

ORIGINAL PAPERS

Will lessons be learned from the corona pandemic for health care policy after 23 weeks?

Prof. univ. Wim J.A. van den Heuvel

Honorary professor of University of Groningen and University of Maastricht, The Netherlands, Professor in Care Sciences

Received: 7.06.2020 • Accepted for publication: 20.06.2020

Abstract

For some time Europe is under the spell of covid-16. Remember how it started? Statistics dominated the news in de last 4 months: the finger on the pulse! In the beginning the statistics didn't tell us much. Then the statistics warned us – so said the 'experts' – to be careful, but the question was also raised: are these statistics reliable? And what do the data show? The (possible) shortage of proper protection and treatment, while health care professionals had to make choices: who to give a chance to survive? Apparently, Europe was not prepared for a pandemic. Another problem arose: who should decide about measures to beat the pandemic. In most countries, policymakers and experts joined wisely in a taskforce and prepared measures to be taken. In some countries policy-makers thought – wrongly - they know best. International organizations did play an important advisory role, although their advices were not always welcomed. So, various countries really run into problems and had to call for the army. Health care systems in most countries were not prepared or able to deal with the pandemic. These experiences may stimulate to restructure some health care systems and the way they are managed. International organisations could evaluate the experiences. Statistics showed a higher number of death in some countries, but not in all. Some countries did not test the presence of a covid-19 infection and reported 'zero'. We need reliable statistics and complete data, collected accordingly to well-defined criteria, to study the consequences of the pandemic. Opinions and political blindness will not be helpful to learn. The experiences with the pandemic covid-19 may offer many lessons. The question is: are we willing to learn?

Keywords: *covid-19, pandemic, statistics, World Health Organisation, health care system*

ARTICOLE ORIGINALE

Ce lecții pot fi deja învățate din pandemia corona pentru politica de sănătate publică?

Rezumat

De ceva vreme Europa se află sub vraja lui covid-16. Ne amintim cum a început? Statisticile au dominat știrile din ultimele 4 luni: ca degetul pus pe rană! La început statisticile nu ne spuneau prea multe. Ne-au avertizat să fim atenți: sunt de încredere, sunt incluse toate decesele covid-19? Datele au arătat deficitul de protecție și tratament adecvat. Profesioniștii din sănătate au fost nevoiți să aleagă: cui să ofere o șansă de a supraviețui? Aparent, Europa nu era pregătită pentru o pandemie. A apărut o altă problemă: cine ar trebui să decidă cu privire la măsurile de combatere a pandemiei. În majoritatea țărilor, factorii de decizie și experții s-au alăturat cu înțelepciune într-o task force și au pregătit măsurile care trebuie luate. În unele țări, factorii de decizie s-au gândit - greșit - ei știu cel mai bine. Organizațiile internaționale au jucat un rol important consultativ, desi sfaturile lor nu au fost întotdeauna binevenite. Așadar, diverse țări au într-adevăr probleme și guvernanții au fost nevoiți să solicite armata. Sistemele de asistență medicală din diferite țări nu au fost pregătite și nu au putut face față pandemiei. Aceste experiențe pot stimula restructurarea unor sisteme de sănătate și modul lor de gestionare. Organizațiile internaționale ar putea evalua experiențele. Statisticile au arătat un număr mai mare de decese în unele țări, dar nu în toate. Unele țări nu au testat prezența infecției covid-19 și au raportat „zero”. Avem nevoie doar de statistici fiabile și date complete, culese în consecință după criterii bine definite, pentru a studia consecințele pandemiei. Experiențele cu pandemia covid-19 pot oferi multe lecții. Întrebarea este: suntem dispuși să învățăm?

Cuvinte cheie: *covid-19, pandemie, statistici, Organizația Mondială a Sănătății, sistem de asistență medicală*

Looking for (preliminary) lessons because of the covid-19 pandemic one will discover more fundamental questions. Some of these questions will be described, not answered. Answers may be given if experts and policymakers are working together worldwide to find answers, and even than? But let us start by the beginning. Do we – after 23 weeks – remember when and how the covid-19 pandemic started?

