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SIMONA **BIGNAMI-VAN ASSCHE**
DANIELA **GHIO**
ARI **VAN ASSCHE**

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Not Just a Concern for the Elderly: Age Gradient in COVID-19-Related Infections in Italy, Spain and the Netherlands

Simona Bignami-Van Assche [*], *Daniela Ghio* [†], *Ari Van Assche* [‡]

Abstract

It is often highlighted that the largest number of COVID-19-related fatalities is found among the elderly. Although this is true, it is an important omission not to consider the differential trend of infections across age groups as governments devise strategies to flatten both the infections curve and the economic recession curve. We show how these strategies crucially depend on workforce demographics by drawing from the experience of Italy, Spain and the Netherlands. We suggest that restricting the age of essential workers can be a useful policy to mitigate the work-security trade-off while keeping the economy going.

Keywords: COVID-19, Demography, Age Gradient, Workforce, Flattening the Curve, Italy, Spain, Netherlands

Résumé

Il est souvent souligné que le plus grand nombre de décès liés au COVID-19 se trouve chez les personnes âgées. Bien que cela soit vrai, il y a une tendance différentielle des infections selon les groupes d'âge qui n'est pas considérée mais qui est très importante quand les gouvernements élaborent leurs stratégies pour aplanir à la fois la courbe des infections et la courbe de la récession économique. Nous montrons comment ces stratégies dépendent de manière cruciale de la démographie de la main-d'œuvre en regardant l'expérience de l'Italie, de l'Espagne et des Pays-Bas. Nous suggérons que la restriction de l'âge des travailleurs essentiels peut être une politique utile pour atténuer le compromis entre la sécurité du travail et le maintien de l'économie.

Mots-clés : COVID-19, Démographie, Gradient selon l'âge, Main d'œuvre, Aplatir la courbe, Italie, Espagne, Hollande

[*] Université de Montréal, CIRANO, Center for Population Dynamics (CPD)
[†] Joint Research Center European Commission
[‡] HEC Montréal, CIRANO

INTRODUCTION

In the 100 days since the World Health Organization was first notified about what now is officially known as COVID-19, the virus has quickly circled the globe infecting more than one million people. On the basis of the predictions of early epidemiological models (Anderson et al., 2020), governments have asked or ordered more than half of the world's population to stay at home in order to 'flatten' the curve of infections below the capacity of health care systems to treat severe cases (Baldwin, 2020; Baldwin and di Mauro, 2020). These measures of physical distancing have put a halt to the global economy and societies in limbo. Searching for evidence of their effectiveness in containing the disease, policymakers, academics and the general public have thus focused their attention on the daily increase in the number of new infections. In Italy, one of the hardest hit European economies, during the last week there has been a gradual deceleration in the new infections count as well as in the number of fatalities and hospitalizations in intensive therapy. This has prompted discussions about when and how to relax the lockdown measures while Austria, Sweden, and the Czech Republic have told the public to be ready for the opening up period, or "Phase 2", to start after Easter (Bennhold, 2020).

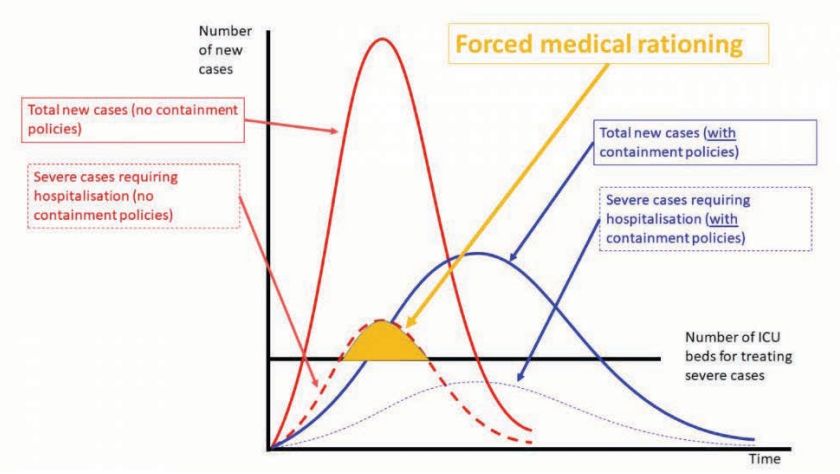
Safeguarding healthcare capacity while restarting economic activity is key to these strategies for Phase 2. In this paper, we use data from Italy, the Netherlands and Spain to show that any plan about how to gradually lift lockdown measures needs to carefully consider the trend in the demographics of COVID-19-related infections. Although these countries are not at the same stage of the pandemic, the common element of their experience is that cases in the age groups 50-59 and 60-69 years have been driving the trend in the overall curve of infections. This is of concern because COVID-19-related morbidity and mortality increase significantly after age 50. We thus

