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Temporal trend in the compensation claim applications for work-related COVID-19 in Italy

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Abstract

Introduction*: The SARS-CoV-2 pandemic is an impacting challenge for the occupational medicine and epidemiology. The identification of occupational groups most at risk of exposure is critical in contrasting and preventing the epidemic diffusion.* **Objective***: To analyse the compensation claim applications collected by the Italian Workers' Compensation Authority (INAIL) for identifying the occupational patterns and the temporal trend, in comparison with general population data.* **Methods***: Daily time series of compensation claim applications for COVID-19 injuries in the period March-October 2020, has been analysed, estimating the epidemiological parameters of interest and comparing findings with general population data.***Results***: In the period March-October 2020, 65,804 compensation claim applications for COVID-19 have been collected by INAIL. The ratio between compensation claims applications and COVID-19 cases in the general population appears decreasing in the period, passing from 20% in the first pandemic period (March-April) to 3-4% in the September-October period. During the summer period, an increase in male and not Italian component and a decrease in mean age, Northern regions, and health care workers contributions to the occupational claims applications have been observed.* **Discussion***: The comparative analyses between occupational and general population data allowed to describe how the so called "second wave" of COVID-19 epidemic in Italy involved the occupational settings less than the other risk factors. There is a need to go towards an occupational surveillance system for COVID-19 infection, with the aim of monitoring and preventing the occupational risk of infection, supporting insurance system effectiveness and managing vaccination policies.*

Introduction

The SARS-CoV-2 pandemic is an important challenge for public health, but also for occupational medicine and epidemiology (1-5). Since the beginning of the epidemic, it has been observed that the protection of health workers is crucial for COVID-19 containment, not only because they are at high risk for disease, but also because they may be a nexus of disease transmission to the community (6,7). In several geographical areas, clusters were reported of individuals infected because of their job and in different occupational settings. In the US, and later in other countries, detailed epidemiological analyses were carried out on workers in meat and poultry processing facilities, because of

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the high number of COVID-19 cases reported (8). Hypotheses on organizational and environmental factors determining risk of infection in such contexts include low temperatures, which are necessary in such environments, and subsequent lowering of immune defenses, the need to speak often and aloud in common spaces, and inadequate ventilation systems (9). Other occupational contexts with necessary and prolonged proximity with colleagues or with the public have been considered as potentially exposing to the risk of infection, especially retail trade, human services, elderly care, assistance to individuals with disabilities, pharmacies (10). The spread of the disease among patients and health workers in care homes and retirement homes has been a central concern of the public health authorities (11). The role of underlying health conditions has been regarded as an important determinant for COVID-19 (12).

The identification of occupational groups majorly involved and the epidemiological surveillance on characteristics and development of the disease in the working population is a crucial theme for public health and for the implementation of prevention and control measures. The availability of a vaccine requires distribution planning with priority to specific groups, including some occupational categories (3, 13).

During the pandemic period, the Italian Workers' Compensation Authority (INAIL) has been tasked with contributing to the definition of the risk profile for all occupational sectors as part of the governmental strategy for epidemic control, and to lead the lockdown and post-lockdown phase. Furthermore, even in the initial period of the epidemic, INAIL introduced the notation of work-related SARS-CoV-2 cases as occupational injuries, thus aligning infections with accidents (14).

In this context, the scope of this study is to analyse data of compensation claim applications for COVID-19 injuries collected by INAIL, to identify the occupational patterns and the temporal trend in comparison with population data. The results of this study have implications for the development of scientific knowledge necessary for epidemic control, to identify risk profiles, and to evaluate the effectiveness of prevention and control measures.

Methods

The analysis of economic sectors involved in the risk of contagion has been performed using the methodological approach described by the national Scientific Committee set up by the Italian government for action-oriented policy advice on the COVID-19 emergency (15). Briefly, each economic sector has been classified as at low, medium-low, medium-high and high risk, based on three parameters: exposure probability, proximity index and aggregation factor. The first two parameters measure the probability, due to the work activity, to be in contact with infected people and the physical proximity to others during work activities by the adaptation of proximity and exposure perception indicators defined by O*Net8 methodology to the Italian context, as available by ISTAT and INAIL (INSuLa 2 project) (16-18). The aggregation factor estimates the social aggregation, due to the presence of third parties, induced by the job. The comparative analyses with the distribution of the applications of compensation claims collected by INAIL has been recently performed and discussed in the scientific literature (3, 13).

