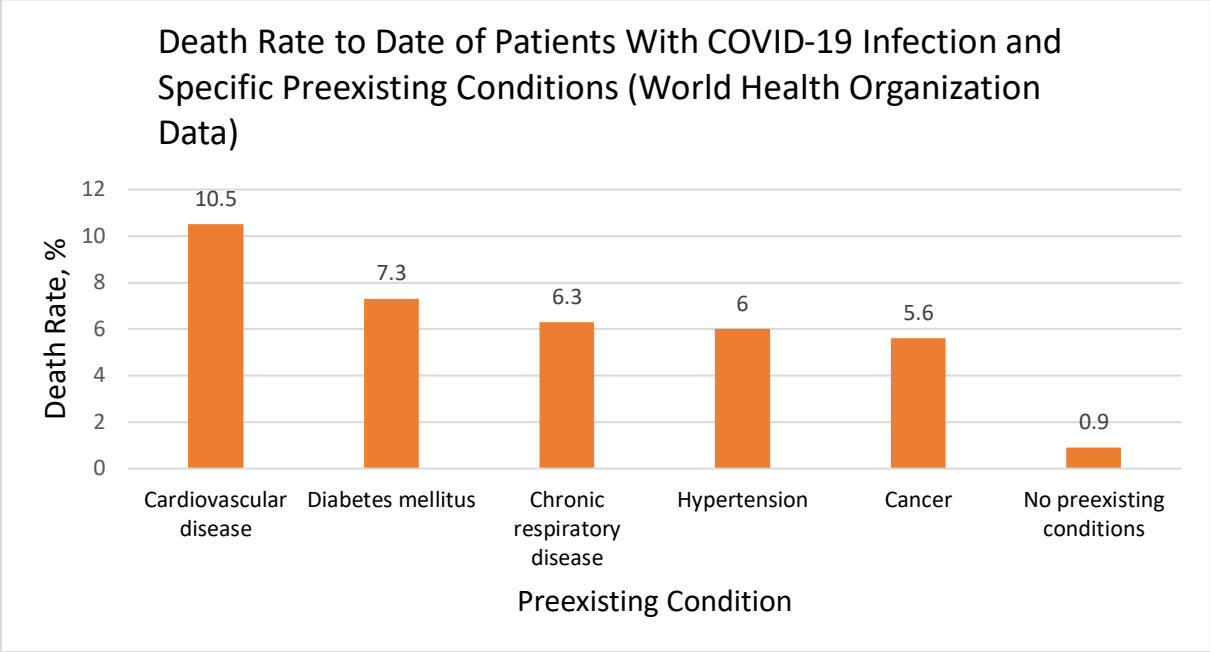


Figure 1.4: Death Rate to Date of Patients with COVID-19 Infection and Specific Preexisting Conditions (World Health Organization Data)

Data on specific health-intensive underlying diseases in COVID-19 related deaths globally as provided by WHO was collected and the chances of survival in infected patients with underlying Cardiovascular disease seems to be quite high as a result of the high mortality rate recorded in patients with this disease. Diabetes, chronic respiratory disease, hypertension and cancer are also recorded to aid mortality rate in COVID-19 patients.

1.2.3 Climate change and health Issues

The variation in climate has had an impact on human health as well as on our ecological systems and it has been reported that one of the positive effects of COVID-19 is a drastic drop in greenhouse gas emissions and air pollution (Piers, et al., 2020). Moreover, greenhouse emission has been the cause of global warming and also the cause of climate change which results in temperature rise, air pollution, various natural disasters and various diseases related to this. As a result of control measures like quarantines and lockdowns, many industrial countries have been forced to shut down their border, which according to the world economic forum, these control measures have helped to reduce emissions by 17% by April 2020. (Thomson Reuters Foundation trust.org, 2020). Also, the reduction in human mobility and emission of harmful

gases into the atmosphere resulted in the reduction of air pollution as observed from the satellites. This however if maintained, coupled with the green transitioning ongoing as seen in the Sustainable Development Goals, there is a high chance of avoiding the forecasted trajectory of global warming. Thereby, possibly leading to reduction in health related issues associated with climate change.

The World Health Organization's estimation shows that in the last three decades, more than 150,000 deaths with 5 million DALYs (a DALY describes the loss of the equivalent of one year of full health) as a result of the diseases related to climate change (Husain, 2008). According to the Guardian, CO_2 emission on the atmosphere has to be below 400 ppm (parts per million) in order to be at a safe mark, however, this mark has already been surpassed in September 2016 (Khan, B, 2016). Cardiovascular diseases have been associated largely with air pollution as one of the main causes and has been one of the highest causes of human death in the world. This disease is also second to the highest cause of human death in Norway (Folkehelseinstuttet, 2019). While reiterating the risk factor in terms of health associated with air pollution and why it should not be ignored, the World Health Organization reported cardiovascular diseases as a major cause of death among women.

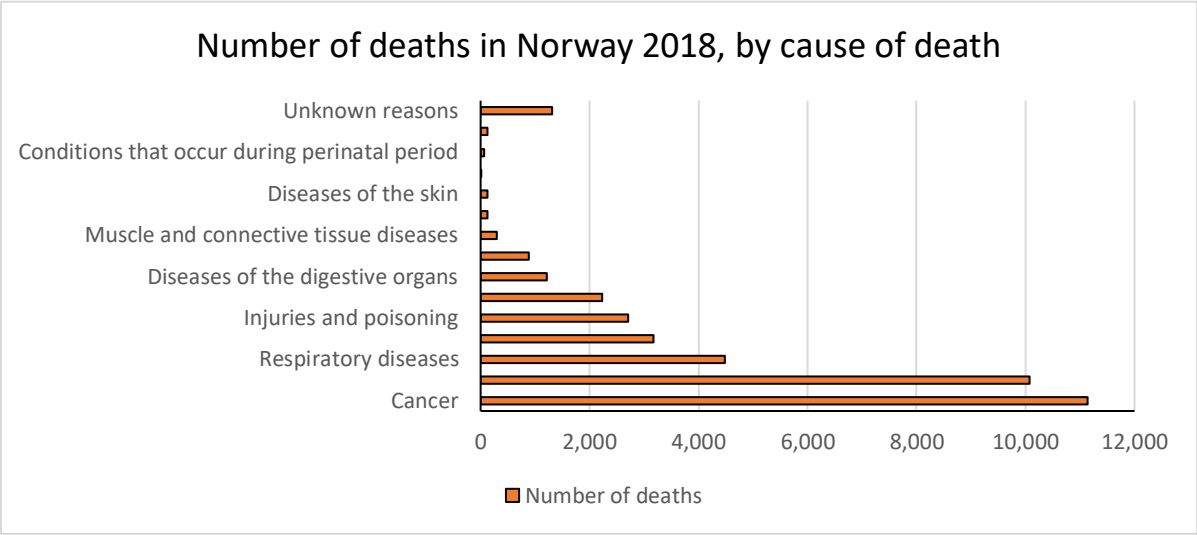


Figure 1.5: Number of deaths in Norway 2018, by cause of death (Folkehelseinstuttet, 2019)

To bring the situation into focus, cardiovascular diseases and cancer are the main cause of death in Norway as shown in Figure 5 however, as a result of cardiovascular diseases, more than one million Norwegians are surviving on therapeutic drugs. In addition, Norwegian institutions of

public health reported that 21 percent of Norwegians live with a high risk of developing this disease (Folkehelseinstuttet, 2019).

1.2.4 Effect of COVID-19 among individuals and recovered patients

Mental Health

It was reported that between one out of every six and one out of every four people experience a mental disorder in a year. However, a recent survey taken during the pandemic compared data taken over the years concerning mental health in the United Kingdom, it shows a great increase in the mental health related issues from 12,321 in 2018-2019 to 17,452 in April, 2020 (Matthias, Holly Hope, Evangelos, Roger, & Simon, 2020) at just a month into the introduction of lockdown in the UK.

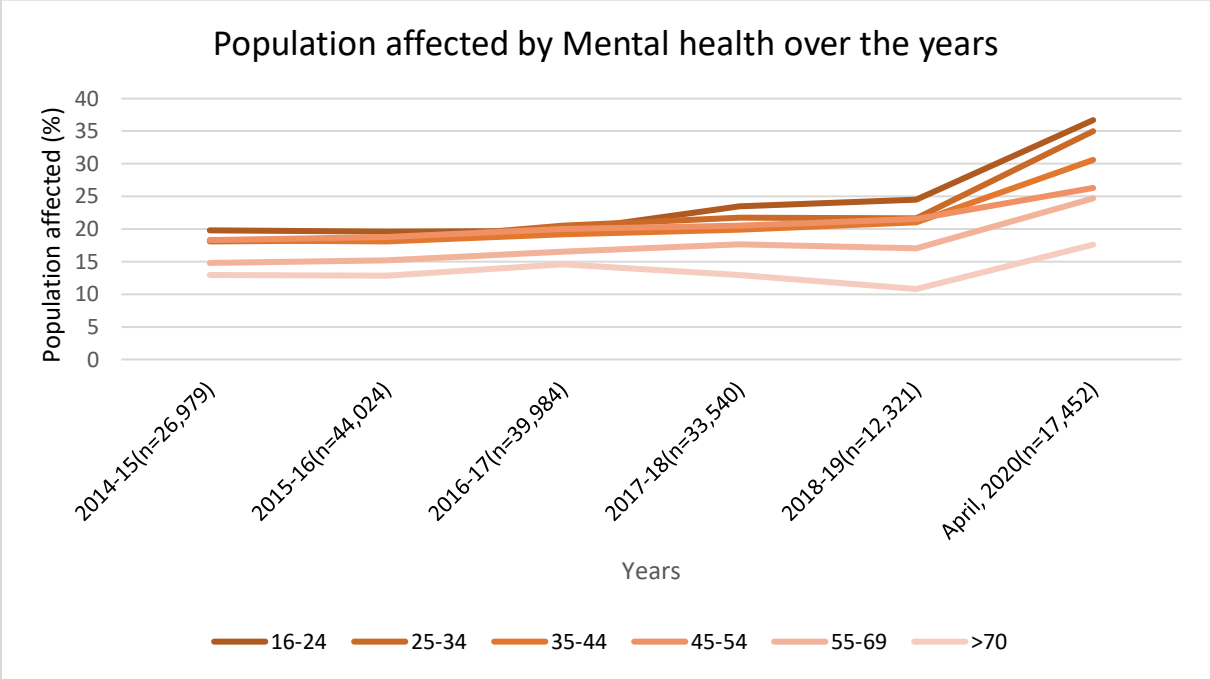


Figure 1.6: Population affected by mental health disorder in the UK (Matthias, Holly Hope, Evangelos, Roger, & Simon, 2020)

As seen in Figure 6, the population within the age range of 16-24 years shows an increase above all other age ranges. This can be as a result of various reasons such as the sudden limitation in mobility and daily activities that has been mitigated.

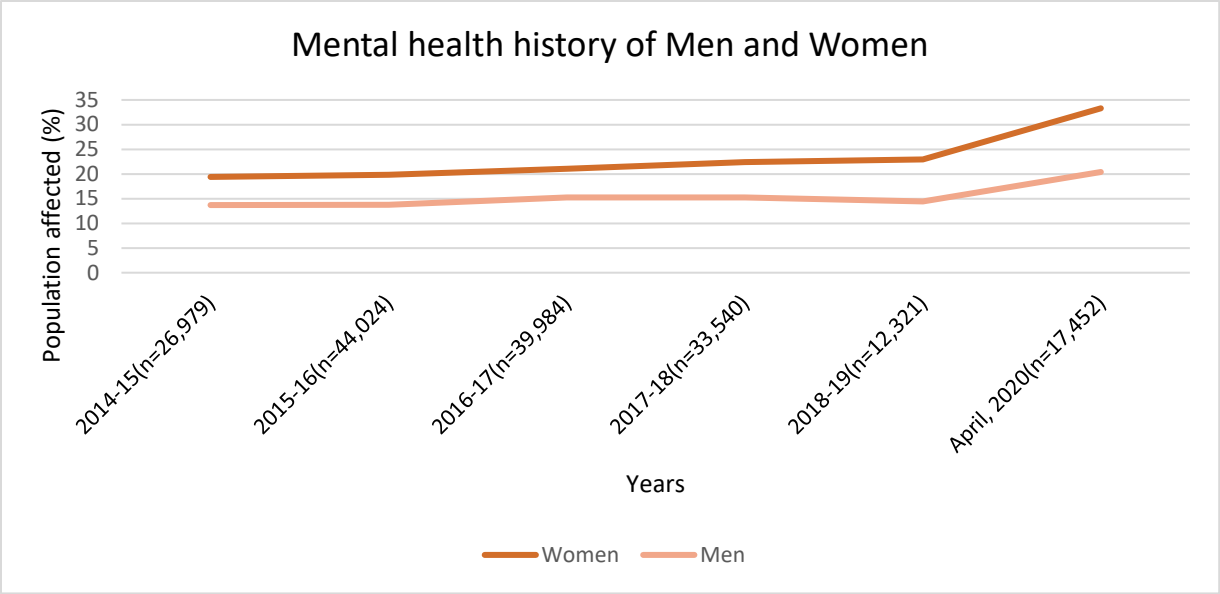


Figure 1.7: Population of Men and Women affected by mental health disorder in the UK (Matthias, Holly Hope, Evangelos, Roger, & Simon, 2020)

In Figure 7, mental health disorder can be seen to be more prevalent in women than men over the years, the spike experienced between the first four months in 2020 shows a greater rate of increase in women which can also be attributed to various reasons. This shows that the virus is not just a threat to older people's mental health but also has a negative effect on young adults.

Loneliness

After the preventive measure of social distancing and travel restrictions, some groups of people were more prone to loneliness as a consequence of lockdown control measures.

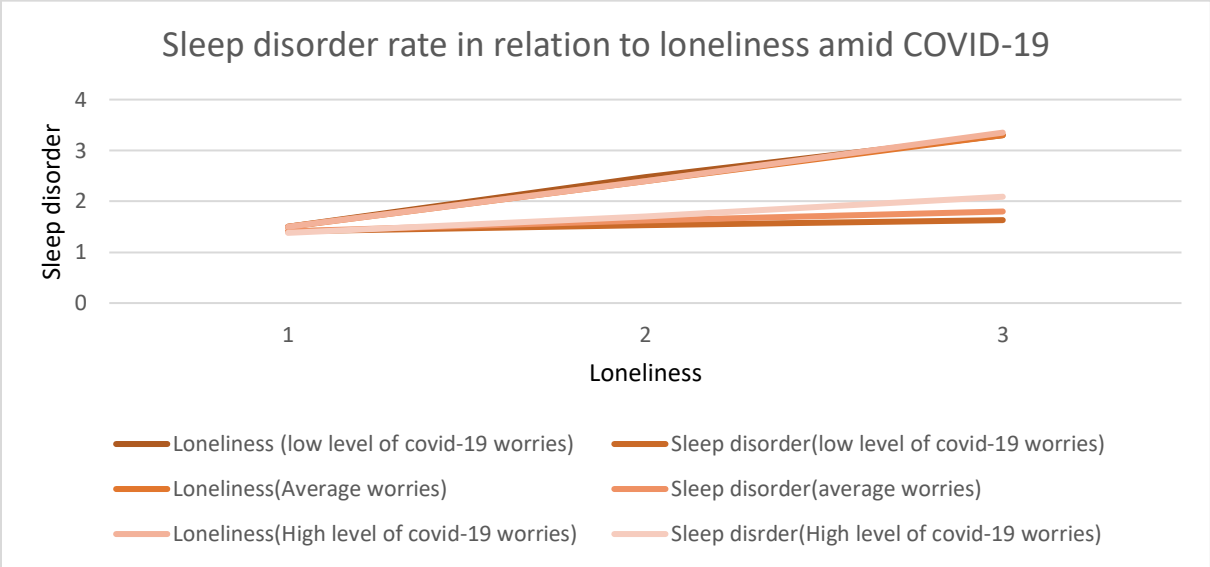


Figure 1.8: Sleep disorder rate in relation to loneliness amid COVID-19

In Figure 8 above, it is observed that there is a certain surge in COVID-19 related worries. Although at varying rates, the low level, average and high level of worries associated with COVID-19 was noted in the data collected from a web based survey of older adults in Israel.

Obesity

As established in a study (Barry, et al., 2020), obesity is a severe factor in relation to COVID-19 and can lead to intensive care hospitalization. Prior to the outbreak of the SARS-CoV in 2002, being overweight was only associated with mild respiratory diseases. During and post-SARS-CoV outbreak, obesity was however linked to underlying health risks such as dyslipidaemia, hypertension, diabetes (type 2), liver disease and chronic kidney disease. An enormous body mass makes it difficult for respiratory support and also intubation.

Sudden changes in diet can be linked to various impacts of COVID-19 experienced in the food industry, impeding consumer's access to fresh food thereby increasing the demand for packaged food. With the longevity of packaged foods, this makes it a more viable option. The effect of the lockdown and social distancing could also ultimately lead to reduced mobility which limits physical activities and promotes unhealthy habits.

Poverty

As projected by the International Monetary Fund (IMF), a downturn of 5% in economic growth was predicted as a result of the varying effect of the pandemic outbreak.

20% increase in the world total population, 15% increase in the world rural population, 23% increase in Africa south of Sahara total population, 15% increase in Africa south of Sahara rural population, 15% increase in the total population of South Asia and 14% increase in the rural population of South Asia (David, Will, & Rob, 2020).

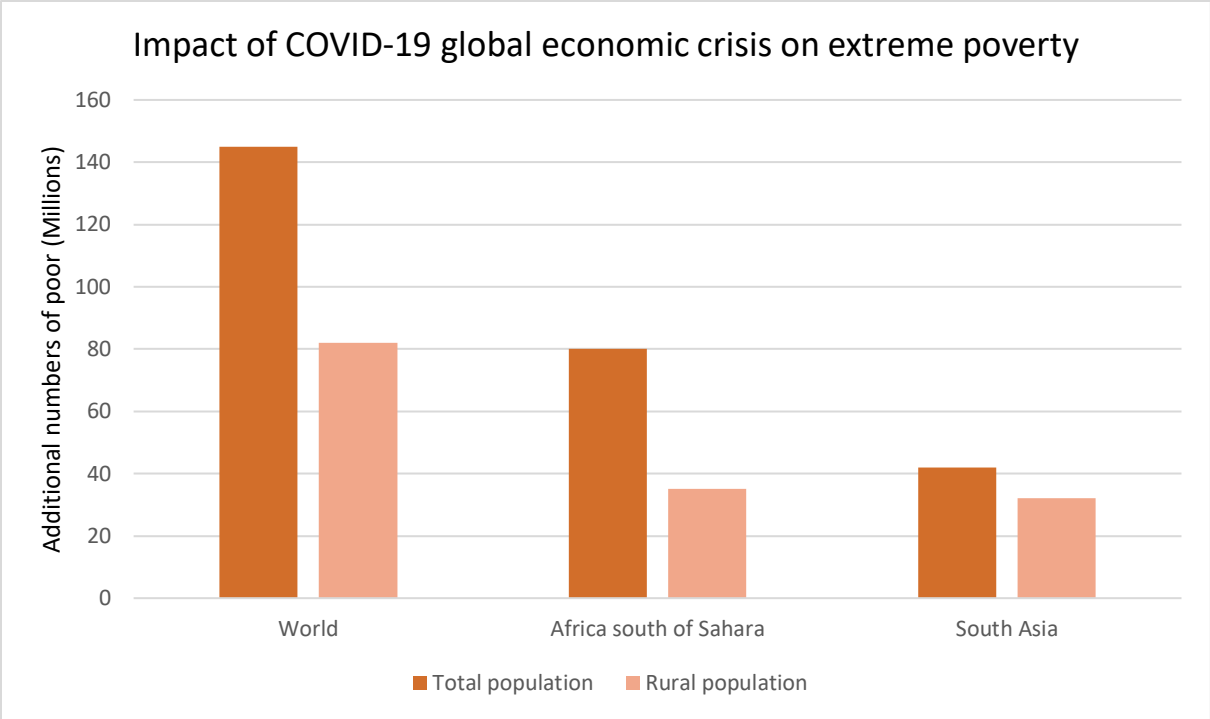


Figure 1.9: Impact of COVID-19 global economic crisis on extreme poverty (David, Will, & Rob, 2020)

The recorded increase in population that has been noted is occurring during a phase where there is already more than half of the world's population in poverty. People who already do not have the means to cater for their family members, adding to their numbers is definitely going to have an adverse effect moving forward.

Chance for increased intimacy with loved ones

The COVID-19 pandemic provides business owners and working-class individuals who are on lockdown in their homes the opportunity to spend more time with their close family members thereby, leading to immense support in terms of mental health and increased intimacy between family members. This can be largely attributed to the work from home strategy employed by various workplaces to mitigate the virus transmission and comply with the directives of the authorities to ensure safety of their staff.

To support this claim, a survey involving 263 participants carried out by (Zhang, Y., & Ma, Z. F., 2020) recorded an increase of 68.2% in females getting support from family members compared to a 24.8% participants experiencing no change and a decrease of 7%. Likewise, the males also had an increase of 57.5%, 29,2% unchanged and a decrease of 13.2%. Also, males getting support from friends increased by 59.7%, with 30.2% unchanged and 10.4% decrease.

While females getting support from friends increased by 68.2%, with 28% unchanged and 3.8% decrease (Zhang, Y., & Ma, Z. F., 2020).

This shows that during the lockdown people were able to connect more with their loved ones and support more as there was more free time.

Long term respiratory complication in survivals of COVID-19

This was a conclusion drawn largely based on the manifestations of acute respiratory complications after the 2003 SARS-CoV outbreak. With studies showing that about 30% of recovered patients of this outbreak had persisting symptoms of lung disorder.

Dilemma of Face Masks

The Centre for Disease Control and Prevention (CDC) recommends the wearing of masks solely as a preventive measure against droplets in the air as a result of sneezing, coughing and even talking, where keeping a meter distance is unfavourable to maintain (Centre for Disease Control and Prevention, 2020). According to a research study (Roger, Tracy, Rebecca, Chandler, & Marian, 2020), aimed at reviewing the various masks in order to recommend suitable masks based on their recommendation for the effective prevention against COVID-19, disposable N95 masks, cloth masks and surgical masks were investigated. Although N95 masks are equipped to effectively filter out airborne droplets and particles, it was reported that N95 is more effective in the prevention of SARS-CoV-1 than SARS-CoV-2 especially in the health centres compared to the public setting (Roger, Tracy, Rebecca, Chandler, & Marian, 2020). Surgical masks however were not considered effective enough due to it's loose fittings which makes it mainly proficient at filtering out only particles of larger size or droplets, while masks made of clothes are dependent on the materials used to determine its effectiveness (Roger, Tracy, Rebecca, Chandler, & Marian, 2020).

In another similar but slightly contrasting study carried out by using randomized controlled trials comparing the effectiveness in the utilization of Medical or N95 masks by health workers, Medical masks were estimated to perform equally as the N95 masks against the prevention of influenza diseases, however N95 masks were recommended for effective prevention against SARS-CoV-2 (Jessica, Mohammed, Waleed, & Mark, 2020).

With side effects found on the side of wearers of masks, a study by Kim et al on the effects of using N95 mask on the heart and the lungs during exercise or high respiratory rate demanding activities showed that although the use of facemask can be valuable against infection, it can only be endured by healthy individuals (Kim, Benson, & Roberge, 2013).

1.2.5 COVID-19 Vaccination Development

The World Health Organization in association with scientists and other health organizations globally have been stimulating the global communities in containing the pandemic outbreak. With conscious efforts on every side to put an end to the ravaging disease, more than 100 COVID-19 potential vaccines are being researched and developed with a few of these undergoing clinical trials. WHO in cooperation with France and the European Commission initiated a platform named COVAX directed by ‘‘Access to COVID-19 Tools (ACT) Accelerator’’ under the World Health Organization are charged with the responsibility of providing access to covid-19 diagnosis, treatments and vaccines once available.

Interestingly, drug maker Pfizer's announcement on the 9th of September, 2020 on its successful COVID-19 vaccine development as reported by CNN news to be more than 90% effective against SARS-CoV-2 virus. The company reports that 42% of their global trial sites and also 30% of their trial sites in the United States engage volunteers of diverse race and ethnicity, with registered participants summing up to 43,538 candidates since July 2020. The vaccine was reported to utilize a technology by the name of messenger RNA (mRNA) which is a genetic material used in manipulating cells to produce protein that resembles the virus (Cable News Network, 2020). Thereby, compelling the immune system to attack the protein replica of the virus in order for the immune system to develop an accelerated response in the case of COVID-19 infection. Although the effectiveness of this vaccine has not been established yet in an extreme COVID-19 infection neither has the long term effect against the virus been documented yet. However, the World Health Organization has projected mid 2021 for the availability of a safe and effective SARS-CoV-2 virus vaccine.

1.2.6 Forecasts of an Imminent Second Wave

Results from the article “Effect of Temperature and Humidity on the Spread of COVID-19” suggested in its review that factors relating to the climate can aid the spread and also mitigation of SARS-CoV-2. These factors such as temperature and humidity can result in variation in

temperature and ultimately aid in either slowing down the spread or further causing more harm than good. In the same context and making use of the low data available, it was observed that warmer and humid climates were considered to reduce the transmission rate of the SARS-CoV-2 virus (Paulo, Renata Travassos da Rosa Moreira, Antonio Carlos Rosário, & David, 2020).

As a fact, the medium of transmission of the virus has been established to be by air droplet (Chan, et al., 2011) and the effect high temperature, at high relative humidity has on the incapacitation of SARS CoV can be compared to lower temperatures and low humidity which supports prolonged survival of the virus on contaminated surfaces. This could be an explanation to why countries in tropical regions like Africa for example did not experience an uncontrollable outbreak as compared to other regions with lower temperature.

Furthermore, these forecasts based on experiments carried out on the survivability of the COVID-19 virus at regions with varying temperatures also established that regions with low relative humidity should brace up for an increased rate of transmission as lower temperature emerges.

According to a series of investigations (Chan, et al., 2011) exposing the SARS-CoV-1 virus at varying relative humidity of 38◦C, 33◦C and 28◦C, the infectivity rate of the virus was observed to be greatly incapacitated in Figure 10 below, with exposure to low relative humidity between 80% to 85% illustrating a relative rise in reducing the potential for viral infection from 3 hours to 24 hours. But there is a higher chance of reduction at a high relative humidity of 95% over the course of 24 hours. The same applies for the exposure of the SARS-CoV-1 virus at 33◦C and 28◦C. However, trajectory of reduction illustrated in Figure 11 shows a lower tendency of viral infection being reduced in relation to Figure 10 and Figure 12 shows a much lower tendency of viral infection being reduced when compared to Figure 11. Thereby, indicating the effect of temperature and relative humidity on the viral transmission of the SARS-CoV-1 virus.

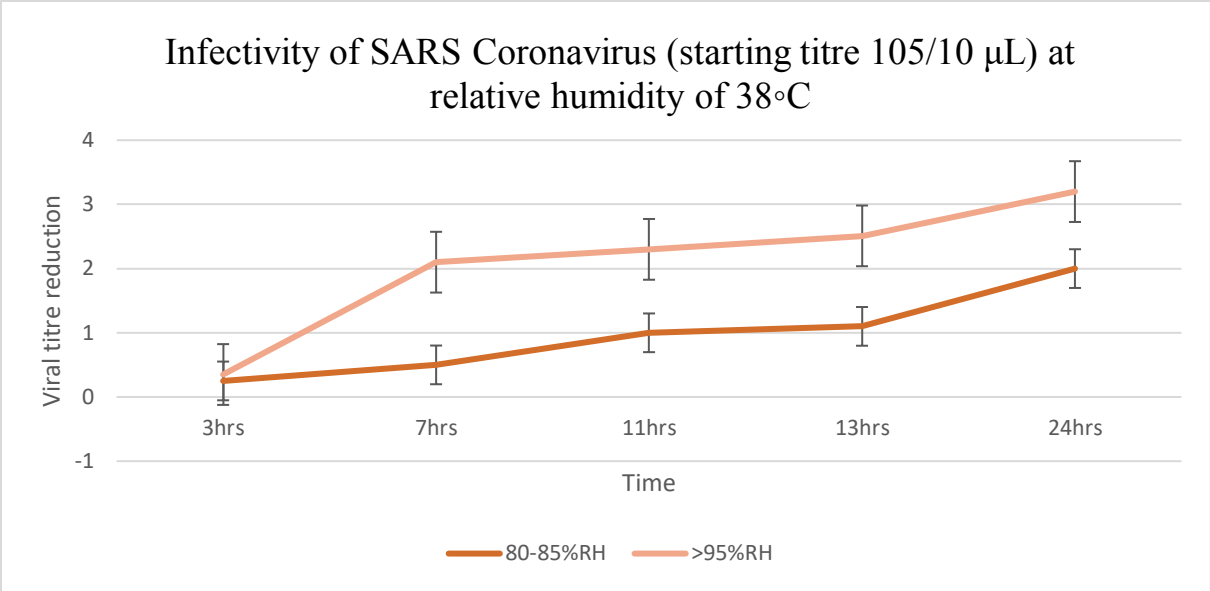


Figure 1.10: Infectivity of SARS Coronavirus (starting titre 105/10 µL) at relative humidity of 38◦C (Chan, et al., 2011)

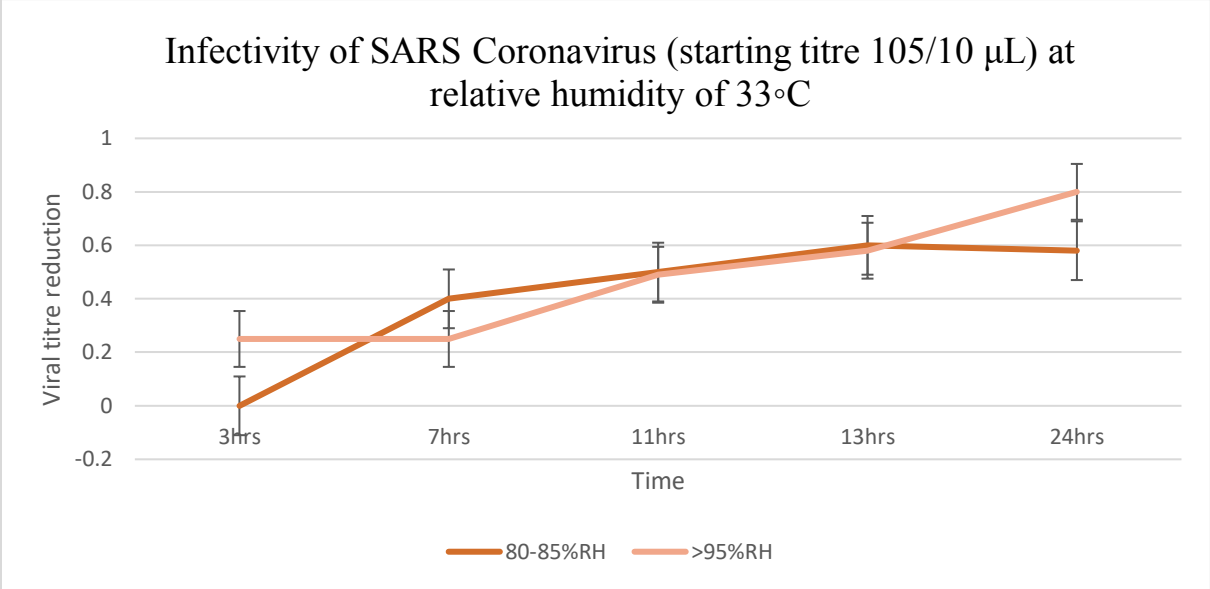


Figure 1.11: Infectivity of SARS Coronavirus (starting titre 105/10 µL) at relative humidity of 33◦C (Chan, et al., 2011)

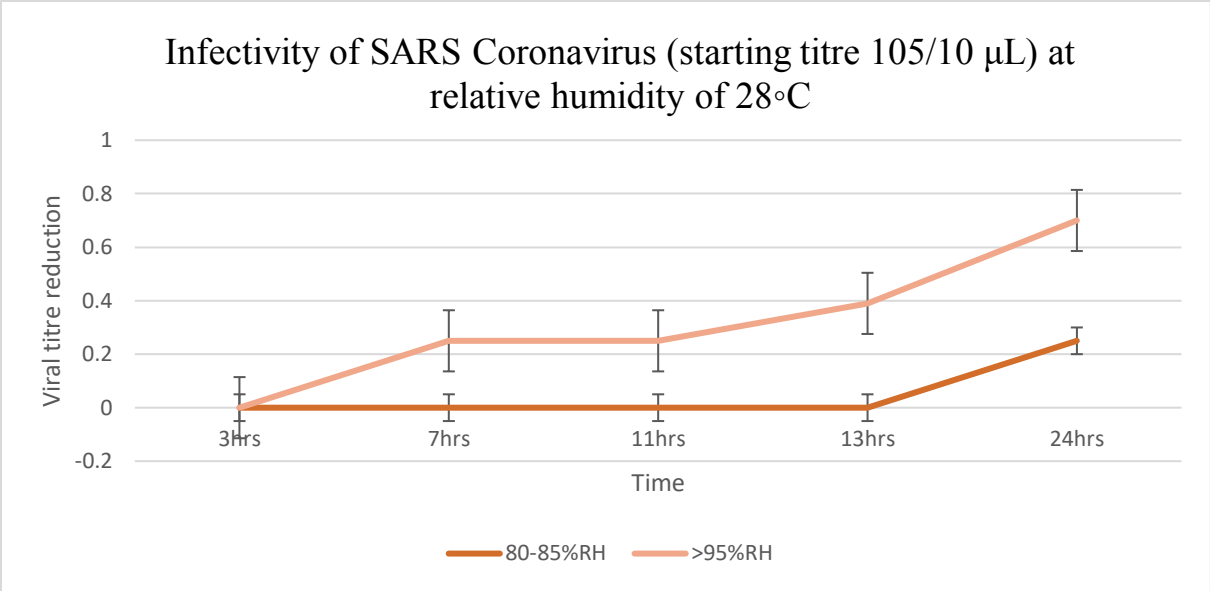


Figure 1.12: Infectivity of SARS Coronavirus (starting titre 105/10 µL) at relative humidity of 28◦C (Chan, et al., 2011)

1.2.6.1 Institute for Health Metrics and Evaluation (IHME) Projections on COVID-19

These projections on COVID-19 carried out by the Institute for Health Metrics and Evaluation (IHME), which is an independent global health research centre located in the United States with the aim of providing insights into how future events in relation to mortality rate, infection rate and adherence to control measure put in place against further outbreak of the virus will play out, making use of the data sequence gathered since the beginning of the outbreak.

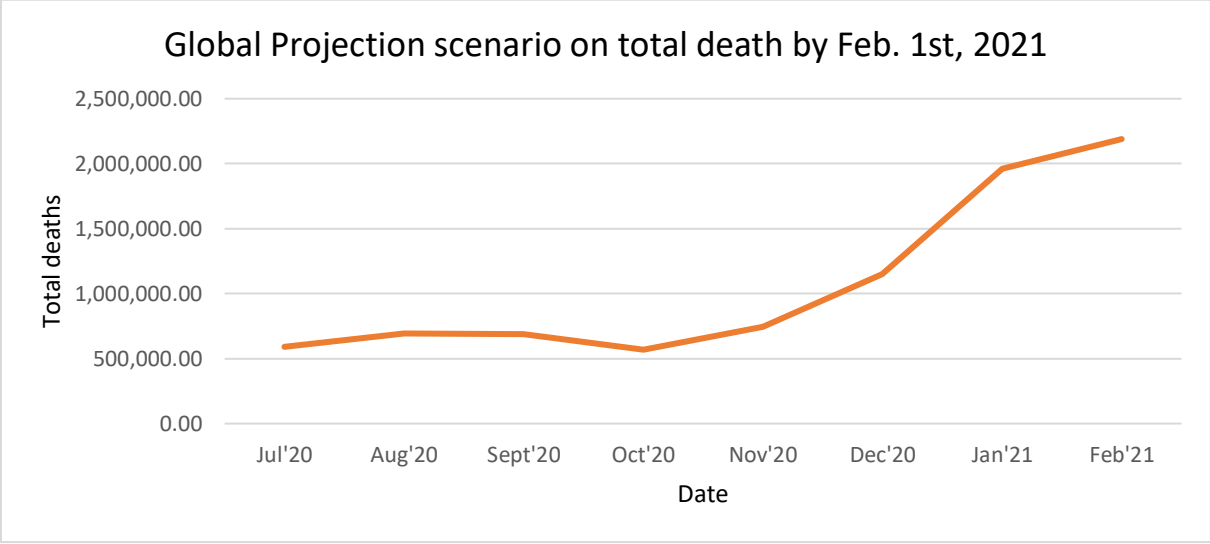


Figure 1.13: Global Projection scenario on total death by Feb. 1st, 2021 (Joe, Patrick, & Emmanuela, 2020)

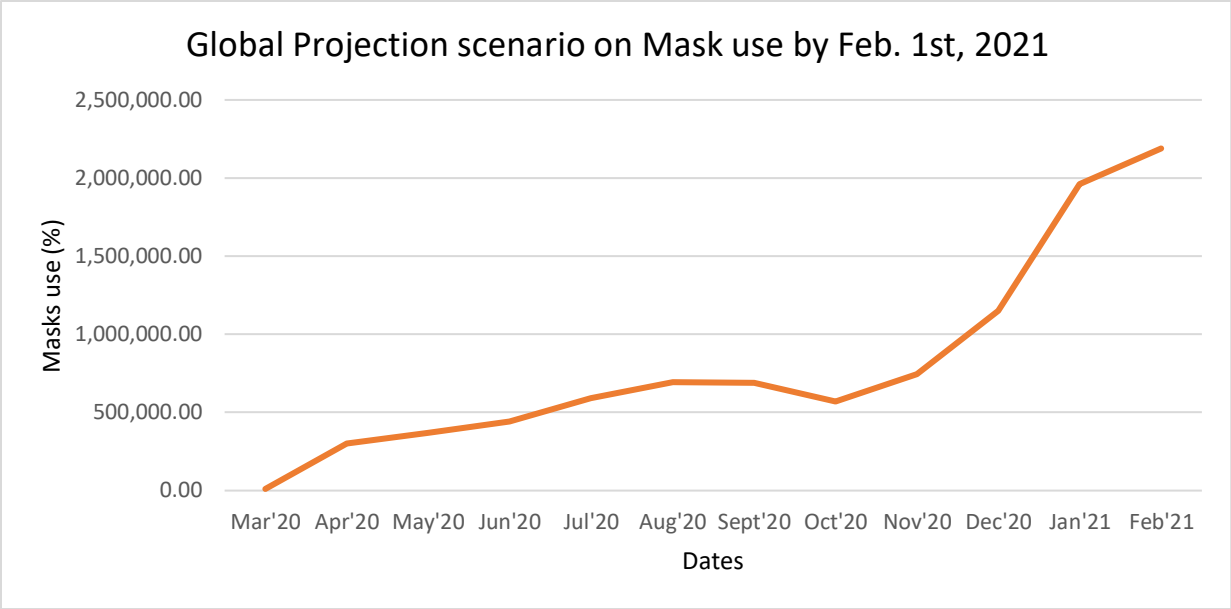


Figure 1.14: Global Projection scenario on Mask use by Feb. 1st, 2021 (Joe, Patrick, & Emmanuela, 2020)

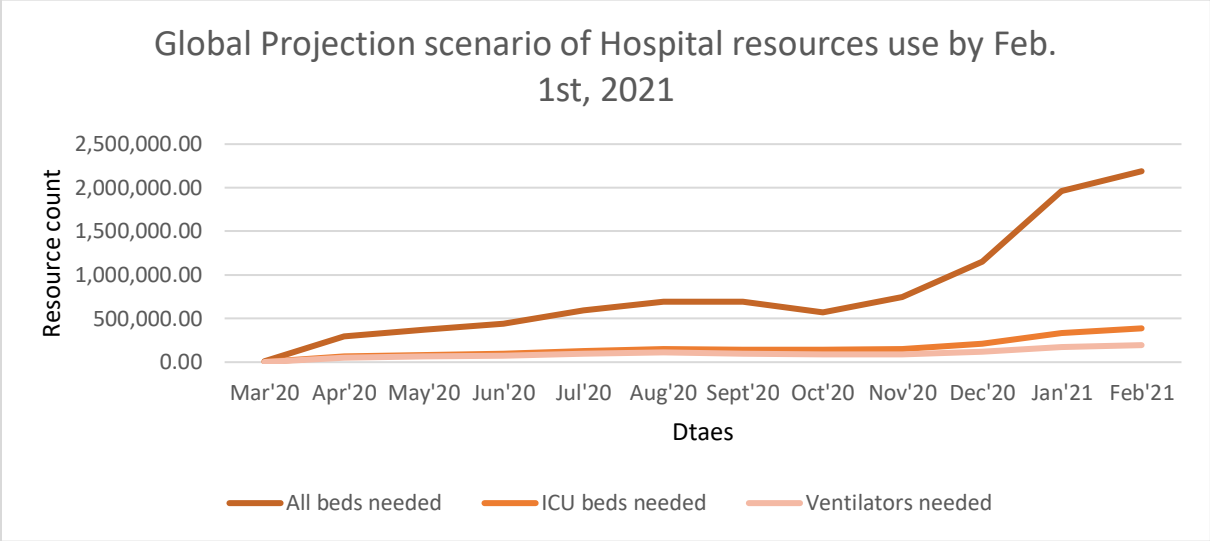


Figure 1.15: Global Projection scenario on Hospital resources by Feb. 1st, 2021 (Joe, Patrick, & Emmanuela, 2020)

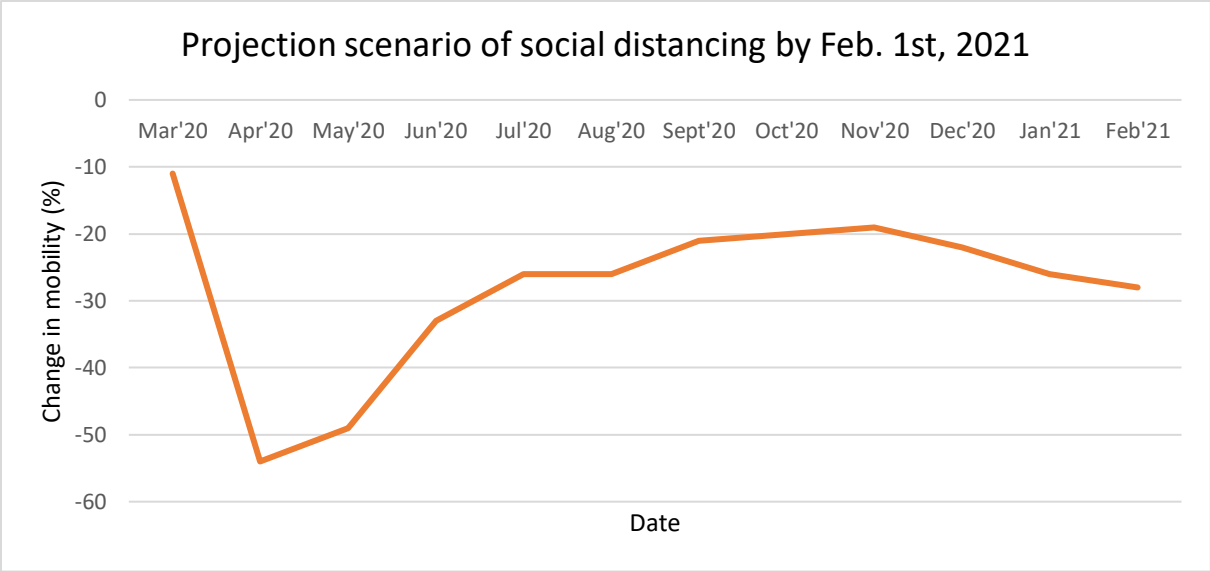


Figure 1.16: Global Projection scenario on social distancing by Feb. 1st, 2021 (Joe, Patrick, & Emmanuela, 2020)

As predicted, the global total death will be on the rise with a corresponding rise in hospital resources and the use of facemasks in public places around the world. However, a decline in the adherence to social distancing can be also observed which is still worrying as the vaccines still have not been confirmed yet.

1.3 Discussion

1.3.1 What needs to be addressed

1.3.1.1 Detection and Control

Despite varying strategic measures being employed in the fight against the ravaging COVID-19, different parts of the world are experiencing different reactions such as high levels of mortality, panic and the negative impacts on economy and trade. (World Health Organization, 2011). It is also pertinent to access the global health needs and also research into what consequences and risks these measures put in place have on the mental, physical and psychological health of individuals at various age groups around the world.

In order to mitigate or curb the spread of a disease, early detection and treatment goes a long way in controlling the infection and aids in putting out an effective plan of action towards public health strategies (Monica, Gandhi, & Diane, 2020).

1.3.1.2 Global Awareness and Education

According to a survey spanning across various countries carried out by the World Health Organization, an encouraging level of knowledge in relation to COVID-19 prevention and easy access to information is one of the basic and foremost strategies employed. However, the effective application of this knowledge is highly dependent on the emotional state of mind and also the location of people (WHO Regional Office for Europe, 2020). This emotional variability can be stabilised by employing strategies that take into consideration planning and implementation based on the societal, cultural and economic situations of individual countries, thereby, ensuring no one is left behind in the fight against this virus (WHO Regional Office for Europe, 2020).

An online survey carried in the United Kingdom and the United States reported that although participants are well informed on the means of transmission, several inaccuracies in the comprehension of how the virus can be effectively prevented were observed (Annals of Internal Medicine, 2020). Aiding the health sector and the media in prioritizing important accurate information needed to correct misconceptions, the same survey reported tendency of discrimination against individuals of East Asian origin for fear of getting infected (Annals of Internal Medicine, 2020).

1.3.1.3 Spread and Curbing the Virus

The SARS-CoV-2 outbreak has infected over 16 million individuals and over 600 thousand deaths as of July, 2020. Also, to further validate the novelty of this virus in relation to the previous coronavirus outbreak in 2003, Monica et al reported that despite implementing previously deployed strategies, in 8 months, SARS-CoV-1 had infected about 8100 people and effectively mitigated. On the other hand, more than 2.6million people were infected with SARS-CoV-2 in the first 5 months of its outbreak and still spreading at a faster rate globally (Global preparedness Monitoring board, 2019). Also, in comparison, the global influenza pandemic outbreak in 1918 had a mortality rate of 2.8% of the global population which amounts to about 50 million people (World Health Organization., 2011), in a similar outbreak with comparable impact in this dispensation of population that is four times more and with less than 36 hours access to anywhere around the globe, 50 - 80 million people could get infected (Murray, Lopez, Chin, Feehan, & Hill, 2006). In a recent study aimed at reviewing the transmission of the SARS-CoV-2 virus which was initially portrayed to only emanate from

droplets of air through cough, sneeze or even through breathing and the risk health workers are exposed to, the possibility of this virus being airborne was discovered (Kangqi, et al., 2020). This discovery, made when 41 health workers who had less than a two meter distance and not more than 10 minutes contact with a middle aged man with diabetes and hyperlipidaemia, who was hospitalized on the basis of an initial community pneumonia diagnosis, all tested positive to COVID-19 (Kangqi, et al., 2020).

Another study establishes the ambiguity in relation to the influence of face masks in the protection against a respiratory infection as the effect varies with the quality and the mode of wearing the face masks (Helsenorge, 2020). Furthermore, a transmission reduction of about 40% was estimated in an assessment carried out on the public use of a cloth or face mask over the nose and mouth (Helsenorge, 2020). The centre for disease control and prevention also asserts that COVID-19 can be spread by people considered to be asymptomatic, so the risk of getting infected by adhering to keeping at least a meter is reduced relatively to 80%, thereby making social distancing more effective than wearing face masks (Helsenorge, 2020). A lot of these preventive measures put in place have their adverse effects on certain individuals as opposed to the general aim of prevention and safety functions advised to all. In cases of underlying diseases or health complications, adhering to measures like wearing of face masks, social distancing, lockdown and washing of hands can further pose serious health risks. In a study against the positive effects of washing hands and the use of hand sanitizers, disregarding the preventive capacity of these measures over the virus, Cristina B. et al reported concerns such as the skin's prolonged exposure to water, constant use of alcohol based hand sanitizer, wearing of gloves, incessant use of soap, detergents and solvent, which can lead to swelling of the outermost layer of the skin, increasing its sensitivity to chemicals, skin infections among other health threatening challenges (Cristina, Mara, Liliana, Luiza, & Marius, 2020) that can arise as a result of unrestrained fear-sponsored employment of these measures.

Furthermore, as reported in the annual report on global preparedness for health emergencies, a future outbreak of a new pandemic will always present great risk due to insecurity and severe weather conditions amongst others (Global preparedness Monitoring board, 2019). However, a study conducted by Monica G. et al argues that based on the similarities in infection and transmission of this novel virus with the 2003 Severe acute respiratory syndrome, a similar approach was initially employed by public health officials to curb the outbreak of the recent

COVID-19 (Monica, Gandhi, & Diane, 2020), which due to its novelty was not able to be put under control.

1.3.1.4 Mental Health and Mobility Restrictions

Restrictions to social mobility and gathering doesn't only pose a great threat to easy access to health needs, but also, health measures put in place to accommodate various individuals without discrimination. This was further buttressed in a survey research in which concerns such as loss of health insurance and jobs has further led to escalation in global exposure to mental health risks and various illnesses (Efrat, et al., 2020). However, social distancing in the absence of a verified vaccine to fight the novel SARS-CoV-2 virus has been a viable preventive measure put in place to slow down the spread of this virus is social distancing (Joakim, Weill, Stigler, & Deschenes, 2020). An analytical correlation study of the COVID-19 outbreak and control in China carried out by Ainslie, K. et al showed the daily increase in new confirmed cases to be between 2,000 and 4,000 early February (Tyrrell & Williams, 2020). Additionally, the strict introduction of social distancing which led to the drastic reduction of new daily cases and gradual economic bounce back in early March displays the effectiveness of this approach to curtail the pandemic outbreak in China. Also, a republic of Korean based modelling study to simulate preventive measures proposed social distancing as highly effective in curtailing the spread of this virus (Choi & Ki, 2020). Meanwhile, a similar modelling analysis taken in the United Kingdom also gave a high recommendation for the implementation of social distancing, although with a conclusion that a combination of all these measures taken against further outbreak of the virus should also be implemented to achieve significant results in curbing the pandemic (Kamal, Carl, & Jeffrey, 2020).

As important as this strategy is to implement reduction in the virus outbreak, isolation and loneliness has its own effect on the physical and mental health of individuals especially people above the age of 60 years of age. Research in this regard shows social distancing which is intended as a preventive strategy for safety and well-being can in actual fact lead to more complicated health issues like depression, suicidal thoughts, anxiety and panic attack for individuals (Tyrrell & Williams, 2020).

The limited mobility and travel restriction around the world have brought about this great reduction in air pollution. According to (Piers, et al., 2020), the national mobility data estimated a global reduction in NO_x to be 30% in April and also about 20% reduction in SO_2 emissions

globally. Coupled with the cooling effect experienced by the planet, underlying health conditions associated with global warming such as cardiovascular diseases which have been largely associated with air pollution can also probably get a chance at reducing.

1.3.1.5 Politics

Despite the raging upsurge in the mortality rate globally, some researchers reported how the pandemic has been highly politicized in the United States, ranging from president Trump's description of the virus as an hoax, to the Republican governors late implementation of recommended preventive measures relative to their Democratic counterparts, leaving individuals confused and with no option than to count on the politically divided elected officials (Hank, et al., 2020), which unfortunately impedes any achievement when the policy makers are not allies. Additionally, in another similar study, results displayed that in comparison, Republicans who are politically inclined to Donald Trump do not hold social distancing implementation order seriously relative to Democratic (Marcus & Tian, 2020). In another development in Italy, an investigation was carried out on how the citizens were ready to abide by the government's policy when adherence was really crucial to slowing down the spread of the outbreak and most importantly, reduce the limitation faced by the health sector (Guglielmo, Nicola, Mario, & Mirco, 2020). In the same context, achieving full compliance in a democratic setting even with strong enforcement can be challenging to implement. It was however concluded from the survey carried out that individuals' expectation on when the lockdown measure or social distancing will be relaxed must effectively communicated as this aids the public's intent to abide with whatever policy is put in place to mitigate the pandemic outbreak (Guglielmo, Nicola, Mario, & Mirco, 2020). On the contrary, a study carried out in south korea reported a high level of compliance to preventive measures in place to mitigate spread and also a better understanding of the risk associated with COVID-19 by the public, thereby instinctively aids in the practice of various preventive measures without the implementation of any enforcement measure by the authority (Minjung & Myoungsoon, 2020). This study being one of the first studies performed in the early phase of COVID-19 outbreak in South Korea however also reported responses psychologically and in individual behaviour as the public was reported to have a low sense of vulnerability, but high sense of extremity (Minjung & Myoungsoon, 2020).

However, moderate and controllable adherence to these preventive practices as recommended by the World Health Organization (WHO), (Cristina, Mara, Liliana, Luiza, & Marius, 2020) would pose no threat, thereby effective in mitigating the spread of the pandemic outbreak.

1.4 Conclusion

The outbreak of COVID-19 pandemic and the control measures put in place has been observed to have a positive and negative effect on global health.

Various factors have been discussed to have led to the continuous spread of the virus and how this can be tackled. Based on the research in the trend of the COVID-19 outbreak, it was learnt that a huge educational gap and lack of basic training needs to be addressed. The non-compliance of individuals by not adhering to the preventive measures put in place by the authorities to put the spread of the virus under control can be traced back to ignorance as a result of improper education on a global and general scale. In this regard, the state should guarantee mask supply for everyone and educate on the proper use. Mass means of communication could be used for this purpose and could also play an important role.

Also, another positive resource established during the fight against COVID-19 is the information obtained providing us with the availability of data to tackle an imminent pandemic outbreak.

In order to improve the human condition, conscious effort should be given to the promotion of cooperation in regards to future public health threats. In addition, effective diagnosis and treatment regardless of social status, place of residence, and personal finances, should be ensured as the health services are very important. And most importantly, the health workers' well-being should also be prioritized by the authorities as they are the unsung heroes during this time. These are the people at the front line in the battle against this novel pandemic hitting the world hard.

Finally, over the few months that the social lockdown and travel restrictions were enforced globally, observations were made of the fall in global warming as a result of reduced air pollution.

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02.
HOME

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2.1 Introduction

Working from home is not a new phenomenon, but since the outbreak of covid-19 it has become more common among some work groups as a means to keep safe distance and prevent infection between colleagues. The International Labour Organization (2020a, p. 5) defines what working from home means:

Working from home is a working arrangement in which a worker fulfils the essential responsibilities of his/her job while remaining at home, using information and communications technology (ICT).

Since the outbreak of the covid-19 pandemic, most of the corporate workforce have been forced to work from home to prevent the spread of the virus. Before the pandemic, around 70% of people globally worked remotely at least once a week, but most of the corporate workforce has moved to home offices on a full-time basis (Arman, 2020). However, these changes in working conditions also pose a risk to the corporate workforce's economy, wellbeing and more. While on the other hand, greenhouse gas emissions plummet while people stay home, and some gain better mental health and time management. Working from home now, with family present or alone, requires a fresh evaluation of the challenges and benefits that occur as a result. This practice is a fundamental issue in the workforce which also is of interest even after the pandemic is over (Holgersen et al., 2020, p. 3). Thus, the different factors playing a role in working from home are discussed further in order to find what we learned that may be continued or changed. How can we then improve human and environmental conditions?

The discussed challenges and benefits of working from home in general and in relation to covid-19 are physical environment, productivity, social effects, physical health, well-being, energy and economics, and environment. This chapter follows up with an example from Telenor that wishes to continue this work-life practice of flexibility even after the pandemic. To summarize the chapter, an overview of the strengths, weaknesses, opportunities and threats of working from home is presented. As a part of the discussion chapter, a proposal to what we can change, improve and continue is presented along with an evaluation. Part 2.4 is dedicated to the conclusion briefly answering the research questions above.

2.1.1 Method

As a methodology for this text, data and survey review, and partial literature review were selected. Literature review is a critical and objective text on published research about a given phenomenon. Data and survey review is a similar evaluation, however it focuses more on the quantitative numbers and results of the data rather than its corresponding text. Thus, the essay stays critical and avoids subjective or biased views of the topic being assessed. Even though surveys can be subjective as it is people's own perception, it is still quantitative and primarily objective as most of the surveys have such large numbers of participants.

Related research showing opposition and support on the working from home topic was evaluated in order to review the phenomenon from different perspectives. In addition, most of the statistics are as recent as 2020. It is also decided to mainly keep the research within a particular type of country, developed countries such as Norway, UK, USA and Germany.

2.2 Theory: The Effect of Working From Home

2.2.1 Who Can Work From Home?

New technology has made it easier the past couple of decades to work from home. However, this is not an option for everyone. In this section, who can work from home and who is unable to work from home is discussed. Employment in Norway is the main focus, but studies from other countries like the US and Germany are also included.

According to Statistics Norway, 39% of the jobs in Norway can be performed from home (Holgersen et al., 2020). In the US, 37% can work from home, while 56% can work from home in Germany (Alipour et al., 2020a). The majority of these workplaces are often found in the bigger cities. These are typically office based jobs, where the employees often have higher education (Holgersen et al., 2020). Figure 1 shows how remote friendly the different regions of Norway are, and that there are more types of professions where working from home is an option in and around the bigger cities.

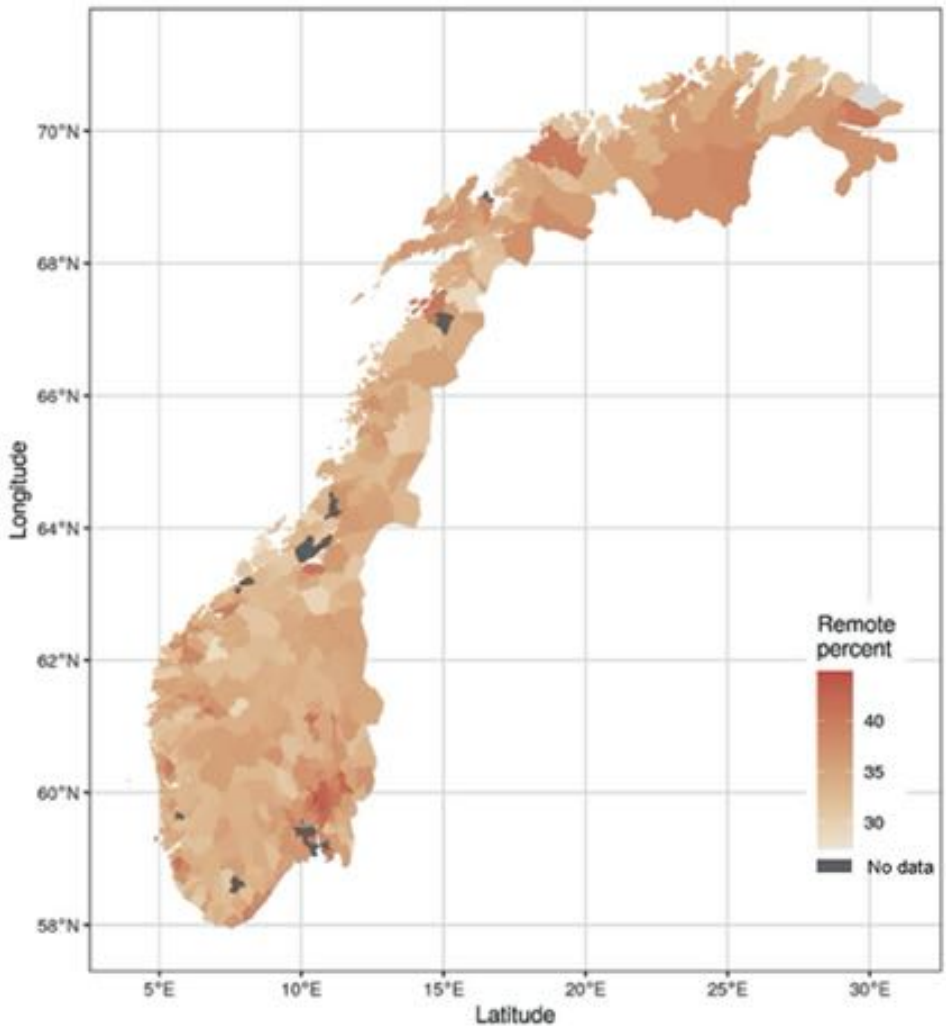

Figure 2 1: Percentage of workers who can work from home, Norway (Holgersen et al., 2020, p. 11).

Figure 2 shows the percentage of employees who can work from home in Europe. The statistics show that Scandinavian countries as well as central European countries have a higher percentage than east and southern Europe. This gives an indication that rich and more developed countries have a larger proportion of employees that can work from home, compared to less developed countries (Holgersen et al., 2020). One reason for this can be a focus on digitalization and investments in new technology.

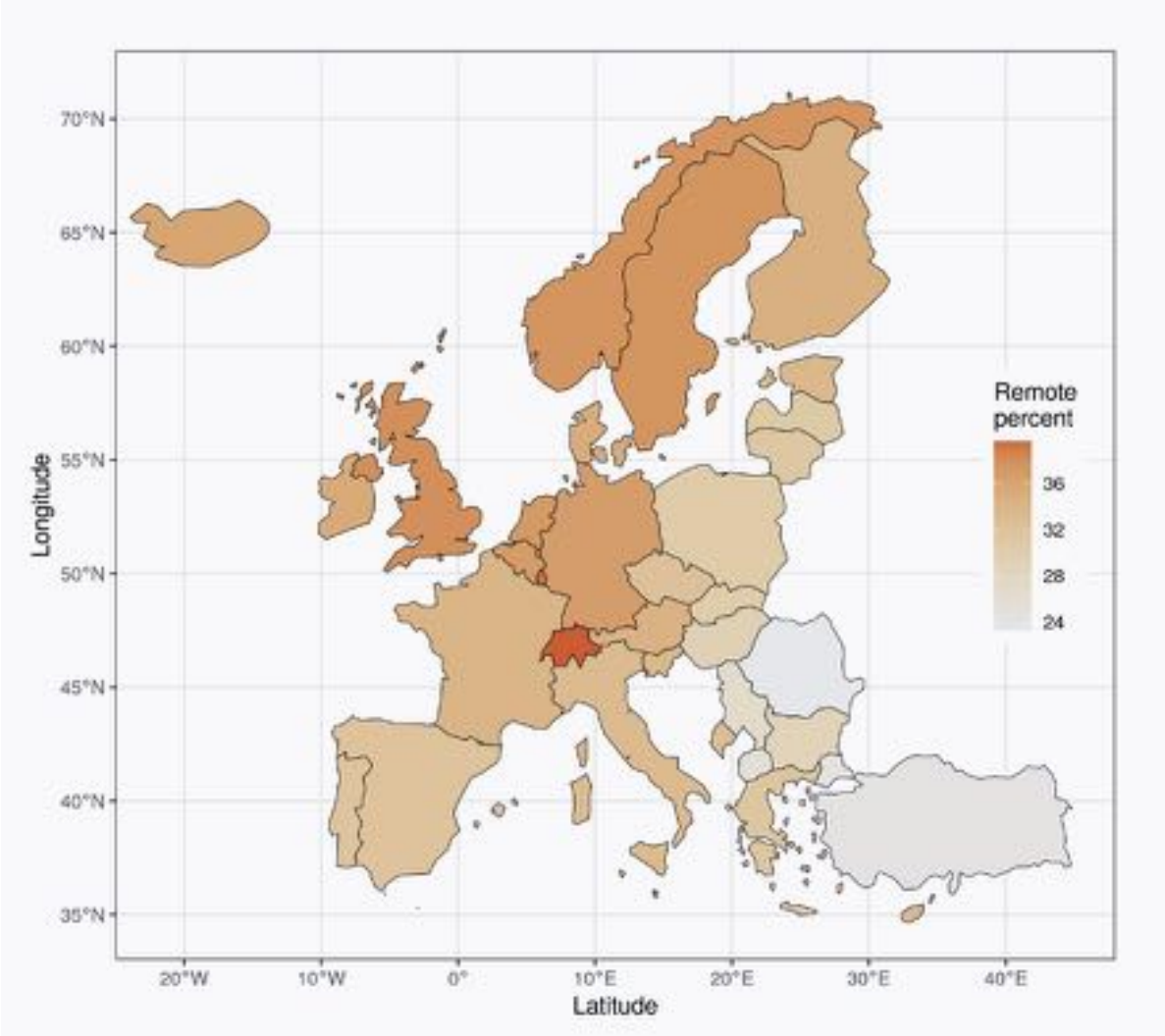

Figure 2.2: Percentage of workers who can work from home, Europe (Holgersen et al., 2020, p. 12).

