

The impact of COVID-19 pandemic on working and health conditions in a representative sample of French workers: a before/after study

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Abstract

Background

Studies on evolution of working conditions and workers' health in developed countries during the COVID-19 pandemic show many diverse outcomes but few studies compared the post to the pre-pandemic period. This study aimed to describe recent evolutions of working conditions and health status of French workers between those periods across different sectors of activity.

Methods and findings

Data from a large national French observatory of working conditions and health were used. This observatory collects, for a random sample of employees, data on their working conditions and health. Data on working conditions and health status of employees in the 10 main French sectors of activity in 2018-2019 and 2023-2024 were used. A two-step weighting method was used to allow results to be extrapolated to the French employees.

Overall, 26,530 and 13,174 questionnaires were collected for the 2018-2019 and 2023-2024 periods, respectively. Job demand significantly decreased and job resources significantly increased between 2018-2019 and 2023-2024 while physical workload, musculoskeletal and psychological disorders remains stable. However, there were large and significant disparities in evolutions between sectors, for exposures and health status. The most worrisome sector was the Accommodation and food service sector with no improvement in the working conditions and increasing health problems.

Conclusion

Although the COVID-19 pandemic has been associated with a number of negative consequences on working conditions and employee health, a comparison of exposure to psychosocial risk factors and physical constraints before and after the pandemic in a representative sample of French employees shows a decrease in exposure. However, this has not translated into an improvement in the physical health of these employees.

Nevertheless, this overall trend masks significant disparities between different sectors of activity, and it is important to monitor trends closely to determine whether the significant changes in the world of work brought about by the pandemic will have long-term negative consequences for the health of certain employees, and to identify those who will be affected at an early stage.

Background

The COVID-19 pandemic has affected billions of workers throughout the globe, either directly and indirectly. Many workers were infected by the SARS-CoV-2, sometimes resulting in fatalities or long-term effects [1]. Overall, SARS-CoV-2 occupational infections has varied with time, depending on lockdowns and implementation of preventive measures [2, 3]. The responsibility of the workplace in infections has varied greatly from one sector of activity to another, as well as over time as the epidemic has progressed. Initially, healthcare workers suffered a high rate of infection, but this gradually converged with the general population, thanks to the protective measures put in place. Conversely, sectors such as food production, warehouse work and transportation were also severely affected, but the incidence remained high throughout the pandemic, often due to unsuitable working conditions (e.g. lack of ventilation, accommodation conditions).

However, the impact of the pandemic on workers has gone far beyond the individual consequences of infection, as the pandemic has profoundly disrupted the world of work. Many employees transitioned to remote working arrangements, thereby mitigating the risk of infection. However, the applicability of this was dependent on the nature of the job in question, and therefore mainly concerned knowledge-based office workers who were able to transition to remote working with ease. In their seminal study, Peters *et al.* employed a multilevel model to illustrate the multifaceted impact of the pandemic on various domains, including work, worker health and wellbeing, the enterprise, employment and labour patterns, and the social, political and economic environment [4]. At each level, the impact may have been neutral, detrimental or even positive. Certain occupations have witnessed an escalation in both job demand and the provision of protective measures. Illustrative of this phenomenon are healthcare workers, who have experienced an increase in job demand, along with commensurate

enhancements in protective measures. Conversely, other occupations, such as those in food production and warehousing, have encountered an increase in job demand without any concomitant enhancement in protective measures. Employees who rapidly transitioned to remote working due to the option of teleworking were somehow protected from infection, but faced a spectrum of consequences in terms of work/life conflict [5].

The pandemic has also had a significant impact on the economy, resulting in tangible effects on workers' health and well-being and increasing social disparities. For example, employees facing job insecurity or financial concerns have been more affected by anxiety and depressive symptoms [6, 7]. Changes in labor force participation were associated with higher risk of depression relative to a steady-state full-time employment particularly among individuals with low labor force participation during COVID-19 [8]. Job loss was associated with depression and workplace downsizings with anxiety for waged workers [7], and reductions in hours and income for the self-employed directly contributed to a deterioration in their levels of subjective well-being compared to waged workers [9].