Most of us did not notice the message from Chinese authorities on 31 December 2019. Of course not, outside China all were preparing for New Year! That date, the Chinese authorities informed the World Health Organisation (WHO) about a pneumonia with an unknown cause in Wuhan City. The unknown cause was later called covid-19. Who in Europe cared? In the middle of January 2020, the US-president talked about a 'Chinese thing'; no serious problem for the USA. On 21 January 2020 the first covid-19 case was reported in France. The virus has arrived in Europe! And many Europeans went skiing in Italy, while China was celebrating New Year on 24 January.

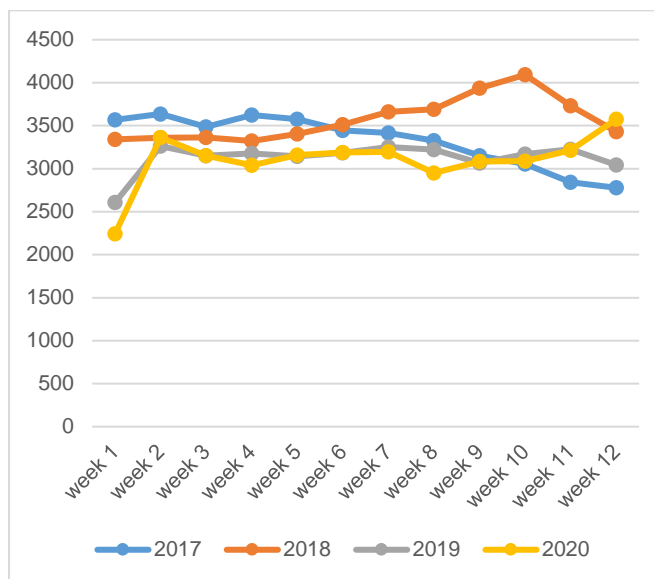
Within the following 2 months, more than 250 million people were in lockdown in Europe. On 12 March 2020 WHO-Europe declared the corona-virus infection a pandemic. Three days later all EU countries had confirmed they had covid-19 cases. In the beginning of April 2020 WHO reported that covid-19 is spreading to rural areas in Africa in more than 16 countries. On 10 of April 2020 over 10.000 persons had died in the USA because of the 'Chinese thing', accordingly the New York Times. One week later it were over 10.000 only in New York City! And each day, we receive new statistics, facts and graphics.

Statistics and facts 1

Facts, statistics, graphics and time tables: what do we learn from all these? Of course, we need more time for research and analysis. Looking at the statistics, in the beginning of what later was defined as a pandemic, the chances for dying from the coronavirus may look like the normal annual risk (1) or like average mortality figures during the influenza season (in Europe in the first 12 weeks of each year, as demonstrated in Graphic 1 about the Netherlands).

In the Netherlands, the first week of the year 2020 had a very low mortality and in the first 3 months of 2020 mortality looked rather 'average' as compared to the 3 previous years. Covid-19 was officially identified in the Netherlands in week 9, on 17 February 2020 (3). The virus needed 28 days to travel from France to the Netherlands! When covid-19 arrived the average mortality rate of the influenza epidemic of 2018 in the Netherlands was evidently higher as compared to other years. The average mortality rate in that week of 2020 was (still) normal.

Graphic 1. Average mortality in the first 12 weeks (the 'influenza season') in 2017-2018-2019-2020 in the Netherlands (2)



Is this Dutch statistic convincing that there was a pandemic? Was it evident that the corona-virus caused these deaths? No; the statistics could not show this for various reasons. The period, over which such statistics have to be followed, has to be based on disease characteristics and treatment possibilities. In the beginning most deaths were not tested on the presence of the virus (even not later)! Also, one has to keep in mind that registration of mortality figures may show serious inconsistencies and need corrections over time. For the UK, the Daily Mail reported on 21 April 2020 – over a month after the outbreak; backdating deaths can take weeks – that in the UK the statistics on covid-19 deaths might be 40% higher than reported!

