

Article

Opening or Not Opening Educational Centers in Time of SARS-CoV-2? Analysis of the Situation in Galicia (Spain)

Almudena Filgueira-Vizoso ^{1,*}, Laura Castro-Santos ², Ana Isabel García-Díez ², Félix Puime Guillén ³, María Isabel Lamas-Galdo ⁴ and Manuel Ángel Graña-López ⁵

¹ Department of Chemistry, Escuela Politécnica Superior, Campus Industrial de Ferrol, University of A Coruña, 15403 Ferrol, Spain

² Department of Naval and Industrial Engineer, Escuela Politécnica Superior, Campus Industrial de Ferrol, University of A Coruña, 15403 Ferrol, Spain; laura.castro.santos@udc.es (L.C.-S.); ana.gdiez@udc.es (A.I.G.-D.)

³ Department of Business, Faculty of Economics and Business, University of A Coruña, 15008 A Coruña, Spain; felix.puime@udc.es

⁴ Department of Navigation Sciences and Marine Engineering, University of A Coruña, 15471 Ferrol, Spain; isabel.lamas.galdo@udc.es

⁵ Department of Industrial Engineer, Escuela Universitaria de Ferrol, University of A Coruña, 15405 Ferrol, Spain; manuel.grana@udc.es

* Correspondence: almudena.filgueira.vizoso@udc.es; Tel.: +34-881013289



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Abstract: The appearance of the SARS-CoV-2 pandemic on the world stage has implemented changes in all social activities and, therefore, in teaching at all educational levels. On the one hand, it is argued that the closure of centers and virtual teaching minimizes the risk of contagion and, on the other, this closure implies a reduction in social interactions in the population at ages in which social skills are lower developing. In addition, it is necessary to guarantee that all children and adolescents have access to the necessary means for distance education. This article analyzes the impact of the COVID-19 pandemic during the second, third and fourth waves in Galicia (northwestern region of Spain), where the centers were kept open with strict security protocols, with the aim of evaluating whether the measure of the center closure is a proportionate measure or not. The results obtained show that, at all educational levels, the incidence of infections has been low, as has the appearance of outbreaks of infections related to educational centers, so the damage caused by this measure can be considered uncompensated, with greater health security.

Keywords: classroom education; pandemic management; schools closed; health education

1. Introduction

COVID-19 is an infectious disease caused by the new coronavirus known as SARS-CoV-2 [1,2]. The World Health Organization became aware of the existence of this virus on 31 December 2019 after being informed of a group of cases of viral pneumonia in the city of Wuhan [3] (People's Republic of China). From that moment on, all countries began to find cases of this virus that spread significantly throughout the world. The appearance of this virus and its rapid incidence of infection, together with the damage it was causing to the world population and the lack of knowledge of how to treat the sick and how to eradicate the virus, led many countries to take precautionary measures [4]. The complex health situation has forced far-reaching political decisions to be made that have a very important influence on all social spheres. One of the first measures to be taken in many countries was to limit the social life of citizens: states of emergency, curfews, massive disinfection, prohibition of meetings, closure of educational centers, etc. In China, on 23 January 2020, they decreed a quarantine for the 11 million citizens of Wuhan, later the same was done with the province of Hubei. Other parts of the country activated social distancing measures [5]. Finally, many countries of the world followed this example and carried out confinements

in their own territories. In some cases, the confinement was limited to certain activities or time slots, and in others it meant a total closure of activities. Thus, during the months of February and March, countries such as: Italy, Denmark, Norway, Czech Republic, Spain, Lebanon, Germany, Holland, France, Belgium, Peru, Portugal, Slovenia, Argentina, Jordan, Poland, Tunisia, Rwanda, Dominican Republic, Malaysia, Bolivia, Canada, El Salvador, Greece, Australia, the United Kingdom, South Africa, Mexico, India, Bangladesh, Brazil, Ireland, Egypt, New Zealand, and the United States applied measures to minimize the damage caused by the virus. Parallel to the extension of restrictive measures to prevent contagion, a debate began to emerge about the suitability of the measures applied. From a strictly health point of view, the need to minimize social contacts to curb contagion was highlighted. On the other hand, from an economic point of view, the radical decrease in all activities meant an economic slowdown and an unprecedented period of global economic recession. In addition to these two factors considered (health and economic), more and more incidence was made of the repercussion that these periods of isolation (increasingly long) could have a very important impact on people's mental health and, more specifically, in the cognitive and social development of children and adolescents.

In this context, one of the most questioned measures has been the closure of educational centers [6–8]. At first (during the course of the first wave of the pandemic), many countries opted to close the entire educational system (nursery schools, non-university teaching and university teaching). This decision was made without clear criteria, since ignorance of the behavior of the virus meant that most decisions were made more for prevention than with established and verified criteria. With the advent of the second wave, this trend changed, and most countries decided to open schools. Some examples of them are: USA, Russia, China, France, Germany, Italy, Spain, United Kingdom, etc. [9].

The maintenance of face-to-face activity in educational centers has been based on the fact that the infection rate of COVID-19 in children is low [10,11] and, therefore, schools are not sources of the spread [12]. Despite this, the measures taken to reopen have been very strict [13–15] and studies have considered that emotional development is important enough to open schools by adopting the necessary measures to preserve the health of students [16,17]. Some countries, like Italy, have opted to implement virtual education for students between 14 and 18 years old, as adolescents are considered to be the main causes of transmissions [18,19].

In 14 of the countries affected by the pandemic, schools have been closed since March 2020, mainly in the areas of East Asia and the Pacific, the Middle East and North Africa, Latin America and the Caribbean, and South Asia [20,21]. The aforementioned countries have kept schools closed and this has created an increase in inequality [22] since not all students have access to the means to be able to train online, and this education has been relegated in many countries to the part of the population with the greatest resources.

Thus, two conflicting currents were established in relation to the management of educational centers [23]. On the one hand, those who defended that the risk of contagion was very high and that schools could be the focus that spread the virus to all social strata [20]. This could lead to a new collapse of the health systems in the countries. On the other hand, those who believed that the harm to which children and adolescents were subjected did not justify such a restrictive measure [24]. The lack of social interaction was highlighted as a possible cause of social and cognitive development problems, especially in those who are at the ages where these skills are being established [25]. In addition, another argument that supported this option was the fact that the most economically disadvantaged sectors and the rural sectors were the most affected by the lack of attendance [26,27]. In both cases, access to the technological resources necessary to replace face-to-face teaching was much less accessible.

The situation that has been experienced with the appearance of COVID-19 has been aggravated by the lack of information and the lack of preparation of society in general. There have been no clear guidelines to help make firm political decisions, which is why, in general, they have acted with a degree of improvisation that has sometimes been detri-

mental. An analysis of the impact of the measures adopted is necessary. In this way, in the face of a possible health situation equivalent to the current one that may arise in the future, there will be more tools to help make more precise decisions. These decisions must keep a balance between the need to protect the population healthily, and the economic and social damage that they entail. It would be essential to have better information than is currently available to be able to decide when a restrictive measure is more harmful than beneficial. With this objective, we have carried out an analysis of the results of the restrictive measures imposed in the second, third and fourth waves. To carry out the stated objective, the research has focused on the impact on the incidence of infections during the periods indicated in the educational field. The incidence at the different educational levels has been evaluated, taking into account the security protocols established by the authorities at each stage, to determine whether, as initially assumed, they are a source of contagion or not.