argue that policymakers need to consider restricting the age of workers as they try to mitigate the work-security trade-off when restarting the economy.

BACKGROUND

In absence of a vaccine, the fight against COVID-19 is centered around the goal to mitigate its spread. COVID-19 mitigation strategies rely on physical distancing to reduce the number of new infections that an infected individual will give rise to (the so-called reproduction rate of the disease). Reducing the reproduction rate is necessary to ensure that the COVID-19 epidemiological curve does not rise too sharply so that the number of severe cases requiring hospitalization and intensive care remains within the local health care capacity. As figure 1 shows, mitigation strategies thus aim to flatten not just the curve of new infections, but especially the curve of new severe cases requiring hospitalisation. As a result, a key principle behind policies aimed at "flattening the curve" is to especially reduce the exposure of those individuals that are at higher risk of severe outcomes.

Figure 1. An illustration of "flattening the curve" of COVID-19 infections



Source: Baldwin (2020).

The elderly population has quickly emerged as the most vulnerable one to COVID-19, and stay-at-home orders were issued first for this group in most countries. Recent studies have shown that the age structure of the population (Dowd et al., 2020), the age structure of the confirmed positive cases (Bignami and Ghio, 2020), and the relative contribution of each of these two factors (Dudel et al., 2020) are important features for understanding the overall severity of COVID-19.

However, the focus on the COVID-19-related mortality risk for the elderly has obscured trends in the population under age 70, which include the working age population that has kept essential activities including health care going during national lockdowns. We argue that it is an important omission not to consider the differential trend of infections across age groups as governments devise strategies to flatten both the infections curve and the economic recession curve. By taking advantage of the three most complete and longest data series currently available for Italy, Spain and The Netherlands, we show that the effectiveness of these strategies crucially depends on workforce demographics.

DATA SOURCES

Aggregate figures at the country or regional level on the total number of infections, hospitalizations and fatalities represent the majority of accessible information on COVID-19. The data used in this paper have been published online bi-weekly by the Italian National Institute of Health since March 12 (Istituto Superiore di Sanità, 2020); daily by the Spanish Ministry of Health since March 22 (Ministerio de Sanidad, 2020)[1]; and bi-weekly by the Dutch National Institute for Health and the Environment since March 23 (RIVM, 2020).

[1] Data about COVID-19 disseminated by the Spanish Ministry of Health between March 10 and March 22 was not disaggregated by age.

Since there is no home-based testing for COVID-19, these data come from health facilities' administrative reporting about the number of individuals who tested positive for the virus, and the number of resulting hospitalizations, intensive therapies, deaths, and recoveries. Most countries follow the guidelines of the World Health Organisation and test for COVID-19 only individuals with fever, cough, and/or difficulty breathing. The data on COVID-19 that we analyze in this paper thus refer to symptomatic individuals who have presented themselves at health facilities and have met the established testing criteria. For this reason, we consider them to be a broad indicator of COVID-19-related morbidity.