In this study, we verified the temporal trend of compensation claims applications collected by Inail with the aim of analysing the differences with the pandemic figures at population level. The daily series of the compensation claims applications with date between March 1st and October 31th, 2020 have been selected. According to the Italian public insurance system, the compensation claim application has to be submitted to Inail by the employer, with adequate clinical and exposure evidence (for COVID-19 disease, a positive laboratory test and a documentation concerning the occupational circumstance of contagion is required). Inail has to verify the disease and the occupational origin. For health workers and for workers with frequent contact with the public (eg. cashiers, retail workers), there is a presumption of occupational cause (ie. more likely), for all the other workers, the causal relationship has to be demonstrated. At this stage, we have analysed exclusively the compensation claims (the applications) without considering whether they have been accepted or not. The statistical analyses of acceptance rates are planned as the next step of our study, needing a suffi-

Table 1. New COVID-19 cases in the population (N), overall COVID-19 mortality in the population (D) and compensation claims applications (I) by month. Italy, March 1st-October 31th, 2020

Month	New COVID-19 cases in the population (N)		Overall COVID-19 mortality in the population (D)		Compensation claims applications of COVID-19 injuries (I)	
	Numbers	Monthly variation %	Numbers	Monthly variation %	Numbers	Monthly variation %
March	104,664		12,399		27,981	
April	99,671	-4.8	15,539	25.3	18,293	-34.6
May	27,556	-72.4	5,448	-64.9	3,823	-79.1
June	7,584	-72.5	1,416	-74.0	914	-76.1
July	7,006	-7.6	375	-73.5	512	-44.0
August	21,702	209.8	187	-50.1	812	58.6
September	45,624	110.2	411	119.8	1,671	105.8
October	364,607	699.2	2,724	562.8	11,798	606.0
Overall	678,414		38,499		65,804	

cient period for the insurance evaluation procedures. Based on the definitive weekly seasonality of occupational and population data, both daily series have been transformed in 7-days moving averages (19). The ratio between compensation claims and incident cases of COVID-19 in the population by days has been estimated and considered as a raw index of the occupational fraction of the disease. Furthermore, for avoiding the bias due to the different amount of tests in the considered period, the compensation claims trend has been evaluated in comparison with a pure health effects pandemic parameter: the overall COVID-19 mortality in the population, performing the graph of compensation claims and deaths in the population daily temporal trend.

Gender, age at the disease, nationality by months have been analysed for selected data. One way ANOVA test has been used to evaluate the significance of differences in the mean age at the disease by month. Gender ratio (the number of compensation claims of male workers for each compensation claims in female workers, M/F) and the percentage of subjects of not Italian nationality have been estimated by months. Finally, the distribution by territorial areas and job categories have been examined with the following classification criteria. Geographical macro area: North-West (Piemonte, Valle d'Aosta, Liguria, Emilia-Romagna); North-East (Lombardia, Trentino-Alto Adige, Friuli-Venezia Giulia, Veneto); Centre (Toscana, Lazio, Umbria, Marche); South and Isles (Abruzzo, Molise, Campania, Basilicata, Puglia, Calabria, Sardegna, Sicilia) (20). Job categories: Physicians (2.4.1 - Istat job classification coding system), Health care workers (3.2.1), Not qualified workers in instruction, personal, social and health sector (5.3.1 or 5.4.4 or 8.1.5), Other jobs (all the other codes) (21).

Results

Between March and October 2020, 65,804 compensation claim applications for COVID-19 injuries were collected by INAIL. Table 1 shows the monthly trend, with 70.3% of the total claims submitted in March and April.

In July and August, a total of 1,324 COVID-19 injuries were registered with a decrease of more than 95% compared to the first two months of the pandemic period, when the cases were 46,274. In

Table 1 bis. Prevalence of compensation claims in relation to either COVID-19 cases or number of deaths recorded in Italy from March 1st to October 31th, 2020

Month	Compensation claims/ Cases (I/N) * 100	Compensation claims/ Deaths (I/D) *100
March	26.7	225.7
April	18.4	117.7
May	13.9	70.2
June	12.1	64.5
July	7.3	136.5
August	3.7	434.2
September	3.7	406.6
October	3.2	433.1
Overall	9.7	170.9

September, the number of compensation claim applications increased by 105% compared to the previous month, and even more significantly in October (+606% compared to the previous month). It should be noted that, during the lockdown phase (10th March – 17th May), the interruption of non-essential activities concerned around one third of the Italian workers. If we consider the policies for the promotion of remote work, it is estimated that about 25% of workers have worked on-site during the lockdown phase. The comparative analyses between compensation claims applications and COVID-19 cases in the general population show a gradual and constant decrease in the observed period (Figure 1).

Such fraction was over 20% in the earlier phases of the pandemic, and then gradually declined. It remained over 10% up to the beginning of the summer season, then reached 3.7% in September and 3.2% in October. In other words, the massive increase in the number of cases in population during September and October (the so-called "second wave") is not equally present in occupational data. It should be noted that, due to the significant increase in cases in the population, the total number of cases in October was three times higher than in March. In Italy, around 20,000 tests were performed daily in March, and almost 200,000 daily in October. The substantial increase in the population observed cases after the summer period (September and October) is strongly related to the test availability and to testing policies and this must be considered in the interpretation of the findings. Occupational data show an increase during September and October, but the monthly records in October (11,798 compensation claim applications) remain significantly lower than in March and April (27,981 and 18,293, respectively). Analyses of percentage variation by month confirm that the growth of the epidemic wave in the population can also be observed in occupational data, although less significant. Analyses of daily time series of fatalities in the general population - which may be regarded as an indicator that is less influenced by testing policies than other indicators - show a trend that is consistent with occupational data (see Figure 2).