The case that concerns us in this study is that of Spain [28]. This country, despite having closed the classrooms in the first wave, has opted in the second, third and fourth waves to keep classrooms open. This decision has been made for both nursery schools and non-university education. In the case of university education, attendance has been a very important factor, provided that the safety distance established by the authorities could be maintained in the centers. In this case, university teaching has been fundamentally mixed, combining tele-teaching with face-to-face teaching [29,30]. In addition, the closure of university centers causes less economic disruption and to the users themselves, since students have greater maturity and greater access to non-face-to-face teaching.

In this work, the incidence of COVID-19 in both nursery schools and educational centers of university and non-university education in Galicia (a region of northwestern Spain) has been analyzed. The objective of this research is to know if the decision to have educational centers open during periods of pandemic in Galicia has been appropriate [31,32].

2. Methodology

The research carried out has been based on the analysis of the incidence of COVID-19 in university and non-university educational centers and in nursery schools in the Spanish region of Galicia, located in the northwest of Spain. In Spain, the regional authorities are the ones that make the decisions that concern education within their region, so the Galician authorities are responsible for making decisions about the closure or not of the centers and about the protocols to carry out in them.

At the start of the study, Spain has experienced four main waves, the first one when COVID-19 appeared in the country (March 2020), the second one in November 2020, the third one in January 2021 and the fourth one in April 2021. The analysis of the present work starts on the second wave, since the educational centers were directly closed during the first wave, and it is not possible to find data about the incidence if they had remained open. During the second, third and fourth waves, the educational centers have remained open, except for very specific cases of some educational center closed due to contagions, but never as a general measure. Therefore, it can be considered that teaching has been entirely face-to-face for non-university educational centers and nursery schools during these three waves.

On the other hand, seven sanitary areas have been taken into account (these are population areas in which the policymakers in the Galician community have divided its health services). These sanitary areas are: Ferrol, A Coruña, Santiago de Compostela, Lugo, Ourense and Vigo. See Figure 1. The data provided by the Galician authorities is separated in these areas, and even the protocols and measures adopted may be different depending on the number of infections that occur over time in each one.



Figure 1. Sanitary areas. Source: Own elaboration.

These areas encompass the entire population of Galicia and have had special relevance when it comes to applying perimeter restrictions, curfews, opening and closing times, depending on the incidence of COVID-19 in each of them.

To complete this study, the incidence in higher education (universities) of one of the provinces of the Spanish region of Galicia, A Coruña, has been analyzed in order to find differences between the diverse educational sectors, since the age ranges are different and the way of carrying out teaching has also been differentiated in the moments of greatest incidence of the pandemic (universities established periods based on non-face-to-face teaching, while this factor has not been considered in non-university education during the course of the second, third and fourth wave, and the teaching has been only face-to-face).

The information used account to carry out this study has been:

- Information from the Ministry of Culture, Education and University [33]. This is the organization responsible for providing data on the incidence of infections of the general population.
- Information from the Galician Health Service (SERGAS) [34]. Together with the previous organism, it provides the incidence of infections by regions within Galicia. It also provides information on the number of centers that have had to be closed or that have had confined classrooms.
- Information from the Galician Statistics Institute (IGE) [35]. Provides information on the composition of the population in Galicia (percentage of people for each age group and in the different areas of Galicia).
- Information from the University of A Coruña (UDC) [36]. It is the organization responsible for collecting data on infections within the university centers it manages.

The information gathered from these four sources has been consolidated for weeks to be able to display the data in a more meaningful way.

Regarding the data of the Ministry of Culture, Education and University, the data have been collected in two educational bands:

- A. Kindergarten (ages 4 months to 3 years)
- B. Non-university teaching (ages 4–18 years)

It is also worth mentioning that the incidence was very low during the first and second waves in Galicia, in comparison to the rest of the country (Spain). Therefore, the immunization of the community was very insignificant and hence the incidence of the third wave has been more pronounced, despite the fact that the prevention measures taken in both have been the same. On the other hand, the fourth wave has had very little impact on the population, not only in Galicia but in most of the Spanish territory. Possible reasons

are both the immunization of the third wave and the application of the vaccines to certain sectors of the population.

For each population group, the number of COVID-19 positive cases has been divided by the population of each sanitary area in that age group. In this way, it is possible to know the number of positives in nursery schools, non-university schools, and universities based on the total population in each of the age ranges corresponding to each educational level and for each sanitary area. This facilitates the comparison between the data observed for the different age ranges. The information about the positive cases for each educational center is published each day on the website of the Ministry of Culture, Education and University [33] and the information on the total population by age ranges is published on the website of the Galician Statistics Institute [35].

On the other hand, another curve that shows the percentage of infected in each sanitary area was elaborated. This curve is based on data about the positives that appear on the website of the Galician Health Service (SERGAS), divided by the total of the population (data from the Galician Statistics Institute) for each sanitary area. In this case, the age ranges were not taken into account. (see Figure 2).

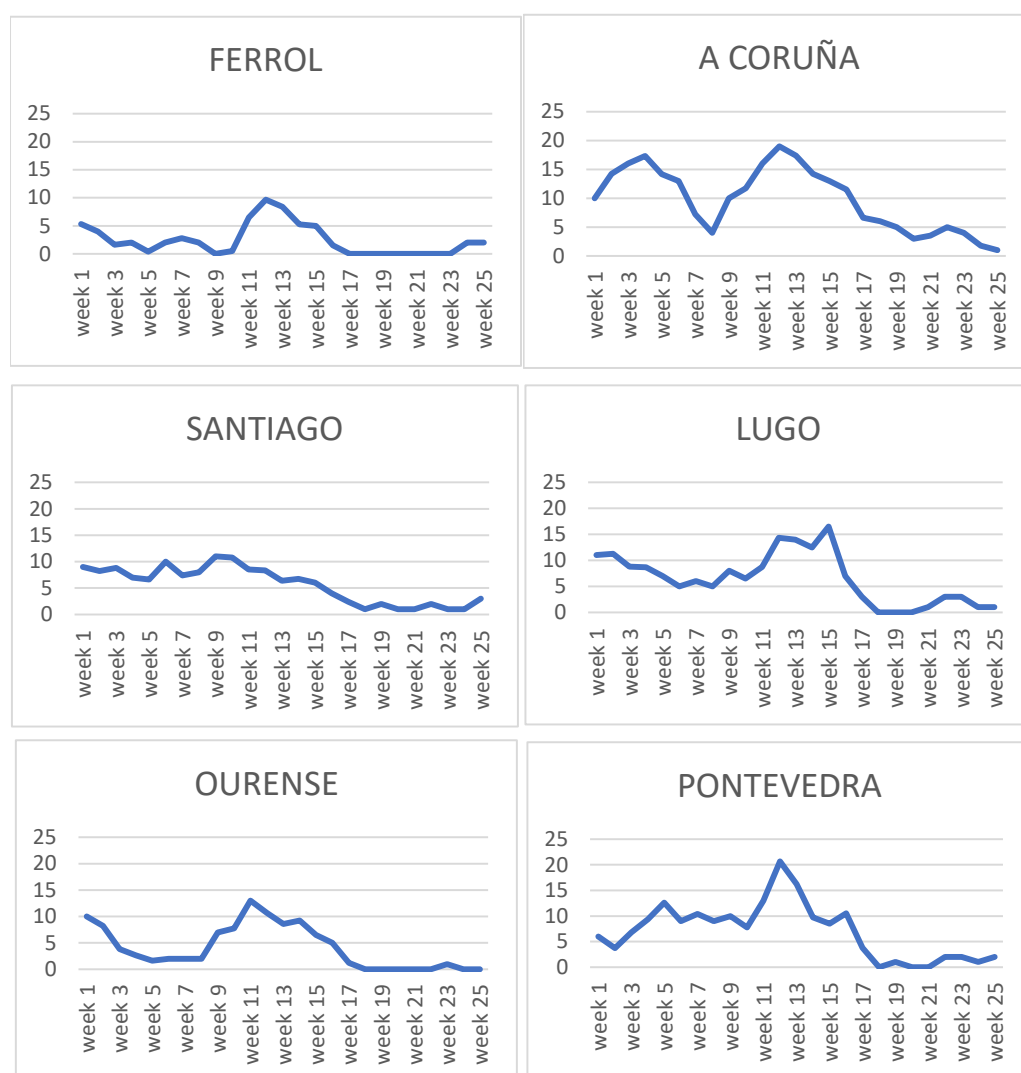


Figure 2. Cont.