So, Graphic 1 is useless, fake news? Not per se, but one should be aware of inconsistencies in statistics and these are understandable. For example, inconsistencies may include that cause of death is registered weeks later in the statistics or cause of death may be unknown, or even age or land of origin of the dead citizens may be unknown.

Hart Island in New York City – an island uninhabited and isolated from the rest of the city with no electricity and the only access is by ferry boat – may indicate this. Hart Island is used to bury 'unknown people', who died in New York City. Over time, the remains of more than one million people are buried there, i.e. individuals who were not claimed by their families or did not have private funerals; the homeless and the indigent; and *mass burials of disease victims*. Clearly, the rich and well-known ones are not buried on Hart Island, maybe in the past they were (Hart means 'heart' in Dutch; it were the Dutch who founded New York).

But death because of a pandemic is visible in the statistics of Hart Island. In the first weeks of April 2020 over *24 bodies per day* are buried on Hart Island after covid-19 hit New York City instead of overall average of *3 bodies per day*. But still, names, age, place of origin of these individuals are unknown as is mostly the cause of death. But it looks like covid-19 may play a significant role in the figures of Hart Island since April 2020. But we do not know how many of these - mostly poor and vulnerable - people died because covid-19.

So, the number of deaths due to covid-19 may be questioned. For example, in the first weeks of April officially 5820 persons have died from covid-19 in New York City, but these numbers did not include persons who were not tested before they died (4). Likely the number is (much) higher as the figures of the New York Times show. This example does not only apply for New York City of the USA. It may be the same in all countries. The lesson is, that the numbers, shown in the statistics, are not per se all cases died because of covid-19. Statistics ask for careful interpretation by experts, not by policy makers.

Choices between life or death because of lack of equipment?

Talking about the number of deaths and persons, who are especially at risk not to survive the virus, (like elderly, homeless, people with chronic illness or more generally: vulnerable adult people) raise another question. As known from the past, most countries have to face a shortage of 'equipment' when a pandemic is developing. Lack of mouth caps, lack of testing kits for the virus, lack of hospital beds (only in Wuhan enough beds were built in 'no time'), lack of qualified personnel (qualified health care workers who are retired, are asked to come back to help) and Intensive Care (IC) beds. Clearly, choices have to be made because of lack of facilities and equipment. Difficult choices: who of the three patients to admit to the one available IC bed? How to make such a choice? Who should made it? On what criteria could or should it be made? Do not think about the UK prime minister; he went exit alive. The question is: how well were we prepared to make such choices? We were not prepared! In some (only poor?) regions in the world, these choices are made by economic conditions. There are no beds, no medicines, and no trained personnel. Without welfare or money no survival!

Such choices have also to be made in the 'affluent Western world'. What are the criteria, where are the protocols, on whose authority; on which base are such choices made? Are these preliminary questions? I don't think so. This is what is written about the USA on April 11th 2020: 'As know, older people and those with underlying health problems are most vulnerable to Covid-19, making the consequences of a nursing home outbreak especially devastating. At least 43 deaths have been linked to an outbreak in one nursing home, at least 35 people have died from the virus in another one. In other places multiple deaths have been tied to senior centers. In Wisconsin, the National Guard was sent to a long-term care facility where patients died. This is no exception; it also happened in Georgia

and in Colorado. The New York Times has identified almost 4,000 cases of the coronavirus associated with nursing homes or long-term care facilities across the nation and is tracking down more data (5).' This description is about medical practice in the USA, the richest country in the world; some believe the best! Could this be related to the insufficient health care system in the richest country in the world? Yes, a recent study (6) about the USA – by an internationally well-known institute – about covid-19 victims confirmed it, although the facts were denied by the US president, fake news of course. Interestingly enough, the same study also falsified another myth, i.e. black people should be less vulnerable for covid-19. It seems to be the reverse. Not color, but poverty explains the risk to be infected and die.

