

COVID 19 Impact: Analysing all-cause mortality and excess deaths.

### Impact of COVID-19 on all-cause mortality

In examining the impact of COVID-19 on all-cause mortality, our analysis depends on data obtained from the Organization for Economic Co-operation and Development (OECD) database. This dataset was chosen for its extensive reportage and up-to-date information. However, it is crucial to be aware of variations in the data. These considerations influence our approach:

- The distinction between the date of occurrence and the date of registration. For some countries reported data may pertain to the date of death registration rather than the actual date of death. Delays in registration are influenced by public holidays, weekends, and the specificities of registering deaths in diverse settings like care homes or the community.
- Account variations in weekly statistics that may not consistently follow a standard week. The counting periods, such as deaths recorded from Saturday to Friday instead of Monday to Sunday, are factors to consider when assessing trends.

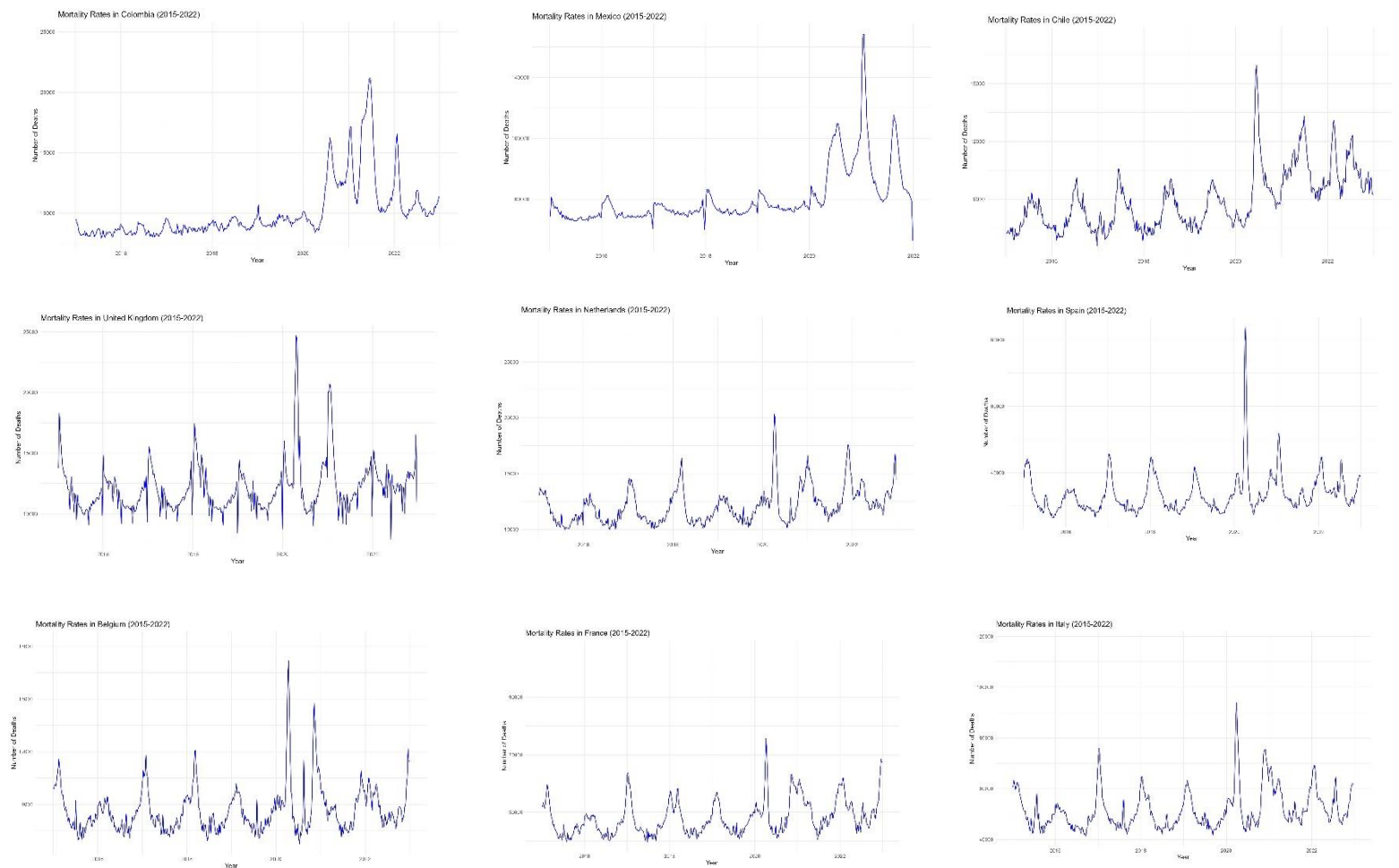
Our dataset encompasses thirty-eight countries and includes variables such as year, gender, ages, population, all-cause deaths, and COVID deaths. The data extraction from the OECD database involved meticulous cleaning, eliminating repetitive variables while guaranteeing the integrity of the information.

In the initial phase of our analysis, we conducted an Exploratory Data Analysis (EDA) to uncover insights into the distribution, patterns, and potential correlations within the dataset. Utilizing time-series plots, we aimed to discern patterns in all-cause mortality across 38 countries from 2015 to 2022. The visualization of time-series data allowed us to observe a notable increase in all-cause mortality rates in most countries in 2022.

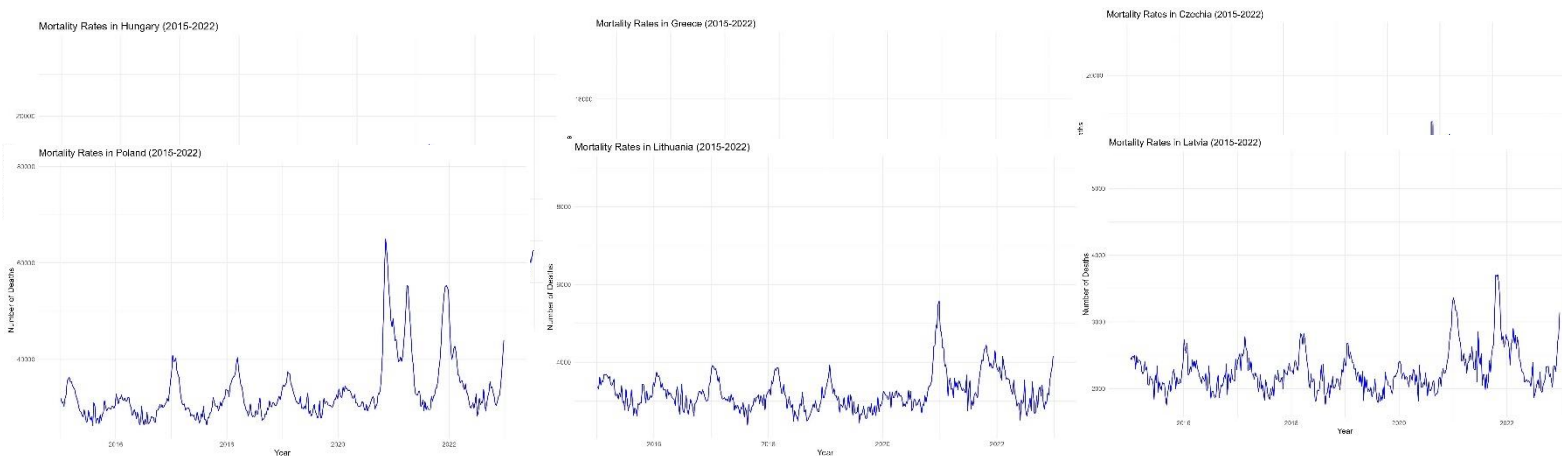
After examining the population and death rates of all the countries, we made a statistical analysis such as mean, median, and standard deviation, so we can compare mortality rates across different countries and years. With these results we were able to compare mortality rates by calculating the percentage of change in mean mortality rates.

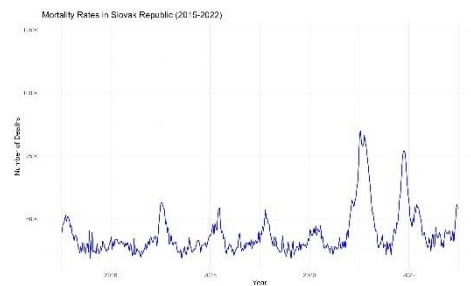
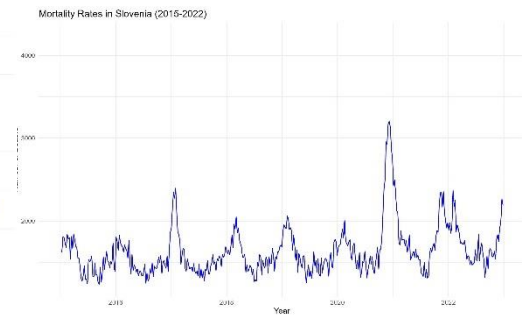
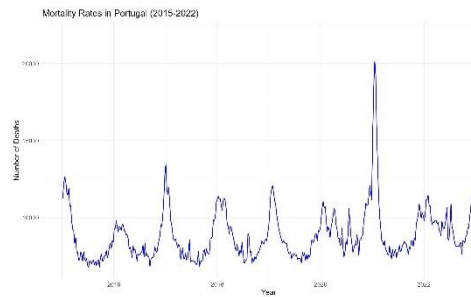
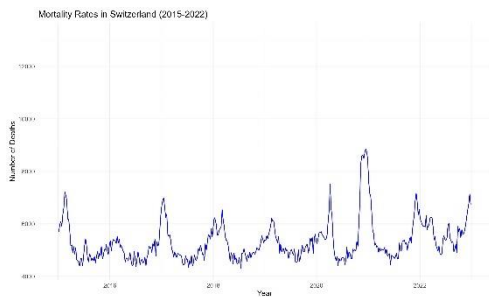
Our analysis reached into the examination of death rate increments since 2015, but since 2020 there were substantial shifts in death rates during key timeframes. Significant increases in death rates were observed in several countries, including Costa Rica, Ireland,

Colombia, Mexico, Chile, the United Kingdom, Spain, the Netherlands, Italy, France, and Belgium.

