GEOGRAPHY OF TWO COVID-19 WAVES IN LATVIA

COVID-19 PANDĒMIJAS ĢEOGRĀFIJA LATVIĀ

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Abstract

The COVID-19 pandemic and its waves of incidence have had a significant impact on our personal and professional lives. This has led to scholarly interest in various fields, including geography. A growing body of scholarly literature is trying to understand the reasons why some places were and still are more affected than others.

The aim of this study was to shed light on the geography of the Covid-19 pandemic in Latvia and explain the geographical patterns of the pandemic during its first two waves. This was done, firstly, by mapping the number of cases per 10,000 in the municipalities of Latvia; secondly, the analysis also combined that same data with a total of eleven variables, by using bivariate correlation.

The results show that during the first wave, Covid-19 incidence was relatively low. However, during the second wave, there were several large clusters of municipalities with a rather high number (over 500) confirmed Covid-19 cases per 10,000 inhabitants. Results of the correlation analysis suggest that geographical patterns of COVID-19 incidence were a result of a complex set of factors, varying throughout the country. Also, the presence of large clusters of municipalities with a rather high number of cases per capita (mostly) during the second wave points to the possible impact of proximity.

Keywords: geography, COVID-19, Latvia, pandemic

Introduction

A new scholarly chapter has opened in studies on the Covid-19 pandemic since the first publications on the subject back in 2020. It has also been acknowledged that geography plays a crucial role and provides explanations for the spread of the virus. Regardless of the various challenges that the Covid-19 pandemic poses in both our personal and professional lives, it provides an excellent opportunity for geographic analysis (Aalbers et al. 2020).

A growing body of scholarly literature is trying to seek examples and give answers to why some places were and still are more affected than others (Florida & Mellander 2022). The virus's uneven distribution throughout and within countries poses fundamentally geographical questions from which we can learn more about the political, economic, financial, sociocultural and demographic dimensions of the pandemic (Aalbers et al. 2020).

At first, it was assumed that population size, particularly density, played a significant role in shaping the geography of Covid-19. Some researchers linked geographical variation in Covid-19 to factors such as overpopulation, household characteristics, income level and injustice (Credit 2020; Drefahl et al. 2020; Florida & Mellander 2022). Whilst large cities were the first areas to be significantly affected, over time Covid-19 spread to other areas, with a large increase in both cases and deaths in smaller towns, suburbs and remote areas (Carozzi et al. 2020).

Previous research on the Covid-19 pandemic in Latvia has shown geographical discrepancies between age groups. The outbreak is creating serious health-related and socioeconomic problems, many of which are related directly to demographic characteristics (Krisjane et al. 2020; Apsite-Beriņa et. al. 2021).

The aim of this study was to shed light on the geography of the Covid-19 pandemic in Latvia and explain the geographical patterns of the pandemic during the first two waves. Consequently, this study sheds light on geographical patterns of Covid-19 in Latvia by mapping the available statistical data and by combining data on Covid-19 cases per 10,000 inhabitants in municipalities of Latvia with several variables, by using bivariate correlation.

Data and methods

The study utilised statistical data from the Central Statistical Bureau of Latvia (CSB) at the municipal level. Data from the Latvian Centre for Disease Prevention and Control (*Slimību profilakses un kontroles centrs*, abbreviated as SPKC), including the number of confirmed cases, the 14-day cumulative number of cases per 100,000 people and the outcomes, as well as the total number of confirmed cases of Covid-19 by municipality was also used.

Information from Latvian government websites (or websites related to the government), along with articles from the news websites Apollo.lv, Public Broadcasting of Latvia (*Latvijas Sabiedriskie Mēdiji* or LSM) and TVNET, was systematised. These sources allowed us to characterise the situation in Latvia during the first two waves of Covid-19, i.e., to provide background.

To show the geographic spread of Covid-19 for both waves, the number of cases per 10,000 inhabitants (also referred to as “per capita”) was calculated and then mapped. For the first wave the average population for 2020 was used, whereas for the second wave, it was the population at beginning of 2021. This allowed for the employment of cartographic analysis.