The pandemic has served to both highlight and exacerbate existing social and health disparities [10, 11], at least in the early phases of the pandemic. Yet, investigating how mental health changed in Germany, between 2018 and 2022, Patzina et al. observed no clear patterns of heterogeneity between age groups, sex, income, education, migrant status, childcare responsibilities or pre-COVID-19 health status [12]. They concluded that the COVID-19 pandemic appeared to have had a uniform effect on mental health in the German adult population and did not lead to a widening of health inequalities in the long run.

The differences in the impact of the pandemic on workers' health are therefore more likely to depend on differences in working conditions and the variability of companies' responses to the pandemic. Larger companies, with substantial financial resources but with a rigidity inherent to their size, have sometimes struggled to quickly implement preventive measures that have evolved rapidly. Conversely, smaller companies, which are more agile, have not always had the resources to implement these preventive measures. [4]. Furthermore, in a previous study, we demonstrated that broad-brush approaches to changes in working conditions actually masked significant disparities between different sectors of activity [13].

The changes in the world of work brought about by the pandemic have not only had negative effects. Many employees, who would like to continue to enjoy its advantages, have deemed the advent of remote working beneficial. The global pandemic has also been a catalyst for technological innovation across a range of domains, including physical, digital, and biological spheres. Thus, according World Economic Forum estimates, more than half of businesses worldwide have reportedly accelerated the automation of tasks due to the pandemic [14].

Despite the numerous studies conducted, the impact of the pandemic on workers' physical and mental health is therefore challenging to assess due to the presence of numerous determining factors, some of which have opposing effects. Furthermore, the majority of published studies were conducted during the pandemic, which did not officially end until May 2023 [15, 16], and few studies compared the pre-pandemic to the post-pandemic situation [15].

The primary objective was to assess whether the COVID-19 pandemic had had a lasting effect on working conditions and on the physical and psychological health of workers in France by means of data obtained from a substantial national French observatory of working conditions and health. The second objective of the study was to ascertain any discrepancies between sectors of activity.

Methods

In France, all employees are required to attend an occupational health examination every two, three or five years, depending on the employee's level of risk exposure (<http://evrest.istnf.fr/page-0-0-0.html>). The National Evrest Observatory (EVolutions et Relations en Santé au Travail – Evolutions and Relationships in Health at Work) is a national observatory, set up in France in 2007 by occupational health physicians and researchers aiming at collecting, for a random sample of employees, a database concerning their working conditions and their health. The scope of this observatory covers all employees in the public and private sectors working in mainland France, excluding agriculture and the state civil service, which includes ministries and

national public administrative establishments. Since 2008, the Evrest database has included about 200,000 questionnaires, completed by about 80,000 employees and 1,700 occupational health teams.

Data are collected using a short, standardized questionnaire (one double-sided page), made up of closed-ended questions that have been used in large surveys on health in workplaces in France [17–20] (<http://evrest.istnf.fr/page-0-0-0.html>).

Working conditions are studied using data about psychosocial and biomechanical constraints.

The psychosocial constraints are explored according to 5 main axes as recommended by the College d'expertise sur le suivi statistique des risques psychosociaux au travail (College of experts on the statistical monitoring of psychosocial risks at work) [21], *i.e.* job demand (intensity and working time), margin of manoeuvre and autonomy, social support and reward, ethical dilemmas and job insecurity. The biomechanical constraints are explored according to 3 items: awkward postures, effort or carrying loads and repetitive movements.

Psychological distress is estimated based on the presence of one of the following symptoms: fatigue, sleeping disorders or anxiety-nervousness during the last 7 days. Musculoskeletal complaints of the upper limbs are estimated based on the presence of shoulder, elbow or wrist/hand complaints. Musculoskeletal complaints of the spine are estimated based on the presence of dorsal/lumber vertebrae or cervical vertebrae complaints (Table 1).

