

Monitoring Belgian COVID-19 infections in work sectors in 2022

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1 Introduction

The workplace is among the main activities for a large proportion of the population, and consequently a source of potential infection. Hence, it is often (up to 25%) reported in the contact centre database as one of the collectivities visited by the index case. It is important to monitor the incidence of COVID-19 by sector as it can help us to better understand causes of increased infection rates and it can offer us ways to reduce infections without jeopardising the continuity of these sectors/companies for the benefit of all, first and foremost the companies and their workers. Two sources of information on infection in work sectors will be used in this report: the RSZ/ONSS data and the contact tracing data.

1.1 RSZ/ONSS data

The RSZ/ONSS data analyses of COVID-19 infections in the working population were set up in the first place to allow for signal detection. The alerts consist of 2 or more cases in the same company as well as the identification of employment of an index case in a risk sector as defined by the regional contact tracing agencies (daily alerts are sent by the RSZ/ONSS to the regions). Aggregated data show the evolution over time of the incidence in the sectors. It helps to better understand the spread of the virus in the active population. The latter is of interest here.

Data description: RSZ-ONSS has been receiving information regarding positive COVID-19 cases from Sciensano since 8 September 2020. RSZ-ONSS links this information to workplace-related databases, at the level of the national number (NISS). The linkage is allowed during a period of 14 days, after which the information on positive cases is destroyed, while the aggregated output tables are stored. Linkage is done of positive cases with the NSSO Dimona database of active workers since 8 September 2020. This covers most of the workers, such as private and public sectors, interim employment and job students. Since 12 January 2021, additional linkage of positive cases with the ARZA-RGTI (Algemeen Repertorium van de Zelfstandige Arbeiders - Répertoire Général des Travailleurs Indépendants) database was allowed, which covers self-employed workers.

Each company is classified by sector of its main activity (as attributed by the RSZ-ONSS), which are identified by the NACE code. This standard code classifies workplaces into 21 main sectors and then in subcategories for which the specificity depends on the chosen granularity (which can have up to 943 subcategories). However, although some companies or self-employed workers may be active in more than one sector, only one NACE number associated with the main activity is used in the analysis. This limitation is particularly important to consider for employees within national education. Because a vast majority of schools provide both primary and secondary education, the employees will be registered as working in “Secondary education” even when in reality they are primary school teachers.

Further, since the link of the cases is only identified at the level of the company, no information is available on the type of the job of the index case (e.g., administrative work in metal industry will be registered under metal industry). Further, information on the exact employment location is not always available and/or accurate (e.g., information on telework or temporary unemployment is not available).

Finally, the actual source of infection (in particular: at the workplace or elsewhere) cannot be traced back from this database. Thus, the size and extent of the database allows us to obtain a clear and precise picture of the level of infection within a given sector, without link to the source and circumstances of infection.

Additionally, information on absenteeism per paritair comité in the entire year 2021 is provided by RSZ/ONSS for ~ 1.33 million of the ~ 4.5 million employees. Per paritair comité, weekly data is available for days worked and for days not worked. The latter is subdivided into temporary unemployment (including Corona force majeure, quarantine, child care, economic reason, . . .), sickness ≥ 30 days, sickness < 30 days and other. Limitations of the absenteeism data is that not all employees are covered and only includes year 2021. Moreover, absenteeism information is available only at the level of paritair comité and not the NACE-BEL code. In order to estimate absenteeism based on COVID-19 incidence, only very specific sectors for which a reasonable match exists between paritair comité and NACE-BEL code can be evaluated.

1.2 Contact tracing

For companies affiliated with IDEWE, COVID-19 positive tested employees are reported to IDEWE starting from 22 July 2020. Of these index cases, contact tracing is performed of high and low-risk contact within the company. Subsequently, appropriate measures are taken within the company and by high-risk contacts to limit spread of the infection. Since 11 March 2021, index cases are asked about the work relatedness of their infection. At the start of the contact tracing, data were registered in a shared Excel file. From 29 October 2020 onwards, a ‘tracing application’ was used to register all notifications of index cases in companies under medical surveillance of IDEWE. Note that high and low-risk contacts are registered only for contacts in the company, contacts at home or in leisure time are not registered.

An index case can be any person present in the company. It can be an employee, but also an interim worker, an intern, etc. Importantly, for schools, the index case can also be a student. Of the index cases the employer information is retrieved via the INSZ number by IDEWE. Information of the employer is subsequently grouped by region and by customer segments. Although some customer segments are similar to the NACE code sectors, this is not true in general. IDEWE considers 10 customer segments based on the NACE codes of the companies, but these segments resemble only partially level 1 and 2. The segment classification is based on similarities in the needs of IDEWE’s customers and in the services IDEWE provides for them.

The incidences in the RSZ/ONSS sectors may differ from those in the contact tracing customer segments due to two aspects:

1. The RSZ/ONSS data concerns all employees and self-employed workers, while the contact tracing data concerns only companies under surveillance.
2. Similar named sectors and customer segments may contain different companies.

For instance, the NACE sector ‘education’ contains only information on positive cases among employees, while the contact tracing data also contain pupils. In schools, a considerable amount of index cases were pupils, especially since the onset of increased testing of children in January 2021. Finally, the contact tracing for the education segment is performed by regionally organised Student Guidance Centres (SGC). The organisation of the contact tracing by the SGC can vary from centre to centre and often only index cases with high-risk contacts are reported to IDEWE.

IDEWE has 9 regional offices that cover the surrounding areas and that are called after the city where they are located. Most Belgian provinces have one regional office, except Antwerp that is served by the regions Antwerpen, Mechelen and Turnhout, and Namur that serves all of Wallonia. The sole exception is Public transport. Companies belonging to this segment are not regionally divided.

Note that some larger companies have organised contact tracing by their internal prevention service. Data of these companies are however not included in this analysis, causing an underestimation of index cases in general. For some segments this underestimation might be more important than for others.

2 Methodology

2.1 RSZ/ONSS data

2.1.1 COVID-19 14-day incidence

The data provided by RSZ/ONSS will be shown per work sector. Work sectors are divided by NACE codes and grouped into 5 levels of detail, going from 21 sectors at level 1 to 943 sectors at level 5. The evolution of the 14-day incidence of positive COVID-19 cases among all employees registered in the same sector (number of cases per 100,000 employees) is presented for the 5 levels of work sectors. A 95% confidence interval (CI) for the incidence is calculated on a logit transformation of the incidence, after which it is backtransformed to the original scale.

At each of the 5 levels of detail of the work sectors, the highest incidences in the last 14-day period are selected (25 January–7 February 2022) and presented together with the COVID-19 14-day incidence over all

work sectors (~ 4.5 million individuals) and the COVID-19 14-day incidence in the general population (~ 11.5 million individuals) for reference.

Because the number of employees in some occupational sectors is low compared to others, the precision of the 14-day incidence is low in such small sectors. Therefore, we select the highest incidences for level 1 sectors with a minimum of 10,000 employees and self-employed workers. For level 2 and 3 sectors with a minimum of 5,000 employees and self-employed workers are selected, while for level 4 and level 5, sectors with a minimum of 3,000 and 1,500 employees, respectively, are selected.

Note that for 25% of the self-employed a sector is missing in the ARZA-RGTI data. Positive cases of self-employed worker with missing sector information are left out of the analysis. Linkage to occupational data shows that missing sector information is dispersed over many sectors, so that the impact of missing data is not affecting a single sector excessively. There will be a slight underestimation of the true incidence, but the ordering among sectors is likely not affected.

Finally, we cannot exclude varying testing preparedness and custom between sectors.

2.1.2 Absenteeism

To estimate the relationship between absenteeism and 14-day COVID-19 incidence, a linear model is fitted to the data. Absenteeism including temporary unemployment and sickness, y_w^{tus} , is expressed as a linear effect of 14-day incidence x_w , with or without the stringency index s_w , and a possible non-linear weekly effect w :

$$y_w^{tus} = \beta_0^{tus} + \beta_1^{tus} x_w + \beta_2^{tus} s_w + f(w) + \epsilon_w^{tus},$$

where w are the weeks 1 to 52 and $\epsilon_w^{tus} \sim N(0, \sigma_{tus}^2)$. The stringency index is a summary measure, that expresses the level of stringency of the COVID-19 mitigation measures on a scale from 0 to 100 (with 100 the most strict). The stringency index is extracted from Our World in Data and helps to explain part of absenteeism due to temporary unemployment. The possible non-linear weekly effect $f(w)$ is modelled with fractional polynomials, piecewise linear functions or splines.

Absenteeism due to sickness only, y_w^s , is modelled by a linear effect of 14-day incidence x_w :

$$y_w^s = \beta_0^s + \beta_1^s x_w + \epsilon_w^s, \tag{1}$$

where w are the weeks 1 to 52 and $\epsilon_w^s \sim N(0, \sigma_s^2)$. As absenteeism due to only sickness does not include temporary unemployment due to Corona force majeure, the stringency index is not expected to improve the model.

As both absenteeism and COVID-19 14-day incidence are time series, it is expected that serial autocorrelation is present. While estimation of the β parameters by ordinary least squares is unbiased in the presence of autocorrelation, the estimation of the variance is biased. Therefore, the ordinary least squares variance estimation in both models for absenteeism is corrected with the Andrews & Monahan sandwich estimator, without pre-whitening, which corrects for both serial autocorrelation and heteroskedasticity. Both the Wald 95% confidence interval for the β parameters and the partial quasi-t tests for testing whether the parameter is different from zero, are based on the sandwich variance estimator. The inference is thus corrected for serial autocorrelation in the time series.

2.2 Contact tracing

In addition to the comparison of the 14-day incidence of index cases between customer segments under surveillance, also the 14-day incidence of index cases between regions are compared. The reported day is the last day of the 14-day period.

Since its initiation on 29 October 2020, the tracing application registers in a standardized manner, besides information on incidences, also information on high-risk and low-risk contacts of index cases. Per segment and per region, the mean number of high-risk contacts by the index case over the entire study period (29 October 2020–3 February 2022) and the four-weekly percentage of index cases with two or more high risk contacts are

evaluated.

There might be an underreporting of high-risk contacts because the number of contacts for an index case is set equal to 0 by default by the application. For index cases, who for example could not be contacted or who refused to answer, the number of high and low-risk contacts is reported 0, which may not coincide with reality. The incidences reported by contact tracing depend on the testing willingness in sectors and accuracy in reporting high-risk contact.

3 Results

This report is accompanied with an Excel sheet, listing all sectors and all NACE-BEL sectors for further examination.

3.1 Level 1 work sector

Of the 20 sectors at level 1, the sector with a 14-day incidence on 7 February 2022 significantly above the working population average is Education (sector P) and Human health and social work activities (sector Q) (Table 1 and Figure 1). The peak of the 14-day incidences has been reached between 18-31 January 2022 in all sectors.

