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**Hard, Not Early:
Putting the New Zealand Covid-19 Response in Context**

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Abstract

A popular narrative that New Zealand’s policy response to Coronavirus was ‘go hard, go early’ is misleading. While restrictions were the most stringent in the world during the Level 4 lockdown in March and April, these were imposed after the likely peak in new infections. I use the time path of Covid-19 deaths for each OECD country to estimate inflection points. Allowing for the typical lag from infection to death, new infections peaked before the most stringent policy responses were applied in many countries, including New Zealand. The cross-country evidence shows that restrictions imposed after the inflection point in infections is reached are ineffective in reducing total deaths. Even restrictions imposed earlier have just a modest effect; if Sweden’s more relaxed restrictions had been used, an extra 310 Covid-19 deaths are predicted for New Zealand – far fewer than the thousands of deaths predicted for New Zealand by some mathematical models.

JEL Codes

C21, I18

Keywords

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Covid-19
deaths
policy timing
response stringency
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1. Introduction

A popular narrative about New Zealand's policy response to Coronavirus is that a 'go hard, go early' strategy was used. This phrase is often mentioned by the Prime Minister and even entered into World Health Organization descriptions (WHO, 2020).¹ It is true that New Zealand 'went hard', with the most restrictive settings in the world in the Level 4 lockdown in March and April (Gibson, 2020). It is less true that New Zealand 'went early' as the likely peak in new infections occurred before the most stringent restrictions were imposed.

While deconstructing catchy but untrue phrases uttered by politicians is normally a political science matter, there are costly economic consequences of a 'go hard but a bit late' strategy. For example, a country that genuinely did 'go early' is Taiwan, whose Covid-19 death rate is just 1/15th New Zealand's rate, despite having eight times as many visitors a year from China, and having a first Covid-19 case a month before New Zealand's first case. Taiwan's success came at far less cost, with forecast GDP growth rates for 2020 and 2021 of 0.8% and 3.5% (ADB, 2020). In contrast, forecasts made for New Zealand (not accounting for the second Auckland lockdown) are for GDP at the end of 2021 to be five percent lower than in 2019 (Infometrics, 2020). The nine percent gap between New Zealand's GDP at the end of 2021 if it grew according to Taiwan's experience, and where it likely will be, amounts to \$27 billion. Moreover, the cross-country evidence reported below is that restrictions applied after the inflection point in infections is reached are ineffective at reducing total deaths, compared with restrictions applied earlier, so 'going a bit late' matters.

