After conducting the time series analysis, we investigated each country. Below is a table with key points we noted. We choose OECD countries: There are 38 countries in total. Among these, 34 are classified as high-income countries, and 4 as upper-middle income countries. Definition (as per WHO): Income level as defined by GNI per capita. Method of estimation: World Development Indicators database: Low income is $1 045 or less, lower-middle income is $1 046 to $4255, upper-middle income is $4256 to $12744 and high income is $12 745 or more . Costa Rica, Columbia, Mexico and Turkey are upper middle income countries and all other countries are high income countries .

Country	Lockdown	Lockdown Strictness	Vaccination	Healthcare Summary	Is this country broadly following the WHO guidelines for reporting Covid deaths?	comment
Greece	Mar 23 - May 25, 2020 (with regional variations)	Strict (movement restrictions, business closures)	Dec 2020	Initially high cases, managed through measures and vaccination. Tourism impacted.	YES (Primarily uses doctor-certified deaths with confirmed COVID-19, aligning with WHO recommendations.) https://www.who.int/countries/grc	https://www.who.int/europe/emergencies/situations/covid-19
Germany	Dec 16, 2020 - Mar 7, 2021 (with varying levels)	Moderate (school closures, mask mandates, limited business closures)	Dec 2020	Steady case numbers, managed with moderate measures and later vaccination.	YES (Records deaths with confirmed or suspected COVID-19, following WHO guidance on broader case definition.)	Germany's economy contracted by just 5% in 2020, outperforming most European peers.

France	Mar 17 - May 11, 2020 (with later local lockdowns)	Strict (curfew, stay-at-home orders, travel restrictions)	Dec 2020	Initial high cases, later waves managed with measures and vaccination. Economic impact.	YES (Initially faced some challenges due to reporting systems, but adopted WHO recommendations for broader case definition later.)	
Finland	Apr 8 - June 1, 2020 (with regional variations)	Moderate (restaurant closures, remote work encouraged)	Dec 2020	Lower case numbers compared to others, managed with targeted measures and vaccination.	YES (Adheres to WHO guidelines for death certification and reporting, including probable COVID-19 cases.)	
Denmark	Mar 11 - May 10, 2020 (with phased reopening)	Moderate (school closures, gathering restrictions)	dec 2020	Early and efficient response, later waves managed with vaccination. Strong healthcare system.	YES (Implements WHO recommendations for death certification and reporting) https://en.ssi.dk/covid-19	Denmark has become the first country to halt its Covid vaccination program, saying it is doing so because the virus is now under control
Czechia	Mar 16 - May 11, 2020 (with stricter periods)	Strict (curfew, border closures, business closures)	Dec 2020	Initially high cases, later waves managed with measures and vaccination. Healthcare system strain during peaks.	YES (Initially had inconsistencies, but later aligned with WHO guidance for broader case definition and	

					reporting.)	
Austria	Mar 16 - May 4, 2020 (with later regional lockdowns)	Strict (curfew, travel restrictions, business closures)	Dec 2020	High cases initially, later waves managed with measures and vaccination. Tourism heavily impacted.	YES (follows WHO recommendations for death certification and reporting,	
Belgium	Mar 18 - May 4, 2020 (with later regional variations)	Strict (stay-at-home orders, mask mandates, business closures)	Dec 2020	Initial high cases, later waves managed with vaccination. Economic and social challenges.	YES (Initially faced some reporting challenges, but later adopted WHO recommendations for broader case definition and reporting.)	
Australia	Mar 30 - May 9, 2020 (with varying state restrictions)	Moderate (school closures, travel restrictions, gathering limits)	Feb 2021	Suppressed case numbers through measures and early vaccination. State-based responses varied.	YES (Generally adheres to WHO recommendations for death certification and reporting, including probable COVID-19 cases.) https://www.health.gov.au/topics/covid-19/reporting	
New Zealand	Mar 25 - Apr 22, 2020 (with later regional	Strict (border closures, stay-at-home orders)	Feb 2021	Elimination strategy initially successful, later outbreaks managed with	YES (At first it was using 'deaths within 28	