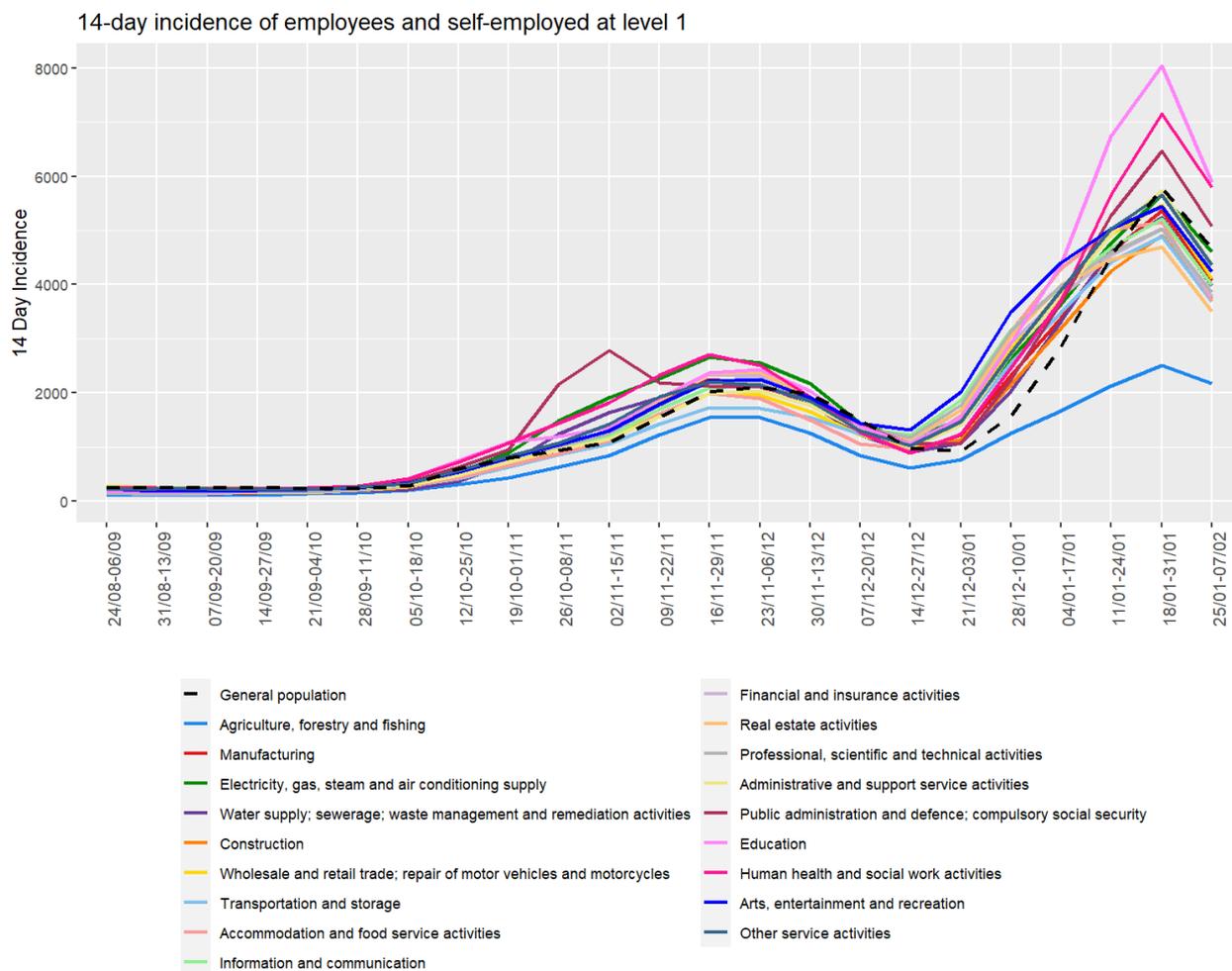


Figure 1: 14-Day incidence of COVID-19 infection of 20 sectors at Level 1 in both employees and self-employed workers

Table 1: 14-Day incidence of COVID-19 infection of 20 sectors at Level 1 on 7 February 2022

DESCRIPTION	NACE-code	Total number of workers	Incidence (95%CI) all workers	Incidence (95%CI) employees	Incidence (95%CI) self-employed	Percentage of self-employed workers
Education	P	727250	5890(5836;5944)	5930(5875;5986)	4829(4576;5095)	3.71
Human health and social work activities	Q	654655	5789(5733;5846)	5930(5871;5990)	4210(4043;4383)	8.42
Working population		4560254	5120(5100;5140)	5120(5100;5140)		
Public administration and defence; compulsory social security	O	576894	5081(5025;5138)	5086(5030;5143)		0.18
General population			4662	4662	4662	
Electricity, gas, steam and air conditioning supply	D	21390	4605(4332;4894)	4724(4439;5026)		6.18
Administrative and support service activities	N	437217	4377(4317;4438)	4603(4535;4672)	3355(3232;3483)	18.50
Other service activities	S	159212	4364(4265;4465)	4625(4482;4772)	4095(3958;4236)	50.04
Arts, entertainment and recreation	R	98726	4239(4115;4366)	4537(4372;4708)	3801(3618;3993)	40.86
Wholesale and retail trade; repair of motor vehicles and motorcycles	C	823807	4108(4065;4151)	4443(4393;4494)	2975(2899;3053)	23.24
Manufacturing	G	618106	4076(4027;4126)	4184(4132;4237)	3143(3011;3281)	10.50
Information and communication	J	183292	3998(3909;4089)	4128(4021;4238)	3688(3533;3850)	30.24
Water supply; sewerage; waste management and remediation activities	E	35842	3973(3776;4180)	4039(3833;4255)		6.63
Professional, scientific and technical activities	M	393435	3854(3794;3915)	4290(4204;4378)	3365(3284;3448)	47.73
Financial and insurance activities	K	159115	3774(3681;3869)	4078(3969;4190)	2704(2540;2879)	22.28
Construction	F	380279	3727(3667;3788)	4240(4158;4324)	2970(2886;3056)	41.24
Accommodation and food service activities	I	284293	3699(3630;3769)	4061(3978;4146)	2604(2489;2724)	25.33
Transportation and storage	H	307586	3691(3625;3758)	3788(3718;3859)	2741(2558;2937)	9.39
Real estate activities	L	58421	3509(3363;3661)	4420(4170;4684)	2845(2673;3028)	58.59
Agriculture, forestry and fishing	A	79715	2174(2075;2278)	2215(2046;2397)	2153(2032;2281)	66.39

3.2 Level 2 work sector

In the sectors at level 2 with a minimum of 5,000 workers, the sectors with the highest 14-day incidence on 7 February 2022 are: Health and care sector (sector 87,86), Education (sector 85), Social work without accommodation (sector 88), Public administration and defence; compulsory social security (sector 84), several Manufacture activities (sector 21, 30, 24), Employment activities (sector 78) and Security and investigation activities (sector 80) (Table 2 and Figure 2).

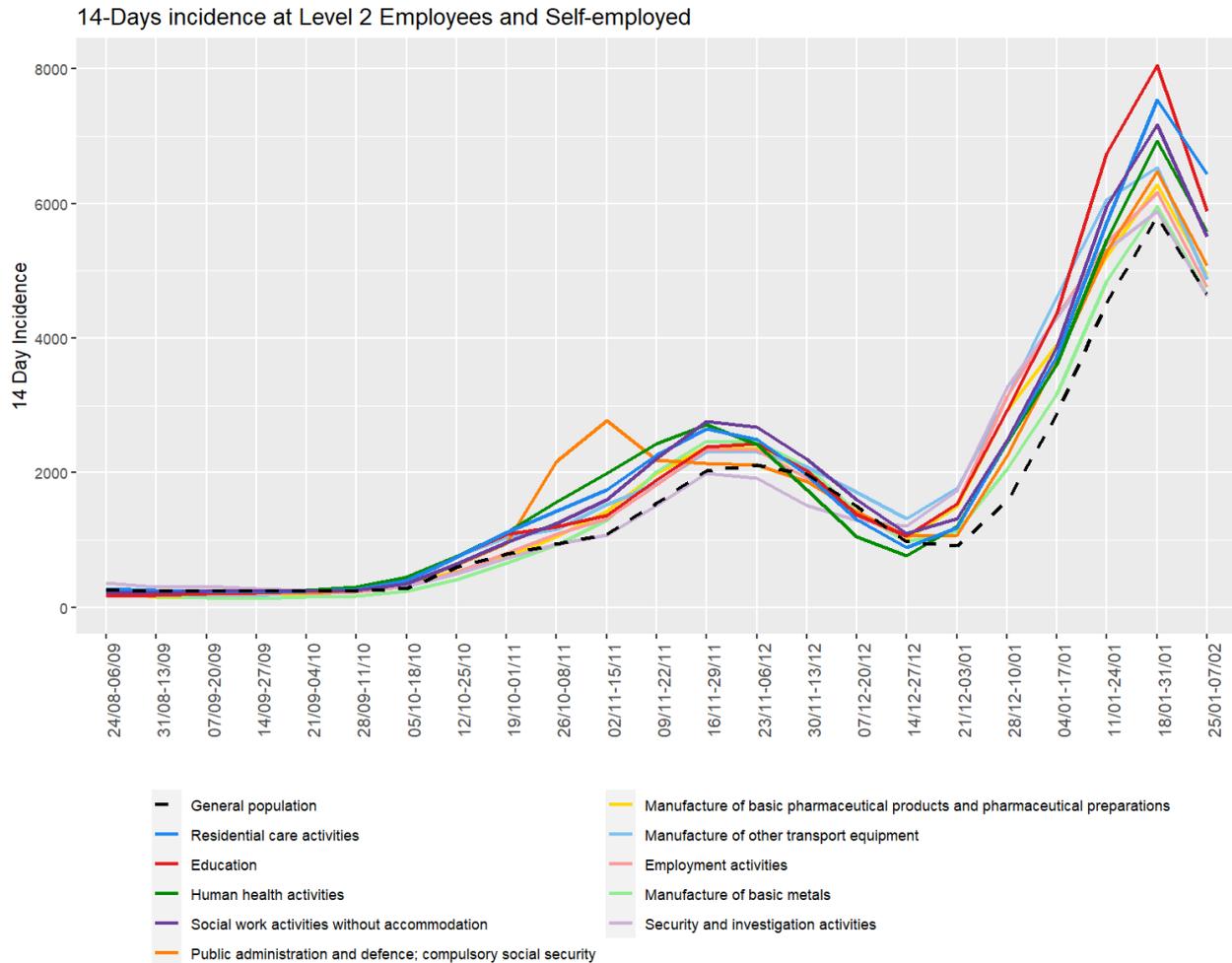


Figure 2: 14-Day incidence of COVID-19 infection in sectors with the highest incidence at Level 2 in both employees and self-employed workers

Table 2: 14-Day incidence of COVID-19 infection in sectors with the highest incidence at Level 2 on 7 February 2022

DESCRIPTION	NACE-code	Total number of workers	Incidence (95%CI) all workers	Incidence (95%CI) employees	Incidence (95%CI) self-employed	Percentage of self-employed workers
Residential care activities	87	171848	6433(6318;6550)	6479(6363;6597)	3040(2412;3825)	1.36
Education	85	727250	5890(5836;5944)	5930(5875;5986)	4829(4576;5095)	3.71
Human health activities	86	315077	5578(5498;5659)	5829(5741;5918)	4154(3978;4338)	15.28
Social work activities without accommodation	88	168902	5502(5394;5612)	5528(5418;5640)	4716(4183;5313)	3.23
Working population		4560254	5120(5100;5140)	5120(5100;5140)		
Public administration and defence; compulsory social security	84	576894	5081(5025;5138)	5086(5030;5143)		0.18
Manufacture of basic pharmaceutical products and pharmaceutical preparations	21	35190	4936(4715;5167)	4953(4730;5186)		1.32
Manufacture of other transport equipment	30	6517	4864(4368;5414)	5026(4506;5603)		6.26
Employment activities	78	81734	4763(4619;4911)	4817(4670;4969)	3391(2808;4090)	3.78
Manufacture of basic metals	24	25624	4648(4397;4913)	4690(4434;4960)		2.97
General population			4662	4662	4662	
Security and investigation activities	80	21212	4620(4346;4911)	4710(4426;5012)		5.26

3.3 Level 3 work sector

In the sectors at level 3 with a minimum of 5,000 workers, the sectors with a 14-day incidence on 7 February 2022 significantly higher than the working population average are: Primary and Secondary education (sector 853, 852), Residential care activities (sector 871, 879, 873, 872), Hospital activities (sector 861), Social work without accommodation (sector 881, 889), Other human health activities (sector 869) and Administration of the state (sector 841) (Table 3 and Figure 3).