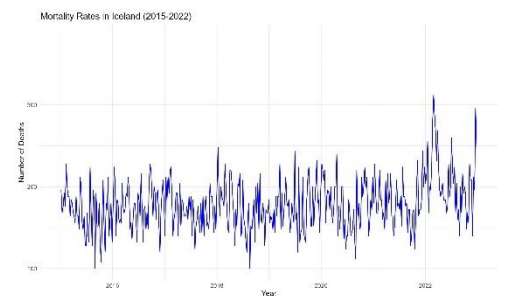
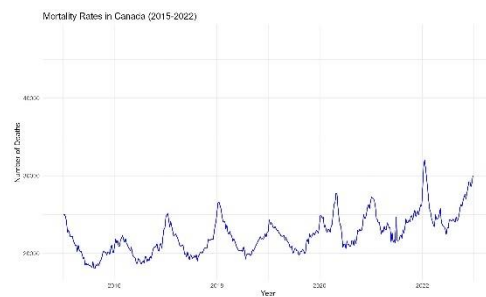
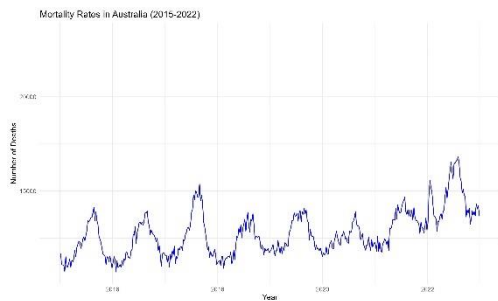


At the end of 2020, countries such as Slovenia, Lithuania, Latvia, Switzerland, the Slovak Republic, Portugal, Poland, Hungary, Greece, and Czechia exhibited marked increments in death rates, signifying potential challenges in managing the impact of the pandemic.





The beginning of 2022 saw distinctive patterns in death rates for countries like Israel, Iceland, Canada, and Australia, highlighting the ongoing evolution of the global health landscape.



At the midpoint of 2022, New Zealand demonstrated unique characteristics in its death rate trends.

Conversely, certain countries, including Estonia, Sweden, Norway, Luxembourg, Germany, Finland, Denmark, and Austria, did not display significant increments in death rates since 2020, maintaining relatively stable mortality patterns. This finding underscores the diverse trajectories that different countries have followed in responding to and mitigating the impact of the COVID-19 pandemic. For a more comprehensive analysis of mortality rate fluctuations, we calculated the percentage change spanning the years 2015 to 2022. This calculation supported us to identify countries experiencing the most noticeable increases on an annual basis since 2015. The graphical representation of these findings emphasizes a significant observation: a strong rise in death rates initiating in 2020, coinciding with the arrival of the global pandemic. This graphical illustration serves as a visual evidence to the impact of the pandemic on mortality trends, providing a clearer understanding of the evolving patterns over the specified time frame.

In our year investigation, significant trends emerged as follows:

2020: Mexico, Colombia, Spain, Poland, Slovenia, and Belgium exhibited a considerable increase, surpassing a 15% increment compared to the previous year. Conversely, New Zealand, Australia, and Norway displayed a negative percentage of change, signifying a decrease in mortality rates compared to the preceding year.

2021: The Slovak Republic, Colombia, Latvia, and Estonia experienced an increment of more than 15% compared to 2020. In contrast, Belgium, Spain, Sweden, Switzerland, Italy,

Slovenia, the United Kingdom, and Luxemburg demonstrated a negative percentage of change, indicating reduced mortality rates compared to 2020.

2022: Iceland, Australia, and New Zealand registered an increase of over 10% compared to 2021. Conversely, Colombia, the Slovak Republic, Czechia, Poland, Hungary, Latvia, Lithuania, Estonia, Slovenia, Greece, the United Kingdom, Luxemburg, the Netherlands, Chile, and Portugal displayed a negative percentage, suggesting a decline in mortality rates relative to 2021. This comprehensive breakdown allows for a detailed examination of specific countries' mortality rate trajectories across the investigated years.

While all-cause mortality in New Zealand, Australia, and Iceland initially declined in 2020, a notable shift emerged by 2022. These countries witnessed increases in both total deaths and, specifically, COVID-19 fatalities, prompting deeper exploration of the factors driving this divergence.

Studying this divergence further revealed a crucial dimension influencing the observed trends: age. As we pursued to unravel the details of the mortality rate shifts between 2020 and 2022, our investigation homed in on the impact of age demographics. Recognizing that age is a key factor in health outcomes, we explored deeper into age-specific data for the countries in focus. This analysis expected to reveal the differential effects of COVID-19 fatalities and overall mortality increases across distinct age groups.

In here we found out that the age group that was reporting more deaths was the 65 and over group

To analyze all cause deaths by year, we took the mean, media, and standard deviation, we chose this because with these measures we can compare between distinct groups and time periods. Being able to see the increase or decrease in mortality rates.

The t-test was used to compare mortality rates between two periods: before COVID-19 and during COVID-19.

The percentage measures the fluctuations in health outcomes over the years. This measure is derived by comparing the current year's mean mortality rate with the rate from the preceding year. The formula employed for this calculation is as follows:

$$\text{percentage change} = \frac{(\text{current year mortality} - \text{previous year mortality})}{\text{previous year mortality}} \times 100$$

Seeing this results, we found that the countries that had a high percentage of change in 2020 show a negative change in 2022 and the ones that had a negative percentage of change in 2020 show the highest percentage of change in 2022. We found this interesting so we did a research and found that the countries that presented the highest percentage of change were the ones that have older population, so we decided to dig more into this and made an analysis by age

After observing these results, we noticed an intriguing trend: countries that experienced a negative percentage change in 2020 demonstrated the highest percentage change in 2022. Intrigued by this pattern, we conducted further research and discovered that the countries with the highest percentage change tended to have older populations. Motivated by this insight, we delved deeper into the data and conducted an age-based analysis.

Intriguingly, our year-long investigation revealed a counterpoint in mortality rate trends: countries that experienced a decline in 2020 saw the highest increases in 2022. Motivated by this observation, we embarked on a more granular investigation of the specific factors driving these mortality rate fluctuations. A central tenet of our analysis involved scrutinizing the role of COVID-19 fatalities and all-cause mortalities in shaping these trends. Through a meticulous dissection of data pertaining to COVID-related mortality and comprehensive consideration of overall deaths across diverse age demographics, we aspired to elucidate the nuanced interplay of forces reshaping the mortality landscape. Now, let us delve into the intricate dance between the pandemic and broader health factors, and their potential influence on the observed patterns.

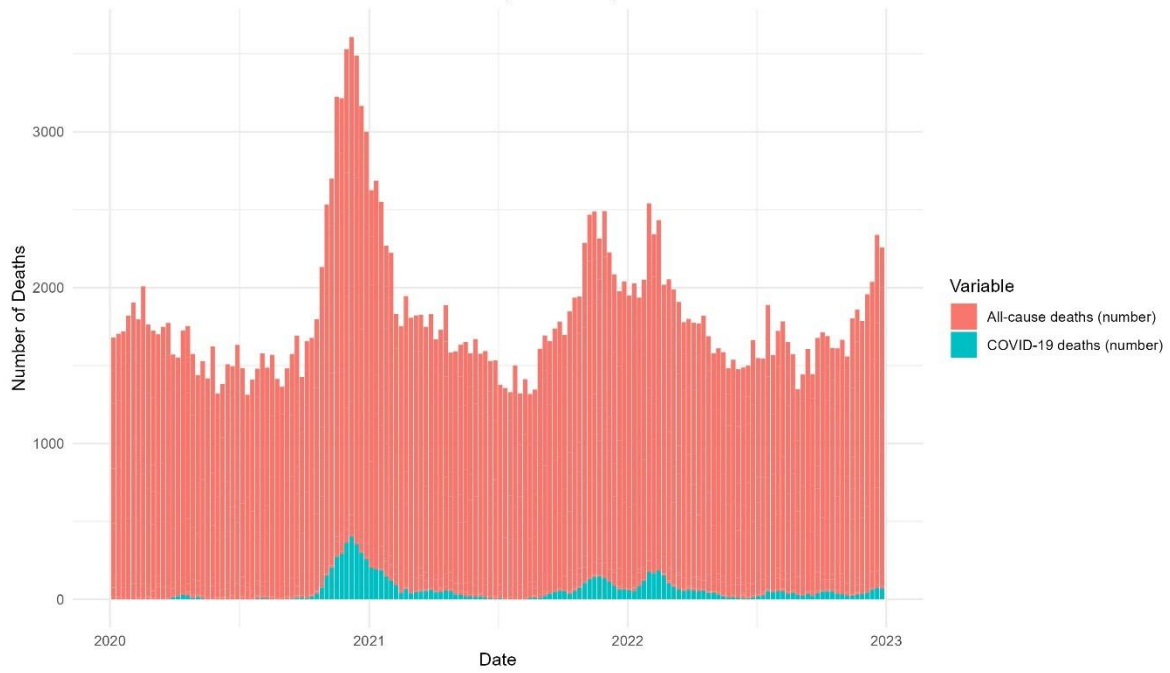
Building on this observation, we delved deeper into the specific factors contributing to these mortality rate shifts. A central aspect of our analysis involved examining the role of COVID deaths and all-cause deaths in shaping these trends. By analyzing the data on COVID-related mortality and considering all cause deaths across various age groups, we aimed to uncover the dynamics influencing the mortality landscape. Let's explore how the interplay between the pandemic and broader health factors may have played a crucial role in the observed patterns.