RESULTS AND DISCUSSION

Community transmission of COVID-19 began in Italy on February 21 with 16 cases confirmed in Lombardia and two in Veneto. In Spain, sustained community spread linked to travellers from Italy begun on February 25 with cases confirmed in Madrid, Barcelona and Seville. In The Netherlands, a number of returning travellers from Italy ignited community transmission of COVID-19 since February 27. Lockdown measures went into effect as of March 8 in Italy, as of March 14 in Spain, and as March 15 in The Netherlands. Non-essential activities were halted beginning on March 26 in Italy and March 28 in Spain. As of April 12, the number of confirmed positive cases stands at 156 363 in Italy, 166 019 in Spain, and 25 587 in The Netherlands.

Figure 2 shows the trend in the cumulative number of positive cases by age group in the three countries. In line with previous studies, the age-specific epidemic curves are steeper for the older age groups than the younger ones in all countries. At the end of the observation period, in Italy and Spain people aged 70 and over were responsible for, respectively, 38 and 34 percent of confirmed positive cases, which was more than double their share in the total population (17

percent in Italy and 15 percent in Spain). In the Netherlands, the 70+ age group accounted for 42 percent of confirmed infections, which was three times their share in the overall population (14 percent). Focusing on the elderly, however, obscures the age gradient of infections in two other age groups that have disproportionately steep epidemiological curves: 50-59 and 60-69 years old. In Italy and Spain, the former was the age group that accounted for most confirmed cases and the latter followed closely. In the Netherlands, the number of confirmed cases among 50-59 years old was about the same as in the age groups 70-79 and 80-89 years.