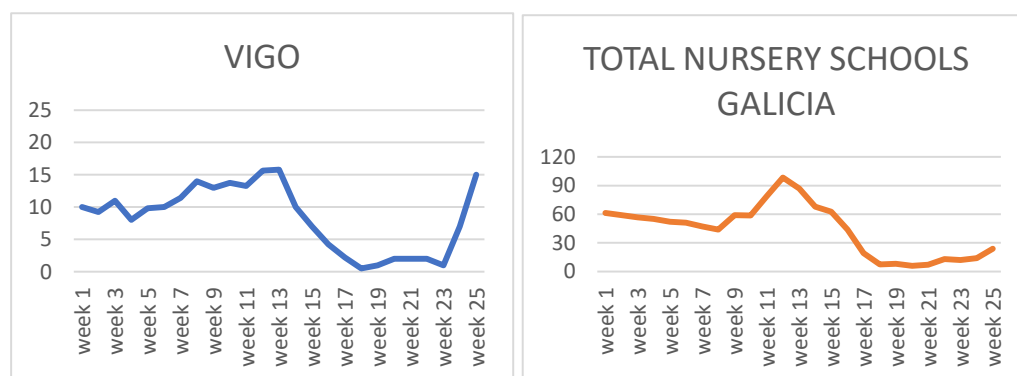


Figure 2. Active cases in nursery schools in each sanitary area of Galicia. Source: Own elaboration based on data from the Ministry of Culture, Education and University [33].

Finally, closed classrooms and closed educational centers were analyzed to find out where medical needs have resulted predominant over educational ones [37]. In order to carry out this analysis, it is necessary to know the protocols established by the authorities that determine under what conditions it is necessary to close individual classrooms or entire educational centers.

In the Galician educational system, the Ministry of Culture, Education and Universities establishes in its “Action Guide in the Event of COVID-19 Cases in Educational Centers” [37] that an outbreak in an educational center will be under any group of 3 or more cases with active infection in which an epidemiological link has been established. This is included in the Strategy for the Early Detection, Surveillance and Control of COVID-19 [38] (Ministry of Health). The Ministry of Culture, Education and University sets out actions for the following four possible scenarios. The scenarios described below are those established by the authorities to determine when it is necessary to close a classroom or an entire center. The authorities establish the four possibilities and determine the measures or protocols that must be applied in each of them. This gives us an idea of the requirements that had to be met for a classroom or center to be closed.

- Scenario 1: the outbreak occurs in a classroom. When there are 3 or more cases in a group with stable coexistence (GCE, being a group with stable coexistence that group formed by a maximum of 15 students together with the tutor and must avoid iteration with other groups of the educational center, as well as limit the maximum the number of contacts), or class not organized as GCE with epidemiological link between them. Specific control actions will be indicated through the implementation of the usual control measures:

- Home isolation of cases.
- Identification and quarantine of members of the GCE or the close contacts of the class not organized as GCE.
- If the cases belong to a GCE: suspension of the teaching activity until 10 days after the start of quarantine of the contacts.
- If the cases belong to a class that is not organized as GCE: maintenance of teaching activity for students not classified as close contacts or, based on the risk assessment, indicate the quarantine of the entire class.

The indication of quarantine to the whole group or only to close contacts should be based on whether the group really functions as a GCE or not, and not so much on the course to which it belongs.

It will be taken into account if:

- Inside the classroom, prevention measures are not followed (use of a mask, distance, ventilation...).
- Students from that classroom mix, at some point, with students from other classrooms (socialization, recess, joint activities, dining room...) without maintaining preventive measures (mask, distance, ventilation...).

Teaching activity continues in a normal way, extreme prevention and hygiene measures in the rest of the educational stages (infant, 1st, 2nd or 3rd cycle of primary, ESO or Baccalaureate), with the exception of the affected group.

- Scenario 2: An outbreak in several classrooms with no epidemiological link: 3 or more cases in GCE or classes not organized as GCE with no epidemiological link between the cases in the different classrooms (each case may have an out-of-school epidemiological link, for example outbreak but the cases of the different classrooms do NOT have an epidemiological link between them). Specific control actions will be indicated for each of them through the implementation of the usual control measures:

- Home isolation of cases.
- Identification and quarantine of the members of each GCE or the close contacts of each class not organized as GCE.
- If the cases belong to a GCE: suspension of the teaching activity of each GCE until 10 days after the start of the quarantine.
- If the cases belong to a class that is not organized as GCE: maintenance of teaching activity for students not classified as close contacts in each of the classes not organized as GCE or based on risk assessment, indicate quarantine of the whole class.

Teaching activity continues in a normal way, extreme prevention and hygiene measures in all educational stages (infant, 1st, 2nd or 3rd cycle of primary, ESO or Baccalaureate), with the exception of the affected groups.

- Scenario 3: outbreaks in several classrooms with epidemiological link: Detection of cases in several GCE or classes not organized as GCE with a certain degree of transmission between different groups, regardless of the way the virus was introduced in the school (that is, the cases do NOT have a clear epidemiological link outside of school and the most likely link between them is the school itself).

- Home isolation of cases.
- Identification and quarantine of the members of each GCE or close contacts of each class not organized as GCE.
- The relationship between the cases will be studied and if the existence of an epidemiological link is demonstrated and the prevention and hygiene measures have not been maintained, the adoption of additional measures such as the extension of the quarantine and suspension of the teaching activity will be assessed. from other groups up to 10 days after the start of quarantine or the time indicated depending on the evolution of the outbreaks. The action may entail closure of complete lines, cycles or educational stage.

Teaching activity continues in a normal way, extreme prevention and hygiene measures in the educational stages (infant, 1st, 2nd or 3rd cycle of primary, ESO or Baccalaureate), with the exception of the affected groups.

- Scenario 4: Outbreaks in the context of uncontrolled transmission: If it is considered that there is an uncontrolled transmission in the educational center with a higher number than expected due to the transmission existing in the community in a specific territory for that age group, the public health services of the Spanish region will carry out a risk assessment to consider the need to scale the measures, ultimately assessing the temporary closure of the educational center.

- Home isolation of cases.
- In a situation of uncontrolled transmission, after an evaluation of the epidemiological situation, control measures must be scaled up, which may lead to the temporary closure of the educational center.
- Initially the closure of the center would be for 10 days, although the duration of this period could vary depending on the epidemiological situation, the appearance of new cases that develop symptoms and the level of transmission detected in the educational center and in the community.

- The reopening of the educational center will take place when the situation is controlled and does not pose a greater risk to the educational community.

3. Results

As mentioned previously, the data has been grouped in weeks. Week 1 for this study would therefore be the week of 1 November 2020 (second wave, covers from week 1 to 5) as shown in Table 1.

Table 1. Correspondence between weeks and dates.