Motivated by this observation, we conducted an age-based analysis that revealed a crucial factor - nations with higher increases in 2020, often characterized by older populations, tended to see decreases in 2022, supporting the link between age and mortality trajectories. This complex interplay highlights the nuanced impact of factors like initial pandemic exposure, demographics, and public health interventions on different country's mortality patterns.

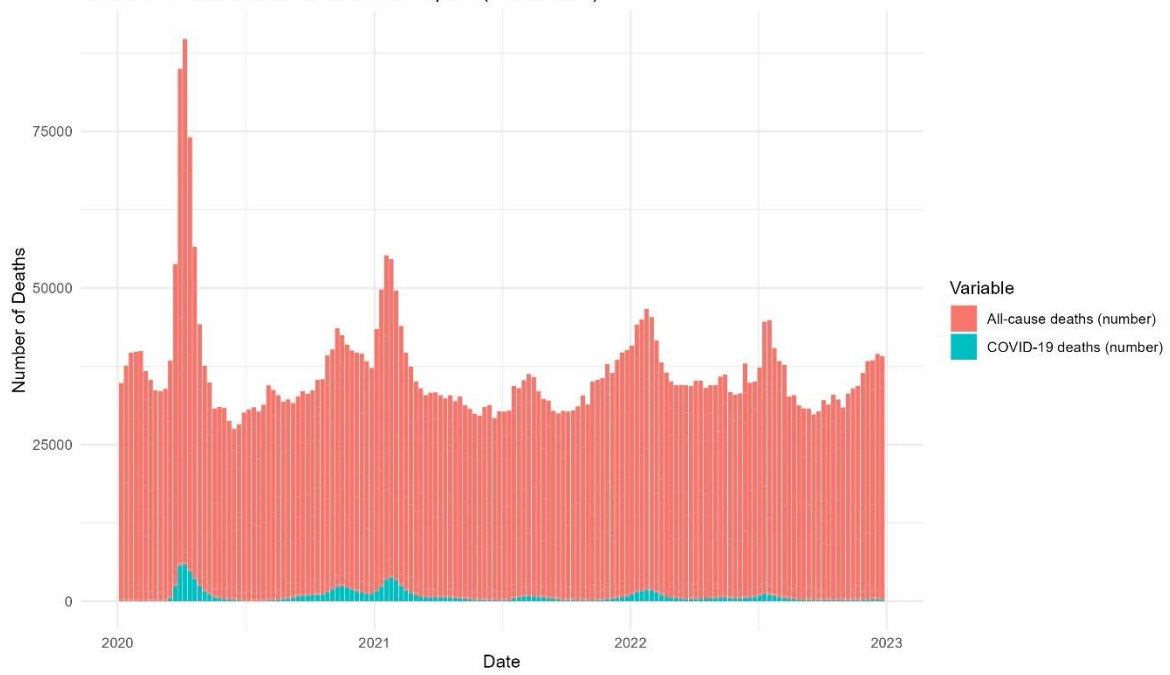
For a more comprehensive analysis of mortality rate fluctuations, we calculated the average percentage increase spanning the years 2020 to 2022 for each country. This calculation allowed us to quantify the rise in mortality rates since 2020. Notably, for Australia, the average percentage increase in mortality rates from 2020 to 2022 was approximately 7.52%. This approach was extended to all countries in our dataset, enabling us to identify those experiencing the most noticeable increases on an annual basis since 2015. The graphical representation of these findings emphasizes a significant observation: a strong rise in death rates initiating in 2020, coinciding with the arrival of the global pandemic. This graphical illustration serves as visual evidence of the impact of the pandemic on mortality trends, providing a clearer understanding of the evolving patterns over the specified time frame.



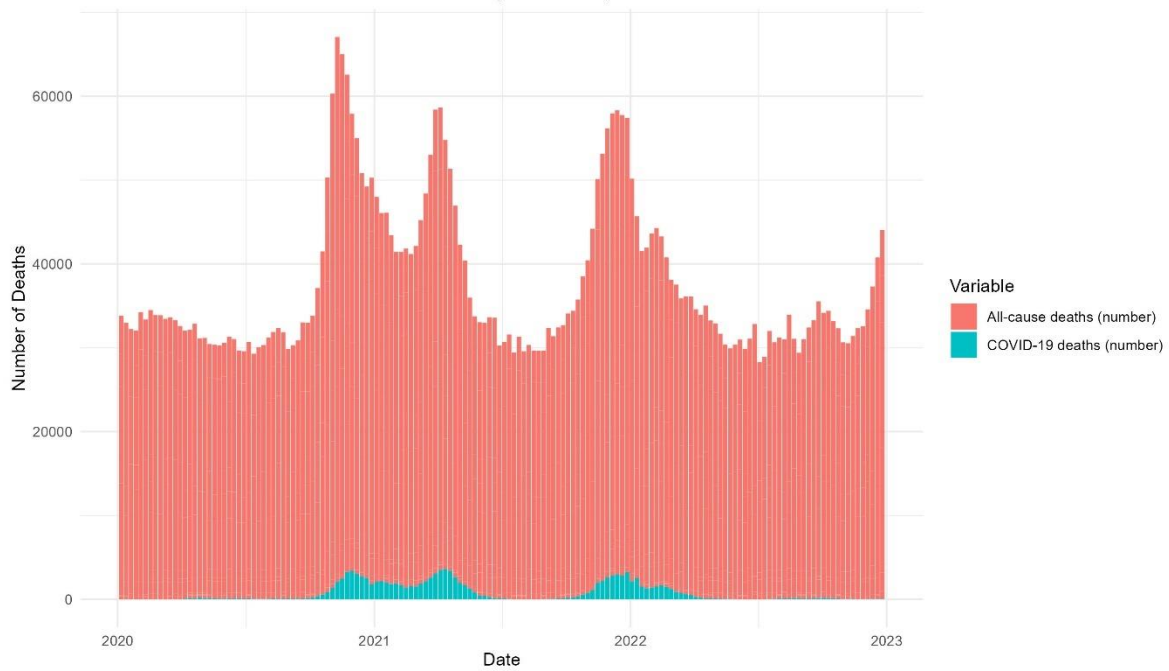
Total Deaths and COVID Deaths in Slovenia (2020-2022)



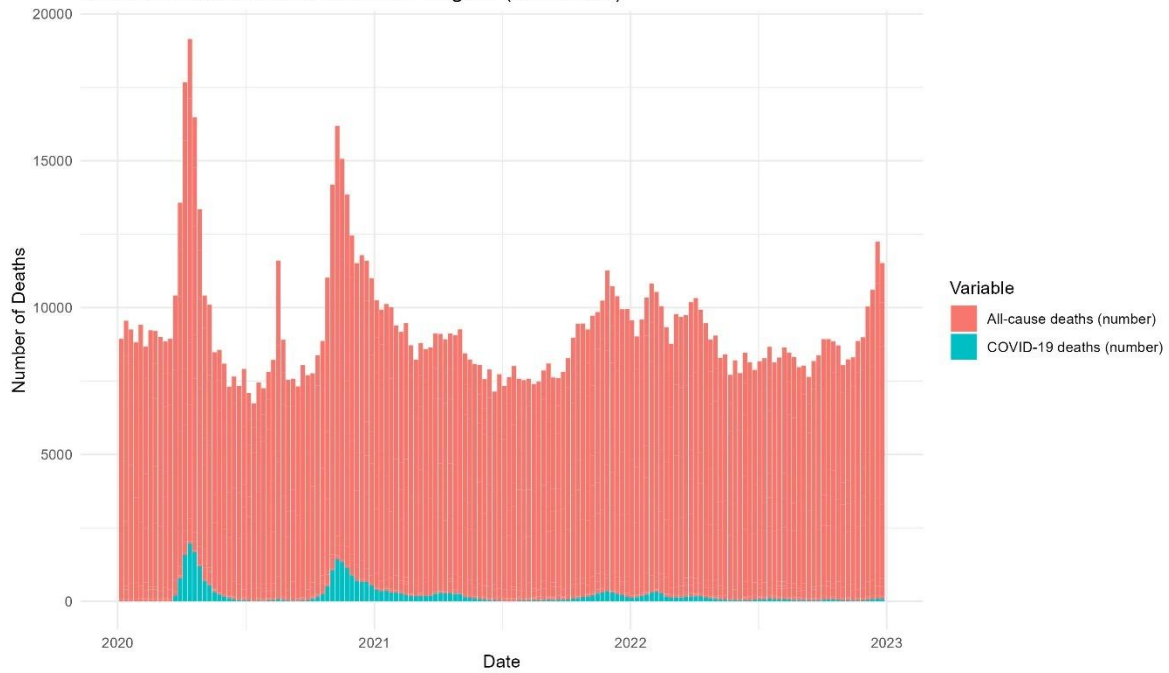
Total Deaths and COVID Deaths in Spain (2020-2022)



