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The mortality and psychological burden caused by response to COVID-19 outbreak

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ABSTRACT

The world is experiencing a severe COVID-19 outbreak. To control this outbreak, many governments in the world have imposed lockdown or quarantine measures. We hypothesize that these measures may cause additional mortality and morbidity in the (near) future due to delay in diagnosing diseases and other indirect effect on health (such as economic crisis).

To support this hypothesis and to estimate the additional mortality that may linked to the COVID-19 controlling policy, we performed a step-by-step pragmatical approach. First, we chose a country (The Netherlands), and looked at the most common causes of mortality in this country. Then, we performed a literature study on the additional mortality when these causes were diagnosed late, and selected a paper with the most severe scenario. We also performed a literature study on the effect of economic crisis on additional mortality. The mortality data were then extrapolated to the demography of The Netherlands, and the results were compared with the present data on deaths directly due to COVID-19. Roughly, we forecast 388 additional deaths a week in The Netherlands in 5 years due to the direct and indirect effects of the lockdown measures.

The most important implications of this hypothesis is that the additional mortality and increased mental health problem should be considered in evaluating the necessity of lock down and quarantine policy.

Background

The world is in the middle of a severe acute respiratory syndrome corona virus (SARS-CoV-2) outbreak. Many governments try to curb the spreading of this virus by implementing the so-called lock down policy, where businesses, restaurants, schools and universities are closed. Citizens are also prevented from leaving their home except for essential activities. This policy aims at reducing the number of infected patients, therefore reducing mortality rates. However, this policy will have several drawbacks on population health and the health-care system itself.

It has been reported, for example by The Royal College of Emergency Medicine that emergency departments visited in the United Kingdom dropped by 25% in the week after the start of their lockdown (March 23–29, 2020) [1]. There are several possible explanations. The patients might fear getting infected by the SARS-CoV-2 virus in hospitals or in health-care facilities. It is also possible that hospitals need to reorganize health-care service, for example by closing down several services in order to create capacity for COVID-19 care. Consequently, it can cause delay of patients being seen by physicians, and this delay may lead to late diagnosis with subsequent poor outcomes.

Social distancing and lock down policies also mean that travel, manufacturing and other industries do not have productivity as before the SARS-CoV-2 outbreak. Consequently, the policies will likely result in economic recession. An economic recession will also have a direct and indirect impact on health. Furthermore, lock down policies give rise to stressors such as duration of restrictions, fear of the infection, inadequate supplies and inadequate information which can have psychological impacts [2]. Due to lock down, many industries do not operate as normal and this will inevitably lead to economic recession. Economic recession may also lead to physical and mental health problems.

The hypothesis/theory

We hypothesize that mitigation policies to curb the COVID-19 outbreak may cause additional mortality and mental health problems in the (near) future. The additional mortality may be due to the delay in

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the diagnosis of several diseases, or due to the indirect effect of the lock down policy such as economic crisis. The mental health problem may arise because of the social isolation.

Evaluation of the hypothesis

To support our hypothesis, we tried to calculate the additional mortality and describe the mental health problems that may arise due to quarantine and lock down policy.

Additional mortality

To give tangible numbers and reduce complexity, we used a pragmatic and stepwise approach by first selecting a country (the Netherlands). No modelling approach was performed. The Netherlands is a country with approximately 17 million inhabitants that performed a light version of lock down to curb COVID-19 outbreak, i.e. people could go outside only for work if they could not work from home, to do grocery shopping, to take care of someone or to get some fresh air. Bars, cafés and restaurants were closed [3,4]. Second, we narrowed down the possible impacts on by selecting top ten diseases that caused premature in the Netherlands (http://www.healthdata.org/netherlands). In 2017, the most important causes of premature death in the Netherlands were lung cancer, ischemic heart disease, stroke, Alzheimer's disease, COPD, colorectal cancer, breast cancer, self-harm, lower respiratory tract infection and pancreatic cancer.

Then, we searched in available literature using Pubmed database up to May 8th, 2020 to identify papers that either investigating 1. The association between increased time to diagnosis and treatment of these diseases and mortality or 2. The association between economic crisis and mortality. We found multiple publications, and since the purpose of this manuscript was to provide an hypothesis and not to provide precise estimation, we chose one publication that fulfilled the following criteria: 1. Performed in Europe (in order to make comparison with the Netherlands somehow possible), 2. Had at least 5-years follow-up, 3. Had the largest dataset among identified studies, 4. Performed valid statistic and appropriate modelling according to the authors.

Among the top 10 diseases, increased time to diagnosis and treatment of lung, colorectal, and breast cancers is already shown previously to be associated with poorer outcomes [5]. A population-based study from Denmark (5.8 million inhabitants) on delayed diagnosis of lung, colorectal, breast, and other cancers, including melanoma and prostate cancer, showed an additional increase in mortality of 40% with longest diagnostic intervals among patients who presented in primary care compared with reference group (odds ratio of 1.4 of all cancers combined in the fourth quartile compared to the reference quartile). The follow-up duration in this study was 5-years [6].

In 2008, the global financial crisis came abruptly and several European countries were severely affected and one of these countries was Greece [8,9]. Greece had a population of 10.7 million in 2018. A study explored whether the economic crisis affected the trend of 'overall and cause-specific mortality rates' [9]. The researchers compared data before the crisis (January 2001 to August 2008) with those from 5- years after the crisis (September 2008 to December 2013). Comparing the expected values of the period after onset of the crisis with extrapolated values based on fitted regressions for the period before the crisis, the researchers showed a mean of 153 additional deaths per month from circulatory system diseases.