2. Covid-19 Policy Stringency: New Zealand and Elsewhere

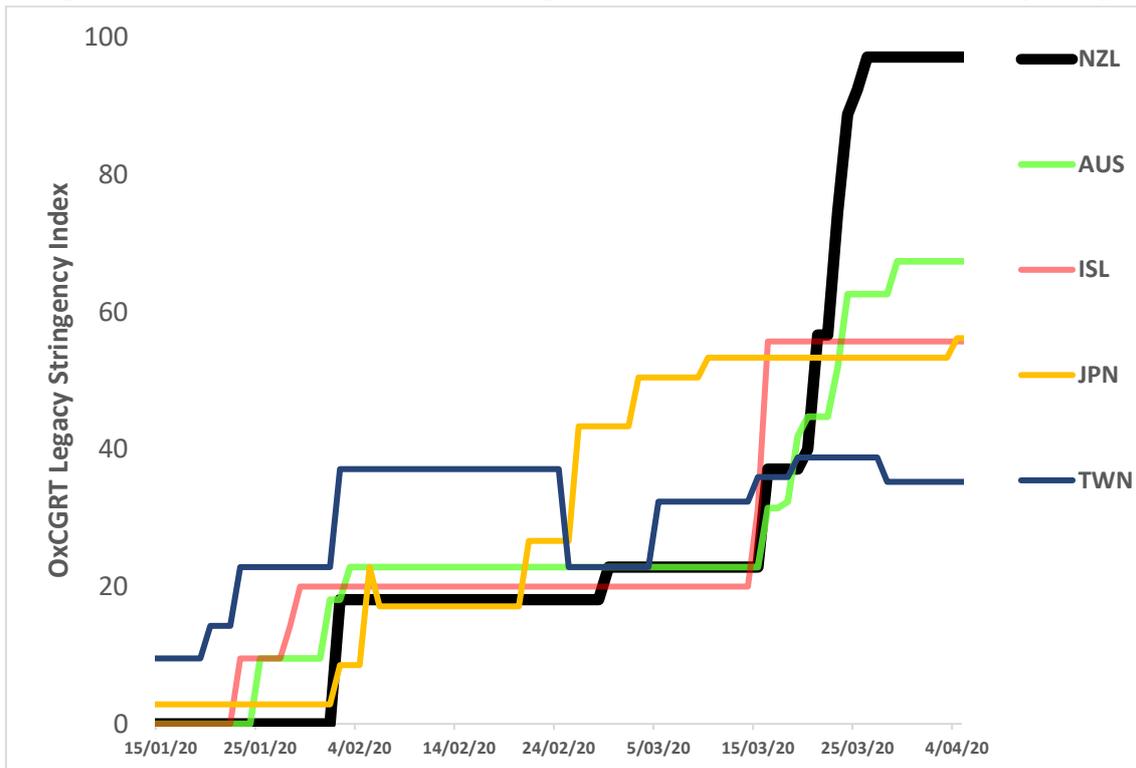
The evolution of New Zealand's Covid-19 policy response until early April is shown in Figure 1, along with that of the other OECD countries without land borders (Australia, Iceland and Japan), and Taiwan. Countries without land borders may have an advantage in keeping the virus out, and so make a natural comparison group. I use the legacy stringency index of Hale *et al.* (2020) that focuses on closures and containment and on public health information, unlike the broader government response index that includes various economic support measures, health sector strengthening and investment in vaccines.

Up until mid-March the New Zealand response generally lagged the other countries in Figure 1. Moreover, the initial response, from 3 February, required foreign nationals arriving from China to self-isolate for 14 days. In late February, this extended to travelers coming from Iran. Subsequent genomic sequencing of confirmed cases in New Zealand from 26 February until May 22 shows representation from nearly all the diversity in the global virus population, and cases causing ongoing local transmission were mostly from North America (Geoghagen *et al.* 2020). Thus, aside from self-isolation being poorly policed, restricting travelers from certain

¹ See, for example a March 14 report: <https://www.newsroom.co.nz/we-must-go-hard-and-we-must-go-early>

countries (for example, China, Iran) is ineffective at keeping the virus out, unless all countries in the world simultaneously impose the same restrictions. Without such coordination, the virus can spread to third countries, from whence it can enter New Zealand. It is like bolting one door on a stable with many exterior doors, with horses free to roam around inside so that a smart horse (*aka* ‘a tricky virus’) can escape through any of the other doors.