After the seasonal holidays, the 14-day incidence in the primary and secondary schools increased much sharper than in other and certainly higher education (Figure 4). The increase in primary and secondary education goes well beyond the working population average. A comparison between primary and secondary schools is inaccurate based on the available data. Indeed, the NACE-BEL code for school employees is assigned to the main activity of the school. Hence, for schools offering both primary and secondary education, all employees are counted as secondary education employees. Employees under the NACE-BEL code primary education are employees in schools that offer only primary education.

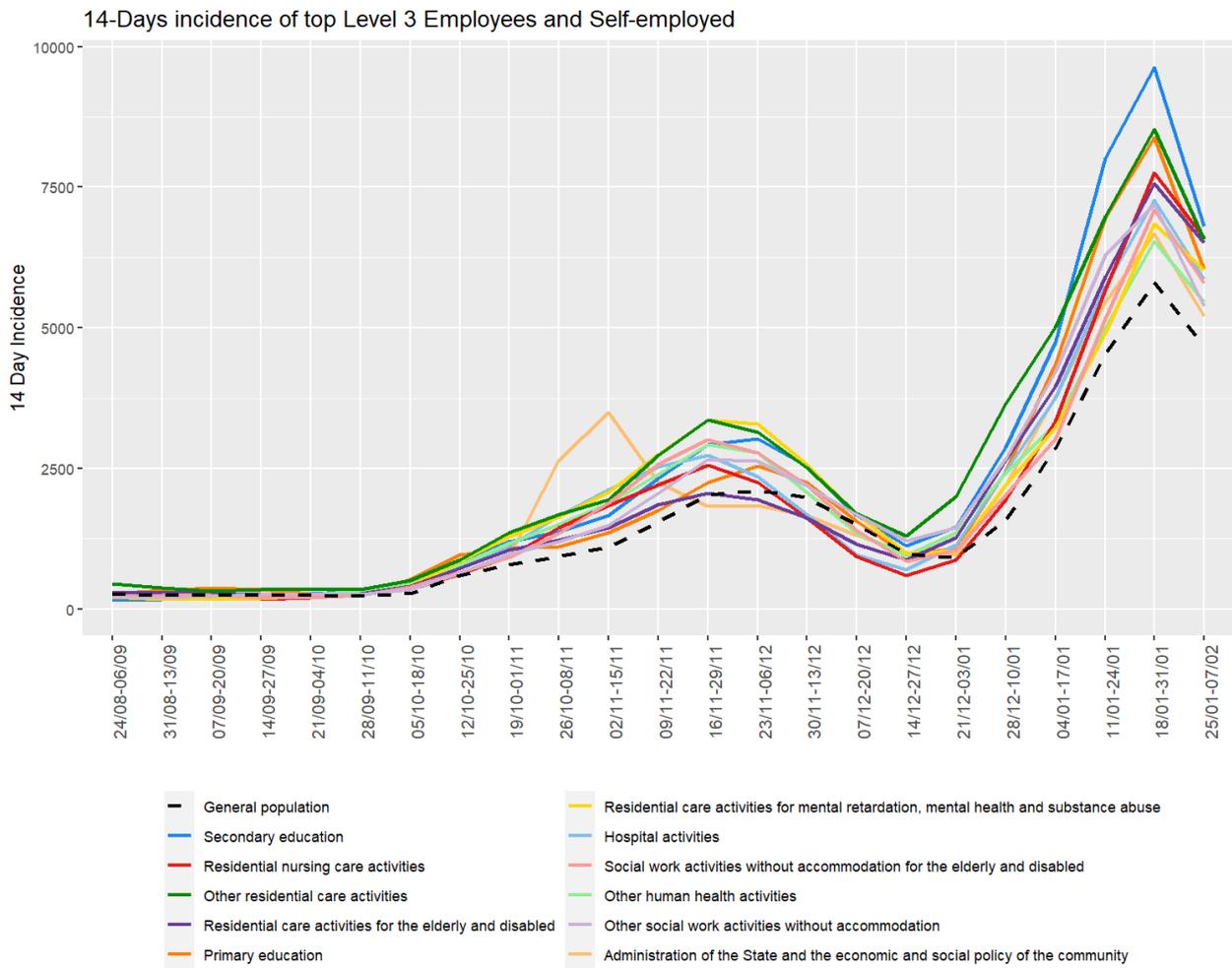


Figure 3: 14-Day incidence of COVID-19 infection in sectors with the highest incidence at Level 3 in both employees and self-employed

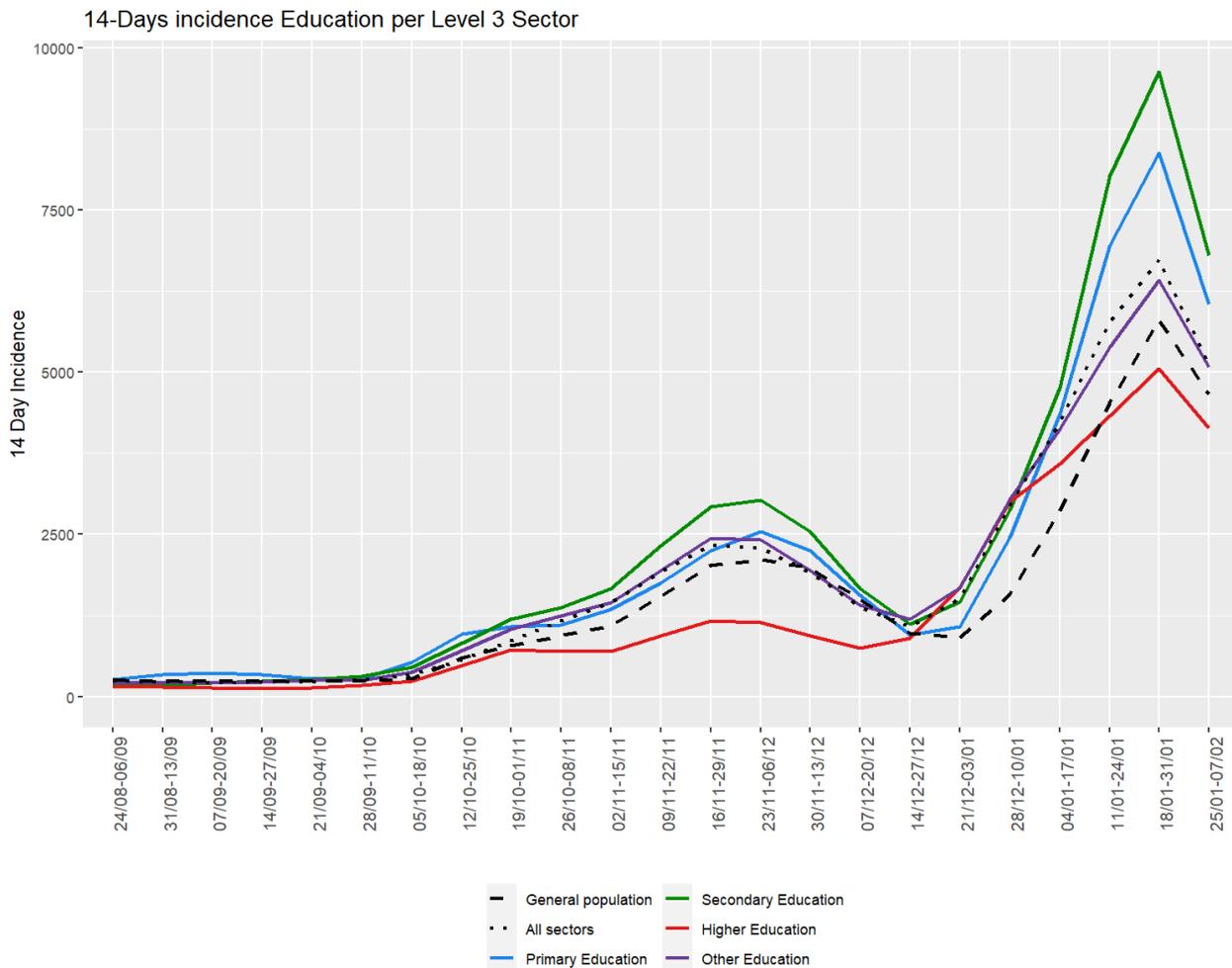


Figure 4: 14-Day incidence of COVID-19 infection in Education sectors at Level 3 in both employees and self-employed

Table 3: 14-Day incidence of COVID-19 infection in sectors with the highest incidence at Level 3 on 7 February 2022

DESCRIPTION	NACE-code	Total number of workers	Incidence (95%CI) all workers	Incidence (95%CI) employees	Incidence (95%CI) self-employed	Percentage of self-employed workers
Secondary education	853	451294	6800(6727;6874)	6808(6735;6882)		0.19
Residential nursing care activities	871	45306	6604(6379;6836)	6630(6404;6864)		0.89
Other residential care activities	879	16296	6572(6202;6963)	6681(6301;7082)		3.56
Residential care activities for the elderly and disabled	873	68227	6515(6332;6703)	6562(6377;6751)		1.30
Primary education	852	8605	6043(5559;6567)	6288(5773;6846)		8.56
Residential care activities for mental retardation, mental health and substance abuse	872	42348	6031(5808;6262)	6102(5876;6336)		1.78
Hospital activities	861	215731	5861(5763;5961)	5877(5778;5977)		0.33
Social work activities without accommodation for the elderly and disabled	881	48740	5794(5590;6005)	5833(5627;6046)		1.09
Other human health activities	869	54674	5456(5269;5650)	5764(5502;6038)	5108(4845;5384)	47.25
Other social work activities without accommodation	889	120275	5381(5255;5510)	5402(5273;5534)	4894(4332;5525)	4.22
Administration of the State and the economic and social policy of the community	841	406041	5214(5146;5283)	5219(5151;5288)		0.15
Working population		4560254	5120(5100;5140)	5120(5100;5140)		
General population			4662	4662	4662	

3.4 Level 4 work sector

In the sectors at level 4 with a minimum of 3,000 workers, the sectors with a 14-day incidence on 7 February 2022 significantly higher than the working population average are: Child day-care (sector 8891), Education (sector 8531, 8520, 8532), Residential care (sector 8710, 8790, 8730, 8720), Regulation of providing health care, education, cultura and other services (sector 8412), Hospital activities (sector 8610), Social work activities without accommodation (sector 8810), Retail sale of cosmetics (sector 4775) and Other human health activities (sector 8690) (Table 4 and Figure 5).