Table 1, on the next page, shows a research by Statistics Norway, where managers are the occupational group in Norway with the highest remote friendliness at 66.8%. Clerical support workers are the second most remote-friendly at 62.3%. Service and sales workers are at around 34.2%, as they are often connected to a physical retail store. At the lower end of the scale we find skilled workers within agriculture, forestry and fishery at 17.3%. This profession is typically very hands-on and requires the workers to be outside their homes. According to this research, the least remote-friendly occupations are the elementary occupations. Table 2 shows that remote-friendly occupancy often has a higher salary.

Tabell 2.1: Percentage of occupations that are remote-friendly across occupational groups (Holgersen et al., 2020, p. 9).

Occupational group	**Estimated % remote-friendly**	**No. of jobs**
Managers	66,8	222 678
Professionals	49,1	652 356
Technicians and associate professionals	40,3	374 858
Clerical support workers	62,3	169 230
Service and sales workers	34,2	573 415
Skilled agricultural, forestry and fishery workers	17,3	21 631
Craft and related trades workers	16,5	219 843
Plant and machine operators and assemblers	6,9	163 197
Elementary occupations	1,7	134 400
All occupations	**38,5**	**2 531 608**

Tabell 2.2: Monthly wage payments for remote/non-remote jobs (Holgersen et al., 2020, p. 9).

Remote friendly	**No. of occupations**	**No. of jobs**	**Average earnings**	**Median earnings**
High (> 0,8)	47	348 136	56 146	50 974
Medium (0,2-0,8)	208	1 439 876	45 171	43 619
Low (< 0,2)	139	743 596	44 214	43 174

The ILO (International Labour Organization) estimates that 7.9% of the world's workforce worked from home permanently before the covid-19 pandemic (International Labour Organization, 2020b). Figure 3, on the next page, represents the number of home-based workers before the pandemic. It is based on data from labour force surveys of approximately 260 million workers. These estimates are based on data from 118 countries representing 86% of the global employment. According to the International Labour Organization (2020b), less than 5% was working from home prior to the pandemic. However, based on DNB business brokerage, 20% are estimated to work from home after covid-19 (Ramcilovic, 2020).

Figure 2.3: Percentage of workers that are home based in the World in 2019 (International Labour Organization, 2020b, p. 3).

To summarise, there are a lot of professions in the world with no opportunity to work from home. However, there is a higher percentage of employees in developed countries that have the opportunity to work from home. These are often office based, while the people working in stores, schools and hospitals as examples cannot work from home. These professions require the employees to meet at a certain place to be able to execute their job. In this text, the focus will mainly be on the professions that are able to work from home.

2.2.2 Benefits and Challenges of Working From Home

Many people all over the world were forced to work from home when the pandemic hit in the spring of 2020. Working from home is not a new concept, but has been discussed a lot more over the past few months. There are many benefits of working from home, but people are also experiencing a lot of challenges connected to it. A lot of research on home office has been conducted, both before and after covid-19. This chapter focuses on this research and discusses both the positive and negative sides of working from home.

Physical Environment

The pandemic has accelerated a development within technology, reinforcing the standard course of working with new and more efficient ways of working from home. This is for example

communication platforms that make it possible for people to have meetings while being in different locations. Established tools like this can reduce absence and sick leave when people need to work from home, for example when you or your child are sick or there is a storm making it difficult to travel. With a technology still being improved, it will also be easier to cooperate with people across municipal, county and even national borders.

The physical housing environment in the urban areas where the building complexes are of old age pose some difficulties when working at home. Numerous old buildings are not constructed with viable isolation, thus noise between neighbours will become a challenging factor of the home office environment (Sang, 2011, p. 208). Moreover, densification in urban cities is a phenomenon that has resulted in skyscrapers. The issue of living in high-rise buildings, when staying indoor for long periods, are feelings of alienation and distress (Roaf et al., 2005, p. 242). These issues need to be accommodated so they are not forced to work at home if they do not have the suitable physical environment to work indoors for long hours.

The Norwegian Work Environment Act (arbeidsmiljøloven), states that the employer is responsible for the employees safety, health and welfare (Arbeidstilsynet, 2020). This means that they, as far as practicable, have to ensure that the working conditions are fully acceptable, also when the employee is working from home. Working from home therefore requires the employee to have a comfortable chair and a suitable desk to avoid any damages that might happen if the employee for example uses the bed or the couch as a workspace. This can be challenging for the employer, and be an extra expense for the businesses. Working from home also requires having an office space in the house. Not every household has this, and if more than one person lives in the house that is working from home, more than one acceptable office space would be required.

Productivity

Saving time in day-to-day life is a benefit that many people will appreciate (Birnir, 2020). According to a travel habit survey (Reisevaneundersøkelsen 2013/14) conducted in Norway, the average time spent traveling to or from work was 24 minutes in 2013/14 (Transportøkonomisk Institutt, 2018). In one day, this is almost one hour every day spent traveling. This is valuable time that could be spent resting, doing a workout or other useful activities. A questionnaire by Buffer and AngelList (2020) shows that “remote workers almost

unanimously want to continue to work remotely (at least for some of the time) for the rest of their careers.”. This questionnaire includes 3500 participants from all over the world.

Working from home could also lead to more flexibility for many people when it comes to working hours. This can give more control over one's work situation, and lead to a more productive work environment. Depending on the situation at home, some people also have fewer disturbances at home and work more efficiently. A study by Bloom (2014) concluded that more people should have the opportunity to work from home, because it proved to be more productive and the employees were happier. According to a survey conducted during the covid-19 period, 12 000 employees from the US, Germany and India learned that they were able to improve their productivity during lockdown (Dahik, et al., 2020). Figure 4 shows the result of the survey, and it clearly shows that the majority was as productive or more productive than before covid-19. Many of the employees also stated that they would like to continue to work with this flexibility after the pandemic is over.

Figure 2.4: Illustration of the response to the survey in the US, Germany and India (Dahik, et al., 2020).

Even though many people found working from home more productive, figure 4 also shows that the participants were less efficient with non-individual tasks (Dahik, et al., 2020). Collaboratory work seems to be the most challenging according to this survey.

Figure 5 shows a survey conducted in April, which found that 39% of Norwegians were less productive when children were home, while the majority experienced the same or higher level

of productivity (Arbeidsgiverforeningen Specter, 2020). Only 16% were more productive, which is a vast difference from 49% chance of working less effectively.

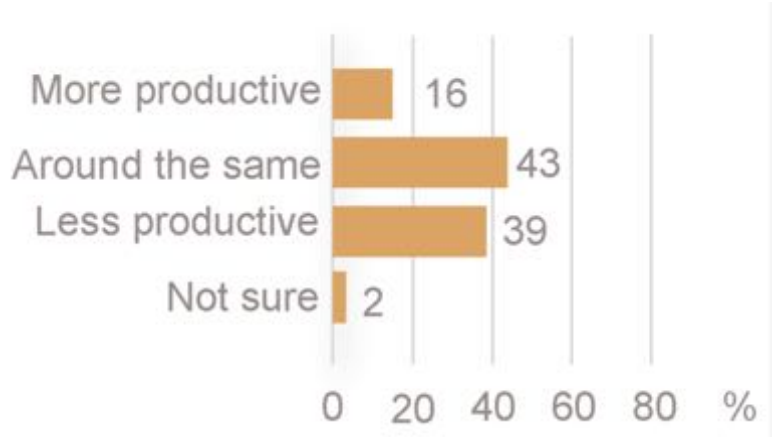

Figure 2.5: Productivity of employees surveyed in Norway (Nergaard, 2020, p. 4).

Teamwork is a part of nearly every work field, and was shown as one of the most challenging aspects of working from home in figure 4. A sintef-scientist points out that home office means fewer interruptions, which provides the opportunity to be more productive while a challenge is that it is easier to discard meetings that are actually useful (Arbeidsgiverforeningen Specter, 2020). Thus, misunderstandings arise because most communication is in writing. He mentions that the real challenge is making these virtual teams work well rather than the productivity of the teams.

In addition, research in the UK distributed by age indicates that youth between the age of 16 and 24 are less likely to be productive at home, shown in figure 6 (Office for National Statistics, 2020, p. 5). On the other hand, more recent Swedish assessment indicates that age does not have direct correlation with productivity or focus, but whether the person is new to the job, as seen in figure 7 (Westberg et al., 2020, p. 9). New employees are usually young. Scientists explain that it is more about these new employees' need for support from their supervisor.

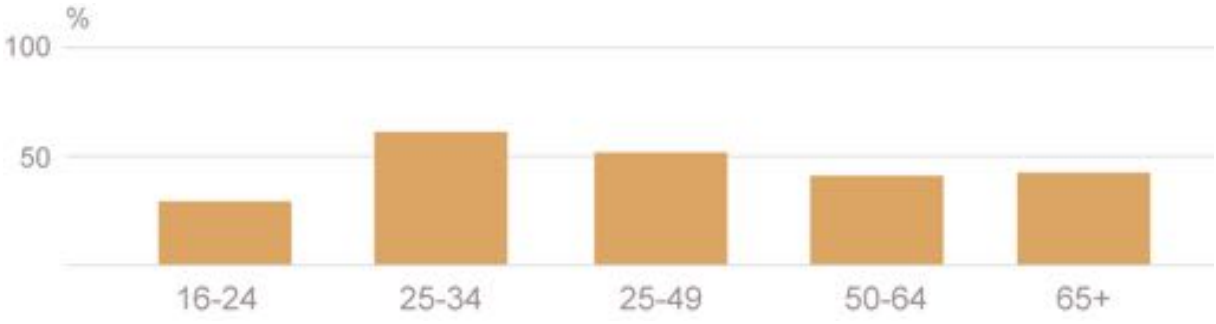

Figure 2.6: UK's productivity by Age (Office for National Statistics, 2020, p. 5).

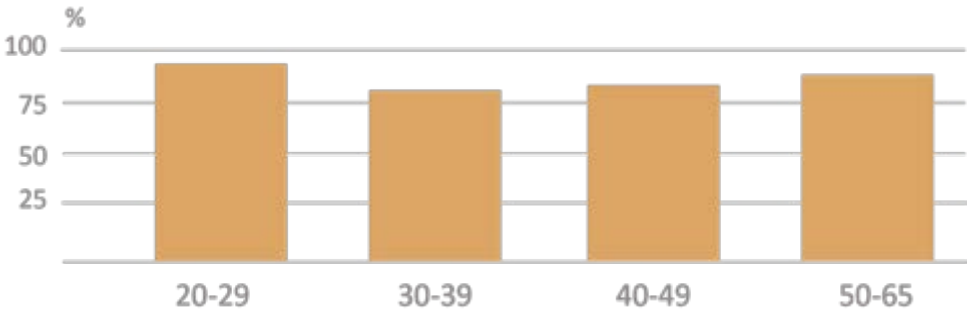

Figure 2.7: Sweden's focus distributed by age (Westberg et al., 2020).

Considering most research was conducted during the pandemic while the children were home, it can obviously influence the productivity of the individuals during home office. The counter effect can be observed in the Swedish numbers showing higher levels of productivity when the children are away. Meanwhile, teamwork is more about communication issues, best resolved through verbal communication rather than writing.

Social Effects

A survey from Denmark, illustrated in figure 8, conducted in March 2020 shows the employees' biggest challenges when working from home during the covid-19 pandemic (Statista Research Department, 2020). 1012 employees from different offices responded to this survey. The survey had one question, which asked; which of the following aspects do you see as the most challenging related to home office during the pandemic?

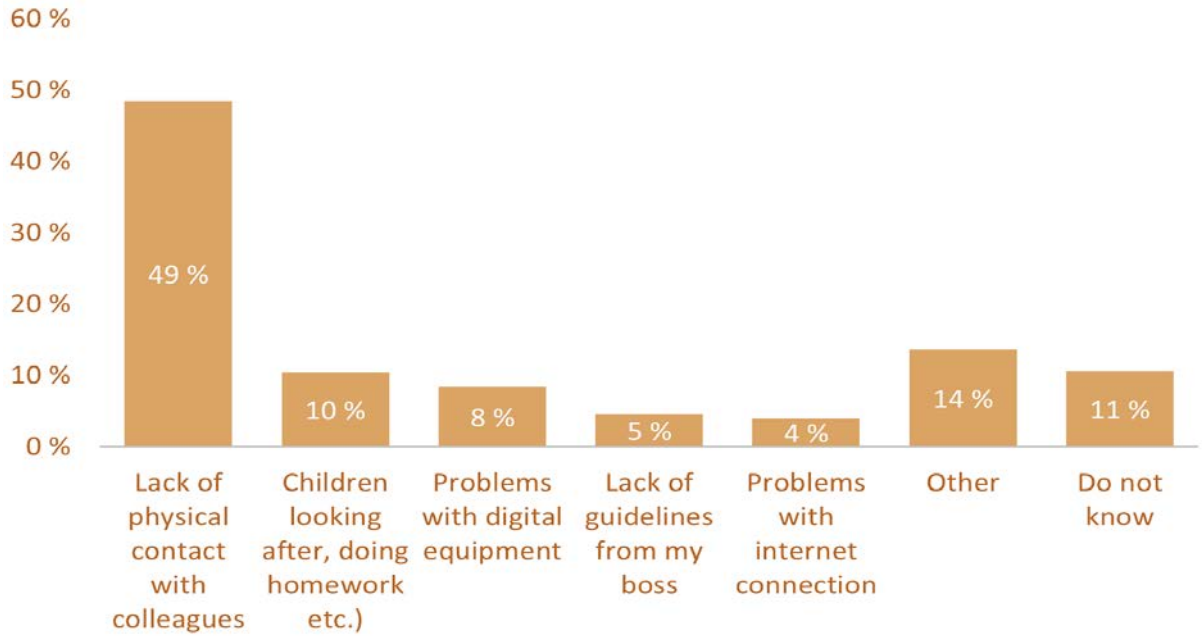

Figure 2 8: Employees biggest challenges when WFH (Statista Research Department, 2020).

According to the survey, most employees working from home find it challenging to not have physical contact with their colleagues, with as many as 48.5% of the respondents. This, however, only states that most feel “lack of physical contact with colleagues” are seen as the biggest challenge, and it is important to note that these employees may have other difficulties as well.

The issue of having children at home while working from home is also shown in the survey. However, there are some benefits of having family nearby while working from home. For some people, more flexibility and better control over one's work situation can make it easier to combine work life and family life. For example, working from home often gives the opportunity to be able to eat lunch with family or pick the kids up from school. A research by Baker et al. (2007) shows that working from home can be useful for attracting parents with young children back into work. They point out that women in their 30s with kids under five years old was a well presented group in the research, where it shows that many of these women would like to get back to work without having too many family conflicts. According to the research this could hence be solved with home offices.

Physical Health

The main reason for working from home during covid-19 was to reduce the likelihood of being infected by the virus. According to Alipour et al. (2020b), working from home proved to be a very effective method for reducing the spread of the virus in their case-study country, Germany. In this period, reducing the spread of the virus has been the main goal of working from home, where it also appeared other benefits that might entail that it should continue also after covid-19.

The physical well-being of the people was certainly impacted due to the enclosure of the workplaces, schools, day-cares and leisure facilities. Reduced physical activity during the early days of the pandemic is a product of, among others, closed leisure facilities and working from home. Early research in the UK found that 85% of over 47 000 people did not engage in moderate - strenuous exercise at all (Physiopedia, 2020). 40% did not engage in walking or similar exercise. At a similar period, Norwegians experienced back-, neck pain or similar issues due to working from home. A scientist from Oslo Met mentioned issues such as musculoskeletal disorders, sleep disorders and fatigue, and believes it is important to return to work to prevent

physical, mental and social consequences of working from home (Arbeidsgiverforeningen Specter, 2020). Nevertheless, the physical activity increased and the early data does not provide a true reflection of their general physical health. It is merely an exaggerated impact of suddenly staying at home.

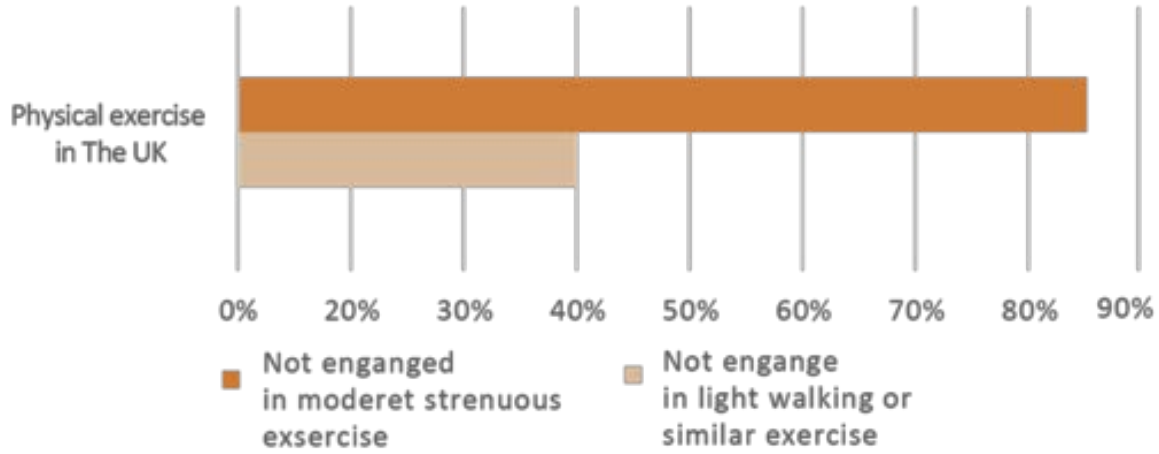

Figure 2.9 Percentage of disengagement in physical exercise a few weeks after the pandemic reached the UK (Physiopedia, 2020).

Well-being

The physical health was not the only thing that was impacted by the enclosure of the different facilities, but also mental health. The sudden change it brought on people's everyday lives had various effects on one's well-being, especially for vulnerable groups. Even though less social interactions while working from home can have its issues, many have felt an improved mental health after changing the workplace from the office to their home. According to a survey by ZenBusiness (2020), 60% of the 1035 respondents felt that working from home had improved their mental health, shown in figure 10. This applies especially to large companies with more than 100 people, compared to the smaller ones. However, the survey also showed that fewer of the people who *only* work remotely were feeling the same improvement. This indicates that a full-time home office may not be favourable for people's well-being, but rather part-time. The questionnaire was most likely being held before the covid-19 crisis, hence the possibility that these results may have changed since after the pandemic outbreak.

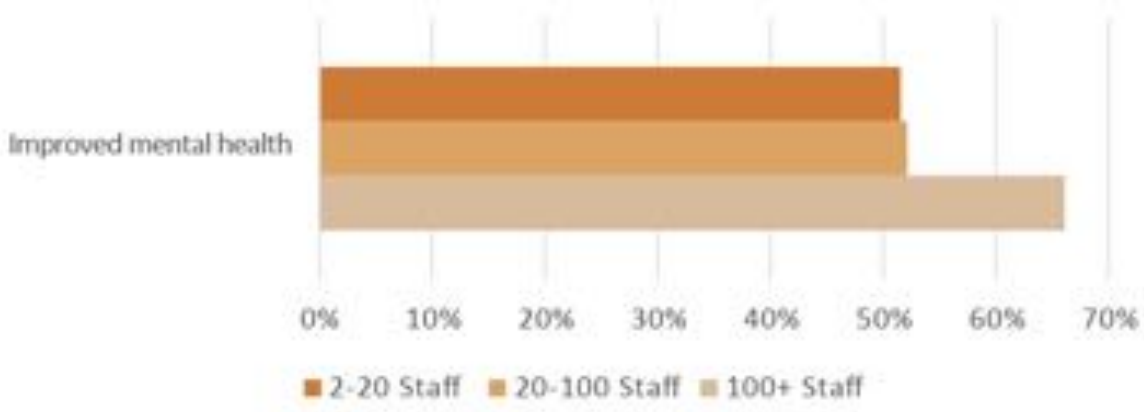

Figure 2.10: Percentage of employee's improved mental health while working from home (Team ZenBusiness, 2020).

Working from home may be beneficial for people's mental health for several reasons. For example, some people may have a calmer and more comfortable environment at home than at the office, making them happier and more relaxed. People might feel less pressure and distractions from co-workers, as they are less exposed to other disturbances, which can be especially good for introverts or people with social anxiety (Birkevold, 2020; Henke et al., 2016, p. 611). In addition, people can still be social and see other people in their spare time even if they are working from home, for example by going out for lunch. Home offices can also be beneficial for some specific groups like people having trouble working with colleagues. For them, working from home may be the best solution for being able to concentrate better and have better control over their own work. In addition, people with physical disabilities that prefer working from home because it is easier not having to travel to work, may have more jobs to choose from with a more established system for working from home.

According to a study from Henke et al. (2016, pp. 610-612), working from home may reduce health risks in general. An important note was that the probability of developing depression was much lower for people working from home eight hours per month or less compared to the people not working remotely at all. This indicates that working from home may have positive health effects, including mental health, and they suggest that more people should have the opportunity to work from home.

Even though working from home can have a positive effect on some people's mental health, some can also find it challenging. A Danish survey found that looking after children was the second most challenging aspect of working from home (Statista Research Department, 2020). The spatial distance between the workplace and home has been a natural division between

professional and personal life (Arman, 2020). This border may fade for some employees, which causes new, unknown stress in everyday life. For some, it is hard to balance between taking care of family matters, getting work done and self-care.

Data from the general population experiencing anxiety or depression was around 40% in the US in July (Panchal, et al., 2020). After long term closure of schools and children's care in the States, 50-60% of parents reported negative impacts to their mental health. Norwegian numbers showed that one third of parents were more agitated with their children during the lockdown of the schools and day-cares (Skogstrøm, 2020). Additionally, nearly 25% reported significant symptoms of anxiety and depression. Most of these were single parents. However, Norway's numbers are based on short-term closure of these facilities compared to the US.

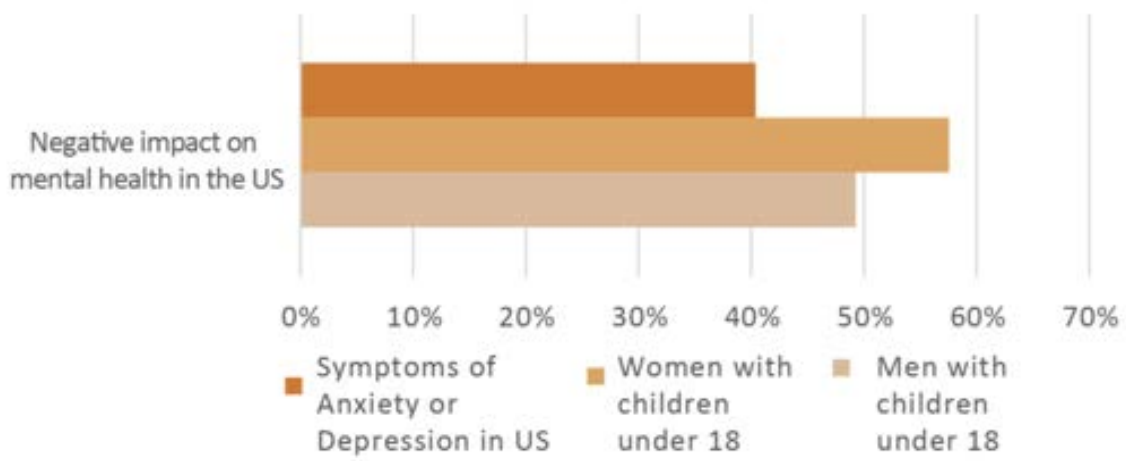

Figure 2.11: Percentage of people with mental health issues in the US around July (Panchal, et al., 2020).

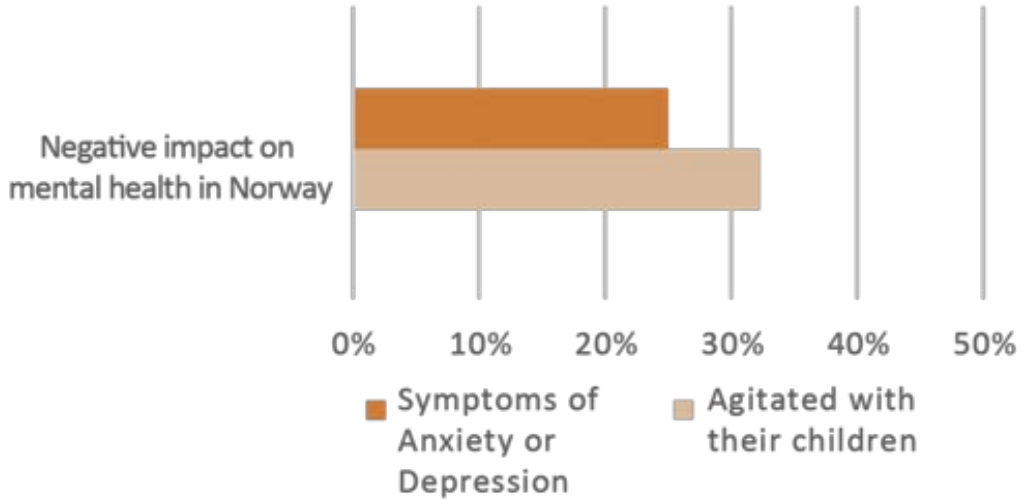

Figure 2.12: Percentage of people with mental health issues in Norway around April (Skogstrøm, 2020).

Energy and Economics

Working from home can also have effects on personal finances, as a result of saving money on fuel or public transport when commuting to work. However, a person working from home may have to pay higher electricity bills by working from home, or one can decide to go out and buy a coffee or lunch. Personal economy will therefore have an individual effect on each employee who chooses to work from home in the long term.

	Share of Europeans reporting poor health and living in:		
	Comfortably warm home	Cold homes	Percentage increase reporting poor health
EU	9%	20%	113%
Austria	8%	27%	221%
Belgium	8%	24%	212%
Bulgalia	8%	15%	82%
Croatia	24%	45%	88%
Cyprus	4%	11%	149%
Czech Republic	12%	24%	99%
Denmark	8%	24&	190&
Estonia	16&	31%	97%
Finland	7%	26%	249%
France	8%	20%	158%
Great Britain	7%	20%	171%
Greece	8%	13%	61%
Hungary	14%	26%	80%
Iceland	6%	15%	155%
Ireland	3%	6%	154%
Italy	11%	18%	69%
Latvia	14%	21%	56%
Lithuania	17%	26%	49%
Luxembourg	7%	32%	344%
Malta	3%	6%	88%
Netherlands	6%	25%	323%
Norway	6%	32%	393%
Poland	13%	26%	102%
Portugal	15%	27%	83%
Romania	9%	16%	67%
Slovakia	12%	21%	76%
Slovenia	13%	31%	131%
Spain	8%	12%	61%
Sweden	4%	14%	216%
Switzerland	3%	9%	189%

Figure 2.13: "Europeans living in cold homes are more likely to report poor health" (Rasmussen, et al., 2017).

Having well enough work conditions at home may be challenging for people that struggle financially. The Healthy Homes Barometer from 2017 showed that almost 50 million people in Europe are suffering from energy poverty (Rasmussen, et al., 2017). As a result, they live in cold homes that are often already in poor condition, and many of them are reducing heating in the house to save on electricity bills. Cold homes lead to an increased risk of poor health, especially if they choose to work at home as well, if they have a job that requires home office or makes it possible. As figure 13 show, there has been an increase in the amount of reported cold homes across the EU. These poorly insulated buildings have caused severe levels of winter deaths in the UK, three times the level of Sweden and Germany (Røstvik, 2013, p. 8). Several modern creators may solve the noise and heat issue by constructing 50 cm thick walls, which is not necessary considering the future temperatures. Moreover, researchers found that increasing thickness above 20 cm results in a less noticeable change in heat loss and decreased cost efficiency (Røstvik, 2013, p. 9). This raises several ethical questions as to how much these people should have the opportunity to work at home and how much the company is able to help them.

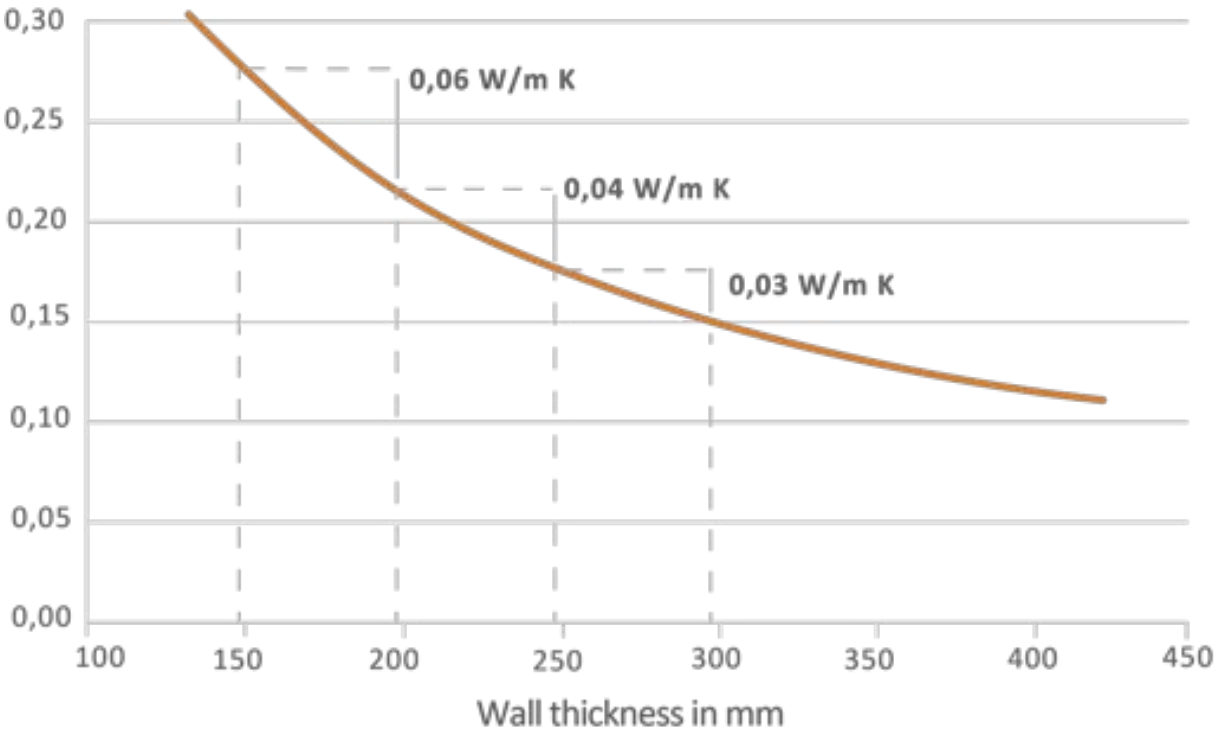

Figure 2.14: Energy transmission of U value as a function of insulation thickness (Røstvik, 2013, p. 9).

Environment

Cutting greenhouse gas emissions is an important factor in several different sectors. In Norway, the transport sector emits the most emissions. Two important factors that will cut greenhouse gas emissions in the future is improved technology and densification of cities (Røstvik, 2018). New technology can make the transport sector cleaner, while densification reduces transport volumes by locating jobs within the city borders. Densification takes time to achieve, and it is forecasted that densification within a period of 45 years has little effect, while new technology in transport has a much greater effect. In this case, working from home can be a contributing factor, where emissions can be reduced by not commuting to the office.

The covid-19 situation has in recent months shown that the use of home office also has different effects on several other sectors in the society. Working from home as a result of covid-19 has also reduced the car traffic on Norwegian roads (Sandberg, 2020). According to overviews from the Norwegian Public Roads Administration, the car traffic at the end of March 2020 was reduced by about 40 % for the similar week from the previous year. Less traffic on the roads can also contribute to lower greenhouse gas emissions and better air quality. At the end of March, the Norwegian Institute for Air Research stated that fewer cars on the road had reduced the greenhouse gas emissions (Grythe & Solbakken, 2020). The use of home office in addition to other covid-19 measures resulted in fewer cars on the road, which shall have reduced emission from the transport sector by approximately 15-20 % for road traffic. Fewer cars on the roads will also contribute to better air quality, fewer accidents, less noise, shorter queues, less road wear and airborne dust pollution. Figure 15 below shows the approximately NO_2 levels for the average emissions in Oslo before covid-19 measures on the left, while the right figure shows the same area in the period after measures were implemented.

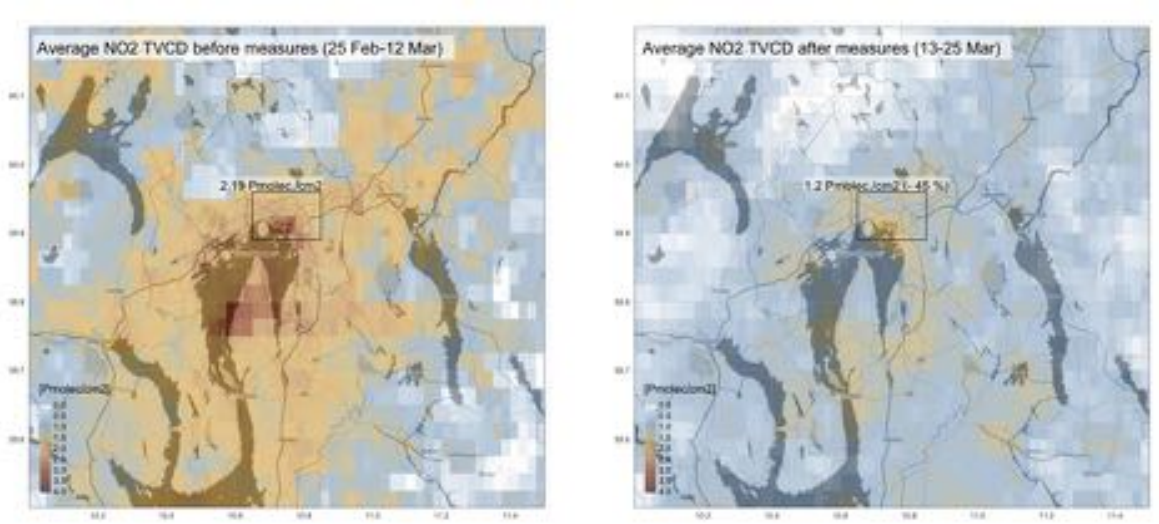

Figure 2.15: NO_2 emissions in Oslo before and after new measures related to the pandemic were implemented (Høiskar & Solbakken, 2020)

Working from home can also reduce the emissions from the aviation sector, where the use of a home office and technology can make job meetings etc. more suitable from home through various communication platforms.

Considering the climates temperature will still rise in the future, the effects can also contribute to the decrease of excess winter deaths.

2.2.3 Example: Telenor, Work From Home

Following the covid-19 situation, several companies have considered whether a voluntary home office solution is an option for the future. Telenor has already offered such a solution to its employees (Stoltz & Tollersrud, 2020). Telenor's employees do not have to meet physically at work in the future, but are allowed to decide their own work situation. After several months where most of the employees worked from home during the covid-19 period, CEO Sigve Brekke could see that the solution worked surprisingly well. In June, he announced that all the employees in Telenor could decide themselves whether they want to work from home or physically be at the office.

Brekke has seen over the past months that the situation where employees are working from home has given the employees more flexibility, and that it has in most cases been more efficient for the company (Stoltz & Tollersrud, 2020). He believes the solution connects more people and breaks with the classic hierarchy in the company. Telenor envisages a weekly solution where employees may spend two days at home, and three days at the office during a working

week. This idea is taken from Telenor's Finnish subsidiary DNA, which has had such an arrangement for the past 5 years. Brekke imagines that the office landscape gradually will become more creative zones where employees can work together, and having the possibility to rent out more of their space than they do today. Nevertheless, Brekke states that this is about flexibility for the employees, and not about finances.

Psychologist Oddvar Skjæveland is critical of Telenor's offer regarding home office (Stoltz & Tollersrud, 2020). He believes that working from home can have several problems in the form of facilitation of tasks, the indoor climate and productivity. Skjæveland believes that the biggest loss of working from home is the social community, which can in some cases lead to loneliness. Skjæveland is nevertheless not negative about the idea of Telenor's solution where employees can work two days at home, and three days at the office, and he thinks that this can be a possible solution. He sees such a solution as healthy, which can act as a compromise between the interest of both employees and the company.

Telenor succeeded in appearing as a forward-thinking, innovative company with confidence in its employees. Nevertheless, new information has shown that not all employees at Telenor get the opportunity to work from home (Nilsen, 2020). In September, the company stated that 3 out of 10 employees in Telenor Norway still have to work from the office. 30% of Telenor's employees in Norway are thus exempt from the flexibility Telenor profiled itself on earlier this year. Criticism has been raised towards Telenor, where it's the employees in customer service who are not affected by the benefits from the new flexible working environment in Telenor. The criticism points out that this can lead to dividing lines in the society, where those who are perceived to be lowest on the social rank, are also often those who are least trusted. Telenor responds to the criticism by stating that the work tasks in the company are different, and that some employees are therefore best suited at the office. Customer service is a critical and important department at Telenor, where they state that the managers' ability to listen to conversations with customers and guide the individual employee is seen as very important.

2.2.4 SWOT

A SWOT-analysis is made to conclude chapter 2.2, pointing out the strengths, weaknesses, opportunities and threats that have been discovered through the research. These will later be used to be able to create a recommendation for future development of home office.

Figure 2.16: SWOT-analysis illustrating the main findings in chapter 2.2.

2.3 Discussion

The recommendations for future development is based on the research found in chapter 2.2 and the SWOT-analysis. Further, the recommendations are evaluated, both looking at negative and positive sides. A conclusion based on the evaluation is drawn, contributing to answering the question if working from home should be further implemented or not.

2.3.1 Recommendations

Many businesses and employees discovered home office as a potential method of working during the covid-19 pandemic. The principle of working from home is constantly being discussed, where the solution can change the working environment in the long term. This research has looked at both the positive and negative effects of working from home, and it is therefore important to come up with a solution that takes advantage of the positive effects, as well as reducing the negative consequences home office can have.

Working from home during the pandemic has shown that a large number of employees have a greater efficiency and productivity when working at home, which is one of the main reasons why this is being considered as a permanent solution in many companies going forward. It is also shown that many employees felt a lack of sociability and weakened teamwork when working at a home office. Moreover, teamwork was found to be problematic when communication happens through text where misunderstandings occur. This issue is correctable through phone calls and video communication tools, while staying at home.

Not every employee has the opportunity or work tasks that make it possible to work from home. However, some living in old and noise prone buildings have the opportunity, but it is not viable. Given that the social organization functions well, it is recommended to create bottom-up adaptation techniques within the community of users for the noise issues (Sang, 2011, p. 208). Bottom up considers the user's needs and living context first. Thus they can change their use of space to reduce sound as needed. Moreover for those employees who have the opportunity to work at home, it is important to find a solution that every employee and company is satisfied with. The key is therefore flexibility. An ideal solution, illustrated in figure 17, could be to work from home two to three days a week, and work from the office the remaining days to ensure human conditions. This is merely one option, but it is more important that each employer and employee agree on a solution that works for both parties. Some employees may

be more independent and will be able to work more from home, while others are more dependent on social contact, or are more comfortable working from the office.

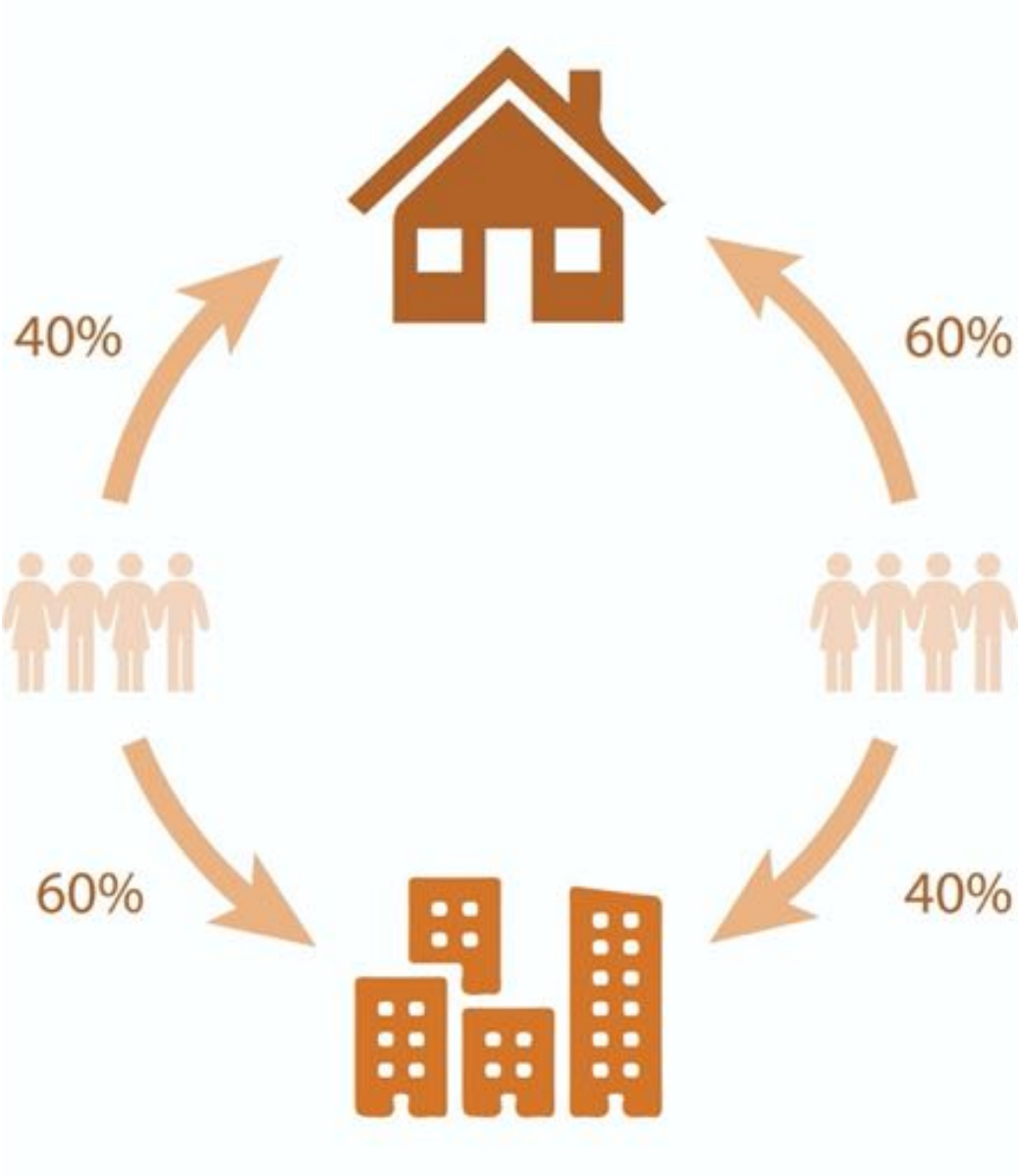

Figure 2.17: An example of how working from home could be divided among the working population.

Trust is an essential factor and the foundation of the home-office system. Trust is important between the management and employees, and between individual team members. The company is responsible for ensuring that all employees have the best conditions for solving their work tasks, while ensuring a healthy balance between work and private life. For such a solution to work, it is also important to improve the remote-work technology, for the communication to be optimal. An increase in the use of home office can also lead to a reduction in commuting, which

will contribute to reducing greenhouse gas emissions and the stress many people may experience commuting to and from work.

2.3.2 Evaluation

There are numerous noticeable benefits to gain by working from home, which is why the recommendation includes home offices as a workspace. For example, many people have a calmer environment at home, which is good for their individual work, as well as people save time and energy by not commuting to work. It is also recommended to still use the company's office for work, because it is a valuable place for doing teamwork and being social with colleagues. There are several reasons to be optimistic for this new way of working. However, there are still challenges to face, and it is therefore important to ensure the right precautions to avoid or reduce it as much as possible.

In the future, assuming that there is an end to the covid-19 pandemic, some of the negative sides to working from home is forecasted to diminish. Many of the negative effects of working from home, like stress and noise, have been a result of having kids home during the day. In the future, it is assumed that schools and kindergartens will be permanently open as prior to the pandemic, and the effects of this issue will be greatly reduced.

Working from home is a vital measure to reduce the risk of infections during the pandemic. Making it easier to work from home in the future will probably contribute to reducing the spread of other viruses as well. Therefore, working from home might result in fewer sick leaves among employees which in the long run will be cost-beneficial for businesses. Still, more home offices are not without the risk of poorer health, as well as other issues that might occur if working too much at home. For example, people might be less physically active or develop depression or anxiety. Also, it can cause too many work hours a day with less productive work. These negative aspects of working from home may occur if people have too much freedom and flexibility. The solution is to balance the amount of flexibility and structure just enough to take advantage of the benefits of both working from home and the office. However, it can be difficult for people to determine how they will manage working at home in the long run if they have never tried it before or only tried it during the pandemic. Therefore the recommendations focus on a good dialog between the employee and employers.

Studies show a high number of people getting depression and anxiety while working from home. It is important to take this into account when implementing more home offices, since people might get more lonely, lose their connections and daily structure. People also struggled to balance family and work life, which was especially difficult for parents with children being home from school during the pandemic. Nevertheless, there are several signs indicating that the home-office system might have a positive impact on people's well-being. This is why the recommendation suggests people using both the office and their home as workspace. When kids go back to school full time, a lot of the issues connected to working from home will be reduced.

Working from home has been proven in multiple studies to create issues in the social environment at the workplace. Flexible solutions may solve some of these problems, giving those in need of social stimulation the option to be around the workplace more than those who are without this social need. However, this would still result in half occupied offices, and only some colleagues will get to meet every day. Hence, working from home can contribute to creating a barrier between the work and the social aspect of the job. This would be particularly difficult for new employees which can experience issues getting social relations with all the other colleagues. New employees would likely need to be present at the workplace to a greater extent than other co-workers, due to the need of creating a social network at work and getting trained in their profession. Home office would be a place for work and the office would function as a place for meetings, creativity, social stimulation and networking.

More people working from home in the future implies a larger proportion of technology-based communication. A more reliable internet connection and technology is beneficial for co-workers at different locations, though the lack of physical presence creates issues for some people. For example, it can create a barrier between colleagues making it more difficult to have a discussion and ask certain questions, which can affect productivity and well-being. When working in a team, people are depending on frequent communication with colleagues to be efficient. Body language is important for humans to help understand each other, which may result in difficulties when communication through digital tools. Therefore, home office changes the overall communication, compared to being at the office five days a week, which can have both positive and negative outcomes.

In addition, there might be an increase of digital communication tools at meetings, especially when people are located far apart. This is useful for reducing the longer journeys, which then saves costs and is beneficial for the environment. However, those attending a meeting digitally

can have issues being included if there are too many people being present in the room. It is possible they end up only being shown on a screen, without a real chance to participate in the discussion.

Good working conditions at home are important to be able to work from home, and the employer is bound by the Norwegian law to ensure that these conditions are acceptable. However, it can be challenging to determine exactly how much responsibility the employer has in comparison to the employee. This includes having a proper desk, chair, a reliable internet connection and computer, which is important to ensure productivity and reduce the risk of physical problems. Some people might blame the company if they develop neck pain or sleep disorder while working from home, and it is therefore necessary to have good communication between the employer and employee in order to avoid this. Nevertheless, this is a bigger problem for the people suffering from energy poverty and living in cold, unhealthy homes. In countries where this is a big problem, the companies need to reconsider how much people are going to be able to work from home.

If home offices are implemented to a greater extent, some workplaces might start to rent out office space to save money and reduce areas in cities used for office space. Businesses should however consider this carefully as it would take away the flexibility, where all employees will not have the option to be present at the workplace at the same time due to limited space. In addition, not all employees would have their own desks. As the company rents out space, the offices would have less desks, and the employees would have to rotate on the available desks at the office. This could eventually result in the employees feeling frustrated and experiencing more of the negative effects by working from home.

It is also important to note that the superiors, as well as employees may be frustrated and struggle with not knowing who is present and who is working from home from time to time. As it is recommended that all employees choose themselves when they want to be present at the office, it may result in a chaos where no-one will know who is where at a certain time. This disorder may lead to a challenge when it comes to meetings etc., as the superiors and employees would need to inspect who is present from time to time. However, this could be easily fixed by creating an interactive calendar system where the employees update their schedule.

It is important to note that not everyone who could potentially be working from home, can actually do it. Three out of ten employees in Telenor’s customer service team do not have the

opportunity to work from home. Many people have drawn the conclusion that these people are often lower educated, and that this is the reason why the company does not trust these people to work from home. It can also be as a result of logistic reasons, as needing a stable phone line to be able to give good customer service. Other companies may also experience the same thing, and not being able to offer the same opportunity for home office for all of the employees. If you work with research and development, where most of the work effort consists of hatching good ideas and inventing new and better technological solutions, a home office can be a good opportunity to work efficiently and focused in periods.

Working from home can reduce emissions and save the environment as long as the daily work trips are not replaced by other trips. The car is often used to go to the supermarket and drive the kids to school, kindergarten or activities. These trips are often done on the way to or from work. When working from home, it is important to consider other modes of transportation to be able to contribute to reducing the emissions. If these trips are done as extra trips, the emissions will not go down as a result of home offices.

2.4 Conclusion

The research showed that there are both negative and positive sides to working from home. However, many of the negative sides can easily be avoided with certain measures. It is therefore recommended that working from home should continue after covid-19, but within a custom framework that works for both the employer and the employee. The framework should be based on the individual needs as well as what suits best for the company. A flexible solution provides people in need of social stimulation the opportunity to work at the office, and people who work more efficiently at home are able to do so. Viable working conditions at home are also easily achieved through improved communication between the employer and employee. However, if the conditions at home are not optimal as a home office, the employee has to be able to work full time at the workplace. Working from home should therefore not be forced, as it has been during the pandemic, but rather encouraged and recommended.

Considering that some people miss the social aspect of the workplace, the solution of three days in the workplace and two days working from home can be a favourable solution. In this case,

they will have three workdays along with colleagues, and two days at home focusing on their individual work with fewer interruptions.

Prior to the pandemic, many people did not have much or any experience with working from home. During lockdown people were then forced to work from home, and they might have associated this with noisy and messy working conditions. It is, however, forecasted that the pandemic will end and many aspects of daily life will go back to normal. Working from home with children is not very beneficial or efficient, as shown during the covid-19 pandemic. Kids going back to school creates better working conditions in many homes, and hopefully may lead to more people wanting to work from home.

Saving time in day-to-day life is one of the reasons why working from home should be continued after covid-19. Research found that workers in Norway use in general almost one hour a day traveling to and from work. By reducing travel, it can become easier to combine work and family life. Reduced travel to and from work, and a reduction of business travel as result of more digital meetings, can potentially lead to a reduction in transport emissions. However, it is important that these travels are not replaced by other travels.

Renting out work space can be an ideal solution to reduce the area used for offices, especially in cities. However, it is important to evaluate the possibility for this in each business to avoid less flexibility for the employees. It is important that the employee can come to the workplace if they have to, without feeling that they do not have a suitable place to work.

In the end, it is important to focus on implementing as much home office as possible to reduce traffic congestion during rush hours and reducing greenhouse gas emissions. For this to have an effect without creating a society filled with physical and mental issues, it is important to have a flexible solution that is adapted to the individual needs. All in all, the pandemic has shown the world how working from home can improve both the environmental and human conditions.

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BYG655 – Autumn 2020

03.
WORK

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3.1 Introduction

One of the perhaps most severe societal consequences of the corona virus is the effect it had and still has on working life. Many businesses had to close, forcing many employees to work from home if possible. Many jobs – however, had no choice but to accept government furlough and self-isolate at home, due to the manual nature and physical presence their job required, which includes everything from taxi drivers, restaurant workers, retail sales assistants to maintenance workers. This, more than anything else shows how much of a class-based society we live in, where the managerial and professional job sector which historically has had better wages than the goods and service sector. This class gap is also reflected in the covid-19 death toll, where the manual labor force is overrepresented (Williams, 2020).

Many of these jobs, especially nurses and other medical staff and home carers are not known for having high wages, which is odd given their responsibility and commitment during this crisis. With covid-19, the term essential and frontline workers have become prevalent in public discourse, as a way of distinguishing between workers critical to a functioning society. Such as the ones maintaining important infrastructure, including sectors like food & agriculture, emergency services and other jobs that have less impact on society.

Even though many jobs are classified as essential, many workers are experiencing a lack of safety and protection on their workplace, especially in the US. Adequate protection against the corona virus is absolutely essential work that is in constant contact with its customer base, like grocery stores in the food sector, yet many employees in major US grocery chains have reported a lack of Personal Protection Equipment supply by the employers (PPE). Amazon, for example, has had several employees protest the working condition in amazon fulfillment centers, after several Covid-19 related deaths (Stewart, 2020).

This text highlights some important aspects of work that have been particularly impacted by the corona virus. While theory is an important part of academic writing, we have chosen ‘‘The Concept of Environmental Comfort theory’’ to see how the psychological, functional and physical comfort can determine the well-being of the workers in relation to the changes in office space after the outbreak of covid-19.

3.2 Theory

3.2.1 The concept of environmental comfort

"The concept of environmental comfort links the psychological aspects of workers` environmental likes and dislikes with concrete outcome measures such as improved task performance, as well as with organizational productivity through workspace support for work-related tasks" (Vischer, 2007a, p. 179).

The concept of environmental comfort consists of three types of comfort, physical comfort, psychological comfort and functional comfort. Each of these three types of comfort can be measured separately or together to determinate the well-being of the workers, the tasks that needs to be performed and effectiveness (Vischer, 2007b, p. 21). To understand comfort, all the three levels in the triangle needs to be considered. Physical comfort is defined as the base of comfort related to standards of health and safety. Such standards related to the work environment is to ensure that people are not working under extreme environmental conditions, such as noise or the temperature at work are too high or too low. Psychological comfort is related to territoriality, privacy and control. Territory consist of individual territory and group territory. Control consist of letting people participate in decisions related to their own space and let them be a part of defining their territory, to increase the psychological comfort. Functional comfort is more defined as how effective the workspace is, giving the people the required tools that they need to perform their work tasks (Vischer, 2007b, pp. 23-25). The environmental comfort model is used to determinate whether the workspace support the comfort conditions or fail to support the comfort conditions, making it uncomfortable and can cause stress (Vischer, 2007a, p. 181).

3.3 Discussion

3.3.1 The conditions and value of the welfare-state

Shortly after the virus had spread to all corners of the world, every country had to implement measures to prevent the spread within its borders. One of the first measures taken by many, was to initiate a country wide "shut-down", forcing people to stay at home unless the nature of their work was deemed critical to society. This meant that many people were put on leave

indefinitely, which for many meant that they effectively lost their job and were put on government furlough in the countries with a working welfare state system, such as the Nordic countries and Great Britain. In Norway, the measures taken were described the "most comprehensive measures taken since the end of world war II" (Regjeringen, 2020), marking a full societal shutdown, including major social restrictions. According to the Norwegian Bureau of Statistics (SSB), 270'000 people became unemployed as a direct result of the corona pandemic, increasing from 2,2% to 10,4% compared to last year's labor statistics. A vast majority of these people registered for government furlough (dagpenger) to make ends meet (SSB, 2020). Norway is in a unique position with its welfare state. It has a very strong public sector that enjoys a very high level of trust by its citizens. These - coupled with the oil-and gas-based economy which includes a very large pension fund, have been the main reasons that Norway has been able to handle the crisis as well as it has (Christensen, 2020).

The welfare state has shown itself to be a crucial element in handling large scale pandemics like covid-19. Having strong public institutions, a large and generous safety net will allow much more efficient crisis management. One of the indicators of how successful a welfare state, is the level of trust citizens have in the government. Norway and the other Nordic countries consistently score very high on indexes that seek to determine subjective well-being within a country's population, such as the UN *Happiness Report* (Davies, et al., 2019). The welfare state can take a large amount of credit for this by counteracting the poverty and unhappiness often experienced by states with limited or ineffective welfare models. As mentioned earlier, Norwegian society is defined by high levels of trust in its government and public institutions, meaning people were more likely to take the advice and guidelines outlined by the public health authority seriously. This is in stark contrast to societies with lower levels of trust – like the United States – where only 47,43% of the population trust the national government (Ortiz-Ospina, 2016).

Even though the US has a limited form of welfare state, it cannot really be compared to the Nordic welfare model. While there is a safety net, it is much smaller in terms of unemployment benefits. Where US citizens receive a lump sum, in an amount varying across states, most European welfare states pay a percentage of the lost salary when a citizen becomes unemployed (McHugh, 2020). The medical safety net is even worse because there is no universal healthcare available, meaning most citizens rely on employer sponsored medical insurance (Kumar, Ghildayal & Shah, 2011).

Unemployment in the US can therefore be said to have a much more detrimental effect on a person's financial situation, because it means not only losing income, but also the medical insurance provided by the employer.

Shortly after the outbreak of the pandemic, the US also created stimulus packages for its affected industries as well as people left unemployed as a result of the crisis. On a global level, we have not had this level of generosity by welfare states since the second world war which saw a large increase in both the number of people covered by, as well as the value of payouts by welfare states due to the looming uncertainties at the time, lasting until the 1970s in most states (Sandher & Kleider, 2020). This means that a similar lasting change could happen in today's welfare states. We have witnessed how important these public safety nets are during times of crisis, which could fundamentally change welfare states across the world, even for a long time after pandemic has subsided. In conclusion, the corona pandemic has made a very strong case for strengthening welfare state models to improve the human condition in times of extreme stress and uncertainty. Corona pandemic and the resulting economic crisis have made the welfare state more relevant than ever before, even in countries that have traditionally had limited social welfare programs.

3.3.2 Essential vs. Non-Essential services

After the outbreak of Covid-19, the government has issued *Executive order (*Stay at *home order),* which required people to stay at home or at other place of residence. This order exempted individuals working in essential services. The Ministry of Justice and Emergency Preparedness (JD) has in according to instructions (Royal Decree 15 June 2012) a general coordination responsibility for social security and emergency preparedness in the civil sector. This includes among other to define which societal functions a cross-sectoral perspective is to be considered critical and what functional capacity must society always maintain?

What are essential services?

These are critical services and functions that are necessary, even during a pandemic. They maintain important societal functions and take care of citizens' lives, health and basic needs under various forms of stress. Without these services, a government cannot run its business as usual, violence, poverty, diseases and chaos will erupt. It is therefore important for every government to determine what essential services are. Based on the 14 critical societal functions

that appear in the report Society's critical functions from the Directorate for Civil Protection and Emergency Planning (2016), the ministries have prepared a list that will help to clarify which types of companies and personnel groups that are central to maintaining critical societal functions. The list also includes critical business functions within other societal functions that are considered important in connection with the management of the outbreak of coronavirus (Regjeringen.no, 2020). Here are some examples:

- Executive arm of government (The head of state, Governor, mayor who has the authority to make executive decision and enact policies).
- Health services: this includes hospitals, nursing home, pharmacies. All people who are working in such institutions are very critical in the societal functions.
- Police services: to maintain law and order in the society.
- Rescue services: this includes rescue preparedness, fire protection, civil defense as well as chemical and explosive preparedness.
- Food and fuel supply: this applies to the entire value chain - from production to distribution.
- Water and waste management services: the municipality's staff, or other personnel, whose task is to secure clean water and sewage management.
- Maintenance of communication infrastructure (telephone, radio and internet systems).
- Provision of food and other essential goods such as medical supplies and gasoline.
- Financial services: this can be interpreted broadly, but we assume that this includes the most socially critical functions - payment transactions, access to means of payment and maintaining the financial market by ensuring secure distribution of capital
- Road maintenance.
- Power supply: this will include people who work at, for example, power plants, have key tasks within power supply and maintenance of energy infrastructure.

Failure to maintain these services during this covid-19 pandemic will result many unnecessary deaths and chaos. Countries that create resilience plan in advance, will be able to reduce the negative consequences of a pandemic (Betterteam, 2020).

Nevertheless, after the outbreak of covid-19, many of these essential workers have been affected due to shutdown of the schools or daycare for the children, hence forced them to stay at home with their children. However, the government of Norway has come up with a program that will enable parents that work in critical services to be provided with childcare for children under the age of 12 years. Childcare is offered where one of the parents is to be regarded as critical personnel or an employee has parental responsibility alone and is his/her services is vital to the society (KS, 2020).

Despite the economic difficulties the country is facing during this pandemic, there is an increase demand for essential service workers, especially health personnel. Many municipalities had to employ extra workers in order to control the spread of virus.

What are non-essential services?

These are the services that do not impact the critical societal function and can be stopped or closedown during a pandemic. Examples are:

- Entertainment centers
- Libraries
- Restaurants
- Barber shops
- Boutiques
- Tourism
- Schools

Nonessential employees in various states across the globe were ordered to stay at home to help control the spread of the virus. Depending on the nature of their work, nonessential employees are either asked to work from home, accept unpaid leave or some are even been terminated from their contracts since many companies are running out of the business due to Covid-19 pandemic.

According to the Statistics Central Bureau of Norway (SSB), many industries that were affected by the corona regulations and control measures have had the highest decline in the number of jobs. For example, the number of jobs in hospitality and catering services in September 2020 was as much as 15.5% lower than the same month last year.

Business services, such as travel agency and tour operators, had a job decline of 11.5 %. Also, in the transport sector (airline and ship service), there were significantly fewer jobs in September 2020 than in the same month the year before, with a decrease of 6.4 % and 5.8 %, respectively. Personal services e.g., hairdressers and other activities related to body care, have had similar experiences during this Covid-19 pandemic. Cultural and entertainment activities were also affected (Horgen, 2020).

What have we learnt from this pandemic?

We have seen how important these services are to the society. Many of these services might not get much attention from the society in normal times, but the Covid-19 crises have fully demonstrated how important it is that the renovators provide functioning waste systems, the very basis for good infection control and how crucial cleaners are to reduce the risk of infection. They are at the forefront of the fight against the pandemic, they tend to, and they maintain vital services while the country is more or less shut down.

After the crisis, society should reconsider the wages and status of many occupations. Healthcare professionals and other essential employees have shown tremendous loyalty. They have been incredibly conscientious and worked for the citizens. Therefore, they deserve to get a better treatment and working condition.

3.3.3 Work from home

The Covid-19 pandemic required many workers to relocate and perform work from home, as it was seen to be a very effective tool to reduce infection risk. Workers whose work tasks were

suitable for that, were now working from home (or any other place), but not in the regular office.

In order to get a better overview of how many people were working remotely, it was first decided to look at the data from 2015, right before pandemic and after Covid-19 outbreak. Then, it can be analysed and compared in which degree it varies with the present results.