FIGURE 2. Cumulative number of confirmed positive cases, by age group

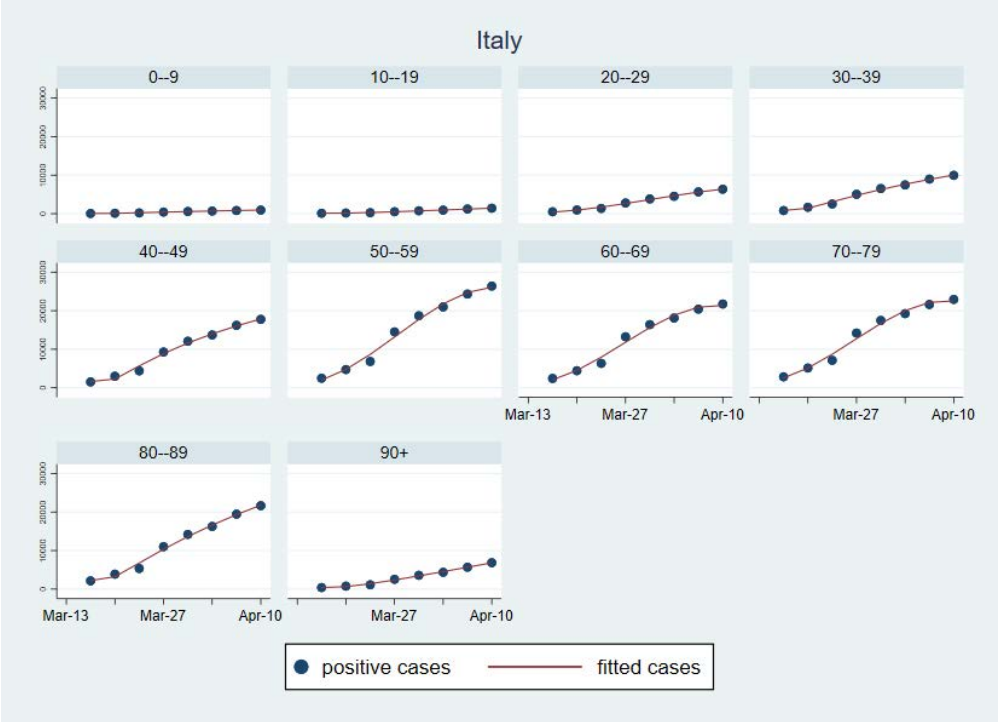
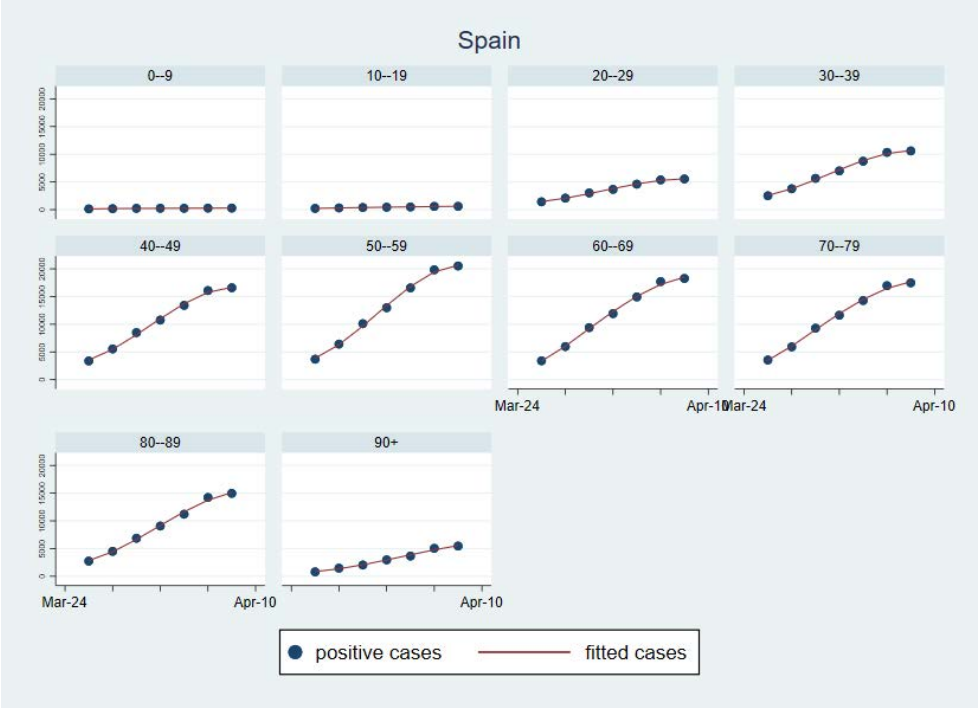
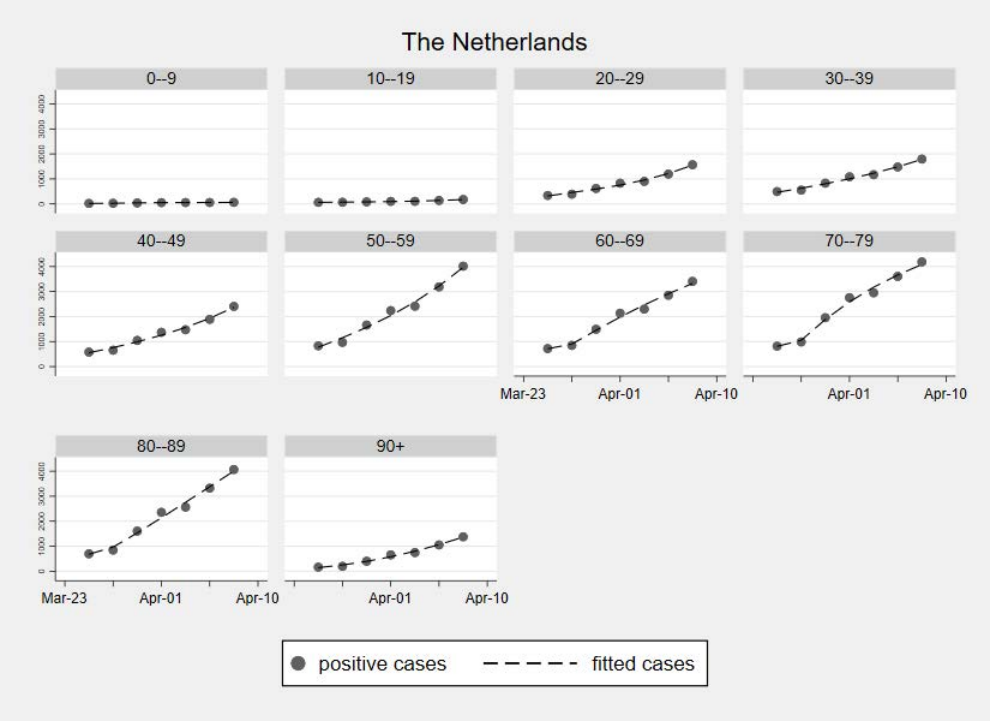