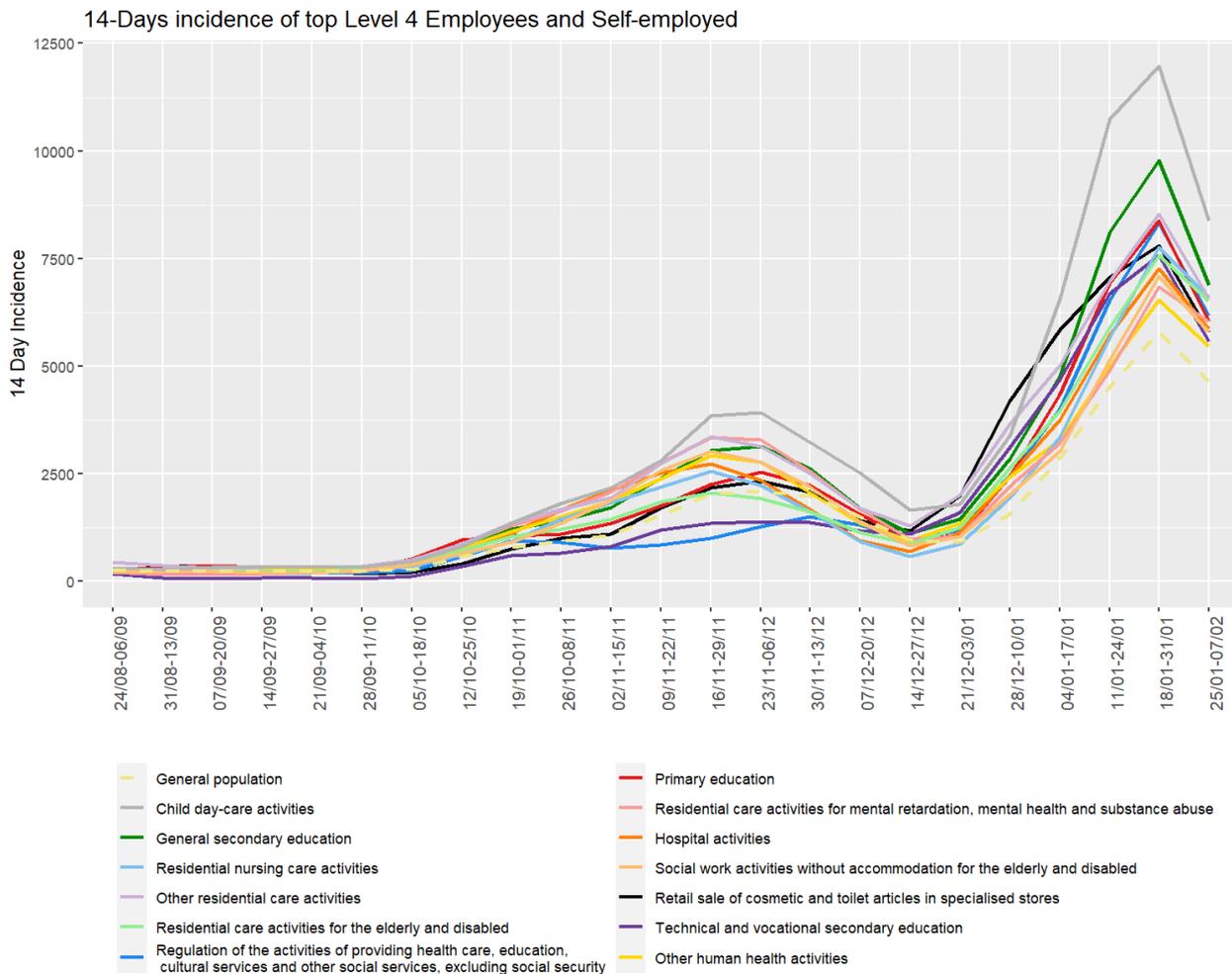


Figure 5: 14-Day incidence of COVID-19 infection in sectors with the highest incidence at Level 4 in both employees and self-employed

Table 4: 14-Day incidence of COVID-19 infection in sectors with the highest incidence at Level 4 on 7 February 2022

DESCRIPTION	NACE-code	Total number of workers	Incidence (95%CI) all workers	Incidence (95%CI) employees	Incidence (95%CI) self-employed	Percentage of self-employed workers
Child day-care activities	8891	28490	8375(8059;8702)	8546(8217;8887)	5816(4821;7001)	6.30
General secondary education	8531	421156	6887(6811;6964)	6894(6818;6971)		0.16
Residential nursing care activities	8710	45306	6604(6379;6836)	6630(6404;6864)		0.89
Other residential care activities	8790	16296	6572(6202;6963)	6681(6301;7082)		3.56
Residential care activities for the elderly and disabled	8730	68227	6515(6332;6703)	6562(6377;6751)		1.30
Regulation of the activities of providing health care, education, cultural services and other social services, excluding social security	8412	41847	6182(5955;6417)	6199(5972;6434)		0.32
Primary education	8520	8605	6043(5559;6567)	6288(5773;6846)		8.56
Residential care activities for mental retardation, mental health and substance abuse	8720	42348	6031(5808;6262)	6102(5876;6336)		1.78
Hospital activities	8610	215731	5861(5763;5961)	5877(5778;5977)		0.33
Social work activities without accommodation for the elderly and disabled	8810	48740	5794(5590;6005)	5833(5627;6046)		1.09
Retail sale of cosmetic and toilet articles in specialised stores	4775	8852	5784(5316;6290)	6240(5695;6834)	4130(3325;5120)	21.45
Technical and vocational secondary education	8532	30156	5581(5327;5846)	5596(5341;5862)		0.68
Other human health activities	8690	54674	5456(5269;5650)	5764(5502;6038)	5108(4845;5384)	47.25
Working population		4560254	5120(5100;5140)	5120(5100;5140)		
General population			4662	4662	4662	

3.5 Level 5 work sector

In the sectors at level 5 with a minimum of 3,000 workers, the sectors with a 14-day incidence on 7 February 2022 significantly higher than the working population average are: Nurseries and crèches (sector 88911), Secondary education (sector 85311, 85321, 85319, 85314, 85324, 85204), Integrated youth work with housing (sector 87901), Residential care (sector 87302, 87101, 87301, 87201, 87202), Mental health activities (sector 86904), Regulation of providing health care, education, cultura and other services (sector 84120), Youth work associations (sector 94991), Public centers for social welfare (sector 84115), Hospitals (sector 86103, 86101, 86104), Retail sale of cosmetics (sector 47750), Activities of family and elderly care at home (sector 88101) and Nursing activities (sector 86906) (Table 5 and Figure 6).

14-Days incidence of top 15 Level 5 Employees and Self-employed

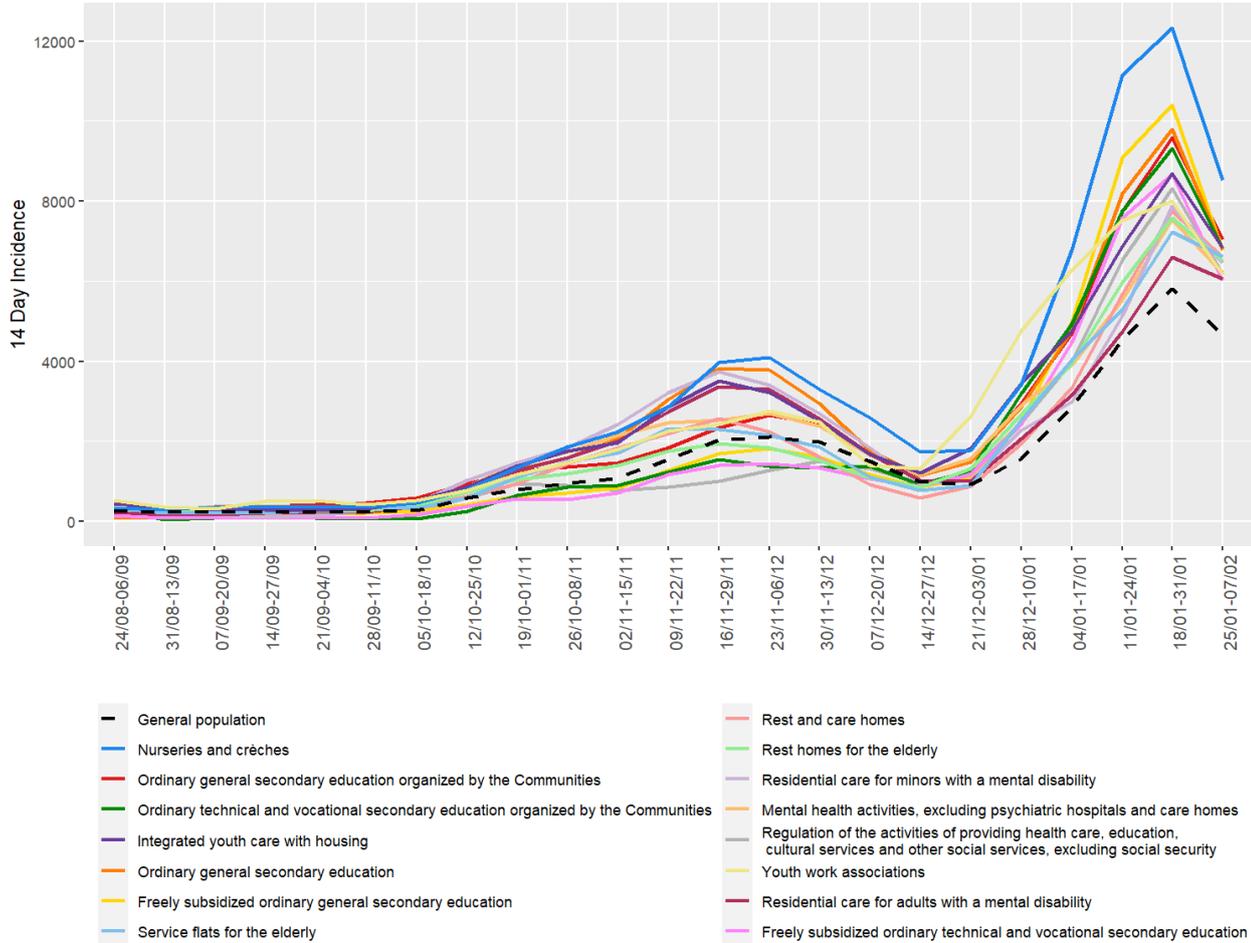


Figure 6: 14-Day incidence of COVID-19 infection in sectors with the highest incidence at Level 5 in both employees and self-employed

Table 5: 14-Day incidence of COVID-19 infection of sectors with the highest incidence at Level 5 on 7 February 2022

DESCRIPTION	NACE-code	Total number of workers	Incidence (95%CI) all workers	Incidence (95%CI) employees	Incidence (95%CI) self-employed	Percentage of self-employed workers
Nurseries and crèches	88911	25185	8533(8194;8884)	8715(8362;9082)	5875(4828;7132)	6.45
Ordinary general secondary education organized by the Communities	85311	165583	7043(6921;7167)	7043(6921;7167)		0.01
Ordinary technical and vocational secondary education organized by the Communities	85321	5051	6831(6167;7560)	6815(6152;7544)		0.06
Integrated youth care with housing	87901	12515	6824(6395;7279)	6918(6480;7383)		2.86
Ordinary general secondary education	85319	210146	6801(6694;6909)	6801(6694;6909)		0.02
Freely subsidized ordinary general secondary education	85314	42990	6762(6528;7003)	6827(6591;7071)		1.40
Service flats for the elderly	87302	6355	6625(6039;7263)	6749(6148;7404)		3.23
Rest and care homes	87101	45269	6605(6380;6838)	6633(6406;6867)		0.85
Rest homes for the elderly	87301	58181	6521(6323;6725)	6564(6365;6769)		1.09
Residential care for minors with a mental disability	87201	9102	6460(5973;6984)	6520(6028;7049)		1.26
Mental health activities, excluding psychiatric hospitals and care homes	86904	6933	6202(5658;6795)	6367(5583;7253)	6052(5322;6875)	53.45
Regulation of the activities of providing health care, education, cultural services and other social services, excluding social security	84120	41847	6182(5955;6417)	6199(5972;6434)		0.32
Youth work associations	94991	4987	6156(5522;6858)	6526(5843;7283)		9.11
Residential care for adults with a mental disability	87202	27933	6068(5794;6354)	6135(5857;6425)		1.68
Freely subsidized ordinary technical and vocational secondary education	85324	15078	6022(5653;6413)	6038(5668;6431)		0.70
Public Centers for Social Welfare	84115	89928	6007(5854;6164)	6007(5854;6164)		0.15
Specialized hospitals	86103	4646	5919(5276;6635)	5988(5336;6714)		1.51
General hospitals, excluding geriatric and specialty hospitals	86101	177638	5867(5759;5977)	5880(5771;5990)		0.26
Psychiatric Hospitals	86104	32591	5836(5587;6096)	5854(5604;6115)		0.37
Freely subsidized ordinary primary education	85204	6872	5806(5277;6384)	6086(5519;6707)		9.18
Retail sale of cosmetic and toilet articles in specialised stores	47750	8852	5784(5316;6290)	6240(5695;6834)	4130(3325;5120)	21.45
Activities of family and elderly care at home	88101	44847	5764(5552;5984)	5794(5581;6015)		0.86
Nursing Activities	86906	16475	5748(5403;6114)	5974(5598;6374)	4242(3466;5182)	13.04
Working population		4560254	5120(5100;5140)	5120(5100;5140)		
General population			4662	4662	4662	

Finally, when considering specifically the non-medical contact professions, we continue to see that the incidence in the employees is higher than the incidence in the self-employed. Additionally, the average incidence in the beauty saloons is similar to the working population average, while the average incidence in the hairdressers is similar to the general population average. (Figure 7).