Table 1
Dimensions description and scales used

Domain and dimension	Dimension formulation	Response scale in present study	Question number
Job demands			
Time pressure	Due to your workload, do you ever skip or shorten meal times, not take a break?	1 = never, 2 = rarely, 3 = quite often, 4 = very often	1
Time pressure	Due to your workload, do you ever complete too quickly an operation that should have required more attention?	1 = never, 2 = rarely, 3 = quite often, 4 = very often	2
Overtime	Due to your workload, do you ever work overtime?	1 = never, 2 = rarely, 3 = quite often, 4 = very often	3
Task interruptions	Are you frequently disturbed in your work by having to stop working on one task to complete another unforeseen one?	1 = yes, 2 = no	4
Ethical dilemma	Do you have the means to do your work to a high standard?	1 = not at all, 2 = Mostly no, 3 = mostly yes, 4 = yes, absolutely	5
Ethical dilemma	Do you have to do things you disapprove?	1 = not at all, 2 = Mostly no, 3 = mostly yes, 4 = yes, absolutely	6
Job insecurity	Do you work with the fear of losing your job?	1 = not at all, 2 = Mostly no, 3 = mostly yes, 4 = yes, absolutely	7
Job resources			
Autonomy	Can you choose how you do things yourself?	1 = not at all, 2 = Mostly no, 3 = mostly yes, 4 = yes, absolutely	8
Social support	Do you have enough possibilities to obtain help and cooperation?	1 = not at all, 2 = Mostly no, 3 = mostly yes, 4 = yes, absolutely	9
Reward	Is your work recognized by your professional entourage?	1 = not at all, 2 = Mostly no, 3 = mostly yes, 4 = yes, absolutely	10
Learning opportunities	Does your work provide opportunities to learn new things?	1 = not at all, 2 = Mostly no, 3 = mostly yes, 4 = yes, absolutely	11
Physical workload			
	Are you exposed to repetitive movements?	0 = no, never, 1 = yes, sometimes, 2 = yes, often	12
	Are you exposed to awkward postures?	0 = no, never, 1 = yes, sometimes, 2 = yes, often	13
	Are you exposed to carrying heavy loads?	0 = no, never, 1 = yes, sometimes, 2 = yes, often	14
Health status			
Musculoskeletal disorders	Neck pain or symptoms	1 = yes, 2 = no	15
	Back pain or symptoms	1 = yes, 2 = no	16
	Wrist pain or symptoms	1 = yes, 2 = no	17
	Elbow pain or symptoms	1 = yes, 2 = no	18

Domain and dimension	Dimension formulation	Response scale in present study	Question number
	Shoulder pain or symptoms	1 = yes, 2 = no	19
Psychological	Sleep disorders during the last week?	1 = yes, 2 = no	20
	Fatigue during the last week?	1 = yes, 2 = no	21
	Anxiety during the last week?	1 = yes, 2 = no	22

In the questionnaire, sectors of activity and occupations are coded according to the national classifications of the National Institute of Statistics and Economic Studies, PCS-ESE-2003 (<https://www.insee.fr/fr/metadonnees/pcsese2003/categorieSocioprofessionnelleAgregree/1?champRecherche=true>) and NAF-2008, respectively (<https://www.insee.fr/en/metadonnees/nafr2/section/A>).

The questionnaire is proposed by occupational health teams (physicians and nurses) participating in the survey to employees during their periodic occupational health examination. All other types of examination (resuming work after sick leave, spontaneous visit for health complaints, pre-employment visit) are excluded. The part of the questionnaire concerning working conditions is completed by the employee in the waiting room and the second part, concerning state of health, is completed by the occupational health physician or the nurse during the visit.

To obtain a random sample of employees, only those born in October are asked to complete the questionnaire.

Population studied

Workers surveyed as part of the Evrest program in 2018–2019 and in 2023–2024 were included.

Data were collected for all sectors of activity but comparison within each sector between the two periods was performed only for sectors for which we had at least 300 questionnaires per period, which led us to analyse 10 main sectors of activity.

- C: Manufacturing
- D: Electricity, gas, steam and air conditioning supply
- F: Constructions and construction works
- G: Wholesale and retail trade; repair of motor vehicles and motorcycles
- H: Transportation and storage services
- I: Accommodation and food service activities
- J: Information and communication services
- M: Professional, scientific and technical services
- N: Administrative and support service activities
- Q: Human health and social work activities

Weighting methodology

A weighting methodology allowing results to be extrapolated to the French employees was used. The detailed weighted methodology is available in a previously published article [22]. Briefly, the weighting method includes two steps: 1) a first weighting based on the date of the last occupational health examination, to consider the probability of participation of each employee; and 2) a marginal calibration method to correct potential distortions of the sample in comparison with the scope of the survey, based on the distribution of French employees in 2021 (middle of the studied period) in terms of gender, age (5 groups), company size (6 groups) and sector of activity crossed with occupations (8x4 groups) (National Institute of Statistics and Economic Studies, <https://www.insee.fr/fr/statistiques/3536754>).