				vaccination. Strict border controls.	days of testing positive for COVID-19' as the definition, but it then changed the definition to 'deaths attributed to COVID-19'. Stringent case definition and reporting system aligns with WHO guidelines, capturing probable and suspected cases.) https://www.tewhatuora.govt.nz/our-health-system/data-and-statistics/covid-19-data/covid-19-current-cases/	
Canada	December 2021- March 2022	Moderate (travel restrictions, isolation, work from home)	Dec 2020	Different public health such as hand hygiene, self-isolation, social distancing, and lockdown, and a testing strategy to identify cases and to find close contacts to the confirmed positive cases	YES They follow most guidelines but every state had its own. https://laws-lois.justice.gc.ca/eng/acts/C-11.01/page-1.html#h-1334525	
United States	No national lockdown implemented. States had their	Varying degrees of restrictions.	Dec 14, 2020 (Each state had their own vaccination	The US struggled with not having enough resources despite spending a lot on healthcare and certain	Mostly followed the guidelines from WHO. However, sometimes they were	

			policies and lockdowns in place)	groups like low-income communities. However, they did well in innovation and research for vaccines.	different because each state had its own way of doing things.	
Mexico	Government applied strict measures to contain the spread during March 2020 but started to reopen on May 2020	Low (only school was close)	Dec 2020	4154 health policies across health institutions were found to be uncoordinated and heterogeneous, leading to health inequalities in access and potential health outcomes	Yes https://www.ssm.gob.mx/portal/coronavirus/descargables/Lineamientos/correcto_llenado_defuncion_0.pdf	
Costa Rica	Borders close, public institutions worked from home. June 2020 they started differentiated restrictions.	Low (first everything close then started with differentiate restrictions, open for tourism on Nov 2020)	Dec 2020	One of the first Latin American countries to launch a COVID-19 vaccination campaign and achieve broad vaccine coverage for those willing to be vaccinated.	Unclear	
Chile	May 2020 the whole city of Santiago was put under mandatory quarantine due to an increase of cases, and similar situations were extended to most of the largest cities in Chile.	Low (Quarantines were established locally in different cities and neighborhoods.)	Dec 2020	One of the fastest countries in the world to inoculate their population: by March 2021 a quarter of the population had received at least one dose.	Unclear	
Colombia	Starting from May 2020, restrictions were gradually	Less strict compared to March during the first lockdown.	Feb 2021	Vaccination rates got better, but they're still not as high as in some other	Generally adhered to WHO guidelines, with some changes to the	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC734544

	lifted, but with variations depending on the region, and specific measures were implemented in response to outbreaks.			South American countries.	national context.	
Turkey	Apr 19th - May 17th, 2020	Strict lockdown. Businesses closed and essential outings required permissions. Restrictions on movement.	Dec 14th, 2020	Responded quickly to the pandemic, establishing a Scientific Advisory Board and issuing health guidelines early on.	Followed most of the WHO case reporting and minor adjustments to national context.	
Korea	National lockdown in Mar 2020	Strict. Mainly focused on social distancing and contact tracing. Heavy restrictions eased by May 2020 and no more national lockdown since but wearing masks was still mandatory and testing requirements.	Dec 2020	Effective response infrastructure with testing, contact tracing, and isolation measures. Resource limitations occurred during peak waves. Primary care and telehealth consultations were prioritized.	Yes Korea generally aligned with WHO guidelines particularly in reporting cases and using case definitions and lastly their testing protocols.	
Japan	No national lockdown but lockdown depended on peak waves across the egions.	More strict in areas during peak waves. Continuation of mask mandates and social distancing.	Feb 2021	There were problems at first with scarce funding and a shortage of hospital beds. The priority was on acting voluntarily and avoiding close contact with other people. Healthcare spending increased over time, and testing capabilities improved.	Followed WHO guidelines in most areas.	Three Cs avoiding strategy- (closed space, crowded places and closed contact settings)