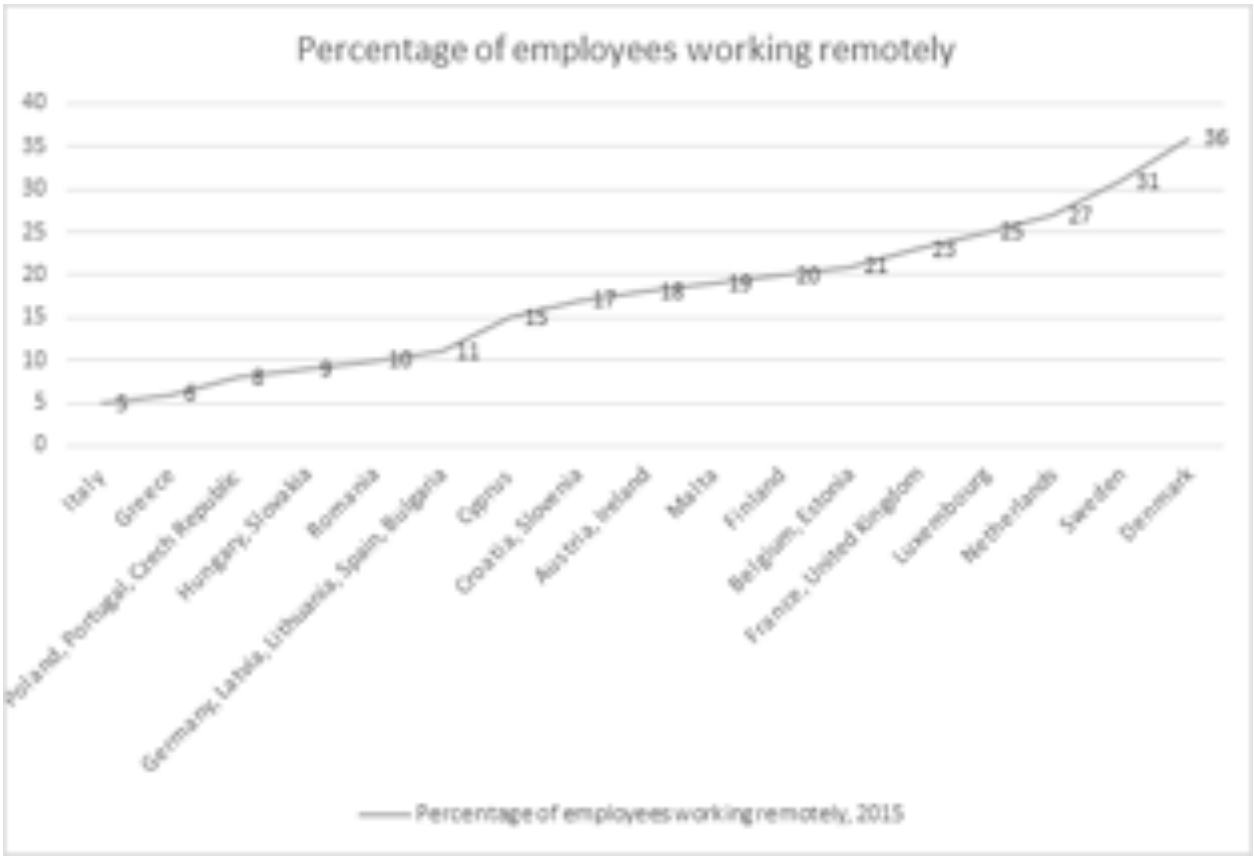

Table 3.3. Percentage of employees working remotely in 2015. Source: Eurofound (2020b)

Table 1. presents how many people in European Union member states and United Kingdom were working remotely in 2015. (Note that the chart presents only employees, self-employed workers are not included). In 2015, employees in Denmark worked 36 % remotely, while in Italy only 5 %. It is said that the argument for this great diversity is ‘a combination of factors, such as a country’s affinity for technology; the availability and quality of its technological infrastructure; management culture and the drive for higher productivity within companies; and employees’ needs for spatial and temporal flexibility to balance work demands with family commitments and other personal responsibilities’ (Eurofound, 2020a). Some countries which present low percentage of remote work, suddenly after the Covid-19 outbreak are forced to

relocate and start a totally different work and daily life, so it is going to be important to discuss advantages and disadvantages of this change.

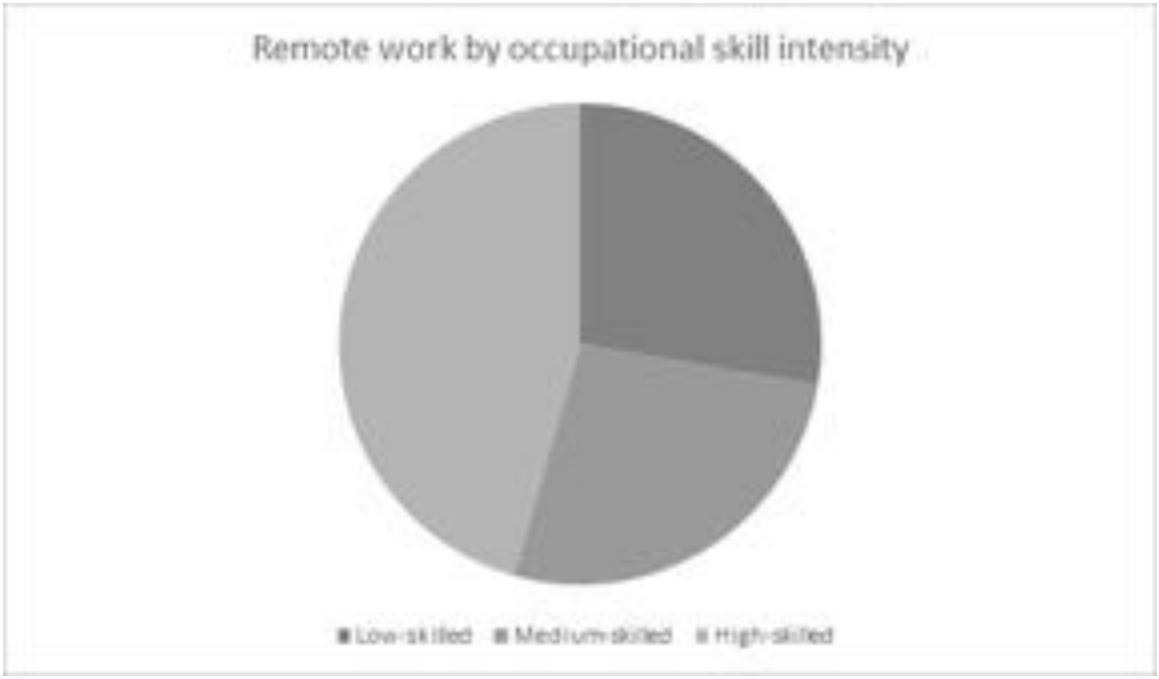

Table 3.4. Percentage of remote work by occupational skill intensity, 2015. Source: Eurofound (2017)

Another important aspect is what kind of works are suitable for remote work in general. Thus, it was chosen to look at the remote work by occupational skill intensity. As it is seen from Eurofound (2017) data, in 2015 remote work is least common between low and medium-skilled workers. It is often that the tasks of those works are not possible to perform outside of the workplace and requires physical presence. For instance - sales or industry workers. (Note – the data are calculated by country averages for each sector across Albania, Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, those countries: Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Montenegro, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom) (Eurofound, 2017).

As knowing these factors before Covid-19, was it done any forecasting how is it going to affect the workers? It is often that those who have low education and low skills are paid less and thus already are in a worse position than the high-skilled well-paid workers group. It can be said that many of them must continue working as it requires physical presence, in order to perform work tasks. Thus, these workers are in much higher risk to be infected by Covid-19. Dingel and Neiman (2020) in their paper “How many jobs can be done at home?” looking at different work

sectors and after data analysis claim that it is a big variation between different sectors regarding remote work. Remote work in US is much more frequent between the industries which better educated and better paid workers. These are mostly jobs which require intensive knowledge and tasks can be performed electronically. Applying their occupational classification to other 85 countries outside US, Dingel and Neiman (2020) also present the results that countries with lower income economies have lower number of jobs which can be performed remotely. It can be said that the policymakers should be aware of these factors as people who do not have ability to work remote have a higher chance either to lose a job as business can be closed or be infected by covid-19 on the way/ at work. So, it can be said that inability to work remotely brings some level of inequality

Work from home before and after Covid-19

European Foundation for the Improvement of Living and Working Conditions (Eurofound) performed a survey in order to see how Covid-19 affected people's work life. Aim of this survey is to help policymakers in various countries to bring about an equal recovery from this crisis (Eurofound, 2020b). The research was about to explore how does the pandemic influenced work life by country, gender and age. Some of the areas research has covered are regarding changes in working hours, stressing about work when not working, frequency from work at home before the outbreak and after, satisfaction with work and other important aspects.

Table 3. and table 4. presents the data of European Union member states regarding how often people were working at home before outbreak of Covid-19 and frequency of working from home after the Covid-19 outbreak. (Note: table 3. – low reliability in Denmark, Estonia, France, Greece, Latvia, Luxembourg, Netherlands, Poland, Romania, Slovenia and Sweden, table 4. - Cyprus, Latvia, Malta, Netherlands and Sweden). As we can see, all the countries showing highly increased percentage of work performed remotely. In Austria it has increased by 27,8%, in Belgium by 35,3%, in Bulgaria 10,2%, in Croatia 17,5%, in Czech Republic 25,1%, in Denmark 33,1%, in Estonia 11,3%, in Finland 45,3%, in France 17,5%, in Germany 18,8%, in Greece 14,5%, in Hungary 8%, in Ireland 30,6%, in Italy 29,3%, in Latvia 13,2%, in Lithuania 18,3%, in Luxembourg 41%, in Netherlands 35,4%, in Poland 12%, in Portugal 20,1%, in Romania 3,8%, in Slovakia 20,1%, in Slovenia 13,9%, in Spain 15,6%, in Sweden 28,4%. Majority of countries shows significant increases. Average percentage of remote work increase in those countries is 21.8%.

One of the findings of this survey says that "if teleworking is to continue across the EU, social partners must seek to include provisions for workers on the voluntary nature of telework or the suitability of specific tasks to teleworking in any legal frameworks or agreements" (Eurofound, 2020b).

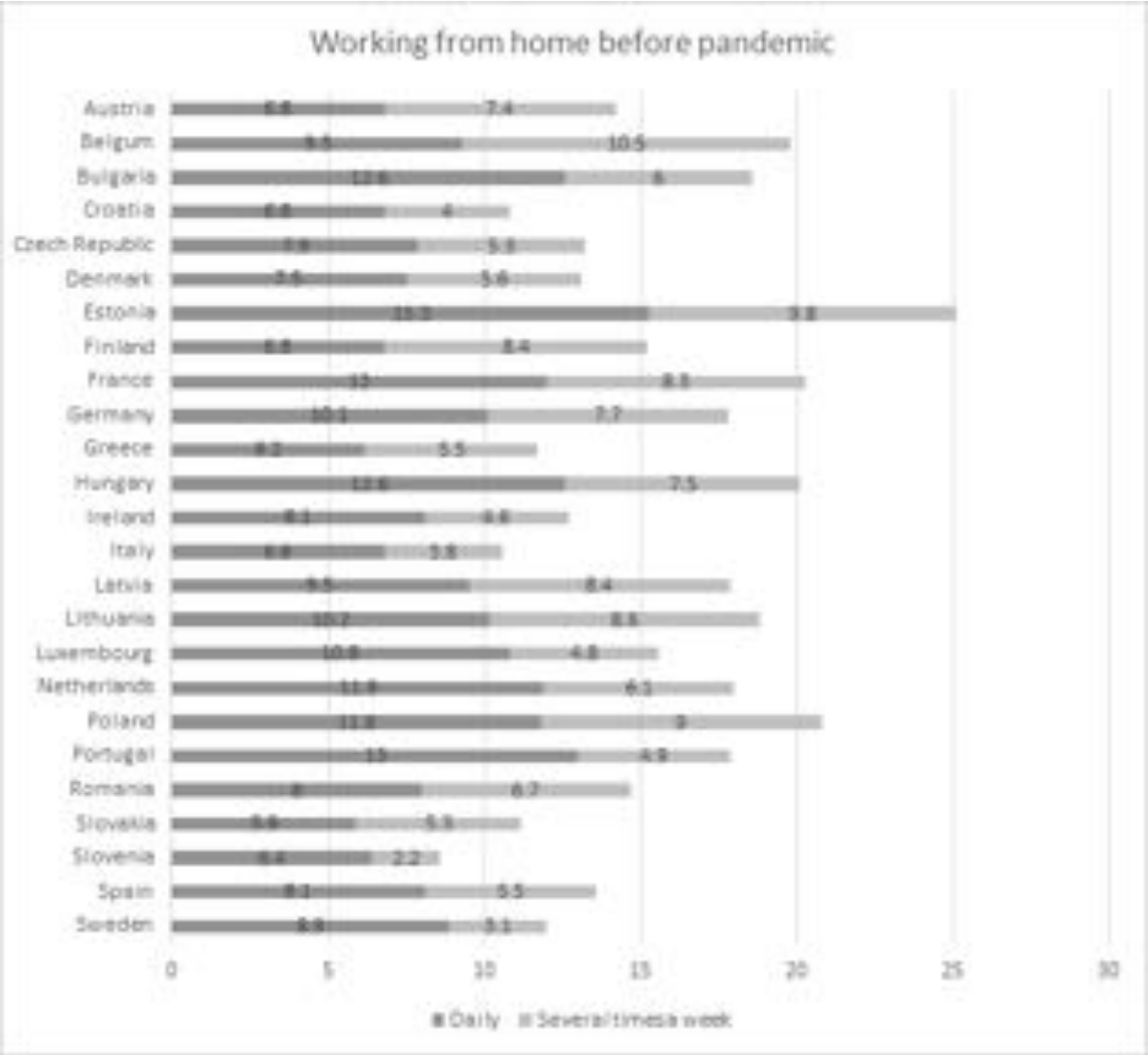

Table 3.5. Working from home before pandemic, period June-July. Source: Eurofound (2020b)

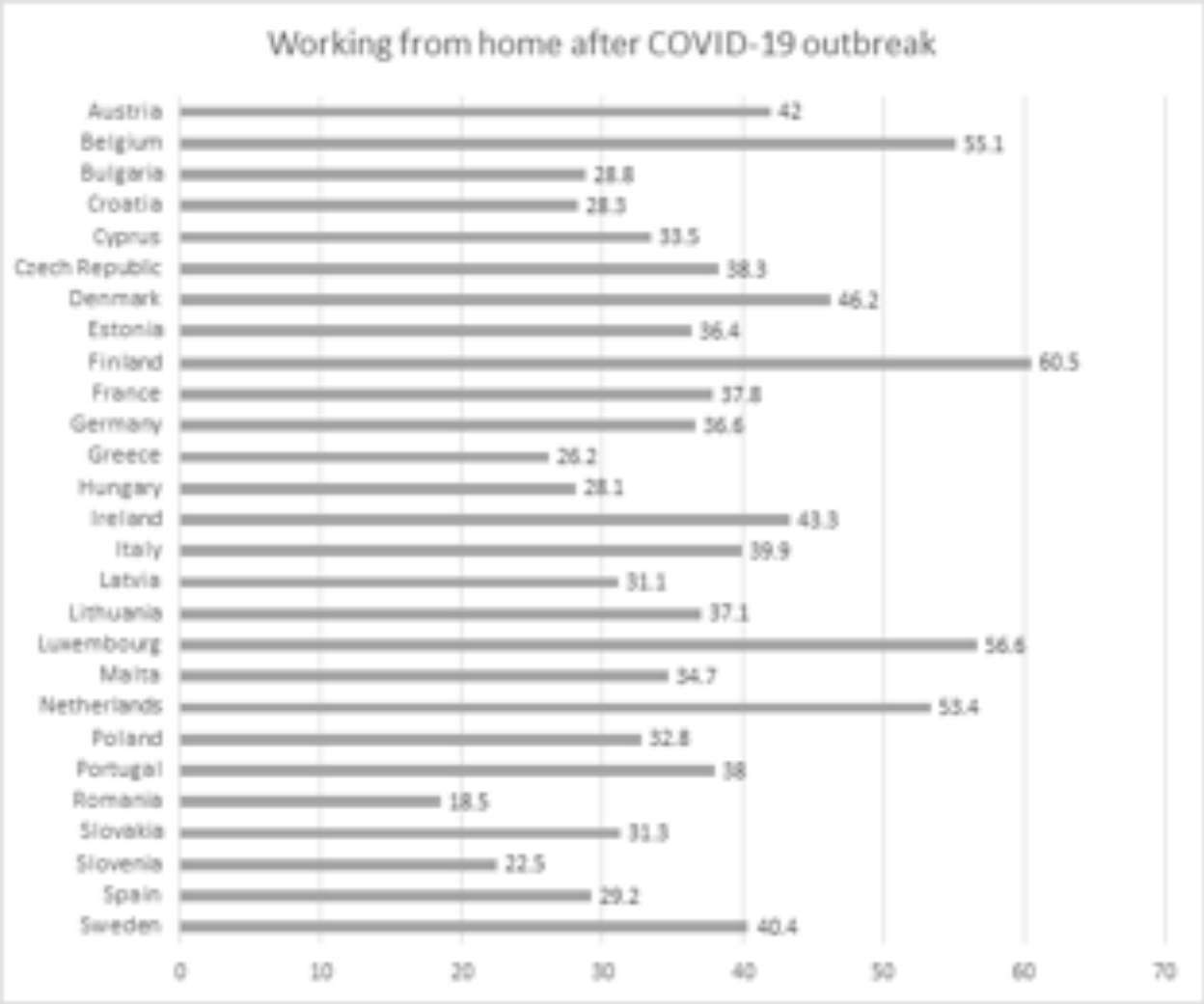

Table 3.6. Working from home after COVID-19 outbreak. Source: Eurofound (2020b)

One of the questions asked in the survey is in which degree respondents agree to this claim "Overall, I am satisfied with my experience of working from home during Covid-19 pandemic" (table 5.). Smaller part of respondents claim that they strongly agree to this statement and there is higher number of respondents who are overall satisfied with working remotely during Covid-19. In order to see what factors could influence the results, it is important to analyse the positive and negative sides of remote work.

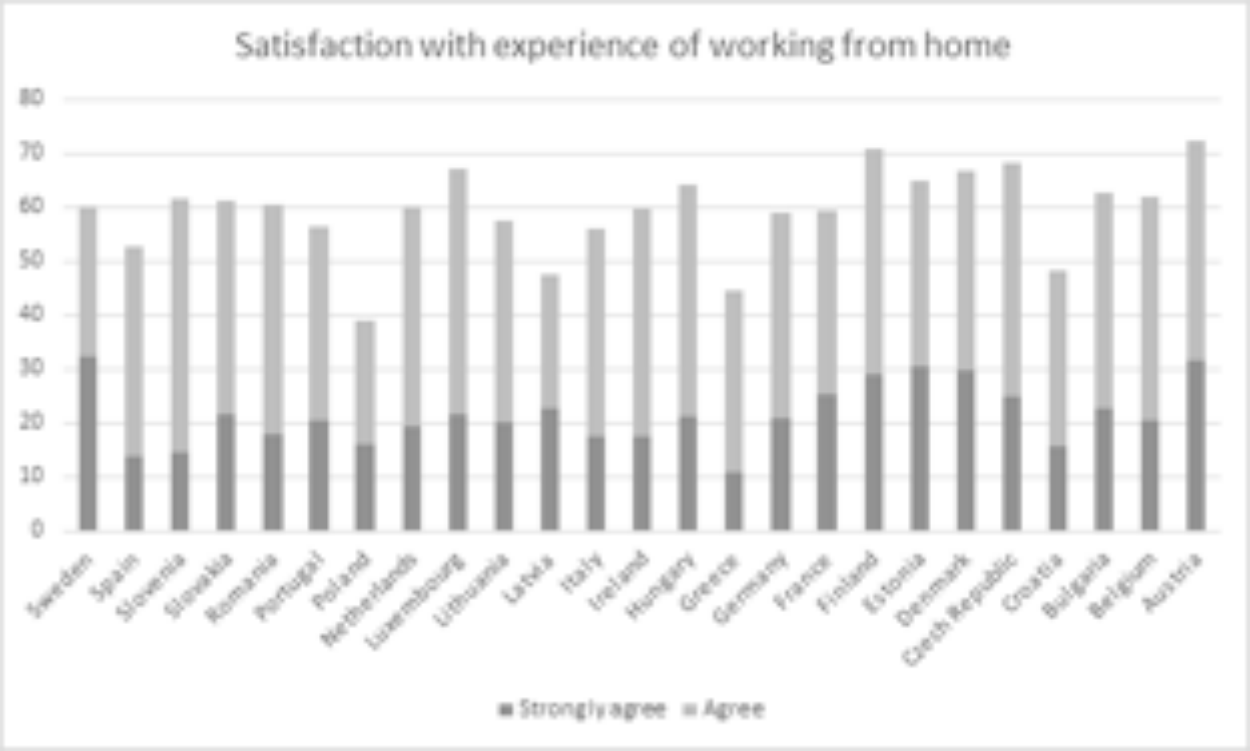

Table 3.7. Satisfaction with experience of working from home. Source: Eurofound (2020b)

Advantages and disadvantages of working from home

For some this change required great demands, while some were highly positive about this transition. There is not always easy to find balance between work and personal life in general, what influence does work from home in order finding the harmony do? How does it affect productivity, communication and teams work in the company? According to Nippert-Eng (1996), it is not easy to find harmony between social, personal, physical transitions between work and home boundaries. Even though many can relate to that, at the same time, there are researches showing positive results. Thus, it is important to discuss those aspects and find out what are the pros and cons for working remotely.

Positive side of working from home

The most important advantage at this state of the pandemic is that working from home highly decreases the risk to be infected by Covid-19 on the way or at working environment (Helsedirektoratet, 2020). No need to commute also saves time, transport expenses and does not demand any specific dress code. The saved time can be used to spend with family, practise hobbies, do sports activities and in this way raise the quality of life. Another aspect worth to mention is various flexibility. Working from home could provide more freedom to perform work tasks at different time sheets than the traditional office working hours allows. It also gives

flexibility as a worker is not tied up to one precise place. So, they can not only work from home, but at any other place of preference. At this point the only things one need is necessary equipment and internet connection. Remote work could also be more effective because people cut social meetings and many coffee breaks. After relocating so many workers to work remote, in many places around the world, it was also seen positive effect to pollution, traffic, even though at this point of time it was not the main reason to move to remote work (Jae Ju et al, 2020).

Negative side of working from home

Even though it could look that work outside the office environment can be good, there are downsides of it too. Remote work brings challenges. Those, who were not working from home before, can feel the hardest impact and the time needed to adjust. There are many opportunities to be disturbed and one needs to be very good at finding motivation and organizing their time. Working outside the office can lead to loneliness, especially after not having the feeling that one belongs to a group and missing the social interactions with colleagues.

A recent study of the emotional wellbeing of private-sector employees working from home during Covid-19 analyses what impact does working from home do to the employee's wellbeing. Wellbeing, also described as satisfaction, happiness, healthiness, according to PERMA model, has five core elements: positive emotion, engagement, relationships, meaning, accomplishments (Seligman, 2011). At this point, it is essential to understand the importance of employee's wellbeing as it can have direct impact how good employee perform work related tasks. It is said that positive relationship with colleagues is one of the things which is very beneficial for the organization (Kun, 2016). Thus, working alone outside the office environment, without having daily interaction with colleagues, could make it harder to communicate and make decisions. Another important factor is the difficulty to separate and find balance between work and home life, as employee is always at 'work'. This could also affect employee in a way that it could get hard to not being able to unplug from work modus when work time is over.

There are also many of technical issues as it may be not that easy for some business to provide all necessary equipment as computers, keyboards. It is also essential to ensure that everyone has a decent connection, in order to work productively and efficiently.

According to Malecki (2020:10), “we have witnessed the creation of the largestever global remote workforce.” In his article he discusses data security risks and is the data safe when employers work from home? It was found that only from 2020 February-April cyber-attacks to financial sector boosted by 238% (Malecki, 2020). This shows that personal data of business needs to have a stronger protection and is at higher risk while so many are working remotely. In order to secure working environment, it is recommended safeguard infrastructure, employees should communicate safely, secure the network, contact IT support teams in case of doubts (Malecki, 2020).

The concept of environmental concept may need to be analyzed regarding the home as a place for work. As this concept looks at psychological, functional and physical comfort of the worker (Vischer, 2007b) it is important to understand whether work from home could guarantee the overall wellbeing of employee. Remote work can bring some functional troubles as everybody needs to have the necessary tools to perform work related tasks. Thus, it is very important that the management provides their workers with all necessary equipment. The concept of environmental comfort also claims that the environmental conditions are suitable. However, work from home can also cause problems as it could have higher degree of noise, for instance, related with kids staying at home all day, or not having big enough space at home to perform tasks, which all disturbs the workers and influence their quality of work.

What have we learnt from this pandemic?

As it was seen from the survey results, during the last months, work from home increased rapidly in many countries. Is remote work a future? The present health situation related to Covid-19 could require minimum physical contact so working from home can exist for a longer period or even permanently. Thus, the policy makers should ensure that the workers are supported and all their needs are covered. Employers should also carry responsibility and ensure that the staff is well organized and the work from home model works well. Another important aspect is that usually remote work is suitable for high educated highest income professionals so it can be said that inability to remote work brings some level of inequality. Thus, it is important to find ways to minimize this inequality in the highest degree.

3.3.4 The office during and after Covid-19

After the covid-19 outbreak spread throughout the world, offices had to close, and workers

were ordered to work from home. Cities that normally were affected by people rushing to work and home from work, were suddenly completely absent from this. The work offices were people were co-working, gathering for a social coffee break and working together in a more open landscape, were suddenly replaced with social distance and communication through digital platforms. The pandemic has made several changes in how we work, and maybe after this pandemic is over, there may be new changes and changes that we take with us further. Questions that arise from this situation is, how can we improve the office in the way that makes it safe for people to return and how will the office look like after Covid-19? These questions are something that many people are wondering about and working on. Different companies may adapt different solutions to these kinds of problems. History has thought us that the same solutions probably will not consequently work for everyone.

Answering such questions is all about predicting how the future will look like also called forecasting. In Randers (2012) book "2052*: a global forecast for the next forty years: a report to the Club of Rome commemorating the 40th anniversary of The limits to growth"* he is forecasting "the most likely global future to 2052" (p.2). In this book he is using his knowledge and expertise to give an answer to this question, although he understands that the right answer is impossible to achieve. This answer lies in the future. He also highlights in his book that his forecast will have other uses, such as that people think differently and draws different conclusions (Randers, 2012, p.2). This is the same for the questions that are linked to the office, people will come up with different solutions or draw different conclusions, but the answer lies in the future. What we understand from forecasting is that without it we would probably never get a suited solution. The best solutions come from different people working on solving the problem and tries to find an answer to problems that we do not know the answer to right now.

The Covid-19 situation has thought us that we must consider the role that the office should play now and in the future. The offices must rethink their strategy and make it safe for people to return. In order to achieve this, we must use our creativity and start thinking in new ways (Boland, Smet, Palter & Sanghvi, 2020). Examine the role of the office before the pandemic, is an essential part to help us understand how we can use this to change the role of the office. Before the pandemic companies' wisdom of the office was that it was a place that was critical to culture, productivity and winning the war for talent (Boland, Smet, Palter & Sanghvi, 2020). The office has also moved to a trend of working in a more open-plan landscape rather than a closed-plan landscape. It is also important to look at the implementation of long-term solutions

to prevent the spread of Covid-19 and other disease in the office.

Open-plan offices

An open-plan office is often defined as a space were the barriers between the employees that are working in the same space are limited. Despite the lack of a standard definition, this is often the idea that people have in mind of the open-plan office (Gibbens, 2020). Positive effects from working in an open-plan office is that it makes the communication between the employees easier, makes it easier to exchange thoughts and ideas and has a positive effect on the social interaction between employees. Even though open-plan offices have positive effects, cases are showing us that the risk of getting infected by the Covid-19 virus are high. A recent case from a call centre in an office building in Seoul, South Korea where they tested 922 employees, 201 residents and 20 visitors a total of 1143 people for Covid-19, they found out that 97 of these people tested positive for Covid-19. The most interesting with this case is that 94 of the people that tested positive worked on the same floor in the building, and the total people working on that floor were 216 employees. This shows us that 43,5 percent of the people working on one floor tested positive for Covid-19. The people that worked in the office building were also interacting with other people in the elevator and in the lobby, but the spread of Covid-19 was almost limited to the 11th floor (Centers for Disease Control and Prevention, 2020). This can also show us that factors like the duration of contact one has with other people may be one of the main factors of spreading the virus further. The barriers between the workers that were infected were also almost absent, and they worked in an open-plan office (Centers for Disease Control and Prevention, 2020; Gibbens, 2020).

Table 3 8. Case form a call center in Seoul. Source: Centers for Disease Control and Prevention (2020)

To get a grasp on sickness absent related to an open-plan office, an interesting view is to look at studies that has been conducted in relation to this. A study from Norway from November 2004 to 15 December 2014, where 97 organizations participated and 6328 respondents, which examined the sickness absent related to working in a cellular office (56.5% of the respondents), shared office (27.1% of the respondents) and open-plan office (16.5% of the respondents). Employees that worked in shared offices had 18% higher risk of sickness absent than cellular offices and open-plan offices had 12% higher risk than cellular offices. This was only based on medically certified sickness absence. The limitation with this study is that they did not have the information behind the reason for being sick and how many employees that shared the same office (Nielsen & Knardahl, 2020).

What we can take with us further form this study in Norway is that since there is a higher risk rate of sickness absent related to working in an open-plan office or a shared-office, we might be able to draw a line from this related to the Covid-19 virus, that it will probably not reduce this rate, but it might actually increase it. The reason for suggestion this is that we know that the virus is easily spread when the barriers between people are limited and the example above from South Korea shows us how easily the virus is spreading through an open-plan office. It is important to notice that we cannot conclude on this, because this will be shown better in the future when more research and studies are conducted. Down below is an example from Vitra on how you might be able to work in an open-plan office when considering the Covid-19 restriction.

Vitra which is a design company has given an example to illustrate how an open-plan office could look like before Covid-19 and how it could look like after making it corona safe. The total space is 371 sqm and is the same for both.

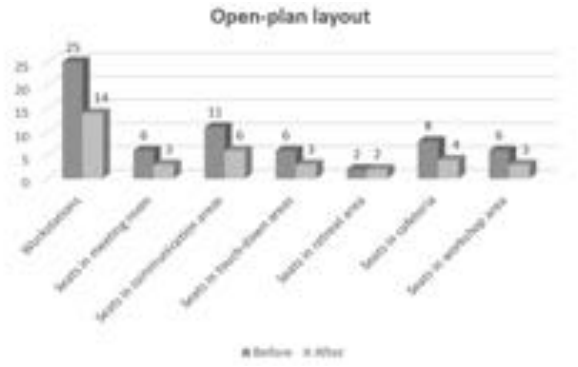

Table 3.9. Open-plan layout. Source: Vitra (2020)

Table 7. shows us that before the implementation of corona restrictions the same office could have 64 people at the same time. After making it corona safe, only 35 people could be in the same office, this means that you must reduce the people working in the same office at the same time with 29 people. Important to note is that this example gives an illustration of the same office layout and there have not been any changes related to the office more than what is required for making it safe (Vitra, 2020).

The role of the office during and after Covid-19

The population is growing each day and so are high-rise buildings to fit the growing population. Architect and urbanist Constantine Doxiades states that looking back to the past the most successful cities where those that both the buildings and the people were in a certain balance with the nature. In these days high-rise buildings is more working against the environment (Roaf, Crichton & Nicol, 2009). One example that support this is that there have been several court cases, which states that these tall buildings are blocking the light and increases the temperature in the cities, and there has been proposed that such buildings should not exceed 30 floors (Roaf, Crichton & Nicol, 2009). Since different crises in the history has been a part of big changes, this pandemic might also lead to new changes. High-rise buildings are often related to the place where the offices are, and because this pandemic makes it hard to work in the office, we might learn from this and see fewer high-rise buildings in the future. This can be seen through that the role of the office might never be the same after the Covid-19 pandemic, different requirements need to be considered when using the office during the outbreak and some we might have to take with us further after the outbreak. This pandemic may be the start of viewing the office differently but also using it differently.

The concept of environmental comfort may need to be considered when examining the role of the office. Considering psychological, functional and physical comfort to ensure the safety of the workers, let them be a part of the decisions and give them the right tools that they need to do their work tasks (Vischer, 2007b). Ensuring environmental comfort may be more important during the pandemic, to first ensure the safety at the office, but also let the workers have more control related to whether they want to work at the office or at home and let them be a part of finding solutions to problems that arise. This may help in reduce stress related to office and the risk of being infected by the virus. Considering this may ensure environmental comfort at the office.

A global survey conducted during the weeks of 1 June and 8 June by PwC which included 989 respondents who were finance leaders to identify the impact from Covid-19 on businesses and economy. The respondents that participate were from 23 different countries and territories: Central and Southern Africa (Ghana, Kenya, Mauritius, Namibia, Nigeria, South Africa, Togo, Uganda and Zimbabwe), Brazil, Caribbean (Bahamas, Barbados, Bermuda, Jamaica and Trinidad), China/Hong Kong, Cyprus, Denmark, France, Germany, Greece, Ireland, Japan, Lithuania, Malaysia, Mexico, Middle East (Bahrain, Egypt, Jordan, KSA, Kuwait, Lebanon, Oman, Qatar and UAE), Nederland's, Portugal, Singapore, Sweden, Thailand, Turkey, US and Vietnam. One of the questions that they asked were focusing on the safety and new ways of working (PwC, 2020).

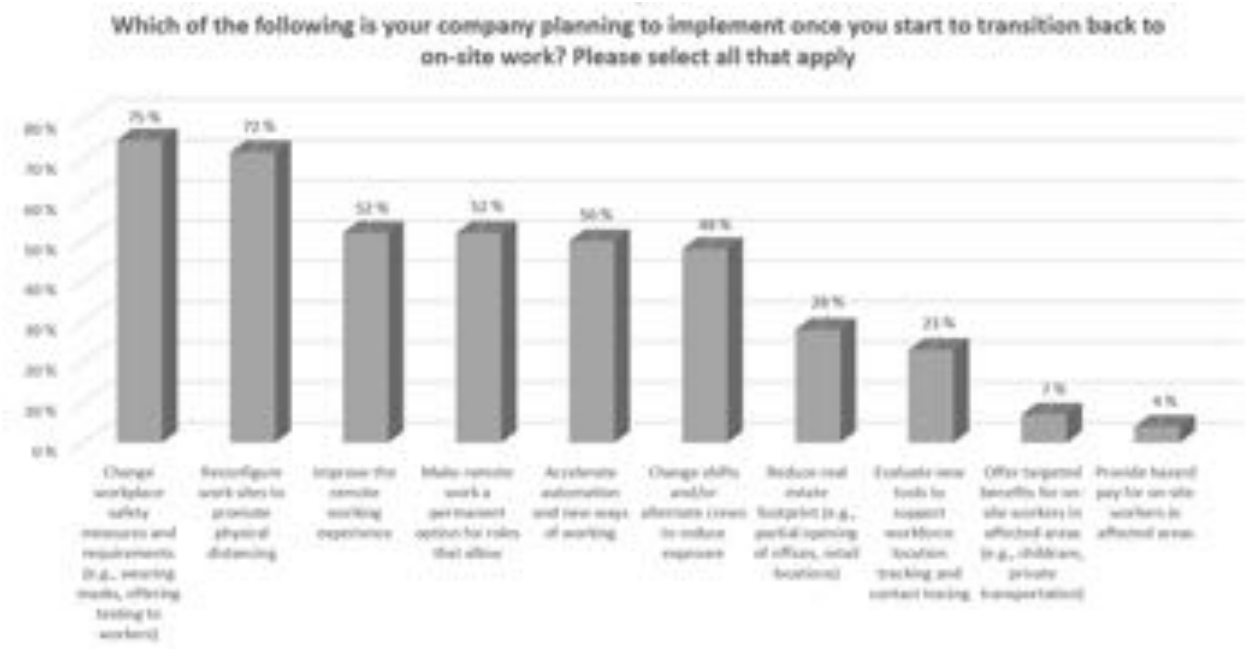

Table 3.10. Source: PwC, COVID-19 CFO Pulse, 1-11 June (2020)

One other survey also conducted by PwC between May 29 and June 4, 2020, were they asked 1200 US respondents that worked in public or private companies in three sectors: media and telecommunications (29%), financial services (42%) and retail and consumer products (29%). All the employees were office works and were also working remotely during the survey (PwC US, 2020).

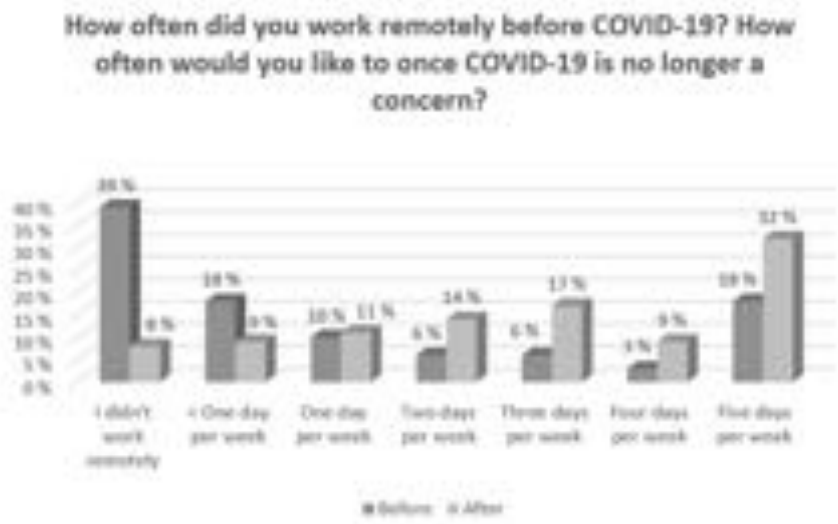

Table 3.11. Source: PwC US Remote Work Survey (2020)

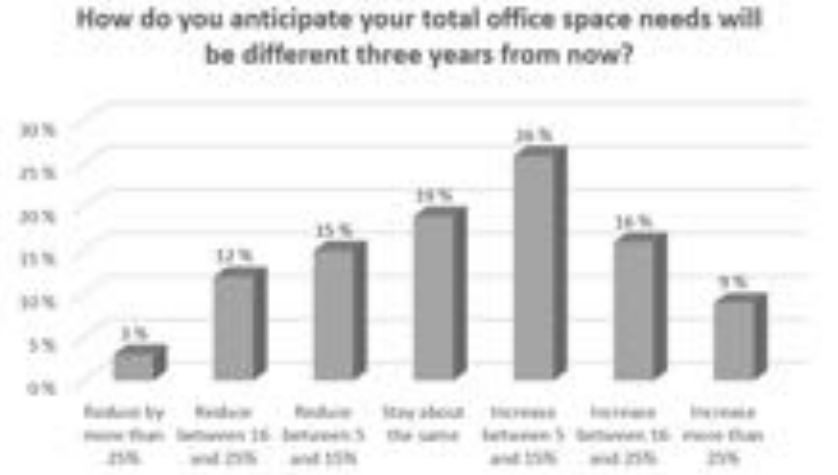

Table 3.12. Source: PwC US Remote Work Survey (2020)

Table 8. shows us that 75% of the respondents wants to implement changes regarding the safety at the workplace. 72% wants to focus on reconfigure work sites, which than makes it easier to keep distance when the workers return to the workplace. It also shows that the focus on working remotely will still be relevant and that 52% wants to implement this solution permeant. From Table 9. we see that 83% of the respondents wants to work remotely one day per week or more compared to 61% before. From Table 10. we can see that 30% anticipate that we will reduce or total office space and 51% anticipate that we will increase or total office space. What we cannot see from this diagram is that those that answered that it will increase, anticipate that this will be related to keeping distance and safety requirements (PwC US, 2020). These three tables show us that which role the office will have is still unclear. In the survey from PwC, it is written

that the employees will not return to the same office and because of that it will requires new ways to connect and collaborate. It is also important to consider the well-being of the employees that are going to work from home and ensure the safety of the people that are going to use the office (PwC US, 2020). One of the main tasks during the outbreak is to implement organizational health and safety policies, which focuses on the different needs of the people working at the office (Shaw, Main, Findley, Collie, Kristman & Gross, 2020). Focusing on the safety and the health of the employees now and after Covid-19 will help improve the human condition at the office. Down below are examples on how to reimagine the role of the office.

Looking at how we can use the office differently is something that each individual company/organization needs to consider for them self. After being forced to work remotely new opportunities appear, and companies/organizations should consider which of these solutions that may be suited to develop further. Reconstruct how organizations are working and use the office for example in the start of the planning prosses of a project, and then switch to work remotely afterword's. This opens the opportunity for people to live in other cities than the city that they are working in (Boland et al., 2020). By doing this we are spreading the people over the countries and not gathering all of them in the heart of the cities. Collaboration between workers is the focus in many organizations. One idea than is to change the workspace into rooms that is more devoted to being used for collaboration and not use the workspace for individual work (Boland et al., 2020). As mention above these are just suggestions on how the role of the office could be. Some organizations may find it difficult to change the use of the office because of the work tasks that needs to be done, others might want to implement some changes. This we do not know the answer to right now, further research must be done in advance here.

Long-term shifts to prevent the spread of Covid-19 and other diseases

Looking at the long-term shifts that may be adopted in a post-covid-19 world, we must consider how we can make the environment a more antivirus-built environment. These days architecture, urban planners and designers are trying to come up with solutions that can help to cope with the challenges that we are now facing during this pandemic. Previous infection diseases have transformed cities in the way that we can ensure the safety of the people, cities are being shaped by diseases (Megahed & Ghoneim, 2020). The task is to find these solutions that can be implemented permanently, and which also can prevent the spread of Covid-19 and other disease, which than can make it safe for workers to return to the office. Such solutions are not

that easy to implement, because it takes time and are affecting the whole infrastructure of the office building.

One of the post-coronavirus principles that may be implemented is the focus on "contactless pathways" which is minimizing the use of hand touching on the surface in the offices (Wainwright, 2020). According to Megahed & Ghoneim (2020) touching surfaces that are polluted is transmitting 80% of infection diseases, so to be able to avoid such contact can help minimize the spread of diseases. This mean that you are going to be able to navigate through the building without being forced to touch the surfaces. The idea consists of using the smartphone to help call for the lift, which results in that you do not need to push the bottoms. Also, the office doors are going to open automatically with the help of sensors and facial recognition (Wainwright, 2020).

A key factor to prevent the spread of Covid-19 is to ensure fresh air in the office. This can be done as easily as ensuring good ventilation, which you can get by simply open the windows. This is not as easy as it sounds, because many offices have windows that are sealed (Kretchmer, 2020). Then it becomes important to maintain good ventilation systems in the room. According to Centers for Disease Control and Prevention (2020) poor ventilation in an indoor environment increases the risk of getting infected by the virus. A study from Taipei university in Taiwan regarding a tuberculosis outbreak showed that improving the ventilation systems to lower the CO2 levels reduced the outbreak. Government agencies are recommending that the indoor air quality at a workplace has CO2 levels of 600- 1500 ppm (Du, Wang, Yu, Chiu, Wang, Chuang, Jou, Chan & Fang, 2019). Focusing on improving the ventilation systems may help in preventing covid-19 and other diseases from transmitting, but it is important to keep in mind that all studies has limitations. It is not easy to conclude that the only reason behind a reduction in an outbreak is improving the ventilation system. It may only help in preventing further transmitting.

What can we learn from this pandemic and what can we take with us further considering the use of the office?

These questions are not easy to answer, because we do not now the full outcome of the Covid-19 pandemic. What we do now is that one of the main factors that must be prioritized is the safety of the people working in the office, and that the implementation of solutions that are minimizing the risk of infection can help make the office safe. Examining the open-plan office

to see how we can change it or use it differently to make it safe should be a priority. Maybe this pandemic is the end of open-plan offices and that we will go back to work more in closed-plan offices if we cannot find the right solutions to implement, to make it safe.

3.3.5 Efficiency, productivity, and the environmental aspect

In this part of the paper, we will focus on the efficiency and productivity of home office, as well as the consequences this entails for the environment. The reason for focusing on efficiency, productivity and environmental consequences is due to the opportunity to develop and mapping new methods, patterns, and habits for how we carry out work. Perhaps there is a lesson we can take with us into the future that can benefit both the environment and society. In in the beginning, we introduced the concept of environmental comfort (Vischer, 2007b). This is a theoretical framework that can help to understand the effects of Covid-19, and help to determine which degree psychological, functional and physical comfort impacts the employee. In this first part in this section, the functional comfort will be addressed in relation to Covid-19.

Efficiency and productivity

Cambridge Academic Content Dictionary (2020) defines efficiency related to work as *"a situation in which a person, company, factory, etc. uses resources such as time, materials, or labour well, without wasting any"* and defines productivity as *"the rate at which a person, company, or country does useful work"*. So, efficiency and productivity can be used to measure how the workers utilize the time on their hands to finish projects, tasks, or other labour. The question we then ask is: can home office lead to more efficient work or not? There will of course be underlying factors that come into play. Because of this, the result will not be indisputable, but a supplement of statistics to the discussion.

Findings from TØI (2020), based on data collected in Oslo and surrounding areas by Kantar AS, show that people are more efficient now after the summer of 2020 than when Norway closed in April 2020. In April 52% answered that they still worked efficient from home, while after the summer 74% said that they are as efficient or more. These numbers can be explained by the fact that after the summer more people were back in the workplace and thus the proportion of people with home offices decreased, and those who still had home offices then had set up routines. Statistics from Opinion (2020) show that one out of three had home offices in September 2020, in contrast to the period, in March and April there were six out of ten that

said they had home offices. On the other hand, now in November 2020, with the infection on its way up again along with the flu season, the amount with home office could increase (Opinion, 2020).

The numbers above show that working from home in this area have not led to an excessive decline in efficiency. Some studies also suggest that productivity can increase when working from home. Stanford-professor Nick Bloom et.al (2015) is an example of this. In this study, it was shown that the productivity increased by 13% when working from home. The study was done by analysing a company where half of the 16.000 employees were to work from home. Positive conditions that were highlighted were a greater focus on the work tasks, less disruption and less sick leave (Nicholas Bloom, 2015).

Although the study from Nick bloom et.al. (2015) indicates that working from home can have a positive effect on employees, Nick Bloom (2020) argue that the global pandemic deviates from this result. In an interview with Stanford News from March 30, 2020, he presents 4 factors that are the reason for this statement: children, space, privacy, and personal choice. The biggest factor is that many parents with young children have had to manage their kids at home during working hours. Bloom (2020) points out that a well-functioning home office is depended on that the children are at school or at other institutions. Another key factor that Bloom (2020) highlights is space. In his study Nick Bloom et.al. (2015) only employees with undisturbed access to a home office were given the opportunity to work from home. Additionally, the personal choice is the final factor that Bloom (2020) mean makes this situation different.

As shown, the productivity and efficiency at home offices are depended on some crucial factors. Also, the result of home offices will vary in any case, based on economic and social conditions. What the efficiency and productivity of working from home could teach us, is that the element of working from home could prove to be a measure against the environmental challenges we face and result in socio-economic gains.

Hilde C. Bjørnland, professor at BI Norwegian Business School (2020) argue that the discussion of working from home should not be focused on efficiency and productivity alone, but also raise fundamental question about how to organize work after the pandemic. In an article in Dagens Næringsliv (DN), she points out four reasons for this. First, a reduction in employees commuting could contribute to less pressure on public transport. Which in turn can lead to lesser spread of diseases and therefore have a positive effect on the sick leave. Secondly, a

larger share of home office can lead to environmental gains through less private transportation and the prioritization of digital meeting rather than travels. Thirdly, a larger share with home office may lead to changes in settlement patterns, which in turn will lead to less pressure in the city centrum. The last effect she mentions is the time saved from travels that can be redirected onto other activities (C.Bjørnland, 2020).

The environmental aspect

It is logical to think that the pandemic will lead to an environmental gain and a lower consumption of energy. Based on recent studies, it appears that the benefits may be fewer than first thought. Even with a global work-from-home movement, a recent article published in IOP Science show that energy savings are small or non-existent. In fact, the consumption might have increased (2020). For example, in June 2020 the residential energy consumption increased by estimate of 6-8% in the United States, compared to June 2019 (2020).

The report from Andrew Hook et.al. (2020) is based on findings from 39 international studies, and in 26 of the studies it appears that home offices have a positive effect on energy use through reduced travel and energy use in offices. However, when a larger proportion of factors are included, such as non-work travel and residential energy use, energy savings are reduced. According to the report, there is too much uncertainty about the total impact of home offices have on the environment. One example of this is the discussion with less numbers of commuters, but which turns out to have a smaller impact than expected. This is explained by the fact that the time saved by working from home is spent on other activities that also includes travel (Andrew Hook, 2020).

Another important argument that appears in the report is that it is too easy to assume that teleworking is a more sustainable solution. A positive effect on the environment will not be a reality unless employees fully commit to the working-from-home model. Otherwise, many potential sources of environmental gains will disappear (Hook, 2020).

The consequences of a global work-from-home movement and national lockdowns have led to many empty offices and other commercial buildings, which in turn could mean a fall in energy consumption. According to a report from EIA (2018), electricity and natural gas is the most common source of energy in commercial buildings. Furthermore, there are also district energy systems that supply heating and cooling to a group of buildings. These energy systems are

powered by fossil fuels. In table 11 we see the amount of major energy sources used in commercial buildings in 2012 (U.S. Energy Information Administration, 2018).

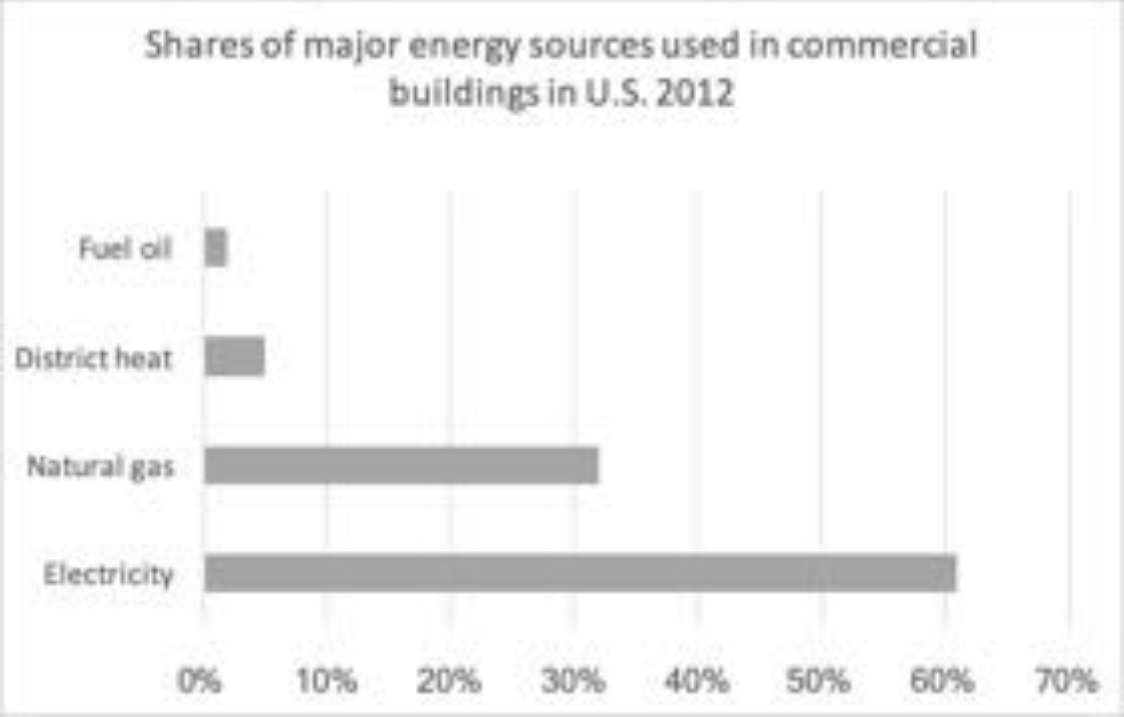

Table 3.13. Source: Energy information administration (2018)

As mentioned earlier, electricity and natural gas make up the largest share of energy sources in commercial buildings, which is shown in table 12. Here we see that in 2012 electricity constituted for 61% of the energy supply in commercial buildings, with natural gas as the see second with 32% (U.S. Energy Information Administration, 2018).

In table 12 the different consuming categories of electricity are shown. As we see, lighting, refrigeration, ventilation, and cooling make up the largest electricity use in commercial buildings with 17%, 16%, 16%, and 15% respectively. The category all other constitutes for 18% and includes the use of air compressors, process equipment, pumps and this includes some of the base load. Even if buildings are empty, most of them will run with something called base load. These are systems that run 24 hours a day and include emergency lights, telecom, data systems and servers (R. Segars, 2020).

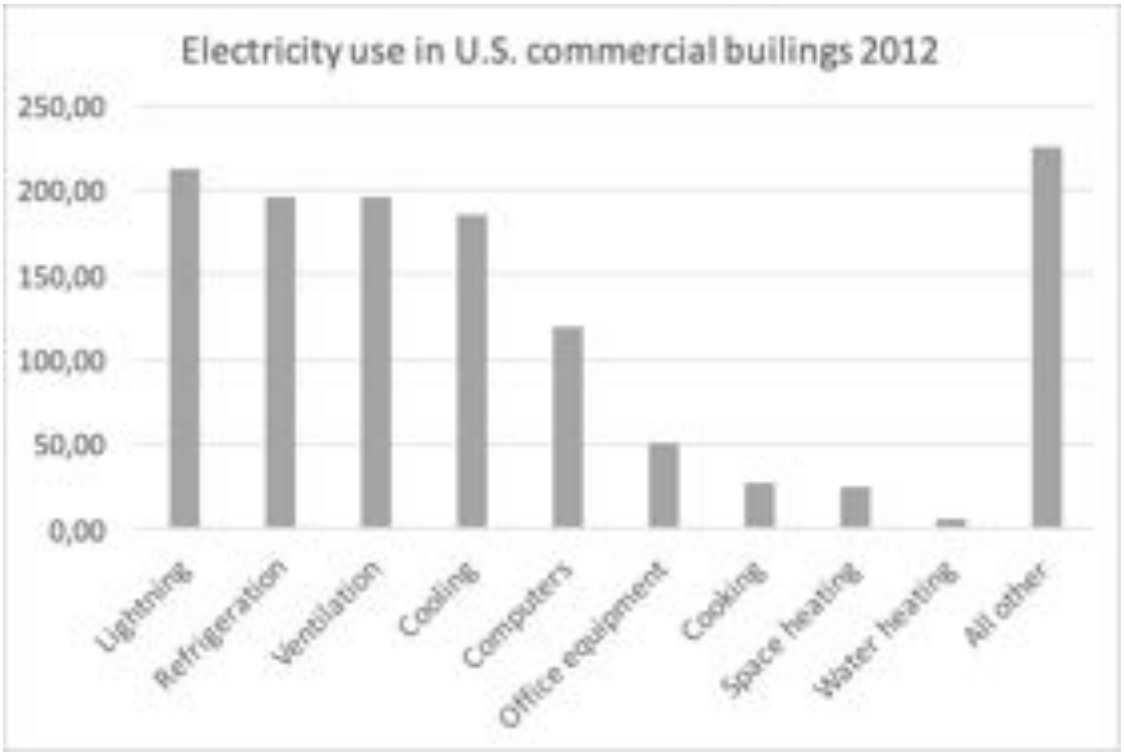

Table 3.14. Source: Energy information administration (2018)

So, are there any environmental impacts from the global lockdown and work-from-home movement? First it will be appropriate to look at the emission numbers before the pandemic. In a comprehensive study conducted by Mengxue Lu and Jospeh Lai (2019), they argue that studies about carbons emission from commercial buildings have not led to consensus among researchers (Mengxue Lu, 2019). Further they say that they have not been able to find any specific statistics on carbon emissions from commercial buildings. However, statistics on consumption was obtained. Findings from their study show that in 2016, the commercial buildings accounted for 450 Mtoe (Million tonnes of oil equivalent) in the U.S. (Mengxue Lu, 2019), which is equal to 5233500000 MWh. According to EIA (2018), the amount of CO2 produced per kWh will vary due to the source of the electricity, but also the conditions of the climate (EIA, 2018).

Further we can see that in a study by Kenneth T. Gillingham (2020), where he explores the short-term and long-term effects on energy consumption from Covid-19, it appears that the largest decline in energy consumption during the pandemic has been in demand for jet fuel and gasoline. This with a reduction of respectively 50% and 30%. This numbers are explained as a cause to the decline in the transport and travel sector. In contrast, other sources of energy have experienced a slight decline. The use of natural gas in commercial buildings has decreased by 20% and electricity with a decrease of less than 10%. Kenneth T. Gillingham (2020) argues

that the reason for a low decline is because of the demand for electricity in residential homes as people have been spending more time at home (Gillingham, 2020). In addition to this, Zhu Liu et al,. (2020) research matches the result from Kenneth T. Gillingham (2020) study. Results from their study display no substainstial change in consupmtion of commercial buildings during lockdown periode (Liu, et al,. 2020).

Based on the findings, it seems primarily that the pandemic has not led to an excessive decline in efficiency and productivity among employees, but as Nick Bloom (2020) argues, it will be difficult to say anything for sure considering all external factors. Furthermore, Professor Hilde C. Bjørnland (2020) points out that the discussion should not just emphasis on how we manage to recreate ourselves with home offices, but to focus on the socio-economic gains which we can take learning from.

As shown in this chapter, there is little to no effect on commercial buildings energy consumption because the consumption has only moved from one place to another. Statistics from EIA (2018) illustrated that electricity and natural gas account for the largest share of energy used by commercial buildings. But the study by Kenneth T. Gillingham (2020) displays that the overall decline in electricity and natural gas is relatively low. However the situation has contributed to research, and commenced new studies about emmisions related to commercial buildings which could generate new ideas for the future.

3.4 Conclusion

Working from home will may be developed further in the future, so policimakers should be aware of it and work towards reducing the inequality and challenges it can bring. Those who are returning to the office needs to be ensured that safety is prioritized and implementations of solutions to reduce the risk are established. From an environmental perspective, studies indicate that the global work-from-home movement and emtpy workplaces has not yet turned out to display any distinct changes in the emissions transmitted from commercial buildings. After the crisis, society should reconsider the wages and status of many occupations. Healthcare professionals and other essential employees have shown tremendous loyalty. Therefore, they deserve to get a better treatment and working condition.

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BYG655 – Autumn 2020

04.
TRAVEL

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Abbreviation	Explanation
CO_2 eq.	Carbon dioxide equivalent
Mt	Million tonnes 10^6 kg
Gt	Giga tonnes 10^9 kg
g CO_2/p-km	Gram carbon dioxide per person kilometre
kWh	Kilo watt hours
BEV	Battery electric vehicle
PHEV	Plug in electric vehicle

4.1. Introduction:

The outbreak of the global pandemic, COVID-19 on 11th March 2020 has affected people's daily lives. During this period, it was also possible to see how human activities directly influence the global environment. This paper will focus on the impacts from the transport sector, where people's behaviour and transport energy use patterns has been changed due to the virus. As a result of different governmental restrictions and concerns about spreading the virus, there was a substantial change in terms of transport related greenhouse gas emissions (GHG) and global mobility. In 2019, the world`s daily emissions were approximately 100 Mt CO_2eq per day, while in early April 2020, this number fell to 83 Mt CO_2eq per day, which is a 17% drop. Some countries saw a drop of as much as 26% on average during the peak of the lockdown. This reduction was larger than during the financial crisis of 2008, the oil crisis of 1979 and even World War II. As part of these changes, the transport sector, including road, aviation, maritime and rail transportation have all been influenced significantly during the pandemic and the statistics show a substantial reduction in global GHG emissions (IEA, 2020).

The transport sector is a large contributor to climate change and air pollution. Most of the emissions from the transport sector comes from burning fossil fuels. During the outbreak of COVID-19, millions of people were forced to work from home and cancel their future travel plans. In addition, roads and airports were close to empty and the demand for oil was reduced (WHO, 2020). According to the International energy agency (IEA) there was a reduction of 5% in global oil demand, which could be linked to the mobility changes happening in the first few

months of 2020. The transport sector handles 40% of final oil demand in the world, and approximate 15% of global GHG emissions (IEA, 2020). It is therefore understandable that when drastic mobility changes are done, such as the pandemic outbreak, it will affect global emissions. The key question is therefore, will these changes in travel behaviours become permanent after the restrictions are lifted? Could the disruptions of current transport pattern help us shift towards more sustainable travel habits? To answer these questions, this paper will present different statistics on pre COVID-19 travel habits, and how these were changed during different travel restrictions around the world. Behavioural tendencies will be analysed, and future demand will be forecasted to answer the main question of this paper:

"Is COVID-19 the starting point of a new paradigm within travel habits, and are these travel habits during the pandemic corresponding to future travel habit goals, both nationally and internationally?"

4.2. Theory – Emissions and Transportation

To understand the impact of emissions from human travel habits, this section will present fundamental theory about emissions and transportation, as well as present the future travel goals. Environmental impacts from the transportation sector are severe, where road transport is one of the largest contributors to global warming through the emission of carbon dioxide (European Commission, 2020). Burning of petroleum does not only increase GHG emissions in the atmosphere but it also creates air pollution, including nitrous oxides and particulates (Perera F., 2018). In this paper, emissions are presented as GHG emission and the unit of measures for this phenomenon is "CO_2 equivalent" (CO_2eq). This is the most used unit of measures when comparing different emissions. This is also the unit measure when referring to GHG (The Guardian, 2011).

4.2.1. Emissions from the Transport Sector, pre COVID-19

According to the scientific publication *Our World in Data*, the total GHG emission in 2016 was 49.36 Gt CO_2eq were 32.2 Gt CO_2eq was energy related (Ritchie & Roser, Greenhouse gas emission, n.d.) (IEA, 2019). Energy related emissions have continued to rise in the previous years, however in 2019 it flattened at around 33 Gt CO_2eq (IEA, 2019). This resulted from a sharp decline in GHG emissions from the power sector because of the expanding role of renewable energy sources and the transport sector switching to more renewable fuel (IEA, 2019). In 2016, the transport sector handled 16.2% or 7.99 Gt CO_2eq of the total global GHG emissions (Figure 4.1). In addition, the transport sector is divided into four subcategories and the split of GHG emissions is presented in Table 4.1 (Ritchie & Roser, Emissions by sector, 2019). It is important to address that these numbers are pre COVID-19 and due to large data sources, different methods are used to gather these numbers. I.e., some distortion of the real world would appear.