The analysis also combined data on Covid-19 cases per 10,000 inhabitants in municipalities in Latvia with several variables which had been previously identified (or a variety of which had been identified) as possible factors related to the

geographical spread of incidence. For this purpose, bivariate correlation with a total of eleven variables was used. These variables were: total population, population density, share of population aged 65 and older, average monthly neto salary (except for private sector enterprises where the number of employees was less than 50), share of people with higher education, average size of a household, share of single households (all provided by the CSB), the average share of unemployed people among those aged 15-64, i.e. the working-age population (provided by the State Employment Agency; *Nodarbinātības valsts aģentūra* or NVA), the presence of social care centres, the number of social care centres and the number of potential clients staying in them (all provided by the Ministry of Welfare, abbreviated as MW).

Results: geography of Covid-19 in Latvia

The first case of Covid-19 in Latvia was recorded on 2 March 2020 (LSM.lv 2020a). A state of emergency to limit the spread of Covid-19 came into effect on 13 March. Consequently, numerous decisions were made regarding numerous aspects of the pandemic. For example, full-time studies in person had to be discontinued at all educational establishments and resumed online. Social distancing measures were also introduced, with no more than two people, who had to be separated by at least two metres, being allowed to gather in public or outdoor areas. Exceptions were, for instance, persons living in the same household and their children, as well as persons performing work or official duties (Likumi.lv 2020).

The aforementioned total number of confirmed cases of Covid-19 by municipality was first published on 19 March (SPKC 2022a). Hence, for the purposes of this study, it is considered to be the beginning of the first wave.

A peak of 48 new cases was recorded on 1 April. Before and after that, the number of new cases was considerably lower. The first death was reported on 3 April. During the first state of emergency, a total of 24 people died from Covid-19 or complications related to it (further on also referred to as “Covid-19 related deaths”). Overall, there were a total of 993 Covid-19 cases during the first wave (SPKC 2022b).

The end of the first wave could be considered as being on 29 May, when the number of cases per 100,000 people was almost on the same level as on 19 March (SPKC 2022b). The Covid-19 state of emergency was extended several times, eventually coming to an end on 9 June. Still, not all restrictions were lifted, and it was decided that the support measures would continue for as long as they were needed to address the threat and consequences of Covid-19 (TVNET 2020).

Figure 1 shows the low level of incidence that characterised the first wave and the first state of emergency: 37% percent of municipalities (44 out of 119) had no recorded cases at all, while in most municipalities (55 or 46.2%) the number

confirmed cases per 10,000 inhabitants did not surpass 10. Thus, it was not surprising that municipalities with these levels of incidence made up large contiguous areas, covering most of Latvia. Elsewhere, in western Vidzeme there was a cluster of municipalities with a slightly higher level of incidence. The few remaining municipalities with comparatively higher level of incidence were scattered across the country.