Was Europe better prepared for the covid-19 pandemic? No. Many countries had problems with equipment and facilities. It was 'solved' more or less, but not for all patients at risk. Statistics from Belgium and the Netherlands show that equipment to protect the inhabitants in nursing homes and homes for elderly against covid-19 were insufficient and that a high percentage of them were infected and died. And it may be the same for other people at risk. Future analyses will learn who had less chance to survive the pandemic and in which countries. Also these analyses may show which countries were most successful in fighting against the pandemic, how and why. Such studies have to be executed carefully and require reliable, complete data. But even if this will be the case, the findings will be considered as false or fake by some, for sure. Why? Because they do not 'like' the outcome. It will be difficult in such countries to learn from the pandemic.

Should measures to beat a pandemic be left to experts or politicians?

The long-term care facilities (for older people, for people with disabilities, for people with long-term psychiatric symptoms) are the places for the 'perfect storm' in this pandemic. But couldn't we know that before? Yes, but – as mentioned - apparently we were not prepared and ready to save the lives of the most vulnerable ones.

They were neglected even in affluent countries, like Belgium, the Netherlands and the USA. But in some 'democratic states' scientific facts and proposals based on these facts are not welcome. The 'leader' knows best. Should mankind leave it to somebody like President Trump of the USA? He retweeted a post on Twitter on 11 April 2020 calling for the resignation of Anthony Fauci, chief infectious disease of the U.S. government. The virologist had suggested in an interview that the government could have saved more lives if far-reaching measures had been taken earlier. He is right, but some comments are not welcomed by some policy makers. Do they accept the 'perfect storm'? Get rid of the useless? Is it because protocols and guidelines are not developed by international organisations? The World Health Organisation and the United Nations could play an important role here to develop guidelines and decision models for all states. The good news is that WHO in Europe did so (see later). But it was not 'accepted' by some politicians.

The lesson: don't leave the fight to overcome a pandemic (only) to politicians. Political leaders in most Western European countries were wise enough to create a 'crisis team' of policy makers and a wide range of experts.

Could algorithms prevent the 'perfect storm'?

The question 'are (potential) victims neglected and why' may – hopefully - be answered later based on scientific analyses. Such analyses may try to answer another question 'based on what to make choices for life or death in case of a pandemic?' Is it better to leave it to experts as compared to 'policy-makers'? Probably. But this brings another rather fundamental issue, raised for example by Harari in *Homo Deus*. In the paragraph 'Five hundred years loneliness' of *Homo Deus* he describes how the 'tree of knowledge' of the Garden of Eden was transformed in the Garden of Woolstharpe Manor by an apple! Was the difference between dead or alive (good or bad) based on divine orders in the Garden of Eden (don't eat the apple), or on the apple which was fallen down on Newton. The later showed the law of gravity, the law of science. It changed the world as the experiences with covid-19 may do, if we focus on scientific evidence.

Time will learn which consequences the covid-19 pandemic had, but the (medical) practice of covid-19 these days makes it likely, that algorithms – based on artificial intelligence – soon will be introduced to make 'officially' choices in the next pandemic or even before. Choices about 'should a patient treated or not?' means: this patient get a chance to stay alive following the algorithm. Choices about which preventive measures are the most cost-effective in case of a specific pandemic will be made by algorithms? Is this the solution? Will it be better than the choices, which doctors now have to make sometimes? Should we prefer the algorithm choice above the proposal of human experts? We may consider, that choices by artificial intelligence are actually made by human experts, which is not the case. It will be basically an economic choice. Some politicians suggest, that economics doesn't have to do with the origin of or beating a pandemic. Are they blind or do they live in another world? Probably both.

Did health care systems fail?

As indicated before, how health care systems have functioned during the pandemic will be debated for some time. And such debate is really needed to learn from the experiences with covid-19. Of course, most health care professionals did the utmost. Fortunately. But let's be realistic about how health care systems are organised and managed till today: health care services are mainly focused on individual care. With a pandemic, one has to think differently. Individual care is focused on direct interventions, immediate healing and rehabilitation, although one has to understand that 'direct' and 'immediate' includes (long) waiting lists!