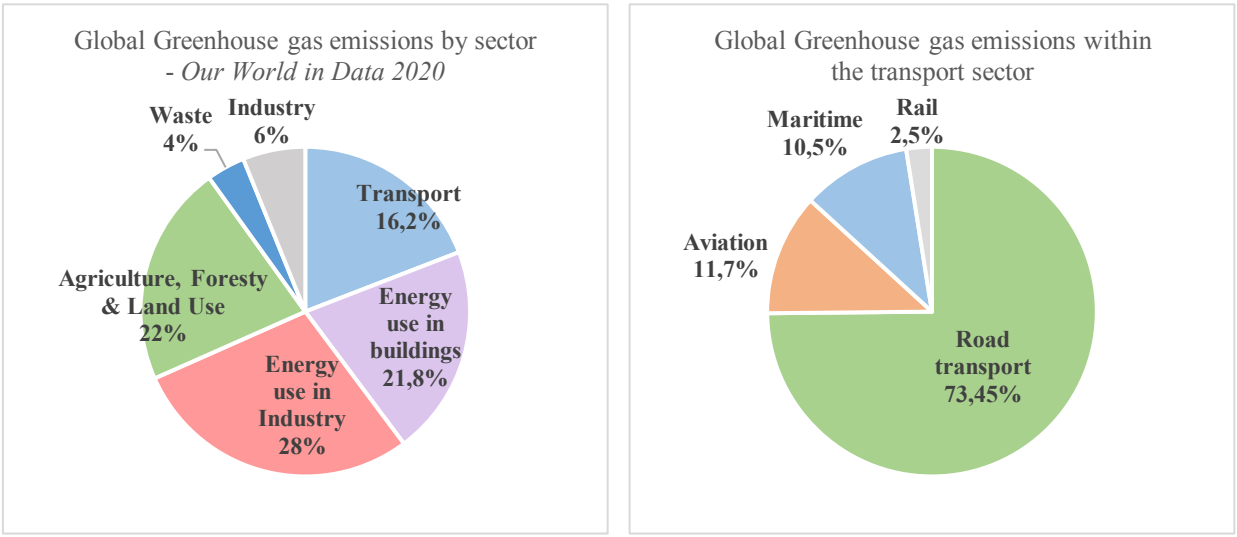

Figure 4.1: Global Greenhouse gas emissions by sector. Source: Climate Watch, The world Resource Institute (2020). Licenced under CC-BY by the author Hanna Ritchie (2020)

Table 4.1 : Global emission from the transport sector divided into mode of transport. Source: https://ourworldindata.org/emissions-by-sector

Mode	Percent (%)	Emissions (Mt CO_2eq)
Road transport	73.45	5874
Aviation	11.7	936
Maritime	10.5	839
Rail	2.5	200

Figure 4.2 shows a comparison between the Norwegian and the European emissions by each transport mode. In Norway, the transport sector accounted for 30% (16.6 Mt CO_2eq) of the total GHG emissions in 2018 (Miljødirektoratet, 2020), and in Europe the transport sector accounts for 22% (946 Mt CO_2eq) of the total GHG emissions in 2017 (eea, 2019). Table 4.2 provides an overview of the percentage and amount of GHG by different modes of transport in Norway and Europe. Note that these figures are without the GHG emission from international aviation and maritime transport. The figures from those two sectors are 158 Mt CO_2eq from aviation and 146 Mt CO_2eq from maritime (eea, 2019).

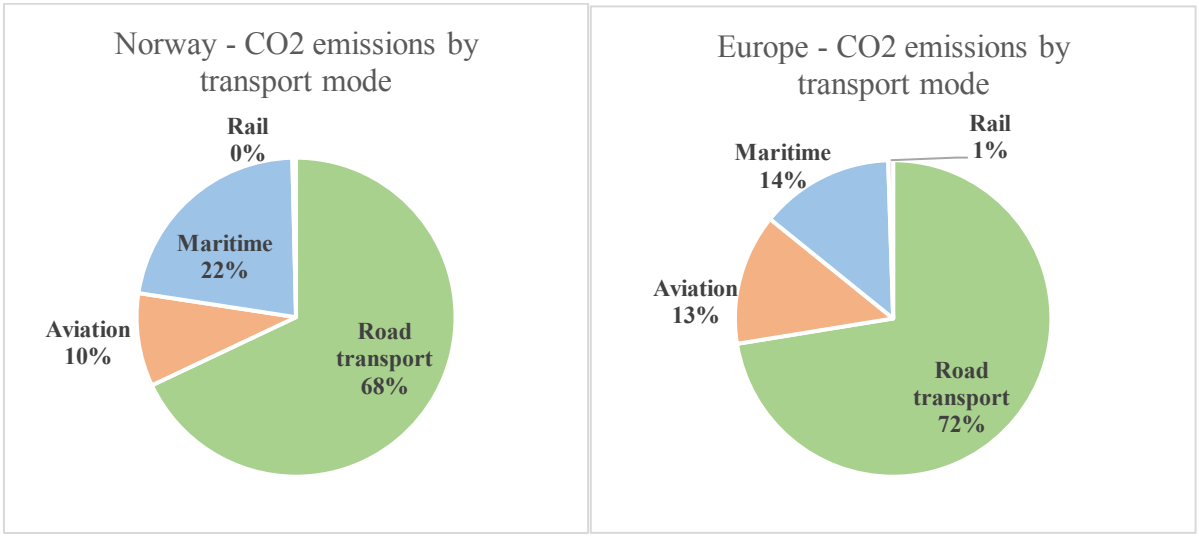

Figure 4.2: Summary of CO2 emission from the transport sector in Norway and Europe (Ritchie & Roser, n.d.) (ATAG, 2020) (Commission, n.d.A) (Helle, 2020)

Table 4.2: Emission by mode of transport in Norway and Europe

Mode	Percent Europe	Mt CO_2eq Europe	Percent Norway	Mt CO_2eq Norway
Road transport	71.7%	678.3	55%	9.1
Aviation	13.9%	131.5	7.7%	1.29
Maritime	13.3%	125.8	19.1%	3.17
Rail	0.5%	4.73	0.3%	0.05
Other	0.5%	4.73	17.9%	2.96

Emissions from Different Transport Modes

When calculating total emissions from the transport sector, numbers are often based on averages. The emissions from each transport mode differentiates and can in addition be presented in different perspectives. For example, a fully seated Boeing 747 emits 79 kg CO_2 per passenger on a 530 km journey, a Ford Mondeo driven by a single driver emits 98 kg CO_2 on the same trip. (Pearce, n.d.). However, if the car was fully seated, each passenger would only emit 19,5 kg CO_2. This illustrates that it is important to consider similar factors and scales to do a realistic comparison and to give an objective representation of the real world.

Research shows that the emissions also differentiate within the same transport modes. E.g., in 1998, new cars had an emission around 203g CO_2/p-km and in 2018 this figure was 170g CO_2/p-km (European Federation for Transport and Environment AISBL, 2018, p. 10). This is because there are different car models with different engine combinations and fuel sources with different emission factor (EMEP/EEA, 2019). The emission factor is the average emission rate of a given source which allows us to convert activity data into GHG emissions (Clim'Foot, n.d.). For this paper, a limitation will be that emissions are estimated and generalised for different means of transport. It is decided to follow the estimation of emission fuel presented in Figure 4.3 when further analysing and discussing the topic of emissions from different transport modes.

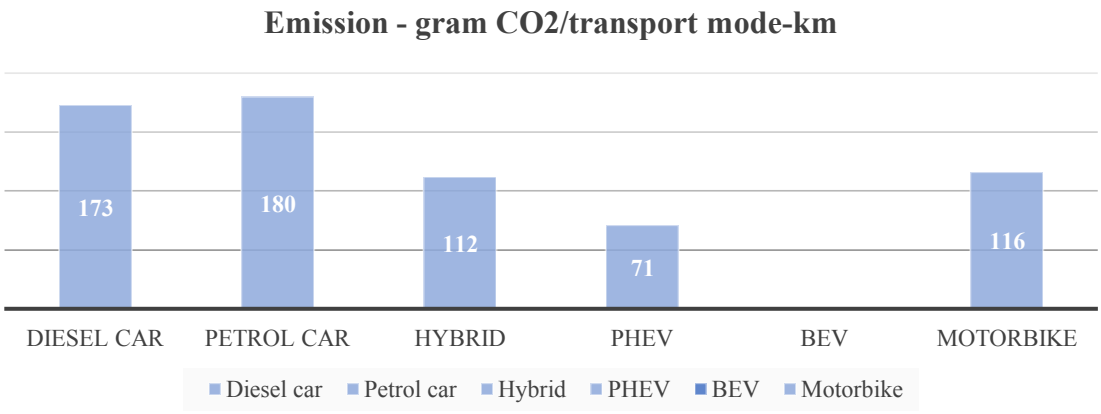

Figure 4.3: Estimation of emission from different transport mode. source https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2019

The figure shows that there is zero emission from battery electric vehicles (BEV), which gives a slight misinterpretation of the realistic emissions. Emissions from the electricity that the car uses are highly dependent on the energy mix where the electricity comes from. For Europe, the energy mix had a CO_2 emission factor of 295.8g CO_2/kWh in 2016 (eea, 2018) and for Norway this factor was 16,4g CO_2/kWh in 2017 (NVE, 2020).

4.2.2. National and International Travel Goals

Greenhouse gas emissions in the atmosphere reached a new historical record in 2019 with 409.8 ppm, and the period from 2010 to 2019 was the warmest decade ever recorded (UN, 2020). In 2016, 195 countries agreed to limit global warming in the following decades and signed the Paris agreement in order to keep the global temperature below 2^{o}C compared to pre-industrial levels. Research has established that most of the emissions reductions needed to meet the Paris agreement targets need to come from GHG emission mitigation that takes place in power generation and end-use sectors (such as transportation, building and industry). To keep temperature within a range that averts the worst climate impact, it is suggested by IEA that transportation emissions need to peak around 2020 (IEA, 2020). According to UN Climate Convention, the transport sector needs transformational changes to meet its emissions reduction potential. This is a call for global climate action in the transport sector. Transitioning to zero-emission transport is an important step towards a sustainable world, but getting there requires a complex improvement, clean fuels, effective vehicles, change in urban planning and how people and goods travel. In addition, each component of the transport system has challenges when reducing emissions, one common issue is that decarbonizing the transport sector requires consumer adoption, decisions from individuals, shipping company managers, fleet owners, and

so on. (IEA, 2019). Figure 4.4Table 4.4 shows how the world is planning to reach net zero by 2050, where renewable energy production and electrification is a key factor.

Plan to reach Net-Zero emission by 2050

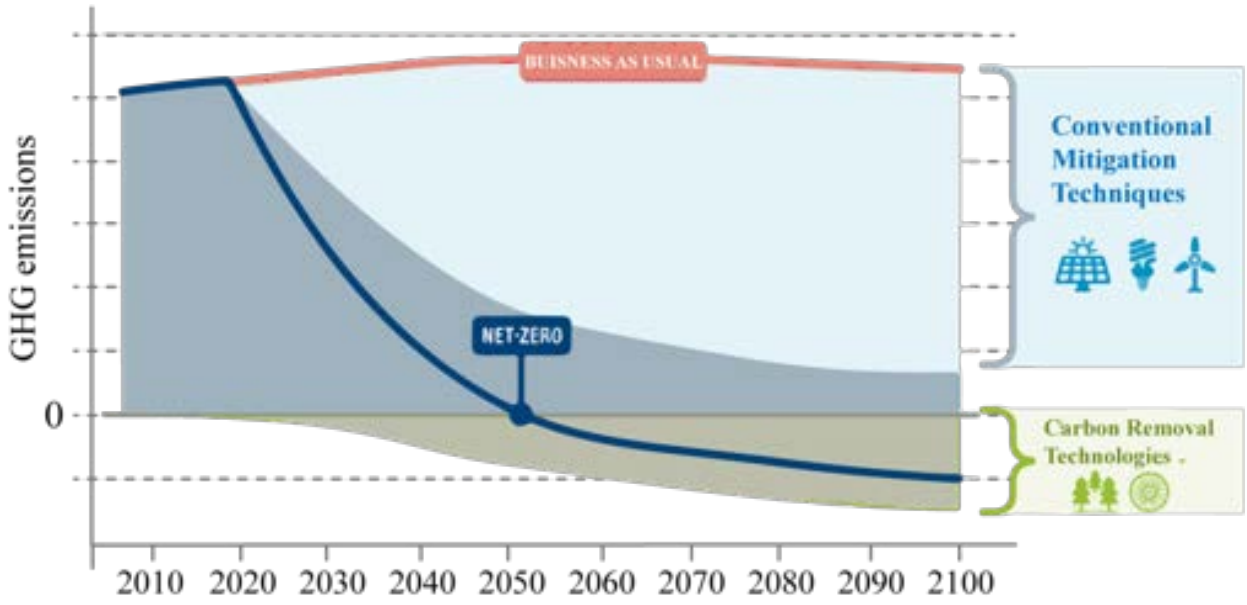

Figure 4.4: Graph showing how the world aims to reach net zero (Source: World Resources Institute, 2020, https://www.wri.org/ndcs)

To meet the goal of reducing global GHG emissions by 40%, each nation that signed the Paris Agreement must submit a nationally determined contribution (NDC) every five years. NDCs include measures, targets and policies and are the basis for national climate action plans. In 2019, 20% of the NDCs submitted quantified mitigation targets for transport. Only a small portion of these include targets for public transport and EVs. It is also expected that each nation should specify transport sector targets and plans addressing the opportunities, not only in their NDCs but also in their Long-Term Strategies. Of the 13 Long-Term Strategies (LTS) submitted, 12 include transport sector strategies; 11 include strategies for electrification, ten for public transport and nine for new mobility. These countries are listed in Table 4.3 (WRI, 2019).

Table 4.3: Countries that has submitted NDCs that includes actions on transport emissions 2019 (Source: World Resource Institute, 2019, https://www.wri.org/blog/2019/10/everything-you-need-know-about-fastest-growing-source-global-emissions-transport)

	Include transport sector measures?	Electrification	Public Transport	New Mobility
Canada, Germany, Japan, Marshall Islands, United States, Portugal	√	√	√	√

Czech Republic, France	√	√		√
Fiji, Ukraine, United Kingdom	√	√	√	
Mexico	√		√	√

The EU

In Europe, the transport sector accounts for around 22% of the GHG and is the main cause of air pollution in cities (European Commission, n.d.C). From the transport sector, 71,7% are emitted from road traffic. The European Commission has developed a mobility strategy, which was adopted in July 2016. The aim of the strategy is that Europe should respond to the increasing mobility-needs for both people and goods, and at the same time consider the global shift towards a low-carbon community. The strategy integrates different measures which support this goal, and the main measures of the strategy are listed below (European Commission, n.d.C):

- Increase the efficiency of the transport system
- Speed up the transition to low-emission alternative energy for transport
- Move towards zero-emission vehicles
- Have a car fleet that only emits 95g CO_2eq for new passenger cars in 2020-2021 (European Commision, n.d.)

The strategy on how to change the transport sector is dependent on the different cities and local authorities. How the nations in Europe encourage different measures, such as the usage of low-emission vehicles, public transport, car-sharing etc. are all important in order to meet the goals of future sustainable mobility (European Commission, n.d.C).

Norway

On a national level, Norway has a goal of reducing the emissions from the transport sector by 50% within 2030 (Regjeringen, 2020). This goal can be met by encouraging transport modes that are more environmentally friendly and with lower emissions, such as electrical vehicles,

bicycles etc., and facilitate in such a way that the transportation need will decrease. More biking and walking will also cause less congestion and local air pollution (Regjeringen, 2020). In Norway the government promotes the selection of zero-emission vehicles (ZEV) instead of fossil fuel vehicles by giving tax relief for people choosing ZEV. There is no value-added tax (normally 25%) or vehicle excise duty which is calculated by the vehicles weight, CO_2 emission, NOx emission and sale volume when purchasing an BEV (Skatteetaten, n.d.) (Norsk elbilforening, n.d.). BEVs only pays maximum 50% of the toll roads fee, ferry fee and the parking fee (Norsk elbilforening, n.d.). These measures make it more cost-effective to choose BEVs.

The national transportation plan (2018 - 2029) has developed some goals for new zero-emission vehicles (Regjeringen, 2020):

- All new private vehicles and light vans must be zero-emission in 2025
- City buses must be zero-emission or use biogas in 2025
- All new heavy vans, 75% of new long-distance busses and 50% of new trucks should be zero-emission within 2030
- The distribution of goods in city centres should become approximately zero-emission in by 2030 (Regjeringen, 2020)

In addition, Norway has a goal to have zero growth in personal transport. The approach to achieve this goal is to preposition for people to walk, bike and use public transport (Trygg Trafikk, n.d.).

4.3. Theory - COVID-19 and Travel Changes

In the previous chapter it was explained that the world is trying to take steps towards sustainable transportation. Mike Hawes, the chief executive of the Society of Motor Manufactures and Traders (SMMT) said in 2019 “The car industry is heading in the right direction, but how quickly we get there is much harder to forecast,” (EC, 2019). During the outbreak of COVID-19 in 2020, we were able to see these quick changes. In this chapter different data and research that has been published during the COVID-19 outbreak will be presented. The pandemic has changed the society and the habits of people's day to day life. After the World Health

Organization classified the outbreak as a pandemic, nations around the world have changed their travel habits to cope with the outbreak (WHO, 2020). In addition, it will be presented the different travel restrictions and changes in travel habits in some countries during the pandemic.

4.3.1. Travel Restrictions

Countries around the world have implemented travel restrictions to prevent the spread of COVID-19. Travel restrictions in different countries varies from airport closures, suspension of incoming or outgoing flights, lockdowns, and other restrictions related to travel (Salcedo, Yar, & Cherelus, 2020). Lastly, more than 90% of the global population lives in a country with COVID-19 related travel restrictions (Salcedo, Yar, & Cherelus, 2020). In this chapter it will be given a brief history of travel restrictions around the world during the pandemic in 2020.

The European Union

On the 17th of March 2020, the European Union declared that they were closing the borders to at least 26 countries, which includes all its members besides Ireland. This was still not a forced decision, as the EU does not have the ability to force the closing of borders, and therefore each country could make changes towards who can or cannot enter the country (Salcedo, Yar, & Cherelus, 2020).

The United States

The US stated on January 31st, 2020 that the virus was a public health emergency. All entries from China to the US within 14 days after the 31st of January were prohibited, except US citizens and permanent residents (Aurbrey, 2020). The residents entering were put in 14 days mandatory quarantine. As from March 19th, 2020 the Global Advisory advised all US citizens to avoid all international travel. Later, on August 6th this was changed to country-specific travel advise from level 1 – 4 where level 1 is “exercise - normal precautions” to 4 which is “Do not travel” (U.S Department of state, 2020)

Norway

On March 12th, 2020, the strongest and most intrusive measures Norway has had during peacetime were implemented. The measures changed the populations freedom, and strongly influenced people's everyday life (Regjeringen, 2020). All kindergartens, primary schools, and

other educational institutions were closed and all cultural- and sports event were forbidden (Helsedirektoratet, 2020). All services with close human contact such as gyms, restaurants, hairdressers, pubs, swimming pools etc. also closed. Restrictions for health personnel travelling abroad were implemented, and quarantine for people travelling into Norway. The public transport was maintained so that people who had important work functions, such as nurses and doctors, could get to work (Helsedirektoratet, 2020). Hence these restrictions reduced the need to travel.

4.3.2. Travel Habits and Changes

In Norway, the society changed overnight, over 870 000 people went from going to school or university every day to staying home and having all their teaching online (SSB, 2019). A survey by *respons analyse* (a Norwegian analytic bureau) showed that the pandemic resulted in more home office, increased use of private cars, and more use of bikes and walks. Over half of all people working or studying say there have been more home office, one quarter use public transport less, and 13% are cycling or walking more (Grøtting, 2020). It is also not recommended to take public transport due to the risk of getting or spreading the virus. Olov Grøtting, the CEO in the Public Transport Association in Norway, points out that if this warning persists, it can have prolonged negative consequences on the use of public transport modes. She argues that more travellers will choose their private cars, even when the conditions are back to normal (Grøtting, 2020).

In addition to everyday travels there was an overall reduction of 36,1% for all travels in Norway from the second quarter of 2020 compared to the second quarter of 2019 (SSB, 2020). In the middle of August 2020, the airplane traffic at Oslo Gardermoen was reduced by 76% compared to the year before (Stave, 2020). In Norway 56% of all flights in 2017 were leisure travel meaning that also business travels are reduced due to COVID-19 (Thune-Larsen & Farstad, 2018).

Internationally there were major changes in travel habits compared to previous years. IEA found in their research that there was a 50% reduction in the global transport activity in March 2020 compared to March 2019 (Sung & Yannick, 2020). During the summer of 2020, people could experience a different holiday season compared to the 'normal', where only some countries had open borders, and these changes were dynamical. Despite some people travelling abroad, most people travelled domestic during their holiday (Visit Norway , 2020). This

resulted in that ticket sales of commercial flights internationally were reduced by almost 75% in April 2020 compared to same period in 2019 (Sung & Yannick, 2020).

In the US there are statistics of how COVID-19 changed the travel habits of the population. In April 2019 approximately 20% stayed home compared to 28% in April 2020 (BTS, 2020A). In addition, the Vehicle Miles Travelled index shows that car travel in April was half of 'normal' (BTS, 2020B). Major European cities have had a traffic volume reduction of between 70% to 85% from January to April in the countries where restrictions have been implemented. An analysis of the UK motorway traffic executed by TRL showed a reduction of up to 75% (ETSC, 2020). In China citizens have stayed home more than usual, and only 11% travel as normal during the weekend. In Beijing, the three largest bike sharing systems have showed an increase use by approximately 150% and metro ridership in seven major cities has decreased by approximately 23% compared to before COVID-19.

4.3.3. Changes in Emissions in the Transport Sector due to COVID-19

During the COVID-19 pandemic, governmental policies have drastically altered patterns of energy demand around the world. As mentioned, data is showing that COVID-19 had a massive impact on daily global emissions. The lockdown situation could also be defined as an 'experiment' where the question is, what happens if we eliminate nearly all vehicles from cities, how does it affect the environment, emissions, and air quality?

Data showing reduction in global greenhouse gas emissions.

According to a study done by an international team of researchers it was proven that the pandemic resulted in a 17% reduction of global GHG emissions in April 2020, and a total of 8.8% reduction of global GHG emissions in the first half of 2020 compared to 2019 levels. The study was done by collecting daily estimations of country-level GHG emissions for different sectors, based on near-real-time activity data. It was also shown that the greatest reduction of emissions came from changes in the transportation sector (Liu, Z., Ciais, P., Deng, Z. et al., 2020). In addition to showing total global emissions, Figure 4.5 is also showing the emission changes seen in the US, EU and China. Furthermore, other research has also shown that during the pandemic there were significant changes in both traffic volume, traffic accidents and air quality in cities around the world (Le Quéré, C., Jackson, R.B., Jones, M.W. et al., 2020).

Global daily CO_2 emissions, 2020 compared to 2019 (Mt CO_2 per day)

Figure 4.5: Graph showing emission difference of US, EU, UK, China and Global. (Source: Liu, Z., Ciais, P., Deng, Z. et al. Near-real-time monitoring of global CO2 emissions reveals the effects of the COVID-19 pandemic. Nat Commun 11, 5172 (2020). https://doi.org/10.1038/s41467-020-18922-7)

The largest cut of emissions was seen in the transportation sector.

Before the pandemic, global GHG emissions were rising by about 1% per year over the previous decades, with no growth in 2019 (Climate Watch, 2020). Renewable energy production has been growing rapidly the last years and prices on electric transport has dropped. Despite heading towards cleaner energy in 2019, much of the renewable energy was being deployed alongside fossil energy and did not replace it. In addition, emissions from road transport continued to rise and air pollution was a major global issue (WHO, 2020). However, when several international borders closed and populations were confined to their homes, the emissions from road transport fell by 36% or 7.5 Mt CO_2 daily in April 2020, and in the first half year of 2020 road transportation emissions decreased by 18.6% or 613.3 Mt CO_2. (Liu, Z., Ciais, P., Deng, Z. et al., 2020). This made it the largest contribution to the total emissions change. According to Professor Daniel Kammen, the significant reduction in GHG emissions from the transport sector is believed to be a direct result from the work-from-home restrictions (Le Quéré, C., Jackson, R.B., Jones, M.W. et al., 2020). The reduction of the emissions from 2019 to 2020 is illustrated in Figure 4.6.

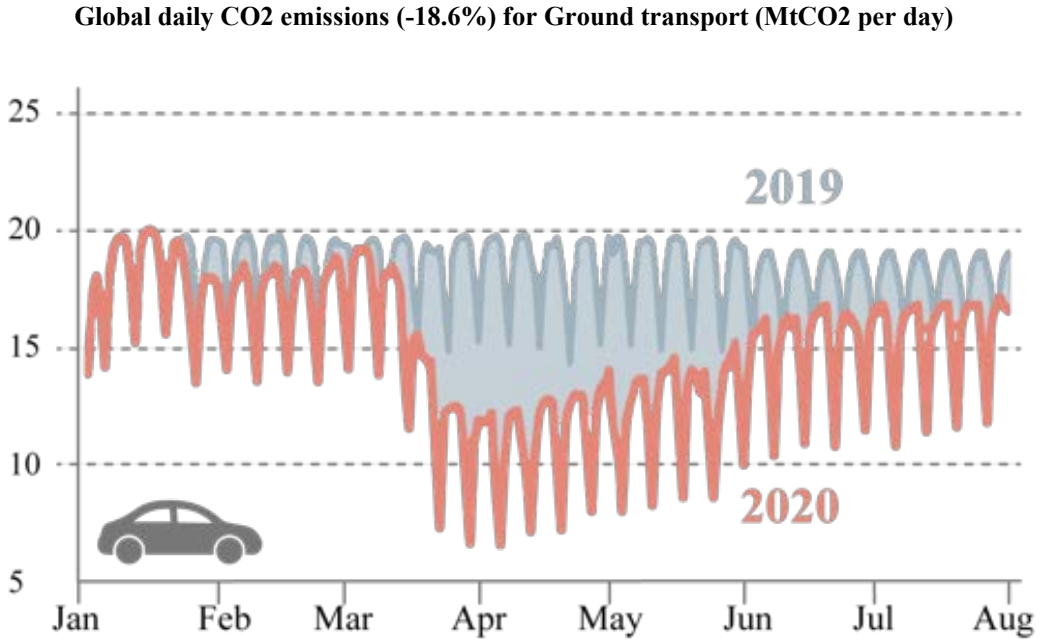

Figure 4.6: Graph showing reduction of emissions in 2020 compared to 2019 for road transportation (Source: Liu, Z., Ciais, P., Deng, Z. et al. Near-real-time monitoring of global CO2 emissions reveals the effects of the COVID-19 pandemic. Nat Commun 11, 5172 (2020). https://doi.org/10.1038/s41467-020-18922-7)

In terms of geography, transport emissions mostly come from upper-middle-income and high-income countries such as the US, China, India, and Europe. These were also the countries that saw the most visible changes in air quality in the larger cities during lockdown. During the strictest lockdown of each country, there was different reductions of emissions. In China in February, transport emissions were reduced by 53.8% compared to 2019 levels. Europe reduced their emissions by 31.9% in April, UK by 65.6% in April, and even without national restrictions to transportation in ground transportation, in US emissions reduced by 24%, in Brazil 17.5% and in Japan 7.7%, in the first half of 2020. (Liu, Z., Ciais, P., Deng, Z. et al., 2020).

Emissions from the aviation sector experienced the largest relative change of any the different sectors. Research has shown that global aviation decreased with 46,7% or 254.5 Mt CO_2eq during the first half of 2020, where 70% of the cut was related to international flights (Figure 4.7). The two largest cuts in aviation emissions happened during two phases. First in Asia at the end of January, when China locked down, and then in the rest of the world when travel bans, and lockdown measures started in March, see Figure 4.7. (Liu, Z., Ciais, P., Deng, Z. et al., 2020)

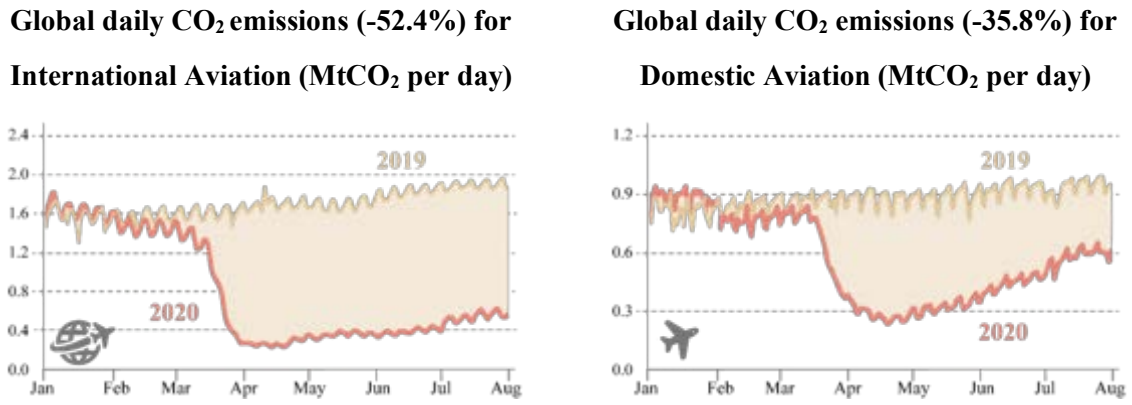

Figure 4.7: Graph showing reduction of emissions in 2020 compared to 2019 for domestic and international Aviation (Source: Liu, Z., Ciais, P., Deng, Z. et al. Near-real-time monitoring of global CO2 emissions reveals the effects of the COVID-19 pandemic. Nat Commun 11, 5172 (2020). https://doi.org/10.1038/s41467-020-18922-7)

Although changes in transport had a major impact of GHG emissions, it is believed to rebound once the world starts easing on the restrictions (UN, 2020). This can already be seen in research, where for instance, it has been shown that global aviation emissions began rebounding in late April and have slightly and gradually increased throughout the end of July. According to Hans Joachim Schellnhuber, founding director of the Potsdam Institute for Climate Impact Research, "decreasing human activities cannot be the answer to reduce emissions". He believes that there is a need of structural and transformational changes in our energy production and consumption systems to meet climate goals. (Liu, Z., Ciais, P., Deng, Z. et al., 2020).

Improved Air Quality as a Result of Reduction in Polluting Transport

In 2019, the World Health Organization reported that air pollution was directly linked to 4.2 million deaths worldwide (WHO, 2020). The transport sector is not only responsible for GHG emissions, but it is also one of the leading causes of global air pollution in cities, where vehicle engines release high levels of dangerous pollutants. As mentioned in chapter 4.2.2 on future travel goals, different strategies like walking, transitioning to electric transport modes, use of public transport and others has been suggested to reduce air pollution in cities. (WHO, 2020). A report published by IQ Air, presented information on how changes in transportation has affected the environment in cities, not only in terms of less deadly particles, but also in a visual perception. The report did an analysis on levels of PM2.5 in 10 large cities around the world during a three-week period of lockdown conditions and compares it with the same period in between 2016 to 2019 (IQAir, 2020). Findings in the research revealed an unexpected and drastic cut in pollutions during the pandemic and below a series of images showing cities before and during lockdown are presented.

Figure 4.8 Beijing, China (Source: Sophie Lewis, 2020. Retrieved from: https://www.cbsnews.com/news/coronavirus-photos-decline-air-pollution-lockdown/)

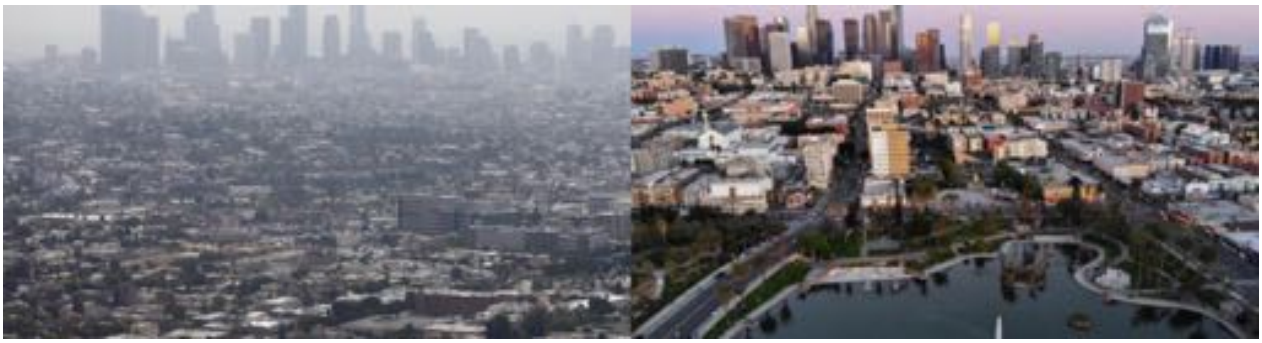

Figure 4.9 Los Angeles, California (Source : Sophie Lewis, 2020. Retrieved from: https://www.cbsnews.com/news/coronavirus-photos-decline-air-pollution-lockdown)

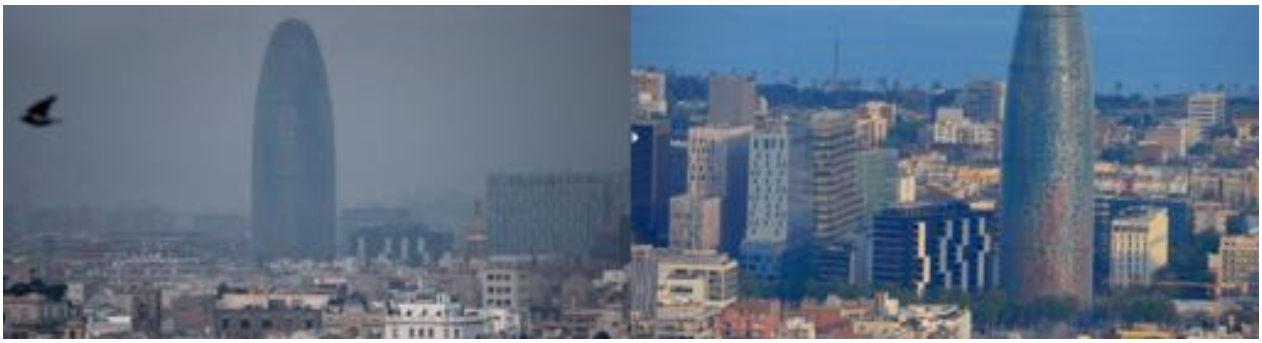

Figure 4.10 Barcelona, Spain (Source : Sophie Lewis, 2020. Retrieved from: https://www.cbsnews.com/news/coronavirus-photos-decline-air-pollution-lockdown/)

Conventional vehicles, fuelled with non-renewable energy could be the main reason for air pollution in large cities, for this reason many countries are now aiming towards electrifying the whole transport sector. BEV produce fewer emissions and can contribute to reducing impacts from climate change and air pollution. Despite the increased production of BEVs, it is according to the IEA an overall decrease of car sales with the outbreak of COVID-19. It is estimated that global car sales in the first half of 2020, could have dropped by 33% from the same period in 2019, with around 9 million fewer cars sold globally. Furthermore, the pandemic did not affect the BEV industry as much as the rest of the car industry. The BEV market have experienced a decade of rapid growth and BEV sales could reach a record share of the overall car market in

2020 (IEA, 2020). However, once cities are emerging from lockdowns, and restrictions on social distancing in public transport are continuing, there is expected a spike in car traffic and sales again. As mentioned in chapter 4.2.2, many cities, especially in Europe, are as a result of expected car traffic and sales, putting together policies to rethink the use of urban space and promote cycling and sales of BEV (Gul, Gorner, & Paoli, 2020).

4.3.4. Who Can Work from Home – a Theoretical Approach

In this chapter, it has been conducted a theoretical estimation on the reduction of GHG emissions from the transport sector, in terms of behaviour change. In this chapter, it will be looked at who can work from home, and how large the GHG emission will be if people continue to work remotely. The estimation is based on research and data about different modes of transport in different countries, working industries and sectors. The key question of this chapter is, who can, and who cannot work from home? And what are the GHG emission factors of the different transport modes people use?

Business and Industry Composition

Before going into describing who can and cannot work from home, one should have a basic understanding of business and industry composition. The basic categorization in economic analysis of the three main industries is, primary-, secondary- and tertiary industries. The primary sector is considered as the extraction of raw materials such as fishing and farming. The secondary sector considers finished goods such as manufactured goods. The tertiary sector offers goods and services to customers (Adam, 2020).

The International Standard Industrial Classification of All Economic Activities (ISIC), has put in place an industrial classification system for economic activities, in Norway this falls under Statistics Norway (SSB). The worldwide and national lists of industries are listed in Appendix 1 (United Nations, 2008, p. 3)

Who Can Work from Home - Factors to Consider

Having a clear understanding for the business and industry composition sets the basis for further description of who can reduce their daily travel, by working from home. There are several factors to consider when determining who can work from home, for this task, the parameters from a research done in the US by Global Workplace Analytics describing who can work from home are used (Global Workplace Analytics, 2020). As the results being only from the US, there are limitation to this generalization to other countries

The research defined who can work from home as following (Global Workplace Analytics, 2020):

- Had an information component
- Included individual vs. group work
- Had a clear parameter for evaluation
- Did not require personal contact with customers
- Did not require physical work that could only be done on-site

The results came from surveys and questionnaires describing the typical experience of US workers in nearly 1000 occupations, and further used to describe who is able and unable to work from home (Dingel & Neiman, 2020, p. 2). The research found that 37% of jobs in the United States can be done remotely, but with significant variations across industries and cities (Dingel & Neiman, 2020, p. 4).

Appendix 2 shows the share of jobs that can be done from home, by occupation's major group (Dingel & Neiman, 2020, p. 5). The percentage ranges from 0-1, where 1 is a 100%. The table shows that those who use computers in their work daily, are more likely to work from home in sectors like IT, education, finance, and management occupations. On the other end of the scale, one can see that cleaning and maintenance-, construction- and farming occupations cannot work from home.

Location also play a role in defining who can work from home, as metropolitan areas have a larger share of jobs that can be done from home. For the case of the US, 45% of jobs in San Francisco and Washington DC could be done remotely, while only 30% or less in e.g. Nevada (Dingel & Neiman, 2020, p. 5).

Work from Home and Car Reduction

Personal trips (PT), refers to a personal trip from one address to another by using one mode of transportation (Dingel & Neiman, 2020). By estimating the number of jobs that can be done remotely, and knowing the number of personal trips per day, one can estimate the reduction in cars on roads, and relate it to the amount of GHG emission reduction. In the case of the US, The National Household Travel Survey for 2017 shows that 72,6% of the daily trips are used with light-duty vehicles which represent cars, Vans and SUV's (Federal Highway Administration, 2017). This is presented in Figure 4.11, which illustrates the ratio of number of person trips by mode in the US.

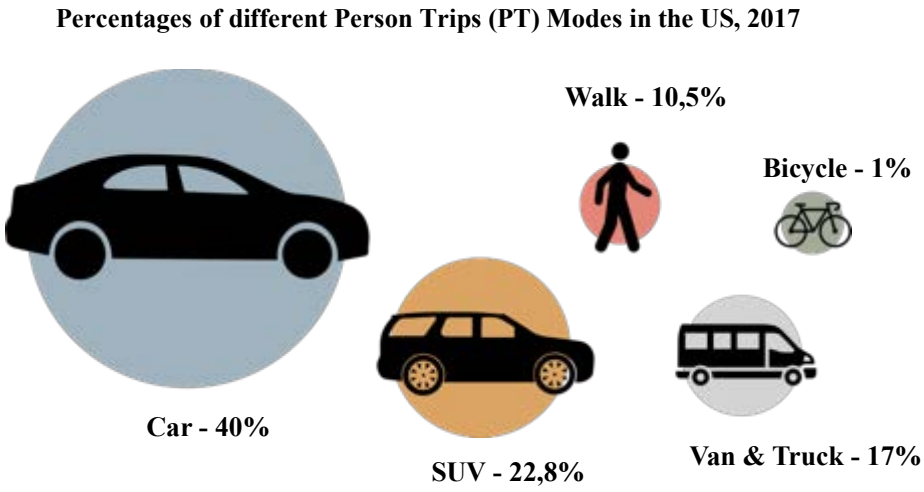

Figure 4.11: Number of person trips (PT) by mode (Source: NHTS, Person Trips (PT) Statistics, 2017 https://nhts.ornl.gov/person-trips)

If 37% of all workforce can work from home, and 72,6% are household cars, it can be estimated that there can be a reduction of 27% of cars on the road, as a result of people working remotely. Reduction in GHG emission as a result of a reduction in daily travels will be presented further in the discussion.

4.3.5. Who Can Work from Home – Actual Data Covered During COVID-19

In this chapter, it will be presented data about how many people worked from home during a selected period of the COVID-19 outbreak. As a result of these findings, it will further be discussed in this paper the question on who can and cannot work from home and if this strategy can help reduce the GHG emissions in the future.

The European Union and Norway

Data during the pandemic showed that 37% of workers within EU started working remotely when the pandemic first struck (Eurofound, 2020, p. 5). Most members had a proportion of 30% or higher as Figure 4.12 also illustrates. The highest proportion of workers who started working remotely was significant in the Nordic- and Benelux countries (Eurofound, 2020, p. 5). Given the situation in the other Nordic countries, Norway is regarded to have a similar working from home percentage.

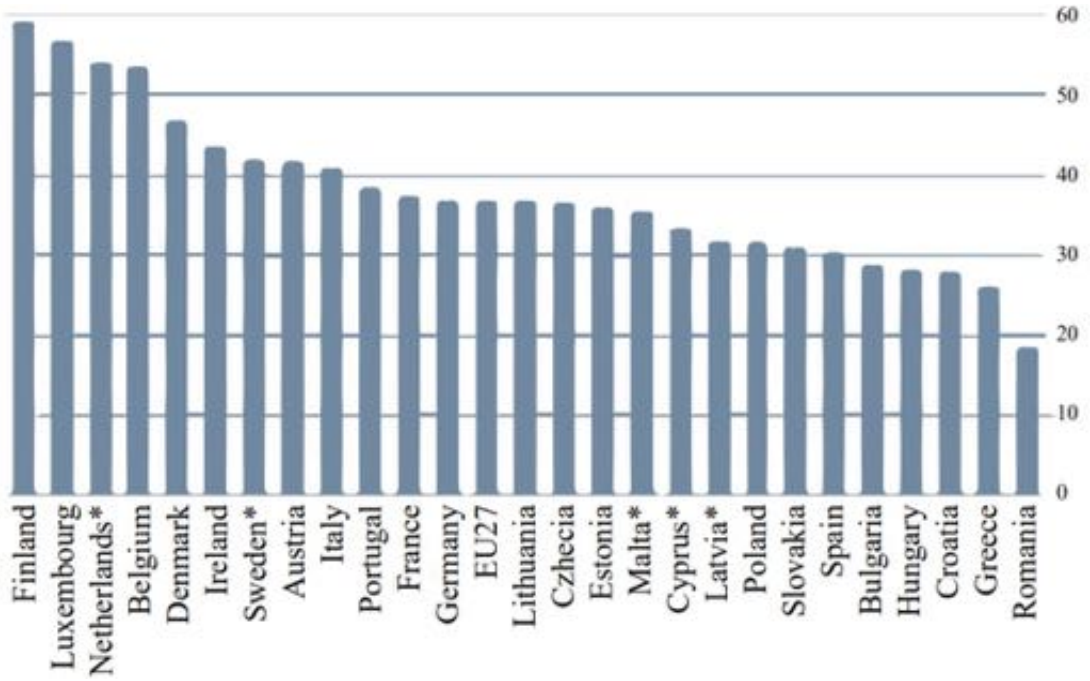

Figure 4.12: Percentage working from home during the pandemic in the EU, 2020, Eurofound, p.5, (https://www.eurofound.europa.eu/sites/default/files/ef_publication/field_ef_document/ef20058en.pdf)

It can be argued that for people who had previously worked remotely, the transition to start working from home was easier, and this is also shown through the different countries' adaptation. For those who had never worked from home before, 24% started doing so, and for those who had worked from home before, 54% started working remotely (Eurofound, 2020, p. 6).

The Norwegian Health Departments recommend that *"home office should only be used where the business can uphold a high-quality offer by the use of digital tools"* (Helsedirektoratet, 2020) during the COVID-19. They also specified that the access to equipment needed to be available for the parties involved.

Australia

In Australia 32% of workers started working remotely when the COVID-19 shutdown was first intact (Roy Morgan, 2020, p. 1). Figure 4.13 shows the different industries with the working from home percentage, where one can see that highest percentage is within data associated industries.

As previously found for the case of US, Australians living in the capital cities were also more likely to start working from home than those in the rural areas (Roy Morgan, 2020, p. 2). The capital city Canberra had the highest proportion of workers working from home with 48% (Roy Morgan, 2020, p. 2).

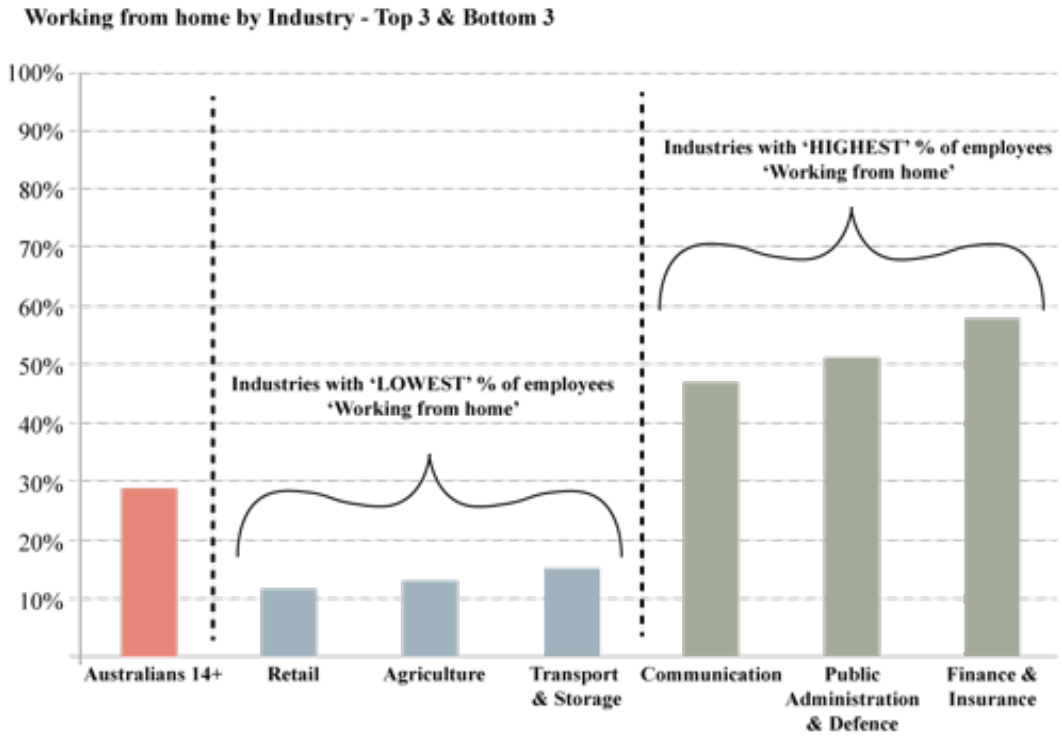

Figure 4.13: Working from home by industry. Source: Morgan, R. Multi-mode survey of Australians conducted from the weekend of April 17-19, 2020. https://www.macrobusiness.com.au/2020/07/nearly-a-third-of-aussies-have-been-working-from-home/)

Work from Home and Car Reduction in the European Union and Norway

The methodology used for the calculations has being using numbers retracted from SSB and European Automobile Manufacturers Association (ACEA) and further quantified them together

to show the reduction in emissions. The numbers used in the computation are presented below and the rest in the Appendix 3 and 4.

The Table 4.4 shows the average daily trip distance in kilometre (km) by car for Norway (TØI, 2016, p. 5) and EU (Fiorello & Zani, 2015, s. 23). Table 4.5 shows the car fleet composition in terms of type of fuel for both Norway (SSB, 2020) and EU (ACEA, 2019, pp. 9, 13). The choice of these two, is a result of lack of data in other places. These figures are going to be further discussed together with the emission factor from different car type, presented in chapter 4.2.1. The idea is to try to show how big the impact is in terms of GHG emissions reduction from passenger car, when several people are working from home due to COVID-19. The theoretical and actual values from the pandemic will be compared in terms of percentage of work from home

Table 4.4: Average distance of daily trips in some selected areas: Sourc: https://publications.jrc.ec.europa.eu/repository/bitstream/JRC96151/jrc96151_final%20version%202nd%20correction.pdf and https://www.toi.no/getfile.php?mmfileid=44092

	Norway	EU
Average daily trip (km)	16	17

Table 4.5: Car fleet composition in terms of fuel types in Norway and EU Source: See appendix 3

Car flet composition Passenger cars	Norway	EU
Petrol	1 033 036	144 630 585
Diesel	1 295 134	112 222 621
BEV	260 692	535 669
PHEV	116 692	267 834
Hybrid	110 695	1 874 840
Other	439	803 503
Total	2 816 688	267 834 417

4.4. Discussion

All data, research and own calculation conducted in earlier chapters will be discussed further in this discussion chapter. To summarize, the research has shown that the COVID-19 pandemic had a significant impact on human travel behaviour during the outbreak. As a result of the change in human travel behaviour, there was a massive and historical drop within the travel sector in terms of GHG emissions. However, there is a collective agreement among researchers that most changes that were seen during 2020, are likely to be temporary as they do not reflect on a structural change in a nation's economy, transport, or energy system. In addition, research is now showing tendency of rebound, and that we are going back to pre-COVID habits at the end of 2020 (Ambrose, 2020). The questions of this discussion chapter are therefore: why should we change our transport sector post COVID-19, how can we change it, and what can we learn from the pandemic?

4.4.1. Why change the way we travel?

The main reason why the world wants to decarbonize the transport sector is to create a cleaner, healthier and more affordable future for everyone. In addition, the transport sector must change in order to meet the Paris Agreement targets on climate change and reduction in GHG emissions as presented previously. The UN and EU are both important policy makers because of their influence in several countries. Moreover, the UN and EU has both ambitious goals of lowering the emissions from the transport sector and shifting towards more sustainable energy use. As mentioned before, the emission from the transport sector constitute for approximately 15% of the total GHG emission in 2016 and the global agreement is to reduce the total GHG emission by 40% within 2030. If the transport sector is to be zero-emission during the following nine years, the total GHG emission will still need to be reduced by an additional 25% (12.34 Gt CO_2eq) to reach the Paris agreement. Data collected in this paper show that the largest reduction in the transport sector during the pandemic was 50% according to IEA. Although the impacts

of the virus were (and still are) tremendous, the world needs to reduce GHG emission even further. Despite this fact, as presented earlier, important stakeholders like the CEO in the Public transport Association in Norway believes that the increased use of private vehicles that were seen during COVID-19, will become stable during the post-COVID years. This can then illustrate that the emission goals by 2030 can be difficult to reach, even an 'utopian' idea (an imagined state).

4.4.2. How can we reduce emissions from transport?

It can be argued that people and goods are now moving faster and farther than ever. All these movements are not coming without cost, which is not just the price of a new car, a flight ticker or a shipping bill, but also a global environmental cost (IEA, 2020). As mentioned earlier, transport emissions, which include road, aviation, rail and maritime accounts for a significant portion of our carbon budget. There is also predicted that these emissions will continue to grow. With this growth comes major challenges when trying to reduce emissions in line with the Paris agreements. Therefore, our question is how can we reduce emissions from the transport sector?

Firstly, we will discuss the topic of road transport. As mentioned in the theoretical chapter, transitioning to zero-emissions transport is a crucial step towards a liveable future. It can be argued that electrification is a major part of the solution when dealing with the increasing transport sector emissions. Electrification is important because it cuts the direct vehicle engine emissions and uses the potential to reduce emissions from the power grid. By accelerating the adoption of modern and efficient vehicles that burns less fuel, one gets closer to reaching our global climate goals. However, electric vehicles are only a desirable solution if powered by clean energy sources. As presented, the emission factor from the power grid varies a lot. E.g., the emission factor was 16.4g CO_2/kWh in Norway and 295.8g CO_2/kWh in Europe in 2016. If an average BEV use 0.20 kwh/km (Virta, 2018), this led to an emission of 3.28g CO_2/km and 59g CO_2/km driven on respectively Norwegian and European energy mix. Table 4.6 shows the emission based on "Average distance of daily trips" from Table 4.4. and the energy mix emission factor. If 100% of Norwegian´s car fleet where to be BEV, the CO_2 emission reduction would be 98.4% and 60.4% for EU. This clearly illustrates that the BEVs need to drive on an energy mix with a low emission factor to be cleaner than traditional cars.

Table 4.6: The emission from the transport sector: Source: Emission factor on electricity grid mention in text above, Table 4.4: average fuel use on BEV mention above, Table 4.5: Car fleet composition in terms of fuel types in Norway and EU

Percentage of BEV	100%
CO_2 emission in Norway´s car fleet if Driven on Norwegian Energy mix	0.148 Mt CO_2eq
Reduction in CO_2 emissions in Norway by:	98.4%
CO_2 emission in EU´s car fleet if Driven on European Energy mix	268.6 Mt CO_2eq
Reduction in CO_2 emissions in EU by:	60.4%

One other key factor that needs to be addressed is the emissions on the production of BEV. A limitation in this paper have been that this issue has not been added in the calculation. For more exact representation of the real world, these numbers need to be added.

According to Institute for Transportation & development policy (ITDP), an 80% reduction of global GHG emissions can be done if cities embrace new vehicle technologies such as automation, electrification, and ride sharing (ITDP, 2018). These strategies can promote decarbonization of the transport sector. In addition, promoting public transport, better city planning and new mobility methods could also help reduce emissions further. It can be argued that public transport is a more efficient way of transporting people compared to private vehicles, however with the outbreak of COVID-19, it is difficult to forecast if public transport will be as efficient, as it is hard to keep social distancing on buses, train etc. Better city planning can reduce transportation demand if the desired functions are within walking distance. The pandemic has shed light on the issues with dense cities, as these are the places where the pandemic has struck the hardest. Therefore, with the outbreak of COVID-19 new methods and ways of travelling should be developed to reduce emissions further.

Another method to reduce emissions is to work from home. Working from home has been a major strategy to mitigate the spread of the virus since it was first addressed as a global pandemic. Due to the change in the contamination situation, the number of people working from home has fluctuated. An example is data collected by the Institute of Transport Economics where 55,8% worked from home in April, while the number was reduced to 38,7% in June (TØI, 2020) in Norway. There is also a trend showing that several companies are implementing working from home even after the situation has normalised, as 43% say they will continue to work from home at least once a week (TØI, 2020). Taking these values into consideration,

Table 4.7 and Table 4.8 are showing the effects of what less passenger car travel to work can have for the reduction in GHG emissions. The calculations are presented as reduction in emissions in terms of Mt CO_2eq for each day one can work from home.

Table 4.7: The effect of less passenger car travel to work in Norway Source: See calculation in Appendix 4

Days of home office <u>Norway</u>	**Reduction in emission (Mt CO_2eq) if: 37% have Home office**	**Reduction in emission (Mt CO_2eq) if: 43% have Home office**	**Reduction in emission (Mt CO_2eq) if: 55.8% have Home office**
5	1,02	1,18	1,54
4	0,81	0,95	1,23
3	0,61	0,71	0,92
2	0,41	0,47	0,61
1	0,20	0,24	0,31

Table 4.7 is showing values for the case of Norway. Numbers are based on The Department of Transport Economics (TØI). The 37% split have been included, as this was the theoretical value presented in the theory part of how many can work from home. Interesting enough, this was also the same percentage of people who started working from home during the first phase of the pandemic in the EU. Table 4.8 shows a similar calculation, but with the case of EU.

Table 4.8: The effect of less passenger car travel to work in the EU Source: See calculation in Appendix 4

Days of home office <u>EU</u>	**Reduction in emission (Mt CO_2eq) if: 37% have Home office**	**Reduction in emission (Mt CO_2eq) if: 43% have Home office**	**Reduction in emission (Mt CO_2eq) if: 55.8% have Home office**
5	139,61	162,19	210,54
4	111,69	129,75	168,43
3	83,77	97,31	126,32
2	55,84	64,87	84,21
1	27,92	32,44	42,11

However, the results have been simplified and assumptions has been made to be able to find the theoretical values for the reduction in CO_2eq. One aspect is that it has been challenging to figure out the annual daily traffic (ADT), and therefore assumed that the entire passenger car fleet is using the road daily. Several aspects have also been considered due to the complexity of the task. Overall, we believe these finding will give an indication of the potential reduction

of GHG emissions when more people work remotely. In Figure 4.14, an illustration showing three scenarios for post COVID-19 everyday transportation is made. Although reducing numbers of cars on the road daily can be thought to be the best solution to reduce emissions, it can be argued that electrification and new technologies will be the way to reaching net zero.

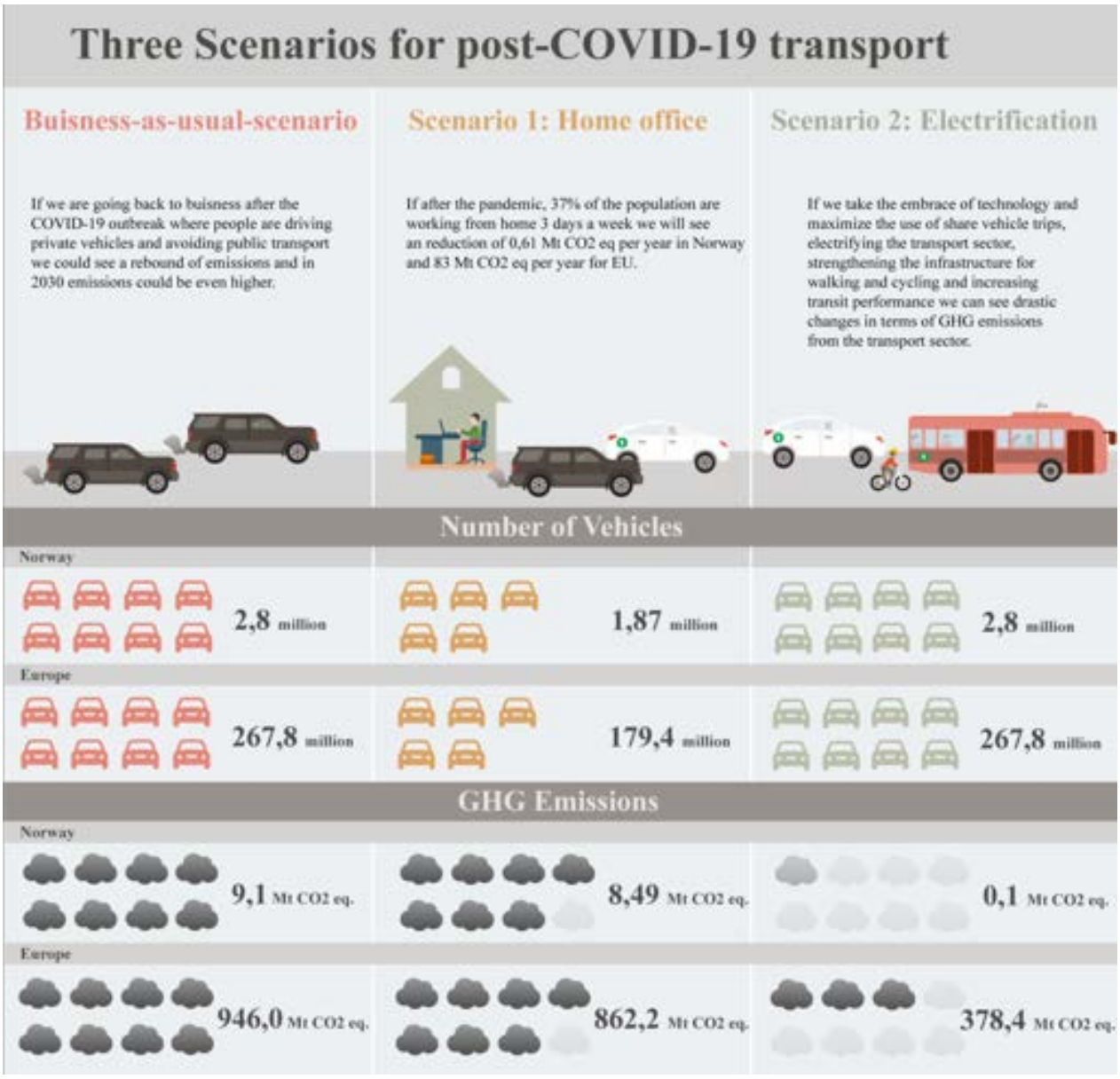

Figure 4.14: Three scenarios for post COVID-19 transportation, (a) Going back to business (b) Scenario 1: Home office (c) Scenario 2: Electrification. (Source: Own Illustration, Own calculations)

In addition to reducing road transport, one must also investigate reduction in air transport. Data collected and previously presented in this paper, clearly shows that the COVID-19 pandemic had a dramatic effect on the aviation industry. Knowing that 54% of the travels by airplane are "leisure travel" (in Norway), and the reduction in airplane traffic in august 2020 was 76% (for

Oslo Airport), this shows that COVID-19 also had a significant effect on the amount of business trips. In fact, according to figures collected in Norway one could argue that the reduction in business trips were minimum 22%. If one says that this figure is close to reality, and the not conducted business trips were manageable from a business operational perspective, despite the lack of travel. The reduction in GHG emissions through this behaviour change in travel is important, to emit less. If one takes this estimation one step further and generalize a 22% reduction in the aviation sector, this is equivalent to a reduction of approximately 28.9 Mt CO_2eq for Europe and approximately 184.6 Mt CO_2eq globally based on the emission figures presented earlier. These reductions of CO_2eq emission could be done through the behaviour change in business trips. Underlining this argument is the broad introduction and use of digital communication methods that could contribute for this to be a valid reason for change. The technology of these heavily used digital communication tools during the pandemic have been available for many years, but the pandemic has forced us to use them globally and could therefore be a disruptive technology that has the potential to change how we conduct business trips from now and into the future. This could be categorised as "an optimistic" approach, forecasting such a scenario to take place, according to Tetlock and Garnder "Superforcasting" (Tetlock & Gardner, 2016, pp. 10-20).

As Norway has been a focus area for this paper, one must investigate how the country can reduce transport emissions. It has been showed that the pandemic has resulted in more use of private cars, bikes and walks, and less use of public transport in Norway (Grøtting, 2020). Less people are using buses and railways around the world due to restrictions and bans, reduced capacity and fear of infection (Gullikstad, 2020). It is not desirable that a larger proportion of travellers go from public transport to driving private cars. A benefit is that more people are using active transport modes such as cycling and walking, which improves the public health. Research has shown that people that cycle to work will improve their health regardless of intensity, but to keep these benefits, it is important to keep it consistent, not just for weeks, but for months and years (Østerås, 2014). The question is therefore, how can we keep those who have started cycling and walking during the pandemic, to continue doing so? Several cities around the world seem to have taken advantage of the huge increase of walking and cycling (Gullikstad, 2020). The sales of bicycles have been increasing significantly in larger cities such as New York and London, and in many countries pop-up bicycle roads have been set up (Gullikstad, 2020). A market research company (NDP group) states that in the US the sales of bicycles, bike repair services and equipment doubled compared to the same time last year

(Goldbaum, 2020). The sales of fitness bikes went up with 66%, leisure bikes increased with 121%, and el-bikes increased with 85%. The plan for EU was to spend 1.325 billion on cycling in the period 2014 – 2020, and just since the outbreak of COVID-19 it has been spent more than 1 billion euros (ECF, 2014) (Vandy, 2020). Carlton Reid, a transport journalist, has discussed the temporary measurement that facilitate for a better cycling infrastructure in an article in Forbes. He takes examples from the Netherlands where the streets were designed for cars in the 1970s. Later, the streets where redesigned to facilitate for people instead of cars, and this led to a change in use (Reid, 2020). The Netherlands is widely known as a country with a strong cycling culture (Zee, 2015). Lastly, Reid argues that the 2020 bike boom can have a more lasting impact on cities if planners, politicians, and people clamor for the change (Reid, 2020). Figure 4.15 shows the difference from today and 1984 in the Dutch street Reguliersbreestraat in Amsterdam.

Figure 4.15 Reguliersbreestraat today and 1984 (Source left: Thomas Schlijper / https://exploring-and-observing-cities.org/2016/01/11/amsterdam-historic-images-depicting-the-transition-from-cars-to-bikes/) (Source right: Amsterdam archives / https://exploring-and-observing-cities.org/2016/01/11/amsterdam-historic-images-depicting-the-transition-from-cars-to-bikes/)

A measure that could have a big effect in Norway (and other countries), is to give bike commuters some of the benefits that the Norwegian BEV have (Elbilforeningen, n.d.). E.g., the exclusion of VAT on bikes sold. If the bikes where to be sold excluding VAT, that could lead to several bike commuters. At least for Norway where VAT constitutes 25% of the cost of a bicycle (Toll Customs, n.d.).

4.5. Conclusion: What have we learned from the changes in the transport sector?

The COVID-19 pandemic has affected many aspects in both human and environmental conditions. Despite the large cost the pandemic has had on countries economy, people health and wellbeing, it is vital that we learn from the crisis. On the background of the information provided in this paper, it is now possible to answer the research questions asked in the introduction to conclude the paper.