Israel	All restrictions in Israel were removed throughout the spring of 2021, later reintroducing face mask requirements. Restrictions on non-citizens entering the country remained until January 2022.	Two-week self-isolation was imposed on all people coming from abroad and on March 12, schools and universities were closed by the government order, partially switching to distant teaching.	Dec 2020	Israel's healthcare system faced a chronic shortage of healthcare resources; however, as Israel shifted from containment to mitigation, structural characteristics were leveraged to enhance the response. We describe Israel's healthcare system attributes as related to geopolitical and societal status and how these factors affected the outbreak response.	Yes (report of covid deaths and cases, use of mask in public places)	
Ireland	First lockdown March 12, 2020 - May 18(at the earliest), 2020	Strict(First school closures, then national level stay-at-home orders) https://en.wikipedia.org/wiki/COVID-19_pandemic_in_the_Republic_of_Ireland#First_Wave	Dec 29, 2020	One of the lowest excess death rate in the world. Longest first lockdown in Europe, and the economy is severely impacted.	Yes('COVID-19 deaths include deaths in all possible, probable and confirmed COVID-19 cases … and all should be notified, unless there is a clear alternative cause of death that cannot be related to COVID-19 infection (e.g. trauma). ')	

					https://www.hpsc.ie/a-z/respiratory/coronavirus/novelcoronavirus/surveillance/covid-19 deathsreportedireland/COVID-19_Death_Report_Website_v1.8_09012024.pdf	
Slovenia	The first lockdown started from March 16, 2020, and the epidemic was declared over at end of May	Strict(from closure of schools, restaurants and bars, to de facto quarantine.) https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Slovenia	Dec 27, 2020	The first wave was handled with great success, but the government did not prepare well for the second wave, resulting in the fourth highest death rate per capita in the World in March 2021.	Unclear	
Latvia	First state of emergency from March 13, 2020 to June 10, 2020.	Moderate(distance learning, travel restrictions, maintaining of a 2-meter distance in events) https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Latvia	Dec 28, 2020	During the first emergency state starting from March 13, 2020, safety measures and restrictions are put into place, and it was extended to June 10 when 'confirmed infection case dropped to almost 0.' Then there was a spike again in late September 'and many of the restrictions were restored and tightened'. The vaccine roll-out started from December 28, 2020 and 'as of 21 January 2023, 2,974,692	Unclear https://www.spkc.gov.lv/lv/covid-19-statistika	

				COVID-19 vaccine doses had been administered in Latvia.' https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Latvia#Timeline		
Lithuania	Quarantine from March 16,2020 to June 16,2020. A national lockdown took place from November 4, 2020 to July 1, 2021	Moderate to strict(public gathering prohibited, shops and businesses closed apart from certain exeptions, travel restrictions) https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Lithuania#	December 27,2020	Quarantine was put in place for the first wave. Then a colour-based risk zones division took place and the country is divided into green, yellow and red zones based on the risk level. 'But due to the rising numbers, the government announced a national lockdown on 4 November.' 'As of 21 January 2023, 4,529,015 COVID-19 vaccine doses have been administered in Lithuania.' https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Lithuania#December_2020	Unclear	
Estonia	State of emergency from March 13 to May 17,2020.	Moderate('All public gatherings were banned; schools and universities were closed; border control') https://en.wikipedia.org/wiki/COVID-19_pande	December 27,2020 https://www.statista.com/statistics/1242440/estonia-vaccination-again	State of emergency from March 13 to May 17,2020. 'In the first months of 2021 situation grow worse and by mid-March Estonia had the most new cases per capita in the world.' More than 2 million	Unclear	