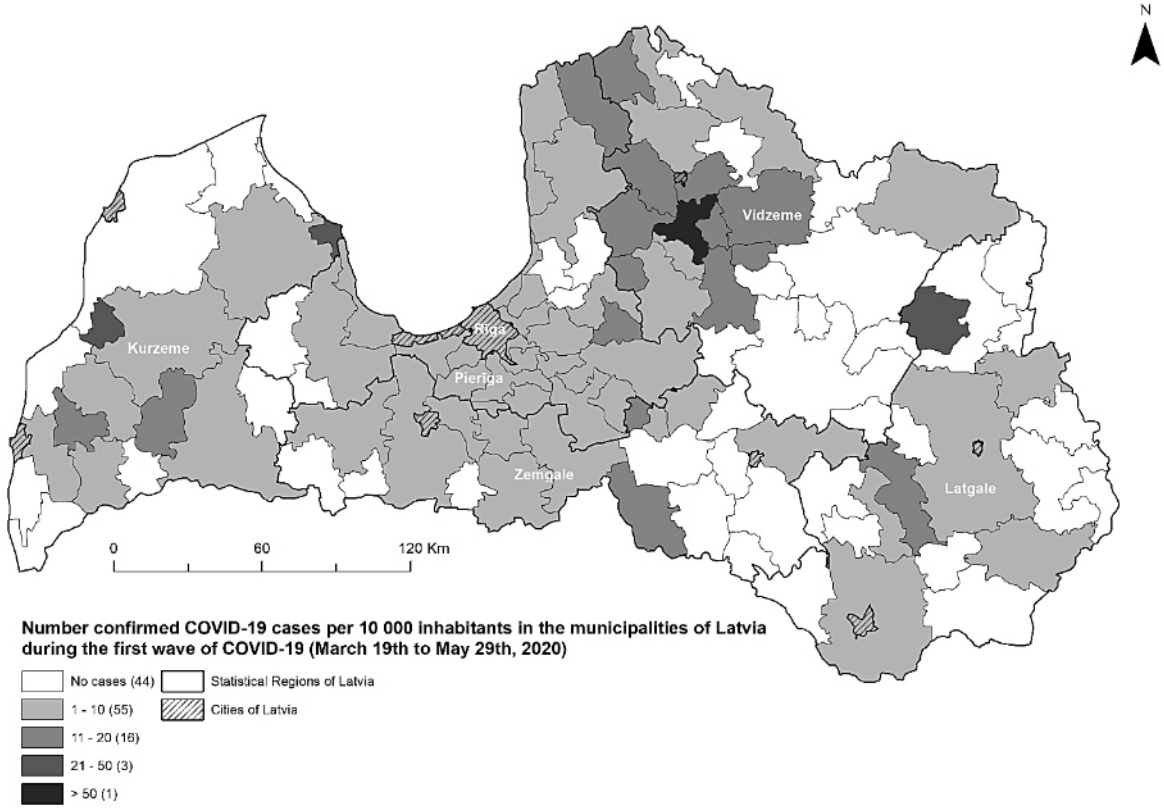

Figure 1. **Number confirmed COVID-19 cases per 10,000 inhabitants in the municipalities of Latvia during the first wave of COVID-19** (authors' figure based on CSB 2022 and SPKC 2022a data)

Table 1 shows bivariate correlation analysis for the total number of confirmed Covid-19 cases per 10,000 inhabitants in the municipalities of Latvia during the first wave. Only one of the 11 variables correlated significantly with cases per capita: the unemployment level. This significant negative correlation could be explained by the fact that those who are unemployed tend to have a smaller probability of interacting with other people, thus leading to lower incidence rates (Florida & Mellander 2022).

Such a lack of significant correlation coefficient values could be attributed to the comparatively low level of incidence - both in comparison with the situation during the second wave and compared to some European countries during the first wave, such

as Italy (see e.g. Ascani et al. 2020) and Sweden (see e.g. Yarmol-Matusiak et al. 2020).

Table 1. **Correlation analysis for Covid-19 cases per capita in the municipalities of Latvia during the first wave** (authors' elaboration based on CSB, MW, NVA and SPKC data)

Variable	Bivariate correlation	Variable	Bivariate correlation
	Cases per capita		Cases per capita
Population	- 0.008	Share of single households	- 0.098
Density	- 0.26	Unemployment level	- 0.211*
Share of population aged 65 and older	- 0.25	Presence of social care centres	- 0.163
Neto salary	- 0.013	Number of social care centres	- 0.092
Share of people with higher education	0.012	Number of potential clients in social care centres	0.13
Average household size	0.126		

** Correlation is significant at the 0.05 level*

*** Correlation is significant at the 0.01 level*

During the summer of 2020, the number of new daily cases remained low. The situation began to worsen in September, especially the second half of the month (SPKC 2022b). The start of the fourth quarter is considered to represent the beginning of the second wave (Kruks et al. 2020, 170). This eventually led to the second state of emergency, which started on 9 November. Initially, it was set to last until 6 December (LSM.lv 2020a) but was eventually extended until 7 April 2021 (Apollo.lv 2021a; Apollo.lv 2021b). During this time restrictions were significantly tightened. This included, for example, restriction of trade and face-to-face services. On 17 December, it was announced that for the next three weekends people would not be allowed to leave their place of residence from 10 p.m. to 5 a.m., unless it was for work purposes (LSM.lv 2020b; LSM.lv 2020c).

Still, the number of cases tended to increase and during the second state of emergency there were a total of 19 days where the number of new cases was above 1,000. All of these occurred in late 2020 and early in 2021, with the last such instance being on 20 February. The record number of daily cases (1,831) was reported on the final day of 2020. Overall, there were 84,634 confirmed cases and 1,584 Covid-19 related deaths during the second wave (SPKC 2022b).

After that, the situation began to improve. From 9 February through most of March the number of new cases, both total and the 14-day cumulative incidence per 100,000 people tended to decline, with a more pronounced decline taking place during February. After that, the number of daily new cases sometimes increased compared to a week before, though the situation overall remained rather stable (SPKC 2022b). Therefore, 1 March could be considered the end of the second wave.

