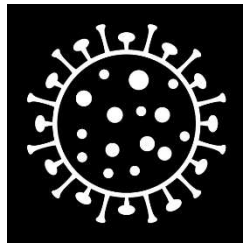


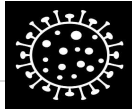
**National Public Health Emergency Team**



Coronavirus  
**COVID-19**  
Public Health  
Advice

**COVID-19: Comparison of Mortality Rates  
between Ireland  
and other countries in EU and Internationally**

**28 May 2020**



## COVID 19

### Comparison of Mortality Rates between Ireland and other countries in EU and internationally

#### Introduction

Comparative analysis of pandemic related mortality in different countries is important to describe the impact of the pandemic on populations, to inform health system responses and to assess the effectiveness of countermeasures taken at national level by different countries. Countries across the world currently report widely different mortality experiences with COVID-19, as demonstrated in Figures 1 and 2 overleaf<sup>1</sup>.

However, there are several factors affecting mortality which make direct comparisons between countries difficult. These include:

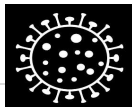
- Differences in testing availability and testing strategies, case ascertainment.
- Differences in mortality case definition and reporting e.g. probable and confirmed, community and hospitalised.
- Demography – age, socio-economic factors:
  - e.g. age structure – percentage of population 65+: Italy 23%, Sweden 20%, Austria 19%, Spain 19%, UK 18%, Ireland 13%.
- Geographic – population density and urban distribution.
- International travel patterns - Number of initial seedings / ongoing importation patterns:
  - Transport hubs – Paris, Brussels and London as major international aviation hubs are judged to have led to multiple introductions and contributed to rapid increase in initial cases in France, Belgium and the UK.
- Point on epidemic curve – rising or falling.
- Timing, stringency and effectiveness of public health measures – case detection, contact tracing, isolation, social distancing, travel restrictions:
  - countries with early imposition of lockdown measures including New Zealand, Austria, Denmark and Norway had lower case notification and death rates.
- Effectiveness at controlling outbreaks in nursing homes and other congregated settings
- Health service capacity and efficacy considerations.
  - ICU bed capacity, availability of ventilators a major factor in mortality in outbreaks where health service capacity was overwhelmed e.g. Italy and Spain.

This paper briefly reviews COVID-19 mortality in Ireland in comparison with a number of comparable health systems and reviews possible factors which have contributed to Irish mortality experience to date.

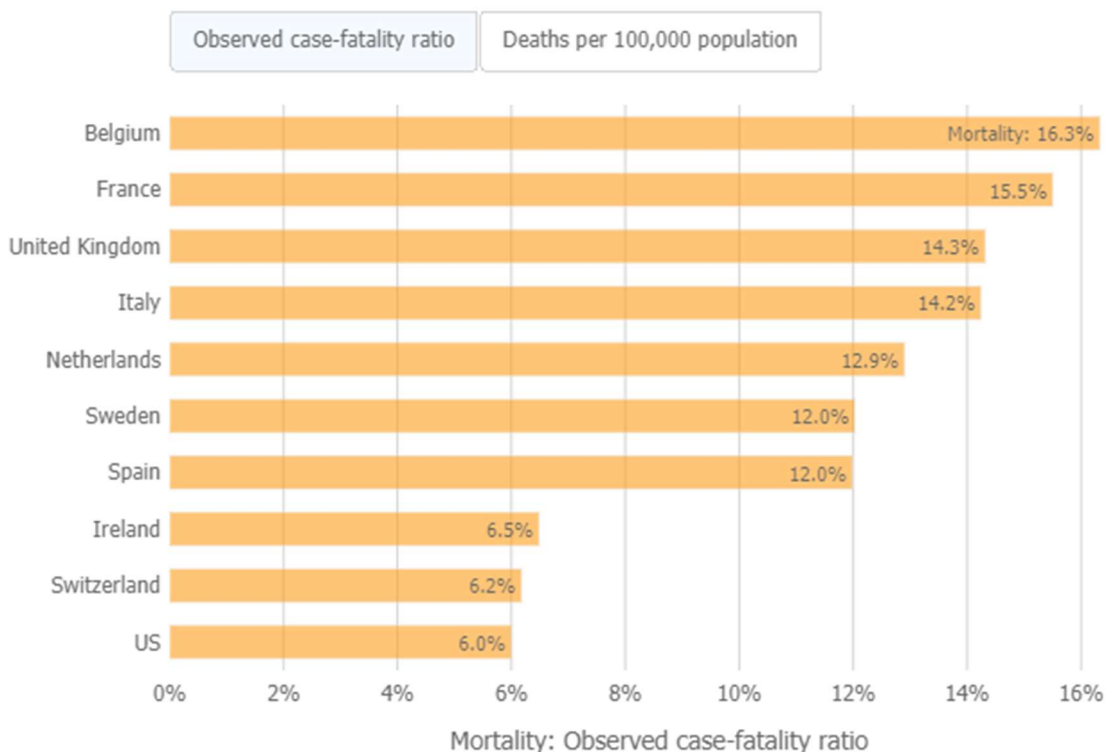
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<sup>1</sup> <https://coronavirus.jhu.edu/data/mortality>