From these studies, the data on additional mortality was extracted and extrapolated to the Netherlands setting by comparing the size of the population between the countries where the study were performed by using the formula: (numbers of Dutch population/numbers of population where the study was performed) × additional deaths/week. In the Netherlands, there are 46,000 deaths each year due to cancer [7]. Applying the additional mortality rate of 40%/year as mentioned by the above-mentioned study, there will be additional 18,400 death/year (353 additional deaths/week) in The Netherlands due to delayed diagnosis of the most common causes cancer. Regarding circulatory disease, assuming that the economic recession that The Netherlands will face of the comparable magnitude to that of Greece, the additional mortality in the Netherlands will be 65 per week. Adding up the possible additional death due to a delay in cancer diagnosis and an increase in cardiovascular related deaths after the last financial crisis, the expected total will be 388 additional deaths per week.

This number could be compared with the number of deaths in the Netherlands. For example, between March 8th and April 7th 2020, there were 2,101 deaths (range 0–234 per day), 865 deaths a week due to COVID-19 (data were obtained from http://www.healthdata.org/netherlands). In the month March and April there were normally between 2694 and 3002 deaths a week in The Netherlands [10].

Effect on mental health

We searched literature on the mental health effect of quarantine policy during the first SARS-CoV outbreak in Pubmed in the same time range as above. We only identified studies with effect of mental health that occurred immediately after the lock down policy (i.e. < 1-year). A case study on quarantine in a small setting (i.e. hospital) during the first SARS-CoV outbreak in 2003 has been published [11]. In a general governmental district hospital with 500-beds and 930 staff members, all 240 patients and 129 visitors at that time were prohibited from leaving the hospital for 2 weeks. The psychological impact was already evident on the third day, when a depressed man suspected of having SARS committed suicide. The confinement has caused a sense of collective hysteria. Patients with SARS reported fear, loneliness, boredom, anger and worried about the effects of quarantine and contagion on family members and friends. Another study in Toronto, Canada with 129 quarantined persons due to SARS-CoV outbreak in 2003 who responded to a Web-based survey showed that 28.9% and 31.2% of them reported posttraumatic stress disorder, respectively [12]. From the present SARS-CoV-2 outbreak, 35% of 52,730 responders experienced psychological distress according to a nationwide survey of psychological distress in the general population of China [13].

Regarding suicides and homicides, they do not belong to top 10 causes of deaths in the Netherlands. The Greek study above showed a mean of two additional deaths from suicides, two from mental health problems and one from homicide per month after financial crisis, which gave a total of 1.3 additional mortality per week.

Consequence of hypothesis/discussion

This study hypothesizes that delay in care and the imminent economic crisis due to quarantine and lock down policy leads to health burden in term of additional mortality and morbidity. Using pragmatic approach, the crude estimation of the additional deaths due to the most common causes of premature death (388/week) is lower than the present additional death of 865/week due to the COVID-19 in the Netherlands. We also found studies that described high burden of psychological distress due to the quarantine during the first SARS-CoV and the present SARS-CoV2 outbreak.

Making an estimation on the future effect of COVID-19 curbing policy on health is complex. Any comparison will be not perfect. Modelling is an approach that is often used but it uses many assumptions that make the translation into policy difficult. The present hypothetical study provides clear and tangible number that may be used to inform policy. In imposing and continuing the lock down or quarantine policy, the benefit of the policy should be balanced against possible health problems in the future. The COVID-19 death rates seem to be more common among the elderly [15] while additional deaths to cancers and cardiovascular disease involve younger individuals. All of these numbers should be put in perspective. For example, the number of deaths due to tuberculosis is immense (approximately 1250 deaths/

week) in Bangladesh [16] and very low in the Netherlands (0.2/week in 2018) [17].

To cope with the possible psychological effects of quarantine, (Government) officials should take measures to make the experience as bearable as possible for the public. First and foremost, this can be achieved by being clear and transparent. In the era of rapid and abundant information, officials need to present information in a clear and rational manner. The general public should not be left confused by discussions including a lot of nuances, which is a common practice in the scientific world. Furthermore, authorities should ensure the availability of basic supplies, guarantee that internet service remains open (especially for social media). Mental and psychosocial support should be a part of emergency planning and response measures.

There are several limitations on our approach in calculating additional mortality to support our hypothesis. First, the estimated number of additional deaths is more likely an overestimation since we chose the extremes for comparison, i.e. the comparison between the highest with the lowest quartile. Moreover, we translate the odds ratio reported as risk ratio. Odds ratio in a common outcomes is known to exaggerate the risk ratio [14]. Secondly, we did not perform a systematic review and did not assess any publication bias. It is possible that only studies with 'positive' results are published and selected for this study. Thirdly, the data on additional deaths to COVID-19 in many parts of the world is still very dynamic in relation to the stage of outbreak. Lastly, the period of additional deaths cannot be estimated. The two studies included in the present study used time period of 5-years.

In conclusion, we hypothesize and showed that there is a potential significant rise of mortality and mental health problems in the future due to lock down policy in curbing COVID-19 outbreak.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.mehy.2020.110069.

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