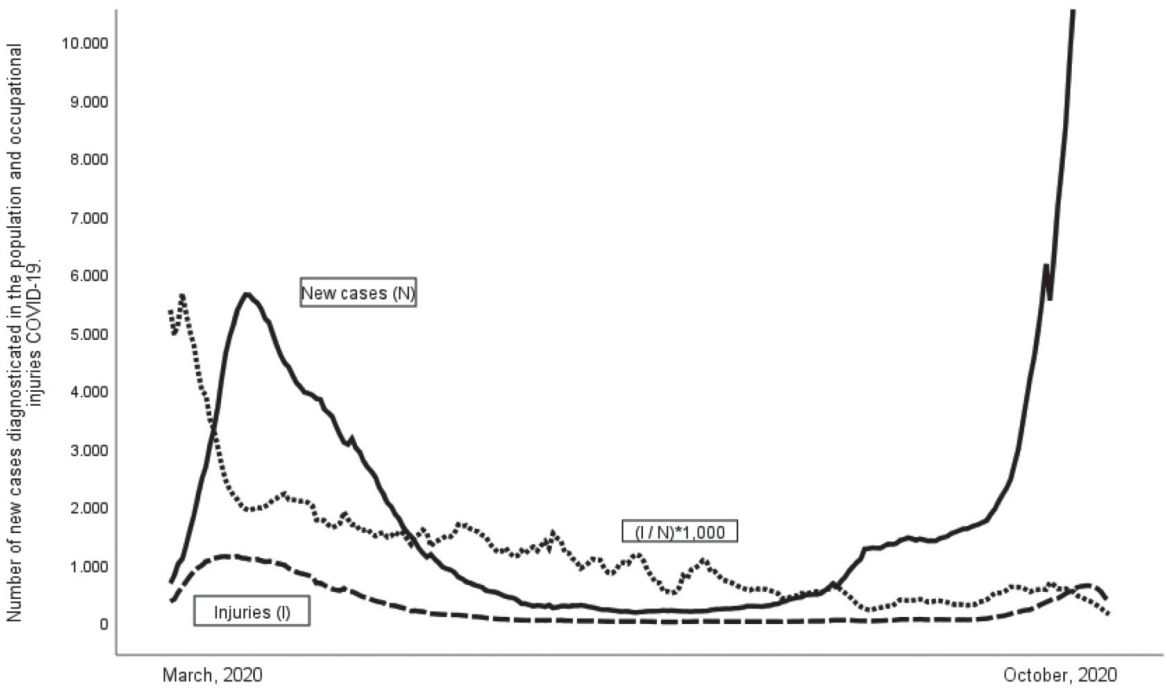

Figure 1. Daily series of new COVID-19 cases in the population (N), compensation claims applications (I) and the ratio between the two parameters ((I/N) * 1,000) Moving average at seven days (MA7). Italy, March 1st-October 31th, 2020, Y axis cut at 10,000 units

Table 2 shows that the mean age of the individuals who submitted compensation claim applications for COVID-19 injuries to INAIL declined steadily between March and July (passing from 47.7 years in March to 43.1 years in July), then increased in September and October (45.6 and 45.2 years, respectively).

Such trend is consistent with the population data reported by the surveillance system of the Italian Ministry of Health and the Italian National Institute of Health (ISS) in collaboration with the Italian Regions. Gender ratio - the number of cases in male workers over cases in female workers - reached equality during the summer season, while a female prevalence is observed in the previous months (0.46 males for each female submitting a compensation claim application for COVID-19 injury in March) and also in the following months (0.52 in October), as shown in Table 2. Geographical distribution of injured subjects by macro-area appears to be varied during the summer season. Northern regions (North-West and North-East) accounted for 80% of the total number of compensation claim applications for COVID-19 injuries in the initial phases of the epidemic (81%, 78%, 82% in March, April, and May, respectively), then reached about 50% in August and September (55% and 42% respectively) and rose again to 59% in October (Table 3).

Figure 3 shows distribution by job for each month. Physicians who tested positive were 12.8% in March, then the rate fell to a low point in July and August (3.4% and 4.1%, respectively), and increased again in October (8.6%). A similar trend is observed for nurses and physiotherapists (41.9% in March, 18% in August, 30.9% in October). Instead, an opposite trend has been found for workers in categories other than health, education, and personal care ("other jobs", in Figure 3): 17.3% in March, 47.7% in July, and 20.3% in October.

