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A Comparative Demo-Geographic Perspective of Covid-19 Spread and Measures in Slovenia with a Special Emphasis on Regional Disparities and Border Areas

The article examines how the initial Covid-19 spread reached Slovenia, how the infections are distributed across the Slovenian regions, and what disparities can be traced in municipalities, especially along the Croatian and Austrian borders. Furthermore, it identifies the demographic groups most affected by the restrictive measures as well as by SARS-CoV-2 infections and Covid-19 deaths. The research hypothesis was that peripheral and border area populations, including ethnic minorities, in Slovenia suffer the Covid-19 restrictions the most. Employing interdisciplinary analyses, we conclude that the spread of Covid-19 in Slovenia and the imposed lockdowns to municipalities create new vulnerable groups and that the wholesale lockdown cannot deliver the desired results if oriented to broad populations without considering regional and local disparities.

Keywords: Covid-19 spread, interdisciplinary research, medical geography, mortality rates, demographic indicators, Slovenian-Croatian border area, Italy, Austria.

Primerjalni demo-geografski pogled na širjenje covida-19 in ukrepe v Sloveniji s posebnim poudarkom na regionalnih razlikah in mejnih območjih

Članek preučuje, kako je prvi val covida-19 dosegel Slovenijo, kako so okužbe porazdeljene po slovenskih regijah in kakšne razlike lahko zasledimo med občinami, zlasti ob hrvaški in avstrijski meji. Poleg tega opredeljuje demografske skupine, ki so jih omejevalni ukrepi, pa tudi okužbe s SARS-CoV-2 in smrtni primeri zaradi covida-19 najbolj prizadeli. Raziskovalna hipoteza je bila, da so omejitve zaradi covida-19 v Sloveniji najbolj prizadele prebivalce obrobnih in obmejnih območij, vključno z etničnimi manjšinami. S pomočjo interdisciplinarnih analiz ugotavljamo, da se zaradi širjenja covida-19 v Sloveniji in zaprtja občin ustvarjajo nove ranljive skupine ter da splošna zaustavitev javnega življenja, če je usmerjena na širšo populacijo in ne upošteva regionalnih in lokalnih razlik, ne prinaša želenih učinkov.

Ključne besede: *širjenje covida-19, interdisciplinarna raziskava, medicinska geografija, stopnja umrljivosti, demografski kazalniki, slovensko-hrvaško obmejno območje, Italija, Avstrija.*

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1. Introduction

For some time now, the public debate across Europe has been heightening in connection with the imposition of very restrictive measures, followed by further austerity in the field of free movement and physical contact, as well as quarantine. In Slovenia, both lockdowns – the one in late winter/spring and the one in the fall – involved online schooling. According to most epidemiologists, these measures were essential to slow down the spread of the ominous infection and thus gradually reduce the number of patients in need of long-term intensive care due to a more difficult progression of the Covid-19 disease.[1] This flattening the curve – as it was dubbed in the early stage (i.e. the first wave) of the epidemic, first thought as seasonal – is primarily oriented towards an ever-degrading healthcare system in many countries. OECD data show decreasing numbers of overall and acute hospital beds ever since the 1970s (OECD 1980). The oil shock of 1973 triggered the first cuts in public expenditure (cf. Harvey 2005, 2011), and hospital facilities were the first to undergo the optimisation plans. An increasing trend towards further optimisation and privatisation of the former resumed after the last financial and economic crisis of 2008 (Humphries et al. 2019). The dismantling of the public health sector inevitably decreased the preparedness to deal with a large-scale inflow of patients to health premises, as shown especially in Italy in the early stage and Slovenia as well.

In the first wave of the coronavirus spread in Slovenia, hospitalisation times increased from 7 to almost 10 days after the first month of the epidemic, indicating a higher number of harsher disease scenarios and an increasing number of consequent deaths. The latter occasionally reached nearly 20 % of those in intensive care units daily, while the average for the first week of April 2020 was around 13 %. This was important as in Slovenia, a fifth (20.5 %)[2] of the population is over 65 years of age and in the spring the total number of intensive care (acute) beds was less than 200. In the second wave (after September 2020), the alarming scenario began after 50 intensive care beds were full (NIJZ 2020), notwithstanding the ever-increasing share of the elderly population and the rising pressures for hospitalisation. Between April and October 2020, Slovenia slightly decreased the total number of hospital beds (to 8,687), but increased the number of beds for intensive care to 270 (Marovt 2020). Back in 1980, Slovenia had 7.0 acute hospital beds available, while nowadays it only has about 4.2 per 1,000 inhabitants. Japan, as the most medically equipped country in the world yet with the world's oldest population – 27 % over the age of 65 – has almost twice as many beds (7.8 per 1,000 inhabitants). The situation in neighbouring Italy drastically worsened after 1980. As the country with the second oldest population in the world (23 % over 65 years), it only has 2.6 acute beds, while in 1980 it had as much as 9.3 beds per 1,000 inhabitants – more than Slovenia (OECD 2020, last available comparable data are those for 2017). It is worth mentioning that in

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1980 the countries had much lower shares of the elderly: Slovenia 11.4 %, Croatia 11.5 %, Italy 13.3 %, and Austria 15.1 %, to name only a few (OECD 1980).

The current data on SARS-CoV-2 infections show that in addition to hospitals, care- and nursing homes, staff included, are the most at risk of spreading the infection. The two weeks in mid-November (9–23 November 2020) confirmed more than 1800 infections among medical personnel (Žurnal24.si 2020), which accounts for about 10 % of all currently infected.[3] The vast majority (75 %) of all infected are the elderly (65+). The most vulnerable are those in nursing homes where 72 % of all Covid-19 deaths occur. The mortality rate of the infected in nursing homes is 14.2 %, up to ten times higher than in the general population (NIJZ 2020). By mid-November 2020, the SARS-CoV-2 infections spread in 85 % of all nursing homes in Slovenia (Vrečar & Švab 2020). Hence, nursing homes, as pointed out in the early spread in late winter/spring, are at the heart of the problem (Josipovič 2020). Beside overcrowding, they are also facing the acute problem of air conditioning systems which, with higher humidity and temperature, can facilitate the airborne transmission of viruses.

Given the high numbers of what are known as institutionalised infections and relatively low numbers of infections circulating among the rest, the question is on what grounds are the decisions of locking down certain areas of public life and economic activity taken. On which data about the prevalence of the infection/disease should the process of co-decision in imposing restrictive measures rest?

Since wholesale measures were introduced essentially to protect the hospitals from overcrowding, the research question was who are the most vulnerable populations affected by the restrictions, regardless of the persistence of tangible threat (larger areas of confirmed SARS-CoV-2 infections). The research hypothesis is that the minority, peripheral, and border area populations in Slovenia suffer the Covid-19 restrictions the most or are the most deprived thereby.

2. Methodology

In approaching the research question, the article employs an interdisciplinary and multidisciplinary framework to explore the possibilities of demographical and regional-geographic analysis for understanding the spatial aspects of the pandemic. Using the available medical, statistical, regional, and geographical data we sought patterns emerging from the individual outbreak districts to geographically distinct areas, for example borderlands. To produce a more comprehensive framework for explaining and understanding this pandemic, we resorted to Närman's (1997) underused approach of bridging the gap between theory and practice and developmental thinking, seeking meaningful translation of academic deliberations to public and to practice.

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The underlying research for the present paper was the determination of the nature of the rapid spread of Covid-19 and its morbidity. This was done primarily by comparing Italy and Slovenia based on the available real-time data from late winter (Josipovič 2020). This research revealed the problems of quality of collected data, differences in collecting the corresponding data, their publication, and their suitability for ex-post-facto analyses of the methodological differences between the two countries back in March and April. The Italian data were timely published and included many attributive data, while Slovenia struggled with paperwork and was completely unprepared for such an amount of inflowing data on Covid-19 statuses. The comparisons were possible only by implementing the assessments based on the specific demographic and medical-geographic indices developed from datasets for previous years. With the hiatus of new infections in May 2020, the room opened for new data acquirements and subsequent analyses.