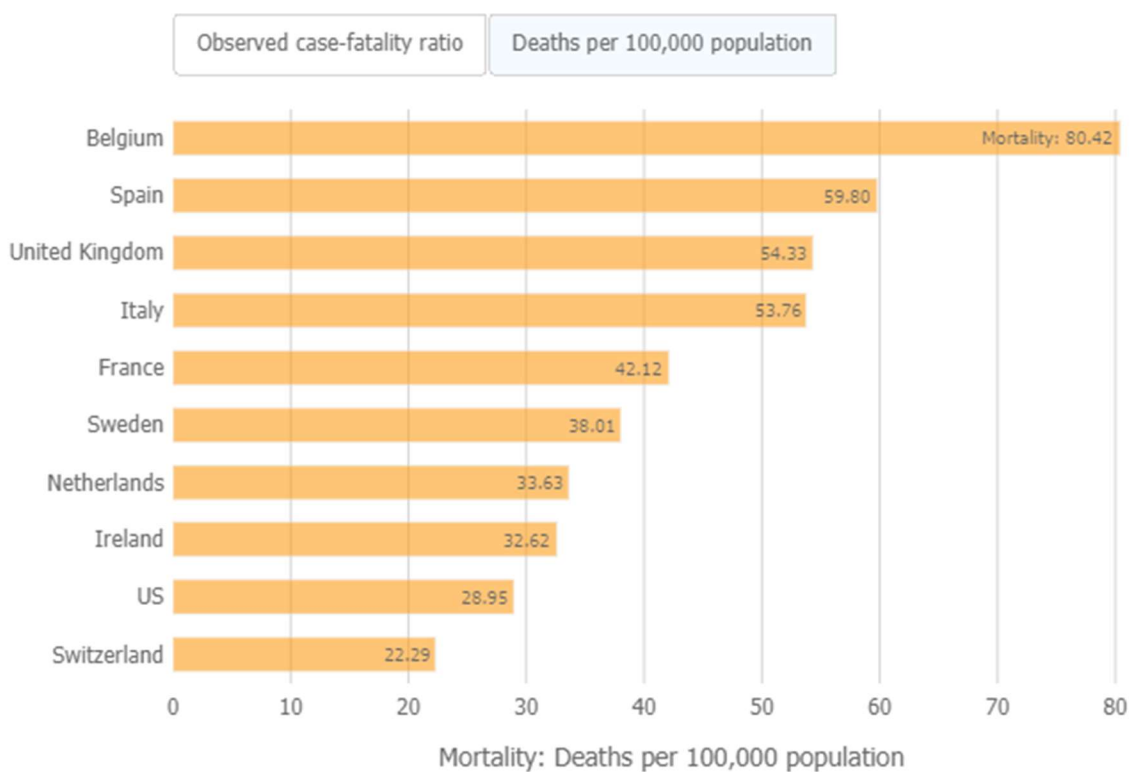




**Figure 1: Observed case-fatality ratio**

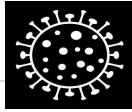


**Figure 2: Deaths per 100,000 population**



Source: <https://coronavirus.jhu.edu/data/mortality>





## Case Ascertainment and Mortality Reporting

Simple comparison of nationally reported figures of COVID-19 cases and deaths is **not appropriate** as a means of mortality comparison because of the wide differences between countries in testing availability, testing strategies and differences in mortality case definitions and reporting.

From the outset of the pandemic, Ireland has reported all deaths in both hospital and community settings of laboratory confirmed cases of COVID-19, unlike many other countries which have reported deaths in hospitalised cases only. Following a NPHE decision in mid-April, Ireland further extended its mortality reporting to include deaths in probable COVID-19 cases (as well as laboratory confirmed), in line with new guidance issued by the World Health Organization in April regarding the classification of COVID-19 as a cause of death as follows: *"A death due to COVID-19 is defined for surveillance purposes as a death resulting from a clinically compatible illness, in a probable or confirmed COVID-19 case, unless there is a clear alternative cause of death that cannot be related to COVID disease (e.g. trauma). There should be no period of complete recovery from COVID-19 between illness and death. A death due to COVID-19 may not be attributed to another disease (e.g. cancer) and should be counted independently of pre-existing conditions that are suspected of triggering a severe course of COVID-19."* In doing so, we have sought to provide the fullest and most accurate picture possible of the impact of COVID-19 on mortality.