Discussion

Epidemiological surveillance of risk factors is an essential element for the development of epidemic-control policies. It is crucial to identify the role of each causal determinant in order to set up contain-

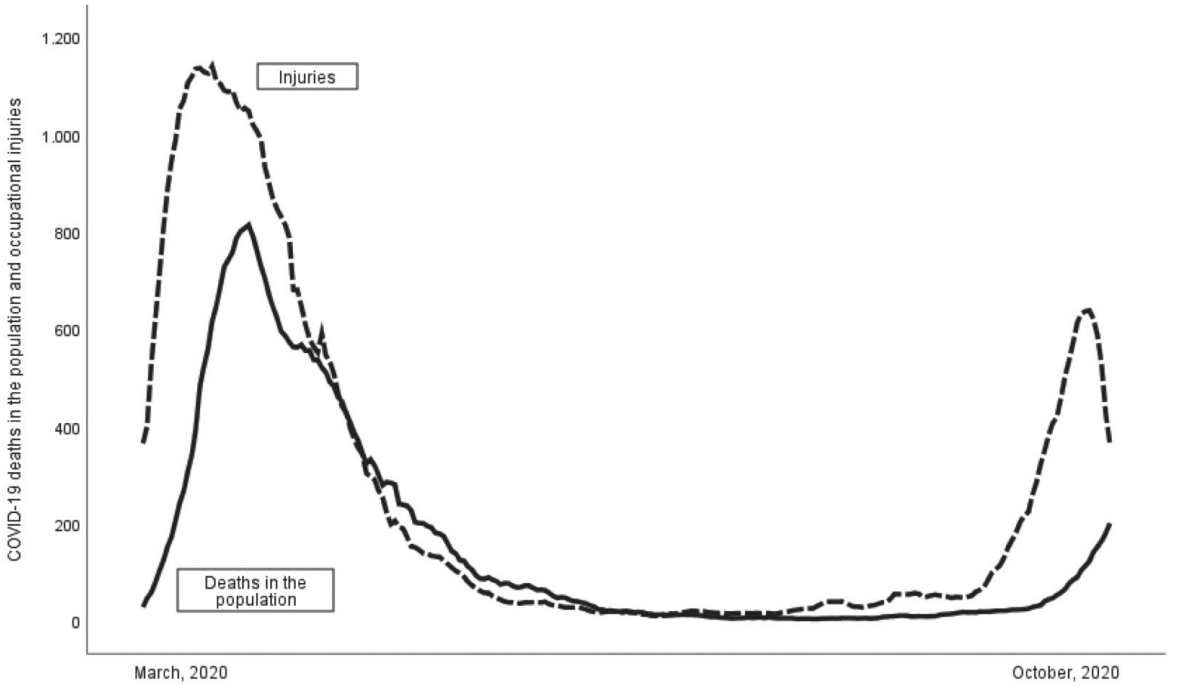

Figure 2. Daily series of COVID-19 deaths in the population and compensation claim applications. Moving average at seven days (MA7). Italy, March 1st-October 31th, 2020

Table 2. Gender ratio, nationality, mean age at diagnosis of COVID-19 compensation claims applications by month. Italy, March 1st-October 31th, 2020

	Gender			Nationality			Age			Overall
	Women (F)	Men (M)	Gender ratio (M/F)	Italian	Not Italian	Not Italian burden	Mean age	Confidence Interval 95%		
March	19,215	8,766	0.46	24,504	3,477	0.14	47.7	47.6	47.8	27,981
April	13,766	4,527	0.33	14,571	3,722	0.26	45.9	45.7	46.0	18,293
May	2,854	969	0.34	3,062	761	0.25	45.8	45.5	46.2	3,823
June	652	262	0.40	718	196	0.27	45.3	44.6	46.1	914
July	276	236	0.86	349	163	0.47	43.1	42.1	44.2	512
August	402	410	1.02	542	270	0.50	43.5	42.7	44.3	812
September	969	702	0.72	1,420	251	0.18	45.6	45.0	46.2	1,671
October	7,780	4,018	0.52	10,460	1,338	0.13	45.1	44.9	45.3	11,798
Overall	45,914	19,890	0.43	55,626	10,178	0.18				65,804

Table 3. COVID-19 compensation claims applications by months and geographical area. Italy, March 1st-October 31th, 2020