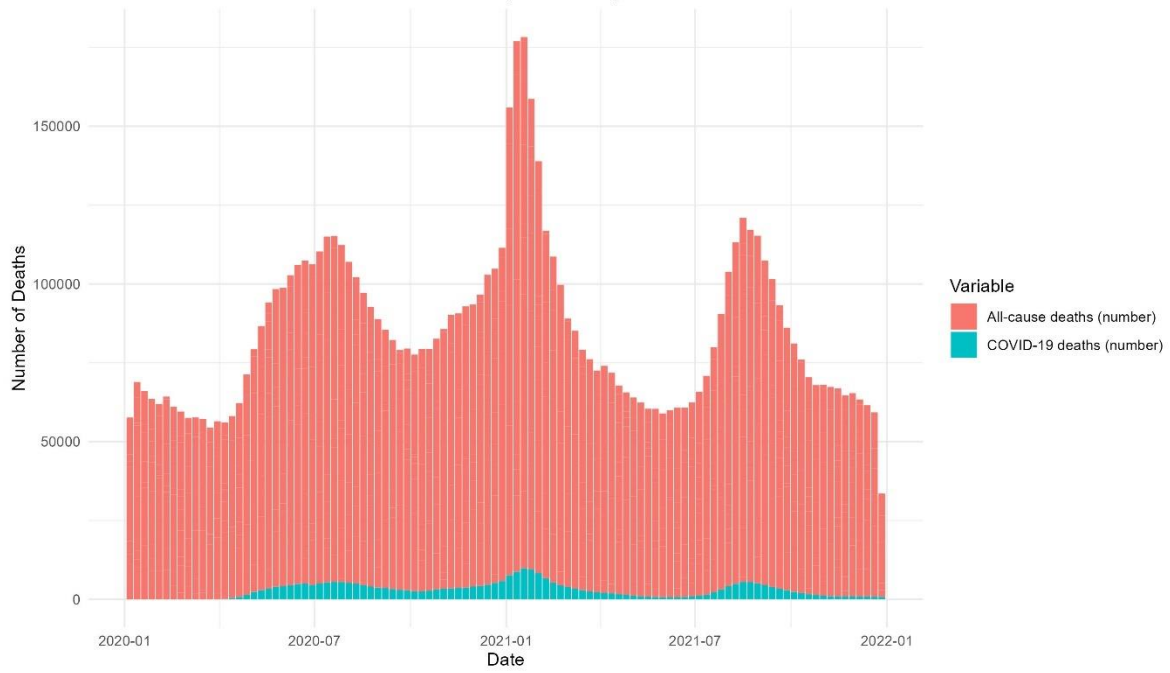
Total Deaths and COVID Deaths in Poland (2020-2022)



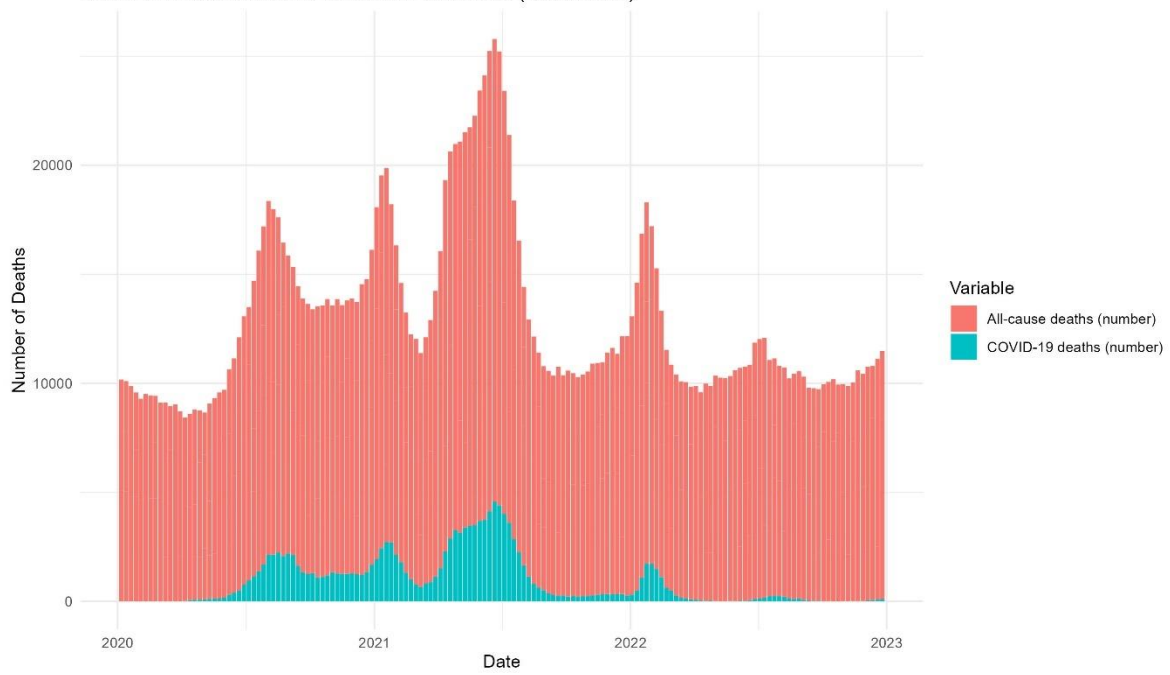
Total Deaths and COVID Deaths in Belgium (2020-2022)



Total Deaths and COVID Deaths in Mexico (2020-2021)

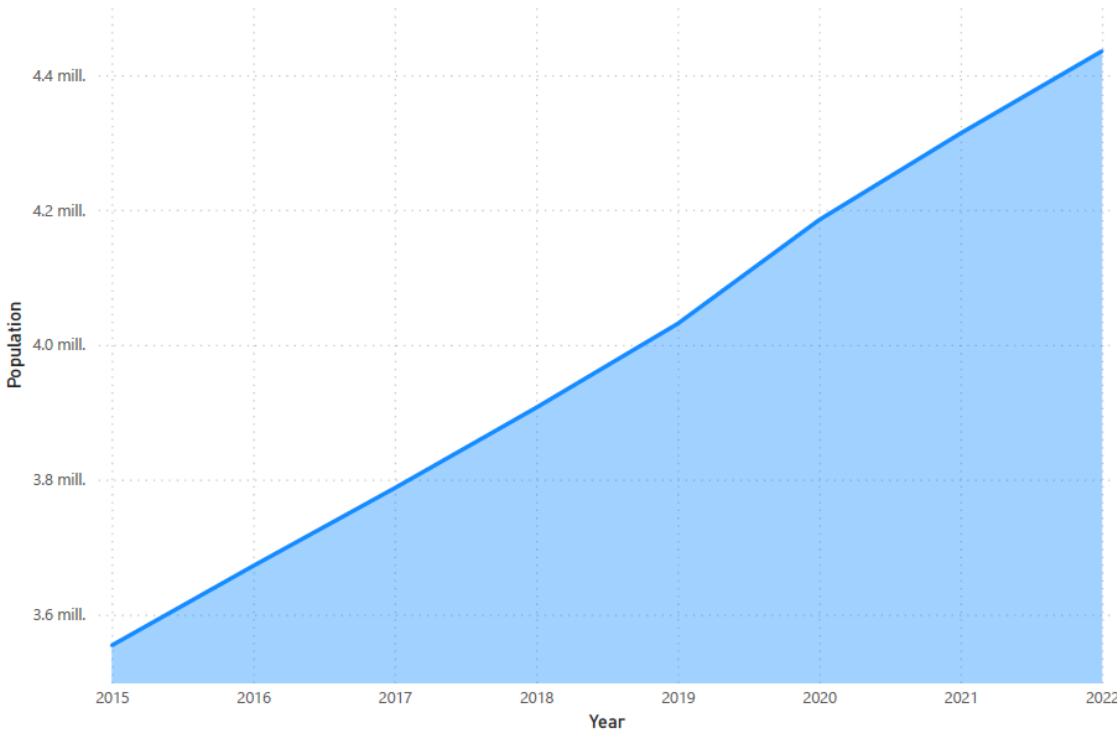


Total Deaths and COVID Deaths in Colombia (2020-2022)