Week	Dates
week 1	01/11/2020–08/11/2020
week 2	09/11/2020–15/11/2020
week 3	16/11/2020–22/11/2020
week 4	22/11/2020–29/11/2020
week 5	30/11/2020–06/12/2020
week 6	07/12/2020–13/12/2020
week 7	14/12/2020–20/12/2020
week 8	21/12/2020–28/12/2020
week 9	04/01/2021–10/01/2021
week 10	11/01/2021–17/01/2021
week 11	17/01/2021–24/01/2021
week 12	24/01/2021–31/01/2021
week 13	01/02/2021–07/02/2021
week 14	08/02/2021–14/02/2021
week 15	15/02/2021–21/02/2021
week 16	22/02/2021–28/02/2021
week 17	01/03/2021–07/03/2021
week 18	08/03/2021–14/03/2021
week 19	15/03/2021–21/03/2021
week 20	22/03/2021–28/03/2021
week 21	05/04/2021–11/04/2021
week 22	12/04/2021–18/04/2021
week 23	19/04/2021–25/04/2021
week 24	26/04/2021–02/05/2021
week 25	03/05/2021–09/05/2021

Source: Own elaboration.

Table 2 shows the infected students in each sanitary area up to 3 years of age, i.e., nursery school:

Table 2. Active cases in nursery schools in Galicia by sanitary areas.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	Total Nursery School
week 1	10	5	9	11	10	6	10	61
week 2	14	4	8	11	8	4	9	59
week 3	16	2	9	9	4	7	11	57
week 4	17	2	7	9	3	9	8	55
week 5	14	0	7	7	2	13	10	52
week 6	13	2	10	5	2	9	10	51
week 7	7	3	7	6	2	10	11	47
week 8	4	2	8	5	2	9	14	44
week 9	10	0	11	8	7	10	13	59
week 10	12	1	11	7	8	8	14	59
week 11	16	7	9	9	13	13	13	79
week 12	19	10	8	14	11	21	16	98
week 13	17	8	6	14	9	16	16	87
week 14	14	5	7	13	9	10	10	68
week 15	13	5	6	17	7	9	7	63

Table 2. *Cont.*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	Total Nursery School
week 16	12	2	4	7	5	11	4	44
week 17	7	0	2	3	1	4	2	19
week 18	6	0	1	0	0	0	1	8
week 19	5	0	2	0	0	1	1	8
week 20	3	0	1	0	0	0	2	6
week 21	4	0	1	1	0	0	2	7
week 22	5	0	2	3	0	2	2	13
week 23	4	0	1	3	1	2	1	12
week 24	2	2	1	1	0	1	7	14
week 25	1	2	3	1	0	2	15	24

Source: Own elaboration based on data from the Ministry of Culture, Education and Universities [33]. Key: (1) A Coruña; (2) Ferrol; (3) Santiago; (4) Lugo; (5) Ourense; (6) Pontevedra; (7) Vigo.

As can be seen in Figure 2 the values are really low, reaching more critical values in the third wave (covers from week 9 to 15) than in the second one. These values do not exceed 21 positive cases in the sanitary area of Pontevedra and 19 cases in the sanitary area of A Coruña.

It can also be observed that the graphs in Figure 2 do not follow the same pattern. In some of them, such as the sanitary area of A Coruña, the two waves are clearly reflected, but in others, such as Santiago, the trend is more horizontal and even it can be seen that the incidence of the third wave has hardly been noticed.

Next, we will show these same data applied to non-university education, i.e., corresponding to ages between 3 and 18 years. In this case, as can be seen in Table 3 and in Figure 3, the trend is the same for the seven sanitary areas. The values of the second wave are much less significant than in the first wave.

Table 3. Active cases in non-university education centers in Galicia by health area.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	Total Non-University Education
week 1	210	143	148	148	108	145	371	1273
week 2	241	108	123	174	100	153	370	1269
week 3	267	68	114	179	93	153	343	1215
week 4	256	76	120	148	64	147	316	1128
week 5	215	80	117	128	42	144	248	973
week 6	191	78	135	100	42	124	202	872
week 7	157	76	159	73	65	149	203	883
week 8	140	54	161	62	70	164	195	846
week 9	232	60	240	78	109	118	196	1033
week 10	365	97	267	112	184	143	280	1446
week 11	644	174	409	206	283	261	511	2487
week 12	944	248	508	314	367	403	638	3421
week 13	1015	297	536	353	397	527	683	3808
week 14	790	224	394	272	287	456	507	2928
week 15	547	115	194	223	108	260	284	1730
week 16	408	90	137	149	50	162	200	1195
week 17	291	63	82	60	25	110	112	743
week 18	227	44	54	26	20	81	86	537
week 19	186	66	37	33	21	47	79	468
week 20	184	60	38	38	19	55	94	486
week 21	112	12	49	11	15	65	111	373
week 22	121	11	67	17	27	80	120	443
week 23	164	14	72	28	33	105	149	535
week 24	154	13	55	43	29	101	198	592
week 25	169	10	74	31	34	101	195	614

Source: Own elaboration based on data from the Ministry of Culture, Education and Universities [33]. Key: (1) A Coruña; (2) Ferrol; (3) Santiago; (4) Lugo; (5) Ourense; (6) Pontevedra; (7) Vigo.

