Life-Years and Lockdowns: Estimating the Effects on Covid-19 and Cancer Outcomes from the UK's Response to the Pandemic

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Abstract

Every policy has direct and indirect effects of intended and unintended consequences. Policies that require people to stay at home to reduce the morbidity and mortality from Covid-19 will have effects beyond the virus. For example, they will adversely affect mental health and economic prospects for many. They will also affect people's willingness and ability to access health and social services. This is likely to result in increases in morbidity and mortality from otherwise curable diseases, such as cancer, acute myocardial infarction and stroke. A comparison between Covid-19 deaths prevented and excess cancer deaths caused shows it is possible that preventing Covid-19 deaths through lockdowns might result in more life-years being lost than saved.

Keywords: Covid-19 • Cancer • UK lockdown policy • Health

Introduction

Every policy has direct and indirect effects of intended and unintended consequences. Policies that require people to stay at home to reduce the morbidity and mortality from Covid-19 will have effects beyond the virus. For example, they will adversely affect mental health and economic prospects for many. They will also affect people's willingness and ability to access health and social services. This is likely to result in increases in morbidity and mortality from otherwise curable diseases, such as cancer, acute myocardial infarction and stroke. A comparison between Covid-19 deaths prevented and excess cancer deaths caused shows it is possible that preventing Covid-19 deaths through lockdowns might result in more life-years being lost than saved.

The Covid-19 Trade off

The UK was effectively in a lockdown from March to May 2020. Public Health England (PHE) data released early in the UK lockdown showed that the number of people attending emergency services with symptoms of a heart attack decreased from an average of around 300 per day at the beginning of March to around 150 per day at the end of March [1]. Figures from the Office for National Statistics (ONS) show that UK deaths from certain "conditions which can quickly become fatal if not treated in time", such as cardiac arrythmia and hypertensive diseases, were above five-year average levels throughout the pandemic [2]. Despite these impacts, most of the scientific evidence used to guide Covid-19 policy in the UK has focused entirely on epidemiological models of the effects of Covid-19 alone, and most notably the model formulated by Imperial College London [3]. This was widely taken to be pivotal in the decision to go into lockdown in March 2020. More recent models, such as the Scientific Advisory Group for Emergencies (SAGE) model immediately preceding the decision to go into a second national lockdown in October 2020, do go beyond direct Covid-19 mortality to consider the excess deaths from non-Covid-19 causes in a scenario without extra measures [4]. Yet these models still do not compare the morbidity and mortality that would result from other policy options.

Lives versus Life-Years

Comparing the various outcomes of different policy options requires a common metric. Over the past few decades, there has been considerable debate about whether mortality risks should be valued according to the number of life-years saved rather than the total number of lives [5,6]. An important goal of policy is to generate as much benefit as possible for as long as possible, and so a life-years approach seems preferable in this regard since lives are never saved but merely prolonged [6]. Considering life years rather than lives is more commonplace in the appraisal of healthcare intervention, where the UK has been at the forefront of the adoption of Quality Adjusted Life Years (QALYs). QALYs seek to combine the value of changes in quality of life and length of life into a single number, where one year of life in full health is equivalent to one QALY. The debate around how to measure benefits, and especially lives versus life-years, is crucial in the case of Covid-19 as mortality risks are highly correlated with age [7], and underlying health issues [8], and hence strongly negatively associated with remaining life-years. According to the Office for National Statistics (ONS), the mean age of deaths involving Covid-19 was 78.7 for males and 82.5 for females [9]. In the UK, the life expectancy for a 79-year-old male is 9.04 years while the life expectancy of an 83-year-old female is 7.95 years [10]. Combining these figures with the gender distribution of Covid-19 deaths [11], suggests that the years of life lost (YLL) for Covid-19 was around 8.6 years without accounting for any underlying health conditions. In contrast, excess non-Covid-19 deaths from treatable illnesses, such as cancer, will result in a much higher average number of years of life lost. For example, a six-month delay in patient presentation and diagnosis for cancer has been estimated to lead to 9,280 lives and 173,540 life-years lost, implying an average life expectancy of around 19 years [12]. Despite the relevance of age and years of life lost, most Covid-19 discussions have focused on lives rather than life-years [3,4]. A study by the Department of Health and Social Care (DHSC) [13] did find that the QALY losses from lockdown exceeded the QALY losses from direct Covid-19 but this study did not nearly gain as much traction as others taking a lives-saved approach.