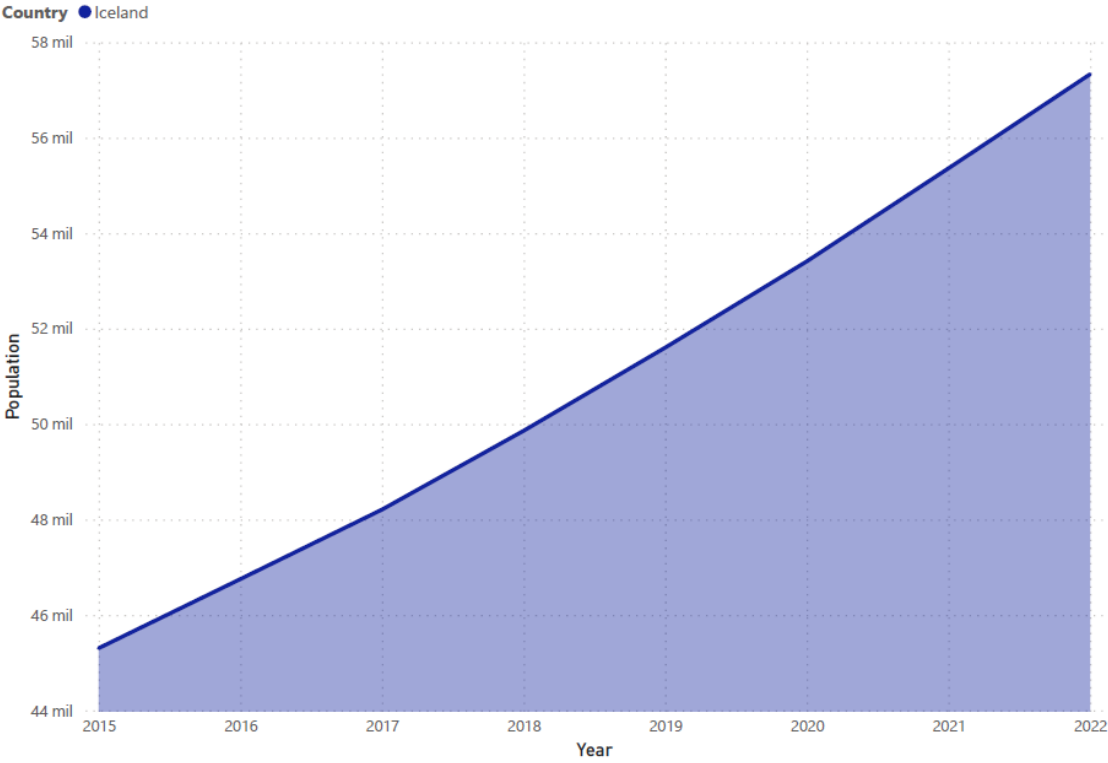


Age Group 65 and over from 2015 to 2022

Country ● Australia



Age Group 65 and over from 2015 to 2022



Age Group 65 and over from 2015 to 2022

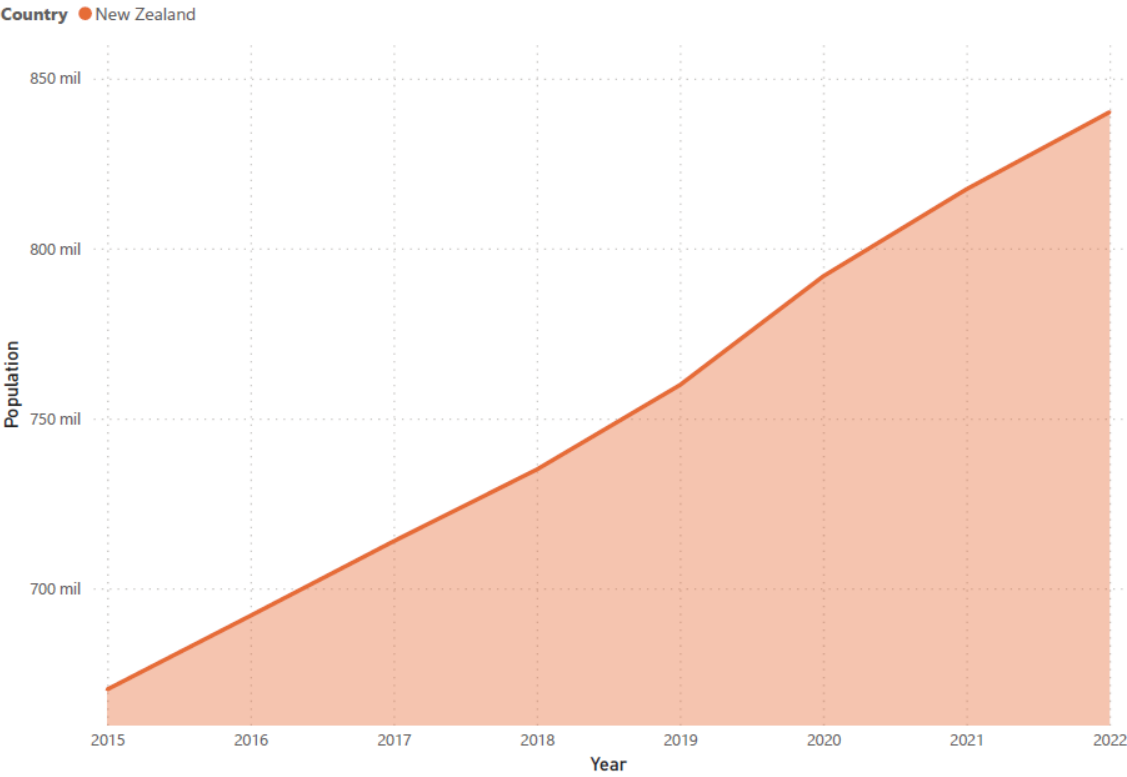


Table. Percentage of change for 2020

Country	PercentageChange 2020	PercentageChange 2021	PercentageChange 2022
Australia	0.23663672	4.21268874	10.8361116
Austria	11.818728	-1.8180622	2.28282964
Belgium	18.4403704	-12.8285785	3.73539605
Canada	9.85120304	-0.42509246	8.30459146
Chile	16.8587771	7.27865312	-0.4489653
Colombia	25.5027165	18.2154638	-21.391416
Costa Rica	14.4798137	17.1508233	-6.95333355
Czechia	17.3634416	5.82231889	-13.8569889
Denmark	3.13525371	2.817333	3.914728
Estonia	4.72867206	14.6914118	-6.59752389
Finland	4.69709945	2.3845511	9.49841954
France	10.988101	-2.84087548	2.15718656
Germany	6.93424444	1.76787624	4.43711119
Greece	6.77367937	8.04586031	-2.35648285
Hungary	10.7975028	8.25143918	-12.3167023
Iceland	3.62350862	-0.29850746	15.0128315
Ireland	3.93010305	5.49670506	2.6766689
Israel	8.15836571	2.27217693	1.69093564
Italy	17.7145221	-6.6870843	0.70966372
Japan	-0.59947883	4.19381043	-0.37292823
Korea	3.94105263	4.33257094	2.29375609
Latvia	6.16676317	17.4989774	-12.2042675
Lithuania	16.0747957	7.08677406	-10.7093947
Luxembourg	8.8386194	-3.81401328	-1.03586545
Mexico	35.9239748	1.78880854	-28.0592932
Netherlands	13.0660664	-0.63814756	-0.60228929
New Zealand	-2.63381728	4.83477423	10.5626113
Norway	1.69043976	1.76183658	8.70674648
Poland	19.1303751	6.81542986	-13.8128012
Portugal	12.5127837	-0.99547114	-0.13811765
Slovak Republic	13.4613574	21.0719323	-18.6489228
Slovenia	18.7764637	-5.39233764	-2.80653125
Spain	19.7416814	-9.87369798	2.68379972
Sweden	12.8165146	-8.64775658	2.61386988
Switzerland	14.3775457	-8.54031235	4.91030343
Turkiye	26.8153029	1.23084095	-19.5240111
United Kingdom	15.9978889	-4.25815619	-1.50739907
United States	20.7620651	0.48626789	-5.18456355