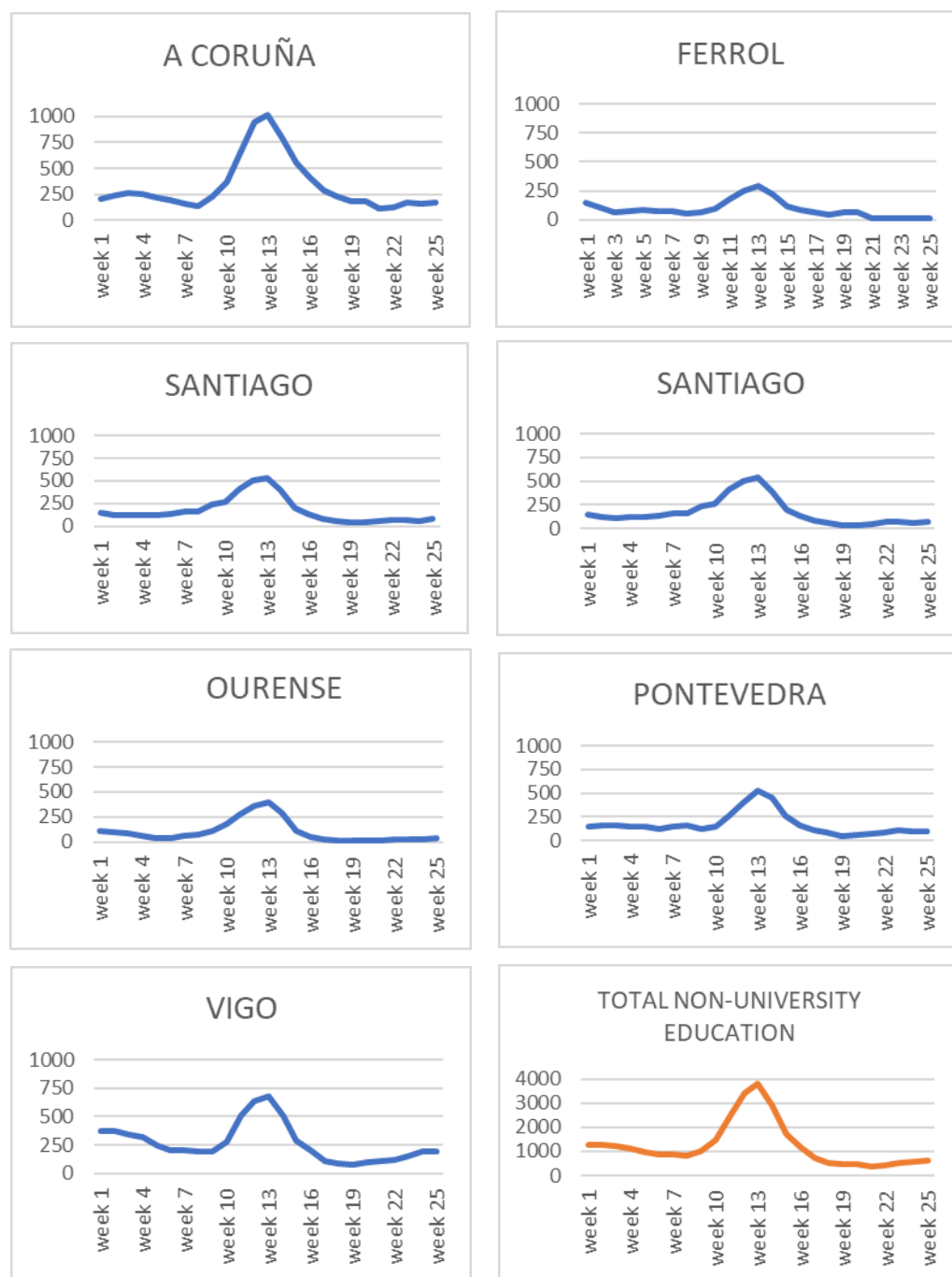


Figure 3. Active cases in non-university education centers in each sanitary area of Galicia. Source: Own elaboration based on data from the Ministry of Culture, Education and University [33].

In order to analyze this in further detail and see if the cases obtained, both in nursery schools and in non-university education, are really relevant, the percentage of active cases has been calculated, taking into account the total population in that band of age and this has been compared with the percentage of active cases for all ages.

In the case of nursery schools, the number of active cases (for each sanitary area and for the total population from 4 months to 3 years) has been divided by the total population in that age group (data provided by the Galician Institute of Statistics) and in the case of non-university education centers (ages between 3 and 18 years), the same has been done, i.e., the number of active cases due to COVID-19 has been divided in each center among the entire population in Galicia in that age group.

The results are shown in Figures 4 and 5. As can be seen in Figure 4, the incidence percentages in nursery schools are much lower than the incidence in the population of that age. Many studies show that several reasons are responsible for this. The incidence in young children is very insignificant in terms of the possibility of being infected, but once they are infected, the ease of transmission is seen to be less, possibly because in nursery schools children are without masks, and prevention measures are not as harsh as in non-university education centers. Transmission to other children is also low, so the incidence in these centers does not facilitate the appearance of outbreaks as is happening in nursing homes, etc.

Figure 5 shows that the trend is totally different from that of nursery schools. Despite the school children wearing a mask in these centers, bubble groups have been established, both in classrooms and in common facilities, etc., i.e., there are many more preventive measures. In this age group, as shown in Figure 5, each sanitary area is very similar to the total population.

In order to analyze whether the measures that have been carried out in non-university education centers are correct, we would have to analyze whether the infections occur in educational centers or come from abroad, i.e., if there are outbreaks in educational centers. For this, we have analyzed the number of closed classrooms and the number of closed non-university education centers.

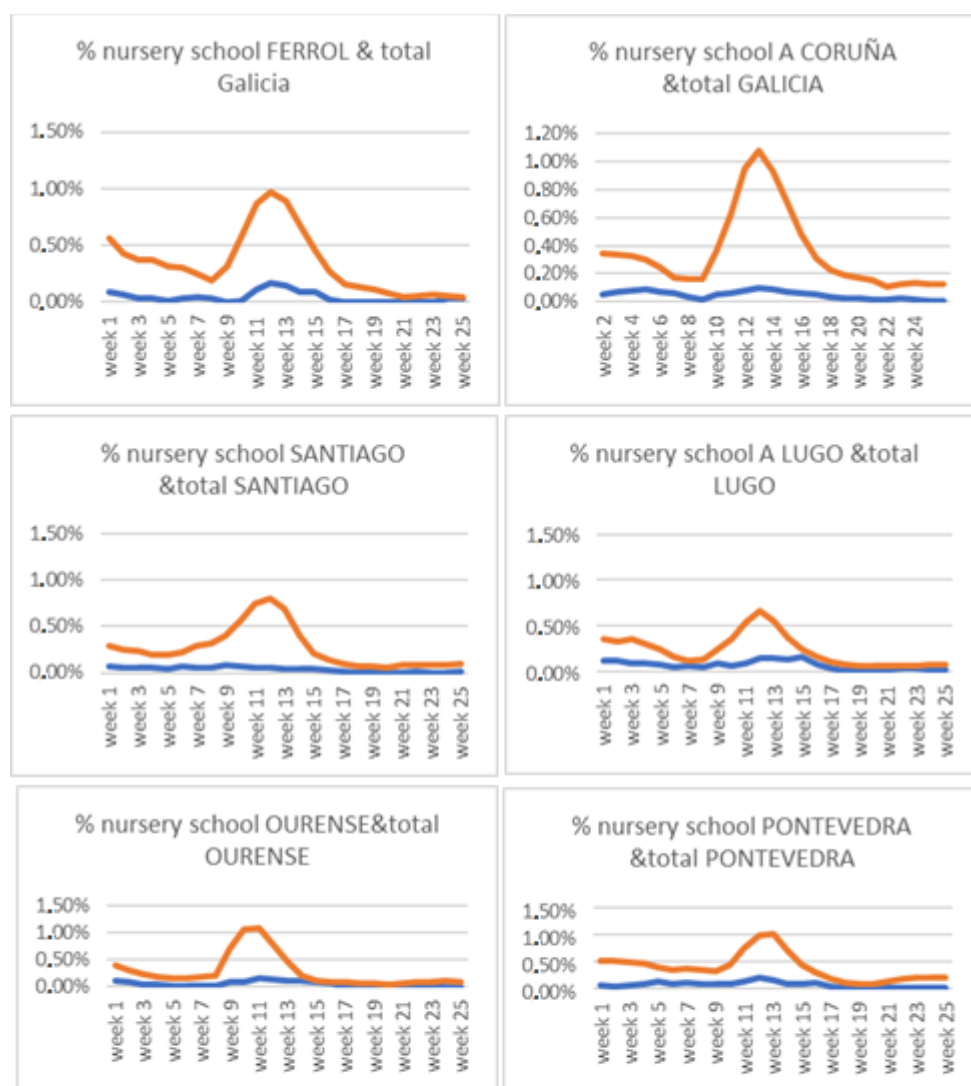


Figure 4. Cont.

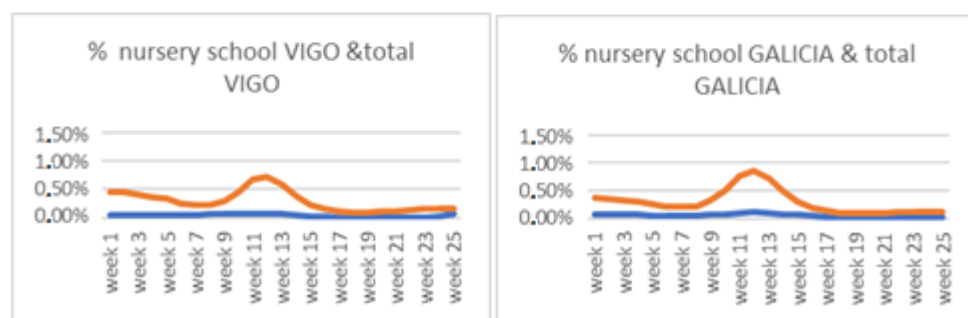


Figure 4. Percentage of active cases in nursery schools in each sanitary area (blue line) of Galicia compared to the percentage of active cases in that age group (red line). Source: own elaboration based on data from the Ministry of Culture, Education and University (“Volta segura ás aulas | Consellería de Cultura, Educación e Universidade,” n.d.), SERGAS (“Datos Coronavirus,” n.d.) and the Galician Institute of Statistics (“IGE. Cifras poboacionais de referencia,” n.d.).