In the prolonged spread of the first wave, it turned out as very useful for the analysis to compare the situation in Austria and Croatia, i.e. Slovenia's and Italy's neighbours, to establish the situation within a geographical sequence of the SARS-CoV-2 infection spread. The neighbouring Hungary was at that point excluded from the analysis due to a different type of the initial spread of infection not directly connected with the outbreak in Italy. With the addition of Austria and Croatia, we were able to follow the sequence in the geographical spread of SARS-CoV-2 and assess the lessons learned from the early Italian and a few early Slovenian cases.

There were multiple issues in the joint interdisciplinary analytical framework which had to be overcome with suitable methodological ameliorations. The first of them concerns the available data. The question arose on how to treat and understand the relation between the number of tests vs. the number of confirmed infections. Issues in PCR[4] testing procedure and other types of testing (e.g. rapid antigen tests) were revealed and the question of the reliability of testing arose. Similarly, distinguishing between symptomatic and asymptomatic or oligosymptomatic infections and the related problems of susceptibility and the conditions of contagiousness also represented an issue in relation to the quality of data. As regards Covid-19 mortality data, much remains unclear on the primary cause of death. Additionally, we do not have data on Covid-19 deaths in the second wave relative to the status of their potential infection in the first wave and the corresponding repetitive testing. Yet another potentially uncertain institutional medical data source was the occupancy and the availability of healthcare premises. Already a brisk comparison between Slovenia, Italy, Croatia, and Austria shows that due to the different approaches to testing, we have been receiving markedly deviating mortality indicators, which are subject to misinterpretation. Due to known issues of testing, the data of the second wave might be of better quality compared to the first wave.

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On the side of states' responses to and measures against the spread of the coronavirus, another analytical difficulty was the arbitrary threshold of 40 infections per 100.000 inhabitants per 14-days set by the Slovenian government's specialised task-force for combating Covid-19 as an indicator of public safety. This threshold disregarded a myriad of relativisation factors, such as (a) geographical pattern of the spread (dispersed or spatially concentrated cases), (b) health-care institutions density (locations of hospitals, nursing homes, other premises), (c) share of institutionalised population per local community (e.g. municipality) and the ratio between the general municipal population and the institutionalised; (d) ethnic composition of a region or local community (minority population areas), (e) geographical position of a region or municipality (peripheral regions, border- and cross-border areas), (f) age structure and gender ratio (local demographic structure, socio-economic activity of the local population), (g) type of municipality or local community (rural, urban, with or without urban centre), (h) health issues and vulnerable populations in a spatial perspective (public health in the regional or municipal perspective).

2.1 Data Sources

All data collections are open-source and made publicly available. The Slovenian National Institute of Public Health (NIJZ) initially published data on the number of people tested and infected in oversized age groups, which was back then acceptable due to the low numbers. This error was soon corrected. The data are now largely displayed by 10-year age groups, but the user-unfriendly form of the 10-year age span instead of at least 5-year age-groups remains. As an effect, the current number of five Covid-19 related deaths in the 35–44 age-group does not allow us to surmise upon the real age being closer to 44 or 35. Additionally, we do not have any indication of their underlying medical problems, etc.

Contrary to Slovenia, the Italian (Ministero della Salute 2020), Austrian (GÖG 2020), and Croatian (MZRH 2020) statistics of the Covid-19 epidemic are much more detailed (by birth-year and area/region), which is somewhat not surprising given the number of cases, the size of the countries, the spatial organisation and regional distribution. After the first month of the outbreak there, we can apply a demo-geographical analysis to identify many hidden characteristics not visible in the data for Slovenia with a certain predictive value for other countries.

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3. Results and Discussion

3.1 The Covid-19 Spread in the First Wave (Late Winter/ Spring 2020)

In the earlier phase of the research during the first wave, the lack of suitable timely data or the missing data were compensated by various methods, mostly normalisations. The distributions across the selected year-spans were normalised to render comparable month-specific death rates. The results were promising. As shown by the comparison of Slovenia and Italy in the first wave, this method produced low discrepancies: –0.12 / +0.21 % of absolute and –3.54 / +3.85 % of relative data variability across the months in the period 2011–2017.

As Italy was among the first countries in Europe to be severely hit by the pandemic, it was important for the spread in other countries to understand the induced mortality pattern. The analysis of mortality rates by national average, regions, and provinces in Italy show a different picture than that reported by public media. Given the size of the total population (60,551 million inhabitants), Italy experienced high daily numbers of both infections and mortality. However, this was only the first impression as per year all deaths in Italy amounted to 633,000 in 2018. Among those, the elderly aged 90 and above account for one fourth (25%) or a total of 160,000 deaths. The regional distribution showed that 15 % (almost 25,000) died in Lombardy, where the province of Bergamo, the most struck by the Covid-19 deaths, is represented with about 2,400 deaths or one tenth (9.8%) of Lombardy's deaths in this age group (ISTAT 2020).

One month after the initial outbreak in Italy, on 26 March 2020, the Covid-19 death toll was 8,165, accounting for 1.29 % on an annual basis, but at the same time representing a conditional increase of 15% of excess deaths compared to the previous inter-year monthly level, what could be called excess mortality. This monthly surplus does not constitute an unexpectedly severe deviation, though. For example, the January 2017 mortality rate in Slovenia exceeded the multi-year average by 32 % – the number of monthly deaths was as many as 2,400 deaths instead of the usual 1,800 for a few years' average (SORS 2020). Similarly, the newly published data in Slovenia show +26.8 % excess mortality in October 2020 compared to October 2019. Clearly, with a smaller population, the data and the derived indicators are also more volatile.

The Covid-19 deaths should thus be observed through this comparative demographic optics. The age-specific and month-specific mortality data are a methodological key to understanding the relationship between the number of deaths and deaths due to Covid-19. This methodological approach is important since Slovenia shares with Italy a convergent picture of the monthly mortality schedule, therefore analogue starting points for assessing potential developments can be applied to both (Chart 1).

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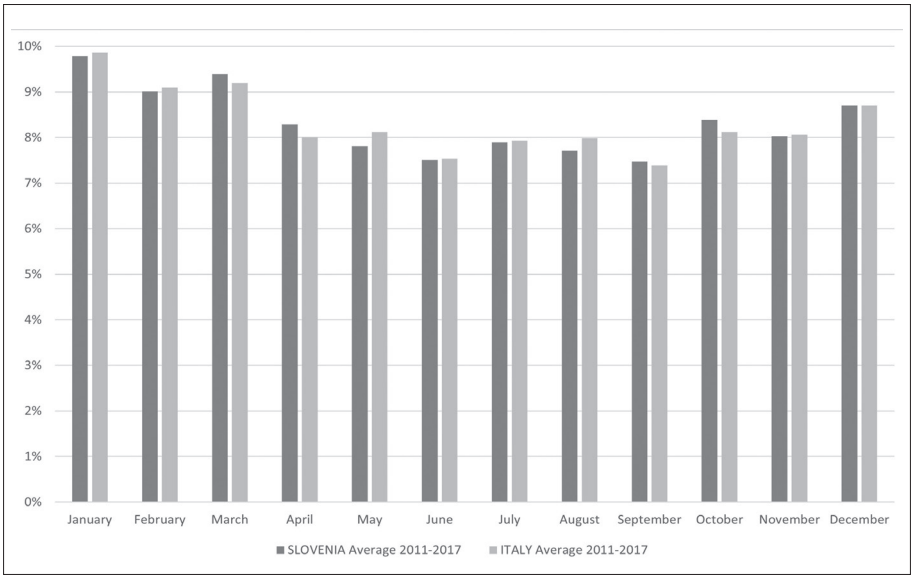
Chart 1: Average monthly distribution of deaths in Slovenia and Italy, 2011–2017



Source: NIJZ 2020; ISTAT 2020.