Table. T-test comparison before and during COVID-19

Countries	t_value	df	p_value
Australia before COVID-19 vs. during COVID-19	-2.9251836	3669.144196	0.003463636
Austria before COVID-19 vs. during COVID-19	-3.606607294	3607.502105	0.000314429
Belgium before COVID-19 vs. during COVID-19	-2.629373251	3623.490642	0.008590391
Canada before COVID-19 vs. during COVID-19	-5.118682546	3516.677808	3.24E-07
Czechia before COVID-19 vs. during COVID-19	-5.158308219	3341.927208	2.64E-07
Denmark before COVID-19 vs. during COVID-19	-2.143975882	3712.780359	0.032099576
Finland before COVID-19 vs. during COVID-19	-3.081182772	3631.422325	0.002077246
France before COVID-19 vs. during COVID-19	-3.385594188	3597.183054	0.000717857
Germany before COVID-19 vs. during COVID-19	-3.103222672	1818.14783	0.001943721
Greece before COVID-19 vs. during COVID-19	-4.241439347	3550.699101	2.28E-05
Hungary before COVID-19 vs. during COVID-19	-3.597177657	3522.659567	0.000326108
Iceland before COVID-19 vs. during COVID-19	-2.847351206	3687.339053	0.004432853
Italy before COVID-19 vs. during COVID-19	-3.639543325	3571.293017	0.000276989
Luxembourg before COVID-19 vs. during COVID-19	-2.902342143	3679.337418	0.003725845
Netherlands before COVID-19 vs. during COVID-19	-4.038064259	3536.623663	5.50E-05
New Zealand before COVID-19 vs. during COVID-19	-3.481949778	926.9989168	0.000521021
Norway before COVID-19 vs. during COVID-19	-1.645200899	3781.241671	0.100011505
Poland before COVID-19 vs. during COVID-19	-6.345971933	3239.228003	2.52E-10
Portugal before COVID-19 vs. during COVID-19	-3.747060011	3545.033151	0.000181768
Slovak Republic before COVID-19 vs. during COVID-19	-6.204445237	3236.923656	6.19E-10
Spain before COVID-19 vs. during COVID-19	-3.643621116	3534.639802	0.000272692
Sweden before COVID-19 vs. during COVID-19	-1.066656598	3810.016833	0.286194517
Switzerland before COVID-19 vs. during COVID-19	-3.221822825	3583.665209	0.001285179
United Kingdom before COVID-19 vs. during COVID-19	-5.464740517	221.0650207	1.25E-07
United States before COVID-19 vs. during COVID-19	-4.719615803	1123.120215	2.66E-06
Chile before COVID-19 vs. during COVID-19	-8.386416004	3231.550923	7.39E-17
Estonia before COVID-19 vs. during COVID-19	-3.694005649	3583.642677	0.000224043
Israel before COVID-19 vs. during COVID-19	-5.356996782	881.1670661	1.08E-07
Latvia before COVID-19 vs. during COVID-19	-3.338213439	3588.952731	0.000851786
Lithuania before COVID-19 vs. during COVID-19	-3.715487964	3555.854091	0.00020593
Slovenia before COVID-19 vs. during COVID-19	-4.58854334	3397.67713	4.62E-06
Mexico before COVID-19 vs. during COVID-19	-13.95508999	1606.613568	7.32E-42
Colombia before COVID-19 vs. during COVID-19	-12.01663665	674.4155589	2.81E-30
Ireland before COVID-19 vs. during COVID-19	-3.527317727	905.9190148	0.00044087
Costa Rica before COVID-19 vs. during COVID-19	-6.993906307	64.94491852	1.79E-09

Countries	t_value	df	p_value
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Australia before COVID-19 vs. during COVID-19	-2.9251836	3669.144196	0.003463636
Iceland before COVID-19 vs. during COVID-19	-2.847351206	3687.339053	0.004432853
New Zealand before COVID-19 vs. during COVID-19	-3.481949778	926.9989168	0.000521021

Table. Statistical analysis comparison between two time periods “before COVID-19” and “during COVID-19”.

Country	Mean		Median		SD	
	before COVID	during COVID	before COVID	during COVID	before COVID	during COVID
Australia	644611.2	702424.667	639662	686870	11181.6441	52843.7919
Austria	325393.6	363088	326228	364784	6152.70711	4343.85267
Belgium	438396.8	475368	437112	464552	7529.87724	34257.4619
Canada	1105644	1280031.67	1109545	1249140	34015.7492	58165.1576
Chile	424234	535149.333	424368	545910	8792.53013	20806.6232
Colombia	460755.8	634164.333	453545	611453	18491.3879	79774.6754
Costa Rica	22363	28855	23134	28931	1341.76786	2276.95147
Czechia	444849.6	520682.667	448160	525976	9447.82328	38835.5073
Denmark	214389.2	229057.333	213740	228164	3756.49134	7631.31688
Estonia	61829.6	68898.6667	61904	68804	595.110746	4718.71225
Finland	214780	235816	214604	230312	1660.32768	14430.0004
France	2413032.8	2672470	2417238	2684650	29160.9287	39841.6955
Germany	2784945.4	3070448	2796296	3043061	51396.0928	96891.2639
Greece	487994.4	555891.333	493296	561128	11267.3432	21872.3254
Hungary	521142.4	578947.333	522478	572894	11262.1045	38550.1102
Iceland	9009.6	9829.33333	9000	9380	114.10872	802.638981
Ireland	62560.4	67939.3333	62492	68518	464.037498	2748.0803
Israel	89362	101184.667	88850	101364	1602.14981	1989.07248
Italy	2584378.4	2899165.33	2571856	2845048	68028.2173	111547.355
Japan	1463195.2	1552011.33	1465484	1569228	46845.0911	35030.5125
Korea	292852.4	332747.333	288980	334822	12457.2659	10940.5414
Latvia	113958.4	125424.333	114636	121051	2062.38813	10943.3003
Lithuania	160813.6	178886.667	159960	177288	6493.16786	10259.842
Luxembourg	16663.2	18131.3333	17004	17956	645.491441	473.980309
Mexico	812343.8	1093008.67	821156	1192302	60971.5191	190750.01
Netherlands	601710.4	680826.667	599172	680736	7226.13346	4236.72767
New Zealand	65611.4	70984.6667	66118	69604	2286.74918	5414.66909
Norway	163093.6	171632	162564	167732	1751.44877	9382.96414
Poland	1608219.2	1935142.67	1610132	1942416	37150.8227	143432.376
Portugal	443290.4	498114	442632	496678	5277.10648	3100.3503
Slovak Republic	214228.8	256781.333	214808	241060	4067.27073	30429.7887
Slovenia	80937.6	93246.6667	81712	92356	1562.76319	4003.01753



Spain	1674780.8	1872509.67	1682356	1839149	33924.8831	102275.474
Sweden	355904.8	368529.333	357612	363524	8143.65343	17319.2334
Switzerland	267632.8	295925.333	267552	296380	6013.59753	13195.8759
Turkiye	412024.8	501311	412734	531994	6690.6359	58906.3038
United Kingdom	604473.4	673580.333	604706	667043	6372.92494	20652.1637
United States	5571073.6	6784198.33	5615114	6881392	128663.973	198031.35

Table. Percentage of change in age group 65 and over in total population.

Country	Year	pop_65_over	PercentageChange
Australia	2016	3672251	3.31842746
Australia	2017	3787660	3.1427318
Australia	2018	3906925	3.14877787
Australia	2019	4031367	3.1851648
Australia	2020	4185311	3.81865506
Australia	2021	4313779	3.06949711
Australia	2022	4435789	2.82837855
Austria	2016	1616431	1.37942107
Austria	2017	1635834	1.20036055
Austria	2018	1657884	1.34793628
Austria	2019	1681523	1.42585368
Austria	2020	1707773	1.5610848
Austria	2021	1733049	1.48005619
Austria	2022	1765550	1.87536532
Belgium	2016	2078829	1.57599893
Belgium	2017	2112826	1.63539185
Belgium	2018	2147929	1.66142408
Belgium	2019	2184889	1.72072727
Belgium	2020	2216799	1.46048609
Belgium	2021	2249220	1.46251419
Belgium	2022	2290062	1.81582949
Canada	2016	5920968	3.47295996
Canada	2017	6135012	3.615017
Canada	2018	6355552	3.59477699
Canada	2019	6600010	3.84636928
Canada	2020	6844404	3.70293378
Canada	2021	7082151	3.47359682
Canada	2022	7330605	3.50817146
Chile	2016	1985718	4.16263849
Chile	2017	2070796	4.28449558
Chile	2018	2165195	4.5585852
Chile	2019	2260222	4.38884258

Chile	2020	2358616	4.35328919
Chile	2021	2458699	4.24329352
Chile	2022	2560621	4.14536306
Colombia	2016	3894392	4.11025701
Colombia	2017	4058470	4.21318655
Colombia	2018	4247364	4.65431554
Colombia	2019	4450835	4.79052419
Colombia	2020	4695453	5.49600244
Colombia	2021	4868189	3.67879308
Colombia	2022	5035491	3.43663732
Costa Rica	2016	371569.093	4.48001414
Costa Rica	2017	389840.087	4.91725335
Costa Rica	2018	409257.898	4.98096831
Costa Rica	2019	430287.658	5.13851036
Costa Rica	2020	453077.645	5.29645382
Costa Rica	2021	476772.383	5.22973002
Costa Rica	2022	501152.975	5.11367545
Czechia	2016	1960407	2.86654735
Czechia	2017	2013997	2.73361603
Czechia	2018	2063053	2.43575338
Czechia	2019	2108817	2.21826584
Czechia	2020	2145276	1.72888401
Czechia	2021	2159855	0.67958622
Czechia	2022	2195874	1.66765825
Denmark	2016	1086058	2.08472956
Denmark	2017	1105863	1.82356743
Denmark	2018	1126805	1.89372463
Denmark	2019	1146988	1.79117061
Denmark	2020	1167382	1.77804824
Denmark	2021	1187645	1.7357643
Denmark	2022	1205629	1.51425721
Estonia	2016	252399	1.63568055
Estonia	2017	256429	1.59667828
Estonia	2018	260115	1.43743492
Estonia	2019	264025	1.50318129
Estonia	2020	268421	1.66499385
Estonia	2021	271394	1.10758845
Estonia	2022	274300	1.07076796
Finland	2016	1136537	2.64548496
Finland	2017	1164643	2.47295073
Finland	2018	1192077	2.35557162
Finland	2019	1218057	2.17938942
Finland	2020	1243604	2.09735669