In case of a pandemic, also public health, prevention, protection, steering individual and social behaviour have to be

taken into account to control and beat the outbreak, besides the day-by-day treatment and care. Making such changes or combining these functions is difficult for any health care service and system. The large number of patients who arrive at hospitals - all in short time in case of a pandemic – causes logistic problems, which we are not used to. In many health care systems each health care intervention is well planned, even bureaucratic (therefore the waiting lists?). At the same time, the system offers a wide range of interventions and services, which differ considerably in expertise, administrative rules, and financial arrangements. This system makes connections between health care interventions, services, and needed facilities and financing complicated, while connections between the services and facilities (for example: between general practice, emergency care, hospital, long-term care facility and home care) are essential to deal with large numbers of patients in an effective and efficient and given the variations in cure/care problems. We all know this of course, but we are not prepared to act like this, as covid-19 shows as well as the waiting lists.

With the pandemic (think about the large number of possible patients arriving at the door of the hospital), the frontline staff is 'under fire' immediately. Indeed, fighting a pandemic is by some policy makers described as a war. And indeed, when they cannot deal with the pandemic, they did call in the army. In the USA the army was called to regulate proper care in some places. The same was the case in Romania.

But about the frontline: when this is not well prepared and protected, the frontline staff may become infected and, as a consequence, thousands (mostly more vulnerable) persons will also be infected. To arm the frontline staff takes time, as each pandemic shows. How well will we be prepared next time? The data show we were not this time.

Let's look at the bright site. Within one month organisations of health care professionals have developed guidelines and protocols, in various countries and internationally. WHO has published a useful, technical guide with practical information, resources, and measures to strengthen the health system response to covid-19.



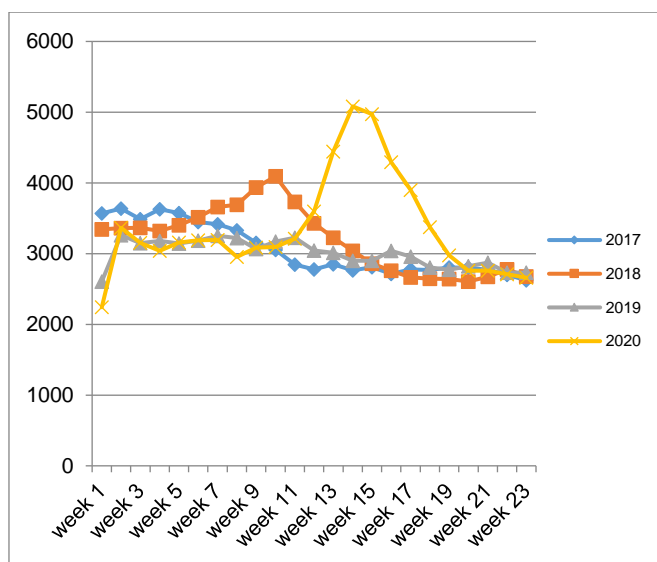
Health Systems Respond to COVID-19
Technical Guidance #2
Creating surge capacity for acute
and intensive care Recommendations
for the WHO European Region (6 April 2020)

One focus is how to create surge capacity in acute and intensive care to treat covid-19 patients while maintaining essential hospital services (7). Another focus will be prevention, including an analysis of the social-emotional damage, which may be caused by a lockdown. Till now, only the economic consequences of a lock down are analysed.

Statistics and facts 2

Let's go back to the 'facts'. Do they show a pandemic and since when? Keep in mind that statistics don't lie but a person can lie with statistics. No doubt, that a long-term follow-up of a disaster is preferable to get more reliable information. Even – as it looks like in Graphic 1 about the Netherlands – if nothing special is going on. The first 12 weeks in 2020 indicated a normal influenza season, although the Chinese authorities declared the pandemic. In the first months of 2020, the Dutch statistics did not indicate that the 'influenza season' of 2020 would develop differently from the last years, but it changed fast in the Netherlands as Graphic 2 indicates. The 'facts' look quite different a few weeks later: covid-19! Such figures apply to all European countries (as long as reliable data are available and/or allowed to be publish).