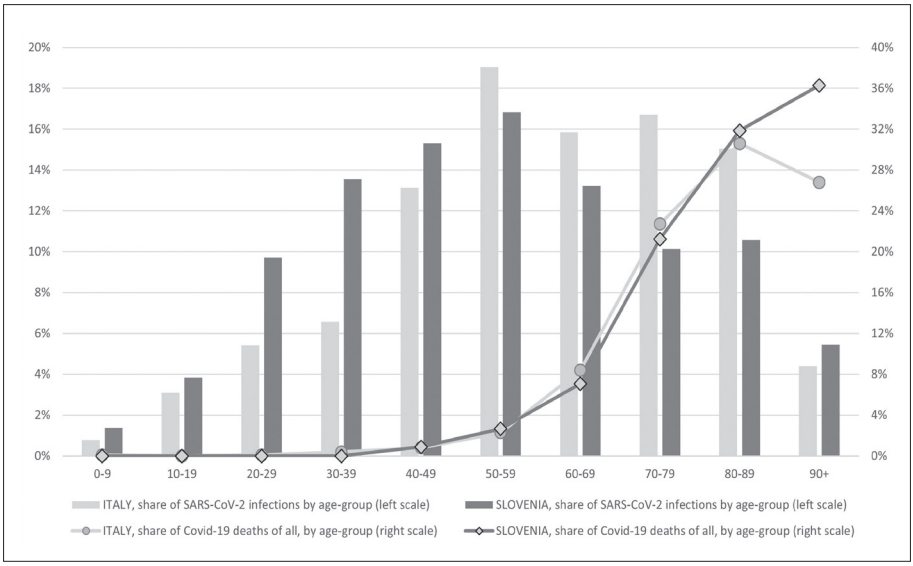
As for the interregional comparison in Italy, Lombardy had as much as 60 % of all Covid-19 related deaths. This was unusually high, especially when comparing the post-Wuhan[5] spread elsewhere, and it has yet to be closely examined as to what factors contributed to such a high concentration of all Covid-19 deaths in Italy. However, demographic analysis again confirms that the average annual mortality rate in Lombardy was higher only by 4.9 % , assuming all deaths are attributed to Covid-19 as a terminal cause of death. But, on a monthly basis, that number rose to 58 % and caused early deaths which would normally occur in the last months of the year. Moreover, in Slovenia, this rise was twice as much as the contribution to increased mortality by influenza and other causes in 2017, keeping in mind that in 2018 and 2019 Slovenia had about 150 deaths attributed to the flu which after March 2020 almost completely vanished (RKI 2020). So, the excess mortality per a given month does not necessarily mean a higher annual mortality rate but helps understand the seasonal changes and the redistribution across months. Thus, as regards the second wave in autumn, a higher number of deaths in Slovenia and a lower number in northern Italy might shed some light of confirmation on the aforementioned intra-annual redistribution of mortality pattern, since Slovenia had a very small death-toll in the first wave – overall less than 200 deaths (NIJZ 2020)

A closer mezzo-regional glance furthermore reveals that Bergamo (population 1.1 million) was the worst off among all the provinces of the Lombardy region (population 10.0 million). In the first wave, Bergamo accounted for 10.4 % of

all Italian Covid-19 related deaths. At a monthly level, the number of Covid-19 related deaths already exceeded the usual monthly number of deaths (+125%) which was quite remarkable. In some counties, mortality after the first month was tripled compared to normal at that time. This was a sign of markedly altered and increased mortality rates that are yet to be evaluated, for which we do not have sufficient and appropriate data, except the forerunning September and October 2020 data.

Another important analysis used for forecasting compares the mortality of people across the specific age-groups. We analysed the Covid-19 deaths and other mortality in the 90+ age group, where deaths concentrated disproportionately. In the province of Bergamo, an average of at least 214 people of this age group were expected to pass away in March 2020 based on the 2011–2017 average. This is 15 % less than 249 people who died due to Covid-19, as 24 % of all Covid-19 patients are those aged 90 or more. Otherwise, the Bergamo province has a total of 11,300 people aged 90 or more.

Chart 2: Covid-19 patients in Italy and Slovenia, and the age-specific structure of deaths, first wave



Source: NIJZ 2020; Ministero della Salute 2020.

The Covid-19 mortality in Slovenia in the first wave cannot be directly compared to Italy due to low numbers, but the proportion of victims entering intensive care in Slovenia was exceedingly high – more than one third. Two thirds (65 %) of the infected were in the economically active age (25–64). If the age group 30–49 was the most infected during the first wave in spring, the centre of the infections later moved towards the age group 45–54 (NIJZ 2020). The proportion

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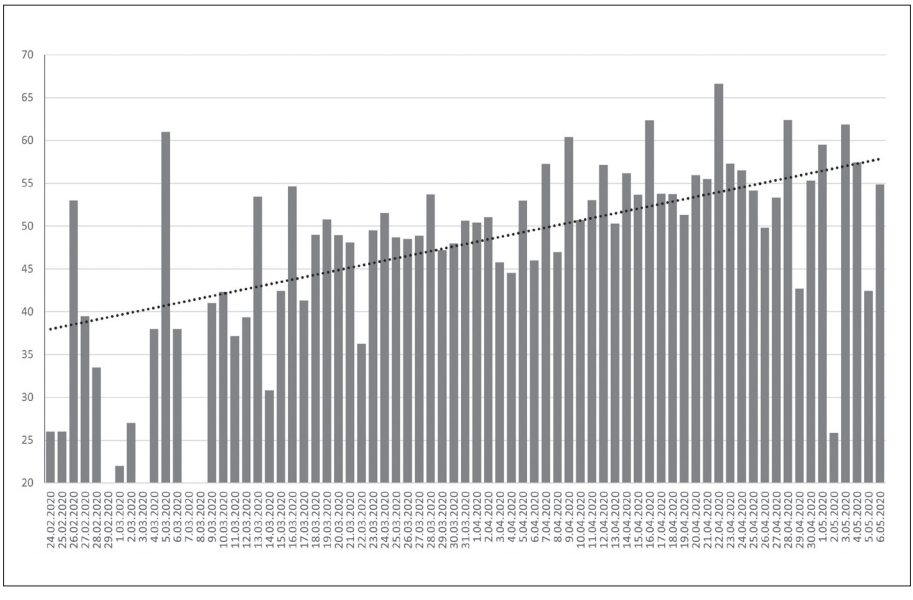
of the infected aged 60+ rose from 15 % to 30 % and is still rising. In November 2020 this group represents as much as 80 % of all Covid-19 infections in Slovenia. It is henceforth clear that the elderly population should be given particular attention as the most vulnerable population. In Italy, 96 % of Covid-19 deaths are in the 60+ age-group. Of central concern are those aged 80–89 with a 31 % chance of dying if infected. Similarly, the age groups 70–79 and 90+ share one fourth chance of dying (Ministero della Salute 2020; Chart 2). The second wave in Slovenia was much more lethal than the first. The chance of dying in the age group 85+ climbed to 40 % , but with an enormous gap between men (52 % of patients died) and women (32 % of patients died) (NIJZ 2020; Chart 6).

3.2 The Geographical Sequence of the Covid-19 Spread

The geographical sequence of the Covid-19 spread depicts the process of a gradual change in the mean age of the infected as a direct indicator of the timing of the first outbreak. This sequence enables us to decipher the position of a given country in the progression of the spread. The spread of infections by country shows a slow trend, but gives some idea of its geographical direction. The Croatian case is illustrious since it confirms the slightly delayed spread of infections from Italy and/or Austria (or *vice versa*), first to Slovenia and then to Croatia (Charts 3 and 4).

Chart 3: Mean age of SARS-CoV-2 positive in Croatia in the first wave from 24 February to 6 May 2020



Source: MZRH 2020.