	North-West		North-East		Centre		South and Isles		Italy	
	N	%	N	%	N	%	N	%	N	%
March	15,646	55.9	7,226	25.8	2,842	10.2	2,267	8.1	27,981	100.0
April	10,136	55.4	4,155	22.7	2,571	14.1	1,431	7.8	18,293	100.0
May	2,422	63.4	733	19.2	411	10.8	257	6.7	3,823	100.0
June	555	60.7	129	14.1	183	20.0	47	5.1	914	100.0
July	205	40.0	163	31.8	102	19.9	42	8.2	512	100.0
August	166	20.4	280	34.5	146	18.0	220	27.1	812	100.0
September	363	21.7	338	20.2	308	18.4	662	39.6	1,671	100.0
October	5,452	46.2	1,465	12.4	2,204	18.7	2,677	22.7	11,798	100.0
Overall	34,945	53.1	14,489	22.0	8,767	13.3	7,603	11.6	65,804	100.0

ment measures and evaluate their effectiveness (22), especially against the effects of a virus we do not have enough knowledge of in terms of epidemiological and pathogenetic mechanisms (23). At present, in Italy the COVID-19 microbiological and epidemiological surveillance system, led by the Italian National Institute of health (ISS) (24), collects, compares and analyses - in a continuous and systematic way - information on SARS-CoV-2 cases confirmed by molecular detection tests, which are carried out in partner regional laboratories. Every day each Region/Province transmits to the ISS data on laboratory-confirmed SARS-CoV-2 cases. As part of this surveillance system, the analysis of clusters has enabled to identify 19,058 cases among health workers in the period between 11 October and 11 November, i.e. 3.17% of the total number of cases in the population in the same period (601,605). If we consider the entire period from the beginning of the pandemic, the rate is 5.4% (53,276 cases among health workers, on 979,975 total cases) (25). The issue of the spread of the infection among health workers, especially in the initial phases of the pandemic, has been repeatedly stated by scientific literature and institutional communication (7). Such data, with the identification of clusters in many other occupational contexts, such as slaughterhouses, food processing industries, personal services and retail, highlight the role of occupational risk as a determinant for the spread of the COVID-19 pandemic (10, 26). Furthermore, it is reported that prisons (27), homeless conditions (28), and migrants are associated with specific risks of infection (29). A special surveillance system for the identification of the circumstances leading to infection at work, based on individual anamnestic analysis, would be instrumen-

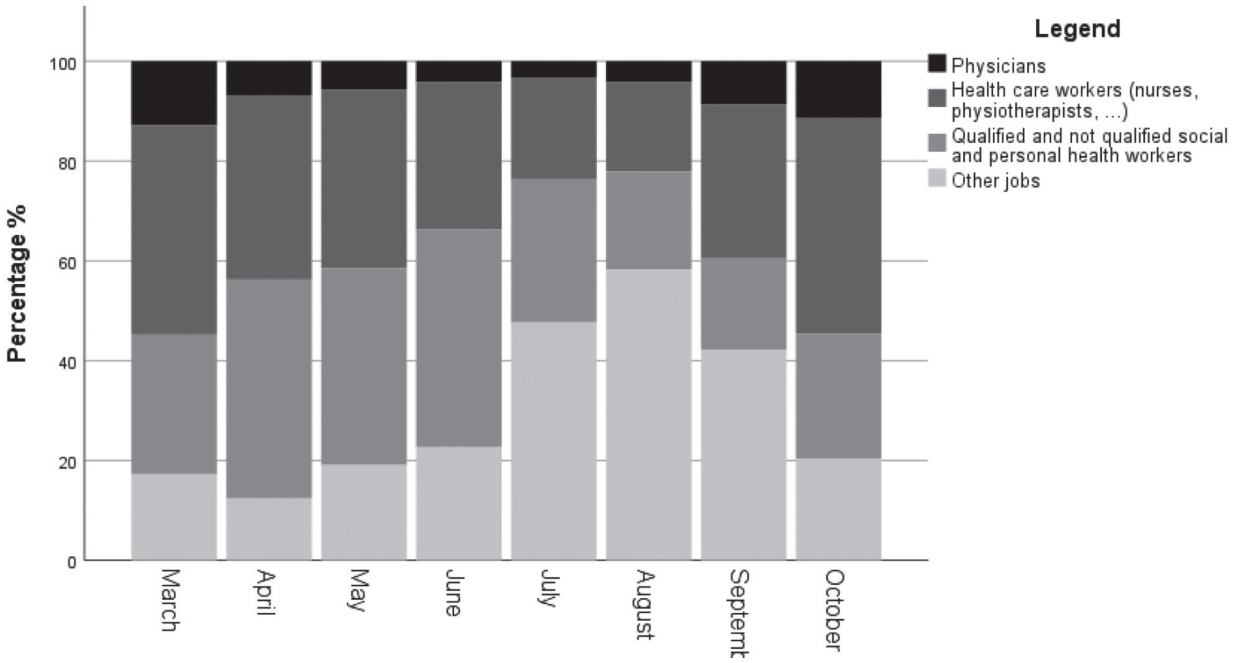

Figure 3. COVID-19 compensation claims applications by months and jobs. Percentage of cases with available job. Italy, March 1st-October 31th, 2020

tal for a systematic monitoring of risks, for the evaluation of the effectiveness of containment measures, and for pandemic spread prevention (13).