Figure 2 further highlights the more notable spread of Covid-19 during the second state of emergency. That was not the only shift, as the patterns had also changed. There were large contiguous areas with an average level of incidence (201–500 cases per capita) – 61.3% (73 of 119) of all municipalities were a part of this group. Also, there were several clusters of municipalities with a rather high number (above average; over 500, but less than 1,000) of confirmed Covid-19 cases per 10,000 inhabitants. A total of 33 municipalities (27.7 % of all) had this level of incidence.

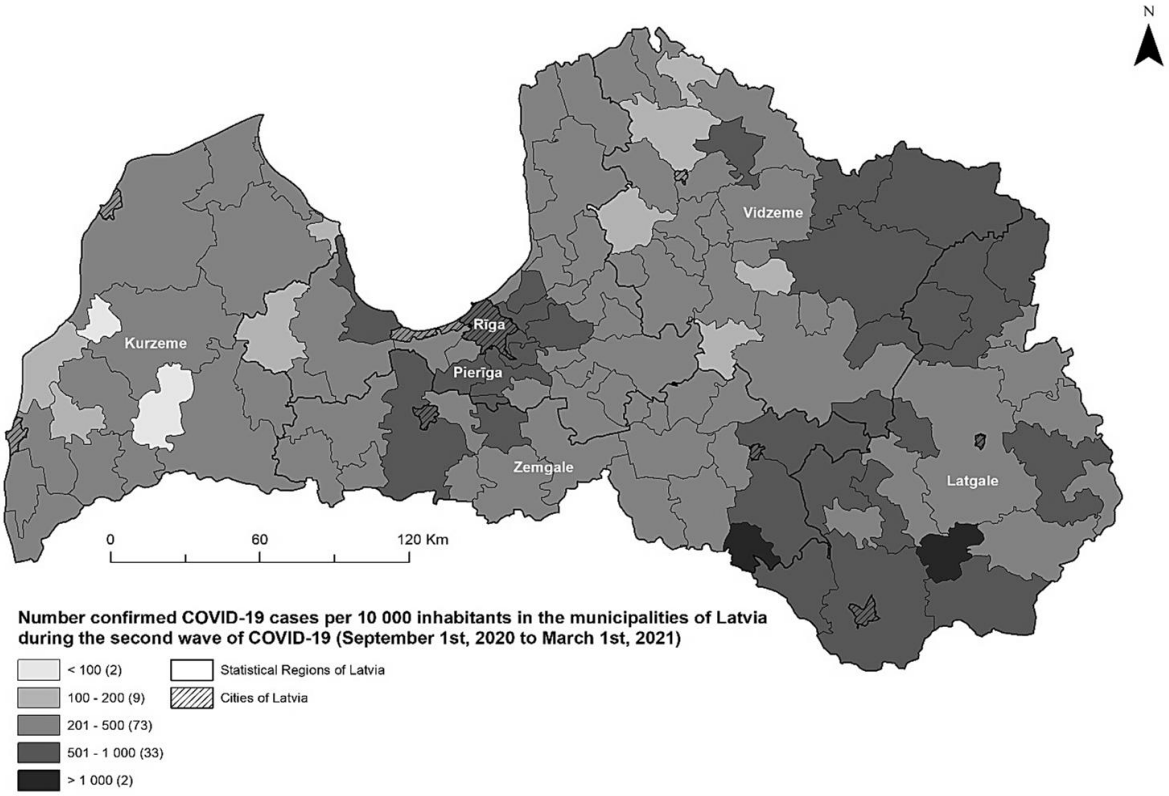

Figure 2. **Number of confirmed Covid-19 cases per 10,000 inhabitants in the municipalities of Latvia during the second wave of Covid-19** (authors' figure based on CSB 2022 and SPKC 2022a data)

Table 2 shows bivariate correlation analysis for the total number of confirmed Covid-19 cases per 10,000 inhabitants in the municipalities of Latvia during the second wave. Unlike the first wave, in this instance four variables correlated significantly with cases per capita.