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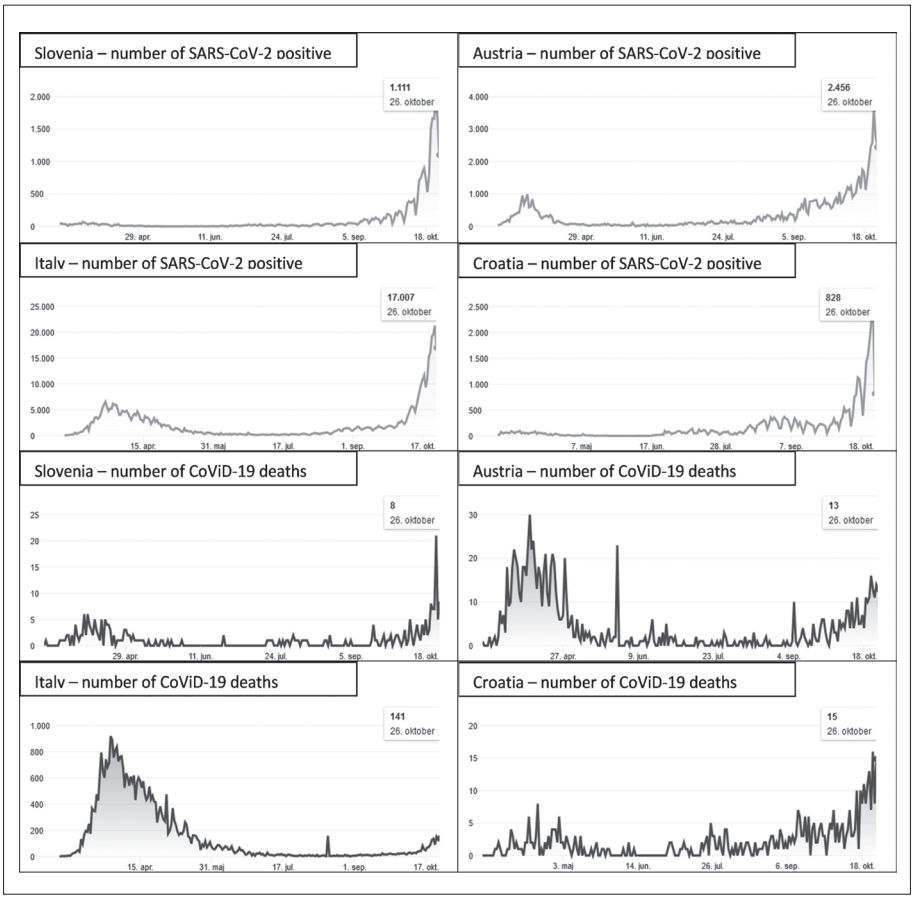
Chart 4: Daily number of SARS-CoV-2 positive (above) and daily number of Covid-19 deaths (below) by country – Slovenia, Austria, Italy, and Croatia



Source: NIJZ 2020; Ministero della Salute 2020; GÖG 2020; MZRH 2020.

Chart 4 shows that the earlier developments that took place in Austria and Italy (Bad Ischgl, Bergamo) resulted in the first peak (first wave) of confirmed cases and deaths. While both Slovenia and Croatia resonated the developments in the former countries with a significant delay, the chart also reveals the delayed deaths in October due to a sharp weather change from hot September to unusually cold October[6] and stable November (ARSO 2020). On the contrary, despite similar weather developments in Austria and Italy, both countries did not develop the echo from the first wave since the number of deaths had already been consumed earlier.

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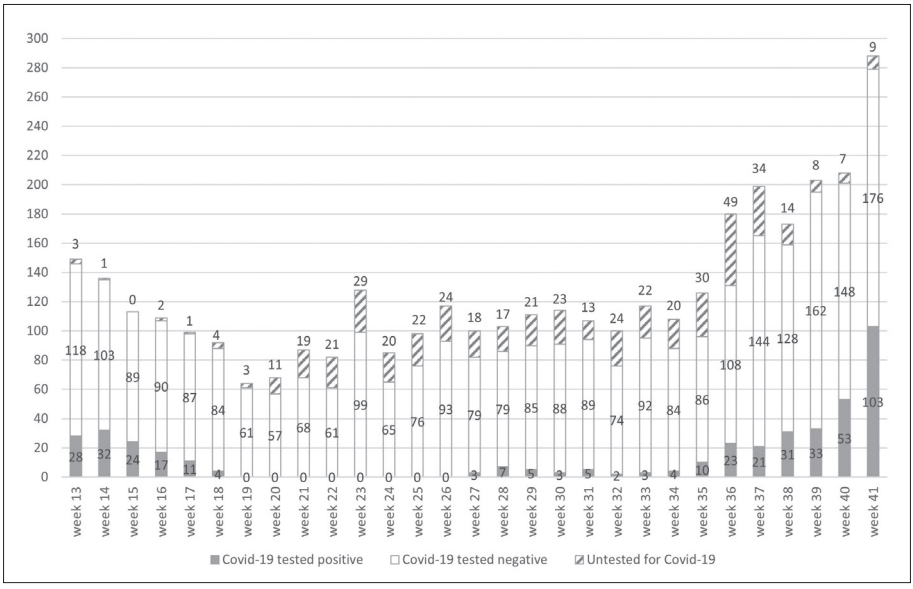
3.3 The Characteristics of Covid-19 Spread in the Second Wave (Autumn 2020)

The number of confirmed positive cases in the second wave shows a strikingly different picture compared to that of late winter and early spring, though the responses of all four countries were looser. In the first half of October 2020 in Slovenia, the ratio of those testing positive among all tested for SARS-CoV-2 peaked at 8 %, while the same ratio soared to 30 % in the last third of the month. Apart from this, it reveals another remarkable feature. The hospitalised SARI[7] patients tested positive for Covid-19 in only about 20 % of the cases compared to the number of all hospitalised for severe acute respiratory indications (Chart 5). The data unfortunately do not specify the type and kind of other strains causing these difficulties. However, Chart 5 shows that the preceding epidemic of unusual respiratory (non-Covid-19) infections lies at the core of understanding the spread of the second wave. Some authors claim that such an augmentation of hospitalised persons due to unknown or atypical respiratory diseases may have its triggering counterpart back in the early spring lockdown. The measures imposed, such as the restriction on movement, insufficient exposure to fresh air and sunlight, the lack of vitamins, rising fear, uncertainty, precariousness toppled with increasing air pollution causing oxidative stress, etc., all weakened the population's resilience (Nitschke et al. 2020; Klipšteter 2020).

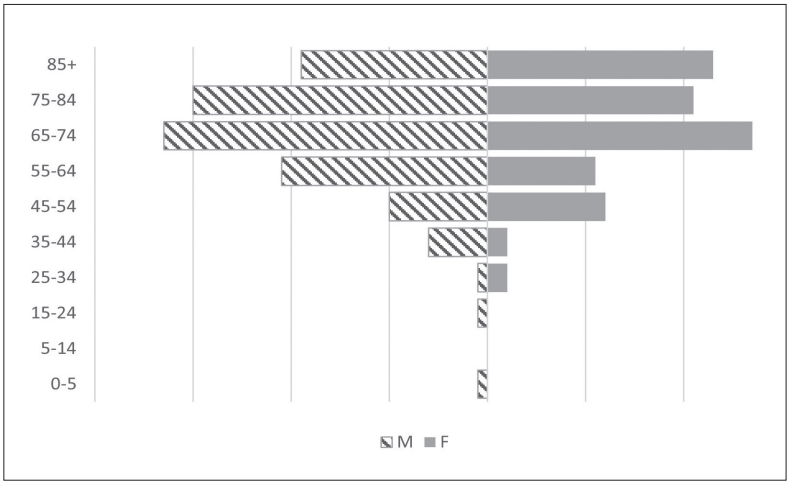
Chart 5: The breakdown of SARI cases and the relation with SARS-CoV-2 positive 2020



Source: NIJZ 2020.

The beginning of the new school year resonated in the slight increase toward the second week of September 2020, but then quickly decreased. This might have been due to fine weather, since with the advent of low temperatures in October the share of Covid-19 patients among all respiratory infections in hospitals rose from 16.3 to 25.5 % by 11 October 2020. Another rapid rise to 35.8 % share of Covid-19 hospitalisations occurred between 12 and 18 October 2020, but the first week of November exhibited as much as 81 % of Covid-19 positive among all SARI hospitalisations. As pointed out in the introductory part, data from Slovenian hospitals confirm high contagiousness within medical facilities while, e. g., the German average is 58 % of Covid-19 patients among SARI in the 47th week of 2020 (RKI 2020).