The impact of inter-country differences in case ascertainment and mortality case definitions is illustrated in Table 1, which shows that Ireland has a relatively high reported population incidence rate of COVID-19 cases (480.78/100,000) when compared with England (232/100,000), Scotland (225/100,000) and Wales (358/100,000).

Despite this difference in incidence rates, which can be attributed to a higher testing strategy in Ireland, Ireland has substantially lower reported mortality rates than the UK countries. In addition, Irish mortality figures include confirmed and probable cases in all settings, whereas figures from England and Wales include only laboratory confirmed. It is important to note that Scotland reports registered deaths unlike the other UK countries in the table, which is likely to explain the higher mortality rate in Scotland. Scotland has reported that its registered death data is 77% greater than that based on laboratory confirmed deaths only (2795 versus 1576).

Similarly, as demonstrated in Figure 3 which shows cumulative cases of COVID-19/100,000 population in Ireland and ten EU Member States (ECDC data), Ireland ranks as one of the countries with the highest overall rate of cases of the countries reviewed, again reflecting the relatively high testing and case ascertainment rate in Ireland. By contrast, in Figure 4 which demonstrates cumulative reported deaths from COVID-19/100,000 population in the same eleven countries, the mortality rate in Ireland ranks 4<sup>th</sup> lowest overall of the countries reviewed.



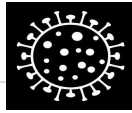


Figure 5 and Figure 6 show cumulative cases of COVID19 and deaths from COVID19 in the same eleven countries adjusted for population density. By this metric, mortality in Ireland ranks **third lowest** of the same eleven countries and has a markedly lower mortality curve than the three highest ranked countries (Spain, France and Italy).

Figure 7 demonstrates the reported case fatality ratio over the course of the epidemic to 21<sup>st</sup> May 2020 in eleven EU Member States. Ireland's case fatality ratio has plateaued at just over 6% and is slightly higher than Denmark, Germany, Austria and Norway. Of these countries, Ireland is the only country reporting confirmed and probable deaths. France, Belgium, UK, Italy, Sweden and Spain have a reported case fatality ratio approximately double the Irish rate, ranging from 12% -19.7%.

It is important to emphasise that the reported case fatality ratio will vary between countries as a result of demographic differences, testing availability, testing strategies and differences in mortality case definitions and reporting as well as differences in health service performance and countermeasures employed.





**Table 1: UK and Ireland Cases and Deaths: 11 May 2020**

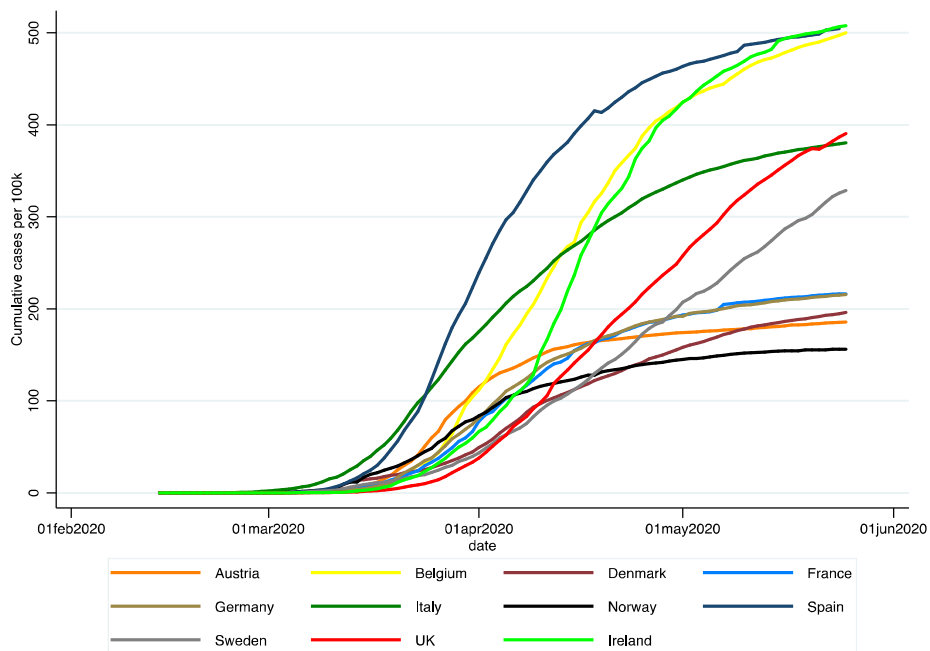
Area	No. of Cases (6 May 2020)	Incidence Rate*	No. of Deaths (6 May 2020)	Death Rate**	Population	
<b>England</b>	<b>129,799</b>	<b>232/100,000</b>	<b>27,008</b>	<b>48.3/100,000</b>	<b>55.9 million</b>	
North West	21,000	288/100,000	4,197	58/100,000		
West Midlands	14,151	240/100,000	3,480	59/100,000		
South West	6,726	120/100,000	1,373	25/100,000		
South East	18,025	203/100,000	3,428	39/100,000		
North East	8,395	316/100,000	1,428	54/100,000		
Yorkshire & The Humber	11,477	209/100,000	2,238	41/100,000		
East Midlands	7,292	152/100,000	1,869	39/100,000		
East of England	11,874	184/100,000	2,991	46/100,000		
London	25,357	285/100,000	5,580	63/100,000		
Information on residential location is pending for 5,502 cases and 424 deaths Number of deaths with lab-confirmed COVID-19 in all settings as of 5pm on Tuesday, 5 <sup>th</sup> May Relates only to tests performed under Pillar 1 of the UK Government COVID-19 testing programme *Incidence Rate - the cumulative number of confirmed cases of COVID-19 since 31 January 2020 divided by the population of each PHE Centre multiplied by 100,000. **Death Rate – the total number of people who have died in England and had tested positive for COVID-19 since 31 January 2020 divided by the total population of each PPE Centre multiplied by 100,000.						
Area	No. of Cases (4 May 2020)	Incidence Rate	No. of Deaths (3 May 2020)	Death Rate		Population
<b>Scotland</b>	<b>12,226 cases</b>	<b>225/100,000</b>	<b>2,795</b>	<b>50/100,000</b>	<b>5.5 million</b>	
Note: In week 18, 59% of deaths occurred in care homes. Of all 2795 deaths 43% occurred in care homes. This Scottish data uses registered deaths unlike other UK reports. The Scottish report that registered death data is 77% greater than that based on laboratory confirmed deaths only (2795 versus 1576) <sup>2</sup>						
Area	No. of Cases (11 May 2020)	Incidence Rate	No. of Deaths (10 May 2020)	Death Rate	Population	
<b>Wales</b>	<b>11,468 cases</b>	<b>358/100,000</b>	<b>1,116</b>	<b>36/100,000</b>	<b>3.2 million</b>	
Note: Deaths: lab-confirmed deaths and clinician says causative factor)						
Area	No. of Cases (9 May 2020)	Incidence Rate	No. of Deaths (10 May 2020)	Death Rate	Population	
<b>Ireland</b>	<b>22,894 cases</b>	<b>480.78/100,000</b>	<b>1,458</b>	<b>29.6/100,000</b>	<b>4,929,643 million</b>	