Figure 1: New Zealand Government Response to Coronavirus Was Not Notably Early

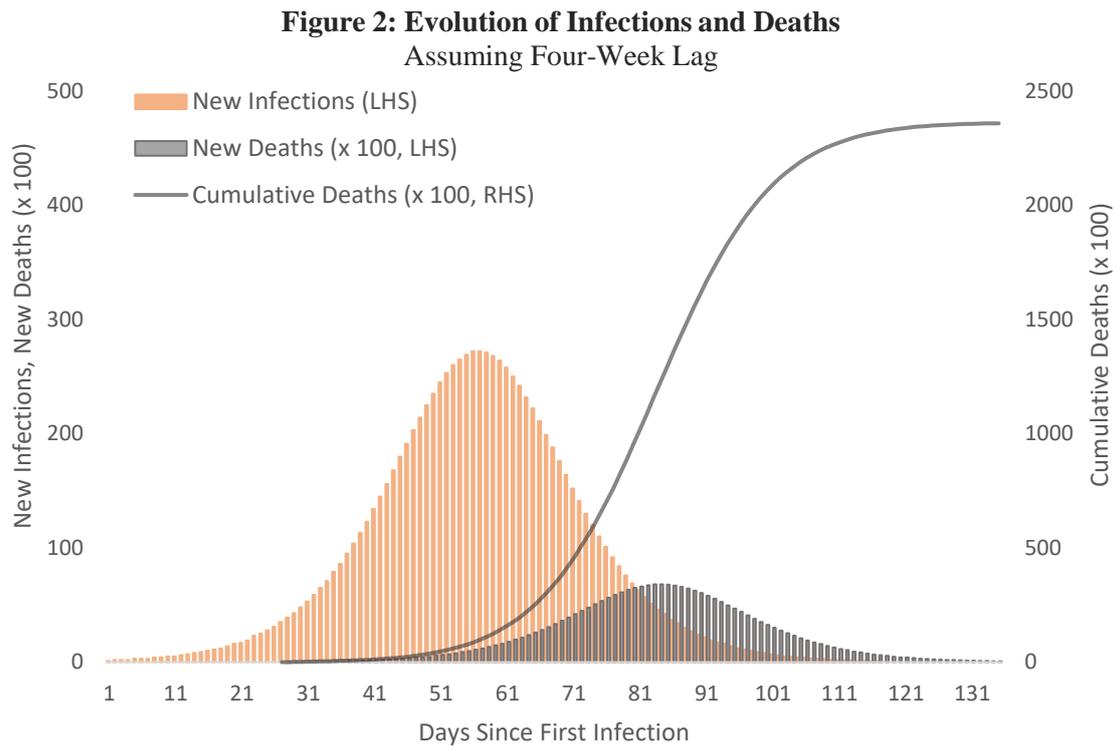


The evidence in Figure 1 is open to at least two criticisms. First, different comparator countries may allow alternative interpretations. Secondly, comparing with responses of other countries may not be the right metric. Sebhatu *et al* (2020) find a lot of mimicry; almost 80 percent of OECD countries adopted the same Covid-19 responses in a two-week period in mid-March: closing schools, closing workplaces, cancelling public events and restricting internal mobility. These homogeneous responses contrast with heterogeneity across countries in how widely Covid-19 had spread, in population density and age structure, and in healthcare system preparedness. One interpretation of this contrast is that some governments panicked and followed the lead of others, rather than setting fit-for-purpose Covid-19 responses that reflected their local circumstances. So another approach to study policy timing is to compare policy responses with the spread of the virus in each country.

3. Infections, Deaths, and Policy Stringency for OECD Countries

It is hard to directly study spread of SARS-CoV-2 given systematic population-based testing was not implemented, with reported cases partly reflecting variation in testing effort. While

data on Covid-19 deaths are also subject to variation in reporting standards, they are more informative than cross-country data on cases and can be used to infer the timing of infections (Homburg 2020).² Figure 2 shows how the peak of the unobserved distribution of new infections can be inferred from the observed distribution of new deaths (or cumulative deaths). Note that with almost 400 infections per death, according to seroprevalence studies from population samples (Ioannidis 2020), the deaths data in Figure 2 are multiplied by 100 to make the two distributions visible on the same scale. The typical lag of about four weeks between infection and death is used to identify the distribution of unobserved infections.³



The approach shown in Figure 2 was used by Homburg (2020) to date turning points in new infections for nine countries. A logistic function: $f(t) = S/(1 + ae^{-bt})$ was applied to the time series of cumulative daily deaths, where S is the asymptote, a the displacement (in time) and b the growth rate, with the inflection point occurring when $t = -\ln(\frac{1}{a})/b$. With the lag from infection to death, the median turning point in new infections was estimated to be March 14. All seven countries with lockdowns in Homburg’s sample had turning points before lockdown, leading to his conclusion that lockdowns were superfluous.