Graphic 2. Average mortality in the first 23 weeks in 2017-2018-2019-2020 in the Netherlands (2)



So, that is how the pandemic looked in the Netherlands in a graphic: about 7 weeks of excess mortality. That's all? No, not at all! For the questions we have to answer for the future the graphic in itself is not important. Such statistic maybe a tool to find answers to questions that will prepare us better for the next pandemic. More analyses of data – if reliable – are needed.

Analyzing all the data and statistics is complicated. Which data could learn us when (already after 1 or 2 weeks?) the pandemic reached Europe? Will counting the deaths by covid-19 be helpful and could comparisons of the numbers teach us something about the quality and functioning of the health care systems within Europe? Yes, it could, although one has to be careful. As mentioned before, there could be backdating of deaths in the statistics, but also it is related to the number of people tested and demographic composition of the population. The John Hopkins University has created a corona resource centre, which records corona death worldwide, specified by country, using case fatality ratio, i.e. the number of deaths divided by the number of confirmed cases

(<https://coronavirus.jhu.edu/data/mortality>). The case fatality ratio was in April 2020 the highest in Belgium (14,6%), followed by Italy (13,3%) and UK (13,2%). A low fatality ratio is found in Slovakia and Russia (about 1%). In the last 2 countries the number of 'covid-19 confirmed deaths' per million inhabitants is 2. However, if people are not tested, they cannot be registered to be died by covid-19; the ratio is zero! Countries, which do not test, will register no deaths by covid-19!

Another problem with registration is: what is registered as the cause of death. Since covid-19 causes respiratory problems, one may consider this as cause of death instead of the virus or should heart-failure be registered (8)? And how to register one of the consequences of the panic about the pandemic, i.e. some people with a health care problem did not visit a health care centre or hospital, because they fear contracting the virus, or they did not want to burden the health care system yet (8,9,10).

It needs to be repeated: comparing and analyzing statistics requires reliable, complete data, i.e. standardized testing, registration of death, registration of causes of death, changes in attendances, in consultations, in medicine prescriptions etc...In countries, which meet all conditions of testing and registration, the effects of the covid-19 pandemic (number of cases, deaths, recovery time, cost of treatments etc.) could be analysed by comparing countries, health care systems, qualities of health care professionals and health care facilities, life styles, management systems, social security etc. Such analyses will help the various experts together with international organisations (WHO-UN) to share expertise, to picture scenario's and propose protocols and guidelines (proposing test procedures, preparing health care workers, needed equipment, models to avoid complications, information models for the population, social measures etc.) to cope with the next pandemic. It should be supported and executed by policymakers worldwide. They would be better prepared and could take solid decisions. Or are we just waiting for a perfect storm and leave the war against the pandemics to the robots and their algorithms. Also, in that case, we will need the answers of the mentioned questions in advance!

Do we want to learn?

Already on 7 March 2020 wrote George Friedman in the Financial Times on "the looming crisis that faces" the USA, predicting that "it will get worse before it gets better". One month later the International Monetary Fund predicted the coming economic crisis because of covid-19 would beat the economic crisis of 2008(11). In the debates till now, it seems that lessons about the health care systems are not welcome. But there are exceptions. In the New England Journal of Medicine King wrote "Never before has the need for health care reforms that ensure universal access to affordable care for all Americans been more apparent. Our policies on health and health care, both during this pandemic and in the future, should reflect this reality, and we should not let the lessons of this crisis pass us by" (12).

It is not only about health care policy. It is also about what politicians do or nor do, but say. A careful analysis on how governments dealt with the pandemic may indicate, that those governments who were advised by real experts (clinicians, epidemiologists and health scientists) and followed their advices were more successful in dealing with the pandemic and the panic!

It is also about health care professionals. In many countries, health care professionals are for good reasons praised because of their effort, commitment and dedication, but it should also be noted that in some hospitals health care professionals refused to use the available protection measures, because 'they did not like it'. They infected dozens of vulnerable patients, who died because of the lack of professional quality.

And science may learn us more. By 2050 there will be more than twice as many people over 65 as there are children under 5, and the number of people 65 years of age or older globally will surpass the number of people 15 to 24 years of age (13). Ageing of the world creates new challenges for health care systems and for basic sciences. It is not only about considering chronic diseases, multi-morbidity and long-term care arrangements, but – as covid-19 shows by its high mortality in ageing populations – also the vulnerability to infectious diseases. How well do we understand the human immune system when it is ageing?