<sup>2</sup> Deaths involving coronavirus (COVID-19) in Scotland Week 18 (27 April to 3 May 2020) The Welsh data is taken from the Welsh dashboard on the Public Health Wales website. The English data is taken from the weekly Covid19 surveillance infographic 6<sup>th</sup> May PHE website

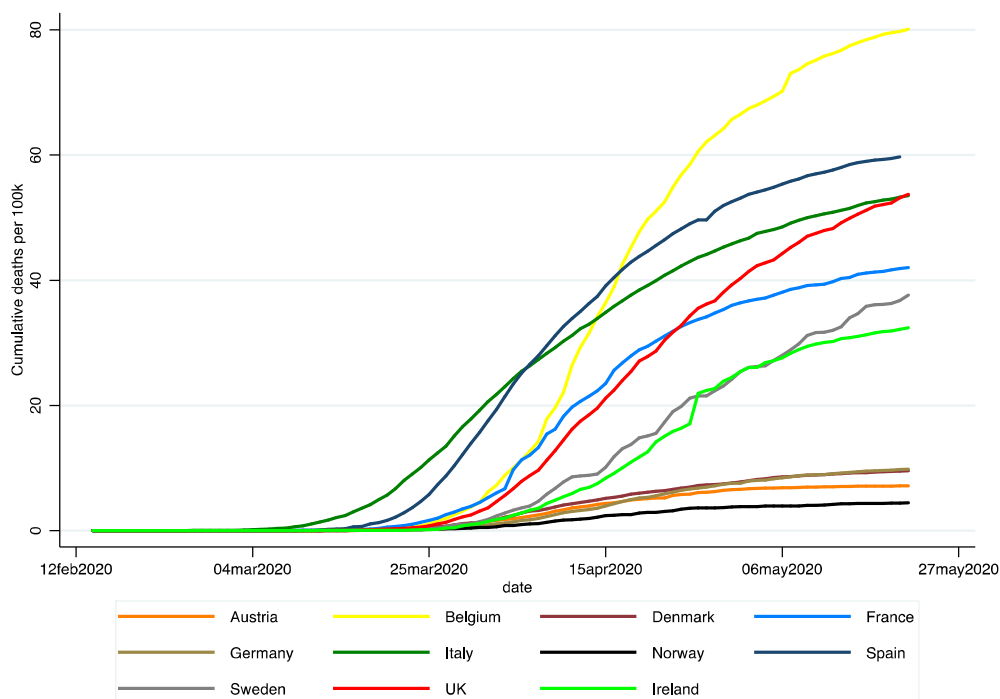




**Figure 3: Cumulative reported COVID-19 cases per 100k for eleven selected countries, from 15th February through 21<sup>st</sup> May 2020<sup>3</sup>**