Statistical analysis

Data from workers surveyed as part of the Evrest program in 2018–2019 on the one hand, and in 2023–2024 on the other hand, were compared.

If necessary, each working condition indicator was dichotomized, by grouping together: for time pressure and overtime, the responses “Yes absolutely” and “Mostly yes” in one hand and “never” and “rarely” on the other; for ethical dilemma, job insecurity, job resources, autonomy, social support, reward and learning opportunities, the responses “quite often” and “very often” in one hand and “not at all” and “mostly no” on the other; for physical workload, the response “yes, often” was opposed to the responses “no never” and “yes, sometimes”.

A decline in the proportion of individuals exposed to job demands (i.e. from “quite often” or “very often” to “never” or “rarely”), to physical workload (from “yes, often” to “yes, sometimes” or “no, never”), a decline in the proportion of individuals complaining of musculoskeletal or psychological disorders (from “yes” to “no”), or an increase in the proportion of individuals declaring good job resources (from “not at all” or “mostly no” to “mostly yes” or “yes, absolutely”) was deemed to be an improvement. Conversely, the reverse was considered to be a deterioration.

For each working condition and health indicator studied, the proportion of workers who were concerned was calculated for each period, and a proportion difference test for weighted data (Rao-Scott) was performed to test the evolution of the situation between the two periods. The Rao-Scott method introduced a correction into the classic chi-square test in order to take into account the weights as well as, if any, the clustering and stratification involved in the collection of the sample[23].

The significance threshold was set at 5%, and analyses were performed with R version 4.1.2.

Ethics statement

The recruitment period for this study started on January 1, 2018, ended December 31, 2019 for the first period. It started on January 1, 2023, and ended December 31, 2024 for the second period.

Before participation, employees were informed of their rights in writing and they had the choice to decline completing the questionnaire and participating to the study. No minor was included in the study.

All personal data are anonymized in the database. The observatory and the database obtained authorization from the French Data Protection Authority (Commission nationale de l’informatique et des libertés, CNIL, Authorization number 906290V1) and the National Advisory Committee on the Processing of Health Research Information (Authorization number 06.390) in 2006. The observatory and the database comply with the European General Data Protection Regulation (EU 2016/679).

Results

Description of the population.

Overall, 26,530 and 13,174 questionnaires were collected for the 2018–2019 and 2023–2024 periods, respectively, and 23,207 and 12,033 questionnaires belong to the 10 sectors of activity analysed (Table 2).

Table 2
Description of the population included (weighted percentages)