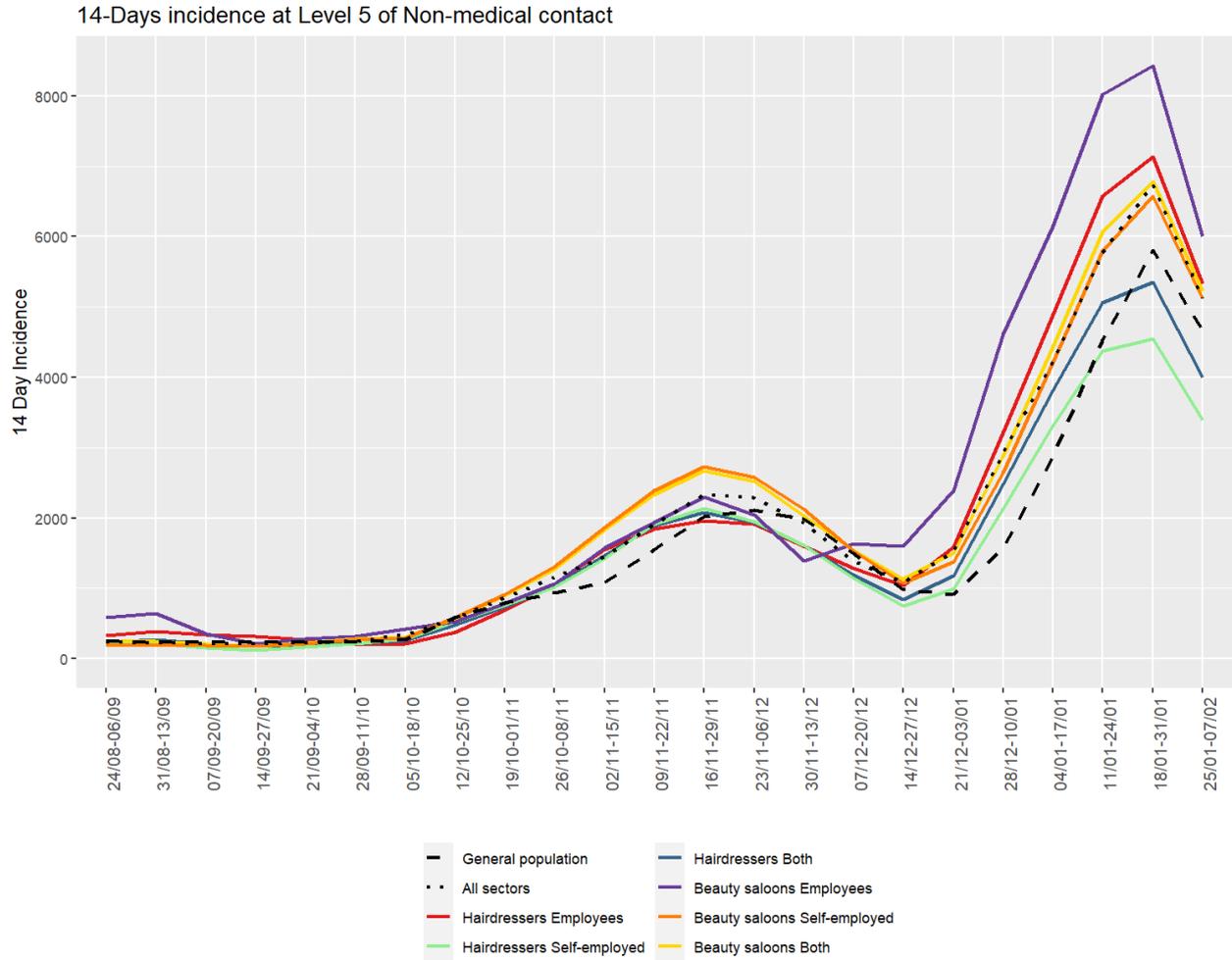


Figure 7: 14-Day incidence of COVID-19 infection at Level 5 of non-medical contact professions.

3.6 Additional analyses

3.6.1 Cross-level overview

When contemplating the 14-day incidences across NACE-BEL sectors, it is possible to gauge the contribution of each sub-level sector to the higher level incidence (Figure 8).

The 14-day incidence in the Education (sector P) and Human health and social work sector (sector Q) are elevated compared to the working and general population (Figure 8). The increased incidence in Education comes primarily from the increase in incidences in all subsections of Secondary education and Primary education, while in the health and social work sector the increase in incidence is broadly present, mostly in Residential care, with an extreme in Child day-care activities.

Although the 14-day incidence in Public administration and defence (sector O) and Other service activities (sector S) is around or below the working population average, individual subsectors show an increased incidence. Regulation of providing social services (sector 8412) and Youth associations (sector 94991) all show increased incidences compared to the working population.

It is encouraging that the incidence in and Arts, entertainment and recreation (sector R), Accommodation and food service activities (sector I) and Transportation and storage (sector H) is similar to or below the general population average.

The sectors Manufacturing (sector C) and Wholesale and retail trade (sector G) are sectors with the highest number of sublevels. In all manufacturing, whole and retail sectors the incidence is below or close to the working and population average, except Retail sale in cosmetics (sector 4775) show an increase incidence compared to the working population average (Figure 8).

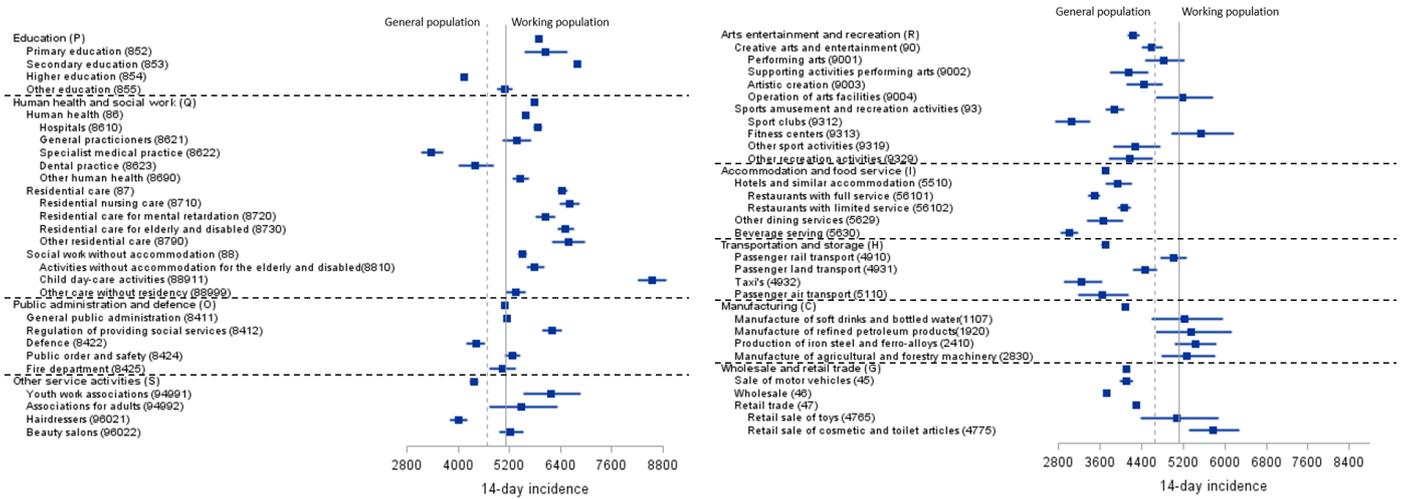


Figure 8: Forest plot of 14-Day incidence and 95% CI of selected sectors on 7 February 2022 in both employees and self-employed.

3.6.2 Absenteeism

With increasing 14-day incidences to levels higher than ever measured, absenteeism at work is a cause of concern for the continuity of activities in companies, sectors and for the chain of economic activities. Information on days worked and on the reason of days not worked in the entire year 2021 is provided by RSZ/ONSS for ~ 1.33 million of the ~ 4.5 million employees. We consider two forms of absenteeism: (1) Absenteeism due to temporary unemployment (including Corona force majeure, quarantine, child care, economic reason, ...) and sickness and (2) absenteeism only due to sickness. Of each form of absenteeism, the proportion of days not worked are weekly aggregated over all sectors (Figure 9).

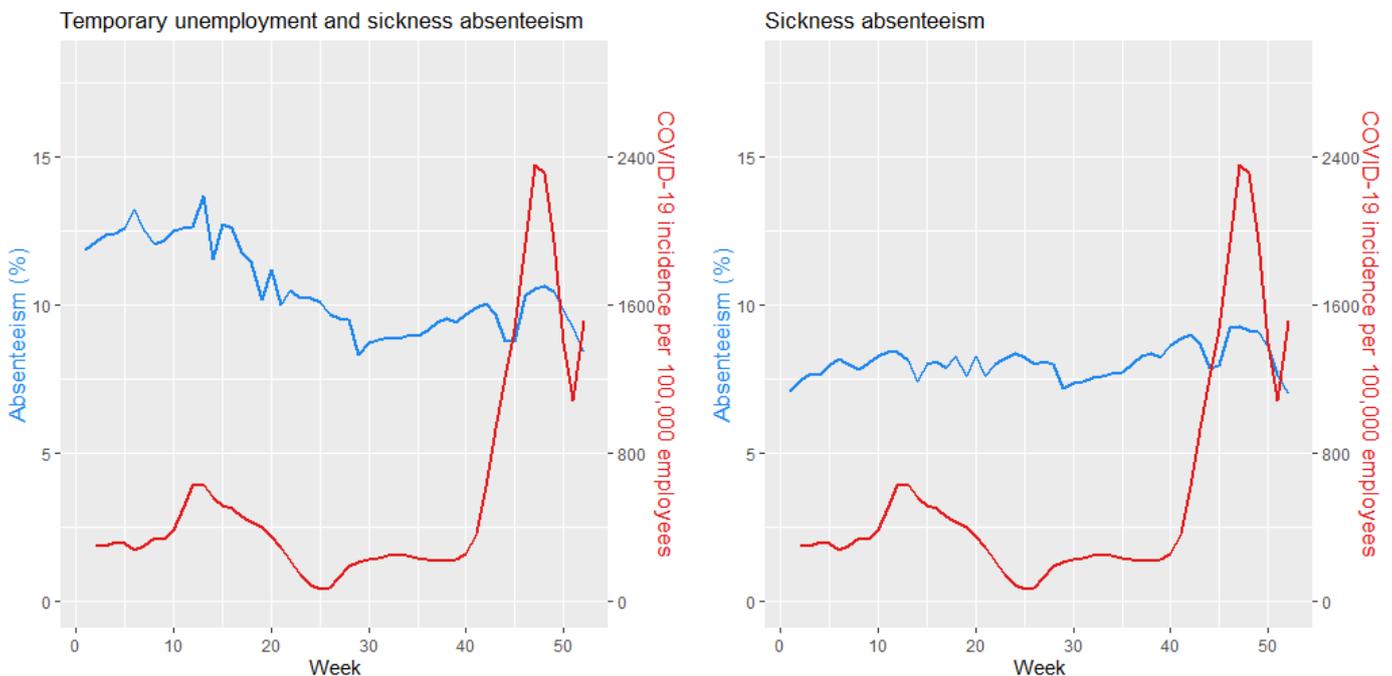


Figure 9: Absenteeism due to temporary employment and sickness and 14-Day incidence of COVID-19 per week in 2021 (left) and Absenteeism due to sickness only (right).