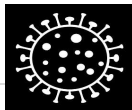


**Figure 4: Cumulative reported COVID-19 deaths per 100k for eleven selected countries, from 15th February through 21<sup>st</sup> May 2020<sup>4</sup>**

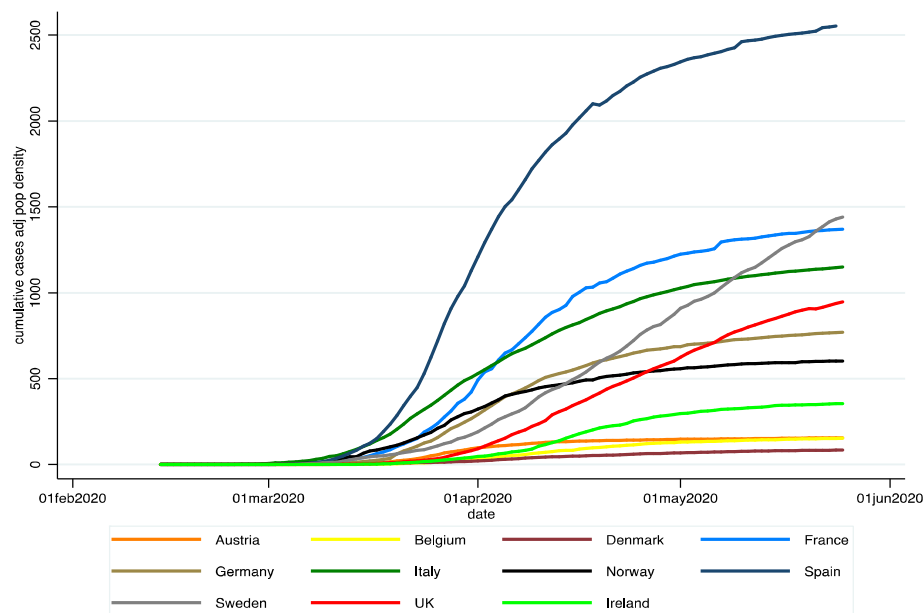


Source: European Centre for Disease Control and Prevention January – May 2020

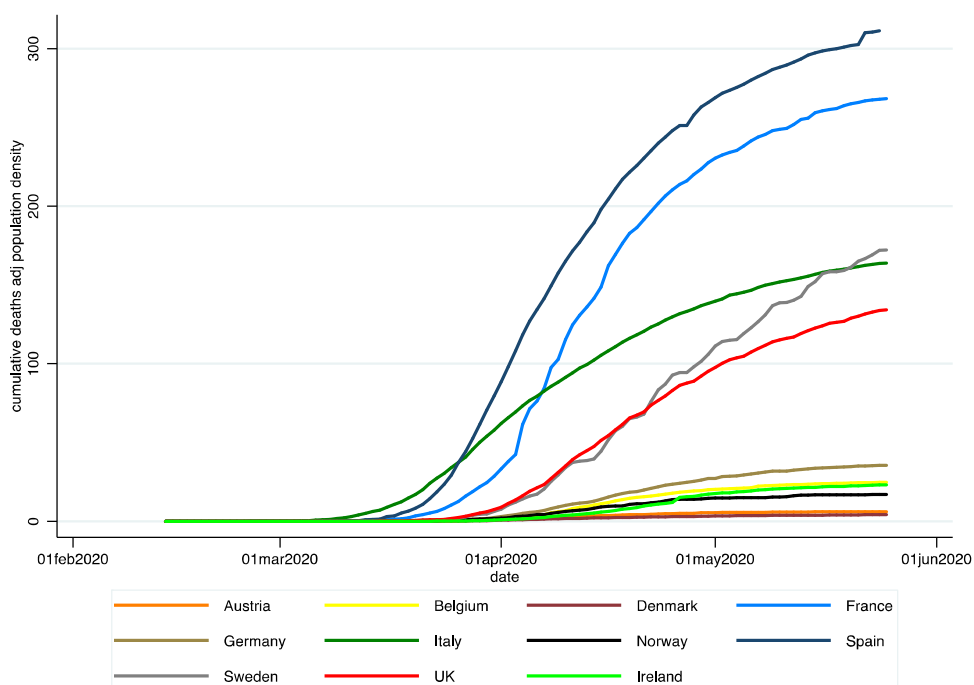




**Figure 5: Cumulative reported COVID-19 cases adjusted for population density for eleven selected countries, from 15th February through 21<sup>st</sup> May 2020<sup>5</sup>**



**Figure 6: Cumulative reported COVID-19 deaths adjusted for population density for eleven selected countries, from 15th February through 21st May 2020**