Will these changes in travel behaviours become permanent after the restrictions are lifted?

It is a challenging task to forecast how the transport sector can change for the better. Forecasting is usually a hypothetical task (Mauboussin & Callahan, 2015), but the pandemic let us see what a massive disruption can do to the total daily global GHG emissions. Instantly we saw empty roads, public transport stopped running and people stayed at home. One of the lessons learnt are how cities are without traffic. With the help of disruptive technology as digital solution we can learn new ways to conduct business. In the paper we have seen that this has a positive effect in terms of reducing GHG emissions. Some scientist believes that there will be a rebound once the virus subsides, even important policy makers also thinks that more people will use their private cars after the conditions are back to normal. This is because of governments, businesses and people will want to make up for the lost time spent in lockdown. Other scientist believes that the transport sector has changed permanently, and that the pandemic has created opportunity for countries to scale up sustainable transport solutions that already exists (IEA, 2020).

Could the disruptions of current transport pattern help us shift towards more sustainable habits?

Many people have learned how to work from home. Office workers have previously said that working from the office is more productive, but the pandemic has taught us that working remotely can be just as productive. It is discovered that if more people work remotely 1-5 days a week it will have a big reduction GHG emission. Hence the pandemic has taught us that working remotely is not only more productive, but it also helps us reducing the GHG emissions.

There could be a need to electrify and decarbonize the transport sector without requiring people to drastically lower their quality of life. It is demonstrated in the paper that if the transport sector would consist of 100% BEVs it will reduce the CO_2 emissions in EU by 60,4%, if driven on electricity from the electrical grid in EU. For Norway this number would be almost emission free, due to the clean electricity grid. Emission free transport sector through electrifying it is therefore feasible, but heavily dependent on the emission from the electricity grid. The emission from production is another issue that have not been addressed in this paper.

"Is COVID-19 the starting point of a new paradigm within travel habits, and are these travel habits during the pandemic corresponding to future travel habit goals, both nationally and internationally?"

It is a challenging task to discuss the future of the transport sector because it is often based on assumptions. The existing infrastructural system is well developed through many years, and it can be argued that willpower and money will not transform the system as quickly as needed to cope with the climate crisis. Instead of requiring every people to change all travel habits at once, one could for example aim towards reducing traffic 10%, incorporating work-from-home as a new 'normal', and developing better networks of walkable streets and cycling lanes, like what has been done in The Netherlands. As showed in this paper changes in travel habits have an effect in terms of lower GHG emission from the travel sector. The challenge is that these changes are too small to reach the SDG and the 40% reduction of emission within 2030 seems to be a utopian goal.

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4.7. Appendix

APPENDIX 1: Industrial classification of all economic activities

Table 4.9: The worldwide and Norwegian standard of industrial classification of all Economic Activities (United Unions, 2008, https://unstats.un.org/unsd/publication/seriesm/seriesm_4rev4e.pdf)

Worldwide	National (SSB)
Agriculture, forestry and fishing	Healthcare
Mining and quarrying	Retail
Manufacturing	Industrial
Electricity, gas, steam and air conditioning supply	Construction
Water supply; sewage, waste management and remediation activities	Education/Teaching
Construction	Public administration
Wholesale and retail trade; repair of motor vehicles and motorcycles	Professional services
Transportation and storage	IT and media
Accommodation and food service activities	Oil and gas
Information and communication	Financial activities
Financial and insurance activities	
Real estate activities	
Professional, scientific and technical activities	
Administrative and support service activities	
Public administration and defense; compulsory social security	
Education	
Human health and social work activities	
Arts, entertainment and recreation	
Other service activities	
Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	

Activities of extraterritorial organizations and bodies

APPENDIX 2: Jobs that can be done at home by occupations major groups

Occupation and percentage of the share of jobs that can be done at home (Dingel & Neiman, 2020, p. 5), http://www.nber.org/papers/w26948

Occupations	O*NET-derived baseline
Computer and Mathematical	1.00
Education, Training and Library	0.98
Legal	0.97
Business and Financial Operations	0.88
Management	0.87
Arts, Design, Entertainment, Sports, and Media	0.76
Office and Administrative Support	0.65
Architecture and Engineering	0.61
Life, Physical, and Social Science	0.54
Community and Social Service	0.37
Sales and Related	0.28
Personal Care and Service	0.26
Protective Service	0.06
Healthcare Practitioners and Technical	0.05
Transportation and Material Moving	0.03
Healthcare Support Occupations	0.02
Farming, Fishing and Forestry	0.01
Production	0.01
Installation, Maintenance and Repair	0.01
Construction and Extraction	0.00
Food Preparation and Serving Related Occupations	0.00

Building and Grounds Cleaning and Maintenance	0.00

APPENDIX 3: Reductions of cars on road Norway and EU if 37%, 43% and 55,8% work from home

Reduction of cars on the road and percentage of work from home, 2020, SSB, https://www.ssb.no/bilreg. 2019, ACEA, https://www.acea.be/uploads/publications/ACEA_Report_Vehicles_in_use-Europe_2019.pdf?fbclid=IwAR1aaRYhYX9C-rGVor1iwEp9EMkUxyOpQOz4_twSfD8MwSx-ql049raOObc

Fuel type (Norway)	Percentage of fuel type	gCO_2/km	Reduction of cars on road%: if 37% work from home	Reduction of cars on road%: if 43% work from home	Reduction of cars on road%: if 55,8% work from home
Petrol	37%	0,18	14%	16%	20%
Diesel	46%	0,173	17%	20%	26%
BEV	9%	0	3%	4%	5%
PHEV	4%	0,071	2%	2%	2%
Hybrid	4%	0,112	1%	2%	2%
Other	0,02%	0,116	0,01%	0,01%	0,01%

Fuel type (EU)	Percentage of fuel type	gCO_2/km	Reduction of cars on road%: if 37% work from home	Reduction of cars on road%: if 43% work from home	Reduction of cars on road%: if 55,8% work from home
Petrol	54%	0,18	20%	23%	30,1%
Diesel	42%	0,173	16%	18%	23,4%
BEV	0,20%	0	0,1%	1%	0,11%
PHEV	0,10%	0,071	0,04%	0,04%	0,06%
Hybrid	1%	0,112	0,3%	0,3%	0,4%
Other	0,02%	0,116	0,1	0,13%	0,17%

APPENDIX 4: Work from home 5 days Norway and EU- CO2 reduction calculation

Reduction of CO_2 emissions because of work from home, 2020, SSB, https://www.ssb.no/bilreg. 2019, ACEA, https://www.acea.be/uploads/publications/ACEA_Report_Vehicles_in_use-Europe_2019.pdf?fbclid=IwAR1aaRYhYX9C-rGVor1iwEp9EMkUxyOpQOz4_twSfD8MwSx-ql049raOObc

Fuel type Norway	Reduction in CO_2 emissions (Mt): if 37% work from home 5 days a week	Reduction in CO_2 emissions (Mt): if 43% work from home 5 days a week	Reduction in CO_2 emissions (Mt): if 55,8% work from home 5 days a week
Petrol	0,40	0,47	0,61
Diesel	0,61	0,71	0,92
BEV	0,00	0,00	0,00
PHEV	0,00	0,00	0,00
Hybrid	0,00	0,00	0,00
Other	0,00	0,00	0,00
Total	1,02	1,18	1,54

Fuel type EU	Reduction in CO_2 emissions (Mt): if 37% work from home 5 days a week	Reduction in CO_2 emissions (Mt): if 43% work from home 5 days a week	Reduction in CO_2 emissions (Mt): if 55,8% work from home 5 days a week
Petrol	88,43	102,76	133,36
Diesel	51,17	59,41	77,17
BEV	0,00	0,00	0,00
PHEV	0,00	0,00	0,00
Hybrid	0,01	0,01	0,01
Other	0,00	0,00	0,00
Total	139,61	162,19	210,54

BYG655 – Autumn 2020

05.
SOCIAL

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5.1 Introduction

In this chapter of the report the social effects of Covid-19 have been examined. It has been argued that the impacts of the commonly named coronavirus will reach way further than the spreading of the virus itself, where the social implications of the virus are expected to be the most persistent.

Throughout this report mainly two questions are aimed to be answered: “What did we learn that may be continued?” and “How can we improve the human condition and environmental situation?”. These two questions are attempted to be answered by (1) analyzing how societies globally have adapted to the pandemic, (2) discovering the current and expected impacts of Covid-19 on people's mental health and (3) discussing how the results of the pandemic could aid in improving the global environmental situation. The information given further in this chapter is based on findings before November 2nd 2020.

5.2 How have societies adapted to the pandemic socially?

Only a few months after the initial outbreak of Covid-19 in Wuhan, China in January 2020, societies worldwide started shutting down and had to find ways to adapt and adjust to a new way of life (World Health Organization, 2020a). This was in an attempt to minimize the spreading of the virus and to protect the vulnerable individuals in the societies. The gravity of the measures that were implemented varied from one country to another, this depending on the country’s politicians and leaders, the inhabitant’s cultures and habits and lastly on the advancement of the virus in the different countries. According to UNESCO, United Nations Educational, Scientific and Cultural Organization, by the end of April approximately 90 percent of countries worldwide had closed their World Heritage sites from the public (United Nations Educational, Scientific and Cultural Organization, 2020a).

Further on, in this report examples from primarily three countries will be reviewed and discussed. Those countries being: (1) Norway, (2) the United States and (3) Singapore. This due to these three countries handling the Covid-19 outburst noticeably differently. These differences will on the following pages be analyzed for the various social arenas: Food and beverage services, Cinemas, theaters and concert and Fitness centers and recreational facilities.

5.2.1 Norway

Norway
Food and beverage services **March 12th:** • Distance with one meter and table requirements (Helsedirektoratet, 2020). **June 15th:** • All services reopened, distance with one meter, except for people from the same household, max. 20 people gathered inside (Oslo kommune, 2020). **August 8th:** • Alcohol serving after midnight is forbidden and registration with Næringsetaten to serve alcohol (Oslo kommune, 2020).
Cinemas, theaters & concerts **March 12th:** • The government closed down all cinemas in the country (Dorholt, 2020). **March 27th:** • The Norwegian government announced that all cultural-and sport events were not permitted if the number of participants exceeded five (Regjeringen, 2020a). **May 7th**: • Cinemas reopened in the start of May, but with strict guidelines. 50 people were allowed to gather at events as long as one meter distance could be upheld and the responsible host who makes sure everyone upholds the distance (Regjeringen, 2020a). • **June 15th:** 200 people could gather indoor (Regjeringen, 2020a).
• **Fitness centers and recreational facilities** **March 12th:** • The government closed the country and fitness centers, organized sports events both indoor and outdoor (Helsedirektoratet, 2020). **June 15th:** • Centers were reopened with measures of one-meter distance for regular training and two meters distance for high intensity workouts at fitness centers. Maximum 20 people in groups, and possible to arrange events up to 200 people (Folkehelseinstituttet, 2020a).

Table 10: The table shows the Covid-19 measures in Norway for three different categories.

5.2.1.1. Food and beverage services

In Norway, the lockdown occurred on March 12th 2020. Most of the food and beverage service industries were for this reason closed, except for serving services which offered food serving and who could maintain 1 meters distance between customers (Helsedirektoratet, 2020). It was not before June 15th 2020 that all food and beverage services were allowed to reopen, in terms of some safety measures. As a result of the new measures, some new technology has been used to reduce the exposure of the virus, for instance Smittestopp which is an app made by authorities

to limit the spread of Covid-19 by notification about infection via an text message (Helsenorge, 2020). This app was after a period deactivated as a result of the Data Inspectorate claiming that the app gave forbidden access to personal information. In addition to this, the city council of Bergen announced that all cafes, pubs, restaurants and canteens needed to require customers to identify themselves, so the business had an overview of the guests who had visited them and aid in tracking a potential spreading of the virus (Bergen kommune, 2020a).

5.2.1.2 Cinemas, theatres and concerts

The Norwegian government announced on March 27th 2020 that all cultural and sports events where the number of participants exceed five people were not permitted. Initially, gatherings of up to 50 people were allowed, and one month later it was opened up for up to 200 people. In September 2020 it was planned to open up for up to 500 people, but this could not be implemented due to the second wave of the virus (Regjeringen, 2020a). Cinemas had similar restrictions and closed on March 12th as requested by the government (Dorholt, 2020).

In May 2020 the government allowed for cinemas to reopen, but the consequences of the restrictions were already apparent in June. Cinemas had a 78 percent decrease in sales compared with 2019, meaning that 706 590 tickets were sold in June 2019 compared to 152 212 tickets sold in June 2020 (Aftenposten, 2020). A couple of reasons behind that drastic reduction in ticket sales could be the 1 meter restrictions meaning only every other seat at the cinemas could be utilized. In addition, there has been an increase of “drive in” concerts and movies, making the traditional concerts and cinemas lose customers. This was done in Lillestrøm where the band “Klovner i kamp” played a concert for 200 cars with up to five people in each car. The restrictions were still strict, no one was allowed outside of their vehicles and the windows had to be shut throughout the entire concert. In Bergen a rooftop was utilized as a movie theatre where large projector screens were put up to give everyone a good view (Gøril Huse, 2020). There has also been a rise in online concerts or online festivals. In Easter this year a festival called “Et helt annet sted” sold 6400 tickets. Movies that were supposed to be in the cinema from April and onward, have been made exclusively available online.

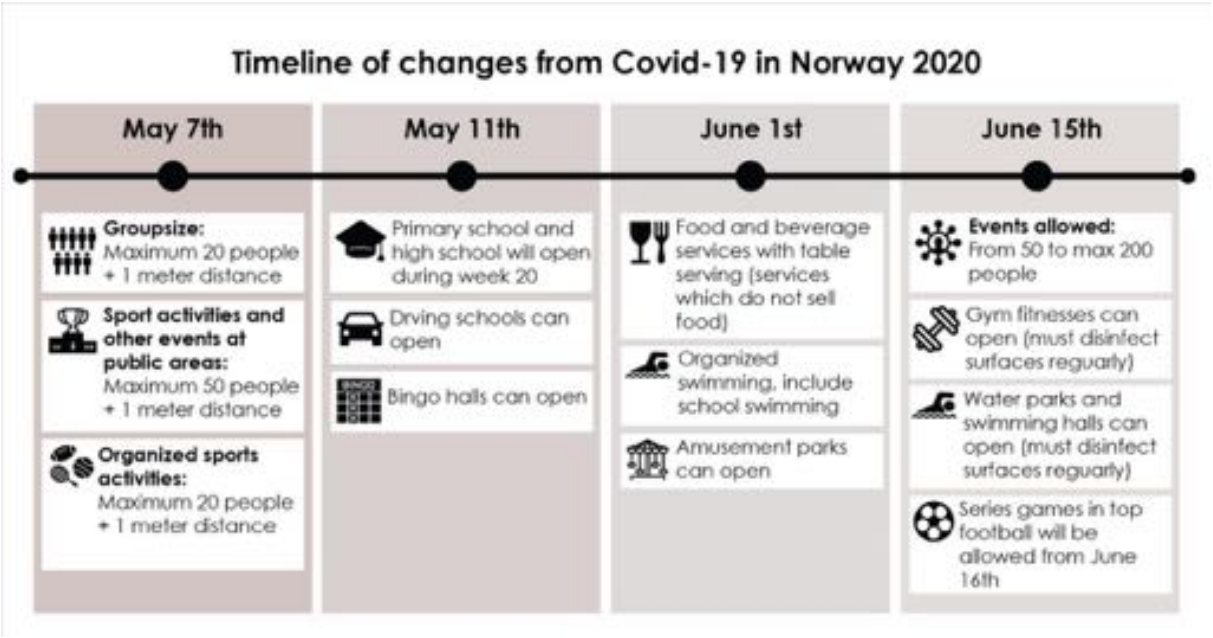


Figure 5.16: Timeline of changes from Covid-19 in Norway 2020 (Regjeringen, 2020).

5.2.1.3 Gym centers and recreational facilities

When Covid-19 appeared in Norway the government closed the fitness centers and recreational facilities (Helsedirektoratet, 2020). They reopened the country three months later, but they added measures to keep a distance of one meter for regular exercise, two meters with high intensive workouts and maximum 20 people in groups. Workers must clean the areas more regularly and members must sanitize wherever they have been working out and what they have been touching. In addition, spas and saunas remained closed, fewer people were allowed in group workouts and there had to be a minimum 15 minutes pause between each class to clean the air. Lastly, seniors got their own group workout classes and everyone was encouraged to bring their own exercise mat to the classes. Some workout centers offered online statistics showing when people were at the center working out, so it became easier for people to avoid going to a crowded center (SATS, 2020). By keeping the gyms open one can help people stay active during the pandemic. Recreational facilities such as water parks, swimming pools etc. could stay open as long as the spreading of the virus was under control.

5.2.2 The United States

The United States
Food and beverage services **June 1st:** • Checklist for food establishments provided by FDA, for reopening closed services (Ignacio Felix, 2020). **August 3rd:** • Guidance from CDC provided by FDA: Recommended to wear cloth mask, physical distance of six feet, provide temperature and/or symptoms screening at restaurant and bars (Centers for Disease Control and Prevention, 2020a).
Cinemas, theaters & concerts **March:** • CDC recommended no bigger gatherings than 50 people. Only guidelines and measures are made within each state. The restrictions then vary from what the states find appropriate (Consumer News and Business Channel, 2020).
Fitness centers and recreational facilities **March 17th:** • Fitness centers closed (Puhak, 2020). **June 2nd:** • Every business must place an updated Covid-19 information sign in every entrance, they must be updated on the social distance rules, everyone must wear a mask while working out. CDC introduces measures such as keeping a distance with six feet and members of the gym should avoid touching surfaces (Centers for Disease Control and Prevention, 2020b).

Table 5.11: The table shows the Covid-19 measures in The United States for three different categories.

5.2.1.1. Food and beverage services

When it comes to The United States of America (USA), the pandemic has had a huge impact on the food and beverage services since March, where the country's inhabitants started to physically distance themselves from each other. This led to sales declining by 27 percent, where only some parts of the food industry remained open throughout the pandemic and all with limited services (Ignacio Felix, 2020). While some parts of the food industry remained open throughout the pandemic, but with limited services, others had to shut down permanently due to not managing to maintain 6 feet distance. Some of the new implemented measures in many restaurants were the digital or disposable menus, disposable cutlery and plates, and self-opening doors and trash cans (Center for Strategic & International Studies, 2020). To avoid crowded waiting areas, a phone app was utilized in some facilities to alert when the tables were ready.

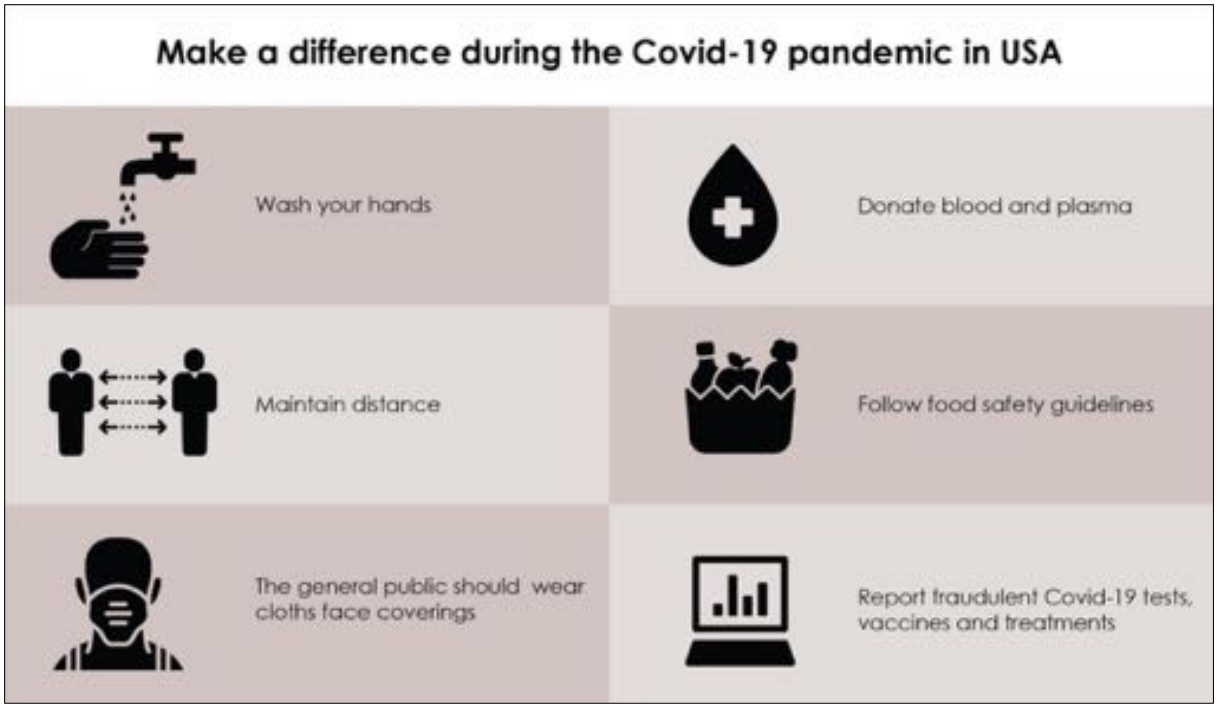


Figure 5 17: Information sign in USA for protecting people from the virus (Food and Drug Administration, 2020).

5.2.1.2 Cinemas, theatres and concerts

In America the CDC, Center for Disease Control and Prevention, is one of the major operating components of the Department of Health and Human Services. They work to protect and improve the health, safety and security of Americans and foreigners. On their website they have considerations for events & gatherings to help mitigate the spread (Centers for Disease Control and Prevention, 2020c). In March CDC recommended cancelling all events with 50 or more people for the next eight weeks, they said all gatherings should be reconsidered if the organizers could not protect vulnerable people, assure proper hand hygiene and social distancing. However, those guidelines excluded schools, universities and businesses and were only national guidelines for citizens and event planners and not actual restrictions (Consumer News and Business Channel, 2020). The restrictions were made on a state level, meaning that the restrictions for the number of people allowed to gather in one place varied greatly from one state to another. In Mississippi indoor gatherings are tapped at ten people and outdoor gatherings at 20. When in public indoor spaces or outdoor public spaces where safe distance is not possible everyone over the age of six is required to wear a mask. This is a big contrast to the state of Nebraska where indoor gatherings are allowed to open up to 50 percent occupancy or up to 10.000 people, while outdoor gatherings are permitted to open to 75 percent occupancy or up to 10.000 people. There are also states that now have no restrictions only recommend

people to keep a safe distance (Dena Bunis and Jenny Rough, 2020). Cinemas in America have for the most part been closed. The major movie theatre chains have recently released quarterly results which show a near 100 percent loss of revenue the last couple of months. With the number of Covid-19 cases rising in the US, states are not likely to encourage movie theatres to reopen any time soon (Consumer News and Business Channel, 2020).

5.2.1.3 Gym centers and recreational facilities

Every gym center had to close March 17th in the entire country (Puhak, 2020). Approximately three months later the officials in the US let the centers reopen and implemented different measures to reduce the risk of infection, such as everyone would have to wear a mask while working out (Emergency Operations Center, 2020). For instance, Minnesota made a guideline for safely reopening gyms and fitness centers. The guideline has set up a cleaning checklist to ensure that all surfaces are clean. Gym centers have implemented information signs with "handwashing" and "cover your cough". It is required to cover one's face with a mask both indoor and outdoor and to keep a six feet distance if possible. Food and drink stations are not allowed. Gym centers encourage events to be closed if they do not have enough space for the activities (Stay Safe Minnesota, 2020).

5.2.3 Singapore

Singapore

Food and beverage services

April 7th:

- Allowed to remain open: delivery and take-away sales (Baker, 2020).

May 4th:

- Only licensed central kitchen, warehouse and manufacturing facilities sale allowed (Baker, 2020).

June 19th:

- All food and beverage services and dine-in services with restrictions, no public entertainment (Enterprise Singapore, 2020).
- Alcohol serving forbidden 10.30 p.m. daily, face mask use and maximum five people in a group. Fines for breaking safety measures (Baker, 2020).

Cinemas, theaters & concerts

April 7th:

- All social gatherings were prohibited including gatherings in parks and public spaces. There were however exceptions for essential workers (Wei, 2020).

June 2nd:

• The restrictions were still in place for social gatherings, but were loosened up for visiting family members. The visitors could not be more than two people, had to live in the same household and could only have one "group" of visitors a day (Wei, 2020). **June 18th:** • To present day the rules have been further relaxed. Now small groups up to five people can gather, meaning also outside of the household, such as restaurants and cafés, as long as they keep a safe distance and avoid mixing with other groups. A household can have up to five visitors in one day (Wei, 2020).
Fitness centers and recreational facilities **April 7th:** • Country went into lockdown (David Lee, 2020). **June 18th:** • The country reopened, including gyms and fitness centers, parks, sports and other public facilities etc. (Ministry of Health Singapore, 2020a). • Required to have a distance of three meters, wear a mask while working out and recreational facilities can be held but maximum ten square meters per person (Sport Singapore, 2020).

Table 5.12: The table shows the Covid-19 measures in Singapore for three different categories.

5.2.1.1. Food and beverage services

In Singapore, dine-in food and beverage establishments were closed from April 7th, when the preventative measures for covid-19 period or "Circuit Breaker period" was introduced (Baker, 2020). Some of the new measures were to place plastic partitions between tables for protection and proposed extending serving time of alcohol while limiting the time each group can stay, in order to reduce the risks of exposure (Heng, 2020). As an example regarding the measures, The Market Grill restaurant, established a 1,5 hour limit for customers of each table, and they were also encouraged to make online reservations at the restaurant (Tay, 2020).

5.2.1.2 Cinemas, theatres and concerts

The restrictions for concerts, cinemas and theatre have been strict in Singapore. From April 7th to June 1st all social gatherings with anyone not living in the same household were prohibited. Gathering in parks and shared public spaces were also prohibited (Wei, 2020). The government announced that 100-person audiences will be allowed in the country from November (Peters, 2020). On March 26th the government announced that all cinemas and theatres in the country would be closed (Patrick Frater, 2020). Three months later it was announced that the cinemas and theatres were to be reopened if they could follow the "Safe Management Measures" for

cinema listed by Singapore's government of measures for different workplaces. Each screening would be limited to 50 people at a time, where five people were allowed to sit together, all had to wear masks except for when eating and drinking and one meter distance had to be upheld at all times to staff and other customers.

5.2.1.3 Gym centers and recreational facilities

The Singaporean authorities closed all gyms and recreational facilities in the country on April 7th (Kwek, 2020). Almost two months later the community's gyms, fitness centers, parks, sports and other public facilities were re-opened (Ministry of Health Singapore, 2020b). Sport Singapore, a government site to make the residents enjoy sports, have made a complete overview of every sport in the country such as dance sport, shooting, triathlon, weightlifting, bowling, skating and more. For instance, the Singapore Bowling Federation have developed guidelines on ways to stay safe whilst bowling. Visitors must scan their entry and exit with "Safe entry", an app to register Covid-19, and are to be screened before entering the area. If the visitor's temperature were 38 degrees Celsius or higher, they would be denied entry. All employees had to check their temperature twice a day to make sure they were healthy (Singapore Bowling Federation, 2020).

Figure 5.18: Food and Beverage information sign in Singapore (Go business, 2020).

6.2.4 Comparing the Measures

When comparing the three countries with each other, there are clearly differences in how the government in each country has handled the situation of the pandemic. They all have set some different safety measures, making it harder for the population to meet and socialize, but to a different degree.

The magnitude of the restrictions in Norway was bigger than those in the US but weaker than those in Singapore. When it comes to the safety measures in Norway, the contributed information was clear and always easily accessible to the population. On the other hand, there have been fewer measures implemented in the country throughout the entire period compared to Singapore. Fees have not been applied in Norway, which could be explained by the Norwegian government and the population having a more trusting relationship to each other than compared with Singapore.

In the US, on the other hand, the measures were less strict then in Singapore and Norway. The information given by the government was not as clear as it was in Singapore and the country did not go into full lockdown as most other countries did. The officials in the US only gave guidance for safety measures that could help prevent exposure and some social gatherings were limited. This gave the impression that the US did not take the spreading of the virus seriously.

The officials in Singapore have from the very beginning systematically and strictly informed their population about the pandemic and warned them with fees if the rules were not followed. These actions can be based on the country's high willingness of taking care of the population's needs, as well as the highly structured government taking quick actions for the country's economy.

Other global responses to Covid-19 for the social and cultural sectors have contributed with different solutions from supporting artists or getting people involved during a lonely pandemic.

- In **Iraq**, an initiative called "Literature and Arts as Helpmate" was launched to aid people in confinement experiencing loneliness (Centers for Disease Control and Prevention, 2020a).
- In **Kenya**, the government created a 1,9 million USD fund to give artists a minimum wage (United Nations Educational, Scientific and Cultural Organization, 2020b).
- In **Senega**l, filmed guided tours were broadcasted online and on television of the Museum of Black Civilizations (United Nations Educational, Scientific and Cultural Organization, 2020c)
- In **Italy**, a system was started of vouchers for reimbursement or replacement of cinema, museum, theatre and concert tickets that were already sold. This was done to reboot the cultural life again after the immense outbreak of Covid-19 in the country had passed (United Nations Educational, Scientific and Cultural Organization, 2020d).

The measures presented in each country will affect people in different ways. The World Health Organization published a report in March 2020 addressing the virus's effect on people's mental health (World Health Organization, 2020b). in relation to this there has been a concern for a potential spike in suicides as a result of self-isolation, physical distancing and the fear/anxiety caused by the pandemic (David Gunnel, 2020). The next chapter will dive into mental health through the same three countries presented earlier.

5.3 Human Condition

When trying to paint an accurate picture of the global effects of Covid-19 on people's mental health one must compare numbers of mental health cases from before and after the pandemic. As of now that will be difficult to accomplish due to the still ongoing pandemic. Nonetheless, there are several reports, research papers and scientists which have attempted to describe the expected effects of the pandemic on people's general mental health.

According to a policy brief issued by the United Nations on May 14th it was reported that the need to increase the investments in mental health services was urgent. If not, one would risk an enormous increase in mental health conditions in the coming months (World Health Organization, 2020b). Director-General of the World Health Organization, Dr. Tedros Adhanom Ghebreysus stated that the impact on people's mental health is already extremely concerning.

In a research paper by J. J. Mari and M. A. Oquendo something along the same line was concluded. Here the researchers chose to call the expected mental health effects of Covid-19 "the next global pandemic" (Oquendo, 2020). Mari & Oquendo explained that an emergence of mental health disorders in the vulnerable individuals was guaranteed, due to the global population being exposed to traumatic events associated with the pandemic.

Dr. Vikram Patel, the Pershing Professor of Global Health at Harvard Medical School, stated that a rise in clinically significant mental illnesses and suicides naturally may follow the pandemic. The clinical mental illnesses being: depression, anxiety disorders and substance abuse (Patel, 2020). In addition, Dr. Vikram stated that general mental issues would also be

widespread, such as experiences of anxiety, fearfulness, sleep problems, irritability and feelings of hopelessness.

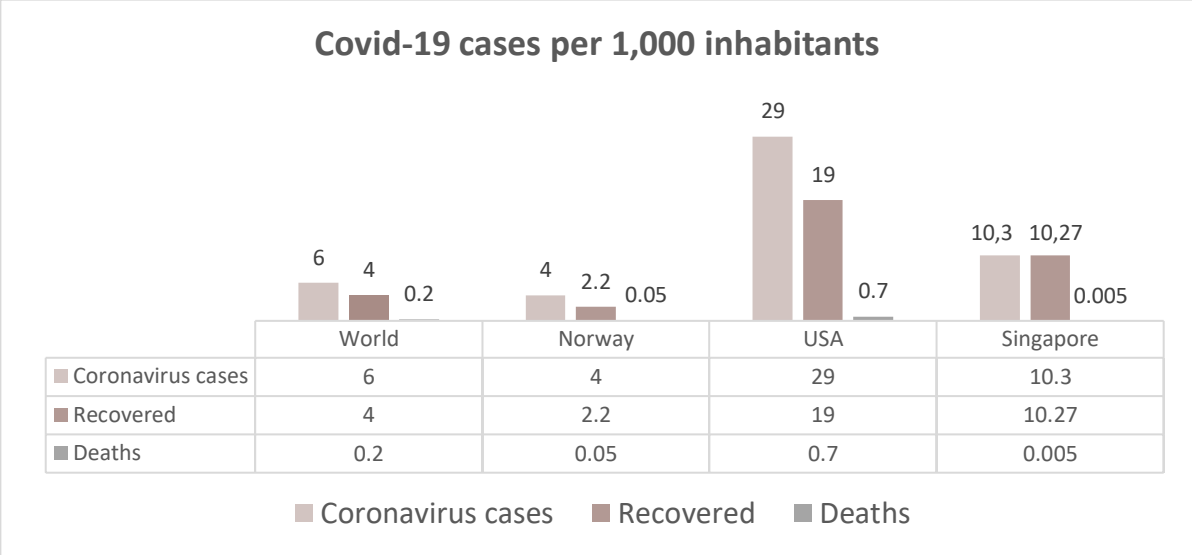
In addition to the clinical mental illnesses mentioned by Dr. Patel, Mari & Oquendo stated that PTSD, Post Traumatic Stress Disorders, would be widespread, especially amongst healthcare workers, frontliners and others who have experienced the traumatic results of the Covid-19 virus. Mari & Oquendo wrote that many of those individuals are subjected to witness suffering daily, are forced to make difficult ethical decisions and are often exposed to physical and emotional demands, this often with insufficient personal protective equipment to guarantee safety.

Furthermore, Mari & Oquendo explained that the impact of Covid-19 on people's mental health will be caused by primarily five different effects of the pandemic, where each one of these effects independently is expected to have colossal consequences on one's mental health. The first effect being the sudden and unexpected occurrence of the virus which brought fear and triggered stress reactions amongst the population. The second effect was said to be the need for quarantine or self-isolation. The sudden change to people's routines, the lack of socialization and the loss of freedom lead to feelings of helplessness, boredom, anxiety, irritability and anger. The third expected effect on mental health relates to the numerous casualties resulting from the virus. As of November 3rd 2020, there have been 46 591 622 confirmed Covid-19 cases and 1 201 200 deaths reported globally to WHO (World Health Organization, 2020c). These numerous deaths worldwide are overwhelming hospitals, mortuaries and funeral homes. The loss of a loved one alongside not being able to spend time with them before passing or having a proper burial could lead to prolonged grief and depression and suicide risks may increase.

The fourth effect which is said to impact mental health is related to the individuals who had to be admitted to intensive care or witnessing someone having to be admitted. Those individuals will be vulnerable to developing major depressive episodes, post-traumatic stress disorders and other clinical mental illnesses. The fifth and final instance affecting people's mental health are the economic losses, unemployment, food insecurity and greater social inequalities. These effects are all causing chronic stress for large parts of the global population and increase the risk of serious mental disorders.

Director of the Department of Mental Health and Substance Use at WHO, Dévora Kestel, stated that this expected global mental crisis could be seen as an opportunity to build better and stronger mental health services that are fit for the future (World Health Organization, 2020b). Kestel stated that this could be accomplished by funding and developing national plans, ensuring coverage of mental health conditions in health insurances and developing the capacity to offer quality mental health care in the different communities.

There are reports from a number of countries that already indicate that the above mentioned effects on mental health and expected symptoms of depression and anxiety are correct. For instance. In a study from Ethiopia, published in April 2020, a 300 percent increase in symptoms of depression was reported. This was in comparison with estimates from before the Covid-19 outbreak (World Health Organization, 2020b). Going forth in this report the mental health implications in three countries, Norway, The United States of America and Singapore, will be presented and the measures taken by the countries politicians and leaders are to be reviewed.



	World	Norway	USA	Singapore
Coronavirus cases	6	4	29	10.3
Recovered	4	2.2	19	10.27
Deaths	0.2	0.05	0.7	0.005

Table 5.13: Covid-10 cases per 1,000 inhabitants compared to each other (Worldometer, 2020).

The table above gives an indication of the corona situation in three different countries compared to the world on average. It shows how many got contaminated, recovered and how many died from the virus. The numbers for each country are based on the number of inhabitants. It is nevertheless important to point out the uncertainty linked to these numbers. The number of contaminations is only based on people testing positive to corona and can for this reason be inaccurate to some degree. This is due to the country's willingness and capacity of testing

people, and the numbers could for this reason be different. Additionally, Singapore shows a more accurate number between the different categories, while Norway and the US has some omitted data when it comes to people recovering from the virus.

5.3.1 Norway

Key findings for Norway

- 41% of the participants of "Bergen i endring" answered "The corona virus have made it difficult for me to take care of people close to me in need of help"
- 48% of the participants of "Bergen i endring" answered "I fear that the breakout will lead to economic challenges"

  (Universitetet i Bergen og Bergen kommune, 2020).

- Increase in calls to the mental health helpline "Kirkens SOS". going from 500-600 to 600-900 call daily. Calls concerning thoughts about committing suicide have also doubled (Thomassen, 2020a).

- A 2-3 times doubling in symptoms of depression (Forskning, 2020).

Table 14: Key findings for Norway

During the coronavirus pandemic, NAPHA, the National competence center for mental health and intoxication for adults, has been in contact with a number of Norway's municipalities to see if the capacity was sufficient, how the reorganization of routines has been affected and how the ability to perform health services has been affected. They received 76 responses from 51 different municipalities; the general feedback was that the measures and reorganization in mental health had put the whole system to a test, both when it came to conversion to new habits, routines and the way of working to find digital solutions. But they also reported the situation to be stable and the capacity to be good in most municipalities. The municipalities make sure priorities are continually reevaluated and follow-up with the priorities. Individual sessions and treatments are offered over the phone, by text and internet with video consultation in several places. Where physical meetings are important, they offer walks with proper distance and hygiene rules. Home visits are minimized to meet the bare essential needs of the patients and several municipalities have developed plans for potential quarantine for care homes (NAPHA, 2020).

The Department of psychology in Oslo, have found that there have been more frequent calls to the helpline (Thomassen, 2020a). Kirkens SOS, a Norwegian emergency call, is one of them which has experienced a doubling of calls than normal. Just by the three first weeks with infection control measures they have reached 600-900 calls daily, where they normally have had 500-600 calls. Also, calls about suicide thoughts have doubled, which can be related to the increased symptoms of anxiety and depression. The increased calls can be a result of more retract and insulation, as well as a reduction in follow-up by healthcare professionals due to capacity problems.

Additionally, the survey conducted by The Department of Psychology in Oslo shows an increased number for people expressing depression, anxiety and PTSD. The study was carried out by the University of Oslo together with "Modum bad", private institution with research based treatment of mental illnesses, by Sverre Urnes Johnson, Asle Hoofart and Omid Ebrahimi. About 10 000 people around Oslo took part in the survey showing two times the cases of feelings of anxiety and three times more experienced depression. The results from this survey are only the feeling of anxiety or depression and not diagnosed by a professional, but the results are still alarming. An increase of these types of mental health issues are normal at the start of a pandemic, but not as high as seen in this survey. Ebrahimi makes predictions saying a substantial part of the individuals experiencing these symptoms will be able to get back to normal when living conditions go back to how they used to and the virus no longer is a threat. However, this will probably not be the case for everyone and some may experience a continuing or higher feeling of anxiety or depression. The study also showed that one of four people working with infected patients suffer from PTSD (Stranden, 2020). These cases are quite likely to also be persistent for some time after the pandemic.

The University of Bergen, Bergen municipality and Folkehelseinstituttet, the Norwegian National Institute of Public Health, have conducted similar research for the people of Bergen called "Bergen i endring". In total 80 000 people were randomly selected to take part in a questionnaire (Universitetet i Bergen, 2020). The questionnaire was made in two versions, one for adults and one for youth. In total 29 535 adults took part in the survey and 2997 youth. To date only the first phase of the survey has been fully completed. One part of the survey is "Everyday Challenges" where they ask "Has the corona virus made it difficult for me to take care of people close to me in need of help? From the 25 944 people who answered 41 percent said this statement was fully or partly correct. Another statement was "I fear that the breakout

will lead to economic challenges", here 26 132 answered this question and 48 percent said the statement was fully or partly correct. Additionally, there was a segment in the survey concerning people's mental health which has still to be quality assured before it can be published (Universitetet i Bergen og Bergen kommune, 2020).

"Folkehelseinstituttet" presented some conclusions in their reports "The vulnerable groups during the corona pandemic" and "Social and economical aspect" that it is too early to assume which groups are more vulnerable than others, in addition to having a very small amount of research-based documentation to be able to draw a conclusion. Nonetheless, based on the other findings presented it will be important that the availability of healthcare services is restored and improved as fast as possible (Folkehelseinstituttet, 2020b).

5.3.2 The United States

Key findings for The United States
• More worry about the health and safety of family members or friends (66% of respondents) • Feeling more frustrated about not being able to do what they usually enjoy doing (58%) • More worry about their own personal health or safety (57%) • More worry about possible breakdown of society (56%) • More worry about own finances (53%) • Being more bored (53%) • Being more anxious or ill at ease (51%) (Olafur S. Palsson, 2020) • More than eight-fold increase in phone calls and text messages to helpline since February (Hopkins, 2020) • Three of five healthcare workers had worsened mental health due to the pandemic (Centers for Disease Control and Prevention, 2020d)

Table 5.15: Key findings for The United States.

Due to the coronavirus pandemic with societies going into lockdown, many people have turned to mental health apps and telehealth platforms as an alternative to seeking professional mental help. According to the survey of 880 community behavioral health care organizations, in total 61 percent has shuttered at least one program because of the pandemic, as well as almost all organizations that were surveyed reduced their operations. In addition to having a mental healthcare system which was already failing to meet people's needs before the pandemic, the

situation only got worse with the spreading of the virus and people having to self-isolate (Altiraifi, 2020).

In the US mental health care is unaffordable and inaccessible, this due to high prices and the lack of insurance coverage for mental health services. In addition, some individuals experience difficulties accessing these services due to their skin color, even if they have insurance (Altiraifi, 2020). In addition to this, more than half of the counties in the US have no practicing psychiatrists, which can provide mental healthcare. Even if American adults are one of the most likely to seek professional help compared to other high-income countries, they are also the largest amount of reported access issues and unaffordability care (Roosa Tikkanen, 2020). In addition, The Commonwealth Fund article concludes that the US has a very low supply of mental health care workers, particularly psychiatrists and psychologists. Only about one-third of the primary care practices have mental health professionals.

When regarding the mental health helplines in the US, there has been a large spike in activity while the pandemic has been going on. The helpline Vibrant Emotional Help and the Substance Abuse and Mental Health Services Administration are some of them. They have answered up to 7000 calls and received 19 000 text messages only in March, which is more than eight-fold increase since February (Hopkins, 2020). Callers to the National Alliance on Mental Illness´ helpline are reporting feelings of anxiety and depression, and are seeking advice on how they can continue their mental health treatment, as well as medicine refill during stay-at-home orders.

To map the mental health situation in the US, NCHS, The National Center for Health Statistics, in collaboration with the Census Bureau, made a 20-minute survey called the Household Pulse Survey to monitor changes in mental health during Covid-19 (Centers for Disease Control and Prevention, 2020d). The questions in the survey included information about the frequency of depression and anxiety symptoms of the population of the U.S. Results showed that clinically significant symptoms of anxiety and depression have more than tripled among the population during the pandemic and that it occurs more than half of the days or almost every day. In addition, frontline healthcare workers reported in May that three of five workers had worsened mental health due to the pandemic. The report of the survey also shows that generally, anxiety and depression disorders have the highest numbers of cases where people of color are disproportionately affected and people in the age of 18-29. The chances of depression and anxiety decrease relatively with the increasing age of the individuals.

As seen from the results of the Household Pulse Survey, it is also important to map out why and where these high increased depression and anxiety cases are coming from. In a report conducted in May 2020 by the U.S. National Pandemic Emotional Impact it was found that the virus and the extensive changes to the population´s everyday life, has in a substantial degree had a negative effect in the emotional wellbeing and lives of the majority of American adults (Olafur S. Palsson, 2020). On average, people of ethnic or racial minorities, especially Hispanic/Latinos, as well as adults under the age of fifty and women, had been most affected mentally compared to the rest of the population. They have experienced disproportionately worse mental health outcomes, elevated substance use, and heightened risk of committing suicide. The results of the report indicate that the pandemic has multifaceted personal effects on U.S. adults and has substantial implications for their mental health in the near future. Further adequate resources and research efforts are essential in order to address mental health effects like these, in addition to determining helpful prevention and intervention strategies throughout the remaining course of Covid-19 in the U.S, as well as in other future pandemics and crises.

The conclusion that can be drawn here is to empathize that public health practices in the US need to be strengthened, by increasing prevention and intervention efforts. It is recommended that federal, state and local governments take action, by providing increased funding to medical providers and in-need communities, larger funding for community-based and peer support, addressing the social determinants of mental health, and funding these policies permanently (Altiraifi, 2020).This is important in order to better the human condition for those affected by the pandemic. Young adults, ethnic/racial minorities and healthcare workers should be prioritized due to them being significantly more affected by the pandemic than the rest of the population.

5.3.3 Singapore

Key findings for Singapore
• Working from home reported feeling stressed at work (61%) • Frontline workers reported feeling stressed at work (53%) (National University of Singapore, 2020).
• Are willing to sacrifice eating out expenses (75%) • Are willing to sacrifice gym membership (61%) • Are willing to sacrifice life insurance premiums (18%) (Swiss Re, 2020)

Table 5.16: Key findings for Singapore.

Singapore is the country in Asia-Pacific with the 4th best healthcare system, scoring 76,4 points out of 100 in a test, with New Zealand, Australia and Taiwan being the top three countries (Evlanova, 2019). The test is based on four different topics which concern how the nations contribute different benefits to the community, such as helping people get jobs, offering social and healthcare services, helping people with mental-health rights and more. The pandemic has affected the inhabitants' mental health negatively, with mental health cases increasing by 22 percent from April to May. During Covid-19 the SOS hotline calls for mental health issues have increased with 35 percent since last year. They received about 4,265 calls in March, 4,265 calls in April and 3,831 calls in May. The numbers have declined since March but remain higher than the year before (Teo, 2019). The increasing number of calls indicate a worsened mental health among the population in Singapore during the spreading of Codiv-19.

According to a survey conducted by the National University of Singapore, with 3,259 participants, 61 percent of the participants answered they felt stressed during work when having to work from home and 53 percent of the frontline workers also were more stressed than usual (National University of Singapore, 2020). It was concluded in the survey that women felt more stressed about the pandemic than men and that half of all workers are stressed about the current global situation. If these circumstances were to continue with people experiencing heightened stress, it could lead to bigger mental health problems, such as anxiety disorders, within the different job sectors. Singapore has easily accessible information for people who need mental health support. On Singapore Counselling Centers website one can find who to contact and Provision of Counselling Sessions, live webinars for mental wellness talks and training for peer supporters. The website also has comforting messages saying it is okay to need help in a situation like this. They also offer special health support for organizations (Singapore Counselling Centre, 2020).

As for the vulnerable groups in Singapore, which the government has concluded to be workers, students and seniors, there has been initiated additional mental health support for these groups (Ministry of Health Singapore, 2020b). For employees, an inter-agency advisory has provided for counselling resources to support peoples mental well-being, students have been provided both face-to-face and online sessions and the elderly have been assigned to assistance as required. The government was also willing to continue to give accessible mental health support and services for the ones in need, in addition to staying open to potentially other vulnerable groups of individuals emerging over time due to the coronavirus, wanting to further strengthen their mental health services. Generally, the government in Singapore has good information available for those struggling due to the pandemic. Since the government in Singapore has managed to provide essential mental health support and other services as psychiatric day centers, the nation has had an advantage in tackling the mental health challenges arising in relation to the pandemic.

5.3.4 How can we improve the Human Condition?

As previously seen, there has been a huge impact related to the changes made correlated to the Covid-19 pandemic, especially on people's mental health. There have been challenges in form of morbidity, mortality, and mitigation activities which have affected the population to a higher degree than previously assumed. Many have reported considerably serious mental health conditions.

The mental health issues that have been presented are primarily anxiety, depression and PTSD, which are the largest mental disorders worldwide (World Health Organization, 2017). In a long term perspective these illnesses can lead to even worse outcomes, like reduced quality of life, self-harm and suicide, causing the society great emotional and economic losses. Mental health numbers from previous years compared with when the pandemic started to spread in 2020 were good indicators of that stricter measures and less social interactions can lead to higher cases of anxiety and depression. It is for this reason important to find solutions that can improve the human conditions in order to lower the cases of mental disorders through this pandemic and others in the future. Huge costs for the society will occur with the more mental health issues that are happening. The global pandemic has taught us that the time has come to build up and strengthen the existing health services in most countries. It is important that these types of services get the funding that they require in order to be able to provide the correct care for those

in need. All inhabitants in a society should be able to get the help and treatment that they need. The findings and learnings of this pandemic can additionally improve future planning if subsequent outbreak waves occur, as well as eventually new pandemics or similar in the future, to prevent the spread and save lives.

What will also be of further importance is the countries focusing on receiving reliable and timely information, which includes updates on advisories on social responsibility and other important cases. Multi-platform, multi-format and multi-language approach as given in Singapore, is important to ensure effective information to different segments of society (Ministry of Foreign Affairs Singapore, 2020). Additionally, it is important to keep in mind that the data on mental health has a high uncertainty so it is still important to be cautious about comparing differences between countries and to interpret any changes over time. Mental health disorders are common everywhere. What should be the essential health focus globally is to improve recognition, awareness, treatment and support for this range of disorders. Trying to understand the circumstances of the physical environmental situation will also be an important way to understand the impact on people's mental health and to give a higher understanding for how to improve the human condition.

5.4 Environmental Situation

When attempting to answer the second question in this report “How can we improve the Environmental Situation?” the environment at hand must be defined first. The global environment, here meaning CO2 emissions, pollution and climate change, is difficult to connect to the social effects of the pandemic. Several reports have stated that the environmental situation, with regards to global climate change, has temporarily improved during the pandemic (Tollefson, 2020). However, those effects were not social but rather a consequence of societies shutting down, where several businesses and factories had to close, people had to stay home and cancel their vacations. More about those effects on the environment can be read in Chapter 2: Home, Chapter 3: Work, and Chapter 4: Travel.

The environment that mostly relates to this research topic is the physical environment. This includes peoples housing, living conditions and public and recreational areas. People's surroundings have always been known to affect one's mental health, and during the pandemic

this became even more evident (Colman, 2020). For many it became a challenge staying at home either without having anything to do or perhaps with children and home office. In addition, it became a challenge to stay in good physical health when fitness centers and the possibilities to leave one's home became limited. These aspects of the physical environment that affected the social situation are to be reviewed on the following pages.

5.4.1 Housing and living conditions

How does housing during the corona pandemic affect people's mental health? The corona situation has made big changes to how people live their lives for over half a year now. Most of the world has had some form of lockdown and for many this has included quarantine. Here people's housing situation can have an impact on their level of wellbeing. There have been studies conducted on the effect on mental health and psychological wellbeing on people that have undergone quarantine. Some of the results show a connection to heightened stress and several negative psychological outcomes such as low mood, irritability, anger, insomnia and emotional exhaustion. In a study of symptoms of stress 338 hospital staff members were placed under a nine-day quarantine during the SARS epidemic in 2003. The results showed that being placed in quarantine was the biggest factor to the development of acute stress disorder. There were also other factors that affected the level of stress including stigmatisation and inadequate information. A different study published in Lancet Synthesised showed that being placed in quarantine shows heightened likelihood of developing posttraumatic stress and avoidance, fears of infection, frustration, boredom, sense of isolation, fear of inadequate supplies, anxiety and anger. They also point out that duration has a big factor and that longer duration of lockdown is associated with poor mental health outcomes (Psych Scene Hub, 2020).

The social situations are vastly different for families social distancing together in one house versus young adults and elderly who live alone. Here the people who are living alone are more vulnerable to social distancing influencing their mental health than people living with others. People's economy also influences comfort during the quarantine. Those with a good economy generally have more space and private outdoor space while those further down on the economic ladder might live more cramped and with less available private outdoor space. The decision to live in a big city or to live in more rural areas also influences how easy it is to distance yourself from others while out and then also how fast the pandemic can spread if people do not follow guidelines. On one side one finds families living on farms away from cities and with a great distance to neighbours and the other side of the spectrum with people living alone in cramped

apartments in the middle of the city with no balcony or private outdoor space. In the future this can be a heightened problem as we move towards more high density living with more shared green spaces to improve climate change challenges. Although a focus on high density is not always the quick solution as it has been presented as. The argument supporting density is the travel distance from home to work and other daily destinations, however this distance is not automatically shortened by moving residents or workplaces closer to the city. If people work and live outside of the city, moving one of them will only create a bigger problem (Røstvik, Stavanger Aftenblad, 2020).

Continuously more people are living alone due to the aging population, people tend to get married at an older age and the divorce rate is increasing in the western world. “Housing is a fundamentally key factor in people's mental health. People with housing problems are at greater risk of mental health problems” - Mental Health Foundation. The University of Versailles Saint-Quentin-en-Yvelines in France has conducted a survey of people living alone and its implication to mental health challenges in England and collected data from 20,503 older adults in the ages 61-74. The study concluded that living alone is linked to common mental disorders, CMDs, meaning anxiety and substance use disorders. The survey included a clinical interview Schedule-Revised questionnaire, to assess if they had experienced neurotic symptoms the last week. From the survey the scientists looked further into what caused these CMDs and in 84 percent of the cases it was linked to the feeling of loneliness (Newman, 2019). Professor Harald N. Røstvik talks about this in his report “Densification of cities or improved technology to curb greenhouse gas emission?". A growing feeling of alienation is at the extent that health issues is an ongoing discussion with its relation to loneliness. Some of the cities where we find a lot of single housing are New York with 33 percent and Stockholm with 58 percent (Røstvik, Densification of cities or improved technology to curb greenhouse gas emissions?, 2018). Using the same three countries as earlier, it will be focused on the implication of quarantine and the living situations in the different countries.

5.4.1.1 Norway

Norway has not had a quarantine put on the whole public, but from March 12 the government made rules for when quarantine was required and general guidelines for the public. When traveling in from other countries a 14 day quarantine was required no matter where you had been. This was later changed to 10 day quarantine and only when entering from countries that have been graded yellow or red based on their level of contamination (Helsedirektoratet, 2020).

In Norway the number of people living in single residents is at 18,3 percent based on data from January 1st 2020. This is a 0,3 percent rise from 2019 (Andersen, 2020).

5.4.1.2 The United States

In the US there have been measures implemented within each state, making a general statement impossible. However there have been people going into quarantine in some states. In February 2020 the government put in the first mandatory 14 day quarantine, this was to 600 Americans arriving from China's Hubei province (Steinmetz, 2020). Later different states imposed their own quarantines. In June New York imposed quarantine on eight US states along with New Jersey and Connecticut. This also had the duration of 14 days (BBC, 2020a). The number of single-person households in 2019 was at 28,4 percent. This is following the trend as mentioned from 16,7 percent in 1969 (Census Bureau, 2019).

5.4.1.3 Singapore

From April 7th to June 1st all social gatherings with everyone not living in the same household were prohibited. Parks and shared outside spaces were also prohibited. From June 2nd the restrictions were still in place for social gatherings, but they loosened up for people to be able to visit parents and grandparents living elsewhere. The visitors could not be more than two people, they have to live in the same household and people can only have one "group" of visitors a day. From June 18th to the present the rules have been further relaxed. Now small groups up to five people can gather, and this also means outside of the household as restaurants as long as they keep a safe distance and avoid mixing with other groups. A household can have up to five visitors in one day (Heng, 2020). These restrictions meant that those who lived alone in Singapore during the pandemic, without family living close by, spent a total of 72 days in lockdown without any physical social contact. In Singapore 15,2 percent were reported to live alone in 2019. This is a rise from 10,3 percent living alone in 2009 following the general global trend. As found earlier, the added mental health risks with living alone and being under quarantine for a long time can result in major issues with mental health throughout the country.

5.4.2 Public and recreational facilities

Parks and recreational areas worldwide played a big role in keeping people active during the pandemic when great parts of society shut down. Big parks, hiking areas and open spaces became safer for residents then the crowded places people usually were going to, such as the

gym, shopping center and entertainment centers. The Norwegian authorities were urging people to stay home as much as possible, but recommended that if one were to leave the house one should keep a safe distance to others, avoid taking public transportation and choosing non-popular recreational areas (Sørdal, 2020).

In a big survey conducted in North Trøndelag, Norway, researchers have studied the chances of developing depression between active and inactive individuals (Oslo universitetssykehus, 2020). One of the main findings in this survey was that those who were in regular physical activity had significantly less depression than those who were physically inactive. Furthermore, it was found that as much as 12 percent of future cases of depression could be prevented by physical activity, according to Arnstein Mykletun from Folkehelseinstituttet, the Norwegian Directorate of Health. In addition, it is known that physical activity is one of the best medicines for mild to moderate anxiety and depression.

Inactivity in the Norwegian society is essentially too high, but is now additionally in danger of being intensified due to the restrictions put in place to prevent the spreading of Covid-19 (Oslo Universitetssykehus, 2020). It is estimated that around 80 percent of the population is less physically active than what is recommended by Folkehelseinstituttet. Developing and facilitating more parks and recreational areas should become a priority, especially since knowing that mental health is greatly affected by one's amount of physical activity.

5.4.2.1 Norway

In the middle of March, the government closed the country and outdoor events such as fitness centers. NRK, the Norwegian broadcasting corporation, recommended the resident to stay healthy for preventing good mental health such as hiking or running in the nearest parks/forests (Jørgensen, 2020b). A survey from Trondheim in March shows that every fifth Norwegian reports poorer physical condition and six percent of the survey reported for being in a healthier position than before coronavirus (Trondheim By, 2020). By the middle of August schools started and students gathered to get to know their classmates known as “fadderuke”. Several Norwegian universities, such as NTNU and Førde, cancelled their get-to-know week since the virus had increased weeks before the start of the semester (Kvikstad, 2020). But students at other schools met in parks for a safer environment to get to know other students. Oslo facilitated by spraying up distance in the grass in the parks to make it easier for people to hold a distance (NRK, 2020b). Drinking in public was not permitted, therefore the Norwegian police had to

end these types of events to be able to handle the Norwegian law and the measures for coronavirus (Stavanger Aftenblad, 2020).

Figure 5.19: Spraying marks in different parks in Oslo for keeping the right distance (Jonassen, 2020).

5.4.2.2 The United States

The coronavirus entered the US in March and people were recommended to stay home. Only half of the amusement park were closing down, and the rest still remained open. Usually parks hope to get visitors, but during the virus in the spring some parks suggested on their Facebook page that visitors should stay home. Overall parks suggested people to follow CDC guidelines (McGivney, 2020). One month later national parks were re-opening and this made people rush to the parks after staying home for two months. Psychology professor Shelly Carson explained that being outdoors and breathing fresh air will help peoples mental health and made it clear that people needed to get out. Still he was worried for crowded parks, but recommended to follow the guidelines for each county (McKelvey, 2020).

Figure 5.20: Old Faithful Geyser in Yellowstone amusement parks in Wyoming in USA (Reuters, 2020).

5.4.2.3 Singapore

The country was in lockdown for almost two months with strict lockdown measures and breaking those measures could result in fees and even jail time. By making sure that people were holding the measures after the lockdown, Singapore had a robot dog in Bishan Park for two weeks. The robot was patrolling and had a loudspeaker where it said "For your own safety and for those around you, please stand at least one metre apart. Thank you". The dog has a 360 degrees camera to make sure people are following the distance (BBC, 2020b). This project was a success for patrolling the residents and one month later it was possible to buy robot dogs for US $75, 000 (Gill, 2020). This type of robot enforces people to hold the social distance and decrease the virus for spreading.

Figure 5.21: Robot dog patrolling in Bishan Park in Singapore (Gill, 2020).

5.4.3 How can we better the Environmental Situation?

The international shared medical ideas platform, Psych Scene Hub, presents different measures that can prevent some of the consequences connected to mental health during quarantine happening or at least reducing them. The advice they give from the quarantines is keep lockdown or quarantine since a big factor is how long people are under lockdown. Keeping the duration to a minimum can have big psychological benefits. Give adequate information, frustration concerning wrong information is one of the challenges that should be easier to get right. Creating a platform to present information and updating throughout the pandemic is important to reduce frustration and anxiety. Adequate supplies are important to be able to mitigate spread and treat those who have been contaminated. Reduce boredom, improve communication, social network activities are important for people to feel a sense of purpose and keep social interactions with close friends and family. Telephone services with health care workers or psychiatric nurses should have additional resources put in. Support for healthcare workers who are particularly vulnerable and more likely to be quarantined. The last advice is tapping into altruism to reinforce the message that quarantine is helping to keep yourself and others safe (Psych Scene Hub, 2020).

The move towards more dense housing structures will increase the number of residents living in the most challenging environments and most likely increase the percentage of citizens

struggling with mental health issues. A bigger focus on these challenges is crucial for people's wellbeing and the community. The physical environment has a great effect on people's mental health, especially in a time where people's movement, and thereby freedom, has become restricted. To better people's mental health, one will also have to better the environmental situation. This can be done by altering some aspects of the physical environment. Primarily, one should pursue developing more recreational areas and making those areas easier to access from one's home by foot.

5.5 Conclusion

The main questions in this report were “What did we learn that may be continued?” and “How can we improve the human condition and environmental situation?” By looking at the measures implemented within the different countries we have learned that the approach to deal with the pandemic has been quite different from one another. When looking at Norway, The US and Singapore these differences were quite clear. Singapore came out as the “toughest” in most categories, putting strict restrictions on all citizens and fees for people breaking them. Norway followed with a more trusting approach of strict guidelines but without the fees and more directed at people who are more likely to be infected. The US has for the most part the most relaxed approach. On a national level there have only been guidelines. Measures that have been put in place have been on a state level and so they have differed quite a bit within the country. From the standpoint of saving as many lives as possible the stricter approach done by Singapore has seemed to be most effective with a total of 0,0005 per thousand inhabitants. While the measures implemented, or the lack thereof, in the US had led to the biggest consequence for the public with a total of 0,7 per thousand inhabitants. From the number of contamination and deaths in the different countries, one can conclude that when faced with other similar pandemics in the future, although the measures implemented in Singapore were strict, they still seemed to pay off.

To improve the human condition, it is important to look at scientific data being collected during the covid-19 pandemic as it can give valuable data to deal with future pandemics. One of the most important findings from the data analyzed in this report is how much of an impact a pandemic can have on people's mental health and how this can further create social and economic challenges. Plans on how to deal with anxiety and depression when restrictions are

put on social interactions and measures to deal with people going through post-traumatic stress for frontline workers in the health sector. Focus on leaders delivering information and clear guidelines is also important for people to feel secure and they know what the current situation is.

To improve the environmental situation the mental health comes in again when looking at the impact of housing and living conditions. This is even more evident under lockdown or quarantine when people's social interaction is more or less limited to one's household. The duration of a 72 day lockdown as in Singapore can then be quite challenging to people's mental health so here it is important to find measures that can help when they start to struggle. Public and recreational areas are important because of the way they better both physical and mental health. By keeping these areas open the benefits of some available physical activities can help prevent mild to moderate anxiety and depression. This can be a good compromise to a full lockdown if the areas are big enough for people to keep the required distance. This becomes even more crucial with the expected increase in people moving to big cities. The tighter people live the more necessary it is going to be to have big recreational areas available in close proximity. Technical interventions as the robot dogs used in Singapore to make sure people keep their distance can also help in the future to make following restrictions easier. In all, there are many aspects of the covid-19 pandemic that should be studied further to make us more prepared for future pandemics and to help mitigate the consequences of this pandemic.

