

## The contribution of demography to the COVID-19 pandemics

INED research group on COVID-19 related deaths – 27 March 2020

*Comparing the dynamics of COVID-19 related deaths in the most severely affected countries shows that France is following the same trajectory as Italy and Spain. With earlier lockdown, the death count in China reached a plateau on the 20th day after the onset of the epidemic (the date when total deaths reached 25). In Italy and Spain, however, the virus continued to spread exponentially beyond this timeframe. South Korea is the only country to have stabilized virus-related mortality by Day 6.*

*The faster containment of the spread in China may also result from differences in population structure between China, which is younger, and Europe, which is older. Last, while males account for the majority of deaths, the sex ratio is lower in France, with 1.4 male deaths per 1 female death, than in Italy (2.4) or China (1.8).*

*The lockdown exit strategy in France must take account of the demographic and health characteristics of local populations, as well as individual living and care arrangements (private homes, institutions). These factors all affect the social and family interactions of the most vulnerable populations, older adults especially, who are among those at greatest risk of death when infected by COVID-19.*

The French institute of public health (Santé publique France) publishes daily **updates on the number of COVID-19-related deaths reported by hospitals**. These figures are available by place of residence, age, and sex. They serve to monitor the progression of pandemic-related mortality and to identify the clusters with the highest numbers of deaths [1].

These hospital statistics also indicate the number of patients who are confirmed to have the virus and those who die. Interpreting these statistics calls for knowledge of their limitations. **The analysis of mortality dynamics is an essential component of demography**, a discipline that applies purpose-built tools to rigorously evaluate data quality and comparability—a key prerequisite for **accurate trend analysis and projection**.

### **Data sources and coverage**

Mortality analysis in France is based on all deaths recorded in the civil registers. As the COVID-19 death counts provided by Santé publique France only cover hospital deaths, they represent not all but a portion of the pandemic-related mortality. For example, out of the 594,000 deaths reported in 2016, nearly 60% occurred in a hospital or clinic, 26% at home, and nearly 14% in care homes [2]. The proportion of total deaths occurring in care homes increases sharply with age, rising from 4.2% at ages 70–74 (69% in hospital and 25% at home) to 24% at ages 90–94 (50% in hospital and 25% at home) [2]. Care home residents account for a quarter of total annual deaths in France. As female residents greatly outnumber males, most who die are women; male residents' risk of dying is higher than that of females of the same age, however, probably due to their poorer health [3].

To determine the total number of deaths due to COVID-19, it is necessary to estimate the number of deaths due to the virus but **occurring outside the hospital environment** (in institutions or in private homes), which are not accounted for in the statistics provided to date. It can be assumed that, among deaths at home, those due to COVID-19 are less frequent than those due to other causes because COVID-19 symptoms frequently lead to hospitalization.

However, the number of COVID-19-related deaths among care home residents, who are often treated internally without hospitalization, is probably far from negligible. **The number of these missing deaths can be estimated via a rapid analysis of death statistics** by place of occurrence (hospital, care facility, or personal home) and cause of death [4, 5].

### **Monitoring the dynamics of COVID-19-related deaths from an international perspective**

The daily count reveals trends and possible points of deceleration or acceleration. In this context, comparison with other countries is crucial. However, the pandemic has not affected all countries at the same time. It is important to align the curves with the dates of the crisis onset (the incubation period—8 days—is subtracted from the date when the cumulative number of COVID-19 deaths reaches 25), and to identify the key associated health events [6]. **At the crisis onset, the COVID-19 epidemic showed strong similarities from one country to another**, with exponential increase in the number of cases and deaths at the same daily rate. The increase in deaths followed a **very similar pattern in China, Italy, and France up to 'Day 13'**.

The curve for China then began to level off, reaching a plateau on Day 29 (12 February) before gradually declining from Day 39. In Italy, the curve started to level off on Day 20 (11 March). In France, which reached Day 20 on 20 March, the weekly curve was still following an exponential progression similar overall to that observed in Italy and China. In Spain, the number of deaths also increased exponentially, but faster. These four countries eventually decided on strict confinement for the whole population, but this measure was implemented earlier in China (Day 8) than in Spain (Day 14), Italy (Day 17/18), and France (Day 17). Germany, which entered the epidemic later, is now following the same path as its European counterparts. In South Korea, the death curve followed the initial exponential progression only until Day 6 before stabilizing at a fairly low level (0–7 daily deaths). In that country, the detection and confinement of populations most at risk of contamination was implemented very early (Day 2).

### Addressing gender and age disparities

Given the vulnerability of older people to the virus, the population age structure plays a determining role. China, which is younger, has not been affected in the same way as European countries. A note from Santé publique France (18 March), concerning the first 160 COVID-19-related deaths, reported that two victims (1.3% of the total) were under age 45, and 127 (79.4%) were at least 75.

This brings France closer to the age distribution of deaths observed in Italy. **In all countries there are more male than female COVID-19-related deaths**, but the extent of the male disadvantage differs from country to country. The French report indicates a sex ratio of 1.4 male deaths per 1 female death, which appears low compared to the Italian (2.4) and Chinese (1.8) ratios.

The proportion of COVID-19-related deaths below age 50 (45 for France) seems much lower in Italy and France than in China. **More importantly, in both Italy and France, there is a much greater concentration of deaths among people ages 70 and older (75 in France) than in China.** These initial results will have to be verified when more precise data on the distribution of COVID-19-related deaths by sex and by 5- or 10-year age groups become available.

To make reliable, cross-country comparisons, careful documentation must be provided on how data are collected in each country and what the data cover (total deaths, hospital deaths only).

### Taking into account territorial disparities in public policies and lifestyles

Differences between countries can be explained in part by demographic, social, and health disparities in the population of older adults and by differences in elder care. These factors must also be taken into account when analysing subnational differences [7, 8]. The exposure risk of elder populations may vary across different French *départements* due to dissimilarities in population structure and in the local management of home care services or institutions.

In addition to the triggering event and the epidemic itself, factors such as **age structure, health status, care provision for vulnerable populations, and interpersonal contact, intergenerational contact especially, are key** to understanding the spread of the virus, the exposure of older adults, and the risks of severe illness and death [9]. All these aspects must be taken into account to limit the spread of the epidemic and tailor measures to the specific characteristics of each region.

## References

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