Chart 6: Age structure of hospitalized with SARI status (including Covid-19), 21 Sep – 18 Oct 2020



Source: NIJZ 2020.

The Slovenian case is instructive from several aspects, with the age of the infected being critically relevant. Between 21 September and 18 October 2020, only 5.9 % of SARI patients were younger than 45. Hence, it is possible to draw a logical conclusion that the closure of schools, kindergartens and even universities was less productive or of minor impact in preventing the spread of SARS-CoV-2 and Covid-19 than expected. Additionally, the numbers of infected persons kept lingering around 1,500 daily cases during the last weeks of 2020. So far, we lack evidence that those below 45 transfer the infection to the elderly population (see Chart 6). Moreover, there is evidence that children are even less prone to spreading the infection than mid- or older generations (Jenco 2020), and only 0.97 % of patients are below 25 years of age (Chart 7).

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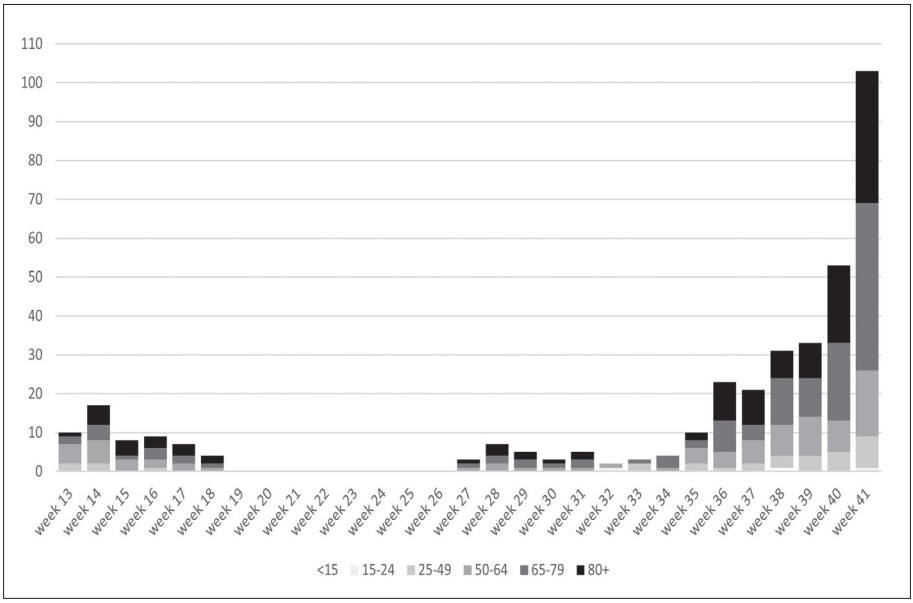
Chart 7: Age structure of hospitalised patients with SARI status (including Covid-19) by week, March–October 2020



Source: NIJZ 2020.

The breakdown of data per week shows another important feature that might cause problems in the interpretation as it does not distinguish between the lengths of hospitalisation. Given that the majority of patients stay in hospital for more than a week, it is analytically important to distinguish persons who are present for multiple weeks. The so-called repetitive cases should be collected and presented separately.

3.4 Regional Disparities and Border Areas

Given that the majority of new infections within the second wave are expected to stem from nursing homes and hospitals on one hand and from employment in general (especially where industrial and intensive group work is undertaken daily) on the other, it seems geographically illogical to introduce wholesale measures for preventing the spread from a tiny share of population being scattered across the country. On the contrary, geographical scale matters and should be included in deliberating the imposed measures, especially school closure. Those restrictions are no less justifiable even if we deduct the infected employees.

According to the NIJZ November 2020 data, about 15 % of infections came directly from cross-border workers which might involve also those employed in hospitals, clinical centres, and nursing homes, without considering the potenti-

ally infected members of their households. They mostly brought the infections from Austria (51 %), but also Bosnia-Herzegovina (13 %), Germany (9 %), Serbia (7 %), Croatia (7 %), and Italy (4 %). The data structure does not allow us to discern the nationality or citizenship of these workers, but from the geographical distribution of infections, it can be concluded that a vast majority of those living along the Austrian border and working in Austria are Slovenian citizens, while others are mainly posted workers with a significant if not major part of foreign citizens (Josipovič 2018). Henceforth, it seems that the Slovenian government does not recognise the value of a cross-disciplinary approach, nor the importance of the spatial distribution of restrictive actions, and it does not collect all the necessary data that some other European countries do. For example, Austria published data gathered from the cluster-inspected transmission of the SARS--CoV-2 infections (Table 1). Hence, if the source of infection came mainly from the households (Table 1), locking people down to their homes and municipalities could be a problem.

Table 1: Distribution of the SARS-CoV-2 infections per source, Slovenia, Austria

	SLOVENIA			AUSTRIA			
SOURCE	nr. of cases	% of infections	SOURCE	nr. of Clusters	nr. of cases	cluster reproduction rate	% of infections
local	4842	55.4	households	1110	3181	2.87	52.6
unknown	2478	28.3	leisure	321	1366	4.26	22.6
in epidemiological investigation	666	7.6	employment	92	393	4.27	6.5
imported	529	6.0	education	43	336	7.81	5.6
imported cluster	186	2.1	health and social institutions	41	557	13.59	9.2
no data	45	0.5	mixed source	17	93	5.47	1.5
TOTAL	8746	10.0	hotel / gastronomy	14	57	4.07	0.9
			travel	7	17	2.43	0.3
			sport	7	43	6.14	0.7
			commutation	4	9	2.25	0.1
			TOTAL	1656	6052	3.65	100.0

Source: NIJZ 2020; GÖG 2020.

* NB: data for Slovenia are for the period 1 June – 13 October 2020 while for Austria for the period 19–25 October 2020.

Another problem is that the Slovenian National Health Institute does not collect and publish data on the sources of infection as locality-sensitive and region-spe-

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cific, which dramatically affects the regional or municipal probability of getting in touch with the infected. To address this problem, we rendered the available data at the municipal level of Slovenia. Thus, the intraregional disparities are more visible, as shown in Figures 1–4. North-eastern Slovenia and the border regions – where also a significant number of ethnic minorities' members reside (Hungarians, Croats, and Roma are traditional to the region of Prekmurje in NE Slovenia) – are much more affected by new infections, thus confirming the research hypothesis, yet the Covid-19 deaths are generally lower. Another important feature of the regional perspective is that especially the Štajerska region, with most cross-border daily commuters, suffers the most cases and deaths by place of permanent residence. Another area very much affected by the Covid-19 indicators is the municipalities hosting the seats of nursing homes and hospitals, i.e. at-risk, but relatively closed institutions. Here, again, it is possible to discern that the effect of closing people to the municipal boundaries is far from being efficient, for the majority of infections come from the patients and staff in nursing homes and hospitals, i.e. institutions with better possibilities to control the infections among staff or daily visitors.

Looking at the regional and municipal level by means of analytical maps (Figures 1–4), knowing the underlying infrastructure, the size of municipalities, the number of inhabitants, and the specific cultural and historical traits of the area enables us to conclude that smaller municipalities in border regions are generally also places where ethnic minorities reside, as in the case of NE Slovenia. The closure within municipal boundaries is – besides fewer possibilities of movement and a lower number of available public services due to smaller and rural settlements – far more harmful not only from the psycho-social point of view but also in terms of the possibility of getting infected, as shown in the case of cross-border workers.

Another look at the municipalities in terms of Covid-19 deaths renders a different picture. While some areas are pronouncedly more affected, huge areas are left blank and are Covid-19 deaths free in the last two weeks of November 2020 (Figure 3). Among them, the previously at-risk Pomurska region shows a problematic situation only in the border municipalities of Kuzma and Rogašovci, both with nursing homes with a high number of infections, and Lendava with the heart of the Hungarian minority in Slovenia. Yet, despite the considerable number of infections, a closer look reveals a very low overall number of Covid-19 deaths (Figure 4).