The mental health implications can become extremely difficult to handle for most nations if a vaccine against Covid-19 is not made in the near future, this due to people having to remain in quarantine and self-isolation. It yet remains to be seen if the consequences of the pandemic will result in a global mental health crisis as forecasted. But if the predictions are true then it is very likely that a revolution will occur in the mental health sector in the coming years. Therefore, the magnitude of the mental health consequences must be researched thoroughly, to be able to mitigate them accordingly.

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06.
CRIME AND SOCIETY

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6.1 Introduction

During the COVID-19 pandemic which has spread across the globe at a rapid pace, there have been shifts in the crime and safety landscape. The landscape on how criminals act has changed dramatically during this time period. As COVID-19 has continued to spread, our normal routines have changed. People are ordered to stay at home as much as possible, changing the way we work, travel and act (Hodgkinson & Andresen, 2020). A collective behavior change has resulted in a change in how criminals operate. Certain types of crimes have seen an increase while others have decreased. Domestic violence is one of the crime types that have increased during this period, due to the fact that the offender and the victim converge over a longer period of time. Crimes that have decreased during this time have been cases like assault and robbery, due to the fact that offenders and the victims are unable to converge in the same way as before (Hodgkinson & Andresen, 2020).

On the background that our working habits have changed there has been a need for employees on a global scale to work from home one can see an increase in cybercrimes. Personal devices used to access sensitive information can leave companies vulnerable for attacks without the right security measures, which can have serious consequences for the parties involved (Ahmad, 2020). It is reported that by 2021, cybercrimes will cost the world around 6 trillion dollars annually. That's an increase in 3 trillion dollars from 2015 (Ahmad, 2020). Fraud is also one of the crimes that have seen an increase during COVID-19. These criminals usually take advantage of difficult situations and see their opportunities to make money on counterfeit goods, illegal medicine and financial fraud (Karpoff, 2020). COVID-19 have caused many countries to run short on disposable medical equipment, which have caused an increase in demand and have resulted in questionable actors taking advantage of the situation (Karpoff, 2020). Road traffic accidents have been identified as an important issue with a direct impact on societal safety during the pandemic (Qureshi et al., 2020). Some reports suggest that the amount of traffic on the roads have decreased due to lock down. But on the other hand, speeding and reckless driving have become more usual due to the fact that there are less vehicles on the roads (Qureshi et al., 2020). In this section there will be an attempt to cover some of the most prominent cases of crime and safety during the first lock down period of the COVID-19 virus.

6.2 Crime and the effect of COVID-19

In this part of the paper we will look at different statistics and correlations between the things happening in the world because of COVID-19 and its effects on crime. We will be comparing different countries and how different responses have affected crime rates. The USA, the UK, and Australia will be the three main countries we will be comparing as they had good data and articles available. In the articles and data used in this section, forecasting has been used in some regard. Forecasting is using data and analysis from previous years or periods, as well as input from experts on the area to make a prediction about the future (Randers, 2012). The forecasted statistics have been used in some articles to compare with what the actual statistics were after COVID-19 hit. By doing this it creates a clearer picture of how crime changed because of the lockdowns and stay at home orders that were put in place because of COVID-19.

After the rapid spike of cases in the USA in the start of the COVID-19 most of the major cities in the country went into lockdown. This naturally caused some changes in crime and how it was committed. The crime that was mostly carried out in groups saw a big decrease as people were not meeting up in groups anymore (Boman & Gallupe, 2020). However, crimes caused by individuals like homicide and battery have remained the same or even increased (Boman & Gallupe, 2020). In Los Angeles they noticed a significant increase in calls to the police about domestic violence after the lockdown was implemented (Payne, et al. 2020). All in all, crime is down, this is due to the fact that group crimes are so large in numbers across the USA that when they drop the overall numbers drop significantly. The individual crimes are usually more serious and even though the overall rates are down, if that causes a rise in more serious crimes, that is not a good switch (Boman & Gallupe, 2020).

In Queensland, Australia the lockdowns and social distancing also had an effect on the crime rates. By the end of April 2020, the crime rates for the more common serious assaults and sexual assaults had declined to the lowest level seen in years (Payne, et al. 2020). This was a decline that was beyond the statistical expectations and correlated directly with the social distancing regulations implemented in the area (Payne, et al. 2020). Some police jurisdictions in Australia have had an increase of up to 5% in domestic violence after COVID-19 hit, and some jurisdictions have not had an increase (Payne, et al. 2020).

In the UK, Halford, et al. (2020) did a study of a police service area of about 1,5 million people. They used 5 years of crime data from this area as their background of comparison with the crime stats after COVID-19 hit. One week after lockdown was ordered in the area, there was a significant decline in crime in almost every category, with shoplifting falling nearly 62% (Halford, et al. 2020). Overall, there was a 41,1% decrease in all crime, with the only increase being a 1% increase in vehicle theft (Halford, et al. 2020). See figure 6.1 for more statistics. There is a strong correlation between change in mobility and the change in crime. The decrease in mobility in retail and recreation follows the decrease in theft, and the increase in mobility in residential areas (people staying at home) has decreased the amount of home burglaries by about the same percentages (Halford, et al. 2020).

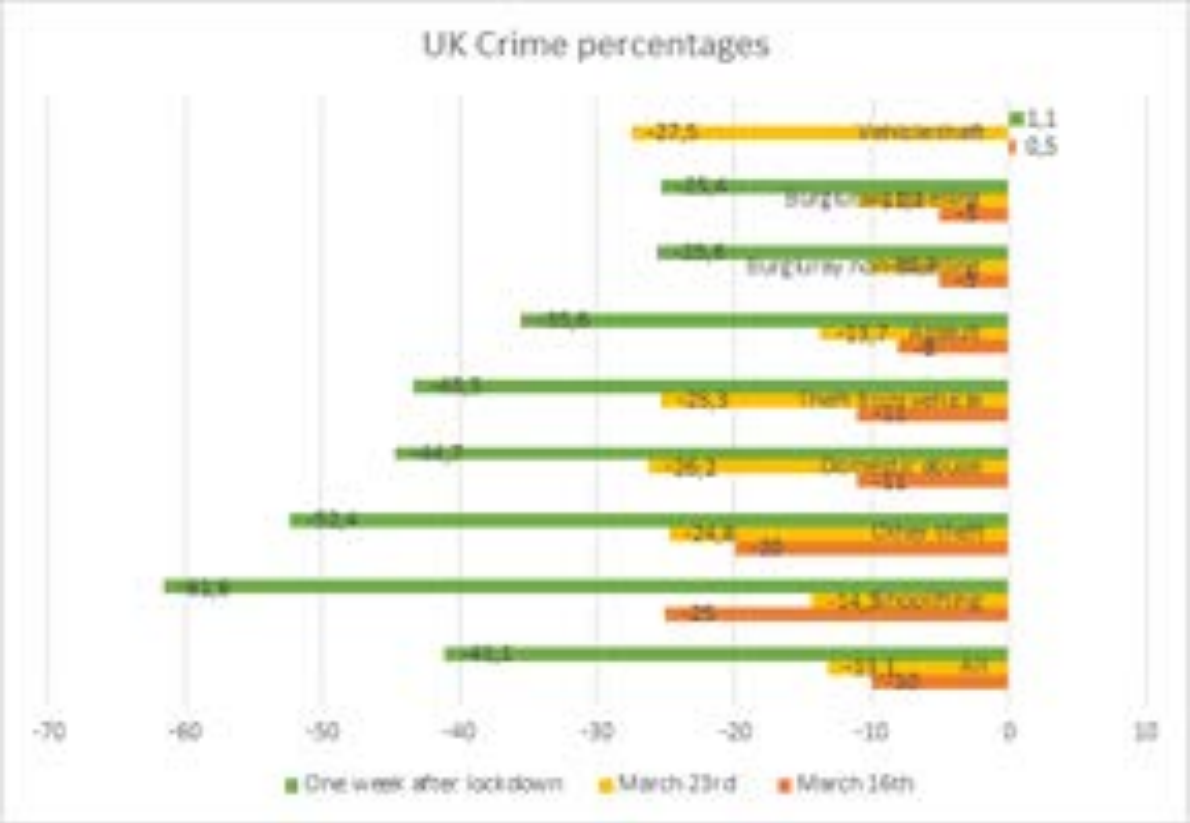


Figure 6.1 (Halford, et al. 2020)

An interesting theory on the strain on the human condition and crime under COVID-19 is that the increased emotional and financial pressure from staying at home, maybe getting furloughed or let go from their job, will make people act out through domestic violence or other criminal behaviors (Payne, et al. 2020). The ones who often get hit hardest by economic decline are those who are in the lower class of society. They often rely on working paycheck to paycheck and if that goes away, they could get desperate and turn to crime. Increase in alcohol

consumption or other drug abuse could also be an effect of the lockdowns and the emotional and economic strain caused by COVID-19 (Payne, et al. 2020).

6.2.1 Cybercrime

As the behaviors of society shift during this time of crisis, so does the behaviors of criminals. People are staying more at home and spending more time online for work and entertainment purposes. This has attracted more criminals to go online in pursuit of their next score. There has been a significant rise in cybercrime since COVID-19 hit. The FBI has reported a 300% increase in complaints regarding cybersecurity since the pandemic started (Dowling, 2020). Some of the scams they are trying to pull are the same as the usual where they try to impersonate something you might be subscribing to in order to get your personal information like credit card information or passwords either by claiming something is wrong with your profile or sending links that downloads malware or spyware to your computer or mobile device (Dowling, 2020). Some of the newer scams try to utilize people's fears surrounding the virus by offering tests or treatments that never show up or do not work (Dowling, 2020).

According to Interpol, there will likely be a further increase as the pandemic goes on. The criminals will keep learning and become more sophisticated as we keep working from home and spending more and more time online on different services. See figure 6.2 for more statistics from Interpol.

“Cybercriminals are developing and boosting their attacks at an alarming pace, exploiting the fear and uncertainty caused by the unstable social and economic situation created by COVID-19.” Jürgen Stock, INTERPOL Secretary General

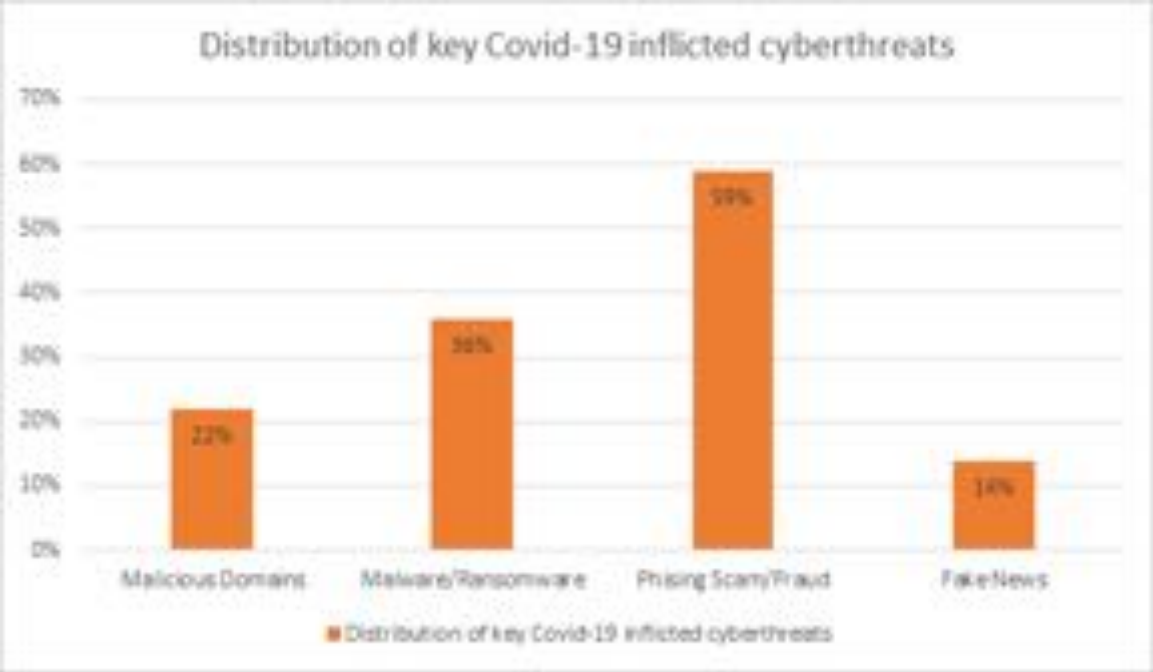


Figure 6.2 (Interpol, 2020).

Wrapping up this part of the section we see that crime overall in most places have gone down because of the restrictions put in because of COVID-19 in all the countries we have looked at here. Crime caused by groups and crimes like shoplifting and burglary have gone down as people don't meet up in groups as much and fewer people are out and about and staying home so there are less opportunities for theft and burglary. Domestic violence and violence in families have risen in some cases and might be expected to rise as the strain on the human condition both emotionally and financially can make people act out more. Cybercrime is drastically on the rise and new ways of combating it is needed. The long-term effect of this is still hard to predict. From all of this we have learned that restricting the free movement of people will reduce crime, however this is not a long-term solution when the restrictions from COVID-19 are not in effect anymore. One thing we can learn from is the increase in cybercrime. We need to take new and drastic measures in order to secure our personal information, and people need more education to avoid clicking damaging links etc.

6.3 Crime displacement theory

The effects that COVID-19 has had on crime can be explained somewhat by crime displacement theory. This theory says that if a criminal is denied the chance to commit a crime it will look

for one elsewhere if their motivation remains unchanged (Johnson, et al. 2014). There are several types of crime displacement that can occur if the offender is denied the opportunity to commit the crime at first, spatial displacement, temporal displacement, tactical displacement, target displacement, and crime type displacement. Spatial means moving the crime to a different geographical area, temporal is moving the time of the crime, tactical is using different methods or tools, target displacement is selecting another target, and crime type displacement is focusing on a different outcome of the crime (Johnson, et al. 2020). We have seen more than one of these types of crime displacements happen during the COVID-19 pandemic and the lockdowns following it.

Cybercrime has increased while neatly every other type of crime has decreased. This is an example of tactical crime displacement as well as spatial crime displacement. Criminals are being denied many of the opportunities they had before now that people are spending more time at home and having to keep a distance from each other, therefore they have changed tactics and moved more online where people are spending more time while at home. They have also changed location, maybe not in the literal sense but still the cybercrimes span over a larger and possibly very different geographical area than where they operated during the in-person crimes.

6.4 Domestic violence during COVID-19

During the COVID-19 pandemic there have been clear signs that show that there has been an increase in domestic violence abuse. This pandemic has created exceptional circumstances for a lot of people during this troubling time. In the pursuit of a large-scale mitigation effort to slow down and prevent spreading of the virus many people have had to endure a significant period of time in their homes (Kofman & Garfin, 2020). As a result of these imposed quarantines across societies and different countries, there have been reported an increase in domestic violence abuse (Usher et al., 2020). “Domestic violence refers to a range of violations that happen within a domestic space” (Bradbury-Jones & Isham, 2020, p. 2047). For many people the uncertainty of life and the fear of both the present and future seems to take its toll on a lot of people and it eventually causes some people to commit atrocities against their loved ones (Usher et al., 2020). All over the globe we have seen people being affected by this. There have been and are still ongoing measures to prevent further spreading through mitigation and containment.

Social isolation requires families to remain in their homes resulting in intense and unrelieved contact as well as the depletion of existing support networks, such as through extended family as well as through social or community-based support networks for families at risk.

(Usher et al., 2020, p. 549)

In the United States emergency hotlines for domestic violence expected an increase in reports from families that were in need for help, but they experienced the opposite (Evans et al., 2020). Some of the regions help centres experienced as much as a 50% decrease in people reaching out for help. This was a consequence of that people were unable to safely reach out for help without the fear of someone in the household finding out that one was calling for help (Evans et al., 2020). A critical factor in violence prevention is economic independence, and for many people that experience partner violence it is too severe to leave without any other source of economic support, which this pandemic has made more difficult (Evans et al., 2020). The shutdown have also resulted in the closing of a lot of shelters, housing for people in need and hotels have closed or have reduced their capacity, all of these restrictions have caused reduces the options when it comes to alternative housing for people who have the urge to get away from an abusive household (Evans et al., 2020). The closing of schools, kindergartens and other childcare facilities have led more children to be at home. One of the reasons this pandemic has had such an effect on children living in unsecure and troubled homes, is that the closure of schools, kindergartens and other social activities has led to less exposure to others. Exposure and gatherings with other people are one of the most common ways to find out if a child has been exposed to threats of visible bruising and other damages that can be hidden (Evans et al., 2020). A child does usually not have the resources and the understanding that it is being neglected and abused and it is therefore crucial that the support systems are in place and their everyday life is returned to normal so that many can be saved.

6.4.1 Domestic Violence in Norway

The Norwegian government announced on 12 March 2020 that a national lockdown was to take place. All schools and day-care were to close down immediately which the Norwegian government meant were a necessary step to take to mitigate the virus in the Norwegian society (Øverlien, 2020). “End Violence Against Children (2020) emphasizes the vulnerabilities of children during times of crisis, such as the COVID-19 pandemic” (Øverlien, 2020, p. 380). An action plan released in 2012 by the departments of Justice and Ministry of Emergency

Preparedness, Children, gender equality and the Ministry of Inclusion, Ministry of Health and Care Services and the Ministry of Education express that domestic violence is a serious societal problem. Violence creates insecurity and can lead to health damage, loss of welfare and limit the individual's life development ((Handlingsplan Mot Vold i Nære Relasjoner 2012, 2012). The public sector has a responsibility to prevent all violence, especially domestic violence and according to the action plan this is a responsibility the government takes seriously (Handlingsplan Mot Vold i Nære Relasjoner 2012, 2012). Norway takes pride in the work that it has put down in the fight against domestic violence, but this aid does not reach everyone. As is the case of many countries.

A web-based survey was conducted by the Norwegian Center for Violence and Traumatic Stress Studies (NKVTS) with the aim of getting an overview of the impact that the COVID-19 pandemic have had on victims that were exposed to domestic violence (Øverlien, 2020). The survey was sent out to 46 different refuges that worked with different kinds of victims. The survey contained a variety of answering methods like fixed answers, follow-up questions and an opportunity for some of the victims to provide some answers if they wanted. The survey was completely anonymous (Øverlien, 2020). "As the survey was taken between 8 and 23 April 2020, it covers four to six weeks following the implementation of the government's strict, wide-ranging virus control measures" (Øverlien, 2020, p. 381).

Below are the four main topics that the survey was based on.

1	Changes in the services due to the pandemic.
2	The refuge´s cooperation with other services.
3	What the refuge staff saw as most worrying in the current situation and what they saw as vital in order to support victims.
4	Changes in the requests and motivations for contacting the refuges.

(Øverlien, 2020, p. 381–382)

As explained in the paragraphs earlier in the text the situation in Norway has the same similarities as many of the other countries that have had similar restrictions during the pandemic.

As 56 per cent of the respondents reported that there had been a reduction in the number of requests from clients, many expressed concern that it is "too quiet out there," and that the victims of domestic violence and abuse are not receiving the help and protection they need during the pandemic.

(Øverlien, 2020, p. 382)

The group that the refuge staff were the most concerned about were the children. Most children living with abusive parents were exposed as many children were spending the majority of the day at home with their parents. The majority of these adults were either working from home, had lost their jobs, were temporarily laid off or and had other problems to deal with either psychological or physical problems (Øverlien, 2020). To further develop the claim that many feared for the home environment during this time, one of the respondents came with this comment:

With families living with prolonged stress, perhaps a worse economy and declining hopes of the future, it is easy to imagine that those who already struggle, now struggle even more. Our greatest fear is that we will see more suicides or familicides. If the hole gets to black and the road too long ...

(Øverlien, 2020, p. 382)

6.4.2 Forecasting

Jorgen Randers (2012) explains in his book A Global Forecast for the Next Forty Years that he worries about the future. This book on forecasting he explains how the future might look like in the next 40 years. Randers (2012) tells us that his book will try to provide the reader with their own ability to create a forecast and if there is a reason to worry about the future (Randers, 2012). His picture might be different from yours because people draw different conclusions from the same pictures (Randers, 2012). The main theme in this book is climate change and how the world could look like in 2052. He writes about food and footprints, energy usage, economic growth, population growth, healthcare and other subjects (Randers, 2012).

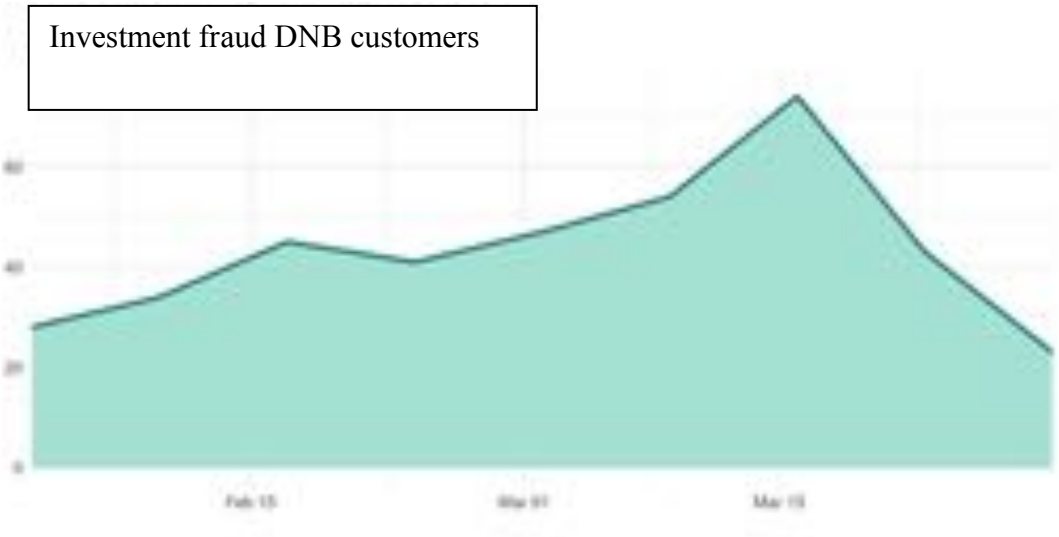
Forecasting on disease and possible pandemics have been researched over the years (de la Barrera & Reyes-Terán, 2005). There have been articles, documentaries and other media submissions through the years telling the public that the question is not if there will be another pandemic, but when. In the book Super forecasting by Philip E. Tetlock and Dan Gardner (2015) writes that leaders must lead and use the people around them to make the best decisions for society (Tetlock & Gardner, 2015). The dilemmas that leaders meet in their position of power is not an easy task. “Leaders must be reasonably confident and instill confidence in those they lead, because nothing can be accomplished without the belief that it can be” (Tetlock & Gardner, 2015, p. 212).

When society faces a crisis of this magnitude, they make choices that make many people take “bigger hits' ' than others. In this case it seems like many of the world's governments that issued lock down in March did not think of the consequences the lock down would have on some people. The fear and uncertainty of this virus that kept on spreading with rapid pace through society needed to be contained in the most effective ways that they knew how to. But how could one not be more prepared?

Domestic violence during this time have seen an increase during this time in many countries like Australia, UK, USA, France, Brazil, Spain, Norway and many other places, while reporting of these crimes seemed to go down (Bradbury-Jones & Isham, 2020; Kofman & Garfin, 2020; Øverlien, 2020; Usher et al., 2020). The pervasive factor has been that many of the places where people spend much of their time like kindergarten, schools, work and other activities have been cut off from daily life have made home to an unsafe place for so many. People do not have the same availability to seek help, and in many cases are too scared to seek help. Abuse against children usually gets detected at school or kindergarten where employees that detect abnormalities in their behaviour or physical marks on their bodies do not match the usual patterns (Bradbury-Jones & Isham, 2020; Kofman & Garfin, 2020; Usher et al., 2020). Governments have gone at extremes to try and mitigate this pandemic by locking down societies around the world to take care of the weak and those prone to disease, but they have not thought about everyone and this is the paradox of the pandemic (Bradbury-Jones, C., & Isham, L. 2020).

6.5 Fraud and COVID-19: Norway

In this part we will further investigate how COVID-19 has affected the crime-rates in Norway. We will also investigate how multiple corporations and companies have been caught in fraudulent activities relating to the virus. DNBs fraud investigating unit made several discoveries on how criminals have adjusted their way of operating to exploit the Covid situation, especially in terms of investment fraud. E24 interviewed Sebastian Claydon Takle who is responsible for DNBs daily threat assessment on economic criminality. He states that the number of fraudulent cases which are COVID-19 related have spiked drastically. According to him many fraudsters who previously did love fraud have changed tactics and are now exploiting the crisis by messaging people telling them they are stuck in COVID-19-stricken countries with no way of leaving and need economic assistance. DNB also reported an increase in investment crimes. Terje Aleksander Fjelvær, leader of the fraudulent unit reports that there has been a doubling of cases on a weekly basis compared to the normal. He states that these cases are rather difficult to get to the bottom of, especially since the money most of the time leaves the country (Fraser, 2020). Graph below shows the investment frauds done to DNB customers.



(E24, 2020). Figure 6.3

NAV (Norwegian Labour and Welfare Administration) which is the Norwegian welfare agency reported in August 2020, 6 individuals and 6 companies to the police for fraudulent abuse of

the compensation initiative related to the virus (Bach, 2020). In the wage compensations initiative, where the employer is required to send in information regarding the salaries of their employees there have been multiple cases of companies, and individuals who abuse this by sending in misinformation. In one of the cases the fraudulent managed to get 4 million NOK in compensation on fabricated COVID-19 cases (Bach, 2020). So far this year the Norwegian government has allocated 126 billion in COVID-19 measures. Where 8 billion of these have gone to salary compensation, which have been paid to 74.000 companies for 393.000 employees. As of October 10, there have been 50 cases linked to fraud according to Økokrim, where half of these have been in the Oslo Police District (Meek, 2020).

6.5.1 Fraud and COVID-19: World

Norway is obviously not the only country where criminals have exploited the pandemic through various scams. There have been several reports and many different types of cases both from big established companies to individuals. The pandemic has created several new opportunities for criminals, who use the pandemic to their own advantage. Social distancing and quarantine is happening all over the world, and people are sitting at home wondering about what is happening. The criminals go after the most vulnerable in such a situation. They prey on the fear and need for information, and use this to provide fake information, create fake supply for the products that are in demand and create fake charities to scam money from people who want to help. These are all factors that make the pandemic a fertile ground for new forms, or at least new opportunities, for fraud.

The rapid rise of the COVID-19 virus all over the world, has caused a huge demand for various medical supplies. This has created a new market for criminals to take advantage. To counteract this, various state institutions in the U.S have launched Operation Stolen Promise (OSP) in coalition with Australia, Canada, New Zealand and the United Kingdom. The OSP is an intelligence coalition created to control the import of illegal, fraudulent, and unauthorized COVID-19-related items (U.S Immigration and Customs Service, 2020). This coalition has been enacted to counteract the increasing number of actors trying to take advantage of the need for medical supplies during the pandemic. Throughout the summer of 2020 the Customs Border Control in the U.S seized a large number of counterfeit and unauthorized COVID-19-items. This includes the import of masks, gloves, alcohol-based hand sanitizer that has not been

approved by any medical authorities (U.S Customs and Border Control, 2020). Just as of June 1, the Customs Border Control in the U.S had seized:

- 107 300 FDA Prohibited COVID-19 test kits
- 750 000 Counterfeit face masks
- 2 500 EPA-prohibited anti-virus lanyards
- 11 000 FDA-prohibited chloroquine tablets

(U.S Customs and Border Control, 2020)

An even more serious aspect of this criminal activity is the illegal sale of medicine. There are at the moment a number of websites that sell medicine that is supposed to help against COVID-19 infection or alleviate the symptoms of the virus. Some of these medicines are fake without any effect, and some of them have little effect. In the worst cases the medicines might even be dangerous and can cause harm to the patients and can facilitate the development of drug resistance. The U.S Food and Drug (FDA) has come out with a national warning against such products, and claimed that the only product that has been approved for COVID-19-treatment is the antiviral drug Remdesivir (FDA, 2020). Still the fear of the virus makes people more likely to try unauthorized medication and other treatment options. Most of these products are sold on fake scam-websites intended to utilize the pandemic to scam people. Some ways these websites are used to scam people is to collect victim's money and personal information, as well as pretending to be a charitable foundation. Fake charities pop up all the time during major health crises, because these are crises that can facilitate an increased will to donate and help within the population. There are also websites intended to imitate official websites of organizations like the World Health Organization, where the websites could infect the victims with viruses and malware (FTC, 2020).

The economic consequences of the COVID-19-pandemic has been vast and has caused some businesses tremendous problems. In the U.S a Paycheck Protection Program (PPP) was established as a loan program to provide fiscal aid to companies through loans. The intention was for entities to apply for low-interest loans to pay for payrolls and other costs during the pandemic. Any company could apply for a loan up to 100,000 U.S Dollars by the 08. August 2020. In this way the U.S Government could provide incentives for companies to keep their

workers on payroll (SBA, 2020)Whilst the intention of this program was good, and has shown good results, it also had negative consequences. The Small Business Administration (SBA) reported in the summer that tens of thousands of companies might have received ineligible loans through the PPP.

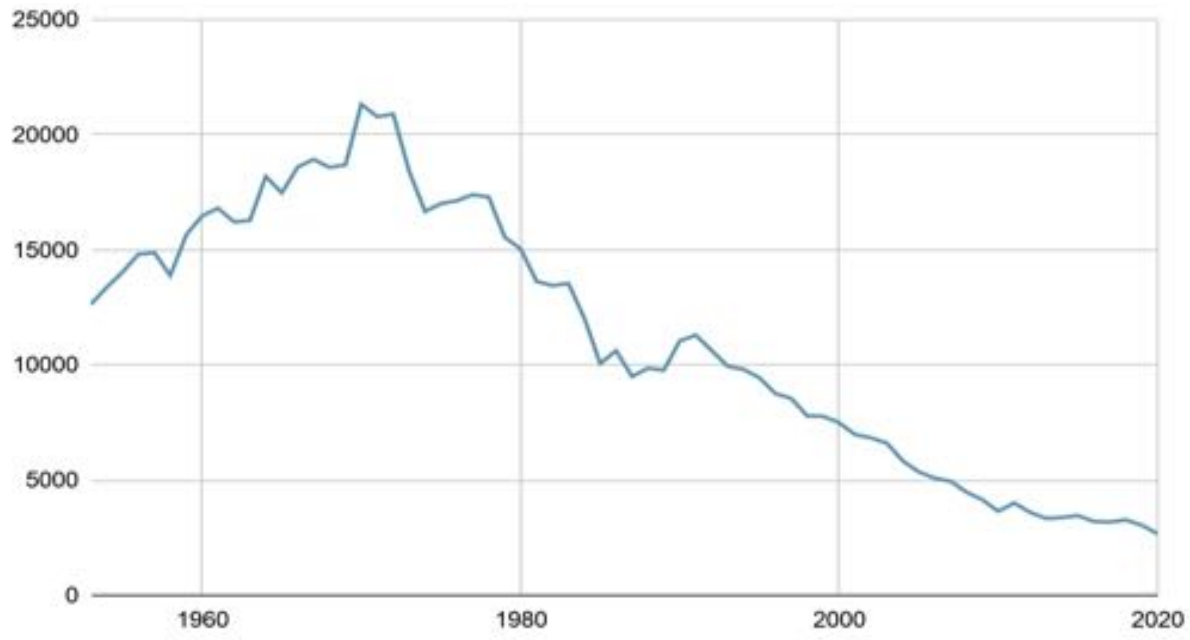
One of the criteria to be eligible for the loan was that the company must have been established before the pandemic started, but it seems that there might have been many companies established after the pandemic that received a loan (Moore, 2020). Many more severe cases were observed. There were cases of people receiving loans for companies they had previously owned, or that already had been shut down. These people used the loan to buy luxury items for their own personal use. One case involved a Minnesota man that received a loan 841,000 Dollars for a construction company called True Cut, a company that was shut down two years ago. This man reportedly used the funds to buy a Harley Davidson (Brooks, 2020). It seems the PPP has provided a very viable arena for fraud. Many applicants, limited time and resources means that the vetting of applicants has not been thorough enough. This means that the PPP, which came because of the pandemic, has been a new source of financial crime that has risen throughout the pandemic. The Justice Department in the U.S has tried to locate cases of fraud in the PPP, and the most clear-cut cases of fraud have been prosecuted. Still some cases are harder to locate, and the Justice Department are still searching for cases. They have also issued a warning to anyone that has used the PPP to illicit illegal funds and claimed that they will be located and held accountable (Brooks, 2020). If all cases of fraud will be located remains to be seen and may be somewhat unlikely.

It seems the COVID-19-pandemic has created new opportunities for criminals to commit fraud, where they prey on the weakest in the society. There are also cases of companies and persons taking advantage of governments and different forms of newly created programs to provide aid during the pandemic. The growing demand for medical supplies has facilitated the growth of a number of criminal actors in the market. They provide the market with unauthorized COVID-19-items which have not been approved by the FDA, as well as medicines that might be dangerous or without any clinical effect. We have also outlined how financial aid programs like the PPP have been a fertile ground for fraud, and actors getting funds from the government without being eligible for them. It seems like an inevitable fact that even though extraordinary events like a pandemic might reduce certain types of criminal activities, they also provide new opportunities for certain types of criminal activities like fraud. A state of chaos, fear, and

disorder - which a pandemic can facilitate - may cause desperation and a need in the certain members of the society which scammers are quick to take advantage of.

6.6 COVID-19 and Traffic Accidents

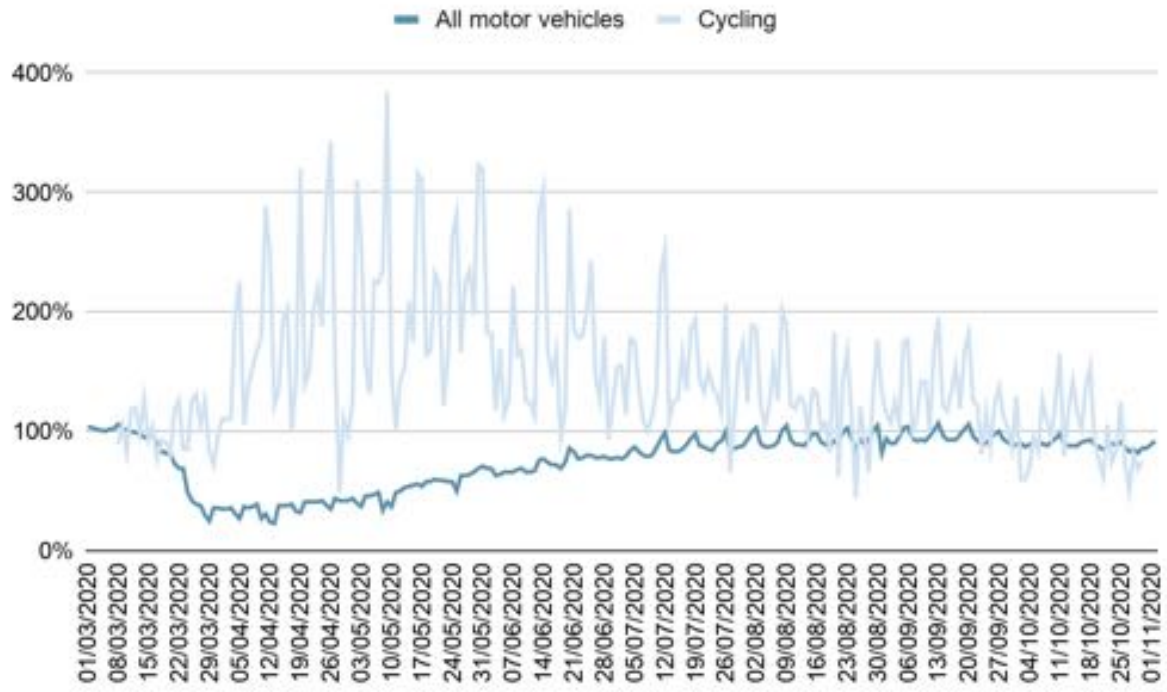
In this part of the crime and safety section I would like to have a closer look on the problematic driving behavior and road safety during COVID-19. I will compare data from various countries representing western Europe, central Europe, and North America. I would like to point out the bad habits in driver's behavior and propose some improvements that can lead to better road safety and less deaths on roads. I will not take into account countries with small death rates, because the percentage expression is dramatically affected by every accident.



Number of persons killed in road traffic accidents in Germany (Destatis, 2020) Figure 6.4

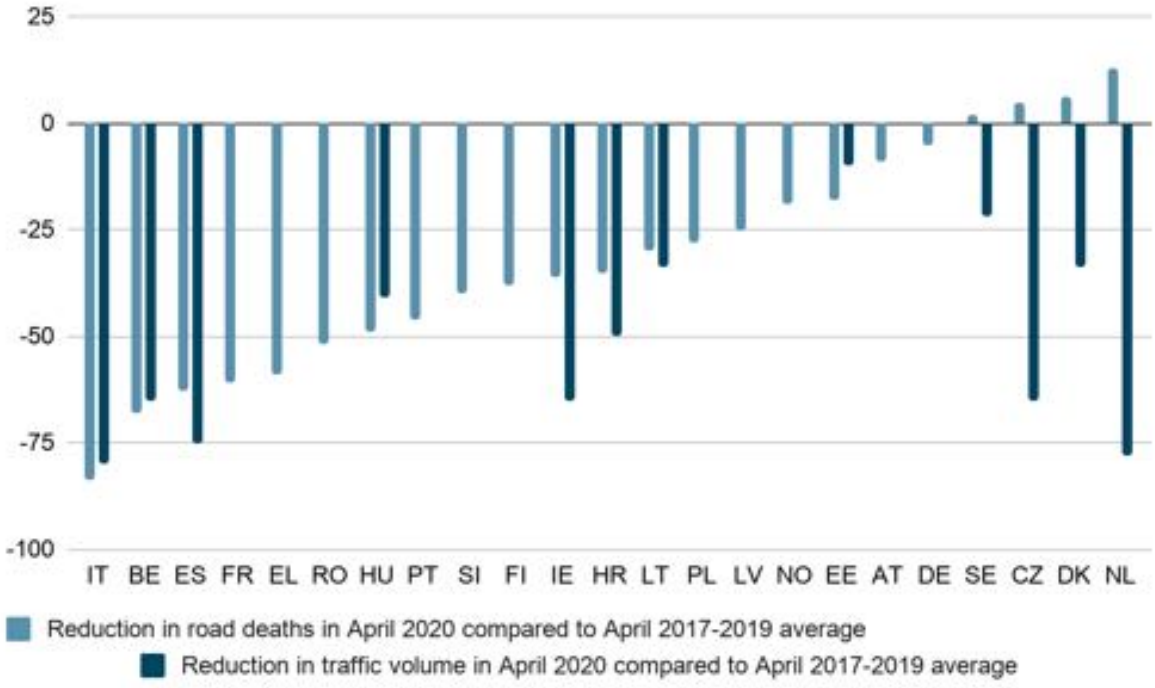
This topic is important, because there are not many human activities where deaths during this activity would be acceptable. But in the world on the roads each year around 1.35 million people die and there are up to 50 10^6 injuries connected with car accidents (WHO, 2020). For example, in Germany, where road safety has improved significantly in the last decades, more than 3000 people died every year. And the number has not decreased much in recent years (see graph from (Destatis, 2020)). We can take today's situation as a challenge that can help us to improve future roads, cities, and rules in such a manner that we will get in most countries to the

level where nowadays Nordic countries are. Or we can try to implement new technologies like full self-driving capability as soon as possible and with these technologies we can even get zero accidents on the roads.



Development of traffic in England (GOV.UK 2020) Figure 6.5

We will have a closer look at the data from the spring pandemic in 2020 and we will compare the date with the same time period of year 2019 in multiple countries. To compare this we will use the period of April 2020 because at this month there was a lockdown in most of the EU countries and therefore the highest drop in the motor vehicle traffic, see figure 6.5. In figure 6.5. for april 2020, we can see that there was a reduction in traffic in all countries that have available data. In some countries the reduction was only a few percent (Sweden), but in others the reduction was significant (Italy by 82%). It was mainly dependent on the strictness of pandemic restrictions. But overall decrease of road accidents was not as significant and, in some cases, (Czech Republic, Nederlands) there were even increases in heavy accidents compared to the average for previous years.

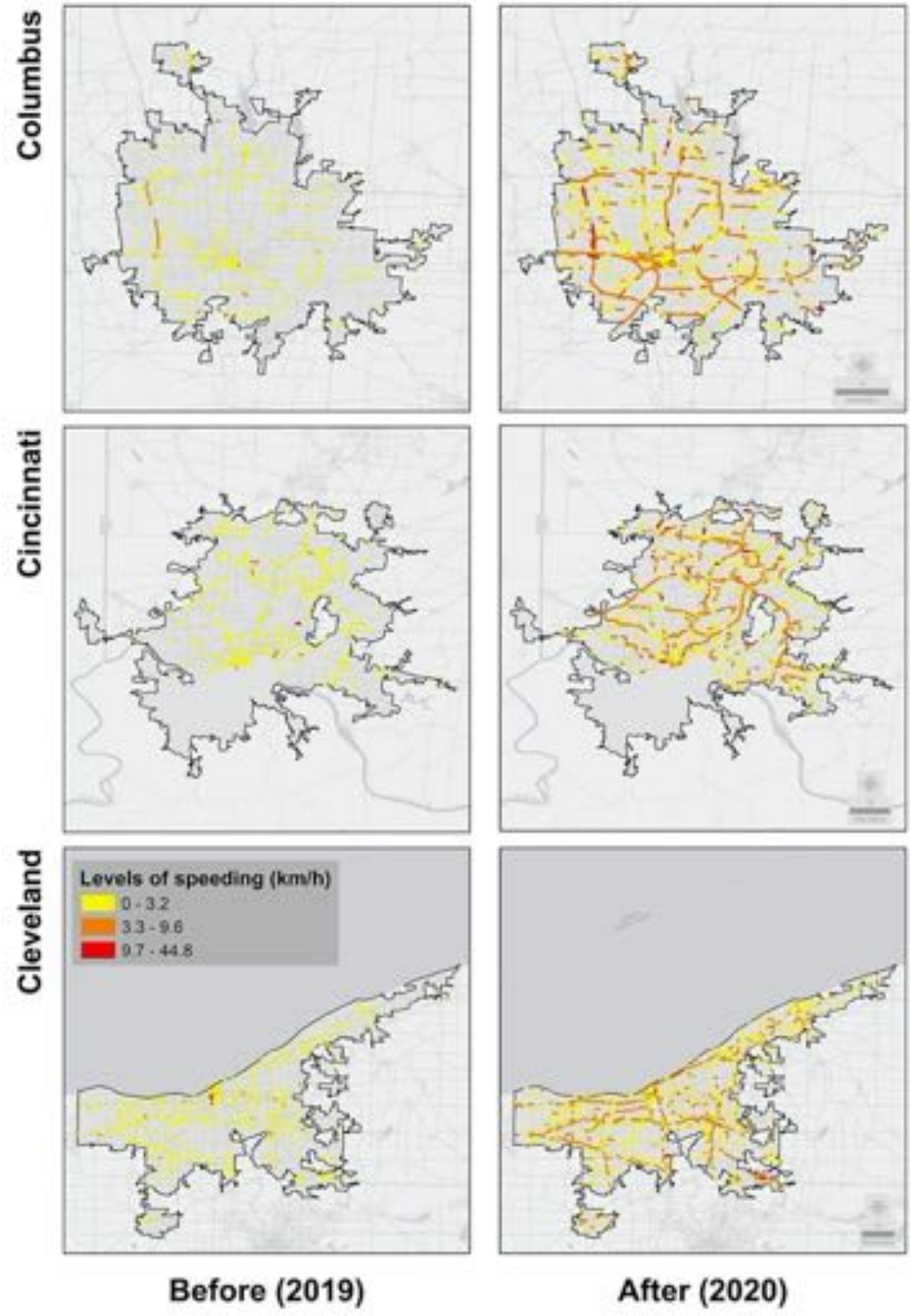


Traffic volumes and road deaths in EU countries Speeding (ETSC, 2020) Figure 6.6

Reasons for this development could be speeding, stunt driving and alcohol. In multiple countries there was reported a serious increase in speeding fines. Some countries have reported overall decreases in traffic accidents, but its severity have increased. For example, in Czech Republic, where traffic decreased by 65%, the collisions decreased by 28%, the number of slightly injured people decreased by 23%, but road deaths increased by 5%. If we have a look at 3 cities of the United States, we can see that the increase in speeding in some areas is significant (Lee et al. 2020). In those pictures the proportion of roads where the speeding was measured has increased from 20% to 60%-70%. Also, the mean level of speeding has increased from 6 km/h to 15km/h. Certain number of drivers apparently is more likely to break the speed limit. In normal times, the traffic is so dense, that they have no opportunity to go faster than the traffic stream. But when the roads are empty, they are more likely to take the opportunity. In the picture from Rome (Marchant, 2020), we can see that the difference between a pandemic situation and a normal situation is significant. In Czech Republic in august 2020, 40% of collisions that caused fatalities were due to speeding. 66,9% of all accidents were in the urban areas, but only 30% of all deaths were from these accidents (Policie CR, 2020). According to (WHO, 2020):

Every 1% increase in mean speed produces a 4% increase in the fatal crash risk and a 3% increase in the serious crash risk. The death risk for pedestrians hit by car fronts rises rapidly (4.5 times from 50 km/h to 65 km/h). In car-to-car side impacts the fatality risk for car occupants is 85% at 65 km/h (WHO, 2020).

Speeding in 3 USA cities - comparison between and during pandemic (Lee et al. 2020)



Traffic in Rome before and in the time of pandemic (Marchant, 2020)

Another change that comes with COVID-19 is more collisions caused by drunk drivers. In Czech Republic there was a 9% increase in collisions caused by drunk drivers and in the category of drivers with more than 1,5‰ blood alcohol level, there was an increase of 19,7%. Reasons for this increase could be boredom, stress, or more free time because of new daily routines. Same reasons can lead to stunt driving. It has been reported from multiple countries, but it is hard to classify if this leads to more accidents (Vingilis, et al. 2020).

We can see in the second wave of the pandemic, that in some countries like Poland and Czech Republic, the public health system was overloaded by COVID-19 patients. This caused there to be no extra room for other patients requiring acute care or even for patients with some previously planned medical care. A good idea would be to include regulations that will be in the COVID-19 19 measure package, this may help to decrease the traffic accidents. Yannis (2020) proposes decreasing the speed limits during the COVID-19 lockdown periods. Another option would be to increase the fines for speeding, drunk driving and driving without a seat belt. A useful tool to prevent car accidents could be to use campaigns and advertising to raise public awareness.

6.7. Concluding Remarks

Throughout our research we have found that most crimes have decreased in almost all countries we looked at. The exceptions being mainly domestic violence, fraud and cybercrime which has had an increase during COVID-19. Cybercrime has increased due to the fact that criminals are

taking advantage of the increase in online activity from people working at home and staying more at home in general (Dowling, 2020). Domestic violence has also increased as people stay more at home, and adding to the issue is that victims find it harder to report when the person they are reporting is often close by (Bradbury-Jones & Isham, 2020; Kofman & Garfin, 2020; Øverlien, 2020; Usher et al., 2020).. Abuse of children is also harder to uncover since many schools and childcare services are closed (Bradbury-Jones & Isham, 2020; Kofman & Garfin, 2020; Usher et al., 2020). Fraud has increased as criminals are taking advantage of the fear and uncertainty that COVID-19 has caused by selling fake products like face masks or medicines (U.S Customs and Border Control, 2020). We have also seen an interesting change in traffic and accidents around the world. In some countries the number of fatal accidents has correlated with the reduction in traffic due to people staying more at home. While in other countries fatal accidents have increased despite the decrease in traffic (ETSC,2020). This is caused by more reckless driving as they have more room on the roads (Vingilis, et al. 2020). From all of this we have learned that by trying to solve one problem, which is mitigating the spread of COVID-19, several others are created. This virus is something never seen before in modern time, so it would be hard to have countermeasures put in place when it comes to crime and safety. All we can do is learn from it and try to create plans that can be put in place for future disasters and challenges.

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07.
BEHAVIOUR CHANGE

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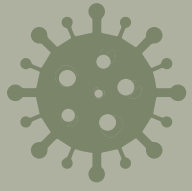
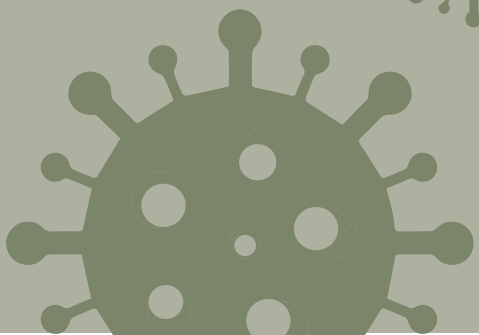
Chapter 7





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Attempts to induce behavioural changes in response to COVID-19 can be conceptualized as a collective action problem, where the interests of the collective are at odds with the interests of - at least some - individuals. Governments have numerous tools for dealing with this, including coercion, appeals to self-preservation and attempting to elevate the desired behaviours into social norms. Governments around the world have applied a variety of such tools during the pandemic, making it a natural experiment in how to deal with these situations. This paper will examine these efforts and their results for three nations: Norway, the USA, and Pakistan. From these cases we will try to distil some general insights into how governments can induce behavioural changes in response to future collective action problems.

7.1 Introduction

COVID-19 has brought the precariousness of modern lifestyles into sharp focus. Seemingly overnight, we went from living at the high-water mark of human civilization and prosperity to hoarding toilet paper and burying our dead in mass graves. Attempts by authorities around the world to manage this predicament have varied greatly - as have their levels of success.

These attempts can be conceptualized as solutions to what social scientists call “collective action problems”. From the perspective of the collective, the rational course of action would be for everyone to put their normal lives on hold, and adhere to strict behavioural guidelines until the virus was contained. Yet from the perspective of individuals who don’t belong to a high-risk group, it might seem preferable to reject the guidelines in favour of maintaining a more active and enjoyable lifestyle. In the lingo of neo-classical economics, ignoring the guidelines might constitute a utility-maximizing strategy for these individuals. Yet if any significant number of them actually acted on this logic, the pandemic might spiral out of control and leave everyone worse off - making it a utility-*minimizing* strategy at the collective level.

Harding (1968) famously dubbed such problems “tragedies of the commons” in reference to a fable by William Forster Lloyd about a communal pasture that is shared by a group of herdsmen - all attempting to maximize their own individual gains by adding more and more animals to their herds. In the end, the pasture becomes so overgrazed that everyone ends up worse off. Cases like this, Harding argues, calls for the implementation of some sort of social mechanism

that can curb our proclivity to act on our own self-interest - and make us adopt behaviours that might seem irrational from an individual perspective, but are in everyone's shared interest.

During the pandemic, authorities across the world have attempted to implement a variety of such mechanisms. Some of these have been widely successful. Others less so. This paper will address the nature and results of these attempts in three different countries: Norway, the United States, and Pakistan. These countries were selected to represent developed nations that successfully contained the virus, developed nations that failed to contain the virus and developing nations without the resources to contain the virus, respectively.

The three case studies will be assessed in light of scientific research and theories about individual and collective behavioural change. From this we will attempt to distil some general insights about how authorities may induce pro-social behavioural changes to solve other collective action problems such as climate change.

7.2 Theory

Perhaps the most straightforward way to induce behavioural changes is through coercion. In the case of a pandemic, this could take the form of curfews, mandatory use of masks or lockdowns. Although such measures have been implemented with some success, they nonetheless tend to be unpopular, politically thorny, and can sometimes trigger a popular backlash. Consequently, many leaders have displayed a preference for encouraging voluntary behavioural change.

One approach for achieving this is to appeal to individuals' concern for self-preservation. This could entail convincing people that the pandemic poses a direct health threat to them or their loved ones. However, meta-studies like Witte and Allen (2000) have found such approaches to work only occasionally, and to sometimes backfire. As Van Bavel et. al. (2020) puts it, “appealing to fear leads people to change their behaviour if they feel capable of dealing with the threat, but leads to defensive reactions when they feel helpless”.

The limitations of this approach also includes the common tendency for people to exhibit what psychologists call an ‘optimism bias’: “the belief that bad things are less likely to befall oneself than others” which can cause people to ignore public health warnings (Van Bavel et. al., 2020:

461). Another problem is the tendency for perceived threats to spur intolerance, punitive attitudes, and even violence toward members of out-groups (Feldman & Stenner, 1997). In the case of COVID-19, there is also the widespread perception that the virus poses only a marginal threat to those who are not in a high-risk group, making attempts to induce behavioural changes by invoking fear unlikely to be effective on its own.

An alternative approach is to try to elevate the desired behaviours into social norms and let the population self-regulate through social dynamics. A basic tenet of social psychology is that voluntary collective action readily occurs among individuals who share a common social identity. As social animals we have a deep-rooted inclination to mimic the behaviours of those we identify with: we dress, act, talk, and to some extent even think in accordance with what is considered appropriate by our respective peer groups. A shared social identity leads people, as Drury (2018) puts it, to "expect support from others who share their [social identity]" as well as to "trust these others to behave in the collective interest"(pp. 39-40).

Drury (2018) describes how collective action can arise among strangers during disasters when a "sense of common fate" among those afflicted give rise to an emergent shared identity – what Fritz (1996) refers to as a "therapeutic community of sufferers". The emergence of these shared identities engenders a range of "behavioural and cognitive consequences" including "expected support, coordination of behaviour, and collective efficacy" (Drury, 2018:38).

Shared social identities do not emerge in every disaster, however, and social scientists are beginning to uncover some of the factors that determine their likelihood. Vezzali et al (2018), for instance, found that in highly stratified societies, members of advantaged groups tends to be less inclined than those of disadvantaged groups to see everyone as one group that is "in this together" - suggesting that collective responses to disasters might be more difficult to organize in countries with major socioeconomic inequalities.

Van Bavel et. al. (2020) outlines a number of ways in which authorities can nurture the development of a shared social identity during pandemics. This includes "addressing the public in collective terms and by urging 'us' to act for the common good"; by making cooperation seem like the normal and default option by emphasizing that "other people are already cooperating"; and by highlighting bi-/multi-partisan support for measures, as this has been shown to reduce polarization and biased reasoning in other contexts (p. 462).

They also stress the importance of "preparing people for misinformation and ensuring they have accurate information and counterarguments against false information before they encounter conspiracy theories, fake news, or other forms of misinformation, [which] can help inoculate them against false information" (p. 462).

To effectively implement and communicate guidelines and restrictions to the public, governments need to keep track of its shifting psychological condition. Academic research about this topic frequently relies on theoretical frameworks such as the Transtheoretical Model (TTM) - a framework originating with research about how patients cease unhealthy behaviours and adopt healthy ones. The model describes individual behaviour change as a slow and gradual transition through distinct stages. This r

esearch thus seems to be of limited value for understanding crises like the COVID-19 pandemic, which calls for immediate changes.

7.2.1 Methodology

This paper is conducted as an exploratory study of cases, by mixing literature reviews of scientific papers, public reports and newspaper articles with an exploratory questionnaire. This exploratory approach is, according to Blaikie and Priest (2019), optimal for inquiring into phenomena for which existing knowledge is scarce. Such studies require high levels of flexibility to enhance the likelihood of obtaining a deeper understanding of the topic at hand (p.81). The purpose of case studies is to observe a certain phenomenon in a real-world context (Yin, 2013). Although it might be difficult to generalize from in-depth case studies, their close-up, investigative nature is key to building a strong empirical foundation (ibid.).

Questionnaires can be useful for providing a basis for answering research questions (Blaikie & Priest, 2019, p. 76). For this purpose, a questionnaire has been included in this paper to gain better understanding of how a specific segment of the Pakistani population experienced the pandemic. The questionnaire was conducted through telephone, using open-ended questions. The respondents consist of a non-random sample of 12 young adults currently residing in Pakistan.

This paper will attempt to gain some insight into which mechanisms that have been the driving forces for behaviour change during the pandemic. The specific topics that will be explored are

how governments reacted to the pandemic, how populations changed their behaviour, and the role of media and technology.

7.3 Discussion

7.3.1. Norway

7.3.1.1 Trust in government

On March 12, the first major regulatory measures in response to COVID-19 were introduced in Norway. These involved closing down kindergartens and schools, cancelling public events, restricting travel and transport, etc. (The Norwegian Directorate of Health, 2020a). At this point 621 people in Norway had been affected by the virus (FHI, 2020a). The prime Minister of Norway, Erna Solberg, clearly stated in a press conference that the measures, despite their obstructive impact on personal freedoms, were absolutely necessary to contain the virus (Solberg, 2020a). One of the first immediate public reactions to the lockdown was panic, in the form of extreme hoarding and desperate attempts to clear out supermarket goods in case supplies were to run out (Andersen & Heggheim, 2020; Munkvik, 2020).

A risk assessment presented by the Norwegian Institute of Public Health (FHI), referred to the lockdown as an immediate societal response in order to flatten the curve of the pandemic in line with the health care system capacity in Norway (FHI, 2020b). At the same time, they expressed concern over potential ethical challenges and citizen's willingness to adhere to such intrusive restrictions. The restrictions, they argued, would first and foremost impair the livelihoods and social lives of the young, while the beneficiaries would primarily be the elderly and people with chronic health conditions (ibid).

Compared to most governments around the world, the Norwegian government managed the pandemic relatively successfully. According to Christensen and Lægreid (2020), it dealt with the crisis through a consensus-based top-down approach grounded in mutual trust with the public, and by working side-by-side with public health experts. Norwegians are in general known for their trust in government (Christensen et al., 2020), and according to surveys satisfaction with the way the government handled the situation kept increasing from 23% to

49% over the course of the pandemic (Christensen & Lægreid, 2020). According to Van Bavel et al. (2020), behaviour change is highly motivated by social norms. More specifically, by how people expect to be perceived by others when they act in certain ways. In the case of Norway, displaying some basic trust in the government appears to be a distinctive social norm. This trust helped the government contain COVID-19, primarily through persuasion rather than coercion (Christensen and Lægreid, 2020; FHI, 2020d).

Still, other sources like Kongsvik (2020) and FHI (2020c) argue that there is in fact a growing gap between the proposed recommendations of COVID-19 control measures and public acceptance.

As argued by Engen (2020), trust is a complex issue and the ability to trust also requires the ability to distrust and critique, for it not to be rendered naïve. In order to maintain trust, it is thus important for the government to openly address any objections or criticisms raised against them and respond accordingly. This may explain why the involvement of the public has worked in the government's favour. So far, there has been relatively little controversy about how the government has handled the crisis. There are few if any signs of political unrest or polarization. Still, given the irregular circumstances we currently find ourselves in, this may eventually change as pandemic-fatigue spreads.

7.3.1.2 Behavioural tendencies

Recent events - such as an illegal cave gathering in Oslo (Kalajdzic et al., 2020), the 'tourist bus incident' (Bjørnstad & Sfrintzeris, 2020), along with the current surge of cases (FHI, 2020e) - have incited strong reactions among the public. However, incidents such as these have not led to paralysis or panic, but rather to shaming and increased social pressures for cooperation (Engen, 2020). This indicates the existence of a shared social identity among Norwegians which is strong and not easily rattled during crises. Events involving negligent behaviours are apparently few, albeit consequential and may be regarded as tendencies leaning towards what scholars (Van Bavel et al., 2020; Sharot, 2011) refer to as Optimism bias.

During the entire period of the COVID-19 pandemic the phrase 'Dugnad' has been frequently utilized by the authorities through media, aiming to promote solidarity and cooperation in the spirit of public duty (Høie, 2020; The Norwegian Directorate of Health, 2020b; Sjøli, 2020; Solberg, 2020b). The concept of 'Dugnad' also known as 'Dugnadsånd' is deeply rooted within

Norwegian culture (Lorentzen & Dugstad, 2011, p.14) and can even be described as a form of social institution comprised by participants as both recipients and donors of goodwill (Bakken, 2020). In this case, Drury's (2018) argument corresponds well with the positive association with the conception of 'dugnad' shared within a "community of sufferers" (Fritz, 1996) in order to actively induce collective behaviour change, rather than through means of coercion.

7.3.1.3 Social behaviour change induced by the government

Throughout the pandemic, several other regulatory measures have been put into practice. Although these have by and large been successful, deviances have occurred. The rule of thumb for social distancing has been to keep at least 1 meter's distance from anyone outside of one's own household (FHI, n.d.). A recent public survey found that 1 in 3 Norwegians found it difficult to abide by this rule (Hirsti et al., 2020). An example of this is public transportation. Although many public transport companies have made efforts to adhere to the 1-meter-rule by separating seating, so that no passengers are supposed to sit together, (Vy, n.d.; Nor-Way, n.d.; FHI, 2020f) there have been several instances where people have been forced to squeeze together in the middle aisle, making it impossible to keep 1 meters distance (Husø & Rørslett, 2020; Husby, 2020; Olsen, 2020).

Also, medical mask-wearing has until recently only been required in certain occupations where maintaining 1 meter's distance from one another is not plausible (The Labour Inspectorate, 2020). Mask-wearing has until recently been entirely voluntary and not strongly encouraged, (FHI, 2020g; Iversen et al., 2020; Ministry of Health and Care Services, 2020a), yet due to the recent surge of cases, masks have now become mandatory in Oslo and Bergen (Mossing, 2020). The Norsk koronamonitor survey reveals that 67% of 12.500 Norwegians are positively inclined towards wearing masks and 61% have even purchased masks during the pandemic (Askheim & Clausen, 2020a). Given the brief span of their implementation, however, all this tells us is that citizens seem to have positive intentions towards mask-wearing, as there is little or no evidence suggesting that any significant number of them actually wear masks in their everyday lives.

Isolations and quarantines are mandatory in instances where people have or may have been exposed to the COVID-19 virus (FHI, 2020h; COVID-19-forskriften). However, research illustrates that Norwegians' adherence to quarantine and isolation has decreased from 66 % to 33-38 %, which is often attributed to "quarantine fatigue" and a growing desire for things to go

back to normal (Steens et a., 2020). These examples indicate some level of inconsistency and perhaps a tendency for "cherry picking" when it comes to compliance with different guidelines and regulations, depending on the degree to which these intrude upon people's everyday life.

7.3.1.4 The role of media

In Norway, the media has played an important role in distributing information about the pandemic. Although its role has been multifaceted, it is clear that there has been some degree of alignment and cooperation between authorities and the media. Throughout the crisis, the media has actively engaged with political leaders, public administration and experts to ensure transparency in decision-making processes and to demonstrate unity in the management of COVID-19 (Christensen & Lægreid, 2020). Furthermore, the Norwegian Institute of Public Health (FHI) has played a major role in communicating public health recommendations and has published extensive information and guidelines through media on topics such as physical distancing, isolation, quarantine, mask-wearing, hygiene, travelling, etc. (FHI, n.d.). As Norwegians generally display high levels of trust in scientists, the FHI has helped bring credence to these messages among the general public (Evensen, 2020).

7.3.1.5 The role of technology

According to experts, COVID-19 has become a catalyst on the trajectory towards a digital society, more specifically because it has forced us to accelerate technological innovations and make use of them almost instantaneously (Morin, 2020; Tennøe, 2020). Although Norway had already come a long way in terms of digitalization prior to the pandemic, the need for instant workarounds has paved way for new technological applications which have altered how people communicate and socialize (Morin, 2020; Tennøe, 2020; Vitterøe, 2020). With efforts to limit the spread of the virus, bars, restaurants and cafés have become entirely cashless through advanced payment transaction applications, such as Vipps and QR-code systems.

These technologies have proven quite popular and are expected to remain in use long after the pandemic is over (Morin, 2020; Hopland, 2020). On the one hand, they have benefited customers as they no longer have to wait in line for someone to take their order. On the other hand, they reduce actual social interaction between people, and thus conflicts with our fundamental need for social interaction (Forgas & Williams, 2012, pp. 4-5).