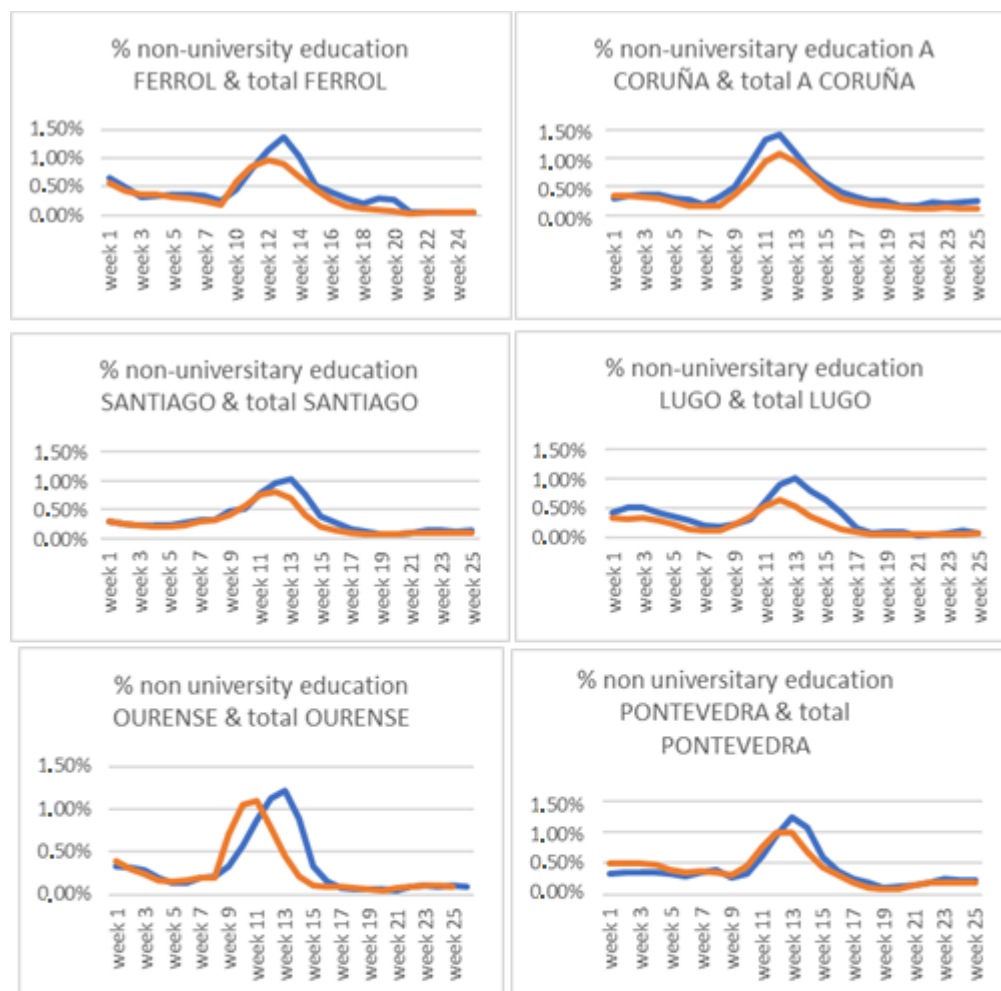


Figure 5. Cont.

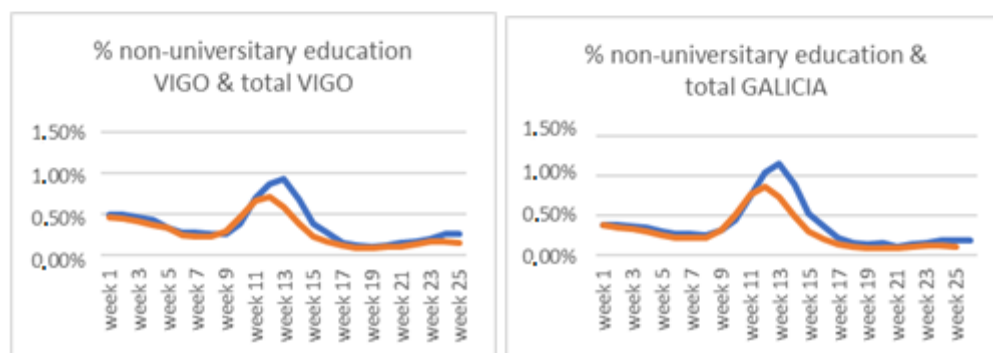


Figure 5. Percentage of active cases in non-university teaching centers in each sanitary area of Galicia (blue line) compared to the percentage of active cases in that age group (red line). Source: own elaboration based on data from the Ministry of Culture, Education and University [33], SERGAS [34] and the Galician Institute of Statistics [35].

Once the measures carried out by the Ministry of Culture, Education and University have been analyzed, we will analyze the number of closed classrooms and closed centers during this second and third waves. This will provide information about if the decision that the educational centers have been open during this pandemic has been correct, Table 4.

Table 4. Classrooms and closed centers in nursery schools by sanitary area.

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		Total Galicia	
	AC	CC	AC	CC	AC	CC	AC	CC	AC	CC	AC	CC	AC	CC	AC	CC
week 1	6	0	3	0	4	0	2	1	2	0	0	0	6	0	23	1
week 2	9	0	2	0	5	0	3	1	2	0	0	0	2	0	23	1
week 3	8	0	1	0	4	0	4	0	1	0	2	0	3	0	23	0
week 4	8	0	1	0	2	1	6	0	1	0	4	0	1	0	23	1
week 5	7	1	0	0	2	0	4	0	0	0	4	1	1	1	18	4
week 6	7	0	0	1	7	0	2	0	0	0	2	1	1	1	19	3
week 7	5	0	2	1	4	0	3	1	0	0	3	1	2	1	18	4
week 8	3	0	0	0	5	0	2	1	0	0	2	1	2	1	14	3
week 9	3	0	0	0	4	1	5	1	2	1	3	2	2	1	19	6
week 10	4	0	0	0	3	1	2	0	2	1	1	0	3	0	15	2
week 11	8	0	4	0	3	0	0	1	6	2	5	2	2	1	28	5
week 12	7	0	3	0	2	1	0	2	1	2	3	2	6	1	21	8
week 13	5	0	2	1	1	0	0	1	5	0	3	0	3	1	18	4
week 14	1	0	2	0	4	0	1	1	3	0	1	0	2	0	13	2
week 15	1	0	0	0	3	0	0	2	2	0	1	1	1	0	8	2
week 16	0	0	0	0	2	0	0	0	1	0	4	1	3	0	9	1
week 17	1	0	0	0	1	0	0	0	0	0	2	0	1	0	5	0
week 18	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
week 19	3	0	0	0	1	1	0	0	0	0	0	0	1	0	5	1
week 20	3	0	0	0	1	0	0	0	0	0	0	0	1	0	5	0

Table 4. Cont.