² Nevertheless, deaths data have some problems of over-counting when positive Covid-19 tests are linked with subsequent deaths from any cause (Williams *et al.* 2020).

³ Homburg (2020) uses a lag of 23 days but from March and early April when treatment protocols for Covid-19 were still being developed. Improved care since then may extend the lag. Heneghan and Jefferson (2020) say 21-28 days and the Covid-19 tracking project (<https://covidtracking.com>) suggests a four-week lag.

In contrast to Homburg, who had just six weeks of data, I use daily data on deaths for six months, from mid-February until 18 August, from the Oxford Covid-19 Government Response Tracker (OxCGRT). I estimate a three-parameter logistic function (the same distribution used by Homburg) for cumulative deaths for each OECD country, using non-linear least squares (NLS). Results are available for 34 countries, as there was non-convergence of the NLS routine for Australia, Colombia and Israel.

The results in Table 1 show that the inferred inflection date in infections ranges from February 23 to 4 June, and for the median OECD country occurred on 23 March. For New Zealand, the approach in Figure 2 suggests new infections peaked on March 16, over a week before the strictest restrictions began on 26 March. Even if a shorter lag from infections to deaths is assumed, the peak in new infections in New Zealand still will have occurred before the Level 4 lockdown began. New Zealand is amongst 17 countries whose peak policy stringency occurred after the likely turning point in infections. So based on comparing policy timing with likely progress of the virus, the ‘go early’ claim seems untrue.

It matters that policy restrictions are applied too late. Over two-thirds of variation in Covid-19 death rates (as of August 18) across these 34 OECD countries is due to baseline characteristics: deaths are higher in more populous countries, with higher density, higher shares of elderly, immigrants and urbanites, and fewer hospital beds per capita and having land borders (Table 2). If the country-specific mean of the OxCGRT policy stringency index is included it provides no additional predictive power. However, if the time-series of policy stringency is split at the inflection point in infections for each country (based on Table 1), pre-peak policy stringency is negatively associated with Covid-19 death rates while post-peak policy stringency has no statistically significant effect on death rates.⁴ A similar pattern is apparent if the (likely) dates of peak new infections are controlled for, or if the maximums of the stringency index are used rather than the means. Thus, it seems to matter more to ‘go early’ than to ‘go hard’.

One worry about these OLS results is that policy stringency may be endogenous. The homogeneous government response to Covid-19 across heterogeneous settings, that Sebhatu *et al.* (2020) ascribe to mimicry, suggests an instrumental variables (IV) strategy; the average policy response of nearby countries can be used as an instrument for own-response.⁵ The IV results in the last three columns of Table 2, and the corresponding Wu-Hausman tests, allay the concern about endogeneity. Moreover, the same pattern is found using IV as was found with OLS: there is a precisely estimated negative elasticity of death rates with respect to the policy stringency that was in place prior to the peak of new infections and an insignificant effect of policy stringency after the inflection point in infections has occurred.

⁴ The difference in the elasticity of death rates with respect to policy stringency prior to peak infections and the elasticity with respect to policy stringency after the peak is statistically significant at the $p < 0.04$ level.

⁵ I calculate leave-out means for the same six OECD regions that Sebhatu *et al.* (2020) use.