For work-related SARS-CoV-2 risk, INAIL is in charge of workers protection and collects injury-at-work certificates from physicians according to art. 42, clause 2, of the Italian Decree Law of 17 March 2020 n.18, and grants insurance protection. For the insurance aspect, as extensively reported in the official documents (30), INAIL recognizes COVID-19 infection as an occupational injury, thus aligning infections with accidents. The research data in this study refer only to compensation claim applications. A more comprehensive assessment of the phenomenon, including cases verified by INAIL, will be possible when the administrative and medical procedure for each application will be complete. Furthermore, INAIL data are a subset of the phenomenon observed in general population, because many occupational sectors are excluded from INAIL insurance protection. Such categories also include more risk-exposed workers, such as family physicians, self-employed physicians, pharmacists, Red Cross and Civil Protection volunteers. It should also be noted that the age structure of the working population is very different from the age structure of the general population, as it does not include retirees, who are generally older and more fragile. Furthermore, compensation claims applications data cannot allow at this stage to distinguish the different stage of the disease (infection, serious illness, death) and to evaluate the interplay between individual, demographic, social and occupational risk factors.

Despite these limitations, data obtained from compensation claim applications for COVID-19 injuries may help to understand the dimension and trend of occupational risk during the current pandemic. Daily time series analyses of compensation claim applications for COVID-19 injuries show that work-related risk was more prevalent in the initial phases of the pandemic, and then gradually decreased after March 2020. In particular, the "second wave" affected workers to a lesser extent. One reason might be the implementation of remote work in many working sectors. It is also possible to hypothesize that the containment measures adopted since April and May have led to mitigation of risks at the workplace, also during the "second wave". In health

care working places, it seems that the introduction of safety protocols after the first weeks of the pandemic have significantly reduced the risk of infection among health workers, as confirmed by the ISS surveillance system data. Prevention measures have been gradually implemented also in trade and personal care sectors. The marked reduction in the occupational portion of COVID-19 cases compared to the general population, dropping from 26.7% in March to 3.2% in October 2020, is remarkable. This should be interpreted also in the light of the increased number of diagnostic tests, depending on higher availability of diagnostic tools, and of more effective prevention at work. The availability of diagnostic tools has increased significantly: in March, around 20,000 tests were carried out each day, and only on symptomatic subjects, while in October almost 200,000 tests were carried out each day, and also on people in close contact with a confirmed case. This fact should be taken in due consideration, as indicated by the scientific community and institutional communication, for the assessment of the epidemic curve of new cases in population, whose interpretation becomes more complex because of the different pool of tested subjects. Based on this evidence, it has been decided to evaluate time series of occupational injuries compared with the curve of health effects. Among such effects, daily time series of fatalities in population may be a valid tool for analysis. If compared with compensation claim applications, it is shown that the two trends are consistent, with an increase during the "second wave", but to a limited extent compared to the data for general population. It is necessary to consider that other limitations are in place when a comparison between compensation claims applications and general population data (incidence and mortality) was performed: mortality and infection are generally distanced by a lag of several weeks and the age profile of general and working population differ significantly. Data also show that, during the summer season, the demographic profile of injured subjects, based on the information submitted to INAIL, includes decreased mean age at the time of infection (in line with population data), equal gender distribution, a significant portion of non-Italian individuals, higher than in the other periods, and a heavier burden in the central and southern Regions. A comprehensive discussion of this statistical evidence is difficult and it should involve an analysis of changing patterns of workers distribution in summer period. Nevertheless, it is plausible that the overall prevalence of females among the subjects with work-related infection is to be associated with the number of women working in the healthcare sector (physicians and nurses). The higher number of non-Italian workers who contracted the infection during the summer season is linked to the employment of foreign workers in seasonal jobs. Temporal trends are very diverse across geographical areas, with work-related infections in the Southern regions beginning in summer. The changing gender ratio, such as nationality and regional distribution of compensation claims application in the different period, may reflect differences in the occupations in different periods. Such data are coherent with the rise, during the same period, in the number of infections in some sectors, such as entertainment, hospitality, restaurants. It should also be noted that cases in physicians and nurses decreased significantly during the summer, then rose again in connection with the "second wave" in September and October. Despite our study cannot estimate the distribution of occupational risk of COVID-19 (due to the availability of compensation claims applications, but not of acceptance rates, neither of exposed workers), the demographic, occupational and territorial characteristics of workers claiming for compensation is a precious tool for identifying occupational groups majorly involved and for monitoring the epidemic evolution.