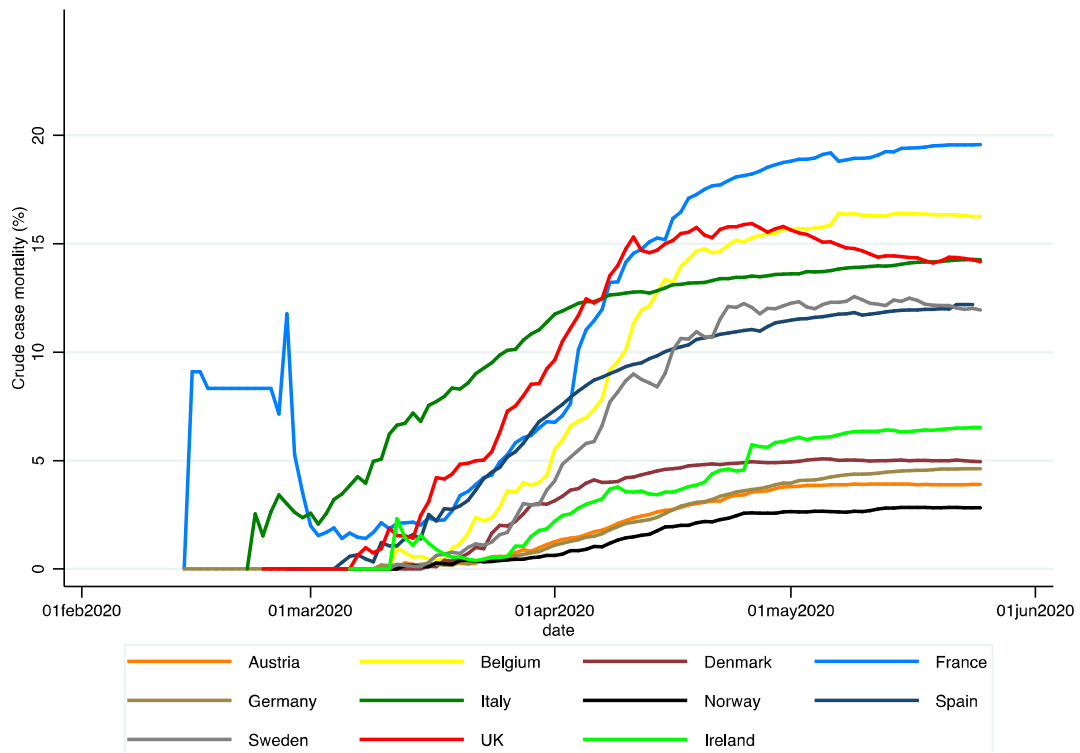
<sup>5</sup> Source: European Centre for Disease Control and Prevention January – May 2020





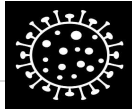


**Figure 7: The case fatality rate calculated as ratio of notified deaths to cases for eleven selected countries, from 15th February through 21st May 2020**



**Source:** European Centre for Disease Control and Prevention January – May 2020





## Mortality associated with Nursing Homes

Older age groups have a higher risk of mortality associated with COVID-19 and nursing home residents have been identified as a particularly vulnerable cohort within the older age groups<sup>6</sup>. Analysis of Irish COVID19 incidence and mortality data identifies that residents of Long-term Care Facilities, including Nursing Homes (LTRCs) had significantly higher infection rates than the general population of similar age; however, the age specific case fatality rate from COVID19 observed in Irish LTRC residents is broadly similar to the age-specific rates reported for the general population<sup>7</sup>.

The Health Protection Surveillance Centre (HPSC) data as of midnight 19/05/20 indicates that 80% of all notified deaths from COVID-19 occurred in the over 75-year age groups.

Deaths in nursing homes (850 cases) represented 54% of total deaths (1576 cases) in Ireland on that date.

There is emerging evidence that patterns of outbreaks in care home residents may differ significantly between countries and impact national mortality figures. A recent publication from the London School of Economics<sup>8</sup> reviewed official data from nineteen countries of mortality associated with Covid-19 outbreaks in care homes. The report stresses the limitations of existing data owing to differences at national level in definition of care homes, death reporting and COVID 19 testing and reporting systems etc and so the data presented are not directly comparable. However, the report found that the available data suggests that the share of care home residents whose deaths are linked to COVID-19 tends to be lower in countries where there have been fewer deaths in total.