Table 1: Timing of Coronavirus Infections (Inferred Date of Inflection) and Beginning of Most Stringent Policies

Country	code	First Covid-19 Death (from OxCGRT)	NLS Estimation Deaths Asymptote	Using Displacement	Cumulative Growth Rate	Daily Deaths Nonlinear LS R-squared	Inferred Infection Date	Starting Date for Maximum Stringency
Austria	AUT	13 March	693	33.7	0.104	0.9982	18 March	16 March
Belgium	BEL	11 March	9683	36.3	0.113	0.9992	14 March	20 March
Canada	CAN	10 March	8840	62.0	0.075	0.9992	5 April	1 April
Switzerland	CHE	6 March	1677	39.6	0.108	0.9994	12 March	17 March
Chile	CHL	23 March	10741	100.3	0.064	0.9983	5 May	3 July
Czech Republic	CZE	23 March	359	31.7	0.071	0.9956	12 April	23 March
Germany	DEU	10 March	8958	43.7	0.095	0.9990	21 March	22 March
Denmark	DNK	16 March	603	33.4	0.089	0.9988	27 March	18 March
Spain	ESP	5 March	27984	36.8	0.113	0.9990	8 March	30 March
Estonia	EST	26 March	63	22.1	0.119	0.9992	23 March	29 March
Finland	FIN	22 March	327	36.1	0.114	0.9995	25 March	28 March
France	FRA	15 February	29552	61.0	0.112	0.9987	23 February	17 March
United Kingdom	GBR	7 March	40359	49.2	0.084	0.9985	25 March	24 March
Greece	GRC	12 March	198	38.7	0.062	0.9954	12 April	23 March
Hungary	HUN	16 March	588	46.3	0.080	0.9987	4 April	28 March
Ireland	IRL	12 March	1727	44.8	0.114	0.9992	17 March	6 April
Iceland	ISL	20 March	10	18.4	0.168	0.9991	9 March	20 March
Italy	ITA	23 February	34535	48.6	0.081	0.9988	13 March	12 April
Japan	JPN	13 February	1001	83.2	0.082	0.9985	9 March	16 April
South Korea	KOR	21 February	285	38.4	0.071	0.9979	15 March	6 April
Lithuania	LTU	21 March	80	40.8	0.060	0.9979	24 April	10 April
Luxembourg	LUX	14 March	112	31.5	0.098	0.9981	21 March	17 March
Latvia	LVA	4 April	31	35.5	0.059	0.9968	6 May	27 March
Mexico	MEX	21 March	63807	109.9	0.045	0.9988	4 June	30 March
Netherlands	NLD	7 March	6076	41.3	0.099	0.9993	16 March	31 March
Norway	NOR	13 March	248	35.6	0.109	0.9986	17 March	24 March
New Zealand	NZL	29 March	22	21.3	0.198	0.9992	16 March	26 March
Poland	POL	13 March	1784	70.5	0.043	0.9952	23 May	9 April
Portugal	PRT	18 March	1676	42.7	0.059	0.9966	22 April	9 April
Slovak Republic	SVK	7 April	28	17.4	0.171	0.9984	26 March	8 April
Slovenia	SVN	18 March	112	30.1	0.108	0.9978	21 March	30 March
Sweden	SWE	12 March	5636	57.9	0.060	0.9978	21 April	4 April
Turkey	TUR	19 March	5431	43.3	0.066	0.9952	16 April	11 April
United States	USA	1 March	152570	75.9	0.046	0.9920	5 May	21 March