To conclude, data obtained from compensation claim applications for COVID-19 injuries collected by INAIL enable to highlight the occupational component as one of the major determinants for the risk of infection. However, time series analyses referring to the first six months after the beginning of the pandemic show a significant decrease in the proportion of compensation claims applications (compared with general population data). It is very difficult to evaluate if this decreasing trend is the effect of the implementation of prevention measures at the workplace (installing plexiglass, stainless steel, or other barriers between workers, or between

workers and customers, using rope and stanchion systems to keep distance between employees, wearing cloth face coverings proved to be effective and to practice regular hand hygiene) and it is largely influenced by changes in the availability of testing. In Italy the second wave, started in September, seems to be less connected to the occupational risk than the first one in March and April, but it is necessary to consider that the curve of occupational injuries is consistent with the curve of health effects, especially with fatalities, on general population (that is not affected by testing availability). It is essential to raise awareness on prevention measures at the workplace. There is also a need to go towards an occupational surveillance system for COVID-19 infection, based on patient anamnesis, to identify the ways in which the infection may spread at work, and to assess prevention measure effectiveness. Policies for vaccine distribution will need to take into account the occupational categories, with an evidence-based epidemiological approach.

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References

1. Sim MR. The COVID-19 pandemic: major risks to healthcare and other workers on the front line. Occup Environ Med. 2020;77(5):281-282. doi:10.1136/oemed-2020-106567.
2. Burdorf A, Porru F, Rugulies R. The COVID-19 (Coronavirus) pandemic: consequences for occupational health. Scand J Work Environ Health. 2020;46(3):229-230. doi:10.5271/sjweh.3893
3. Marinaccio A, Guerra R, Iavicoli S. Work a key determinant in COVID-19 risk. Lancet Glob Health. 2020 Nov;8(11):e1368. doi: 10.1016/S2214-109X(20)30411-3. Epub 2020 Sep 25. PMID: 32986980; PMCID: PMC7518834.
4. Koh D. Occupational risks for COVID-19 infection (Editorial). Occup Med (Lond). 2020;70:3-5. (PMID: 32107548) doi:10.1093/occmed/kqaa036
5. Fellows of the Collegium Ramazzini, Italy. 24th Collegium Ramazzini statement prevention of work-related infection in the COVID-19 pandemic. Occup Environ Med. 2020 Oct;77(10):732-733. doi: 10.1136/oemed-2020-106724. Epub 2020 Jul 30. PMID: 32732392.
6. Shaw A, Flott K, Fontana G, Durkin M, Darzi A. No patient safety without health worker safety. Lancet. 2020 Sep 16:S0140-6736(20)31949-8. doi: 10.1016/S0140-6736(20)31949-8. Epub ahead of print. PMID: 32949501; PMCID: PMC7494325.
7. Nguyen LH, Drew DA, Graham MS, Joshi AD, Guo CG, Ma W, Mehta RS, Warner ET, Sikavi DR, Lo CH, Kwon S, Song M, Mucci LA, Stampfer MJ, Willett WC, Eliassen AH, Hart JE, Chavarro JE, Rich-Edwards JW, Davies R, Capdevila J, Lee KA, Lochlainn MN, Varsavsky T, Sudre CH, Cardoso MJ, Wolf J, Spector TD, Ourselin S, Steves CJ, Chan AT; COronavirus Pandemic Epidemiology Consortium. Risk of COVID-19 among front-line health-care workers and the general community: a prospective cohort study. Lancet Public Health. 2020 Sep;5(9):e475-e483. doi: 10.1016/S2468-2667(20)30164-X. Epub 2020 Jul 31. PMID: 32745512; PMCID: PMC7491202.
8. Dyal JW, Grant MP, Broadwater K, et al. COVID-19 Among Workers in Meat and Poultry Processing Facilities - 19 States, April 2020. MMWR Morb Mortal Wkly Rep. 2020;69(18):10.15585/mmwr.mm6918e3. Published 2020 May 8. doi:10.15585/mmwr.mm6918e3
9. Asadi S, Bouvier N, Wexler AS, Ristenpart WD. The coronavirus pandemic and aerosols: Does COVID-19 transmit via expiratory particles? Aerosol Sci Technol. 2020;0(0):1-4. Published 2020 Apr 3. doi:10.1080/02786826.2020.1749229
10. Lan F, Suharlim C, Kales SN, et al. Association between SARS-CoV-2 infection, exposure risk and mental health among a cohort of essential retail workers in the USA. Occupational and Environmental Medicine. Published Online First: 30 October 2020. doi: 10.1136/oemed-2020-106774
11. Gruppo di lavoro ISS Prevenzione e controllo delle Infezioni – COVID-19. Indicazioni ad interim per la prevenzione e il controllo dell'infezione da SARS-COV-2 in strutture residenziali sociosanitarie e socioassistenziali. Versione del 24 agosto 2020. Roma: Istituto Superiore di Sanità; 2020 (Rapporto ISS COVID-19, n.4/2020 Rev 2.)
12. Clark A, Jit M, Warren-Gash C, et al. Global, regional, and national estimates of the population at increased risk of severe COVID-19 due to underlying health conditions in 2020: a modelling study. Lancet Glob Health 2020; 8: e1003–17.
13. Marinaccio A, Boccuni F, Rondinone BM, Brusco A, D'Amario S, Iavicoli S. Occupational factors in the COVID-19 pandemic in Italy: compensation claims applications support establishing an occupational surveillance system. Occup Environ Med. 2020 Sep 23:oemed-2020-106844. doi: 10.1136/oemed-2020-106844. Epub ahead of print. PMID: 32967988.