Particular findings of note included:

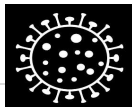
- Trusted data from 19 countries suggests that the share of care home residents whose deaths are linked to COVID-19 tends to be lower in countries where there have been fewer deaths in total, although as the number of deaths grows the share seems to reach a plateau, for now.
- There have been no infections or deaths in care homes in Hong Kong (only 4 deaths in total and 1,056 cases of infections in the total population).
- In the other countries where there have been at least 100 deaths in total and official data is available, the % of COVID-related deaths among care home residents ranges from 24% in Hungary to 82% in Canada)
- An important distinction in comparing data at country level is whether the data covers deaths of care home residents or only deaths in the care home (as there are variations in the share of care home residents who are admitted to hospital and may die there).
- Data from England illustrates the importance of paying attention to differences in definitions and methods used to estimate these percentages: the share of all probable COVID-19 deaths in care homes is 27%, whereas the share of probable deaths of care residents is 38%. The share of excess deaths in care homes during the pandemic has been 44% and the share of deaths of care home residents is 52% of all excess deaths. Also, in France, deaths in care homes are 34% of all COVID-19 deaths, whereas deaths of care home residents are 51%.

<sup>6</sup> <https://www.ecdc.europa.eu/en/publications-data/rapid-risk-assessment-coronavirus-disease-2019-covid-19-pandemic-ninth-update>

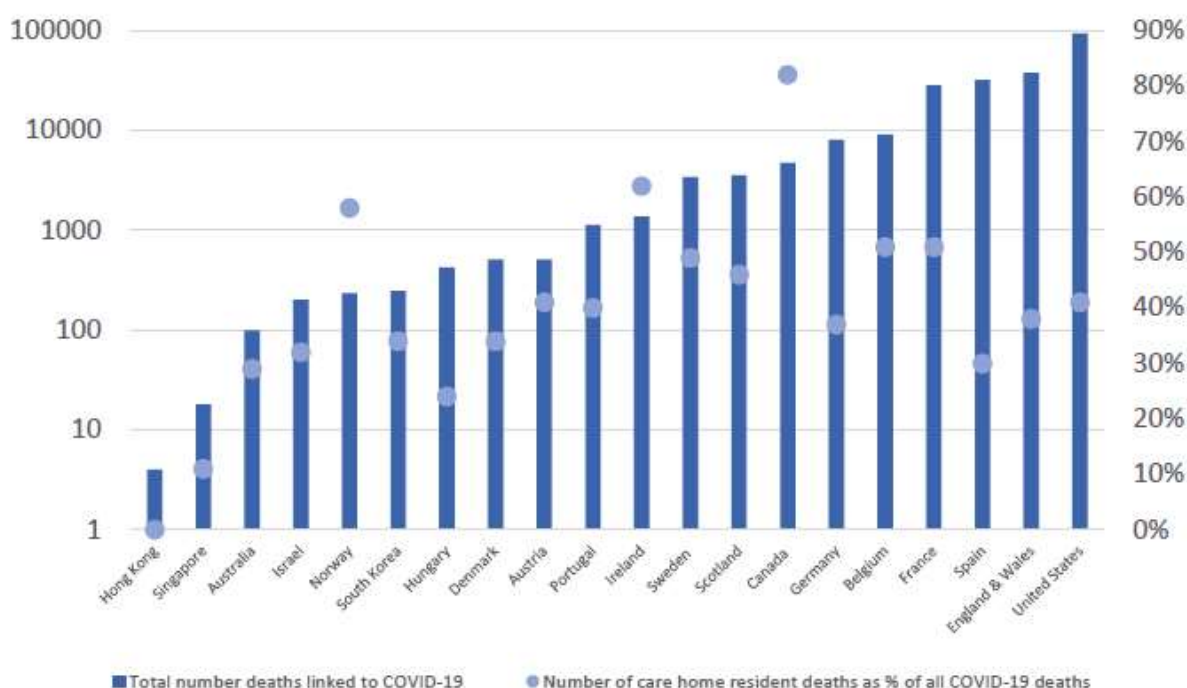
<sup>7</sup> Irish Epidemiology Modelling Advisory Group (IEMAG)

<sup>8</sup> Comas-Herrera A, Zalakaín J, Litwin C, Hsu AT, Lane N and Fernández J-L (2020) *Mortality associated with COVID-19 outbreaks in care homes: early international evidence*. Article in LTCcovid.org, International Long-Term Care Policy Network, CPEC-LSE, 21 May 2020.





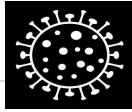
**Figure 8: Total number of deaths linked to COVID-19 in the total population and % of COVID-related deaths among care home residents , plotted using a logarithmic scale for the total of deaths.**



Comas-Herrera A, Zalakaín J, Litwin C, Hsu AT, Lane N and Fernández J-L (2020) Mortality associated with COVID-19 outbreaks in care homes: early international evidence. Article in [LTCcovid.org](https://www.ltc-covid.org/), International Long-Term Care Policy Network, CPEC-LSE, 21 May 2020.