Finland	2021	1267486	1.92038623
Finland	2022	1286775	1.5218314
France	2016	12720473	2.63552085
France	2017	13023872	2.38512357
France	2018	13314321	2.23012788
France	2019	13602819	2.16682473
France	2020	13859808	1.8892334
France	2021	14098498	1.72217393
France	2022	14342496	1.73066663
Germany	2016	17404939	1.22420947
Germany	2017	17609707	1.17649364
Germany	2018	17796623	1.06143731
Germany	2019	17987103	1.07031542
Germany	2020	18181162	1.07887857
Germany	2021	18354067	0.95101182
Germany	2022	18548263	1.05805433
Greece	2016	2306296	1.1106274
Greece	2017	2329951	1.0256706
Greece	2018	2351718	0.93422566
Greece	2019	2374736	0.97877382
Greece	2020	2397027	0.93867276
Greece	2021	2390508	-0.27196189
Greece	2022	2362081	-1.18916147
Hungary	2016	1812405	1.79740104
Hungary	2017	1840095	1.52780422
Hungary	2018	1870960	1.67735905
Hungary	2019	1916095	2.41239791
Hungary	2020	1959451	2.26272706
Hungary	2021	1983505	1.22758875
Hungary	2022	1984836	0.06710344
Iceland	2016	46755	3.19597413
Iceland	2017	48211	3.11410544
Iceland	2018	49862	3.42452967
Iceland	2019	51605	3.49564799
Iceland	2020	53413	3.50353648
Iceland	2021	55362	3.64892442
Iceland	2022	57334	3.56201004
Ireland	2016	629847	3.20792436
Ireland	2017	649877	3.1801374
Ireland	2018	673362	3.61376076
Ireland	2019	696284	3.4041125
Ireland	2020	720141	3.42633178
Ireland	2021	742273	3.07328704

Ireland	2022	768914	3.58911074
Israel	2016	958664	4.25893118
Israel	2017	998127	4.1164579
Israel	2018	1037088	3.90341109
Israel	2019	1074878	3.64385664
Israel	2020	1110793	3.34130943
Israel	2021	1145400	3.11552197
Israel	2022	1179000	2.93347302
Italy	2016	13391566	1.05722626
Italy	2017	13513547	0.91087928
Italy	2018	13629179	0.85567468
Italy	2019	13776150	1.07835549
Italy	2020	13900309	0.90126051
Italy	2021	13996468	0.69177599
Italy	2022	14114424	0.84275547
Japan	2016	34559657	2.04230729
Japan	2017	35087140	1.52629698
Japan	2018	35479224	1.11745785
Japan	2019	35754441	0.77571313
Japan	2020	36026632	0.76127886
Japan	2021	36214248	0.5207703
Japan	2022	36235988	0.06003162
Korea	2016	6757083	3.30086309
Korea	2017	7066060	4.57263881
Korea	2018	7366085	4.24600131
Korea	2019	7688994	4.38372623
Korea	2020	8151867	6.01994227
Korea	2021	8571347	5.14581506
Korea	2022	9018412	5.21580797
Latvia	2016	387246	0.36778141
Latvia	2017	388381	0.29309535
Latvia	2018	388917	0.13800881
Latvia	2019	390195	0.32860482
Latvia	2020	392555	0.60482579
Latvia	2021	392658	0.02623836
Latvia	2022	393268	0.15535148
Lithuania	2016	549363	0.28166186
Lithuania	2017	550998	0.29761742
Lithuania	2018	552085	0.19727839
Lithuania	2019	554174	0.37838376
Lithuania	2020	556511	0.42170871
Lithuania	2021	560283	0.67779433
Lithuania	2022	565847	0.99306957

Luxembourg	2016	83041	2.64901481
Luxembourg	2017	85169	2.56258956
Luxembourg	2018	87267	2.4633376
Luxembourg	2019	89559	2.62642236
Luxembourg	2020	91759	2.4564812
Luxembourg	2021	93968	2.40739328
Luxembourg	2022	96713	2.92120722
Mexico	2016	8479383	3.30876485
Mexico	2017	8771021	3.43937761
Mexico	2018	9081729	3.54243822
Mexico	2019	9412458	3.64169642
Mexico	2020	9763558	3.73016273
Mexico	2021	10135121	3.80561062
Mexico	2022	10527298	3.86948513
Netherlands	2016	3122482	2.49414245
Netherlands	2017	3199385	2.46288049
Netherlands	2018	3276559	2.41215109
Netherlands	2019	3353280	2.34151132
Netherlands	2020	3425045	2.14014338
Netherlands	2021	3491494	1.9400913
Netherlands	2022	3563328	2.05740007
New Zealand	2016	691940	3.23610593
New Zealand	2017	713860	3.16790473
New Zealand	2018	734980	2.9585633
New Zealand	2019	759860	3.38512613
New Zealand	2020	791850	4.20998605
New Zealand	2021	817460	3.2341984
New Zealand	2022	840170	2.77811758
Norway	2016	864959	2.39788139
Norway	2017	885618	2.38843691
Norway	2018	907634	2.48594767
Norway	2019	930329	2.50045723
Norway	2020	953776	2.52029121
Norway	2021	977609	2.49880475
Norway	2022	1000467	2.3381536
Poland	2016	6186885	3.65854272
Poland	2017	6402373	3.48298053
Poland	2018	6618694	3.37876284
Poland	2019	6835529	3.27609948
Poland	2020	7058456	3.26129843
Poland	2021	7175237	1.65448364
Poland	2022	7255004	1.11169847
Portugal	2016	2185731.5	1.88771815

Portugal	2017	2229257	1.99134706
Portugal	2018	2273940	2.0043898
Portugal	2019	2327150	2.33999138
Portugal	2020	2385367.5	2.50166513
Portugal	2021	2436948.5	2.16239217
Portugal	2022	2484783	1.96288514
Slovak Republic	2016	799297.5	3.74996349
Slovak Republic	2017	829757	3.81078384
Slovak Republic	2018	859587	3.59502842
Slovak Republic	2019	889747	3.50866172
Slovak Republic	2020	918599.5	3.24277576
Slovak Republic	2021	937069.5	2.0106695
Slovak Republic	2022	957013	2.12828397
Slovenia	2016	385572	2.95977441
Slovenia	2017	395629	2.60833256
Slovenia	2018	407333	2.95832712
Slovenia	2019	418431	2.72455215
Slovenia	2020	429855	2.73019924
Slovenia	2021	440649	2.51107932
Slovenia	2022	449524	2.01407469
Spain	2016	8752637	1.41167711
Spain	2017	8878946	1.44309652
Spain	2018	9015648	1.53961968
Spain	2019	9177220	1.79212853
Spain	2020	9301398	1.35311129
Spain	2021	9442630.61	1.51840196
Spain	2022	9620056	1.8789826
Sweden	2016	1962044	1.65746658
Sweden	2017	1991503	1.50144441
Sweden	2018	2020931	1.47767791
Sweden	2019	2050539	1.46506734
Sweden	2020	2076732	1.27737146
Sweden	2021	2103428	1.28548123
Sweden	2022	2132948	1.40342336
Switzerland	2016	1509055	1.9416164
Switzerland	2017	1536705	1.83227251
Switzerland	2018	1563832	1.7652705

Switzerland	2019	1591550	1.77244103
Switzerland	2020	1617737	1.64537715
Switzerland	2021	1645493	1.71573006
Switzerland	2022	1676587	1.88964645
Turkiye	2016	6573374	3.61392304
Turkiye	2017	6773447	3.04368807
Turkiye	2018	7040797	3.94703022
Turkiye	2019	7368468	4.65389075
Turkiye	2020	7752143	5.20698468
Turkiye	2021	8099343	4.47876155
Turkiye	2022	8348398	3.0750025
United Kingdom	2016	11814085	1.74761073
United Kingdom	2017	11989322	1.4832888
United Kingdom	2018	12165557	1.469933
United Kingdom	2019	12374961	1.72128576
United Kingdom	2020	12508638	1.08022159
United Kingdom	2021	12537031	0.22698714
United Kingdom	2022	12732805	1.56156589
United States	2016	49208479	3.25795962
United States	2017	50757639	3.14815664
United States	2018	52354605	3.14625745
United States	2019	54036735	3.21295519
United States	2020	54826523	1.46157609
United States	2021	56229126	2.55825634
United States	2022	57794852	2.78454622

Table. Percentage covid deaths.