Life-Years Saved from Covid-19 versus Life-Years Lost from Cancer

Estimates from Cancer Research UK showed that around three million people missed their cancer diagnostics during the UK lockdown [14]. Delays in cancer treatment can cause otherwise curable tumours to become non-curable [12], and a recent systemic review and meta-analysis showed that as little as a four-week delay was associated with an increased mortality for seven cancer types [15]. It therefore becomes important to consider the life-years saved from the Covid-19 deaths prevented by the UK lockdown to the life-years lost from excess cancer deaths. Note that cancer deaths represent only one, albeit important, indirect effect of lockdown measures. Recent research suggests that a delay in patient presentation and diagnosis for cancer would lead to 25,812 life-years lost if the delay is one-month long and 173,540 life-years lost if the delay is six-months long [12]. By dividing these figures by the average life-years

saved from Covid-19 deaths prevented, it is possible to calculate the required number of Covid-19 deaths that need to have been prevented for total Covid-19 life-years saved to equal total life-years lost from excess cancer deaths (Table 1). For example, if the average life-years saved from Covid-19 deaths prevented is eight years [16], restrictions must have prevented at least 21,693 Covid-19 deaths in a scenario of six months of cancer delays.This is the minimum number of Covid-19 deaths that need to have been prevented for the UK lockdown to be the correct policy choice in terms of a maximization of life-years saved. However, considering the frailty of populations dying with Covid-19 [17], the life-years saved from Covid-19 is likely to be significantly lower than eight. According to the Office for National Statistics, around 91% of Covid-19 deaths have been of people with at least one pre-existing condition while the mean number of conditions was 2.1 for the 0-69 age group and 2.3 for the 70+ age group [18]. Some commentators have suggested that somewhere between one-half and two-thirds of Covid-19 deaths would have occurred in the next 12 months, since the deaths are of people at the end of their lives [18]. The excess mortality data for the 2020 summer period in the UK indeed show a lower than expected number of deaths in older age groups (such as 85+), suggesting that deaths that would have occurred later in the year were brought forward in time by Covid-19 [19]. On the other hand, others have suggested that adjusting the YLL from Covid-19 for the number and type of long-term conditions typical of Covid-19 deaths only results in a decrease in YLL of around 10% [20]. However, the latter also note that frail populations such as care home residents may be over-represented among Covid-19 deaths compared to the dataset on which their analysis is based and point out that the inclusion of such populations would lead to a larger decrease in YLL [21]. Therefore, it is plausible that the life-years saved from prevented Covid-19 deaths is significantly lower than eight. If we assume that the average life-years saved from prevented Covid-19 deaths is half at four, then restrictions must have prevented at least 43,385 Covid-19 deaths. The relationship between the number of Covid-19 deaths that need to have been prevented (as a function of average Covid-19 life-years saved) for total Covid-19 life-years saved to equal total life-years lost from excess cancer deaths can be seen in Figure 1. For example, in the case of a six-month delay in cancer diagnoses, if the average life-years saved from averted Covid-19 deaths is four, more than 43,385 Covid-19 deaths need to have been prevented for the UK lockdown to be the correct policy choice in terms of a maximization of life-years saved. Note: Average years-of-life saved from averted Covid-19 deaths could be over 30; x-axis cut for readability.

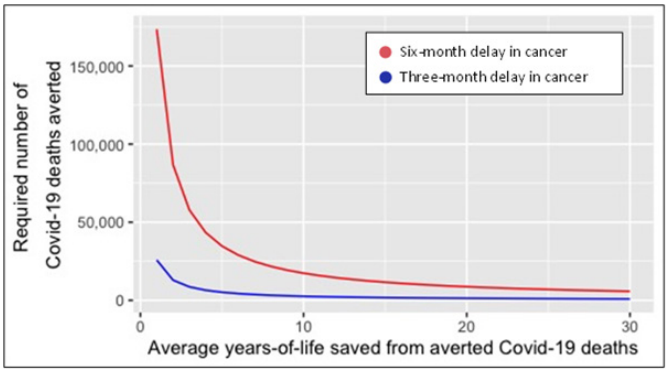

Figure 1. Required number of Covid-19 deaths prevented (as a function of average Covid-19 life-years saved) for total Covid-19 life-years saved to equal total life-years lost from excess cancer deaths.

Table 1. Required number of Covid-19 deaths prevented for total Covid-19 life-years saved to equal total life-years lost from excess cancer deaths.