Figure 8 shows the % of COVID-related deaths among care home residents compared with total population deaths in Ireland and other countries for which data are available, based on the findings of the London School of Economics Report above. As emphasised in the report, care must be taken with inter-country comparisons because of differences at national level in definition of care homes, death reporting and COVID 19 testing and reporting systems etc. and so the data presented are not directly comparable. Ireland has a number of reporting mechanisms in place for deaths in nursing homes to both the HPSC and to HIQA and Ireland reports all confirmed and probable cases of death due to COVID19. Ireland also undertook an extensive census of mortality nursing home since January 2020, therefore mortality statistics at national level for nursing home deaths are likely to be more complete than those reported in a number of other countries.





## Excess Mortality

Comparing all-cause mortality during the COVID-19 pandemic to deaths that have happened in previous years in the same weeks or months (“excess mortality”) is the best way to estimate the mortality impact of COVID-19. All-cause death is an important index to monitor during any pandemic as COVID-19 (like influenza) is expected to give rise to direct and indirect mortality. Therefore, we would also expect to see an increase in deaths from other causes such as strokes, myocardial infarction etc. Excess deaths from the coronavirus disease 2019 (COVID-19) pandemic might arise both in those infected (direct effects), as well as those affected (indirectly, not infected) by altered access to health services; the physical, psychological, and social effects of distancing; and economic changes<sup>9</sup>.

The Health Protection Surveillance Centre (HPSC) monitors all-cause mortality by examining un-coded registered deaths which are received from the General Register Office and it contributes to surveillance of excess mortality at European level through the EuroMOMO network. However, calculation of excess mortality is contingent upon timely death notification data and in Ireland we have a relatively long period before families are legally required to register a death of up to 3 months. Most other EU countries have a shorter period of usually less than a week during which deaths must be registered.

Notwithstanding these delays, the excess weekly mortality report for Ireland produced by HPSC on data up to Sunday 24 May 2020 (end of week 21) noted a significant excess of deaths for weeks 13, 14, 15 and 16. In addition, an increase in influenza and pneumonia related mortality was observed for week 17. Under current delays it is taking approximately 3 weeks to observe these excess mortality patterns, and this is incomplete data.

In the absence of timely registration data, the Health Information and Quality Authority (HIQA) have looked at death notices on the RIP.ie site. Between 19 February 2020 and 26 May 2020 there were 9,937 deaths notices on rip.ie. Based on a time series analysis of historical data, the expected number of deaths notices over that period was 8,622 (95% CI: 8,238 to 9,009). There were four weeks (weeks 14-17) during which the observed number of deaths exceeded the upper bound for expected deaths. The estimated excess mortality for the period was 1,315 deaths (95% CI: 928 to 1,699). The reported number of Covid-19 related reported deaths to 26 May was 1,615. As such, the excess mortality observed on rip.ie was less than the reported Covid-19 related mortality over this period.

The occurrence of excess mortality in association with COVID-19 in Co Kildare has also been indicated in a report of observed increased notifications of deaths (both COVID and non-COVID related) with Natural Death Diagnoses during the month of April 2020, in correspondence received from the Coroner for the District of Kildare to the Department of Health. Information from other coronial districts is not available.

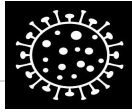
In summary, analysis to date at national level has indicated excess all-cause mortality in Ireland and the observed increased mortality to date can be accounted for by known COVID19 mortality. In this respect, Ireland differs from the UK, where reports indicate a very significant excess of non-COVID19 related mortality<sup>10</sup>. However, the delay in registration of deaths prevents a more complete and timely analysis of the EuroMOMO data in Ireland

During this pandemic, families have been requested to register deaths online or by post. While this is a welcome initiative, unfortunately take up of this online option has been slow. This has added to the delays in registration of deaths. The Department of Health is in ongoing communication with the Department of Employment Affairs and Social Protection in relation to this matter.

<sup>9</sup> [www.thelancet.com](https://www.thelancet.com) Published online May 12, 2020 [https://doi.org/10.1016/S0140-6736\(20\)30854-0](https://doi.org/10.1016/S0140-6736(20)30854-0)

<sup>10</sup> *BMJ* 2020;369:m1931 doi: 10.1136/bmj.m1931 (Published 13 May 2020)





## Conclusion

One of the most important ways to measure the burden of COVID-19 is mortality. Ultimately the final analysis of deaths associated with this pandemic will depend on excess mortality monitoring. Analysis to date at national level has indicated excess all-cause mortality in Ireland and the observed increased mortality to date can be accounted for by known COVID19 mortality. It is also possible that some of the excess mortality currently observed in the very elderly impacted by this virus may be followed by a period of decreased mortality.

Countries throughout the world have reported very different mortality experiences to date. It is difficult to draw definitive comparisons between countries because of widespread differences in the relative numbers of people tested, differences in mortality case definitions and reporting practices.

Factors impacting mortality will include demographic and socio-economic factors, geographic factors, population density and travel patterns as well as the effectiveness of public health measures taken by different countries and health system capacity and efficacy in responding to the pandemic.

Mortality in nursing home residents has significantly impacted national mortality figures in Ireland and many countries with comparable health systems.