If we want to learn, we should do it together, as mentioned, worldwide. On 28 February 2020 an interesting article was published signed by a certain Bill Gates (14). It is a list of steps to address the *coming* (!) covid-19 crisis. But as important, it looks forwards and points to the need to make larger systemic changes to 'respond more efficiently and effectively when the next epidemic arrives'. One of these points concerns strengthening primary health care systems, helpful for building the infrastructure for fighting epidemics, and a disease surveillance system with accessible data bases, with which trained health care workers may monitor disease patterns, serving as part of the early warning systems. And of course, there is the need for international collaboration and data sharing. Therefore, consensus on research priorities and trial protocols to develop and test antivirals and vaccines and massive clinical trials and licensing agreements, are needed worldwide. And of course, this needs funding (BILLions more dollars). The article of 28 February 2020 ended with "These are the actions that leaders should be taking now. There is no time to waste." On 12 March 2020 WHO-Europe declared the coronavirus infection a pandemic.

And - last, but not least - if we want to learn, we should start with being mindful: to make more space for each other – literally and figuratively; physically and mentally – in the way we are living: more respect for other human beings, regardless how they look, where they live, what they believe, respect for nature (of course including environment) and reconsidering our way of living, so less crowded restaurants, houses with more space, safer, less polluting, but offering more spacious traffic

and travelling, less artificial connections (so-called 'social media') but more human connections. Then, we will be better prepared for the unexpected.

Conflict of interest: none/**Conflict de interese:** nu există

References/Bibliografie

1. Spiegelhalter. Available from: <https://www.bbc.com/news/health-51979654>. [Accessed 13th April 2020].
2. Open Data Centraal Bureau van Statistiek. Available from: <https://opendata.cbs.nl/statline/#/CBS/nl/dataset/70895ned/table?fromstatweb>[Accessed 10 April and 20 June 2020].
3. Letter to The President of the House of Representatives of the States General by the Minister of Medical Care and Sport.
4. Steadman O. Coronavirus mass graves New York Hart Island. Available from: <https://www.buzzfeednews.com/article/otillisteadman/coronavirus-mass-graves-new-york-hart-island>
5. Coronavirus US cases. Available from: <https://www.nytimes.com/interactive/2020/us/coronavirus-us-cases.html> [Accessed 21th April 2020].
6. Grag S et al. Hospitalization Rates and Characteristics of Patients Hospitalized with Laboratory-Confirmed Coronavirus Disease 2019 — COVID-NET, 14 States, March 1–30, 2020 Morbidity and Mortality Weekly ReportCenters for Disease Control and Prevention Early Release. Vol. 69 April 8, 2020.
7. WHO report Health Systems Respond to COVID-19 6 April 2020.
8. Appleby J. What is happening to non-covid deaths?BMJ 2020; 369; Available from: doi: <https://doi.org/10.1136/bmj.m1607>
9. Turaga KK, Girotra S. Are we harming cancer patients by delaying their cancer surgery during the COVID-19 pandemic? Available from: <https://journals.lww.com/annalsofsurgery/Documents/Are%20we%20harming%20cancer%20patients.pdf>
10. Docherty KF et. al. Deaths from Covid-19: Who are the forgotten victims? BMJ. Available from: <https://doi.org/10.1101/2020.04.21.20073114https://www.medrxiv.org/>
11. World Economic Outlook Reports.April 2020.
12. King JS. Covid-19 and the Need for Health Care Reform. NEJM.org. 2020; Available from: DOI: 10.1056/NEJMp2000821.
13. World population prospects 2019. New York: United Nations Available form: <https://population.un.org/wpp/> [Accessed 18th April 2020].
14. Gates B. Responding to Covid-19 — A Once-in-a-Century Pandemic? N Engl J Med 2020; 382:1677-1679; Available from: DOI: 10.1056/NEJMp2003762.