In the beginning of the outbreak, public surveillance was introduced in form of a digital tracking device application called Smittestopp, launched as part of an emergency act set in motion by the Norwegian Government (Forskrift om digital smittesporing og epidemikontroll i anledning utbrudd av Covid-19, 2020). The main purpose of the Smittestopp application was to improve the tracking of COVID-19 outbreaks, through automation and user engagement (Ministry of Health and Care Services, 2020b). However due to ethical issues concerning user privacy rights, the first application was eventually banned by the Norwegian Data Protection Authority (NDPA) (FHI, 2020i).

As illustrated by Grøtan (2020), the problem with this type of technology is that it collects and stores large amounts of private information about individuals, which can potentially be misused at later points to control behaviours in entirely different contexts. Nonetheless, the Norwegian Government has set out to launch a new similar application in the near future, despite recent findings illustrating that citizens' willingness to download and make use of the tracking device is only 42% (Askheim & Clausen, 2020b). What seems puzzling in this regard, is the idea of "big brother watching" (Grøtan, 2020, p.49) which has until recently been indisputably repelled, at least in Norway, and is now all of a sudden deemed tolerable.

7.3.2 United States

Few countries have been hit as hard by COVID-19 as the United States. Despite constituting just 4 percent of the global population, it has suffered more than a fifth of all confirmed worldwide cases and deaths (Worldometer, 2020). Although this number is no doubt skewed by underreporting and under-testing in other parts of the world, it nonetheless points to a stark failure by its government to contain the spread of the virus.

Exactly how and when the virus first arrived in the U.S. remains an ongoing topic of discussion among public health experts. Some date it to December 2019, while others argue that it likely arrived as early as November (Melinek, 2020). The first confirmed case, however, was reported on January 20 at a clinic in Snohomish County, Washington (Holshue et al, 2020). The patient was a 35-year-old Chinese American who had just returned to the States after visiting his family in Wuhan.

By the end of the month, six more cases had been confirmed and on January 31, the Secretary of Health and Human Services (HHS) declared the outbreak a public health emergency

(Riechmann, 2020). The same day, President Trump issued a proclamation barring foreign nationals who had been in China within the last 14 days from entering the U.S. Two weeks later, on March 13, he went on to declare the outbreak a national emergency.

Over the next few months, the virus spread precipitously throughout all 50 states. By the end of March, the number of confirmed cases had climbed to 100,000 (Chan, Shumaker & Maler, 2020). On April 11, as the death toll crossed the 20,000 mark, the U.S. outbreak surpassed that of Italy as the deadliest in the world (Shumaker, 2020). Since then, its death toll has remained the highest in the world, passing 200,000 by late September.

7.3.2.1 Government response to the pandemic

Under the U.S. constitution, the authority to impose behavioural restrictions in response to crises like pandemics, rests predominantly with local authorities. The response to COVID-19 has thus largely been the responsibility of individual governors and majors, with the federal government playing more of a communicative, and coordinating role.

On March 15, Puerto Rico became the first U.S. region to enact a lockdown, consisting of a 9 p.m. curfew and a two-week shutdown of governmental operations and non-essential businesses (Vazquez-Garced, 2020). The following day, the White House announced its "15 Days to Slow the Spread": a set of behavioural guidelines centred around physical distancing, self-isolation, and hygiene. It also recommended states to close schools and prohibit gatherings of more than ten people. Over the subsequent weeks, an avalanche of so-called “stay-at-home orders” followed, starting with the epicentres of the disease, California, and New York, but quickly spreading to other, less affected regions.

Despite initiatives like the "15 Days to Slow the Spread", signals from the White House about the severity of the crisis and the necessity of lockdowns have been mixed. During the early months of the outbreak, President Trump repeatedly questioned its potential danger, often comparing COVID-19 to the common flu. For instance, in a speech delivered on January 30, the day before the outbreak was declared a public health emergency, he reassured an audience that “we think we have it very well under control. We have very little problem in this country (..) and we think it’s going to have a very good ending for it. So that I can assure you” (Trump, 2020a). Although such messages might have been intended to prevent panics and hoarding, they may also have had the effect of stalling behavioural changes.

Official guidelines have been particularly mixed with regards to masks. Until early April, the Centers for Disease Control and Prevention (CDC) did not endorse public mask-wearing, due to concerns about supply shortages and the need to reserve stockpiles for healthcare professionals. As the death toll surged during the early spring, however, the CDC reversed its position. On April 3, it issued its first recommendation to "wear masks in public settings, like on public and mass transportation, at events and gatherings, and anywhere they will be around other people" (CDC, 2020). The very same day, however, this advice was essentially undermined by President Trump, who stressed that the guidelines were "voluntary; you don't have to do it" and informed the nation that he himself did not intend to follow them (Trump, 2020b). As discussed in the next section, mask-wearing soon became a deeply partisan and polarizing issue, something that still obstructs its implementation.

7.3.2.2 Behavioural changes in the population

From the onset of the crisis, attempts by U.S. healthcare authorities to induce behavioural changes have been frustrated by political polarization. Although the earliest polls from January depicted bipartisan support for precautionary measures, beginning in early February, this support dwindled among self-identified Republicans. By mid-April, conservative groups and individuals across the country had begun to organize protests against government- imposed lockdowns, decrying their economic and social impacts and demanding their respective states to "re-open". By May, the protests had spread to more than half of all U.S. states (Siegler, 2020). Over the same period, however, threat perceptions and support for precautionary measures kept rising among self-identified Democrats.

This partisan gap has been verified by numerous studies, including a host of surveys (Gadarian et. al, 2020; Christos & Rothwell, 2020; Wu & Huber, 2020; Allcot et. al. 2020; Pew Research Center, 2020). Pew Research Center (2020), for instance, found Republicans to be "nearly 40 percentage points more likely than Democrats to say they would be comfortable eating out in a restaurant" while Democrats and Democrat-leaning independents were "about twice as likely as Republicans and Republican leaners to say that masks should be worn always".

The gap has also been confirmed by tracking movement-patterns through GPS (Allcot et. al., 2020), and remains statistically significant even when controlling for factors such as democrats being "more likely to live in the dense, urban areas hardest hit by the crisis" and thus more incentivized to social distance (Allcot et. al., 2020: 10).

Some have explained the gap as a manifestation of what Allcot et al (2020) terms “partisan cheerleading”. Behaviours like mask-wearing and self-isolation, the argument goes, have taken on symbolic meaning beyond their original healthcare purposes - and are now treated as markers of social identity. As the public watched liberal leaders like Joe Biden wear masks and self-isolate while conservative leaders like Donald Trump refrained from doing so, adapting these behaviours came to be seen as "leftist" and "liberal" while rejecting them came to be seen as "right-wing" and "conservative".

Consequently, members of each camp began to mimic the behaviour associated with their respective in-groups as a way of signalling group loyalty. In the words of Lizza and Lippman (2020), “for progressives, masks have become a sign that you take the pandemic seriously and are willing to make a personal sacrifice to save lives. Prominent people who don’t wear them are shamed and dragged on Twitter by lefty accounts. On the right, where the mask is often seen as the symbol of a purported overreaction to the coronavirus, mask promotion is a target of ridicule”. Instead of banding together under a shared social identity, the U.S. population thus split itself into two adverse ones: one centred around adhering to the behavioural guidelines; the other one centred around rejecting them.

President Trump explicitly made an argument along these lines during an interview with the Wall Street Journal, claiming that some people wear masks as a way to signal their disapproval of him, rather than to limit the spread of the virus (Bender, 2020). Critics like Lindsay Wiley have interpreted this as a way of letting his followers know that he views mask-wearing “as a sign of disloyalty”, prompting them to eschew masks (North, 2020).

7.3.2.3 The role of the media

Others have argued that both sides of the political spectrum are in fact making rational choices, conditional on the information they receive. The observed partisan gap, they argue, can be explained by the divergent messages the two camps receive from their respective thought-leaders and media outlets. According to Allcot et al (2020) right-wing pundits and media outlets have “downplayed the severity of the crisis”, while their left-wing counterparts have “given more emphasis to its dangers” (p. 1-2). Consequently, consumers of left-wing media receive the message that the pandemic is severe, and behaviour changes are vital, while consumers of right-wing media receive the opposite message – and both sides act accordingly.

Indeed, Ash et al (2020) and Simonov et al (2020) found that social distancing decreased when subjects were 'semi-randomly' exposed to news sources downplaying the severity of the pandemic. In particular, Simonov et al. (2020) found that "a 10% increase in Fox Newscable viewership (approximately 0:13 higher viewer rating points) leads to a 1.3 percentage point reduction in the propensity to stay at home". Allcot et al (2020) similarly found the partisan gap to decrease when they controlled for partisan news consumption, while partisan news consumption remained strongly correlated with beliefs about COVID-19 even when controlling for party affiliation. From this, they concluded that their data were more consistent with the hypothesis of divergent messaging than that of partisan cheerleading.

7.3.2.4 The role of technology

Unlike many other developed countries - where the central government released an official contact tracing application - a plethora of such applications circulate in the U.S. Some places, these are managed by state governments. Other places, they are managed by individual counties or cities or even by independent institutions like colleges.

Some places like in the state of Wyoming, it's a hybrid. Following a spike in cases over the summer months, local health authorities in Teton County, Wyoming, contracted Apple and Google to deliver a local contact tracing application. The following month, the Wyoming state health department, "which handles contact tracing for some Wyoming counties—but not for Teton County", settled for a different app, called Care19 (Barber & Knight, 2020). Under the terms of Teton's contract with Apple and Google, no other Bluetooth-based tracking application would work on Apple and Android phones in the county. The state of Wyoming was thus left with one tracing application for Teton, managed by county officials, and another one for the rest of the counties, managed by state officials.

Although such tracking applications could in principle provide local authorities with valuable data on social distancing behaviour, Menni, Valdes and Freidin et al (2020) argue that their volunteer-based and fragmented natures predisposes the data they collect for self-selection bias and poor integration into official surveillance metrics. Effective contact tracing, they argue, furthermore requires widespread and rapid testing; public trust in institutions; and a sufficiently robust social safety net to make some significant portion of the population willing to risk quarantine – all of which are in short supply in most states. The authors thus question the practical utility of these applications in the U.S context.

Some states, however, have been reasonably successful in implementing tracing applications. State authorities in Massachusetts, for instance, released a highly celebrated one in cooperation with the non-profit organization Partners in Health, that also helped users sign up for grants to pay for food and rent during quarantine. According to Jha (2020) this application seems to have been a contributing factor to Massachusetts archiving rates of infections "similar to those in the European Union".

7.3.3 Pakistan

Due to extensive trade and travel between Pakistan and China and Iran, Pakistan was highly exposed to importing the COVID-19 (Abid et al. 2020). Although no one knows exactly when this happened, the first confirmed case was reported on February 26, in Karachi. From there, the virus spread quickly throughout every region of the nation (Abid et al. 2020). As of 9th November 2020, there have been 344,839 reported cases and a death toll of 6,977 (JHU CSSE COVID-19 Data, 2020).

Like governments around the world, the Pakistani government responded to the outbreak by trying to induce behavioural changes like social-distancing, quarantining, and hygiene regulations. However, being a developing nation, the efforts of the Pakistani government ran into some major barriers, including poverty, an ongoing financial crisis, poor healthcare facilities and widespread corruption.

7.3.3.1 Government response to the pandemic and behavioural changes in the population

The Government of Pakistan took unprecedented steps to respond to the pandemic, by implementing a two-months long nationwide lockdown, and regulations that greatly altered the way citizens behaved. Preventive responses were initiated by both federal and provincial governments, including tracing, social distancing, work/study from home, restrictions on large gatherings, mandatory use of face masks and sanitizing habits.

There were multiple pre-existing challenges that made it hard for Pakistani authorities to induce behavioural changes. According to the Human Development Index (HDI), Pakistan has greater levels of inequality in education and healthcare than any other South Asian nation (UNDP 2019). According to the World Bank (2018), around 40% of Pakistan's population lives in

urban slums with narrow streets, crowded homes and neighbourhoods, and lack of clean water, sanitation, and electricity (Hadid 2020). For many inhabitants, the possibility of social distancing and handwashing was thus a luxury not afforded to them. Consequently, slums and other informal settlements turned into major hotspots for transmission of the virus.

Still, Pakistani authorities have introduced significant measures to contain the virus and flatten the curve of infections. Among these are the "Pakistan COVID-19 urban slums response program", which was established as a joint effort between Pakistan's Ministry of Climate Change and the UN-Habitat. Its purpose was to install standard hand washing stations and raise awareness of hygiene measures through digital platforms like TV and social media (UN-Habitat, 2020). The program also provided disinfectant sprays, temperature checks, face masks, gloves, and equipment for the safe disposal of solid and hazardous waste (UN-Habitat 2020).

Another significant initiative was the designation of a virus relief fund and a team of young workers known aa 'Corona Relief Tigers', that were hired as frontline workers to ensure that regulations and guidelines were being followed, and to deliver food to people during the lockdown (Shehzad, 2020).

Social distancing has been practiced in Pakistan in different ways and extents among different segments of the population. While supported by most of the population, its implementation proved controversial and hard to enforce in a society divided by conflicting understandings of the world. The controversies surrounding social distancing stems from its entanglement with the economic, religious, social, and cultural contexts of various Pakistani communities. Many urban communities found the measures to exacerbate their existing difficulties in making ends meet. Many rural communities, meanwhile, were under the influence of religious leaders who preached that the measures were a conspiracy against their communities and religious practices (Khattak, 2020). This made it hard for the government to convince them otherwise.

Since the end of the nationwide lockdown, the government of Pakistan turned its attention to the 'smart-lockdown strategy'. This entailed closing down and sealing specific areas of elevated disease transmission (generally more than 1.5 cases per 1000). These hotspots are typically discovered by data analytics, epidemiologic or field evaluation (NCOC Report, 2020).

A survey conducted by the Institute for Public Opinion Research (IPOR) on a sample of 4000 residents, revealed 51% of the respondents to be satisfied with the government's response to the

outbreak and 42% to be dissatisfied, while 7% declined to answer (Geo News, 2020; The News, 2020).

7.3.3.2 The role of media

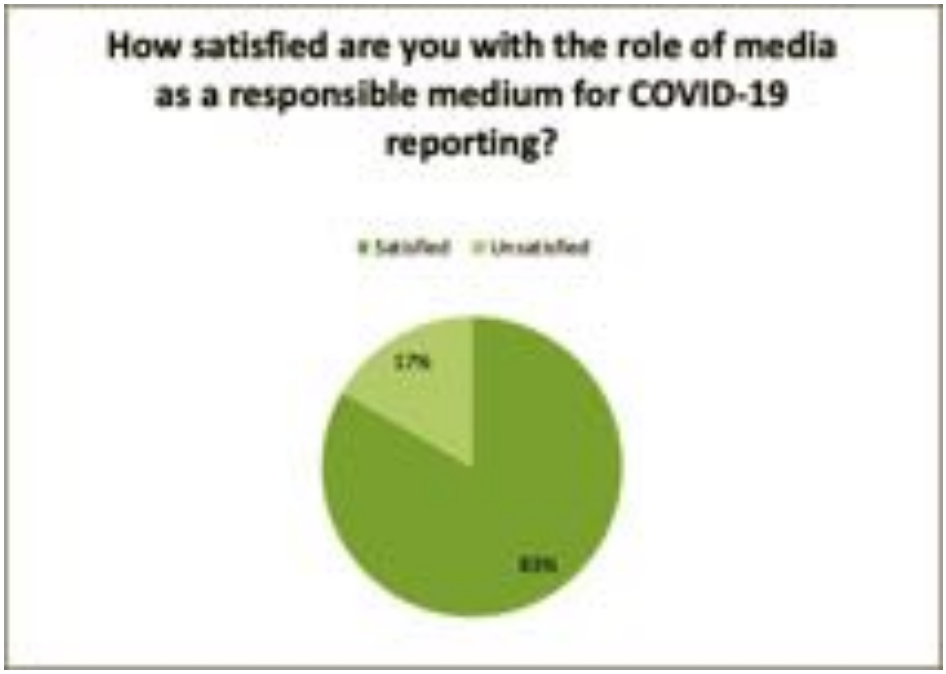
Most inhabitants of Pakistan rely on electronic media - mainly TV and social media - as their main sources of information. Since the onset of the pandemic, these media outlets have thus played a major role spreading information. There are, however, conflicting opinions as to whether or not the Pakistani media has been an effective source of information and medium for behavioural change during the pandemic. Its impact on the social and psychological comportment has, for instance, been questioned in different ways.

On the one hand, the media helped raise awareness about the government's guidelines and regulations, and educated the public about social distancing, hygiene, and working from home. It regularly featured the opinions of public health experts and aided public programs by paying tribute to the frontline workers and by encouraging people to stay at homes and follow the guidelines. This shows us how the media can play a constructive role in moulding the behaviour of individuals.

On the other hand, the media has been criticized for mismanaging their coverage of the pandemic by fabricating controversies and threats, resulting in widespread panic, stress, and depression. According to this view, media coverage of the pandemic has been characterized by misinterpretations and fear mongering. At a press conference, Pakistan's minister of health, Dr Zafar Mirza, for instance, explicitly accused the media for publishing inaccurate information and impeding the efforts of authorities to promote prosocial behaviour changes (The Nation, 2020).

To investigate the public opinion about the media's effect on the behaviour and psychological condition of Pakistanis during COVID-19, a survey was conducted in Pakistan by taking a non-probabilistic purposive sample. Its purpose was to gain some insight into the viewpoint of young Pakistanis by asking a sample of 12 students (three in each of the four provinces in Pakistan) to answer an open-ended questionnaire. The respondents were all aged 23-28.

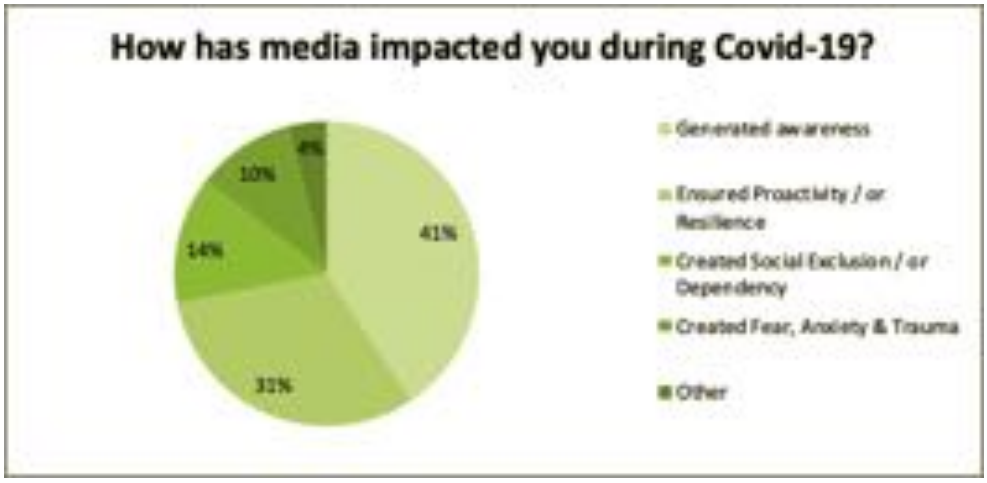
The following chart aims to demonstrate the overall gist of the survey (Appendix 1).



More than 80 % of the respondents answered that they were satisfied with the media's role in educating people about COVID-19, the governmental regulations and how to adapt to them. The respondents noted that the media carried out a campaign of 'Corona sy darna nahi larna hai', which translates as 'we don't have to fear coronavirus, we have to fight it', which had a positive influence on the behavioural and psychological impacts of COVID-19. The respondents also noted that there has been a history of strong relationships between media and civil society during past calamities, with the media being a powerful tool for support and guidance.

The other 17% of the respondents answered that they were dissatisfied with the media's influence on psychological wellbeing. The respondents noted that the media changed the way people in Pakistan operated, and that many developed fear of death and depression by listening to the news. The respondents asserted that the media should be a source of motivation to uplift the morale of the public and air effective ways to mitigate depression and other psychological mishaps.

The following chart depicts the overall responses to the questionnaire:



The respondents were further asked the question 'how has the media impacted you during COVID-19?'. 41% of the respondents regarded generating awareness as the greatest impact of the media during the pandemic. 31% of them considered its greatest impact to be making the individuals more responsive and proactive towards the pandemic. In their view, the media encouraged individuals to take effective precautions, follow guidelines and take social responsibility to an extent that would not have been plausible otherwise (broadcast media/ print and social media). At the same time, roughly 25 % of the respondents claimed that the main impact of the media had been to create fear, anxiety, trauma, social exclusion and/or dependency.

These results illustrate the twin roles the Pakistani media is said to have played during the pandemic. On the one hand, a provider of information and awareness and a champion of responsibility and resilience. On the other hand, a source of misrepresentation and fear mongering.

7.3.3.2 The role of technology

One of the major transformations Pakistan has gone through during the pandemic, is the diffusion of new technologies. Despite the restrictions on cross-border travel and trade, Pakistan - like many other countries - has experienced large-scale international transmission and integration of information technology over the past year. Many segments of civil society, including political debates, education, as well as businesses, were forced to transition online because of the government regulations.

On one hand, the digital dependence during lockdown turned out to be effective in enabling social distancing and to spread information. Previously unheard-of arrangements like online gatherings and weddings soon became a common trend. Many small businesses, like freelance service-providers, greatly benefited from the digital dependence. Even political activities, like the mid-term parliamentary conference in June and the Women Rights Movement in May, were conducted online instead of physically.

On the other hand, this newfound dependence on technology had huge socio-economic ramifications, given that Pakistan is a developing country where most of the population had little or no access to the Internet. For some, this technological shift constituted a source of unemployment and alienation. Many high-quality schools in Pakistan are private and expensive to run. As education moved online, many teachers lost their jobs and some small schools had to shut down (DW News, 2020). In public schools, meanwhile, many students lived below the poverty line and lacked access to the internet and computers. The shift to online teaching thus made it impossible for them to attend school.

7.4 Conclusion

Covid-19 has taught us a great deal about how governments may convince the public to - at least temporarily - forgo their own individual self-interest for the sake of the collective. Over the past year, governments around the world have accomplished this feat to various degrees. They have also run into some major obstacles.

Even in Norway - which is arguably one of the great success stories of this pandemic – some significant portion of the population proved themselves unwilling to forgo their own self-interest for the sake of the collective good. This is evident by cases like private parties that violate restrictions on the size of social gatherings, and by individuals who violate their quarantine for the sake of socializing. Because of this, the Norwegian government - despite its relative success in inducing voluntary behavioural changes - had to supplement this with coercive measures such as hefty fines for quarantine-breakers and mandatory mask-wearing in certain areas. The general insight to be gleaned from this seems to be that although voluntary behavioural changes can take us some of the way towards solving collective action problems,

some portion of the population will almost inevitably refuse to play along. Coercion might thus be an unavoidable part of the solution.

This has clear implications for other collective action problems such as climate change. Although some significant portion of the population might be willing to voluntarily change their lifestyles to reduce their carbon footprint – and although such voluntary change might be an important part of the solution – this is unlikely to be sufficient in and of itself. Instead, the necessary lifestyle changes, as with those in response to Covid-19, might have to be partially enforced.

COVID-19 has also made the importance of effective communication, for inducing voluntarily behavioural changes, painstakingly obvious. For relatively homogenous societies like Norway, this can be achieved by simply presenting the behavioural guidelines in terms of shared, national values. In more heterogeneous societies like the U.S. and Pakistan, such a one-size-fits-all approach to communication has proven less effective. Leaders in such countries need to consider the heterogeneous psychological, cultural, and political motivations different segments of their population has for acting – and adjust their message accordingly.

In hindsight, it seems like these governments could have made a greater effort to tailor their messages for specific social groups, perhaps by leveraging targeted marketing on social media. In the U.S., the government could arguably have made a greater effort to bring conservative audiences onboard by appealing to conservative values such as the potential economic and national security implications of a rampant pandemic. To make these messages credible, they could have enlisted esteemed economists and national security experts to present them. Likewise, the Pakistani government could arguably have made a greater effort to enlist religious leaders to present the behavioural guidelines in a religious context.

In Norway, the political opposition - with precious few exceptions such as when the ruling coalition wanted to grant itself extraordinary emergency powers - went out of its way not to criticize the policies of the government. This is the polar opposite of the U.S. situation, where politicians from both sides of the aisle tried to exploit the crisis for their own political gains by lamenting the policies of their political rivals. Consequently, while Norwegians across the political spectrum took on a shared social identity rooted in narratives about traditional Norwegian values like ‘dugnadsånd’; their U.S. counterparts split themselves into two opposing social identities along sharp partisan lines.

The rampant spread of misinformation and conspiracy theories about COVID-19 in places like Pakistan furthermore highlights the importance of proactively debunking potential misconceptions that might arise before these have the chance to take root in the collective imagination. For ongoing crises such as climate change, it is likely too late to do this, as such ideas are already widespread and have legions of dedicated believers. For the unforeseen crises that will no doubt strike over the coming decades, however, proactively debunking potential misperceptions before they arise could be an important tool.

At the international level, the pandemic can be said to constitute a global collective action problem. From the perspective of Chinese national interests, it might have seemed rational to keep the outbreak under wraps and underreport the number of cases. Yet this proved disastrous from a global collective perspective as it left the rest of us ill prepared for what laid ahead. This gives credence to the realist proposition that we cannot expect sovereign nations to voluntarily undermine what they perceive as their own national interests for the sake of the global good. It also illustrates the need to implement some sort of mechanism that aligns the incentives of individual nations with that of the global collective before the next such problem arises. To paraphrase Randers (2012): China coughed, and because its leaders weren't incentivized to cover its mouth, we all got a severe flu. With the slew of global collective action problems looming on the horizon - climate change, overfishing, arms races etc. - we can ill afford another uncovered cough.

Repeatable learning experiences:

Collective behavioural change is difficult, but not impossible. Cultivating shared identities and elevating behaviours into social norms can get us far, but not everyone can be expected to conform. Coercion might be needed to get non-conformers onboard. Communication should be tailored to specific audiences; misinformation should be debunked proactively; and individual incentives should be aligned with the common good.

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08.
HOUSING

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8.1 Introduction

The COVID-19 pandemic is having a huge impact on all sectors of the world's economy. The housing sector in particular is taking huge hits due to issues such as economic instability, that is intensifying housing unaffordability as well as having disproportionate impacts to certain populations. Inadequate housing conditions leading to increased risk factors for infections and difficulties in proper social distancing, are some of the issues. The aim of this paper is to highlight impacts that the housing sector is facing, providing some input on how they could be overcome in order to improve the human condition. This has resulted in a series of other subsequent research questions, which are introduced in the various subsections.

The paper has analysed the pandemic's effect on housing with a global perspective, although North America is used as a main case study focus. Matters such as housing affordability, trends on suburbanization and social inequities are discussed. This is contrasted with a section on impacts from the perspective of developing countries such as Brazil and Africa. The analysis ends at building unit scale, examining post-pandemics housing design considerations and trends that are already being seen by built environment professionals. An overall recurring theme is social inequity and corresponding disproportionate COVID-19 impacts to certain populations. This forms a large part of the discussion, as well as the potential accelerating effect of COVID-19 on suburbanization, which is intertwined with housing affordability.

8.1.1 Past pandemics and their effects on housing

Urbanization seemingly provides the perfect conditions for a disease to grow and spread, as a higher population is concentrated in a smaller area in contrast with rural areas. Historically, since the middle ages, this has proven to open the opportunity for a disease to spread extremely rapidly and easily, thus the mitigation of this rapid spread has always been a challenge for urban planners.

Previous pandemics have progressively shaped the cities, as they forced solutions to increase the sanitation of human settlements. The Black Death that hit Eurasia in the middle ages allowed creation of early waste management structures and sanitation facilities, in order to expel the disease vectors from cities streets. It was also common in some houses to keep the livestock under the same roof of the family, which could also host the fleas responsible for transmitting harmful bacteria for humans. It might have taken some time for people to understand the real

causes of the Black Death, but it helped to shape houses and neighbourhoods into more sanitized dwellings, like placing animals outside the main house in more proper ways (Hays, 2009).

In the 19th and early 20th centuries, outbreaks of contagious diseases appeared in a context of overcrowded industrial workers' housing in European and North American cities, which also brought the need to reshape somehow housing, healthcare and urban structures. The social inequalities of North American cities contributed to the sprawl of tuberculosis and Spanish flu (Noymer, 2010). Noymer (p. 135, 2010) pointed to the malnutrition and insalubrity of workers settlements to the quick and deadly sprawl of the diseases among the workers' classes. This would somehow contribute to the trend of suburbanization, seeking to avoid crowds and contributing to improved sanitary conditions.

Urban spaces are a complex blend of relationships between various stakeholders, resulting also in uncountable phenomena, which professionals such as architects, engineers, social scientists, urban planners, among others, have been trying to understand and provide solutions. Housing is one of the urban functions that is a source of problems since the consolidation of the urban phenomena in modern societies. Providing affordable and suitable housing conditions is a challenge even in the most developed societies.

8.2 Theory

8.2.1 Urbanization, the form of cities and post-pandemic housing trends

8.2.1.1 Urbanization and the form of the city

Urbanization is the process of people moving within a country. This process concerns people shifting from rural areas of the country to more urbanized places, largely as a way to find work (FN-sambandet, 2019). This urbanization process means that an increasingly larger part of the population will be living in the cities. Today it is estimated that more than half of the world population lives in cities, and it is estimated that 3 billion more people will move into cities within 2050 (FN-sambandet, 2019). Urbanization has both positive and negative aspects. Cities can provide an opportunity for economic and social growth which in turn, can also provide a better life (FN-sambandet, 2019). Another result of urbanization is innovation and increased efficiency, which can result in the economic growth of the country. An issue with this fast

urbanization would be the aspects of everyone fighting for the same resources (FN-sambandet, 2019). This results in problems for the cities as well with a lot of traffic, air pollution, not enough qualified homes and too little money for public services (FN-sambandet, 2019).

While the phenomena of urbanization may speak to the overall trend of people moving from rural to urbanized areas. The spatial patterns of density that these regions of urbanization take, create a multitude of city forms, in various degrees from monocentric to polycentric (Bertraud, 2004). Where monocentric cities are based around a single central business district and polycentric, numerous dispersed ones (Bertraud, 2004). In cities it has been observed that increasing income and mobility can result in a less monocentric and more polycentric form. Historically this has been attributed to a few major factors, such as: historic national transportation policy, presence of inexpensive fuel and plentiful land (Bertraud, 2004). The following section will examine some of the general trends that have happened around cities, people and their living patterns, following the onset of the COVID-19 pandemic in attempts to better understand how COVID-19 may shape the city form in the future.

8.2.1.2 Housing trends following the COVID-19 pandemic: are people fleeing cities?

After the initial outbreak, a phenomenon of urban dwellers fleeing their places of residence gained significant attention in the media. Highly urbanized cities such as Paris and New York documented this phenomenon using various data sets such as smart phone mobility patterns, decrease in waste pickup and other visual observations (Tully & Stowe, 2020; Quealy, 2020). One case in France saw a huge influx of people within a small town which was typically used as a vacation area for Paris residents (Onishi & Méheut, 2020). In Norway, residents who wished to visit their cabins during the initial lockdown were halted through government action. Officials claimed that the influx of city dwellers could spark increased infection in smaller communities, with less adequate and large-scale healthcare facilities (Mon, 2020). Besides the question of whether these large influxes of crowds to smaller towns/vacation areas could lead to increasing case numbers in areas with health systems that could be easily overburdened, another ethical question is raised. The question being, which type of urban resident is provided the privilege to flee the urban centre in preference for more rural or suburban areas? Some data may suggest that it is the ones privileged enough to afford it. A study which focused on New York, highlighted that persons who fled the city were largely of the higher income category, meaning that they may have second homes or cottages in less urban areas, providing them an

easy and non-permanent option for vacating to during the lockdown and pandemic (Quealy, 2020). This trend of vacating during pandemics is one that has been observed not only now but historically and most notoriously being the upper class. “The 1678-80 plague in Vienna “became known as the beggars’ disease when observers noted that, for each 1,000 poor who died, scarcely 10 of the wealthy died (Meier, 2020).” While “Lower- and working-class people often only left when employment had become scarce and there were no other options (Meier, 2020).”

While the initial departure from urban areas may be largely by the wealthy and persons with secondary homes or cottages, other impacts towards housing markets have been noted, such as changes in the rental market in large cities (Gerrity, 2020). With travel restrictions in place the inflow of travellers for business, commerce, education and tourism, have drastically reduced. Meaning cities which have capitalized on this market, now have less demand (Gerrity, 2020). Potentially intensifying this trend of decreasing rents, the young adult demographic has also seen a majority of the impacts for employment loss, a demographic which has been oriented towards the rental housing market in larger cities (Evans, Rosewall, & Wong, 2020). Both of these factors are considerations to a possible over supply of housing within certain urban areas.

A survey by Harris polls conducted in the U.S. indicated 39% of urban dwellers were considering leaving for a less crowded place (Hart, N. D.). Another analysis concluded that as many as 37% of U.S. jobs could be done entirely remotely (Dingel & Neiman, 2020), meaning many may just have that possibility. A combination of lockdown restrictions, negative associations towards dense regions and the increased ability to work from home, all could be contributing factors to a possible shift in preference of housing location. While decreasing rents and increasing vacancy may appear to be a negative sign for the life of more dense housing in urban centres, some say it may help to level off in increasingly unaffordable urban markets, drawing in a new tenant market of deal seekers, hoping to cash in on the lower rents (Florida, 2020).

Looking at the situation in Scandinavia, the housing market in Norway had a down side in the beginning of the pandemic, with similar impacts in Sweden and Denmark (Eiendomsverdi, 2020). The housing market most affected by the pandemic by these three countries would be apartments. This may be because of the geographic aspect between the city and countryside. The same effect happened in all three countries, where the pricing fell at the beginning of the pandemic, but after a while all the prices again rose to the same point as previous years.

By looking at the statistics done by Norske Boligbyggelags Landsforbund SA (NBBL) for the housing market (NBBL Fulltegningsforsikring AS, 2020), the average pricing has changed some from the first quarter of 2020 to the second. The average price for a three-room apartment in Oslo fell with around 260,000NOK in Oslo, while it had a rise in Bergen, Trondheim and Stavanger. More so, while the prices for apartments fell in Oslo, the prices for houses had a rise of around 430,000NOK. It is worth noting that around 25,000 houses or apartments change owners every year. With Oslo being the densest city in Norway, it is possible that this shift in the housing-market may signal a shifting preference, away from living close to each other in apartments and into separated housing.

8.2.2 COVID-19 and housing impacts from a North American perspective

8.2.2.1 The relationship of urban density and social inequity with the COVID-19 pandemic

The relationship between density and infection is complex and has sparked debate within the media. As time has progressed a more developed understanding has formed. This section will examine the science about cities, density, housing and their relationship with COVID-19 infection. Attention will also be drawn to social inequities, as they have been found as a potential exacerbator to the impacts of the COVID-19 pandemic.

While many studies have ascertained there is a correlation between density and increased prevalence of COVID-19 infection in American counties and cities (Carozzi, Provenzano, & Roth, 2020). It has also been highlighted that any cross-sectional examination of major urban cities may reveal larger amount of COVID-19 based mortality in denser areas, as they view the situation at one single point in time (Carozzi, Provenzano, & Roth, 2020). As cities, with their increased social connectedness, are likely to be early starters with outbreaks and therefor will be further along in the development of COVID-19 infection. The research points to a necessary time correction, to account for the early onset in denser regions which will result in more accurate comparison (Carozzi, Provenzano, & Roth, 2020). Another study revealed that while COVID-19 infection rates may be higher per capita in some denser regions, many dense metropolitan counties within the United States actually had a lower COVID-19 mortality rate, a factor which they found as more indicative to the severity of COVID-19 in a region (Hamidi, Ewing, & Sabouri, 2020). Stating one potential determining factor in reduced mortality within these dense counties is a better hospital capacity (Hamidi, Ewing, & Sabouri, 2020).

At the city scale, a series of studies comparing population density by neighbourhood in New York city and number of COVID-19 cases, revealed that some of the areas with lower population densities were the ones with the largest amount of infections and some with the highest densities had the lowest number of cases (Figure 1) (Cleveland, et al., 2020). Stipulating that, in the case of New York, urban density was not as strongly associated with increased infection as household crowding was (Cleveland, et al., 2020).

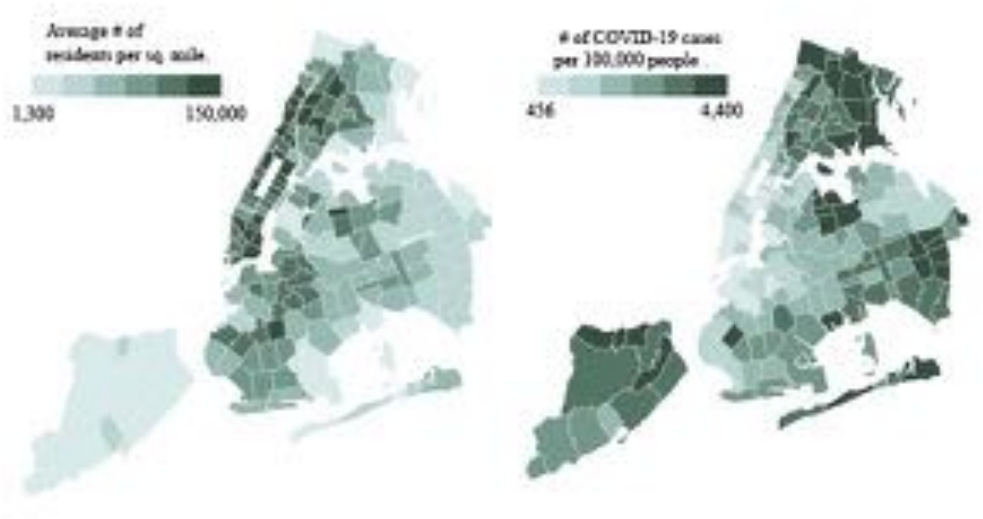

Figure 8.22. Average number of residents/ sq. mile (left) and Number of COVID-19 cases per 100,000 people in New York (Cleveland, et al., 2020).

Household crowding is a condition where the number of occupants exceeds the capacity of the dwelling space available and is most likely to affect areas of lower income. In New York some of the neighbourhoods that had documented higher levels of household crowding also had some of the highest rates of infection. Other studies point to a correlation between crowding and increased rates of infections as well as decreased levels of mental well being (Cleveland, et al., 2020).

In the united states low income households are two times as likely to be overcrowded than white households, while black and latino households are 7 and 2 times as likely to be overcrowded respectively (Cleveland, et al., 2020). This means that such communities are at higher risks of COVID-19 infection. This is worsened by other housing disparities, which are closely tied with the wealth gap, such that 47 percent of latinos and 45 percent of black households were homeowners in 2011 compared to 73 percent of white households (Cleveland, et al., 2020).

Lower quality housing conditions have been tied with adverse health impacts (Shaw, 2003). Figure 2 links housing variables such as the age of the home, water leaks, cracks and or holes in the building to possible associated hazards such as presence of mold, insects or heating issues. The table indicates there is a strong correlation between income and possible hazards in housing, with lowest income groups being most exposed. To date, studies that relate specific health outcomes to housing conditions have tended to be small scale. Although the amalgamation of these numerous studies shows an extensive range of ways in which housing is related to health and could be considered one of its key social determinants (Shaw, 2003).

Housing Variable	Yearly Income Category				Associated Exposures and Hazards
	<$30K	$30K to $60K	$60K to $100K	>100K	
Built before 1980, %	71.56	65.82	57.77	48.63	Lead paint; structural integrity
Area of peeling paint larger than 8x11 inches, %	3.1	2.04	1.41	0.99	lead paint
Any inside water leaks in the past 12 months, %	9.14	8.67	8.24	7.98	Mold and moisture; structural integrity
Neighborhood with heavy traffic, %	28.19	25.42	21.95	16.69	Outdoor air sources - mobile
Industry or factory within half block, %	6.9	5.5	3.54	1.74	Outdoor air sources - stationary
Unit uncomfortably cold for >24 hrs, %	10.7	9.67	7.33	6.71	Supplemental heating; comfort
Evidence of rodents in unit, %	17.77	16.81	16.98	16.26	Allergen exposure; pesticide exposure
Homes with cracks in floor, wall, or ceiling, %	7.13	5.1	3.88	3.31	Allergen exposure (pests)
Homes with holes in floor, %	1.85	1.03	0.58	0.37	Allergen exposure (pests)

Figure 8.23. Housing variables associated with indoor environmental exposures, by household income (Adamkiewicz, et al., 2011).

Additionally, housing is often seen to be segregated in many places across North America by income and race (Contenta, 2018; Massey, 2001). This has developed over time through historic housing policies. One such policy was "redlining", which was "the historical practice of refusing home loans or insurance to whole neighbourhoods based on a racially motivated perception of safety for investment" and was implemented from 1933 to 1977 through the government-sponsored Home Owners' Loan Corporation (Hoffman, Shandas, & Pendleton, 2020; Perry & Harshbarger, 2019). Other policies which can be less directly discriminatory but still exclusionary, are being implemented to this day. They include zoning for large minimum lot sizes, single unit per lot requirements, and minimum square footage requirements for residential property (DeNinno & College, 2019).These policies restrict the development of

higher density or more affordable development in wealthy or affluent neighbourhoods. Whereas the allowance of lower income households into these more affluent areas would enable them to gain better access to education and property, two important factors allowing for mobility through social classes (DeNinno & College, 2019).

The historic red lined areas within the United States have also often been areas to bear the brunt of locally unwanted land uses. Historically the placement of such negatively impactful land uses such as highways, incinerators, bus depots and landfills would be placed into areas considered the path of least resistance, which unfortunately often were these segregated and minority neighbourhoods (Northern Public Radio, 2020). Such land uses have made for negative air and environmental qualities in these neighbourhoods, and these when combined with the decreased indoor environmental qualities found in lower income homes, have led to health impacts such as increased amounts of respiratory illness (Nardone, Thakur, & Balmes, N. D.). Respiratory illnesses such as asthma have been identified to increase the risk of severe illness from COVID-19 infections (CDC, 2020).

The historical redlined areas have also been found to have increased number of impervious surfaces, instead of tree canopy and green areas compared to that of wealthier and majority white-identifying ones (Hoffman, Shandas, & Pendleton, 2020). The lack of greenery in these historically redlined neighbourhoods means that they are victim to increased urban heat island effect. Where these neighbourhoods have shown an increased temperature of 7 degrees Celsius in comparison to their non-redlined neighbouring areas (Hoffman, Shandas, & Pendleton, 2020). This impact will likely only worsen with the effects of climate change. Although, given the importance of green space to the quality of mental well-being in urban areas (Engemann, et al., 2019), another question can also be raised. Are these lower income, historically redlined neighbourhoods at greater risk of decreased mental health through the effects of the COVID-19 lock down?

8.2.2.2 Affordability crisis: Exacerbating impacts of COVID-19

The pandemic has had an immense impact on people's ability to pay rent and has exacerbated a troubled housing market. COVID-19-related hardship, such as job loss and inability to pay rent, has created what some call the COVID-19 housing crisis. This housing crisis has caused a disruption of the affordable housing market and caused long-term harm to renters across the U.S. (Benfer, et al., 2020). Although stimulus packages and government aid might have been a

much-needed support, it only seems to have served as a temporary fix to a much bigger housing affordability problem. The pandemic seems to have only made matters worse during an already existing national affordable housing crisis.

Prior to the pandemic, there was already a shortage of affordable housing units to the lowest-income renters, and over 47 percent of renter households paid over 30 percent of their income towards rent. At the start of the pandemic, 25 percent of all renter households spent over 50 percent of their income on rent each month (Benfer, et al., 2020). Census data now shows that 56 percent of renter families spend more than 30 percent of their income on rent, and at the same time, home prices in Southern California hit a record high in September of 2020 (Dillon, 2020). Statistics also show that almost 1 in 6 renters were not caught up on rent in October 2020 (Center on Budget and Policy Priorities, 2020). Those fortunate (or unfortunate) enough to freely relocate before and during the pandemic have caused a visible shift in the renters market, and metropolitan areas in the U.S. have seen the price of rent decrease during the pandemic (Dillon, 2020).

“Rental prices in the L.A. area are down for the first time in nearly a decade.” As for shifting trends, “Apartment List does expect that COVID-19 could have a significant impact on moving trends in the long-term, [but] the company says the new data is similar to what they saw before the pandemic (Cheney, 2020)”. Figure 3 shows how rent in urban areas has decreased, while rent in suburban areas has increased.

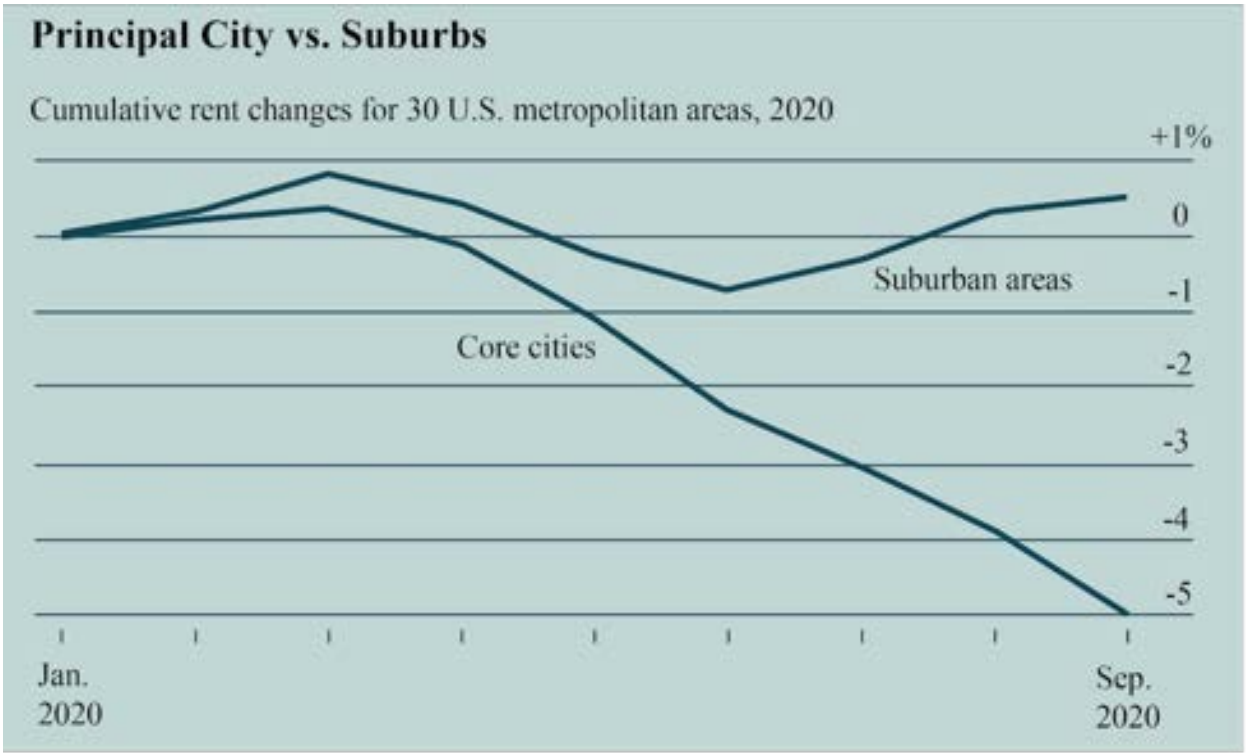

Figure 8.24. Cumulative rent changes for 30 U.S. metropolitan areas (Capps, Patino, & Merrill, In the U.S., City Rents Are Falling, and Suburban Rents Are Climbing, 2020).

The reasons for the decrease in rent prices in major metropolitan areas might be many, but as evictions increase, and landlords struggle to find qualified tenants, basic economics seem to be reason enough. The regulations that accompany this pandemic have also limited a good amount of the amenities and activities that make the city attractive to so many urbanites.

There is little evidence that COVID-19 has caused an urban exodus, but rather accelerated a redistribution trend that was already in existence. “Record low interest rates and severe housing shortages had many people already primed to leave the city; the pandemic gave them a push” (Capps, Patino, & Merrill, In the U.S., City Rents Are Falling, and Suburban Rents Are Climbing, 2020). Unfortunately, some groups seem to be more vulnerable than others in this housing crisis. The statistics say that 1 in 4 Black renters, and 1 in 5 Latino and Asian renters were not caught up on rent while only 1 in 10 white renters found themselves in the same situation of not being caught up on rent at the beginning of October (Center on Budget and Policy Priorities, 2020).

Figure 8.25. Share of adult renters saying their household is not caught up on rent (Center on Budget and Policy Priorities, 2020).

Another vulnerable group seems to be renters with children where almost 1 in 4 are not caught up on rent (Center on Budget and Policy Priorities, 2020). Although the number of evictions is down in 2020, a Census Bureau survey indicated that an estimated one third of renters in the U.S. were expected to miss their rent payment in August. Although the current eviction rate does not seem to be higher than previous years, there could very well be a looming wave of evictions following the end of the federal moratorium (Capps, Across American Cities, Evictions Are Down, 2020).

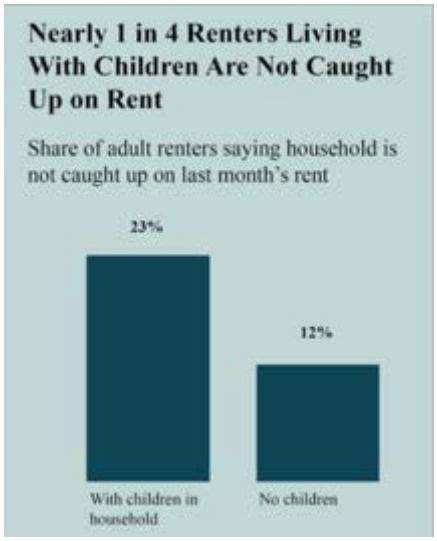

Figure 8.26. Share of adult renters saying household is not caught up on last month's rent (Center on Budget and Policy Priorities, 2020).

One might also think that decreasing rent prices may help make housing more affordable; however, "a rapid decline in rents and home values might be beneficial to Californians who can

keep steady incomes and stable jobs. But for lower-income earners, especially in the service sector, rents will not drop as fast as their incomes. The state will be more unaffordable, not less (Levin, 2020)".

8.2.2.3 A case study of shifting housing trends in Toronto

Given the complexity and location-based context of analysing shifting housing trends due to COVID-19. This section of the paper will focus on Toronto, Canada, in order to reduce the scope and complexity. Where does Toronto housing stand following the onset of the COVID-19 pandemic and has there been a shift implying increased suburbanization? One noticed trend is of falling rent prices, with the greatest concentration around the urban core or City of Toronto (Figure 6) (Myers, 2020). Prior to the pandemic, 2019 marked Toronto as the fastest growing city in North America (Petramala & Smyth, 2020). The rapid growth had also triggered significant interest in real estate. Correspondingly, increased interest led to a shortage of rental units and lack of affordable housing, pushing many residents into long term rental status instead of purchasing, further fueling the rental demand and increased prices (Siatchinov, Champlain, & Verma, 2020).

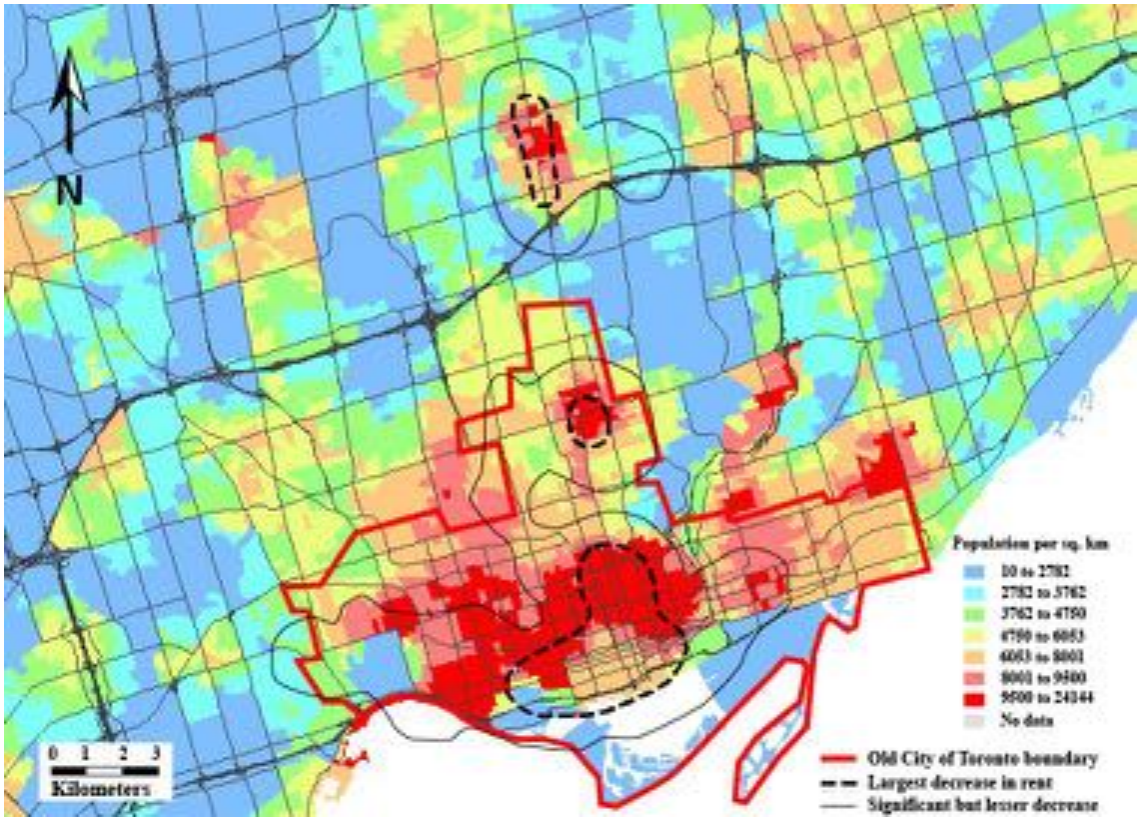

Figure 8.27. Map of population density (2006) and areas of highest decreasing rent in Toronto (2020), self-produced (S.R.) using data from (Myers, 2020) (Toronto Transit Blog, 2017).

One means for investors to seize the financial opportunities that exist in urban areas such as Toronto, is Airbnb. Due to the rapid proliferation of short-term rentals through Airbnb and their operation in a legal grey area, it has taken a considerable time for regulation to control the trend. "In total, Airbnb has likely removed approximately 31,100 units from Canada's long-term rental markets (Combs, Kerrigan, & Wachsmuth, 2019)". While 44% of these short-term rental units are located in Canada's three largest Census Metropolitan Areas (Toronto, Montreal and Vancouver) these areas only contain 36% of the total population" (Combs, Kerrigan, & Wachsmuth, 2019; Statistics Canada, 2019).

How has Airbnb been impacted by COVID-19 and could it be correlated in part to the decreases in rental prices? A study that was completed utilizing data from real estate website Zoocasa analysed ten condo apartment buildings which were known to be popular for short term rentals (Airbnb) within the City of Toronto area (Rane, 2020). The analysis compared the number of listings in these buildings in June 2019 to June 2020 and highlighted that the buildings examined saw an increase in listings of 257%. While the average increase in listings for the city of Toronto was 83% (Rane, 2020). This data provides some quantification to the effect of the travel restrictions resulting in less immigration, domestic and international travel and its subsequent impact, where many short term rentals are put back into the long term rental market due to decreased demand (Rane, 2020; Saric, 2020).

Some of COVID-19 related impacts which may be correlated with the decreasing rents, can be summarized as the following. Firstly, lockdown triggered closure/restriction of amenities, such as restaurants, bars, theatres and the numerous events and community activities that these urban areas typically host would seemingly make Urban Toronto a less attractive place. Secondly, some may fear an increased chance of infection through crowded metropolitan areas and public spaces, disincentivizing urban living (Bogost, 2020). Thirdly travel restrictions, this has reduced the amount of people entering the city for tourism, studying and long-term immigration (Saric, 2020; Robertson, 2020). These travel restrictions also have a secondary impact, where a large proportion of housing which has been directed to short term rentals, now is re-entering the long-term market, helping to create an oversupply. Although, it is questionable as to whether any of these identified causes will have long lasting implications, as travel and lockdown restrictions are removed more permanently, allowing cities to resume as a gateway, and centres of entertainment for people once again.

Another trend to be examined, is reports from real estate agents highlighting that sales and prices have increased in suburban areas surrounding the urban core of Toronto (Balakrishnan, 2020). It is uncertain whether this is correlated with increased preference for these more suburban areas or if it is a surge in activity after the lockdown held back buyers in the market earlier on in the pandemic (Balakrishnan, 2020), while COVID-19 based construction delays slowed new supply (Smith, 2020). It should also be considered that while Toronto has experienced a period of significant growth, it is largely through immigration while it experienced domestic net migration in 2019 (Petramala & Smyth, 2020). This is documented through an increasing amount of middle class and working families leaving Toronto as housing affordability worsens (Siatchinov, Champlain, & Verma, 2020; Fulford, 2020). Across the densest regions of major North American cities, a similar phenomenon of a lack of families is shown, possibly contributing to a demographic gap. Where the largest growth in high density urban areas between 2000 and 2017 in the 25 to 49-year age group was from white, college educated graduates with no school age kids (Thompson, 2019).

Attractive due to their vast economic opportunities and job prosperity but seemingly being less sustainable in any type of long-term living situation, where a family may wish to raise their kids. Cities could be seen as becoming an increasingly transient space. As early as "In the 1960s, sociologist Herbert Gans identified a growing chasm between family-oriented suburbanites and people who favoured city life—"the rich, the poor, the non-white as well as the unmarried and childless middle class," indicating that the draw of suburban living has always been attractive for certain demographics (Modarres & Kotkin, 2013; Bogart, 2006) Examining this trend more recently, one study by the Brookings Institute focused on growth in 53 American metropolitan areas with populations exceeding one million (Figure 7).

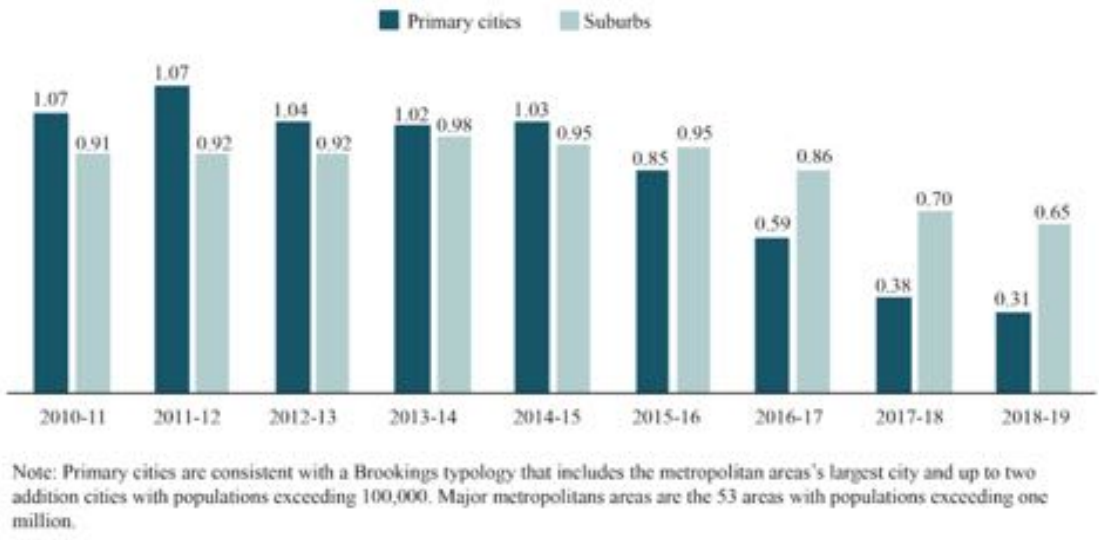

Figure 8.28. Annual growth of primary cities and suburbs within major metropolitan areas of the U.S. 2010 -2019 (Frey, 2020).

It determined that growth in these cities was largely focused within their urban centres from 2010 to 2014. Although in the period of 2014 to 2019 there has been a general decline in growth of both suburbs and primary cities of the major metropolitan areas over 1 million but the growth in suburban areas have been declining at a lesser rate. Indicating a re-emergence of popularity in the suburbs of major metropolitan areas and a spreading out of population into smaller cities and metro areas of less than one million, even prior to the COVID-19 Pandemic (Frey, 2020). Given the data presented on Toronto, it may seem to be following a similar trend, with a growing amount of domestic emigration, largely being middle class families. Following the pandemic an increase of teleworking has occurred in Canada, from 13% in 2017 to 36% of the population following the pandemic, meaning that many more people are less confined to the previous commuting distances potentially restricting their decision in housing location (Deng, Morissette, & Messacar, 2020). This may mean that the COVID-19 pandemic is not shifting trends but potentially just acting as catalyst, accelerating the dispersal of certain demographics to more affordable locations.

8.2.3 COVID-19 and housing impacts from the perspective of underdeveloped and developing countries.

The urban studies of countries in the global north (Australia, East Asia, Europe, New Zealand and North America) differs from those in the global south (Africa, Latin America, major parts of Asia and Pacific Islands). Underdeveloped and developing countries have structural problems not only to provide adequate housing, but also lack sanitation measures and safe

access to clean water. This context is further aggravated with the COVID-19 pandemics, which requires all of these facilities in order to overcome the sanitary crisis.

8.2.3.1 The housing challenges of Latin America and the COVID-19 pandemics

Latin American countries have been hit hard by the pandemics, registering some of the highest contamination rates by COVID-19 and death tolls in the world. Not only slums, with their scarcity of basic structures are especially vulnerable to diseases spread, have been affected but also middle-class dwellings, as they often may house several members of a family such as grandparents living together with small children. This is something that is more uncommon in developed countries but can complicate measures such as social distancing that help contain the spread of COVID-19.

The slums, known in Brazilian Portuguese as *favelas*, are urban settlements where people establish their homes, as they cannot afford to live in formal settlements (Figure 8). The areas where these settlements are built are normally close to main central zones, but not absorbed by the real estate market as they are hard to build in or just not profitable. The central location is attractive as it establishes short commuting times for the residents to their workplace. However, the building processes rely entirely on residents' resources and knowledge, a process termed "auto-construction". As these settlements sprawl, given the difficulty of building structures, the state becomes absent, lacking schools, healthcare and public safety. Often, the *favelas* lack minimal sanitation structures, water supply and solid waste management, and therefore become especially vulnerable to the COVID-19 pandemic. As of 2019, approximately 7.8% of dwellings in Brazilian cities are located inside informal settlements (Instituto Brasileiro de Geografia e Estatística, 2020).

Figure 8.29. Rocinha, the most populous abnormal settlement of Brazil, expanded over cliff areas between the traditional neighbourhoods of Lagoa, Leblon and São Conrado (BBC, 2014)

Also, in Brazil, another aspect to be considered is the number of housing units that are not owned by their residents, being occupied by rent contracts or ceded by the owners for occupation, which is commonly known as “live by favor”, or still being paid by at least one the residents (Figure 9). According to the National Continuous Research of Housing Samples of 2019 (Instituto Brasileiro de Geografia e Estatística, 2020), 18% of Brazilian dwellings are occupied through renting, 9% are occupied through cession and 6% are still being paid. As the events of the COVID-19 pandemic occur, many people have lost their source of income and become unable to pay rents or mortgages. To face this problem, the Brazilian parliament approved in September a bill to prohibit evictions orders filed after the 20th March 2020 until 30th October.