			st-covid-19-by-date/	vaccines were administrated within a month from the beginning of their allocation. https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Estonia#cite_note-Imperial13March2020-19		
United Kingdom	National lockdown rom March 23, 2020 to May, 2020	Moderate('banning all non-essential travel and contact with other people, and shut schools, businesses, venues and gathering places. People were told to keep apart in public. Those with symptoms, and their households, were told to self-isolate, while those considered at highest risk were told to shield.') https://en.wikipedia.org/wiki/COVID-19_pandemic_in_the_United_Kingdom	December, 2020	'severe impact on the UK's economy, caused major disruptions to education and had far-reaching impacts on society and politics' https://en.wikipedia.org/wiki/COVID-19_pandemic_in_the_United_Kingdom	Yes('Referring deaths to the coroner Doctors are reminded that: COVID-19 is an acceptable direct or underlying cause of death for the purposes of completing the MCCD' 'Sequence leading to death, underlying cause and contributory cases The MCCD is set out in two parts, in accordance with World Health Organisation (WHO) recommendations in the International Statistical Classification of Diseases and Related Health Problems (ICD). You	

				are asked to start with the immediate, direct cause of death on line Ia, then to go back through the sequence of events or conditions that led to death on subsequent lines, until you reach the one that started the fatal sequence.') https://www.gov.uk/government/publications/guidance-notes-for-completing-a-medical-certificate-of-cause-of-death/guidance-for-doctors-completing-medical-certificates-of-cause-of-death-in-england-and-wales-accessible-version	
Switzerland	A State of Extraordinary Situation under the Epidemics Act from March 16 2020, and 'the measures were gradually removed in several phases beginning in late April until June 2020'	Moderate('Most shops were closed nationwide…all gatherings of more than five people in public spaces were banned…restrictions on border crossings')	December 19, 2020 https://en.wikipedia.org/wiki/COVID-19_vaccination_in_Switzerland	Restriction measures implemented On March 16, then gradually removed until June, 'but new measures were imposed in October as cases surged again.' 'As with most countries, the number of people actually have had COVID-19 in Switzerland is likely to be much higher than the	Unclear	

	https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Switzerland			number of confirmed cases, especially as, since 6 March 2020, the Swiss government has had an official policy of not testing people with only mild symptoms.' As for vaccination, 'on August 1, 2021, Switzerland achieved a vaccination rate of 52%.' https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Switzerland#Summary_of_Fiscal_Response		
Sweden	No lockdown in place. https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Sweden	No lockdown in place.(However, there are 'non-voluntary recommendations including working from home where possible, limiting travel within the country, social distancing, and for people above 70 and those with potential COVID-19 symptoms to self-isolate.' https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Sweden	December 27, 2020	Unique strategy of limited measures, no lockdown and other legal restrictions, only 'non-voluntary recommendations'. 'An independent commission that evaluated the response found that Sweden managed to keep excess mortality lower than 31 other European countries' https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Sweden#	Unclear	
Spain	From March 14, 2020 to June 21, 2020	Strict('all non-essential workers were ordered to remain at home for	December 27, 2020	Initially responded slow, 'causing the epidemic to become severe'. Then	Unclear	

		14 days from March 29','Many nonessential activities are forbidden, including large gatherings, restaurants, museums and the like. However, citizens are still permitted to travel to work and buy essential items, and religious services are allowed under certain conditions.' https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Spain#Government_response		strict lockdown was implemented, but was seen as 'partially unconstitutional'. 'By 29 March, visits to retail and recreation places, transit stations and parks had fallen by 94%, 88%, and 89% respectively, and visits to workplaces had reduced by 64%' 'As of 28 March, Goldman Sachs was predicting a double-digit GDP decline for Spain.' https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Spain#Impact		
Slovak Republic	State of emergency was declared on 25 Nov 2021 - 22 Feb 2022	For the first lockdown, schools, non-essential shops and restaurants closed and travel restrictions in place. Second lockdown, non-essential shops and restaurants still closed whilst schools remained open with some restrictions. Third and fourth lockdowns are considered the most strict since the first. Curfews in place.	Dec 26, 2020 From 6 Apr 2022, quarantine for those who are not vaccinated are required for entry into Slovakia.	COVID-19 cases were handled based on their severity, from mild to severe. There were challenges for the healthcare system such as being short staffed, not having enough beds and resources, dealing with misinformation and patient flow. However, they did well by starting lockdowns early, adapting to new info quickly and using telehealth and working with other countries for support.	Not the start of the pandemic but later on adopted those WHO guidelines.	