Figure 2 (*continued*)

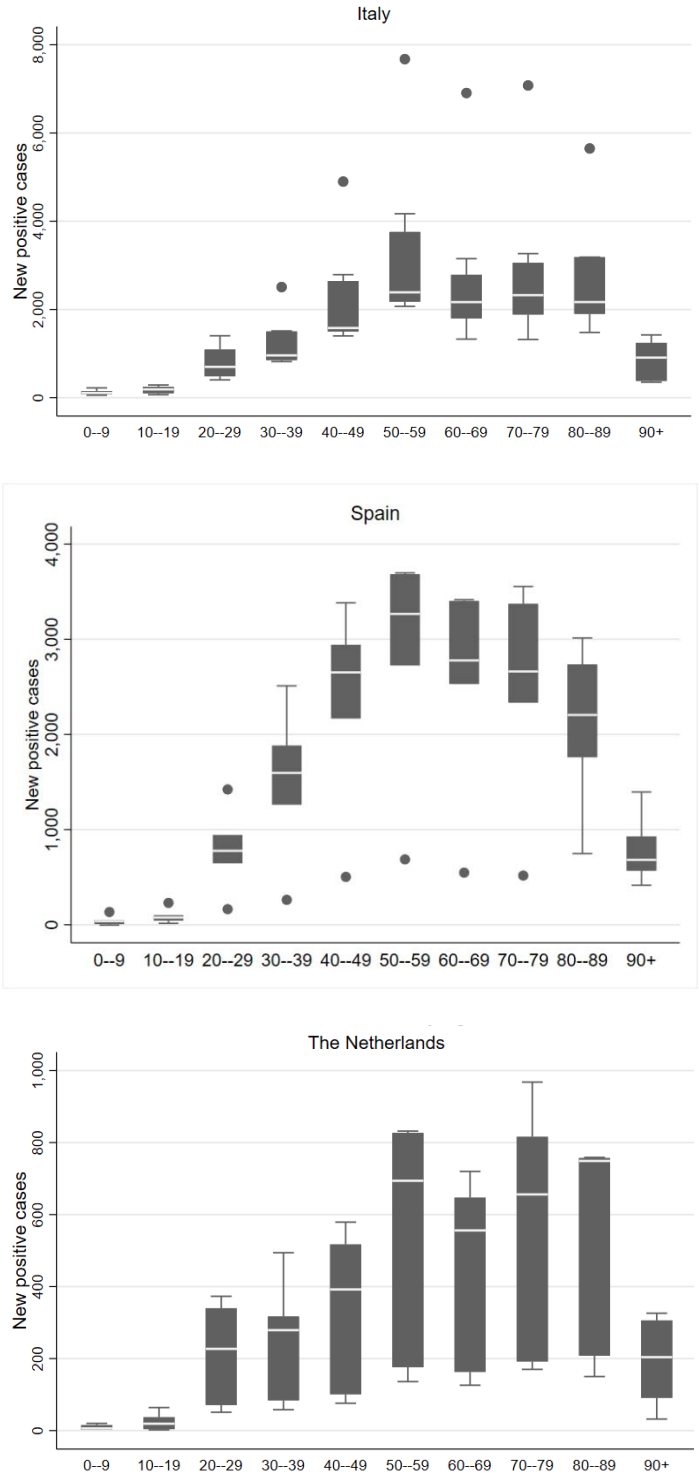




Sources: Our calculations from ISS, Ministerio de Sanidad, and RIVM.

The steep epidemiological curves for the categories 50-59 and 60-69 years in Figure 2 result from the disproportionately large increases in confirmed positive cases for these two age groups as the pandemic unfolded. Figure 3 shows that in all three countries the age group 50-59 years experienced the largest increase in the number of new cases over the respective periods of observation. In Italy and Spain, the median number of daily new confirmed positive cases is also highest in the age group 50-59 years, and second highest in the Netherlands (after the 80-89 age group).