Country	Year	Population	covid_deaths	PercentageChange
Australia	2020	25655289	922	3.81865506
Australia	2021	25688079	1558	3.06949711
Australia	2022	25978935	16430	2.82837855
Austria	2020	8916845	7795	1.5610848
Austria	2021	8951520	9033	1.48005619
Austria	2022	9052856	4902	1.87536532
Belgium	2020	11506938	19748	1.46048609
Belgium	2021	11552615	8232	1.46251419

Belgium	2022	11640788	4824	1.81582949
Canada	2020	38007166	15632	3.70293378
Canada	2021	38226498	14392	3.47359682
Canada	2022	38929902	18747	3.50817146
Chile	2020	19458310	16724	4.35328919
Chile	2021	19678363	22416	4.24329352
Chile	2022	19828563	24032	4.14536306
Colombia	2020	50407647	43495	5.49600244
Colombia	2021	51117378	86447	3.67879308
Colombia	2022	51682692	12237	3.43663732
Costa Rica	2020	5111238.22	2193	5.29645382
Costa Rica	2021	5163037.97	5164	5.22973002
Costa Rica	2022	5213373.67	1728	5.11367545
Czechia	2020	10700155	12461	1.72888401
Czechia	2021	10500850	24026	0.67958622
Czechia	2022	10759525	5681	1.66765825
Denmark	2020	5825337	1014	1.77804824
Denmark	2021	5850189	24	1.7357643
Denmark	2022	5910577	779	1.51425721
Estonia	2020	1329479	323	1.66499385
Estonia	2021	1330932	1528	1.10758845
Estonia	2022	1348840	895	1.07076796
Finland	2020	5529545	579	2.09735669
Finland	2021	5541020	1086	1.92038623
Finland	2022	5556108	6778	1.5218314
France	2020	67538482	66828	1.8892334
France	2021	67738863	61246	1.72217393
France	2022	67942590	38046	1.73066663
Germany	2020	83160877	52743	1.07887857
Germany	2021	83196076	65968	0.95101182
Germany	2022	83797987	47987	1.05805433
Greece	2020	10698597	5002	0.93867276
Greece	2021	10569211	16006	-0.27196189
Greece	2022	10361270	14122	-1.18916147
Hungary	2020	9750153	10562	2.26272706
Hungary	2021	9709893	28075	1.22758875
Hungary	2022	9643048	8789	0.06710344
Iceland	2020	366462	29	3.50353648
Iceland	2021	372523	9	3.64892442
Iceland	2022	382005	148	3.56201004
Ireland	2020	4977443	2328	3.42633178
Ireland	2021	5011460	3810	3.07328704
Ireland	2022	5100229	2211	3.58911074



Israel	2020	9215113	3433	3.34130943
Israel	2021	9371400	4829	3.11552197
Israel	2022	9528600	3805	2.93347302
Italy	2020	59438845	80915	0.90126051
Italy	2021	59133173	60665	0.69177599
Italy	2022	58940424	51749	0.84275547
Japan	2020	125244761	3548	0.76127886
Japan	2021	124612530	14847	0.5207703
Japan	2022	123951692	39326	0.06003162
Korea	2020	51844690	962	6.01994227
Korea	2021	51830139	4768	5.14581506
Korea	2022	51815810	26571	5.21580797
Latvia	2020	1900448	728	0.60482579
Latvia	2021	1884488	4159	0.02623836
Latvia	2022	1879374	2171	0.15535148
Lithuania	2020	2794885	2523	0.42170871
Lithuania	2021	2808380	5586	0.67779433
Lithuania	2022	2833000	1250	0.99306957
Luxembourg	2020	630413	295	2.4564812
Luxembourg	2021	640064	345	2.40739328
Luxembourg	2022	653108	321	2.92120722
Mexico	2020	127792286	150442	3.73016273
Mexico	2021	128972439	153583	3.80561062
Mexico	2022	130118356	27503	3.86948513
Netherlands	2020	17441500	12205	2.14014338
Netherlands	2021	17533048	8887	1.9400913
Netherlands	2022	17703092	1894	2.05740007
New Zealand	2020	5090200	25	4.20998605
New Zealand	2021	5111400	26	3.2341984
New Zealand	2022	5124100	2280	2.77811758
Norway	2020	5379472	547	2.52029121
Norway	2021	5408320	888	2.49880475
Norway	2022	5457129	596	2.3381536
Poland	2020	38354173	29179	3.26129843
Poland	2021	38162224	68795	1.65448364
Poland	2022	37827355	20953	1.11169847
Portugal	2020	10384846	7225	2.50166513
Portugal	2021	10407707	11777	2.16239217
Portugal	2022	10444241.5	6821	1.96288514
Slovak Republic	2020	5458827	3410	3.24277576
Slovak Republic	2021	5441991	13540	2.0106695

Slovak Republic	2022	5431752	2498	2.12828397
Slovenia	2020	2100126	3129	2.73019924
Slovenia	2021	2107007	3024	2.51107932
Slovenia	2022	2108732	2718	2.01407469
Spain	2020	47355685	55251	1.35311129
Spain	2021	47331302	36755	1.51840196
Spain	2022	47615034	27147	1.8789826
Sweden	2020	10353444	10085	1.27737146
Sweden	2021	10415812	5288	1.28548123
Sweden	2022	10486941	7044	1.40342336
Switzerland	2020	8638169	7756	1.64537715
Switzerland	2021	8704542	4207	1.71573006
Switzerland	2022	8775757	1921	1.88964645
Turkiye	2020	83384680	20881	5.20698468
Turkiye	2021	84147318	61480	4.47876155
Turkiye	2022	84979913	18842	3.0750025
United Kingdom	2020	67081234	267727	1.08022159
United Kingdom	2021	67026292	252132	0.22698714
United Kingdom	2022	67299048	150216	1.56156589
United States	2020	331511512	392818	1.46157609
United States	2021	332031554	457832	2.55825634
United States	2022	333287557	244514	2.78454622

Country	2016	2017	2018	2019	2020	2021
Australia	3.31842746	3.1427318	3.14877787	3.1851648	3.81865506	3.06949711
Austria	1.37942107	1.20036055	1.34793628	1.42585368	1.5610848	1.48005619
Belgium	1.57599893	1.63539185	1.66142408	1.72072727	1.46048609	1.46251419
Canada	3.47295996	3.615017	3.59477699	3.84636928	3.70293378	3.47359682
Chile	4.16263849	4.28449558	4.5585852	4.38884258	4.35328919	4.24329352
Colombia	4.11025701	4.21318655	4.65431554	4.79052419	5.49600244	3.67879308
Costa Rica	4.48001414	4.91725335	4.98096831	5.13851036	5.29645382	5.22973002
Czechia	2.86654735	2.73361603	2.43575338	2.21826584	1.72888401	0.67958622
Denmark	2.08472956	1.82356743	1.89372463	1.79117061	1.77804824	1.7357643
Estonia	1.63568055	1.59667828	1.43743492	1.50318129	1.66499385	1.10758845
Finland	2.64548496	2.47295073	2.35557162	2.17938942	2.09735669	1.92038623
France	2.63552085	2.38512357	2.23012788	2.16682473	1.8892334	1.72217393
Germany	1.22420947	1.17649364	1.06143731	1.07031542	1.07887857	0.95101182
Greece	1.1106274	1.0256706	0.93422566	0.97877382	0.93867276	- 0.27196189
Hungary	1.79740104	1.52780422	1.67735905	2.41239791	2.26272706	1.22758875
Iceland	3.19597413	3.11410544	3.42452967	3.49564799	3.50353648	3.64892442
Ireland	3.20792436	3.1801374	3.61376076	3.4041125	3.42633178	3.07328704
Israel	4.25893118	4.1164579	3.90341109	3.64385664	3.34130943	3.11552197
Italy	1.05722626	0.91087928	0.85567468	1.07835549	0.90126051	0.69177599
Japan	2.04230729	1.52629698	1.11745785	0.77571313	0.76127886	0.5207703
Korea	3.30086309	4.57263881	4.24600131	4.38372623	6.01994227	5.14581506
Latvia	0.36778141	0.29309535	0.13800881	0.32860482	0.60482579	0.02623836
Lithuania	0.28166186	0.29761742	0.19727839	0.37838376	0.42170871	0.67779433
Luxembourg	2.64901481	2.56258956	2.4633376	2.62642236	2.4564812	2.40739328
Mexico	3.30876485	3.43937761	3.54243822	3.64169642	3.73016273	3.80561062
Netherlands	2.49414245	2.46288049	2.41215109	2.34151132	2.14014338	1.9400913
New Zealand	3.23610593	3.16790473	2.9585633	3.38512613	4.20998605	3.2341984
Norway	2.39788139	2.38843691	2.48594767	2.50045723	2.52029121	2.49880475
Poland	3.65854272	3.48298053	3.37876284	3.27609948	3.26129843	1.65448364
Portugal	1.88771815	1.99134706	2.0043898	2.33999138	2.50166513	2.16239217
Slovak Republic	3.74996349	3.81078384	3.59502842	3.50866172	3.24277576	2.0106695
Slovenia	2.95977441	2.60833256	2.95832712	2.72455215	2.73019924	2.51107932
Spain	1.41167711	1.44309652	1.53961968	1.79212853	1.35311129	1.51840196
Sweden	1.65746658	1.50144441	1.47767791	1.46506734	1.27737146	1.28548123
Switzerland	1.9416164	1.83227251	1.7652705	1.77244103	1.64537715	1.71573006
Turkiye	3.61392304	3.04368807	3.94703022	4.65389075	5.20698468	4.47876155
United Kingdom	1.74761073	1.4832888	1.469933	1.72128576	1.08022159	0.22698714
United States	3.25795962	3.14815664	3.14625745	3.21295519	1.46157609	2.55825634