Portugal	had several lockdowns throughout the pandemic. (Mar - May 2020) (Jan - Feb 2021) (Jan - Feb 2022)	Strict on the suspension of in-person teaching from the 9th of April 2020.	Dec 27, 2020	The healthcare system was overwhelmed in the number of cases in the early stage of the pandemic, This led to resource shortages and staff burnout. There were delays in testing which slowed early case identification and contact tracing.	Yes, reporting of cases and the types of cases were based on WHO recommendations. Also their laboratory testing, they followed standardized WHO testing protocols.	https://covid19estamoson.gov.pt/
Poland	Mar - June 2020 with more lockdowns after this first and most strict one.	Considered strict with schools closed, restaurants and non-essential shops.	Dec 27, 2020	A successful vaccination campaign despite initial hesitancy, and collaboration with international countries for resources sharing and knowledge exchange.	Poland generally adopted WHO case definitions for confirmed and probable COVID-19 cases. In terms of reporting cases for national data, it was based on WHO recommendations.	https://www.gov.pl/web/zdrowie
Norway	Mar - June 2020	Strict. Schools, non-essential shops and cultural events closed. Gatherings restrictions were also in place.	Dec 27, 2020 (similar to other countries)	Experienced shortage of beds, short staffed and other resources too. They managed to achieve high vaccination rates with their targeted strategies and public trust.	Yes. Norway followed WHO case recording guidelines.	https://www.regjeringen.no/en/topics/koronavirus-covid-19
Netherlands	Mar - May 2020	Strict on gatherings, visitors and schools closed until 9 January 2022. Non-essential shops, hospitality venues closed except for click	Dec 27, 2020	The healthcare system faced challenges and achieved some highs. They had to ensure equitable access in caring for the affected diverse population.	Implemented WHO-based data collection and reporting system as well as case definitions with minor adjustments for	

		and collect orders.			national context. https://www.governm ent.nl/topics/coronavir us-covid-19	
Luxembourg	Mar - April 2020. No further lockdown from Dec 2020 but some restrictions remain based on outbreak situations.	Strict. Schools closed as well as restaurants and non-essential shops. Restrictions in place except for essential workers and needs.	Dec 27, 2020	Limited resources due to increased number of cases, shortage of staff occurred at times during peak waves.	Luxembourg followed and was largely aligned with WHO cases recording and testing protocols. https://covid19.public. lu/en/	first country to implement a large-scale testing programme, country that handled pandemic well
Italy	Mar - June 2020	One of the strictest lockdowns in Europe. Schools, restaurants and non-essential shops closed. Restrictions imposed except for essential workers.	Dec 27, 2020	The pandemic caused hospitals to be overcrowded with COVID-19 patients, which led to a lack of beds and staff. Less urgent medical treatments were put off to prioritize COVID-19 care. The stress of the pandemic also affected the mental health of healthcare workers and the public.	Yes. Italy adhered to WHO guidelines in cases reporting.	
Iceland	No lockdown in Iceland but restrictions were imposed on the number of people at gatherings.	Strict with schools closed and businesses. Restrictions in place particularly when moved to each area.	Dec 27, 2020	Concerns on their ICU capacity because of severe cases reported. Whereas the healthcare system's success was the effective use of digital tools.	Yes. Followed WHO guidelines in cases reporting and testing protocols.	

| Hungary | March 2020 and second lockdown in Nov 2020 | Very strict for the first lockdown then less strictness in the second lockdown. | Feb 2021 | Hungary increased their national healthcare funding and main focus on primary care. | Beginning in 2020, the government established an Operative Corps to guide the country's response to the COVID-19 pandemic. Did adhere to the WHO guidelines in terms of case definitions. | https://en.wikipedia.org/wiki/COVID-19_pandemic_in_Hungary |