14. Decreto Legge 17 marzo 2020, n. 18, art. 42, comma 2, convertito dalla Legge 24 aprile 2020, n. 27. Circolare INAIL n. 13 del 3 aprile 2020 e n.22 del 20 maggio 2020. Available at: https://www.inail.it/cs/internet/docs/circolare-13-del-3-aprile-2020-testo.pdf (Italian)
15. Italian Workers' Compensation Authority (INAIL). Documento tecnico sulla possibile rimodulazione delle misure di contenimento del contagio da SARS-Cov-2 nei luoghi di lavoro e strategie di prevenzione. April 2020. Available: https://www.inail.it/cs/internet/comunicazione/pubblicazioni/catalogo-generale/pubbl-rimodulazione-contenimento-covid19-sicurezza-lavoro.html. (Italian)
16. US Department of Labor, Employment and Training Administration, 2019. O*NET 24.2 Database. Available from: https://www.onetcenter.org/dictionary/24.2/excel/. Accessed 2020 July 7
17. Italian National Institute of Statistics (ISTAT). Memoria scritta dell'Istituto nazionale di statistica per la 5a Commissione programmazione economica e bilancio del Senato della Repubblica. Available at: https://www.istat.it/it/files//2020/03/Aggiornamento_MemoriaAS-1766_rev31marzo.pdf. Published March 25, 2020. (Italian)
18. INAIL, Seconda indagine nazionale sulla salute e sicurezza nei luoghi di lavoro (Insula2). Disponibile al sito: https://www.inail.it/cs/internet/docs/alg-pubbl-seconda-indagine-naz-salute-sicurezza-insula-2.pdf
19. Dagum EB. Analisi Delle Serie Storiche: Modellistica, Previsione e Scomposizione (Italian Edition). ISBN 10: 8847001463 ISBN 13: 9788847001466, Springer, 2001
20. ISTAT. Atlante di geografia statistica ed amministrativa. Roma, 2009. Available at: https://www.istat.it/it/archivio/138158. (Italian)
21. ISTAT. Classificazione delle professioni. Roma, 2011. Disponibile a: http://professioni.istat.it/cp2011/
22. van der Molen HF, Kezic S, Visser S, de Groene G, Maas J, de Wind A, Tamminga S. Occupational COVID-19: what can be learned from notifications of occupational diseases? Occup Environ Med. 2020 Nov 6:oemed-2020-107121. doi: 10.1136/oemed-2020-107121. Epub ahead of print. PMID: 33158969.
23. Baker MG, Peckham TK, Seixas NS. Estimating the burden of United States workers exposed to infection or disease: A key factor in containing risk of COVID-19 infection. PLoS One. 2020 Apr 28;15(4):e0232452. doi: 10.1371/journal.pone.0232452. PMID: 32343747; PMCID: PMC7188235.
24. Italian Institute of Health. SARS-CoV-2 epidemiological data section. 2020. https://www.epicentro.iss.it/coronavirus/sarscov-2-dashboard (accessed November 6, 2020)
25. Italian Institute of Health (ISS). Available: https://www.epicentro.iss.it/coronavirus/sars-cov-2-sorveglianza-dati
26. Agius Raymond M, Robertson John F R, Kendrick Denise, Sewell Herb F, Stewart Marcia, McKee Martin et al. Covid-19 in the workplace BMJ 2020; 370 :m3577
27. Akiyama MJ, Spaulding AC, Rich JD. Flattening the curve for incarcerated populations—Covid-19 in jails and prisons. N Engl J Med. Epub Apr 2,2020. https://dx.doi.org/10.1056/NEJMp2005687
28. Mosites E, Parker EM, Clarke KE, et al. Assessment of SARS-CoV-2 infection prevalence in homeless shelters—four U.S. cities, March 27–April 15, 2020. MMWR Morb Mortal Wkly Rep. 2020. Epub April 22, 2020. https://www.cdc.gov/mmwr/volumes/69/wr/mm6917e1.htm?s_cid=mm6917e1_w
29. Koh D. Migrant workers and COVID-19. Occup Environ Med. 2020 Sep;77(9):634-636. doi: 10.1136/oemed-2020-106626. Epub 2020 Jun 8. PMID: 32513832; PMCID: PMC7476302.
30. INAIL, Circolare n. 74 del 23 novembre 1995. Modalità di trattazione delle malattie infettive e parassitarie. Available at: https://www.inail.it/cs/internet/atti-e-documenti/note-e-provvedimenti/circolari/p1020798983_circolare-inail-n--74-del-23-novembre-1995.html (Italian)