Sector of activity	Years	N	Gender (%)		Age (%)					Occupation (%)			
			Female	Male	< 25	25–34	35–44	45–54	≥ 55	M	IP	E	MW
Manufacturing	2018–2019	3346	28.2	71.8	17.0	19.4	23.4	25.3	14.9	18.1	19.3	12.7	49.9
	2023–2024	2600	27.2	72.8	10.8	19.5	28.6	25.6	15.5	18.1	19.3	12.7	49.9
Electricity, gas, steam and air conditioning supply	2018–2019	3761	23.8	76.2	7.6	32.1	27.2	23.7	9.4	25.1	36.2	8.1	30.6
	2023–2024	2781	20.6	79.4	6.8	27.3	33.5	23.7	8.7	24.7	35.5	8.3	31.5
Constructions and construction works	2018–2019	2230	11.6	88.4	20.8	25.9	22.3	20.8	10.2	8.9	14.4	8.1	68.6
	2023–2024	780	12.2	87.8	17.4	25.3	27.4	19.5	10.4	8.9	14.4	8.1	68.6
Wholesale and retail trade	2018–2019	3718	49.0	51.0	28.6	25.3	19.3	16.8	10.0	11.3	17.1	50.1	21.5
	2023–2024	1416	50.0	50.0	30.0	25.1	17.5	17.2	10.2	11.2	17.7	53.2	17.9
Transportation and storage services	2018–2019	1467	25.2	74.8	10.1	21.5	22.6	27.9	17.9	8.0	11.7	17.7	62.6
	2023–2024	647	19.5	80.5	9.6	18.5	25.0	28.2	18.8	7.2	8.4	14.5	69.9
Accommodation and food service	2018–2019	1017	50.7	49.3	42.3	20.8	16.6	13.1	7.2	3.9	7.9	70.5	17.8
	2023–2024	317	54.0	46.0	36.9	26.4	13.8	12.9	10.0	2.8	6.8	74.4	16.0
Information and communication	2018–2019	903	31.9	68.1	16.4	28.6	21.0	21.6	12.3	52.3	25.9	16.2	5.6
	2023–2024	705	35.0	65.0	11.7	26.5	25.6	22.1	14.1	47.7	29.4	18.9	3.9
Professional, scientific and technical	2018–2019	1481	49.5	50.5	18.4	28.6	23.7	17.6	11.6	35.7	17.9	27.9	18.5
	2023–2024	872	49.6	50.4	18.7	27.0	19.2	19.9	15.3	35.4	17.7	37.9	19.0
Administrative and support service	2018–2019	1848	38.6	61.4	28.3	23.1	19.7	17.6	11.3	5.8	6.2	19.1	68.9
	2023–2024	664	42.3	57.7	22.5	21.9	22.2	19.3	14.2	6.4	5.2	18.1	70.3
Human health and social work	2018–2019	3436	80.9	19.1	11.6	22.7	22.4	25.0	18.3	8.2	22.8	61.6	7.4
	2023–2024	1251	80.5	19.5	14.0	24.1	26.0	22.3	13.6	8.2	22.8	61.6	7.4

N: Number of individuals; M: Managers; IP: Intermediate professions; E: Employees; MW: Manual workers

The global prevalence and trends of exposure to risk factors and health issues for the 26,530 and 13,174 questionnaires collected for the 2018–2019 and 2023–2024 periods, respectively, are presented in Fig. 1.

Legend: n: number of answers in 2018–2019 and 2023–2024 periods, respectively. X%: percentage of workers who were concerned by the exposure / health problem. ↓ : Statistically significant improvement. ↑ : Statistically significant degradation. The radar displays the proportion of workers who were exposed to the dimension of job demand or of physical workload mentioned in Table 1, the proportion of workers who declared having one or several job resources mentioned in Table 1 and the proportion of workers who suffered of musculoskeletal or psychological disorders.

The overall analysis indicates a substantial enhancement in job demand and job resources between the periods 2018–2019 and 2023–2024 (Fig. 1). Concurrently, there was a decline in physical workload, which was significant only for heavy load carriage.

However, considerable variations in trends were observed across sectors for all domains and dimensions (i.e. exposure or health status) (see Figs. 2 to 4).

Legend: n: number of answers in 2018–2019 (brown) and 2023–2024 (blue) periods, respectively. X%: percentage of workers who were concerned by the exposure / health problem. ↓ : Statistically significant improvement. ↑ : Statistically significant degradation. The radar displays the proportion of workers who were exposed to the dimension of job demand or of physical workload mentioned in Table 1, the proportion of workers who declared having one or several job resources mentioned in Table 1 and the proportion of workers who suffered of musculoskeletal or psychological disorders. Sector C: Manufacturing; sector D: Electricity, gas, steam and air conditioning supply, sector F: Constructions and construction works; sector G: Wholesale and retail trade; repair of motor vehicles and motorcycles.

Legend: n: number of answers in 2018–2019 (brown) and 2023–2024 (blue) periods, respectively. X%: percentage of workers who were concerned by the exposure / health problem. ↓ : Statistically significant improvement. ↑ : Statistically significant degradation. Each radar displays the proportion of workers who were exposed to the dimension of job demand or of physical workload mentioned in Table 1, the proportion of workers who declared having one or several job resources mentioned in Table 1 and the proportion of workers who suffered of musculoskeletal or psychological disorders. Sector H: Transportation and storage services; sector I: Accommodation and food service activities; sector J: Information and communication services; sector M: Professional, scientific and technical services.