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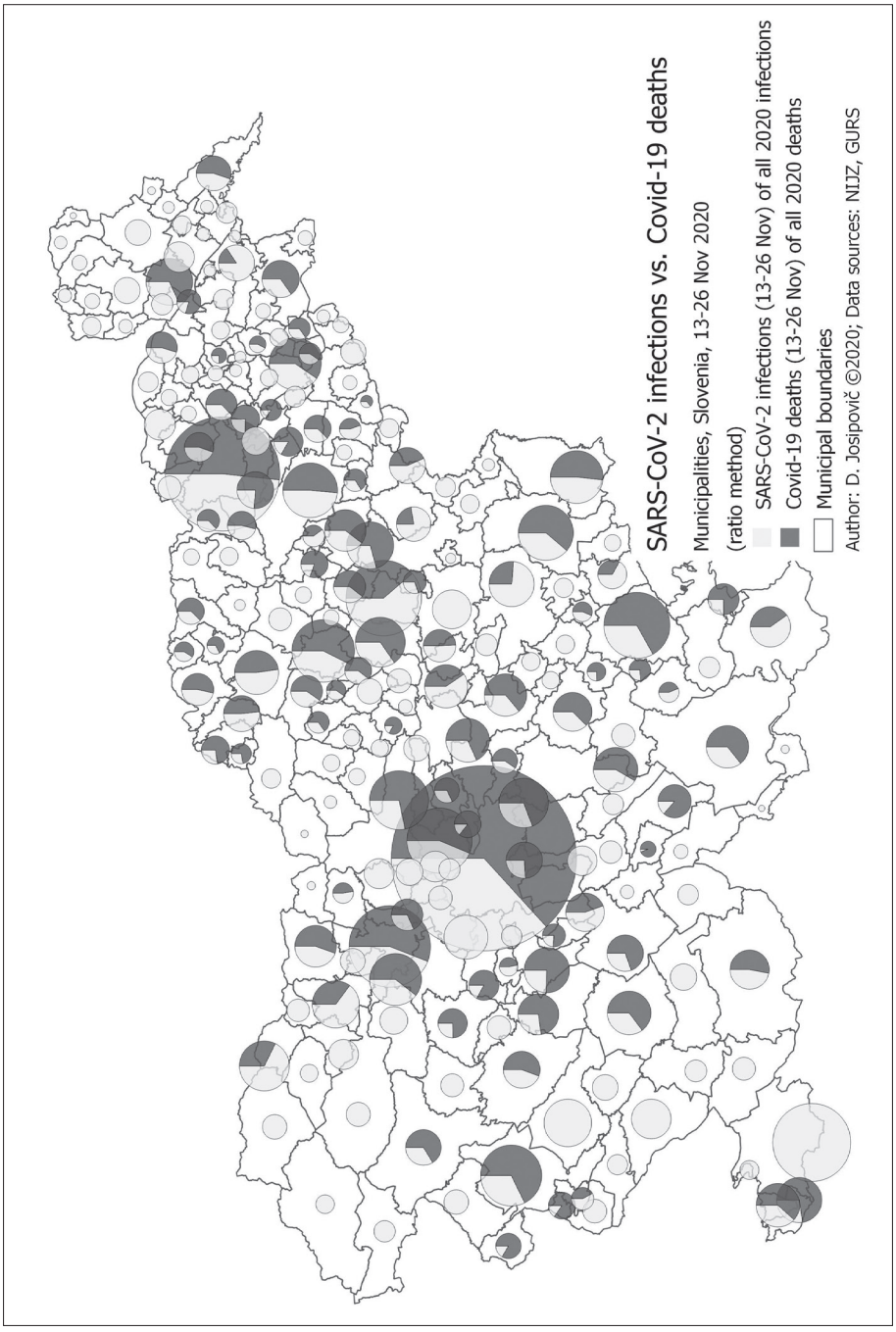
Figure 1: Size- and area- specific distribution of SARS-CoV-2 infections and COVID-19 deaths, Slovenia, municipalities, 13–26 November 2020



Source: NIJZ 2020.

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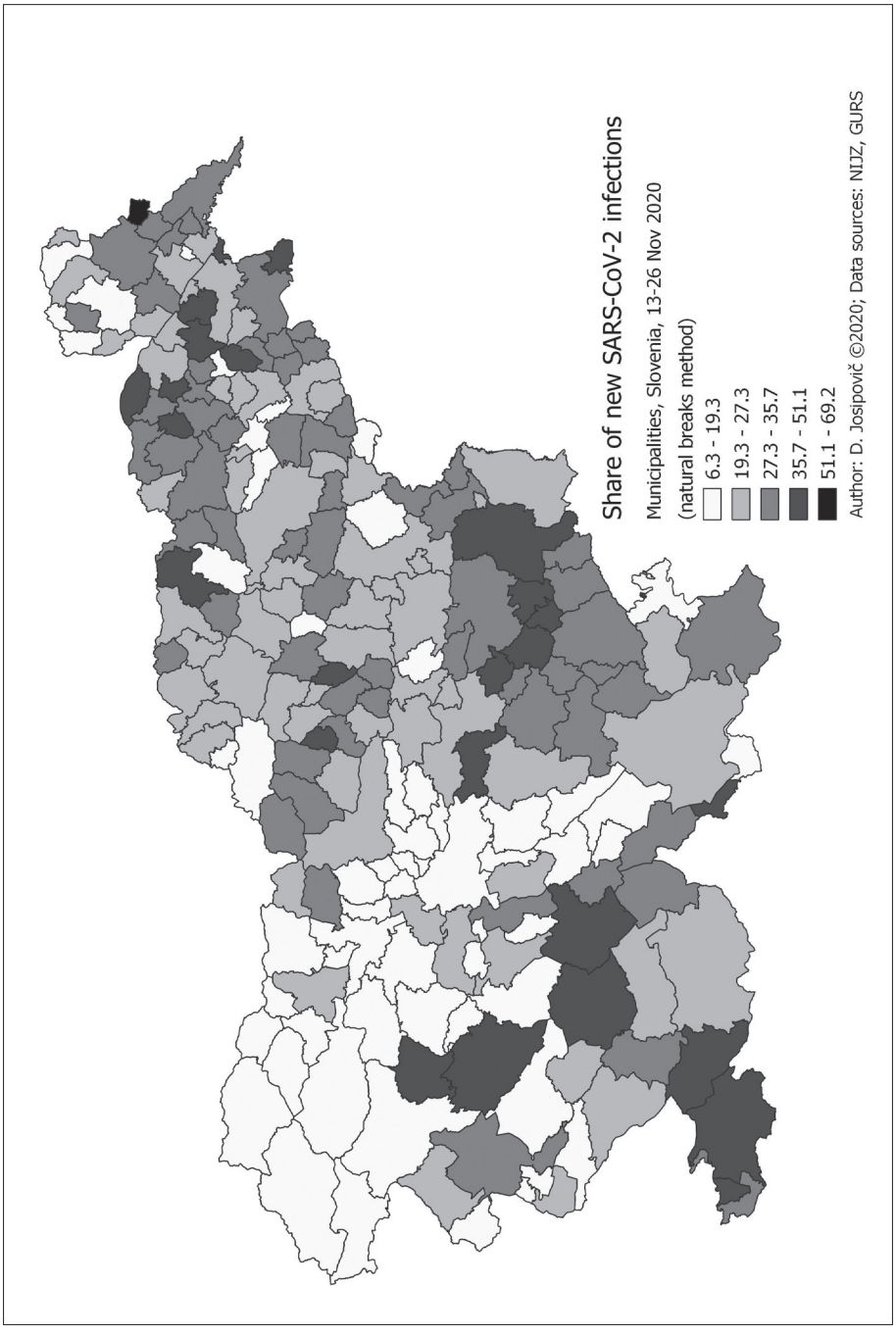
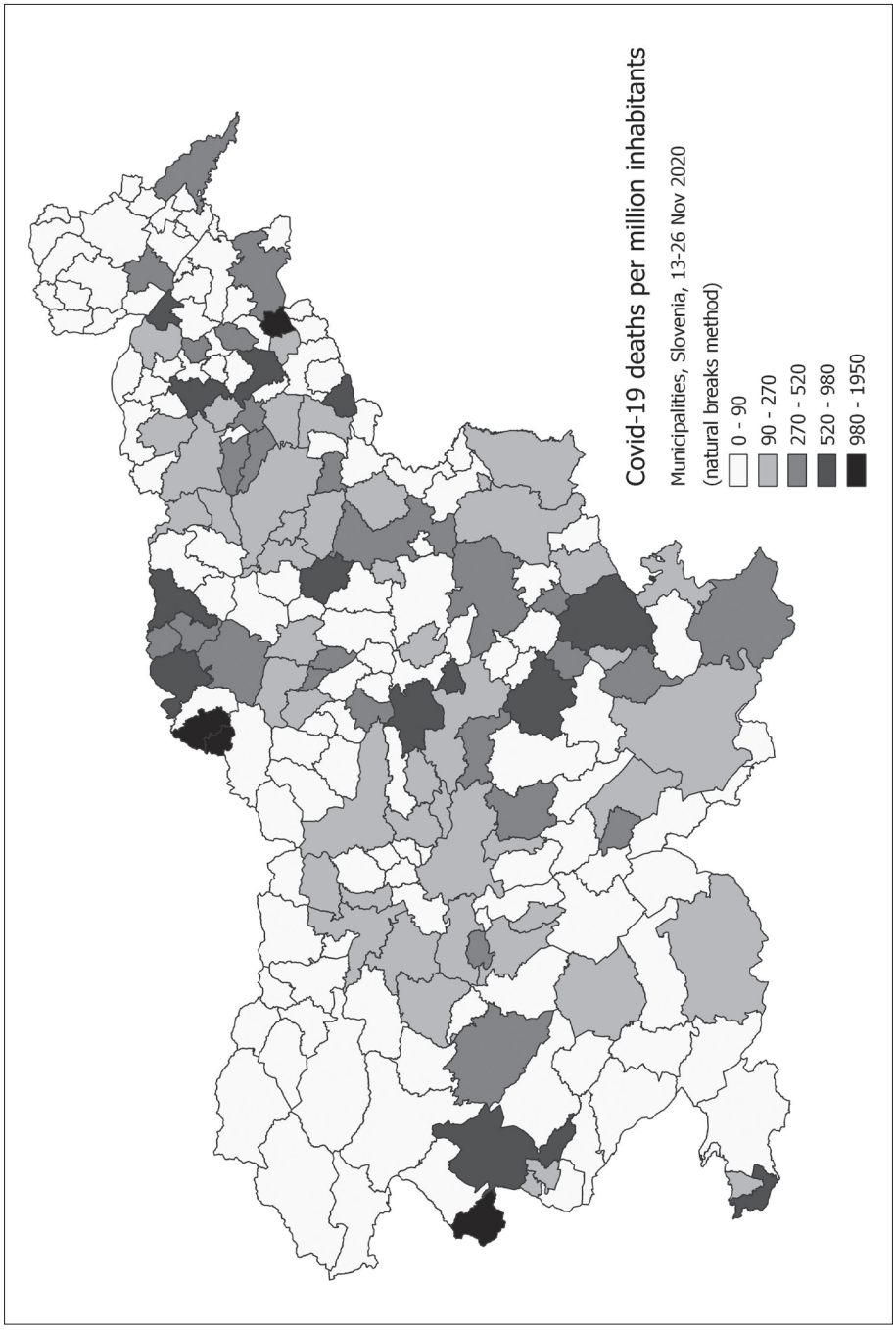
Figure 2: Share of new SARS-CoV-2 infections of all 2020 infections within municipal populations, 13–26 November 2020, Slovenia, municipalities