Absenteeism in the year 2021 can roughly be divided into 2 parts. The first half of 2021 is characterized by a higher level of temporary unemployment, likely due to force majeure as a consequence of the mitigation measures (non-pharmaceutical interventions), evidenced by the higher stringency index (Figure 10). The stringency index is a summary measure, that expresses the level of stringency of the COVID-19 mitigation measures on a scale from 0 to 100 (with 100 the most strict). The stringency index is extracted from Our World in Data and helps to explain part of absenteeism due to temporary unemployment. The second half of 2021 is characterized by an increase in absenteeism due to sickness (Figure 10).

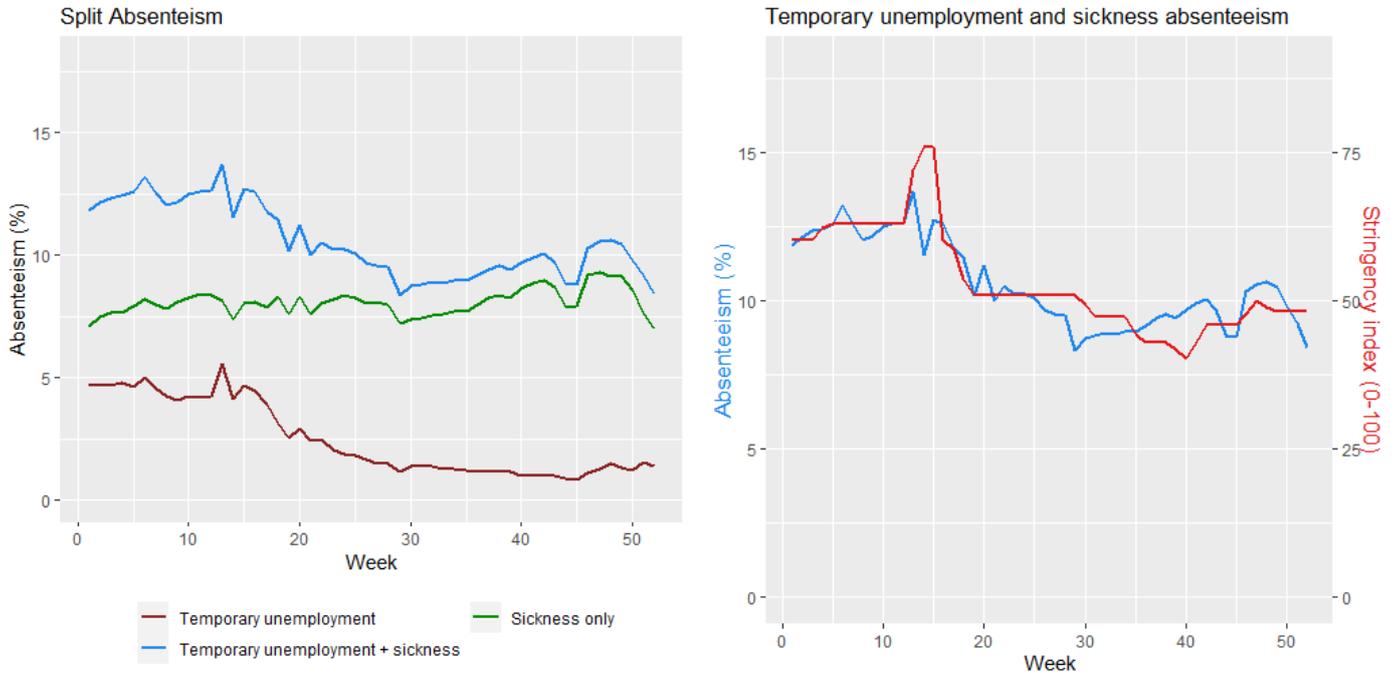


Figure 10: Split of the absenteeism in 2021 by reason of absenteeism (left) and the stringency index versus absenteeism due to temporary employment and sickness (right).

When modelling the effect of increasing 14-day incidences on absenteeism due to temporary employment and sickness, while correcting for a linear time effect and for stringency, an increase of 1000 in the 14-day COVID-19 incidence leads to an increase of absenteeism by on average 1.07% (95% confidence interval: 0.51–1.63) and 1.40 (0.82–1.98)% excluding stringency. When using the weekly COVID-19 incidence, rather than the 14-day incidence, an increase of 1000 in the incidence increases absenteeism by on average 1.71 (0.49–2.92)% including the stringency index and by 2.48 (1.26–3.71)% excluding the stringency index. The baseline absenteeism (absenteeism with a zero COVID-19 incidence) is estimated between 6.7 and 13%, depending on the model (Figure 11 (left)). In model comparisons, of all the non-linear weekly effect $f(w)$ modelled, a linear weekly effect seem to fit the data best.

When modelling the effect of increasing 14-day incidences on absenteeism due to sickness only, no correction for stringency is needed. With an increase of 1000 in the 14-day COVID-19 incidence increases the absenteeism due to sickness by 0.44% (0.27–0.62) and the estimated baseline absenteeism due to sickness is 7.84% (7.63–8.04) (Figure 11 (right)).

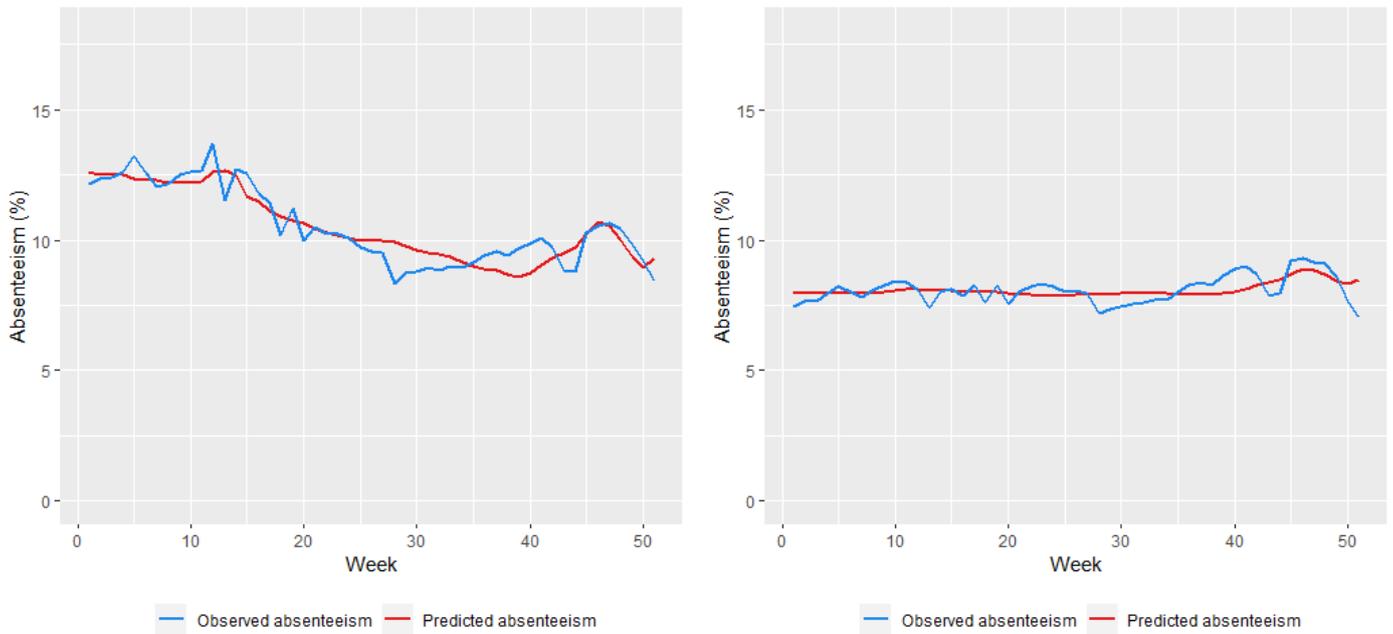


Figure 11: Prediction of absenteeism due to temporary employment and sickness (left) and prediction of absenteeism due to sickness only by the linear models (right).

Absenteeism may however also depend on the work context, such as the possibility of teleworking and the contact risk environment. In sectors where employees are not able to telework and/or have regular high-risk contacts on the workforce, a SARS-CoV-2 infection may lead more often to absenteeism than in sectors where employees can telework.

The Health care, Food processing, and Horeca sectors are sectors where telework is not possible. Moreover, the first sector is an essential sector which was not impacted by mitigation measures, while the latter two were impacted by mitigation measures, but in a different degree (Figure 12). In the bank sector in theory teleworking would be possible and a SARS-CoV-2 infected employee may be able to continue to work from home if his or her health status would allow it. Consequently, absenteeism in the bank sector was not impacted by mitigation measures in 2021 (Figure 12).

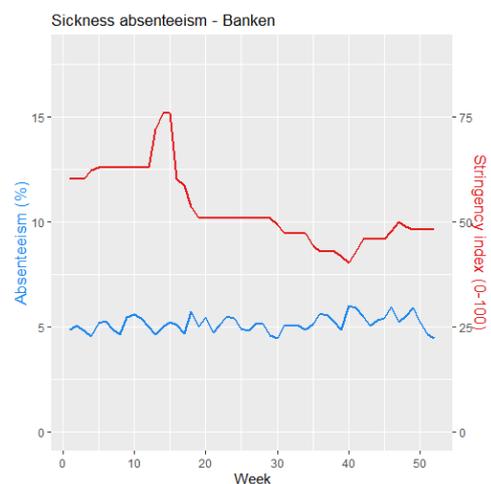
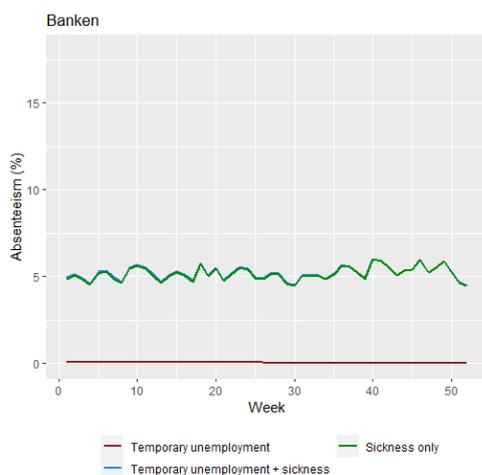
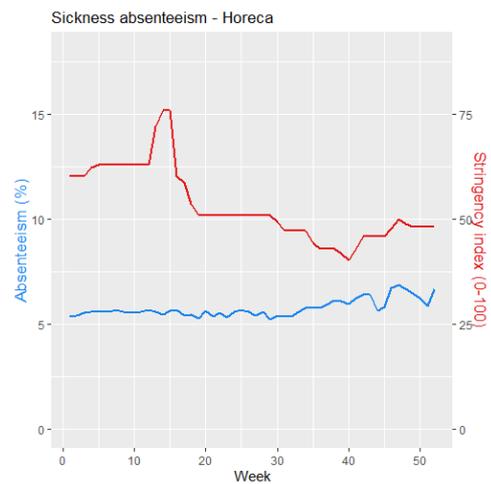
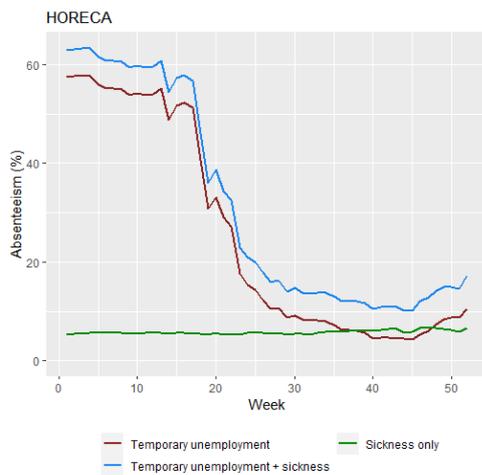
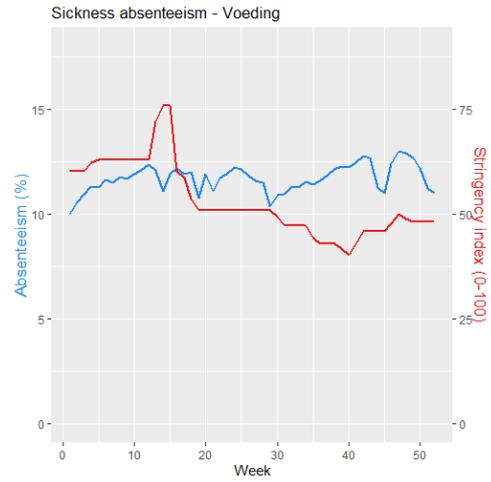
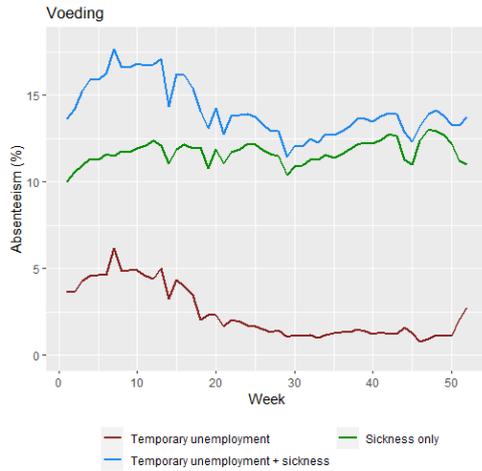
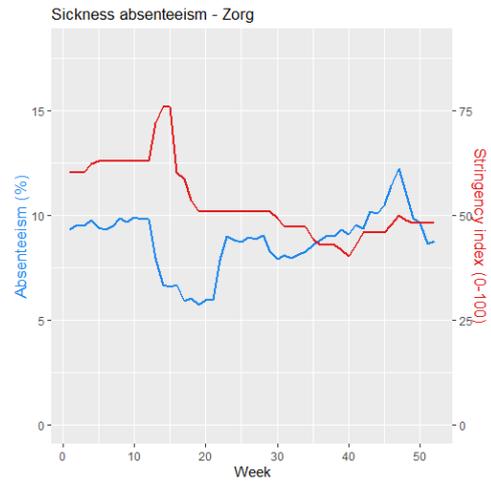
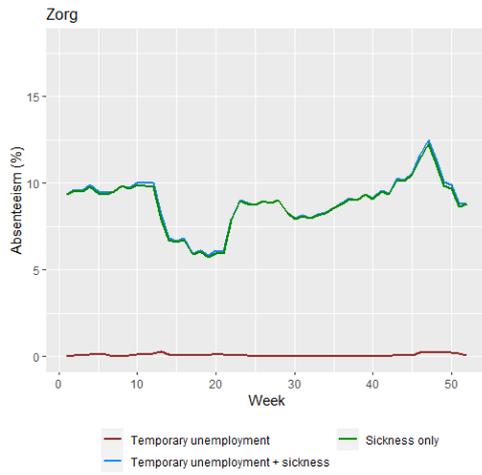