Legend: n: number of answers in 2018–2019 (brown) and 2023–2024 (blue) periods, respectively. X%: percentage of workers who were concerned by the exposure / health problem. ↓ : Statistically significant improvement. ↑ : Statistically significant degradation. The radar displays the proportion of workers who were exposed to the dimension of job demand or of physical workload mentioned in Table 1, the proportion of workers who declared having one or several job resources mentioned in Table 1 and the proportion of workers who suffered of musculoskeletal or psychological disorders. Sector N: Administrative and support service activities; sector Q: Human health and social work activities

Global trends in exposure to psychosocial or physical factors between both periods were significantly different for many factors (Table 3). This was less the case for MSDs or psychological disorders.

Table 3

Changes of the proportion of workers concerned by each item from 2018–2019 to 2023–2024 for each sector of activity.

Sector of activity*		C	D	F	G	H	I	J	M	N	Q	Global	Global p-value
Working conditions		%	%	%	%	%	%	%	%	%	%	%	
Time pressure	1-Shorten meal times	-3	+7	-23	-22	-5	0	-25	-18	-9	-16	-15	< 0.001
	2-Complete too quickly an operation	+3	-8	-13	-10	+2	-10	-21	-11	-29	-15	-13	< 0.001
Overtime	3-Working overtime	-8	+3	-22	-16	-7	-7	-7	-9	-10	-8	-5	0.05
Task interruptions	4-Need to stop his task	+1	-9	-17	-9	-15	+8	-5	-4	-15	-5	-4	0.11
Ethical dilemmas	5-Insufficient means to perform his task	+21	-23	-27	-29	-10	+18	19	-12	-45	-20	-13	0.01
	6-Doing think he disapprove	-14	-20	-22	-28	-17	-22	-15	-9	0	-10	-10	0.02
Job insecurity	7-Fear of losing his job	-40	+5	-48	-11	+12	+37	+3	0	-27	-2	-23	< 0.001
Autonomy	8-Not choosing how to do	0	-15	-36	+2	+20	-15	+5	+24	-28	-6	-8	0.03
Social support	9-Lack of cooperation	-13	-21	-24	-28	+14	+17	+28	-13	-8	-20	-10	0.05
Reward	10-Work not recognized	-4	-14	-41	-20	-19	-12	+22	+24	-35	-25	-18	< 0.001
Learning opportunities	11-No opportunity to learn	+5	-26	-13	-15	0	-9	+23	-10	-17	-21	-13	0.004
Physical workload	12-Repetitive movements	+1	+1	+1	-6	+28	+16	-9	27	-4	+8	+4	0.13
	13-Awkward postures	+14	+18	+10	0	+17	-8	-29	+16	-12	-7	-2	0.68
	14-Carrying heavy loads	-4	+38	0	-13	-6	+3	-35	-15	-26	-7	-10	0.01
Health status													
Musculoskeletal disorders	15-Neck	0	+1	+13	-11	-2	+48	+6	+12	-32	+2	+1	0.83
	16-Back	-9	+2	+8	-3	-10	-19	-21	-7	-8	+6	+2	0.59
	17-Wrist	+8	+20	-3	+24	-17	+71	-20	+46	-49	-3	+1	0.92
	18-Elbow	+18	+2	-41	+47	+31	+114	18	-4	+27	+27	+16	0.08

Sector of activity*		C	D	F	G	H	I	J	M	N	Q	Global	Global p-value
	19-Shoulder	+15	-4	+14	+10	+22	+47	-5	+33	+26	+8	+8	0.17
Psychological issues	20-Sleep disorders	-3	-5	+12	+2	-3	+16	+15	+17	-5	1	-2	0.61
	21-Fatigue	-10	-2	+9	-7	-22	-11	-4	0	-15	-7	-11	< 0,001
	22-Anxiety	0	-23	+3	-6	-25	+10	-9	+45	-16	0	-4	0,32

Legend: * C: Manufacturing; D: Electricity, gas, steam and air conditioning supply; F: Constructions and construction works; G: Wholesale and retail trade; repair of motor vehicles and motorcycles; H: Transportation and storage services; I: Accommodation and food service activities; J: Information and communication services; M: Professional, scientific and technical services; N: Administrative and support service activities; Q: Human health and social work activities.