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		Total Galicia	
	AC	CC	AC	CC	AC	CC	AC	CC	AC	CC	AC	CC	AC	CC	AC	CC
week 21	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2	0
week 22	0	0	0	0	2	0	1	1	0	0	2	0	1	0	6	1
week 23	0	0	0	0	1	0	1	0	1	0	2	0	1	0	6	0
week 24	1	0	1	0	0	0	0	0	0	0	1	0	4	0	7	0
week 25	0	0	1	0	2	0	0	0	0	0	1	1	5	0	9	1

Source: Own elaboration based on data from the Ministry of Culture, Education and University [33]. Key: (1) A Coruña; (2) Ferrol; (3) Santiago; (4) Lugo; (5) Ourense; (6) Pontevedra; (7) Vigo.

Tables 5 and 6 show closed classrooms (AC) and closed centers (CC) for nursery schools, non-university teaching and for the whole of Galicia, respectively.

Table 5. Classrooms and closed centers in non-university schools by sanitary area.

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		Total Galicia	
	AC	CC	AC	CC	AC	CC	AC	CC	AC	CC	AC	CC	AC	CC	AC	CC
week 1	9	0	5	0	6	0	7	1	6	0	7	0	24	0	64	1
week 2	19	0	2	0	7	0	13	1	4	0	8	0	18	0	70	1
week 3	19	0	1	0	7	0	8	0	1	0	4	0	10	0	49	0
week 4	15	0	5	0	6	1	6	0	1	0	6	0	4	0	43	1
week 5	13	1	5	0	6	0	8	0	1	0	7	1	8	1	49	4
week 6	13	0	2	1	10	0	2	0	2	0	3	1	8	1	40	3
week 7	12	0	6	1	10	0	7	1	7	0	8	1	15	1	65	4
week 8	5	0	5	0	11	0	7	1	4	0	10	1	11	1	53	3
week 9	3	0	0	0	4	1	5	1	2	1	3	2	2	1	19	6
week 10	8	0	1	0	5	1	2	0	3	1	3	0	8	0	30	1
week 11	24	0	10	0	15	0	4	1	11	2	12	2	31	1	107	5
week 12	39	0	15	0	18	1	8	2	10	2	20	2	54	1	165	9
week 13	35	0	18	1	22	0	10	1	28	1	24	0	51	1	187	5
week 14	17	0	6	0	14	0	12	1	15	0	22	0	40	0	125	2
week 15	15	0	2	0	9	0	10	1	5	0	17	1	18	0	75	1
week 16	7	0	2	0	3	0	3	0	2	0	8	1	8	0	33	1
week 17	7	0	6	0	3	0	2	0	2	0	8	0	7	0	34	0
week 18	9	0	3	0	2	0	1	0	2	0	4	0	6	0	25	0
week 19	7	0	5	0	1	1	1	0	2	0	2	0	5	0	23	1
week 20	7	0	2	0	1	0	1	0	0	0	1	0	4	0	16	0
week 21	0	0	0	0	2	0	1	0	0	0	0	0	1	0	4	0
week 22	2	0	0	0	5	0	1	1	1	0	3	0	2	0	14	1
week 23	3	0	0	0	4	0	2	0	3	0	7	0	7	0	26	0
week 24	4	0	1	0	2	0	2	0	1	0	4	0	21	0	35	0
week 25	8	0	1	0	7	0	0	0	2	0	5	1	18	0	41	1

Source: Own elaboration based on data from the Ministry of Culture, Education and University [33]. Key: (1) A Coruña; (2) Ferrol; (3) Santiago; (4) Lugo; (5) Ourense; (6) Pontevedra; (7) Vigo.

Table 6. Closed classrooms and closed centers in nursery schools and non-university education centers throughout Galicia.

	Nursery School		Non-University Education	
	AC	CC	AC	CC
week 1	23	1	64	1
week 2	23	1	70	1
week 3	23	0	49	0
week 4	23	1	43	1
week 5	18	4	49	4
week 6	19	3	40	3
week 7	18	4	65	4
week 8	14	3	53	3
week 9	19	6	19	6
week 10	15	2	30	1
week 11	28	5	107	5
week 12	21	8	165	9
week 13	18	4	187	5
week 14	13	2	125	2
week 15	8	2	75	1
week 16	9	1	33	1
week 17	2	0	25	0
week 18	5	1	23	1
week 19	5	0	16	0
week 20	2	0	4	0
week 21	6	1	14	1
week 22	6	0	26	0
week 23	7	0	35	0
week 24	9	1	41	1

Source: Own elaboration based on data from the Ministry of Culture, Education and University [33].

Figure 6 shows the evolution of closed classrooms in nursery schools in Galicia as a whole. As can be seen, the worst case corresponds to 187 closed classrooms in non-university education centers and 9 in the case of nursery schools.

Figure 7 shows the number of closed centers. As can be seen in this figure, the graphs are practically similar. The highest value was reached in week 13 with 8 and 9 closed centers for nursery schools and non-university teaching centers.

If we take into account that the number of face-to-face educational centers in Galicia, according to the Xunta de Galicia [33], is 1624 and that the nursery schools are 171, we can see the low incidence that COVID-19 has had in the educational centers and the effective management carried out, Table 7. The worst value was reached for nursery schools in week 13, with 4.48% of nursery schools closed and 0.53% of higher education centers closed.

Although the graphs of non-university teaching centers were less favorable, it can be seen that the impact on teaching has been very low.

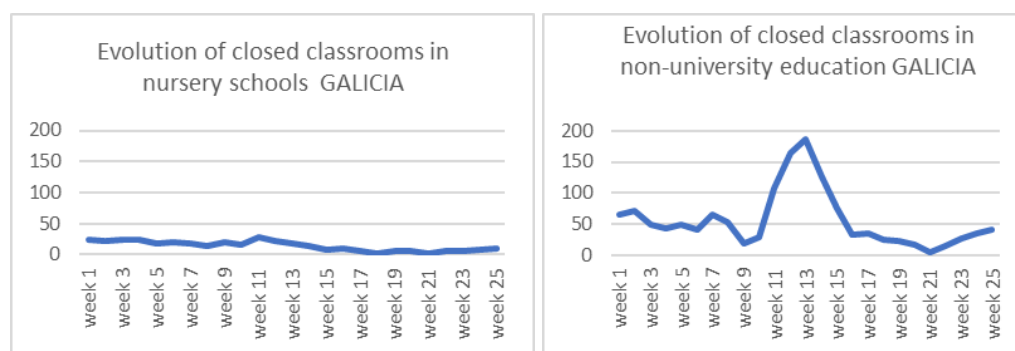


Figure 6. Closed classrooms in nursery schools and non-university education centers for the whole Galicia. Source: Own elaboration based on data from the Ministry of Culture, Education and University [33].

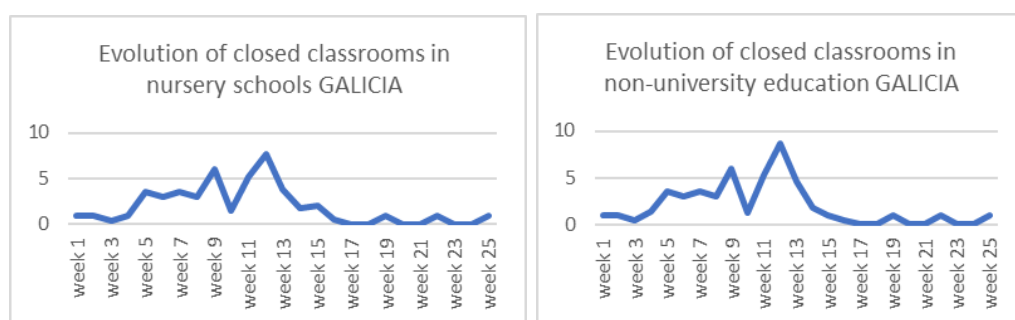


Figure 7. Evolution of closed classrooms and closed centers in nursery schools and non-university teaching. Source: Own elaboration based on data from the Ministry of Culture, Education and University [33].