		1 month of cancer delays (Total YLL=25,812)	6 months of cancer delays (Total YLL=173,540)
Average life-years saved from prevented Covid-19 deaths	4	6,453	43,385
	8	3,227	21,693

Conclusion

A comparison between the life-years saved from the Covid-19 deaths prevented during the UK lockdown and the life-years that will be lost in the near future from excess cancer deaths due to lockdown indicates that preventing Covid-19 deaths through six-month lockdowns might result in more life-years being lost than saved. For example, if the average life-years saved from prevented Covid-19 deaths is eight and lockdown produced six months of cancer delays, anything less than around 22,000 Covid-19 deaths prevented would mean more life-years lost to cancer than saved from Covid-19. Of course, many epidemiological models have put forward very high Covid-19 death estimates for "no lockdown" scenarios that would cause the Covid-19 life-years saved to far exceed the life-years lost to cancer [3,4]. For example, Imperial College [3] estimated that a no lockdown scenario would lead to 500,000 Covid-19 deaths, which would require more than 210,000 cancer deaths for cancer deaths to be prioritized in a life-years approach (if the average life-years saved from prevented Covid-19 deaths is 8). These death projections are open to some considerable doubt, however [22,23]. In any event, cancer deaths represent only one, albeit important, indirect effect of lockdown measures. Policies to deal with Covid-19 affect mortality risks from many other conditions such as stroke and myocardial infarction; it is possible that preventing Covid-19 deaths through lockdowns might result in more life-years being lost than saved. In considering the impact of any policy, we need to capture all its possible ripple effects and not just the initial splash when the pebble of intervention hits the water.

References

1. Public Health England (PHE). "Emergency Department Syndromic Surveillance System (EDSS) Bulletin." (2020).
2. Office for National Statistics (ONS). "Analysis of death registrations not involving coronavirus (COVID-19), England and Wales: 28 December 2019 to 10 July 2020." (2020).
3. Ferguson, N. M., et al. "Impact of non-pharmaceutical interventions (NPIs) to reduce COVID-19 mortality and healthcare demand." (2020).
4. Scientific Advisory Group for Emergencies (SAGE). "Covid in winter 2020, a worst-case scenario." (2020).
5. Zeckhauser, R., & Shepard, D. "Where Now for Saving Lives? Law and Contemporary Problems." 40.4(1976): 5.
6. Sunstein, C. R. "Lives, Life-Years, and Willingness to Pay. Columbia Law Review." 104.1(2004): 205.
7. Zhou, F., et al. "Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study." The Lancet. 395.10229(2020): 1054–1062.
8. Office for National Statistics (ONS). "Deaths involving COVID-19, England and Wale." (2020).
9. Office for National Statistics (ONS). "Average age of death (median and mean) of persons whose death was due to COVID-19 or involved COVID-19, by sex, deaths registered up to week ending 2 October 2020, England and Wales." (2020).
10. Office for National Statistics (ONS). "National life tables: UK." 2020.
11. Office for National Statistics (ONS). "Deaths involving COVID-19, England and Wales. Deaths involving COVID-19, England and Wales - Office for National Statistics." Office for National Statistics: (2020).
12. Sud, A., et al. "Effect of delays in the 2-week-wait cancer referral pathway during the COVID-19 pandemic on cancer survival in the UK: a modelling study. The Lancet Oncology. 21.8(2020):1035–1044.
13. Department of Health and Social Care, Office for National Statistics, Government Actuary's Department and Home Office. "Direct and Indirect Impacts of COVID-19 on Excess Deaths and Morbidity." (2020).
14. Gibbons, K. "Extra cancer victims may reach 35,000 after screening and treatment missed." (2020).
15. Hanna, T.P., et al. "Mortality due to cancer treatment delay: systematic review and meta-analysis" BMJ. 371(2020):4087.
16. Dolan, P., & Jenkins, P. "Estimating the monetary value of the deaths prevented from the UK Covid-19 lockdown when it was decided upon – and the value of "flattening the curve". (2020).
17. Office for National Statistics (ONS). "Deaths involving COVID-19, England and Wales: deaths occurring in June 2020." (2020).
18. Knapton, S. "Two thirds of coronavirus victims may have died this year anyway, government adviser says." The Telegraph. (2020).

19. Public Health England. "Excess mortality in England, week ending 06 November 2020." (2020).

20. Hanlon, P., et al. "COVID-19 – exploring the implications of long-term condition type and extent of multimorbidity on years of life lost: a modelling study." (2020).

21. McAllister, D. A. "Addendum to COVID-19 – exploring the implications of long-term condition type and extent of multimorbidity on years of life lost: a modelling study." (2020).

22. Ioannidis, J.P., et al. "Forecasting for COVID-19 has failed." Int. J. Forecast. (2020).

23. Donnelly, L. & Yorke, H. "Death scenarios used to justify second lockdown 'could be four times too high'." The Telegraph. (2020).

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