Table 2. **Correlation analysis for COVID-19 cases per capita in the municipalities of Latvia during the second wave** (authors' elaboration based on CSB, MW, NVA and SPKC data)

Variable	Bivariate correlation	Variable	Bivariate correlation
	Cases per capita		Cases per capita
Population	0.090	Share of single households	0.144
Density	0.204*	Unemployment level	0,213*
Share of population aged 65 and older	- 0.031	Presence of social care centres	0.262**
Neto salary	0.098	Number of social care centres	0.174
Share of people with higher education	0.091	Number of potential clients in social care centres	0.170
Average household size	- 0.233*		

** Correlation is significant at the 0.05 level*

*** Correlation is significant at the 0.01 level*

The first of these variables was population density which had a significant positive correlation with incidence per capita, whereas (again) no such relationship was found in the case of the total population. Numerous studies have shown that density can have a significant impact in spreading of diseases (Tarwater & Martin 2001; Wood et al. 2017; Holmager et al. 2021). Though it should be mentioned that there are examples in literature indicating high incidence in, among other places, smaller towns and remote rural areas where population density is considerably smaller (Carozzi et al. 2020). Such examples can certainly be found among municipalities in Latvia, as some of the municipalities with high levels of incidence have a low population density. Therefore, the impact of population density was not uniform. Average household size had a significantly negative correlation, which is contrary to the findings of other research papers, as Covid-19 tends to spread more easily indoors and thus larger households could be more affected (Martin et al. 2020; Florida & Mellander 2022). Unemployment level is also positively associated with cases per capita. This change, in comparison to the first wave, could be the result of the municipalities of central Latvia (which have relatively low unemployment levels) having an average or above average level of incidence. The presence of social care centres was significantly (at the 0.01 level) and positively associated with the number of cases per capita. However, it should be noted that no such relationship was found for the two other social-care-centre-related variables. This indicates that the impact of social care centres was not as pronounced.

The second state of emergency came to an end on 7 April (Lvportals.lv 2021a). Nonetheless, most epidemiological safety rules remained in place. The exceptions were, for example, that on-site sales were no longer be restricted to product lists and street trade was allowed (Apollo.lv 2021b).

Conclusions

This paper focused on the Covid-19 outbreak in Latvia, explaining chronological course of the pandemic in Latvia and shedding light on geographical patterns. Results suggest that during the first wave, the number of Covid-19 cases per 10,000 inhabitants was relatively low: 44 municipalities out of 119 had no recorded cases, while 55 municipalities (46.2%) had 10 or less confirmed cases per 10,000. However, the second wave was characterised by several clusters of municipalities with a rather high number (over 500) of confirmed Covid-19 cases per 10,000 inhabitants.

A lack of significant correlation coefficient values for the first wave could be attributed to the comparatively low level of incidence. Four variables correlated significantly with cases per capita during the second wave, which was still less than half of all variables used for this study. This could mean that the geographical patterns of Covid-19 incidence were the result of a complex set of factors varying throughout the country. Also, the presence of large clusters of municipalities with a rather high number of cases per capita (mostly) during the second wave points to the possible impact of proximity.

Acknowledgment

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Kopsavilkums

Covid-19 pandēmija un tās izplatības viļņi ir būtiski ietekmējuši mūsu personīgo un profesionālo dzīvi. Tas ir izraisījis zinātnieku interesi par dažādām jomām, tostarp ģeogrāfiju. Arvien vairāk zinātniskajā literatūrā mēģināts noskaidrot iemeslus, kāpēc dažas vietas tika un joprojām tiek ietekmētas vairāk nekā citas. Šī pētījuma mērķis ir izprast Covid-19 pandēmijas ģeogrāfiju Latvijā un izskaidrot pandēmijas ģeogrāfiskos modeļus tās pirmajos divos viļņos. Tas darīts, pirmkārt, kartējot saslimšanas gadījumu skaitu uz 10 000 iedzīvotāju Latvijas pašvaldībās; otrkārt, analīzē dati tika apvienoti ar vienpadsmit mainīgajiem, izmantojot divfaktoru korelāciju. Rezultāti liecina, ka pirmā viļņa laikā saslimstība ar Covid-19 bija visai zema. Savukārt otrā viļņa laikā bija vairākas lielas pašvaldību kopas ar diezgan augstu (virs 500) apstiprināto Covid-19 gadījumu skaitu uz 10 000 iedzīvotāju. Korelācijas analīzes rezultāti liecina, ka Covid-19 izplatības ģeogrāfiskie modeļi bija sarežģītu faktoru kopuma rezultāts, kas visā valstī ir atšķirīgs. Tāpat par iespējamu tuvuma (proximity) ietekmi liecina lielu pašvaldību klasteru

ar visai augstu saslimšanas gadījumu skaitu uz vienu iedzīvotāju izveidošanās (pārsvarā) otrā viļņa laikā.

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