Table 7. Percentage of nursery schools and non-university education centers closed in Galicia during the second and third waves.

	Nursery Schools	Non-University Education
week 1	0.58%	0.06%
week 2	0.58%	0.06%
week 3	0.23%	0.02%
week 4	0.58%	0.08%
week 5	2.11%	0.22%
week 6	1.75%	0.18%
week 7	2.11%	0.22%
week 8	1.75%	0.18%
week 9	3.51%	0.37%
week 10	0.88%	0.08%
week 11	3.07%	0.32%
week 12	4.48%	0.53%
week 13	2.22%	0.28%
week 14	1.02%	0.11%
week 15	1.17%	0.06%
week 16	0.29%	0.03%

Table 7. *Cont.*

	Nursery Schools	Non-University Education
week 17	0.00%	0.00%
week 18	0.00%	0.00%
week 19	0.58%	0.06%
week 20	0.00%	0.00%
week 21	0.00%	0.00%
week 22	0.58%	0.06%
week 23	0.00%	0.00%
week 24	0.00%	0.00%
week 25	0.58%	0.06%

Source: Own elaboration based on data from the Ministry of Culture, Education and University [33,39,40].

As a complement to this study, data from the University of A Coruña (UDC) has been analyzed. The University of A Coruña encompasses two health areas: Ferrol and A Coruña. These areas are included in the data of Table 8, which shows the active people in the sanitary areas of Ferrol and A Coruña in the age range of 18 to 24 years, which is the average age of the university students of the University of A Coruña.

Table 8. Data of active cases in the UDC during the second and third waves.

	Active Cases	Students	Administration and Services Staff (PAS)	Teaching and Research Staff (PDI)
week 1	6	5	0	1
week 2	7	5	0	2
week 3	11	10	1	0
week 4	8	8	0	0
week 5	12	10	2	0
week 6	6	5	0	1
week 7	6	4	2	0
week 8	3	3	0	0
week 9	9	9	0	0
week 10	19	16	1	2
week 11	32	26	3	3
week 12	41	32	1	8
week 13	18	13	1	4
week 14	13	12	1	0
week 15	3	2	0	1
week 16	2	2	0	0
week 17	4	2	1	1
week 18	8	7	1	0
week 19	1	1	0	0
week 20	7	7	0	0

Source: University of Coruña (UDC) [36].

As can be seen in Figure 8, the incidence in the UDC is much lower than in non-university education centers and in nursery schools, with values evaluated at all times well below the mean for the population of the same age.

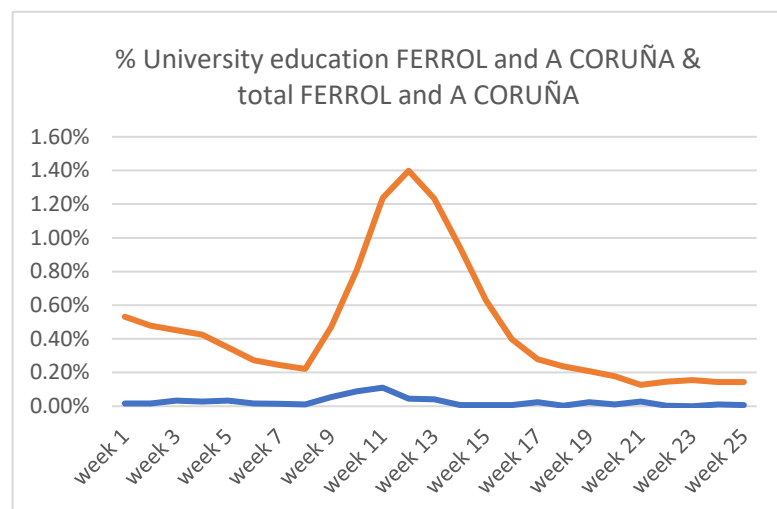


Figure 8. Percentage of active cases in university teaching centers of the University of A Coruña (blue line) compared to the percentage of active cases in that age group (orange line). Source: own elaboration from the University of A Coruña [34,36], SERGAS [34] and the Galician Institute of Statistics [35].

4. Conclusions and Discussion

After analyzing the data, it has been possible to demonstrate that the decision not to close the educational centers has been adequate since the spread of the virus in them has been low.

With the data obtained by official statements, it is shown that the incidence in nursery schools has had very low values. This may be due to the management that the nursery schools have carried out, following the protocols of the competent authorities, or because contagion in these age groups seems lower than in other groups.

Comparing the values of incidence of infections between the general population and that corresponding to non-university education centers, it can be deduced that the values are very similar. Analyzing the data on the appearance of outbreaks in these centers, it can also be seen that the number registered is not very significant, despite the fact that the teaching in this case has been completely face-to-face.

In both cases, nursery schools and non-university schools, it can be seen that the worst data correspond to those registered for week 12 (second wave of infections). In this period, the percentage of closed nursery schools was 4.48% and that of non-university education centers was 0.53% (Tables 6 and 7). With these data, it could be concluded that face-to-face teaching at these educational levels has not posed a risk for the increase in infections, taking into account the action protocols of the corresponding organizations [41]. In this way, it can be estimated that the closure of these centers could have caused greater health and social damage [42,43], being able to also cause, as can be seen in the article by Eiji Yamamura and Yoshiro Tsustui, that the gender gap is greater [44] than the health risk assumed.

From the analysis of the situation observed in university education, it can be seen that the incidence of contagion is even lower than that registered for nursery schools (see Figures 4, 5 and 8). It could be affirmed that, guaranteeing the social distance protocols, it would be possible to have maintained face-to-face teaching at this educational level [41].

On the other hand, it has been seen that there are hardly any differences between the different health areas in infections. The health area with the highest percentage of children of nursery school age are in Vigo, with 3.7% of the population between 4 months and 3 years old. However, the highest incidence values in the general population are not found in this health area, but in the Ferrol area. In this area, the percentage of children with infection is 3.1%. In the case of non-university education, the highest percentages are in Pontevedra with 14% of infections between the students. In addition, the highest incidence is found in the health areas of Ferrol and A Coruña, whose percentages of children in this

age group are lower. With these data, it cannot be concluded that there are significant differences between the different health areas, despite differences between restrictions and in the composition of the population.

In addition, the number of outbreaks detected within the centers of the different educational levels has not been significant, so it does not seem that the total closure of these centers is an effective or necessary measure to face a pandemic of these characteristics. Moreover, it is important to note that the need for socialization of both younger children and adolescents and university students makes face-to-face teaching essential for their development, both intellectual and social, since the lack of socialization, isolation and fear are creating even more serious problems in students, as can be seen in the studies carried out by Vyjayanthi N V and Camila Saggoiro de Figueiredo [45,46]. Therefore, the future perspectives of research of this kind of topic will indicate the importance of face-to-face teaching in school education.

On the other hand, it is important to comment that the data obtained may be helpful in treating subsequent waves of the SRS-CoV-19 pandemic, since although it is a disease that is normalizing in our country, there are countries that have suffered from the pandemic since the first moment and they are still carrying out confinements of the general population.

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