Source: NIJZ 2020.

DOI: 10.36144/RiG85.dec20.33-56

Figure 3: Share of COVID-19 deaths per million inhabitants, 13–26 November 2020, Slovenia, municipalities



Source: NIJZ 2020.

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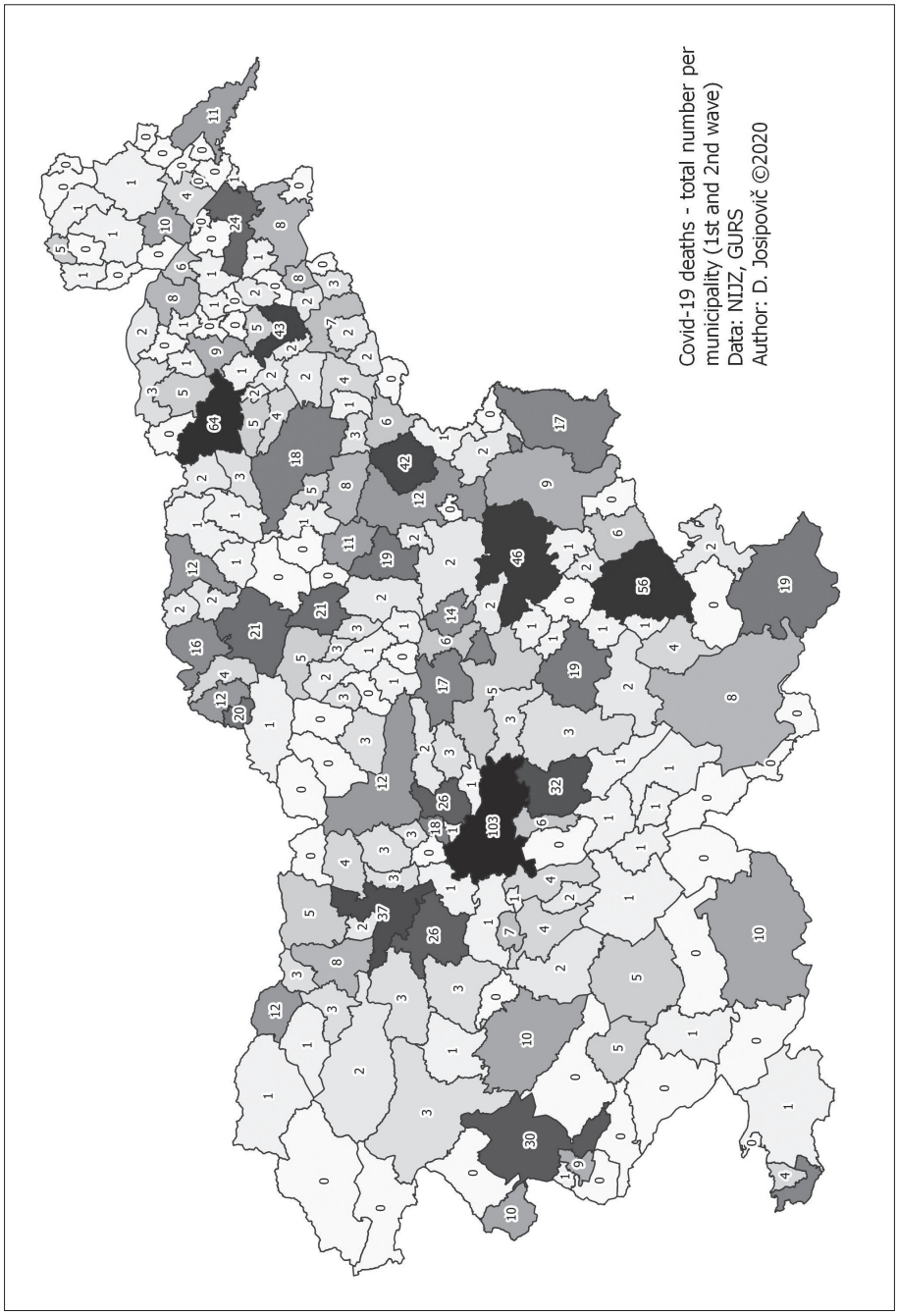
Figure 4: Number of COVID-19 deaths per municipality, first and second wave combined, 2020



Source: NIJZ 2020.