FIGURE 3. Increase in the number of confirmed positive cases, by age group



Sources: Our calculations from ISS, Ministerio de Sanidad, and RIVM. The box plots display the 75th percentile (upper hinge), median, and 25th percentile (lower hinge) for the number of new confirmed positive cases, with the upper and lower adjacent values (lines) and outside values (points).

The trends presented in Figures 2 and 3 do not just reflect the fact that the proportions of 50-59 and 60-69 years old are larger in the overall population than younger age groups (see Annex Table 1). As Table 1 shows, when translated into the number of confirmed cases per 100,000 people in each age group, the proportion of confirmed positive cases is higher for 50-59 years old than the younger age groups 30-39 and 40-49. The prevalence of confirmed cases for 50-59 and 60-69 years old is between 1.4 and 1.7 times higher than for the age group 40-49, and between 1.8 and 2.2 times higher than for the age group 30-39. Since the number of confirmed positive cases in our data corresponds to the number of symptomatic individuals who presented at health facilities, this gives a broad indication that COVID-19-related morbidity is of particular concern for 50-59 and 60-69 years old.

Table 1: Number of confirmed cases per 100,000 people in each age group

(last observation period)

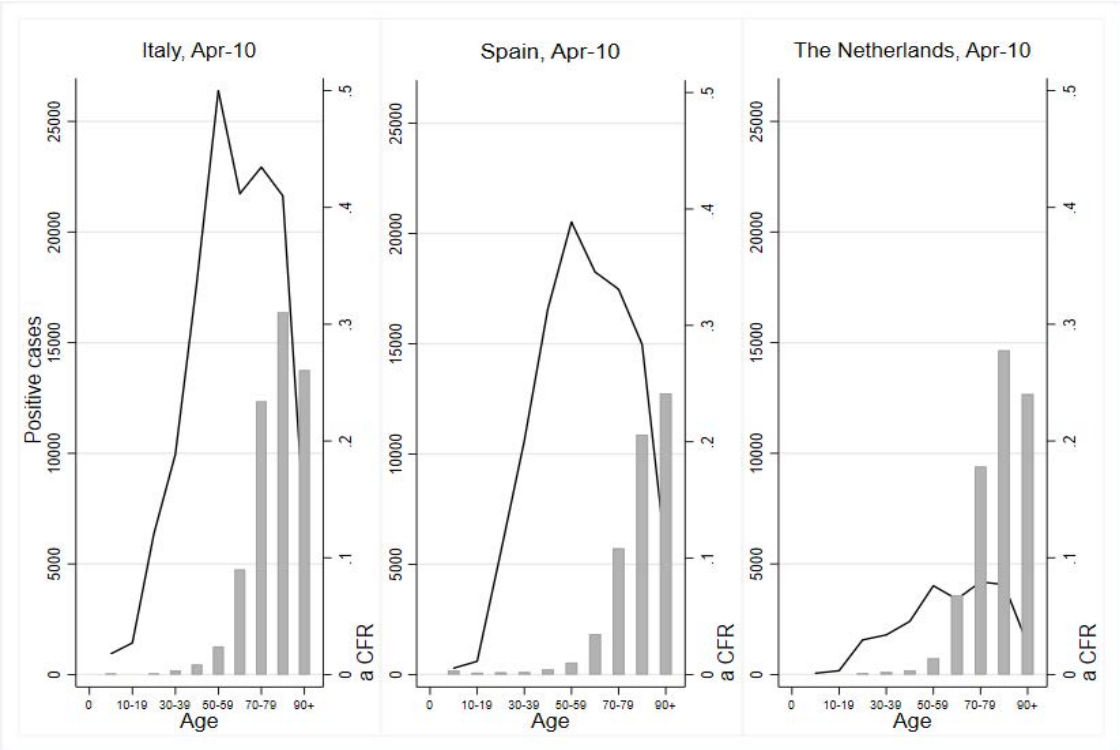
Age group	Italy	Spain	Netherlands
0 - 9	16,3	6,7	3,5
10 - 19	21,2	12,9	8,9
20 - 29	92,3	119,2	74,5
30 - 39	126,5	172,1	86,4
40 - 49	175,6	209,1	109,3
50 - 59	254,9	295,5	159,3
60 - 69	276,1	351,1	161,5
70 - 79	364,2	445,6	274,2
80 - 89	535,9	645,6	598,4
90+	677,1	933,8	1009,3
All ages	205,1	236,1	135,1