Table 2: Determinants of Covid-19 Death Rates in OECD Countries

	----- Ordinary Least Squares -----				----- Instrumental Variables -----		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Mean policy stringency		1.050 (0.75)			1.786 (0.27)		
Pre-peak mean policy stringency			-0.482* (1.91)			-0.930** (2.09)	
Post-peak mean policy stringency				1.540 (1.24)			2.431 (0.74)
Country population (log)	0.350*** (3.12)	0.299* (2.01)	0.391*** (3.66)	0.273* (1.89)	0.263 (0.77)	0.428*** (3.56)	0.228 (1.14)
Population density	0.146 (1.13)	0.110 (0.80)	0.079 (0.52)	0.097 (0.70)	0.085 (0.31)	0.016 (0.10)	0.068 (0.36)
% of population age 65+	0.058 (1.13)	0.063 (1.20)	0.047 (0.89)	0.067 (1.31)	0.066 (1.30)	0.037 (0.88)	0.073 (1.60)
% foreign born	0.044** (2.05)	0.044** (2.16)	0.025 (1.26)	0.042** (2.10)	0.045* (1.87)	0.010 (0.40)	0.042** (2.28)
% living in urban areas	0.035* (1.82)	0.036* (1.88)	0.033* (1.74)	0.036* (1.94)	0.037** (2.18)	0.031** (2.10)	0.036** (2.46)
Hospital beds/1000 people	-0.308*** (3.23)	-0.281** (2.62)	-0.298*** (3.10)	-0.252** (2.25)	-0.262 (1.40)	-0.289*** (3.69)	-0.219 (1.53)
No land border	-2.144* (1.93)	-2.012* (1.71)	-2.175* (2.04)	-1.840 (1.57)	-1.920* (1.86)	-2.204*** (3.53)	-1.664* (1.86)
Constant	0.476 (0.28)	-3.561 (0.62)	2.497 (1.19)	-5.851 (1.09)	-6.390 (0.25)	4.376* (1.91)	-9.507 (0.70)
R-squared	0.686	0.692	0.712	0.700	0.689	0.689	0.695
Wu-Hausman Exogeneity Test $F_{(1,24)}$					0.009	1.376	0.061
First-stage F -statistic					1.021	17.020***	4.014*

Notes: The dependent variable is the log of Covid-19 deaths per million (as of August 18, 2020). The mean policy stringency for each country is from daily records from January 7 until August 18, from the OxCGRT stringency index, or for the sub-periods defined by the inflection points in new infections reported in Table 1. The instrumental variables for columns (5) to (7) are the (period-specific) mean policy stringency for other OECD countries in the same region. $N=34$, t statistics from robust standard errors in (), *, **, *** denote statistical significance at the 10%, 5% and 1% level.

Notwithstanding these results, policy responses do not appear to be that important in causing variation in the Covid-19 death tolls. The incremental R^2 is at best four percent, from adding policy stringency variables to the baseline specification in Column (1). If the log death rate is regressed on pre-peak policy stringency alone, the R^2 is only five percent, so the low value of incremental R^2 is not because policy stringency is highly correlated with the baseline characteristics. This view also supports the point made by Sebhatu *et al* (2020), that there was considerable policy mimicry, rather than policy designed to reflect circumstances of each country. One way to show this relatively small impact of policy is to use the model in Column (3) for the counterfactual exercise of setting policy stringency for New Zealand at the more relaxed level adopted by Sweden over the same period, which increases predicted Covid-19 deaths by 62 per million, or an additional 310 deaths in total, which is a relatively small impact.⁶

4. Policy Implications

New Zealand went hard but not early in responding to Covid-19. This is apparent from comparing with responses in other countries and from comparing with likely progress of the virus. This lagged response matters because policy restrictions that are imposed after the peak in new infections is reached appear to have no effect on Covid-19 death rates even while earlier policy stringency does matter. Thus, any review of New Zealand's decision-making about Covid-19 should especially focus on what was (not) being done in February and early March. The repetition of the 'go hard, go early' phrase should not distract from this task.

The debates in New Zealand about the response to Covid-19 also should recognize the key role of baseline characteristics in accounting for cross-country variation in the death toll. Factors such as population size, density and distribution, hospital beds per capita and having a land border are not things that policy makers can change either quickly or at all. The things that policy makers can alter, such as the stringency of the restrictions they put in place to deal with Covid-19, account for only a small part of the variation in the death toll, even when the policy responses are timely. For example, if Sweden's more relaxed restrictions had been in place, New Zealand might have had an additional 300 Covid-19 deaths, which is far less than the claims made in the media about 'thousands of deaths' that reflect lazy comparisons of death rates across very different settings without allowing for this heterogeneity.

⁶ To predict death rates from a regression with log death rates as the dependent variable, I use the Duan (1983) smearing estimate.

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