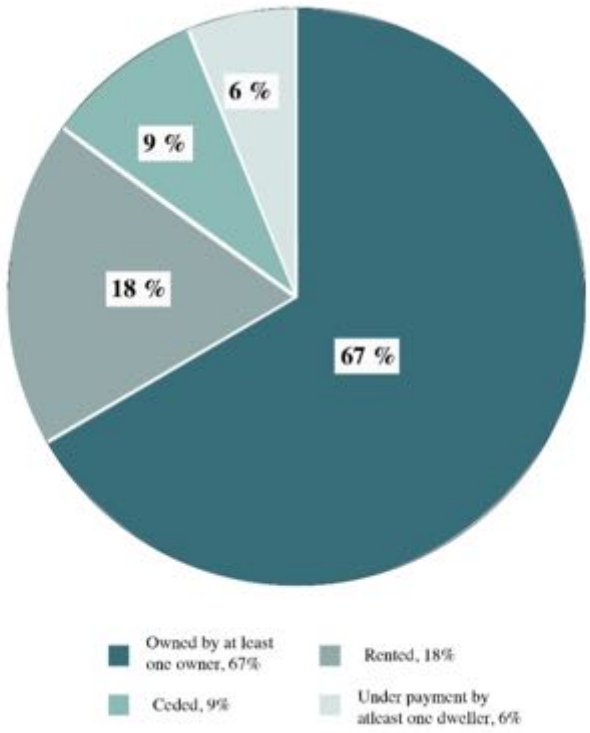

Figure 8.9. Brazilian dwellings by type of occupation (Instituto Brasileiro de Geografia e Estatística, 2020)

Besides the obstacles imposed by the social structures and urban infrastructural weaknesses of Latin American countries to fight the Covid-19 pandemics, the politics seem to also be an issue as the public authorities have not been able to enforce social distancing measures properly (Papi & Madeira, 2020). In Brazil, for instance, the current president has repeatedly denied the severity of the pandemics. Jair Bolsonaro has agitated the masses to leave confinement and go back to their normal routines as before the pandemic. He did, however, approve a financial emergency aid available to all Brazilians that could not perform their jobs from home, being

paid for three months at a value of R$ 600 (US$ 112 in 6th of November exchange rate), which not surprisingly helped him rise his sinking popularity rates. However, the attempt to implement this emergency financial aid cannot continue to be paid due to budgetary limitations, being reduced by half in the 4th month (De Moraes, Silva, & Toscano, 2020).

In Argentina, the president Alberto Fernández enforced strict quarantine rules that held the spread and death rates to COVID-19 low in the first months of the pandemic. But the lack of a plan to loosen the confinement restrictions and allow some economic relief pushed the crowds to the street and the country has rapidly increased its COVID-19 victims rates, figuring today in one the highest ones in the World (Papi & Madeira, 2020).

These two cases are singular examples of a general issue in Latin America, which is the difficulty to promote effective public policies to fight the COVID-19 pandemic. This may also have a heavy impact on how Latin American cities will have to face future pandemics, adding the mentioned previous social and structural challenges. But a positive regard appears, as some community mobilisation (Figure 10) was made in some contexts to help impoverished communities in some adaptations to thrive through the pandemic.

Figure 8.10. A sink installed through community effort in an access alley to an abnormal settlement in Brazil, providing a hand sanitation facility, measure required to fight the Covid-19 pandemic. (CatComm, s.d.)

8.2.3.2 Africa: weak institutions and difficulty to track infected individuals

Nigeria is a country with a largely informal economy and great dependence on daily activities for income and provisions. At the start of the COVID-19 breakout, there was a slow response to social distancing in Nigeria, but that changed when the discovered cases were getting out of hand. The country could not maintain an extended full lockdown because individuals and

businesses were greatly affected and were losing their sources of income. The lockdown had to be lifted for people to find alternative means of income. However, the resulting impact from the lockdown affected all core sectors in Nigeria, which caused the government to revise the 2020 budget. For instance, the fragile Nigerian economy experienced disruptions to global supply chains, a huge loss in global crude oil and commodity prices and fluctuations in the global stock markets (APA News: Agence de Presse Africaine, 2020). The aviation sector also suffered huge losses of jobs numbering over 100,000 with airlines losing approximately N17 million monthly, since the lockdown was initiated (APA News: Agence de Presse Africaine, 2020). The hospitality and entertainment sectors suffered the biggest losses with cancellations of bookings and closure of hotels and production sets, this is considered the most impacted sector because the entertainment industry is the fastest growing in Nigeria and the recovery rate remains to be seen. The underdevelopment of the health sector was greatly revealed during this outbreak as it is one of the sectors the government pays the least attention to. The agriculture, housing and banking sectors were some of the sectors that have been late to feel the impact of the lockdown and pandemic, it could even be said that the agricultural sector experienced growth with the increased demand for food produce.

Critics believe this is an opportunity for the Nigerian government to develop structural reforms and establish local policies such as export diversification, growth of the agricultural industry, exchange rate convergence as well as other policies (APA News: Agence de Presse Africaine, 2020). The situation is not all negative though, as the government has allocated funds and provisions for small businesses and individuals as these are seen as the most impacted and has been disbursed since April 2020. The Central Bank of Nigeria has also set up loans and incentives for individuals and small businesses as well.

Ghana is a country filled with rich mineral resources which are a huge contributor to its export dominant market. Ghana was faster than Nigeria to implement measures to protect its citizens, such as the closure of their borders, dedication of GHC 572 million (US$ 98,3 million in 6th November exchange rate) to fight against COVID-19 and mandatory testing for all incoming travellers. Even with these measures, the country has still suffered huge impacts in the various sectors. The Ghanaian economy is suffering over 3.5% in GDP losses and huge decreases in the export and supply chains (Deloitte, 2020). The hospitality industry is also suffering greatly with the border closures and the lack of tourism. The agriculture sector in Ghana is not very advanced so they rely on food produce imports from neighbouring countries and global

partners, with the country on lockdown the supply chain is disrupted. Commodity prices are also affected as well with domino effects occurring from other sectors (Deloitte, 2020). The health sector is much like Nigeria which is in dire need of development as the skill set are already present in both countries.

Critics say that Ghana cannot persist much longer in lockdown, otherwise there would be huge losses in government revenue and expenditure which would lead to a lot of job losses. Commercial banks in Ghana though are doing their small bit to help the economy such as aiding key industries and the granting extensions of loan payment days (Deloitte, 2020). The Ghanaian government also dedicated money for the country's support. There have also been some incentives and pardons with tax payments and returns for businesses (Deloitte, 2020).

8.2.3.3 Overall perspective

Figure 11 brings a measure of how the COVID-19 infection numbers compare, organized by continents. Europe, for instance, is high in number of infections by 100,000 individuals, which may in part be due to the efforts to test massively and track infected people. On the other hand, the African continent has very low numbers, possibly due to the scarcity of testing. This comes to reinforce the difficulty that institutions of impoverished nations may have in controlling the spread of pandemics, treat the ill and further plan to avoid outbreaks of disease.

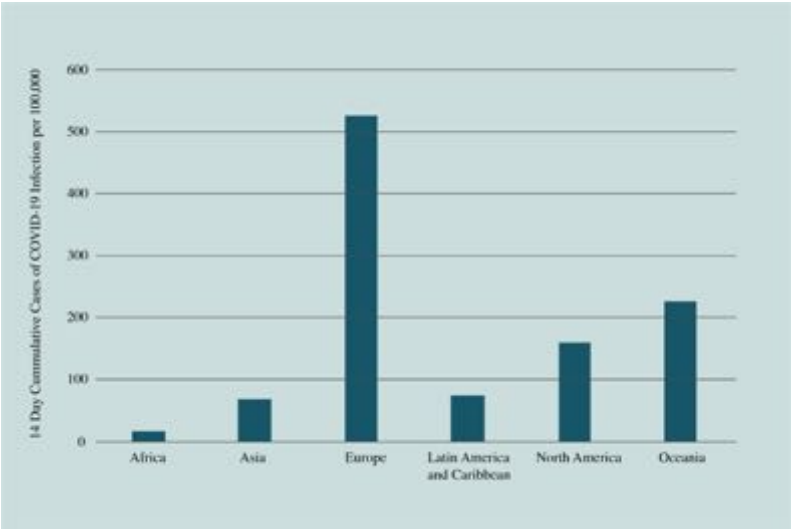

Figure 8.11. Number of cumulative infections in 14 days for 100,000 inhabitants by continent. Low rates in Africa may indicate lack of tests. (European Centre for Disease Prevention and Control, 2020).

8.2.4 Individual buildings - Form of homes and spaces

The COVID-19 pandemic will not only affect housing trends on a national or urban scale, it may also have effects on the actual shape of people's homes as new necessities are rising. Lockdowns meant to reduce the spread of the virus have forced many people to remain at their homes for extended times or are now working from home. This prolonged time inside their homes has brought to light the many necessities that homes are lacking for a proper prolonged stay and for adequately working from home. Another factor that has greatly influenced the rise in these elements for homes to have, has risen through the population movements during the pandemic discussed in previous sections — as there is a perceived increase in people moving to another home, they are paying more attention to the elements and details needed to fulfil their necessities such as working from home or simply staying inside for a prolonged time. This influences the housing market, as the demand for a new place to rent or buy will be affected by people's increased preferences.

The proposed considerations can still be debatable due to some varying factors such as cost, feasibility, available space, ownership of the home etc. During the lockdown, homes have served such multi-disciplinary functions (gyms, classes, theatres) that probably stretched their limits and spaces more than expected. With the many necessities that have risen, many design trends and considerations for future post-pandemic homes will be popularized. Some of the main design trends and considerations are further discussed in detail.

8.2.4.1 Post-pandemic Home Design Considerations and Trends Adaptable and Multifunctional Spaces

Considering that the dynamics of housing are gradually changing, it really isn't possible to have each and every space wanted to be found in a house at once. There's a saying that "there's no perfect house or home, just creative home owners". To be fair, creativity can be fueled by the house's flexibility, for example the creation of a living room which can be converted into a temporary office, gym or even an extra bedroom by simply moving some furniture or having multi-purpose furniture and housing features to begin with (Salmonsen, 2020).

As people need to stay home, the space in a home becomes very valuable and therefore should be taken advantage of as much as possible. This necessity leads to the concept of adaptable or multifunctional spaces. Adaptable spaces should be spaces in a home that can be readjusted or

used for different activities. These spaces can be conditioned for different activities like working or exercising, depending on the time of the day they could be reconfigured (Bermejo, 2020).

One of the ways that this can be achieved is through adjustable partitions, these removable walls and screens can transform an open living room for example into different dedicated spaces (Bahadursingh, 2020). As these spaces may be used for activities that require silence like working, napping or meditating, it is important to think about sound proofing these barriers and isolating acoustically the different spaces (Alati, 2020), therefore acoustic insulation should be an important design consideration for future homes.

To take further advantage of spaces in a home, even bedrooms could be considered adaptable spaces. A way to make this is by implementing Murphy beds (Figure 10), which are beds that can be retracted towards a wall, this way the space can be used for other purposes like exercising. This strategy can also give double purpose to a room only when needed, for example having a room double as a guest room and home office (Alati, 2020).

Another consideration for these separated spaces arises from the current pandemic, as a common problem that has been observed is when a family member has tested positive on COVID-19 and must isolate from the rest of the family. This creates the necessity for a space that can be isolated from the rest of the home for a person that is sick, preventing the infection of the rest of the family (Rizzato, 2020).

Figure 8.30. Example of adaptable furniture to take advantage of a room for different functions, this example could be a room that doubles as home office and guest room (HomeEdit, 2012).

Home Offices

With the pandemic and current technological advances, the surprise arose that working from home has become the new and completely achievable normality for a majority of jobs. This now has brought the necessity to have appropriate spaces to work from home and has been one of the new design considerations that have most caught the attention of architects and designers. The workspace also doubles as a communication room, where virtual meetings can take place without a problem.

The real need for home offices is surfacing especially among young working families with kids at home during the lockdown periods. This is a demand that is probably going to be the most common as workers shift to working from home full time and are looking for more defined and adaptable spaces (Salmonsen, 2020).One issue that can be foreseen in having a home office space is the case where there's more than one house resident working at home, solutions to this issue could be thought out through the design considerations discussed in the previous section, where spaces could be adapted to a secondary office if the need surfaces.

Workspaces at home should be adapted to every necessity and amenity as if people were still back at their office, so people can fulfil their work properly and be comfortable (Bahadursingh, 2020). Some of these necessities are proper seating, work surfaces, lighting, acoustics, and temperature control (Alati, 2020)

The location of the home workspace is a very important factor to consider. If possible, a location that may be isolated or separated from the rest of the home is ideal. This separation helps minimize distractions and give the feeling that one is working at another location; an idea for this is to design the workplace to exit to the front garden of a home to get the feeling that one is leaving their house for work. Another reason for separating or isolating the home office is to reduce noise distractions, so acoustics are crucial. Proper soundproofing can help the person concentrate better and provides a reduced noise environment for virtual meetings. This soundproof workspace will also have the function of a communication room, where family members can have their virtual calls for social, business or educational purposes without disturbances (Alati, 2020). As virtual meetings now usually include video, workspaces should also be aesthetically pleasant to be shown on a screen (Rizzato, 2020).

Private Natural Space

Outdoor spaces give homeowners the opportunity to experience some outside activities, and to pick up hobbies such as gardening, gym or yoga and generally appreciate the landscape and fresh air. This isn't a new design concept by any means, but its relevance has been more emphasized now. Houses with balconies, terraces and gardens always sell out faster than houses that don't have any one of these features.

It is important to consider not only indoor but outdoor space too when thinking of new designs adapted for people spending more time at home. These spaces provide fresh air for the people while enforcing social distancing, and help people relax and improve overall wellbeing and mental health. If a house does not have a significant outdoor space like a backyard, other ideas may be considered like indoor greenery, roof gardens, micro backyards, porches and balconies (Bahadursingh, 2020).

Integrating indoor and outdoor spaces can also be considered, by for example implementing a living room with mixed indoor and outdoor sections or bedrooms with private balconies or patios (Bermejo, 2020). These spaces should have natural elements incorporated like water, light, greenery and fire, and be complemented with being comfortable spaces (Alati, 2020).

The use of rooftops is an important way to solve the space problem, this way these spaces can be taken advantage of without increasing the construction area. This is a more significant problem in dense urban areas where there isn't space to expand. Guaranteeing green spaces for every apartment block in cities should become one of the biggest design considerations (Bermejo, 2020).

Figure 8.31. Example of multi-functional spaces that integrate natural lighting and greenery. Source: LOOKBOX Living Design (Pavapathi, 2018).

Sanitized Areas

With the current disease prevention habits that everyone has adopted to minimize the spread of COVID-19, sanitized areas and areas for sanitizing are going to be integrated into future home designs. At the entrance of a home, a transitional space should be set, an anteroom that will be a space to hang coats and leave your shoes as soon as you enter (Bahadursingh, 2020). These 'mudrooms' are already a design trend that is very common in countries like Norway, where people are accustomed to remove their shoes before entering a home and tend to be wearing a coat outside. These spaces will now also become secure areas for contactless delivery of packages, groceries, and meals (Alati, 2020) with the current increased use of home delivery, that will probably continue to grow in the next few years. These spaces will also have sanitizing products like hand sanitizer to welcome residents and visitors to disinfect their hands when entering a home, as it is usual to see now outside most places.

Antibacterial and antimicrobial surfaces will rise in popularity in design trends. For bathrooms and kitchens porcelain tiles, quartz, granite, solid-surfacing like Corian, or laminate countertops like Formica or Wilsonart give a wide array of choices when considering surfaces that will help fight the spread of viruses and other infections. For appliances stainless steel will become more

popular than it already is, also copper and krion may become more common for countertops and bathroom finishes (Alati, 2020). Other solutions may include auto-cleaning technologies inside wardrobes and kitchen cabinets for example. There could also be changes in fabrics, like rugs that are more easily cleaned (Rizzato, 2020).

Smart Home Design

Smart technology integrated into homes will help make spaces safer and prevent the spread of viruses and other infections. One example of these are contactless technologies. For example, doors with facial recognition and voice-controlled technology will reduce our use of buttons and manual controls (Bermejo, 2020). The use of voice activated technologies could also be useful when a person who lives alone is sick and needs help, this could also be applied to senior citizens living alone. Also, by integrating these technologies it could facilitate senior citizens to connect and communicate with their loved ones while minimizing contact (Rizzato, 2020).

Kitchens should also be an important focus of a smart home design. Kitchens usually function as the hub of a home, and as people are eating out less and cooking more, due to necessity or enjoyment, so they should be spaces where one can spend time pleasantly (Alati, 2020). One element that will become more usual are large pantries as people will try to minimize their trips to the store, therefore their exposure. There will also be voice-activated technologies at a kitchen to control elements like lighting, appliances, HVAC and faucets (Bahadursingh, 2020). Growing what you eat will be considered for indoor areas too, with small indoor areas or vertical gardens equipped with artificial light, air and water to make vegetables grow, they should be located near or in the kitchen, also providing more greenery to the area (Rizzato, 2020).

Sanctuary-like Spaces

With people spending so much time inside their homes now, it is important to consider a person's mental health and how design elements can help people recharge and overall feel better while spending so much time at home. Spaces in a house could become at-home sanctuaries where people seek wellbeing and renovation. This could be achieved by integrating into the design meditation areas and spa-style bathrooms with large soaking tubs, natural light, views to the outdoors, and integrated electronics (Alati, 2020), these spaces should be pleasant and relaxing for residents. By integrating greenery and the outdoors with the indoor areas like the

living room, kitchen or home office, these areas become more pleasant to spend prolonged time in them.

These sanctuary spaces at a home should help embrace the concept of Niksen, a Dutch word that can be translated as “doing nothing” and without any purpose. This concept related to mindfulness and wellbeing, Niksen can help recover from burn-out and help become more creative in the long-term. People being forced to quarantine and stay at home has given them extra time that they did not have before and there have been a lot of moments of doing nothing. These moments, instead of giving anxiety and guilt to people, should be taken advantage of to help people recharge and feel more productive and healthier later. These Niksen facilitating spaces could be entire meditating rooms, green areas, terraces, balconies or simply smaller spaces like reading corners. Vertical gardens and indoor gardening as mentioned before will also have a boom, as a proven way to reduce our stress and to improve the air quality inside our homes (Rizzato, 2020).

Air Purification Systems

Indoor air quality has been a growing topic of importance when coming to sustainable design, being even included as entire categories on different sustainable building certification systems like LEED and BREEAM. It is crucial for the wellbeing of the residents that the quality of indoor air is good, and well-ventilated areas with clean air lead to a better quality of life. The necessity for well ventilated and good air quality indoor spaces is due to two main factors: to keep low levels of CO2 concentration and the elimination of harmful particles in the air as well as viruses that may be transmitted through water droplets (Bermejo, 2020).

It has been determined through research (Hayashi, et al., 2020) that HVAC can and has played a crucial role in the transmission of airborne viruses like COVID-19 indoors. Ventilation systems can facilitate the spreading and distribution of respiratory droplets around a room, and seemingly people are more affected if they are positioned directly in an A/C air stream path. To mitigate this impact, two main factors should be considered: proper air filtration and air injection/ventilation distribution. It has been determined that highly efficient particle filtration (HEPA) in centralized HVAC systems reduces the airborne load of infectious particles, however products like air purifiers are not as effective (Hayashi, et al., 2020). Experts (NewsRx, 2020) recommend the use of HEPA systems to ensure that the air is properly cleaned, reducing

cross contamination between rooms and reducing virus concentration in the air, especially in buildings where the air is recirculated.

It should also be considered that air injection should be directed from roof or floor grates, this way the spread of respiratory droplets in a horizontal manner will be reduced; this will help reduce the chance of the virus being easily transmitted through the air. While the direction of the air injection is important, the design should consider the location of these grates so that the clean, filtered air may reach everyone in a room properly (NewsRx, 2020).

Better Organized Spaces

Storage spaces like pantries or clothing closets are also important to consider in the design. The COVID pandemic showed how panic can ensue when a lockdown is announced, leading to people stockpiling massively on provisions. Provisions and personal items were leaving the shelves of stores faster than staff were able to restock. This leads to the necessity for people to have pantry areas where they can store additional food in case of a shortage.

As people are spending more time at their homes, they are realizing that they have a lot of space at their homes not maximised. As people also have more time on their hands, they have been dedicated to organizing and cleaning up their homes. The KonMari Method to declutter homes has lately been popularized, as people have found the need to free up space and have learned to live with less while in lockdown (Alati, 2020). The KonMari method seeks to have people determine what is strictly necessary to have with them, discarding unnecessary items, not relying on storage, promoting recycling and generally opening up more space at homes. This opens up the opportunity to think of more space effective methods when designing a home, limiting for example, closets to holding only what is necessary and not storing things that will probably never be used. Taking advantage of spaces goes hand in hand with previous concepts mentioned, especially the use of multifunctional spaces and making them more efficient and quickly adaptable.

Implications

There are some pre-existing issues about the presented housing innovations and trends that could challenge the feasibility or accessibility to them. The increase in use of virtual tools and people working/studying from home has led to a strong rise in internet bandwidth demand, so this could limit people if they do not have the proper internet connection. Resilience to natural

disasters will be another important factor to consider as climate conditions are worsening, and many factors may determine if this is an issue that can properly be dealt with. The pandemic is pushing the world towards an economic recession, where currently the unemployment rates are skyrocketing, this can limit the affordability of the aforementioned design trends and will not be accessible by a large portion of the world population.

8.2.4.2 Example Floor Plan

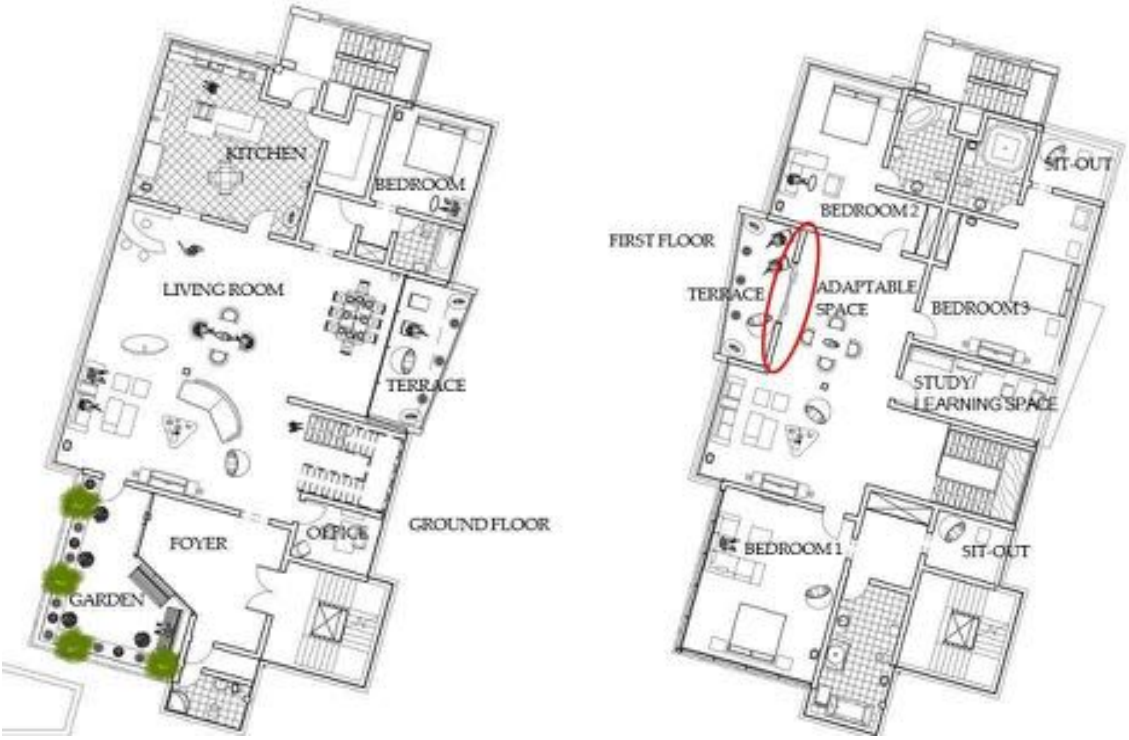

Figure 8.32. Design template of how spaces can be adapted to the necessities of prolonged home stays and work. Source: Self-elaborated.

Figure 11 depicts an example of how a residence with the aforementioned post-pandemic design considerations could look like. This plan is thought out for a multi-story building with each apartment unit having two floors. In the apartment's second floor there is a multi-functional space that contains an adaptable wall (highlighted in red), so the room can be modulated into different shapes depending on the needed use. The entrance to the apartment has a foyer that can be used as the sanitizing and delivery room. There's a garden space which could also be used for indoor gardening, exercise and yoga. The home office in the first floor and a bigger study room in the second floor could cater to a family with children who are also attending school from home or more than one family member working from home.

People living in multi-story building apartments could feel caged especially if their space doesn't provide any terrace or veranda, this design aims to eliminate that feeling by providing an appropriately sized terrace on each floor of the housing unit. The separation of natural spaces is important as mentioned before, so the upstairs bedrooms each have a small private balcony.

8.2.4.3 Sustainable Design

Sustainable design is a crucial part of new home designs, and every time is gathering more strength. Sustainable design will reach a point in the future where it will be integrated into the normality of home designs. This trend is fuelled by the new global tendency towards more sustainable buildings to contribute the effort to one day achieve a low carbon society. This tendency is also starting to be integrated through policies, like the European Council directive that new buildings constructed from 2021 should be nearly zero-energy buildings. This European decision is a great step as all future buildings and hopefully homes will integrate a more sustainable design.

Another crucial element for a sustainable home, if a nearly zero energy standard is expected, is to integrate renewable energy sources for the home, this way through the power produced the net energy consumption can reach zero or even be negative. There are many solutions, but the main solution is installing solar panels at a home, either PV panels for electricity generation, or sun collectors used for water and space heating. Depending on a home's location, other renewable energy sources may be considered for electricity generation and heating: a small wind generator, a small hydropower generator in a nearby creek or in some rare cases the use of geothermal heat for heating a home.

With the inevitable upcoming worsening of the climate situation worldwide, these homes should also be prepared for these consequences. A new home design should include resilient features, adapted to resist the local upcoming extreme weather situations that may occur, one example could be a home in an area prone to flooding which should integrate a design that prepares the home to minimize damage caused by a potential flood. The current trend of increasing insulation to homes has to be re-evaluated for the upcoming years, as global temperatures will keep rising the necessity for so much insulation will not be as necessary, potentially causing an unnecessary rise in emissions related to the higher insulated construction and the materials needed (Røstvik H. N., 2013).

Some of the aforementioned trends go hand in hand with sustainability. Some of the mentioned design trends that are already part of a sustainable design are:

- The use of natural lighting that helps reduce lighting energy demand and helps use a passive solar design to reduce heating demand.
- The integration of greenery into spaces, self-production of vegetables reduces carbon emissions for a household.
- The use of adaptable spaces helps reduce the size of the construction.
- Smart home technology promotes the efficient consumption of energy.
- The use of air purification systems results in a better indoor environmental quality

8.3 Discussion

8.3.1 COVID-19 and the acceleration of unaffordability

The Post COVID-19 trends regarding location choices between urban and suburban locations within North America is complex and quite polarized. This may be in part due to the short period of time in which trends have been observed, a period which has been characterized by much uncertainty, and numerous shifts in the severity of lockdown measures. The data presented in the Toronto case study suggests that there may be increased preference for the surrounding and more suburban areas of the city, due to increased sales and pricing in these locations, as well as decreasing rents in the urban core. Although through examination of trends and discourse prior to the COVID-19 outbreak it is arguable as to whether COVID-19 is causing a shift or just accelerating an existing phenomenon, where many people are already leaving due to growing unaffordability.

Nevertheless, with the potential of larger distances between employee and employer through the use of telecommuting, an accelerated restructuring of populous areas is possible. That is, if telecommuting as some predict, will remain at somewhat similar rates as during the COVID-19 pandemic. A study by one recruitment company, indicated that 86% of surveyed businesses would allow for some extent of teleworking to continue following the end of the pandemic (Hunt, 2020). In light of this, economic and employment prospects which draw urbanization, may have less of an impact in making them attractive options for living. This may signal some

winners and losers in the shifting geographies of expanded housing choices. If we consider the growing number of persons who are unable to afford housing and the growing ratio of housing to income. The economic recession and job loss triggered by the COVID-19 pandemic is likely to worsen affordability, especially impacting some of the more vulnerable and lower income populations. While the ability to telework is skewed towards higher income jobs (Cleveland, et al., 2020). This puts into question, who may be afforded the possibility to shift housing location in seek of less urban areas, as well as how growing unaffordability could result in further housing poverty and homelessness for those who are unable to relocate. With the growing number of individuals and families seeking a move to less urban locations and some of the more affluent seeking secondary homes to weather the lockdown (Gopal, 2020) (Capps, Patino, & Merrill, In the U.S., City Rents Are Falling, and Suburban Rents Are Climbing, 2020). There is a possibility of the aggravation of existing affordable markets.

If moving forward, teleworking and the possible subsequent restructuring to suburbs and smaller secondary cities occurs and adequate policy focusing on some of the root issues of housing affordability and social inequity is not in place. Could it lead to the mere restructuring of unaffordability? While this crisis of affordability through urbanization and commodification of housing has targeted large markets such as Toronto and Vancouver, it has increasingly spread to nearby and smaller markets such as Victoria and Kelowna (Rozworski, 2019). Signalling that unaffordability has increasingly impacted smaller cities and could be accelerated following the COVID-19 pandemic. Michal Rozowrski a Canadian economist and scholar, writes on how the increasing commodification of housing, coupled with the erosion of government investment in social housing with austerity in the 90s has in part, rooted the affordability crisis in Canada (Rozworski, 2019). One example of this, using data from the Canadian Mortgage and Housing Corporation between 2011 and 2016 has shown “that for every new affordable unit constructed in Ottawa, seven are lost to demolition, reconstruction or raised rents. (Bulowski, 2020)” With large government action plans to push economic progress after the COVID-19. Additional measures, which could possibly help in addressing affordability issues and strengthen the supply of adequate housing for low income and vulnerable groups, could also be implemented. These measures may include, a reignition of government funding towards public housing units as well as further research and development of possible improvements to non-profit models of housing development (Bulowski, 2020). This may also serve to reduce re-occurring impacts in the face of future pandemics and economic crisis.

8.3.2 COVID-19 and inequitable housing impacts

The study of literature on urban density and prevalence COVID-19 infections resulted in a lesson learned: social inequity in North America is an exacerbating factor in risk of COVID-19 related impacts. There are many contributing factors to the social inequity in North American housing, such as the historic and current exclusionary zoning policies, the wealth gap and a for profit-based housing model that makes it difficult to build truly affordable housing units. This is further elaborated in figure 13. Where the data in the theory section is utilized in a schematic manner, explaining the exacerbating impacts of COVID-19 and climate change on existing impacts from social inequitable housing. Moving forward, measures such as inclusionary zoning and the more widespread removal of existing exclusionary zoning practices, could help to stifle these impacts (Bulowski, 2020; Ramakrishnan, Treskon, & Greene, 2019). Although many other considerations need to be made and further research developed before such deep-seated inequalities can be effectively addressed, as well as overcoming many political barriers.

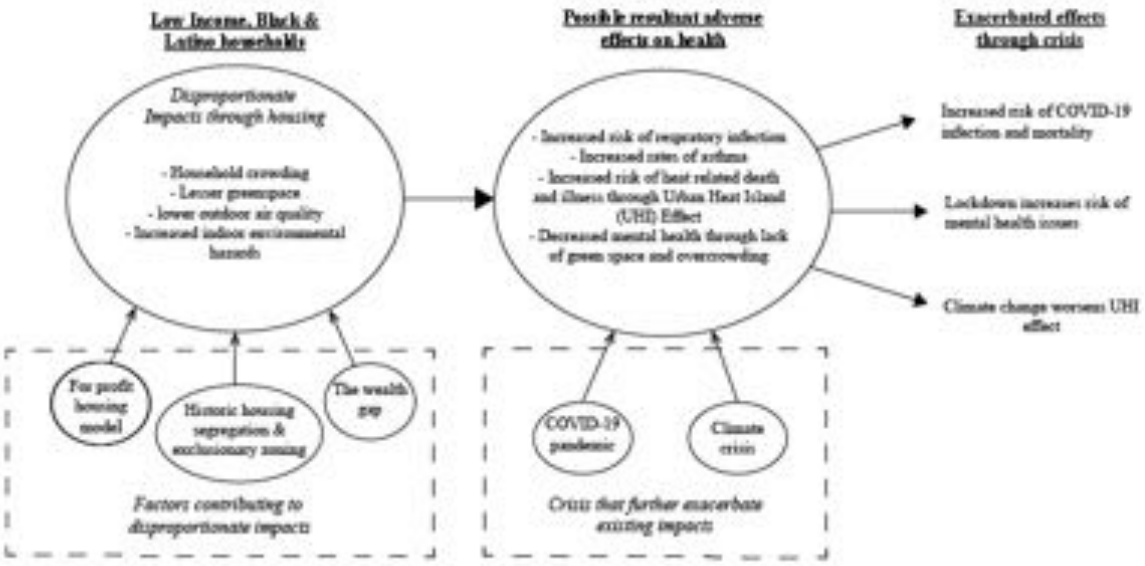

Figure 8.33. Schematic diagram of social inequities in housing and how they may be exacerbated through crises (Self-produced, (S.R).

When investigating the new trends for post-pandemic homes, it was concluded that economic disparity is again an issue within this topic, and the COVID-19 crisis only contributed to worsen the situation. Most of the current articles in Architecture magazines that discuss the new post-pandemic trends are clearly catering for a higher income public, as the economic accessibility of most of the presented trends is very limited. Thus, it is important to consider that these

presented design trends will be more reflected on people who in the medium to long run are planning on buying or building a new home and can currently afford it, so it will take time for some of these designs to be integrated into the new normality of home designs. However, as mentioned before, these design trends will already be on people's minds if they are planning on moving to a new home in the post-pandemic world, becoming an externality for the housing market that may further contribute to disbalancing it; this may lead to a rise in the value of those homes that already have some of these elements integrated, as their demand will rise, contributing to the unaffordability of housing. By comparing these trends to current inequality problems, the question arises of how these post-pandemic housing trends can be adapted to be accessible by lower income households. If these trends get to be successfully adopted, they will contribute to a better standard of living in lower income houses, as mental and physical health of the inhabitants may be improved.

In a post COVID-19 era, policies and measures should be developed that could provide solutions to both pandemic related issues within housing while also serving to reduce social inequity. As social inequity within housing has been seen to intensify impacts to these lower income and more vulnerable groups. This could provide a more affordable housing sector that is also resilient to potential future impacts of crisis.

8.4 Conclusion

In the following paragraphs we summarize the main findings of our analyses, uncovered through the main sections within the Theory. Regarding the topic of shifting housing trends and increased suburbanization following the COVID-19 pandemic. It is difficult to confidently state whether emerging trends will have long lasting impacts towards increased suburbanization. Although, utilizing the data and discourse analysed in the case study of Toronto, it may be forecasted that increased dispersal into suburban and smaller secondary cities following the COVID-19 pandemic is likely. Given pre-existing trends of domestic emigration of largely middle-class families, this may be more accurately described as the acceleration of an existing phenomena, due to increasing unaffordability in large metropolitan areas such as Toronto. The increase in teleworking may be considered the largest potential accelerant of existing trends, while fear of increased risk of infection in potentially crowded urban areas and the desire for more space during lockdown are possible but minor and less long-term accelerants.

In terms of housing affordability, the COVID-19 pandemic seems to have made already existing trends and issues speed up and come to the surface. The already existing housing crisis got worse as unemployment increased, and a spatial redistribution and suburbanization sped up as the pandemic hit. The effects of the pandemic have not affected everyone equally. People of color and lower-income earners have been most impacted by this exacerbated housing crisis.

In the spread of COVID-19 infections, density is found to have a complex role. Some of the contributing factors which have been correlated to a higher number of infections in denser regions, is their increased social connectedness with surrounding areas. This same factor makes denser regions early starters with infection outbreaks. In one study, denser regions were found to result in less COVID-19 mortality, which was strongly associated with increased adequacy of health care in these regions. Other links to COVID-19 related impacts in housing can be made, which are exacerbated through existing social inequalities. Such impacts include increased risk of infection for lower income and ethnic minorities such as black and latino households. These increased risks can be traced to higher rates of environmental hazards and a higher likelihood of over overcrowding in lower income housing, as well as reduced air and outdoor environmental quality and in some lower income or majority black and latino neighborhoods. This is largely the result of historical redlining and exclusionary zoning policies, and the subsequent placement of unwanted land uses within these neighborhoods.

Focusing on buildings and their design, a lot of new housing necessities have risen with the onset of the pandemic. Although it is likely they will not be immediately integrated into the built stock, as only people who are currently about to build new or renovate their existing homes may take these trends into consideration. Out of that small proportion of the population, only those who can afford it will take these design considerations into account. This means that these designs will more likely become slowly integrated into home design in the mid to long range. However, the housing market will be immediately affected, as the preferences for rental and purchase will be impacted by people seeking these new desirable home features. Some of the main preferences people may put as a condition for renting or purchasing is the inclusion of a home office as well as having green and outdoor spaces included. This may cause a shift in housing demand as preferences become more specific and the homes which contain them, may subsequently increase in value.

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09.

ECONOMY

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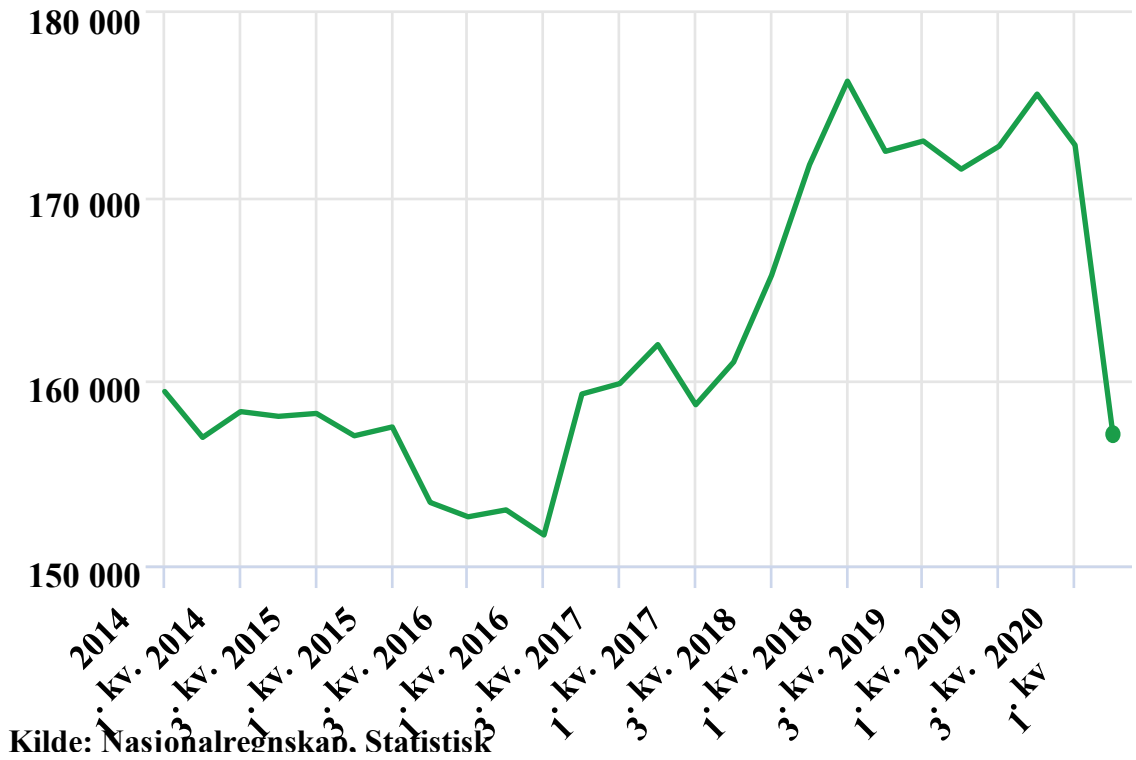
9.1 Introduction

The Norwegian economy was hit hard during the Covid-19 pandemic. For the first time in 25 years the Norwegian government had a negative public deficit (SSB, 2020, September 2). The gross domestic income fell as much as 9% from the first to the second quarter. The negative growth in GDP (Gross domestic product) in the second quarter was as much as -6,3%, which was the sharpest decline SSB has ever measured in a quarter (SSB, 2020, 11 November).



Collected from: SSB

The registered unemployment as observed by NAV, went from 65.000 in the 10th of march to 300.000 by 31st, it did however improve to around 116.800 which was registered September the first (SSB, 2020, September 23). From a report from SSB, the situation as of September 11th has seen improvements, an indicator of this is the increased household consumption that has increased since the onset of the crisis, which is a sign of increased consumer confidence. The fall in Industry investments also seems to have somewhat stabilized and is expected to increase in the coming years. However, the situation is still “dire” in their words (SSB, 2020, September 11). One of the major reasons for this is the international economic downturn which will significantly impact Norwegian markets, despite the situation in Norway internally

improving. They expect the Norwegian economy to bounce back to roughly were it was before the crisis in around a year, but it may take several years to get around the lingering effects of the crisis. The situation as of November in regards to the Covid-19 pandemic, has worsened again both in Norway and Internationally, so these predictions might change with time.

In a deep economic downturn, there are still however some sectors/jobs and groups of people more impacted than others. In this paper I will try to figure out who were hurt or suffered the most economically from the Covid-19 crisis. I will look both at workers and sectors, but with a particular emphasis on the workers. I will compare cases from Norway Europe and the US too see if we can find similarities in groups of people that were hit particularly hard by the Covid-19 economic crises. Although the short term economic consequences might be obvious, there might be longer term economic consequences that might arrive, and are worth taking into consideration, in regards to whether policy makers should or should not allocate funds to try to minimize some of the economic consequences.

In section 2 I will briefly describe the methodology I am using, section 3 will start the literature review and theory part where I start with exploring which workers got hardest hit economically by Covid-19, then in the subsequent subsections explore direct financial aid to firms in Norway, and then broader economic initiatives in Europe. It will also explore which firms went bankrupt due to the Covid-19 crisis. Section 4 will be the discussion part where the questions of what has been learned, what can be done to improve the human condition and what can be done to improve the environmental condition will be explored. Finally, in section 5 I will make the concluding remarks.

9.2 Theory

9.2.1 Methodology

In this paper, I will use a literature review to collect information as my method to answer my research questions. I will use statistical publications, papers and articles to base my discussion on.

9.2.2 Literature review and theory

9.2.2.1 Which workers got hit the hardest economically by Covid-19?

As will probably come as little surprise to most, some of the hardest hit economically by Covid-19 In Norway was within Retail and hospitality (YS, 2020, March 27). Hairdressers, hotel workers, waitresses, chefs and store employees are all employees that were among the first and worst hit by the crisis (Klungtveit, 2020, 27 March) Workers that lack higher education were dominant in the economic fallout from the pandemic Workers in these sectors also happen to earn less that the Norwegian average income. Although as much as 25% of the unemployed and laid off workers are in their 30s, the highest relative increase still happened among younger workers.

Women workers were also hit harder by the economic fallout. The share of women that applied for "dagpenger" (one version of Norwegian welfare payment) were significantly higher than men. As this graph illustrates, this is the case for every age group.

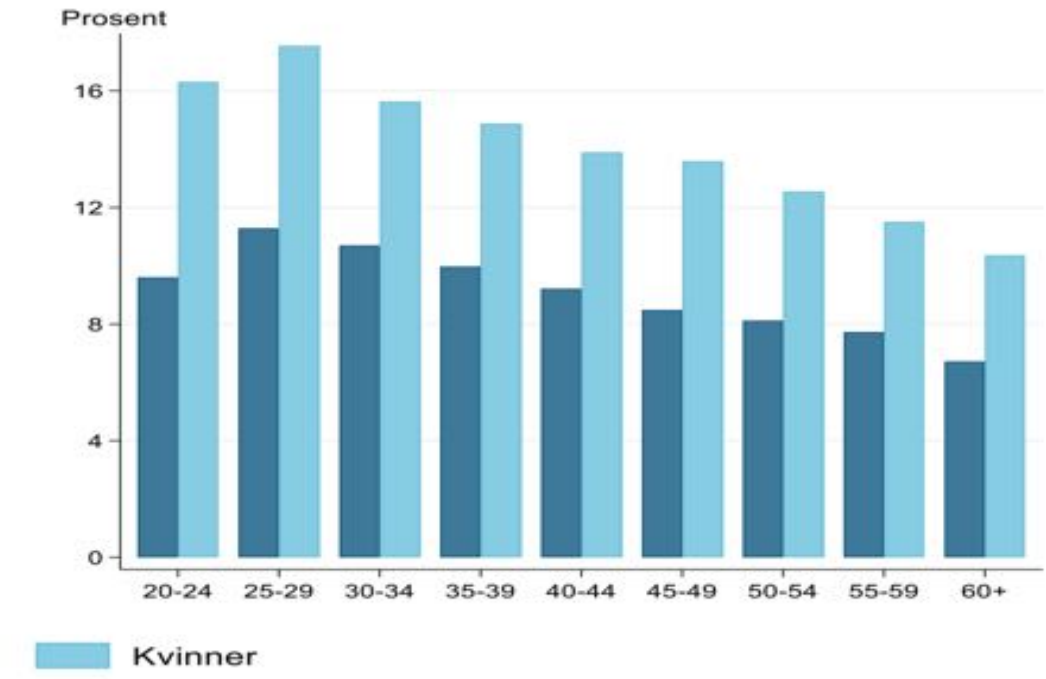


Table 9.1 Graph collected from: https://filternyheter.no/se-oversikten-disse-yrkene-er-hardest-rammet-av-permitteringer-na/

Working families also appears to be hit hard by the economic fallout. This is especially true of working families with children, which appear to be hit harder than families without children (Klungtveit, 2020, March 27).

Numbers from SSB also shows that the workers working in jobs already considered to be "low earning" was hit with harder earnings reductions than jobs with traditionally higher wages (SSB, 2020, July 16). The average earnings for all jobs did actually increase by 2.5% in September which was the month of reference in this case. This would highlight a significant split in who is bearing most of the economic burdens from Covid-19.

In Europe the situation is similar. From the World economic forum, the workers that were hit the most were in the age group 18-24 (WEF, 2020 July 16). It is worth mentioning that the unemployment situation for this age group is more correlated to economic growth in general than others, which explains some of the reasoning behind the situation for this age group. Even as little as a month of unemployment in this age group can lead to lifetime income losses (WEF, 2020, July 16). Hence even if normality can return within a reasonable amount of time, economic repercussions for young adults can persist for a very long time. Some form of economic support might be optimal to make sure young people does not suffer long term or permanent economic consequences form the Covid-19 pandemic. The EU has urged European countries to use existing EU resources and funds to invest and develop training and job opportunities for young people (WEF, 2020, July 16).

Looking at the US again we find very similar patterns. As many as ¼ US adults have had issues paying bills since the onset of the Covid-19 pandemic. Many have had to dip into savings to cover costs and bills, as well as borrow to cover these same expenses (Parker et al., 2020, September 24). However again looking at the Lower income workers, we see the same trends as in Norway and Europe, Lower income workers report higher amounts of economic problems after the onset of the pandemic. As many as 46% report problems with paying bills in this group. Of course this would make sense as lower income people would be more likely to suffer economic stresses in general even disregarding COVID-19, but this group also reports a higher amount of people in their household that has been left unemployed since the onset of COVID-19 (Parker et al., 2020, September 24). This again highlights the fact that it is lower income people that suffer the worst from the economic fallout from the Covid-19 pandemic.

Another similarity from the cases in Norway and Europe as a whole, is the fact that young adults, here classified as 18-29 also disproportionally suffered from layoffs and unemployment as a result of the consequences from Covid-19. Also here looking at lower income adults and younger adults, (Parker et al., 2020, September 24), also finds that these groups was not able to return to their old jobs or find new work as often as other workers.

In terms of savings, it might not come as a surprise that lower income workers have been able to save less during the Covid-19 pandemic, but even if you look at adults that report they usually are able to save, as many as 51% of lower income workers were not able to save or save less after the onset of the pandemic, compared to 36% on average. (Parker et al., 2020, September 24).

Education is also an important factor to consider. Among people with lover education levels, they report in higher numbers difficulty with saving. 41% of people without higher education levels, in this case determined by an absence of a bachelor's degree, reported troubles with saving. This is in comparison with 28% of people with a bachelor's degree or higher (Parker et al., 2020, September 24).

Minority groups in the US has also suffered higher degrees of unemployment and pay cuts related to Covid-19. 53% of Hispanic Americans, and 43% of African Americans compared to 38% of white Americans (Parker et al., 2020, September 24). Hispanic and African Americans were also more likely to report having financial issues related to medical care and bills.

Looking at gender, 38% of women report being able to save less than before the crisis, compared to 33% of men. Again, these numbers take into account men and women who are "usually" able to save (Parker et al., 2020, September 24).

As mentioned earlier in the section, pay cuts and unemployment can lead to longer term economic woes than just the short terms impacts of joblessness and reduced pay, hence for the US to have a plan, maybe similar to the one EU suggested have to be a high priority in order to make sure that the long term economic impacts on people caused by the pandemic are minimized as much as possible.

9.2.2.2 Which sectors and jobs got the most economic relief?

Economic relief is a way of stabilizing and helping businesses and workers stay afloat during difficult economic times. As we have seen, not all sectors and workers have been hit the same. We have seen that young, low educated and workers generally from low paid sectors have suffered worse than others on average. An interesting question would then be how the distribution of economic relief has been between sectors. One would think that helping the sectors and workers that hurt the most would be a logical next step in such a situation. This is

an important question as it puts to the test whether the system works in a fair way to try to improve people's condition under difficult times.

Between May and April, significant sums of money were distributed In Norway to deal with the fallout from the Covid-19 economic crisis. From (SSB, 2020, June 12,) we see that most of the recipients of economic relief are in sectors that have or had suffered shutdown, as well as hard hit sectors. These sectors and jobs include the traveling sector, the trading sector and jobs like hairdressers. The traveling sector appears to be the sector that got the most economic relief to deal with the Covid-19 crisis out of the sectors that were in "lock down" like conditions. (SSB, 2020, June 12).

However, although most of the sectors that got economic relief in relation to the Covid-19 economic fallout were in sectors that were hard hit and in lock down conditions, the average sum received were still higher among other sectors. An example of this is the oil and gas sector, which is a major sector in Norway. The oil and gas sector is the sector that receives the highest average economic support generally as well, from "Norges forskningsråd" and "SkatteFUNN". However, even from the economic relief fund that is designated to deal with the economic fallout from the covid-19 economic crisis, the oil and gas sector still received some of the highest average sums. Although SSB does not go further into detail to why this is, the oil and gas sector obviously is a very important sector for Norway, with major economic repercussions for other sectors, as well as future investments in the sector that can lead to revenues for the Norwegian state. With that said, it still interesting to note that a sector that generally has high paid workers, as well as a high level of economic support even in normal times, receives a significant share of the funds distributed to deal with the economic fallout from Covid-19.

Other Sectors that were not in "Lock down" also got a higher share (More funds, they were not the majority of recipients) of economic relief from the fund than sectors in lock down. These include water supply firms, renovation firms, fisheries and aquaculture. (SSB, 2020, June 12)

The fact that although most firms getting economic aid from the fund were from sectors were "Lock down" like conditions were applied, they were not the ones receiving the most funds. Again SSB does not go deeper into why this is, but the size of the firms and sectors in question here, as well as their importance (water supply, the importance of fishing for the Norwegian economy) would be likely reasons for this. One would still have to ask whether more could be done to help the sectors that were suffering lock down conditions to help stabilize the situation,

especially as we have seen previously, workers in these sectors are often young and work with lower wages. We have also seen that the economic consequences from unemployment, especially when it is difficult to get the job back later or find other work, can have longer term economic repercussions.

9.2.2.3 Economic initiatives in the EU

We will move on now to look at the situation In the EU in general. The European commission and the European council took the economic fallout from the Covid-19 pandemic seriously and put in place measures to alleviate the economic consequences from the Pandemic. On the 28th of October 2020, the European council approved 17 different EU member states a very significant amount totalling 87,9 billion Euros of economic relief (European Commission, 2020). This was done under the SURE (Support mitigating unemployment risks in emergency) program. The program was put in place primarily to protect jobs and workers under the Covid-19 pandemic. The SURE program will work as EU loans that are granted under favourable terms and conditions to the various member states. Some of the important goals of the SURE Program is to make sure member states can deficit spend and keep public spending at a high enough level to combat the reduced economic activity that was caused by the onset of the Covid-19 pandemic. Another important goal is that part of this spending is to be used directly to finance national short-time work schemes (Schemes to keep the the workers income constant at fewer hours worked) and other similar implementations to help stabilize the income of workers during the pandemic, as well as stabilize the economic capabilities of the economy as a whole (EC, 2020).

Cohesion policy for hard hit sectors

The Corona virus response investment initiative (CRII) and the Corona virus response investment initiative + (CRII+) are initiatives that allow the various EU member state to use cohesion policy funding to help the most hard hit and exposed sectors, as well as small businesses. Flexible usage of the funds available is an important aspect of the CRII and CRII+ to ensure funds flow quickly to where they are needed the most at different times (European Commission, 2020). Funding for this can and is used to pay for medical equipment, support the unemployed, keep people in jobs, payment to doctors and other health workers and support small businesses.

The EU tourism sector

As we saw with Norway, traveling and tourism were some of the hardest hit sectors. Tourism within the EU is a quite significant sector, and this has also been a focus for the EU to economically support this sector. Member states of the EU is allowed flexibility to develop and introduce schemes and programs to aid the tourism sector. An Example here are guarantee schemes for vouchers to make sure reimbursement claims that are caused by the Covid-19 economic crisis are met (European Commission, 2020). The EU also offers direct liquidity funding too suffering businesses in the tourism sector through the previously mentioned CRII, this happens through shared management with the member states. The SURE program also plays an important part in the plan for safeguarding the tourism sector in the EU through helping to cover the cost of various short-time work schemes, as well as similar schemes to help business safeguard jobs, which helps workers from going fully unemployed and all the negative economic consequences arising from that (European Commission, 2020).

State aid actions

Looking at hard hit businesses and sectors in general in the EU, we find that the EU has prioritized economic support here as well, and not just in the tourism sector. The state aid rules put out by the European commission allows the EU member states to directly support business in the EU that has been hard hit the by economic crisis and risk being shut down without economic support. These measures include Direct grants to companies, up to as much as 800.000 Euros, public and private loans with subsidized interest rates, subsidized state guarantees and tax advantages (European Commission, 2020). The goal of this aid is to ensure that business remain operative, and if they do have to stop their operations for the time being, they have the means to resume back to normal afterwards, which will have less negative long term negative economic growth consequences. It should be noted that this new framework does not replace existing similar frameworks, but rather complements them. One of the measures introduced was to directly economically support business that had a decline in turnover of at least 30% because of the economic crisis. This can help prevent the business capital to deteriorate and try to keep the economic activity from falling (European Commission, 2020).

As we have seen previously, young adults have been particularly vulnerable to suffer unemployment and reduced pay as a cause of the ongoing pandemic, and specific measures to help young adult workers have also been taken into consideration in the SURE plan. This is

done by strengthening and enforcing the existing "Youth Guarantee" option. This entails that for young people that sign up for the youth guarantee, they are entitled too several different options. These includes offer of employment, traineeship, continued education and apprenticeship. These options will become possible after you have been unemployed or left education without finding work for 4 months. This program that existed prior to the onset of the Covid-19 pandemic now reaches a larger group than before, covering young people from the age of 15-29. Another element of the program is that it also offers guidance to young people to prepare them for the greener and more digitally focused economy that is the future moving forward. (European Comission, 2020). It emphasis that young people having solid digital skills to be able to participate in the digital economy is a priority.

As we can see, the youth guarantee is of course not a product of the Covid-19 pandmic, however it is being expanded and enforced by the economic fallout from the Covid-19 pandemic. At least this tells us that the EU takes the issue of young workers seriously and has a plan to deal with the economic fallout young people face economically from the Covid-19 pandemic. One thing to note however is the fact that it only becomes available after 4 months, as we have seen previously long-term economic consequences can happen after just a few months of unemployment. Another thing to keep in mind is that this is a "sign up" based system, so the effectiveness of the system greatly lingers on how widespread the knowledge young people have about the program. According to the European commission, each year since 2014, over 3.5 million of the registered accepted such as offer. This is of course going back to "the normal times" prior to the Covid-19 crisis, but it shows that there is at least a decent participation and awareness of the program.

9.2.2.4 Did only already struggling businesses go bankrupt due to Covid-19?

The question about which type of business that went bankrupt because of the Covid-19 economic crisis is an interesting question. Maybe it was only struggling businesses that would have issues long term regardless of the crisis, or did it affect substantially more business than this? There is no doubt that businesses that were already struggling with making profits to cover debts prior to the crisis would be particularly vulnerable, as only a short period of time of negative profits would make it very difficult to service their debt, which would lead to quite rapid closure. However, it seems like these businesses were not the only ones hard hit by the Covid-19 economic crisis. From Bloomberg looking at businesses in the US, we can see that a number of businesses both small, medium and large with a variety of different economic

conditions went bankrupt due to the Covid-19 economic crisis (Scigliuzzo et al., 19 July 2020.) Significant firms like Brooks brothers and stein mart, a retailer that had an estimated 757 million dollars in assets are examples here. Golds gym international, started all the way back in 1965, and had its strongest ever year of worldwide growth in 2019, however gym closures and social distancing was too much for the famous gym chain. Scigliuzzo et al., 19 July 2020.) New York and Co another retailer operating in women's fashion that has existed for 102 years with an estimated 405 million dollars in assets is a more complicated example of a long-term successful business that went bankrupt due to Covid-19. This is because the chain had already struggled to adapt to changing fashion changes that was occurring, and the onset of the covid-19 pandemic became the final straw for this fashion chain. It should of course be noted that the vast majority of s businesses that went bankrupt due to the onset of the Covid-19 pandemic were small and medium sized businesses Scigliuzzo et al., 19 July 2020.) , which of course will usually have far less financial resources and leverage to get through a tough economic crisis like the one we are facing.

It was difficult to find hard concrete statistics on the economic positions the various businesses that filed for bankruptcy were in prior to the crisis, but it is at least apparent that both businesses doing well and not so well prior to the crisis did suffer bankruptcy. That a clear majority of businesses went bankrupt were small and medium sized businesses also of course has to be understood in the context that most of the business are small and medium sized businesses, so this could skew the relative distribution of who were struggling the most a bit.

9.3 Discussion

9.3.1. What have we learned?

We know that serious economic crisis like the Covid-19 economic crisis has massive negative consequences for the economic growth outlook. However, we also know that some people are hurt more than others by such a crisis. As we have seen young adults workers, roughly in the age group 18-29, workers with less education and workers that were in low paying sectors and jobs suffered more than the average from the onset of the Covid-19 economic crisis. We have also seen than women were more likely in Norway than men to lose employment due to the Covid-19 crisis, as was minorities when we were looking at the US. Considering the fact that

some people have been hurt more by the crisis than others should lead us to prioritize economic relief and help where it is most needed. We have seen that this has happened in both Norway and the EU. Ranging from tools like direct money transfer by Norway to sectors and firms hard hit by the crisis like the traveling sector, and more well-rounded programs like the SURE program as well as initiatives by the CRII and CRII+. These programs were both as well as the money transfers in Norway, able to achieve two purposes, both stabilize the economy and economic growth prospects in a more general sense, as well as deliver more targeted aid to the specific firms and sectors that needed it the most. These lessons are certainly positive, as it shows that policy makers do not see the helping the general state of the economy, and the groups that has had the worst outcome due to the Covid-19 economic crisis, as in conflict.. As these goals are seen to be in harmony there is room for optimism that more can be done to even out these distributional issues. As the Covid-19 situation as of today seems to worsening in many countries, it is important to remember these lessons, in order to avoid certain groups finding themselves in worse economic circumstances than necessary.

Learning and improving from similar economic crisis

The world economic forum in an article on what lessons we can learn from the Covid-19 economic crisis highlights the importance of a multi-policy response. This entails taking a different approach than from the 2008 financial crisis, were the main goal was just getting the economy back on track to where it were. Rather the focus should be on achieving multiple sets of goals. Examples are not just using stimulus spending to curve the economic recession, but also trying to achieve greener growth alternatives by investing in renewable energy, electric vehicles, high speed data transmission and fiber optic infrastructure (WEF, 24 april, 2020). This multi focused policy perspective to integrate economic recovery with an emphasis on transitioning to a greener economy is a very interesting perspective as it shows a willingness to view these developments as complimentary rather than mutually exclusive.

9.3.2. How can we improve the human condition?

As long as certain groups struggle more with the aftermath of the Covid-19 economic crisis, it would make sense to prioritize a plan that did not only achieve economic stability in the more general sense which have been discussed earlier through means like public spending to counter the fall in economic activity, but also more targeted plans towards workers and sectors hardest hit. As we have seen from examples from the EU, this has been done at the very least to a decent

extent. More of course is always possible, as we are heading into what some consider a second "wave" (Sanders, 2020), these existing programs needs to not be curtailed and abandoned, but rather strengthened and reinforced. Programs that guarantees young workers employment, internships or other educational opportunities if the economic situation deteriorates again will be important to avoid younger workers suffering longer term economic consequences from the Covid-19 economic crisis. Short-time work schemes for workers, and particularly workers in hard hit sectors, and in jobs with already low pay will be important to improve the conditions of the workers under the Covid-19 pandemic, especially so if a second wave would hit hard.

9.3.3. How can we improve the environmental condition?

Going back to the multi-policy perspective discussed by the world economic forum, we see that dealing with the Covid-19 economic fallout does not need to contradict an effort to transition to a greener economy, and hence improve the environmental condition. Instead of taking an approach similar to the 2008 financial crisis were efforts were not put on directing public spending and investments to deal with the 2008 crisis towards greener alternatives, with the multi-policy approach, both economic and environmental conditions can be achieved with similar policy tools. Public spending as mentioned earlier can be used to invest in green and renewable energy, as well as train workers to gain competence in this field. This can be a nice opportunity for younger workers that are struggling economically under the Covid-19 pandemic to get an opportunity to transition into a more environmentally friendly career opportunity, with promise for the future. The Norwegian electric vehicle deployment is an example that shows how economic policy, in this case economic incentives can help lead to greener change Røstvik (2018).

9.4 Conclusion

To conclude, we can clearly see that some groups are indeed more impacted by the Covid-19 economic crisis. Reduced pay, higher Covid-19 related unemployment as well as being forced to cut back or stop saving are all realities more often for uneducated, lower payed and young adult workers. Although the crisis will eventually pass, the fact that economic woes happening now can have longer persistent effects on lifetime income for workers should be a consideration for policy makers to take into account when developing policy. This is especially so if a second

wave of the crisis will lead to a similar or worse economic contraction. The fact that policy makers in Norway and especially in Europe seems to have taken this into account should at the very least give us some hope that these considerations will be taken seriously, not just now, but also in the future. Hopefully, a multi-policy vision will strengthen the view that issues like economic stabilization, workers welfare and a transition to a greener economy are mutual goals that should be worked towards together, rather than being in conflict with each other.

The repeatable learning experience for me working on this was primarily how short term economic impacts have longer term ramifications as well as the broad EU initiatives that stretch between countries to help deal with both the broad economic downturn as well as more targeted measures for struggling workers and firms.

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Summary

While we wait for the pandemic to pass and vaccines to be approved and be applied, we hope for learning experiences that can make the world a better place. After all this suffering, we must make sure that good things came out of it.

We are humans, though, and we worry. As soon as this pandemic is over, there will be something else to worry about. We wait for the next catastrophe and how to survive it.

Our students have done considerably well at trying to make sense of the information available and we gave them a difficult task; to write about this from mid-August to mid-November, while the pandemic is still ongoing and not in the clear light of the aftermath. As we complete this work, we get new data every day, and the findings are not conclusive – indeed, we have been trying to shoot at a moving target. Nevertheless, although that has been a difficult task, we have tried to develop the work so that it provides a snapshot of what was known now so that future readers can make sense of it in the context of its finalization.

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