Sources: Our calculations from ISS, Ministerio de Sanidad, and RIVM. Population data from United Nations (2019).

Figure 4 shows that the prevalence of confirmed COVID-19 cases in the 50-59 and 60-69 age groups is not only a concern for morbidity risk, but also for mortality risk. In the three countries,

the case-fatality risk for 50-59 is 2.3 to 3.7 times higher than for the 40-49 years old, while the case-fatality risk for 60-69 is between 7.8 and 18.1 times higher than for the age group 40-49. The high concentration of confirmed cases in the age groups 50-59 and 60-69 years and their unabated rise are therefore worrisome trends that should be monitored closely.

FIGURE 4. Number of confirmed positive cases and case-fatality risk, by age group



These findings suggest that the age at which COVID-19 morbidity and mortality increases is not fully aligned with the age divide between elderly and non-elderly. The national lockdown policies enforced in all three countries at the beginning of March led to different degrees of physical distancing along the working-age divide. People of retirement age (65 years in Spain, 66 in The Netherlands, and 67 in Italy) were already mostly excluded from work activities and thus substantially reduced their rate of contact with others after lockdown. On the contrary, a substantial proportion of the workforce under retirement age (including health care workers) continued being

exposed to the virus. Retirement age thus helped reduce the exposure to COVID-19 for the elderly disproportionately more than for the working-age population in all three countries, but left workers above 50 more at risk than younger workers.

CONCLUDING REMARKS

In absence of a vaccine or effective treatments, to relax the measures put in place to slow down the spread of COVID-19 is "like walking on a tightrope", as Prime Minister Mette Frederisken of Denmark aptly said (Bennhold, 2020). To ensure that the rope is not too thin, it is necessary to move beyond aggregate numbers of infections and deaths and focus on the on the interplay between the age gradient of infections over time and the demographics of the workforce, which has direct implications for understanding the shape of the overall epidemiological infections curve.

The effectiveness of strategies aimed at "flattening the curve" of COVID-19 infections crucially depends on whether the labor market measures that are adopted integrate age group profiling. Since the share of jobs that can be performed without putting workers' health at risk is limited (Boeri, Caiumi and Paccagnella, 2020), restricting the age of essential workers can be a useful policy to mitigate the work-security trade-off while keeping the economy going. Governments should also carefully consider the demographics of COVID-19-related infections when planning how to gradually lift lockdown measures to reopen the economy.

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ANNEX

Table 1. Age distribution of COVID-19 confirmed positive cases and population age distribution (percentages)

Age group	Italy		Spain		The Netherlands	
	Cases	Population	Cases	Population	Cases	Population
0-9	0.67	8.42	0.26	9.29	0.27	10.31
10-19	0.98	9.47	0.55	10.02	0.76	11.55
20-29	4.55	10.12	5.03	9.95	6.79	12.32
30-39	7.22	11.71	9.61	13.18	7.77	12.14
40-49	13.03	15.21	15.04	16.98	10.42	12.88
50-59	19.56	15.74	18.60	14.86	17.38	14.74
60-69	16.41	12.19	16.55	11.13	14.75	12.34
70-79	17.38	9.79	15.84	8.39	18.13	8.93
80-89	15.63	5.98	13.57	4.96	17.62	3.98
90+	4.57	1.38	4.95	1.25	6.12	0.82
Number	124 352	60 641 000	110 313	46 735 000	23 097	17 096 000

Sources: ISS, Ministerio de Sanidad, and RIVM. Population data from United Nations (2019).