Figure 12: Split of the absenteeism in Health care, Food processing, Horeca and Bank sector by reason of absenteeism (left) and the stringency index versus absenteeism due to temporary employment and sickness (right).

Additionally, the COVID-19 incidence in each of the sectors was different in the year 2021 (Figure 13). The effect of vaccination in the Health care sector is clearly observable by the absence of a peak in the Spring of 2021. Surprisingly, the combination of vaccination and a peak in the non-Health care sectors have lead to a sudden decline in absenteeism in the Health care sector during 10 weeks (Figure 13 (top left)).

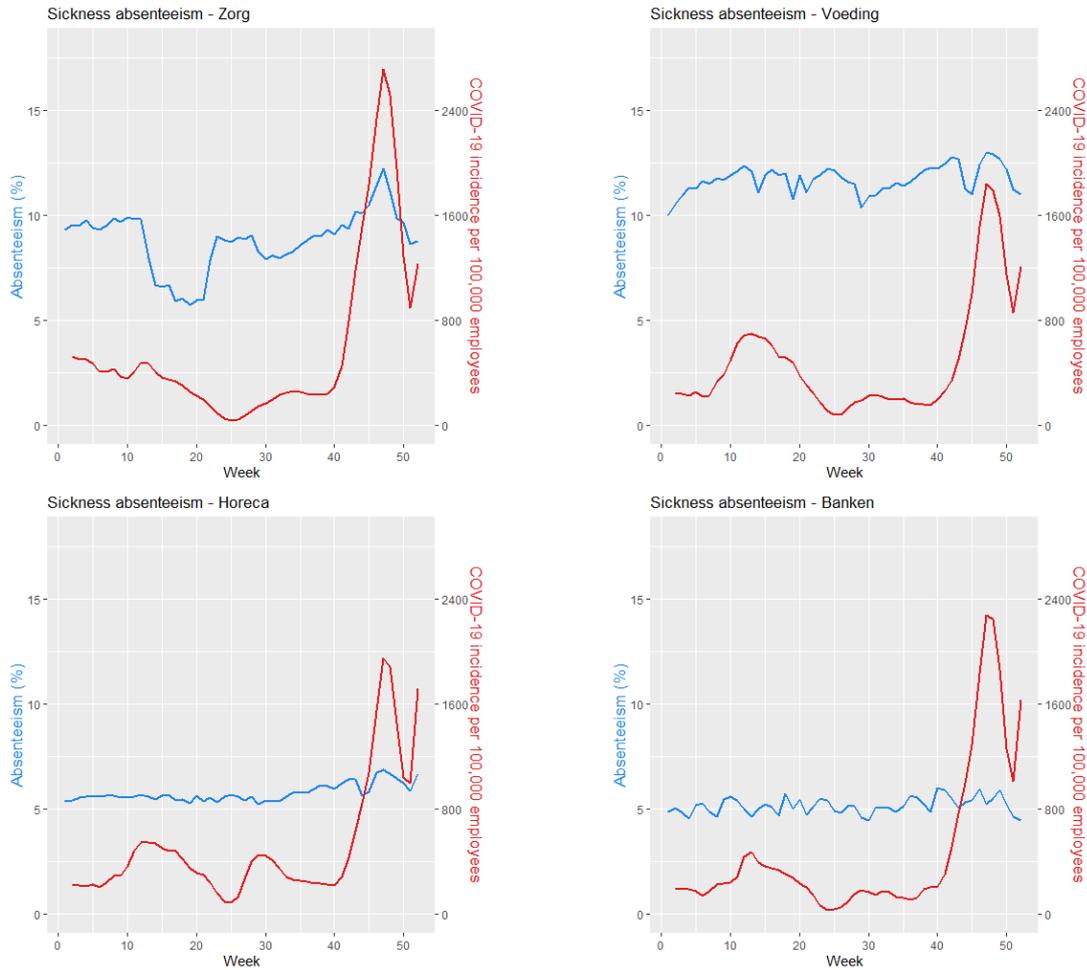


Figure 13: Absenteeism due to sickness and COVID-19 14-day incidence in Health care, Food processing, Horeca and Bank sector.

When modelling absenteeism due to sickness only with model 1 in the different sectors, the increase in absenteeism per 1000 14-day COVID-19 incidence is clearly larger in Health care (1.34%), a sector with high-risk contacts and where teleworking is not possible (Table 6). Teleworking is also not possible in the food processing and horeca sector, which both show evidence for an increased effect of COVID-19 incidence on absenteeism compared to the average. Finally, in the bank sector, where teleworking is possible, the effect of the COVID-19 incidence on absenteeism due to sickness is less than the average over all sector.

Table 6: Model estimates of the baseline absenteeism due to sickness only and the increase in absenteeism per 1000 increase in 14-day COVID-19 incidence for specific sectors (PC=Paritair Comité number).

	PC	NACE	Baseline (95% CI)	Increase per 1000 14-day incidence (95% CI)
Health care	33001	Q	8.02 (7.04; 8.99)	1.34 (0.85; 1.83)
Food processing	118	10	11.46 (11.07; 11.86)	0.55 (0.14; 0.96)
Horeca	30200	I	5.43 (5.24; 5.62)	0.65 (0.50; 0.81)
Bank	31000	641	5.09 (4.95; 5.23)	0.15 (-0.06; 0.36)
All sectors			7.84 (7.63; 8.04)	0.44 (0.27; 0.62)

3.7 Contact tracing

In 2020–2021 about 800,000 employees are under medical surveillance of IDEWE. Among these, 54,139 COVID-19 index cases were registered between 22 July 2020 (week 30) and 3 February 2022, for whom the customer

segment, region and the registration date are known for 53,430 index cases.

After a short period of lower incidence in the end-of-year period, a new record of weekly incidence was set in the week of 19 January 2022 with 4551 index cases, resulting in a peak of the 14 days incidence of 950 per 100.000 in 14 days at the end of January. The highest incidence is seen in Education and Public transport, with 2570 and 1244 per 100.000 in 14 days respectively (Figure 14). Incidence in Education is more than double the overall incidence, but in contrast to the situation in 2021, when 40% of index cases were pupils, this proportion is now 2%, probably due to the changed testing strategy.

Analysis by region shows that currently Leuven, Hasselt and Roeselare are the regions with the highest incidence. The 14 day incidence in Leuven is still increasing, while the other regions are at or over the top of the curve (Figure 14).

Note that two factors, mentioned above, may cause bias in the figures: employees of some large companies are not included and beside employees, external persons are also registered as an index case. Especially students and pupils may influence the figures of Education.

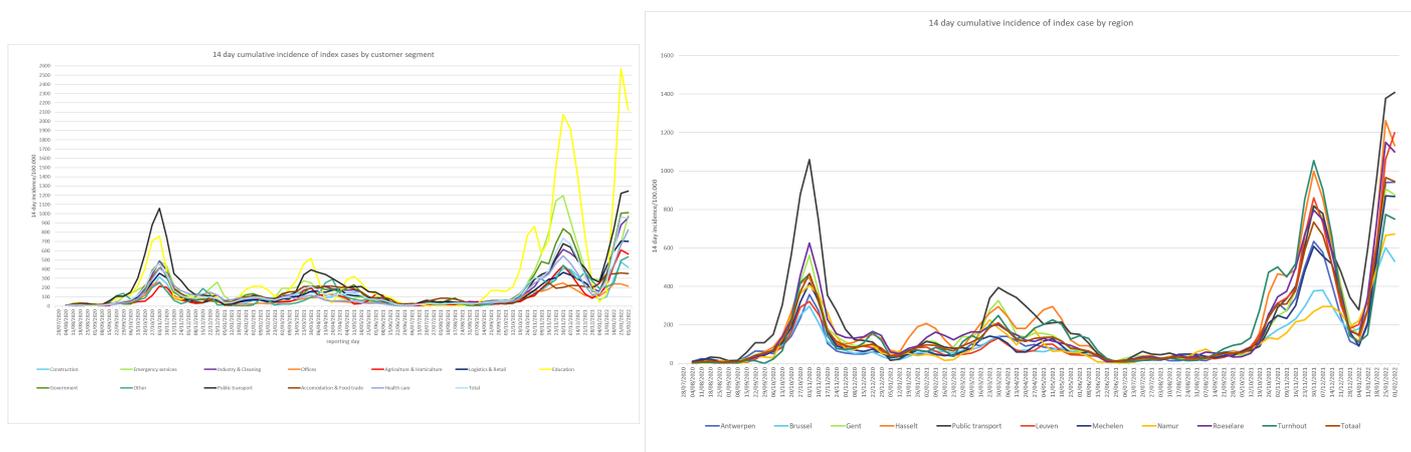


Figure 14: 14-Day incidence of index cases by segments under surveillance (left) and by region (right)

Since January 2022 index cases are encouraged to register their high-risk contacts via the governmental website (mijngezondheid.be). Consequently, high-risk contacted are no longer listed in our registration application. The application registers “0” for all index cases that have no risk contacts listed, creating an underestimation of high risk contacts. Therefore, data of high risk contacts are no longer reported..