As regards other areas along the Slovenian-Croatian border, the situation is the least problematic in Istria (14 overall Covid-19-related deaths) and the Kočevska/Kolpa region (4 deaths). Bela Krajina with Žužemberk exhibits more deaths (30) as well as other parts of Lower Dolenjska and Posavje (58). The Upper Sotla and Haloze border area offer a better picture (19 deaths), but the municipalities are much smaller there. The Lower Drava region with Prlekija has a slightly worse record of 33 Covid-19 related deaths (Figure 4).

Figures confirm that smaller sized municipalities, especially those locked along the Slovenian national border, experience higher shares of local infections, thus alluding to a potential transmission because of the lockdown itself. As some of the most important ethnic minorities in Slovenia reside in border territories with higher numbers of infections (Italians in Izola and Piran; Hungarians in Lendava; Roma scattered in Prekmurje and Dolenjska; Croats in most municipalities along the Slovenian-Croatian border), it is reasonable to expect their higher vulnerability, yet additional research is needed to address that question properly.

4 Conclusions

The interdisciplinary analysis shows that there are significant spatial, micro-regional, and age-specific disparities in the distribution of the coronavirus disease across Slovenia. Applying the combined analysis of statistical, medical, and demographic indicators, the article sheds new light on the systemic restrictions on the population travelling abroad, the elderly in nursing homes, youngsters in schools and kindergartens, and patients in hospitals.

As we witness (end 2020) the rising animosities in Slovenia between the government's top-down approach and the perceptions of the common people, it seems necessary to introduce methodologically sound approaches in analysing the spread of SARS-CoV-2 and consequently Covid-19. While having all measures primarily concentrated at preventing the healthcare systems from collapsing, in countries like Slovenia and Italy, hospitals and medical centres started to delay or postpone for an indefinite time all unnecessary surgeries and medical procedures. This way of approaching the problem of the rising number of hospitalised SARI patients and the high share of institutionalised infections, as in the case of Slovenia, reveals other strains of degradation of the public health system which could deteriorate the position of the immunity deficient, chronically ill, and exhausted, predominantly older populations, adding to higher mortality and consequent lower life expectancy.

The spread of the disease in Slovenia shows more than just a degraded and dismantled public health system as a consequence of long-lasting austerity aiming at, among other things, a systematic cutting of costs and gradual privatisation. With only a few improvements between the two waves of coronavirus

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spread, it seems that Slovenia did not prepare adequately for the announced second wave. Instead, it retreated to seemingly unthoughtful measures with overall rather harmful effects on the vulnerable populations against a backdrop of mitigating the coronavirus spread.

Coronavirus-related restrictions and the lockdown to municipalities most disproportionately affected peripheral rural and border areas with predominantly elderly and traditional minority populations (Hungarians, Italians, Croats, Roma). The insufficient conditions in many hospitals (14 % infected) and especially nursing homes (26 %), topped by infected staff in general (30 % of all infected) vs. only 8 % of infections among teachers and 4 % among kindergarten staff in urban areas, is certainly a vague argument for school closure. All facets of the Covid-19 restrictions and the negative effects of online schooling are yet to be appraised, but already in the first wave, the psycho-social distress along with the overweight children rose significantly.

> School closure, lack of outdoor activity, aberrant dietary and sleeping habits are likely to disrupt children's usual lifestyle and can potentially promote monotony, distress, impatience, annoyance and varied neuropsychiatric manifestations. Incidences of domestic violence, child abuse, adulterated online contents are on the rise. Children of single parent and frontline workers suffer unique problems (Ghosh et al. 2020).

Moreover, regional, and local aspects were not taken sufficiently into account. Tens of municipalities without Covid-19 deaths and with scarce infections are not allowed to return to normal in-school education. where, the misuse of the concept of equal opportunities may be surmised. Cities, in general, have a higher number of cases but lower densities and the chances of transmission can be reduced more easily than within institutions. The highest densities of infections and Covid-19 deaths are in the areas with nursing homes and urban areas with Covid-19 clinics. If we exclude the Covid-19 deaths from nursing homes off the charts, some 75 % of all municipalities become a safe area and the restrictive lockdown is deemed unnecessary.

A regional analysis across municipalities reveals the elderly population mostly in rural and peripheral areas as being the most vulnerable. Especially men (85+) experienced high mortality (52 %) compared to women (32 %), but the overall mortality (40 %) was still much higher than in Bergamo (28 % back in spring). The same goes for mortality in nursing homes and intensive care units. Along with their staff (the highest infection rates) and the industrial and migrant workers (one third of all the infected), these institutions account for 65 % of all the infected with a known source of infection. The official Slovenian data on the source of infection are of limited use or meaningless. They report 55 % to be local transmissions (households, work, vicinity) but with no data on the real source of the infection and the transmission between family members, especially the

elderly and children. An additional 28 % of the infected did not reveal or did not know the source of infection. The transmission from and to children is rare, yet children remain the target of restrictions and in the long run one of the most affected groups.

Considering the initial outburst of Covid-19, combined with the data on the geographical sequence and the increase of the mean age of the infected over days and months, it is possible to conclude that in the first wave infections were transmitted within the group of frequent travellers, especially those travelling by plane, and later concentrated on elderly stationary population with immune deficiencies receiving care mostly from the middle-aged as vehicles of infection. Comparative data from Italy, Slovenia, and Croatia confirm there is an age-specific shift of infections from the relatively younger ones to the relatively older ones. Thus, the geographical sequence in the Covid-19 spread may be discerned.

It is still to be studied how the common state of social fear and uncertainty influences the spread of infections and the disease. Dramatic developments in northern Italian hospitals during the first wave bring to the fore the underestimated role of panic among medical staff and employees during the outbreaks of infections within medical facilities.

Border areas with small municipalities suffered the highest impact of lockdown with no possibility of crossing the border, except in case of cross-border work (mostly in northern – to Austria, and south-eastern border area – from Croatia), resulting in a higher number of infections. The situation in smaller municipalities in the eastern and north-eastern parts of Slovenia is worse compared to those in central and western parts of Slovenia. The combined lockdown to municipalities and school closure were probably the two worst options to which the national coronavirus task force and the government itself resorted.

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Notes

[1] According to Miša Pfeifer from the University Clinical Centre of Ljubljana, some 80 % of all SARS-CoV-2 infected persons have mild symptoms, with 15 % experiencing a difficult course of the disease, while 5 % have severe symptoms including cytokine storms which can also be instigated by several other infections such as influenza, pneumonia, and sepsis (Tang et al. 2020).

[2] In an OECD comparison of 2017 (OECD 2020), Slovenia had 19.1 % of the population aged over 65, followed by Austria (19.2), Croatia (19.7), and Italy (23.0) with almost a fourth of the population aged over 65.

[3] NIJZ collects the data on the source of infection. The average daily number of infections for the 48th week (as of 2 December 2020) was 1,463 with the weekly number of infected medical workers lowering from 1034 in the 45th week to 850 in the 48th week (NIJZ 2020).

[4] PCR = Polymerase Chain Reaction is one of the main technics for testing the presence of SARS-CoV-2. Recently, the rapid antigen tests with lower accuracy are considered for population testing *en masse* (Wernhart et al. 2020).

[5] The latest microbiological analyses of the old wastewater samples in Spain and elsewhere uncover RNA (ribonucleic acid representing the genome of the virus) sequences identical to SARS-CoV-2 in previous years (e.g. Thomas 2020).

[6] The huge leap in the number of infected persons in Slovenia on 20 October 2020 is unusual. This break in the data series almost doubled the number from the previous day (802 : 1505). While the number of tests did not increase that much, a high rise occurred in the percentage tested positive (18.5 : 25.5 %). Thus, the last week of October 2020 with the national holidays was the peak; afterwards, the season's record of 35 % tested positive was not toppled (NIJZ 2020).

[7] SARI – severe acute respiratory infection is not to be confused with the Covid-19 disease, though NIJZ includes data on SARI patients as the main pool or a macro-group of respiratory patients including Covid-19 patients.

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