Since 11 March 2021, index cases are asked if they contracted COVID-19 during work and if they did, which were the circumstances or the source of the infection. Note that pupils and other external index cases were left out of the following analyses.

From 33,177 index cases, we have information about perceived work relatedness of the source of infection. While 39% of the index cases does not know whether the infection took place at work, 15% responded that they were certainly or probably infected at work (Figure 15 left). From 8,116 (24%) of the index cases that answered they were certainly, probably, or possibly infected at work, further information was obtained on how the infection took place (Figure 15 right). A majority of the index cases (65%) indicates to know the source of infection at work.

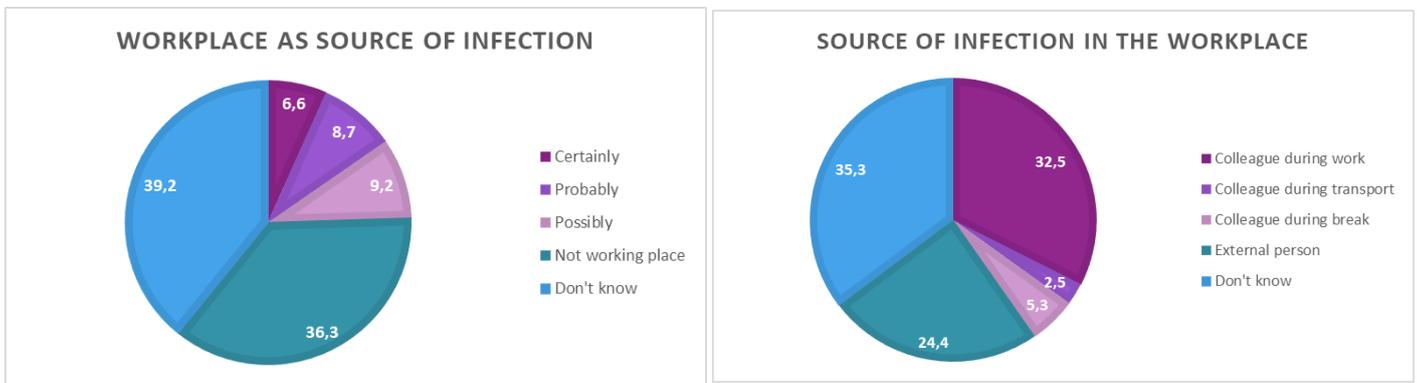


Figure 15: Distribution of the probability and source of infection at work by index case

The proportion of index cases in the Education segment that are attributed to pupils was around 40% during the schoolyear in 2021, but this proportion is now only 2%, partly due to the changed testing strategy (Figure 16 left). This means that most of index cases in the education segment is among teachers. The interpretation of these data should be undertaken, however, with caution. Index cases in schools, both pupils and teachers, were reported to IDEWE by CLBs and schools in order to reach high-risk contacts among teachers and provide them with prescriptions for PCR tests and quarantine. However, CLBs no longer provide contact tracing and testing since 28th January 2022.

Since the tracing app came in use, the social security number of most index cases is registered. Age is calculated from the social security number and is available for most index cases. In contrast to the previous school year 2020, the majority of the index cases in school year 2022 is aged under 12 years. Due to the small number of reported index cases, the age proportions after the end-year holidays numbers do not allow any interpretation (Figure 16 right). Note that some type of schools might be over- or underrepresented in comparison to the Belgian school landscape, as a result of which the proportion of age groups might not be representative for the Belgian school population. Before 20 January 2021, biweekly numbers of cases are too small to allow for an interpretation, as well as the period 31 March–13 April 2021, 9 June–6 July 2021 and 22 December 2021–20 January 2022.

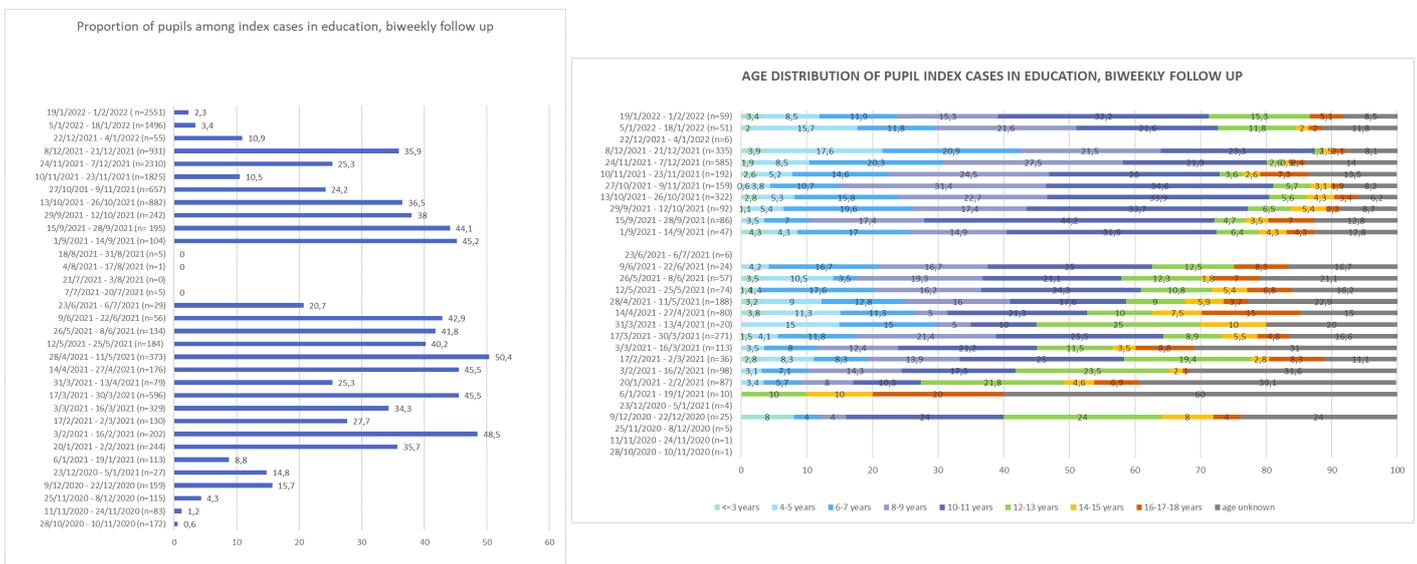


Figure 16: The evolution of index cases of pupils in school (left) and their age distribution (right).

Since 7 June 2021, the vaccination status of index cases is registered, with the type of vaccine if applicable. Because of the large number of index cases since October 2021, it is no longer possible to check the vaccination status of index cases in Vaccinnet. Therefore, self-reported vaccination data are reported and vaccine-effectiveness is no longer calculated, as self-reported data are incomplete and possibly incorrect.

From 27,386 adult index cases we had information about their vaccination status: 24,397 were partially or completely vaccinated (16,674 Cominarty, 3,245 Vaxzevria, 1,742 Moderna and 1,316 Johnson & Johnson and 1,420 did not know the type of vaccine) (Figure 17 left). Vaccination coverage of the population changed rapidly

from June until September and is reaching a plateau since that time. The amount of index cases who received only one dose or who became infected within 15 days after their last vaccination dose made up the majority of vaccinated cases until August 2021 and drops to 1% in October 2021. The increase in the proportion of partially vaccinated index cases since January 2021 is most likely due to the misinterpretation of the term “partially vaccinated” (Figure 17 right). From 14 January, primo-vaccination and booster vaccination is addressed separately in contact tracing to prevent this misunderstanding. From 7,959 index cases we have information about their booster vaccination status: 5,851 received a booster when they tested positive for SARS-Cov-2 between 12 January and 3 February 2022. Of these 2,473 received as booster vaccination Cominarty, 3,226 Moderna and 152 did not know the type of vaccine. A total of 72% of the index cases from the last two weeks received a booster vaccination.

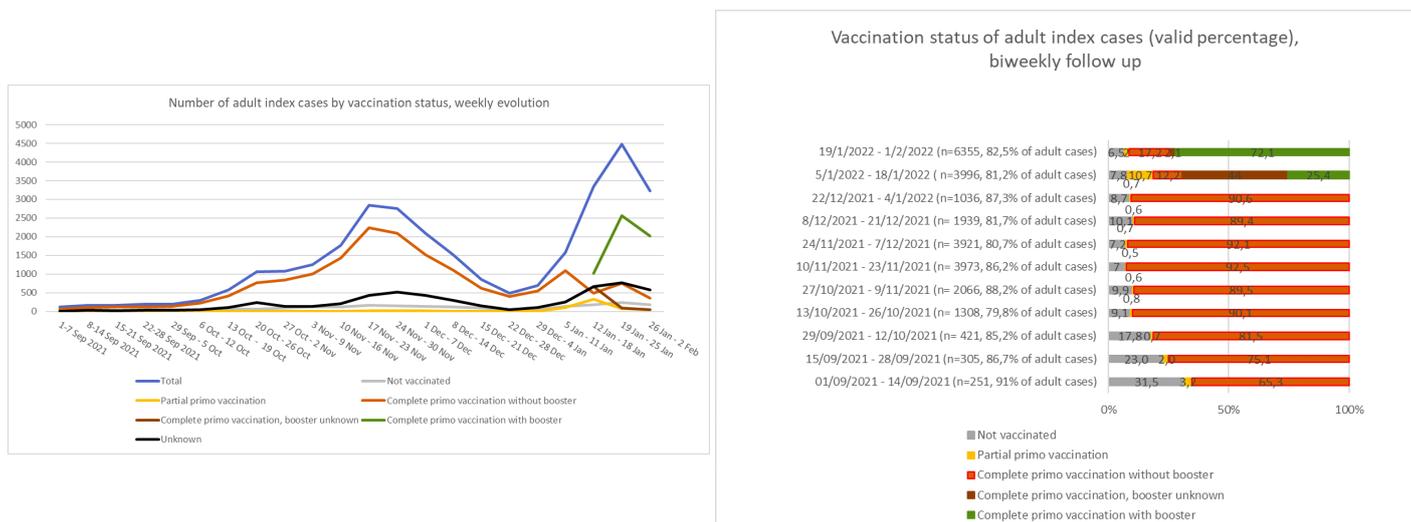


Figure 17: The weekly evolution of index cases and their vaccination status (left) and biweekly evolution of the self-reported vaccination status of index cases (right).

4 Conclusion

Despite the limitations of the data, both the contact tracing as the RSZ/ONSS data demonstrate a sharp decrease in 14-day COVID-19 incidences in all sectors and regions. The highest incidences are still present in child-day care, education and residential care. The average incidence in the working population is higher than the average incidence in the general population, suggesting that infections are passed mostly among adults. Although the changed testing procedure in schools and the general population may influence this comparison.

Although no conclusions can be drawn regarding the location of infection (workplace or elsewhere) nor the location of employment (at work, telework, or temporarily unemployed) of the employees in the RSZ/ONSS data, the contact tracing in the segments under surveillance by IDEWE shows that in the index cases, where this information was available, 7% indicated that the workplace was certainly the source of infection.

It is important to carefully monitor the incidence of COVID-19 and absenteeism in all sectors, especially sectors with multiple close physical proximity, and with close proximity with younger, not yet vaccinated individuals. Child-day care, Secondary and Primary education, Residential care, Human health activities Regulation of providing social services, Youth work associations and Public Centers for Social welfare all show increased incidences compared to the working population average and continue to require careful attention.

Although the incidence in non-medical contact professionals is comparable to the working and general population average, the incidence in employees in non-medical contact professions show a clear increased incidence compared to the self-employed professionals, while the incidence in beauty saloons is higher than in hairdressers.

It is encouraging to note that employees in accommodation and food services, transportation, arts entertainment and recreation and most manufacturing and wholesale and retail sectors are well protected, as they are often not able to telework.

Finally, despite the high degree of vaccination, COVID-19 infection remains possible. Continuous mon-

itoring of breakthrough infections, despite primo and booster vaccination, and especially protection against hospitalization, is warranted.

Acknowledgments

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