The values indicated within the boxes represent the percentage change between 2018–2019 and 2023–2024, with the colour of each bar indicating the statistical significance of the change.

Bold: Statistically significant improvement between 2108/2019 and 2023/2024.

Underline: Statistically significant deterioration between 2108/2019 and 2023/2024.

For example, the proportion of workers who declared being exposed to working overtime increased by 3% 2018–2019 and 2023–2024 in the electricity, gas, steam and air conditioning supply sector but this change was not statistically significant, whereas the decrease of 22% in the constructions and construction works sector was statistically significant.

Evolutions of working conditions.

None of the determinants of Job demand or Job resources has developed in the same way in each of the sectors of activity studied, although time pressure, overtime work and task interruptions decreased in almost all sectors, whereas reward and learning opportunities globally increased. Autonomy and social support have developed very differently from one sector to another, with an improvement of over 25% in some sectors (Constructions and construction works; Wholesale and retail trade, repair of motor vehicles and motorcycles; Administrative and support service activities) and a deterioration of the same proportion in others (Information and communication services; Professional, scientific and technical services).

Exposure to physical risk factors has also varied from one sector to another, but there was an upward trend in exposure to repetitive movements. However, exposure to carrying heavy loads significantly decreased overall, with a 35% drop in the Information and communication services sector, but a 38% increase in the Electricity, gas, steam and air conditioning supply sector.

Evolutions of health status.

The disparities were particularly evident in the context of health status, with certain sectors demonstrating improvement while others exhibited the reverse trend within the same dimension. A high level of significance was found for variations within sectors with regard to neck, wrist, elbow, fatigue and anxiety.

Musculoskeletal disorders (MSDs) of the back tended to decrease in many sectors whereas shoulder and elbow disorders increased in several sectors (e.g. +114% in the Accommodation and food service activities sector and +47% in the Wholesale and retail trade; repair of motor vehicles and motorcycles sector for elbow disorders).

Concerning psychological issues, fatigue globally significantly decreased whereas anxiety increased in 3 the sectors and decreased in 5 sectors.

Relations between exposures and health problems.

Trends in working conditions and health status were in general concordant within one sector, but not always.

For example, while physical working conditions remained stable or improved for the Wholesale and retail trade; repair of motor vehicles and motorcycles sector (G), MSDs of the upper limbs increased.

In the Constructions and construction works sector (F), all factors relating to job demand and job resources improved, most of them significantly, but sleep disorders, fatigue and anxiety increased, although not significantly.

This was also the case, to a lesser extent, in the Human health and social work activities sector (Q).

Looking beyond trends.

A thorough examination of the transitions that have transpired between the two periods under scrutiny within the diverse domains of activity may engender a fallacious representation of the extent of exposure to occupational risk factors or the condition of employees' well-being in these domains.

In certain sectors, a substantial decline in exposure or health impairment has been observed; however, residual levels persist at elevated levels in comparison to other sectors. For example, in Electricity, gas, steam and air conditioning supply (sector D, Fig. 2), prevalence of carrying heavy loads significantly increased and concerned 10% of employees in 2023–2024, whereas the prevalence remained stable in the construction sector (sector F, Fig. 2) but still concerned more than 25% of employees in 2023–2024. Sometimes the percentage and absolute increase in prevalence paint a similar picture, as in the case of the significant increase in exposure to repetitive movements observed in the Accommodation and food service activities sector, which by 2023–2024 affected almost 60% of employees.

Discussion

The primary outcomes of this study were a global enhancement of psychological health status, job demand and job resources, whilst physical workload remained constant and MSDs exhibited a tendency to rise among French workers between 2018–2019 and 2023–2024, with significant variations across sectors of activity.

Limitations.

The number of subjects included is less than half for the period 2023–2024 compared to the period 2018–2019, reflecting the disruption to occupational health services caused by the pandemic. This led to the exclusion from the study of three sectors of activity that had been studied in our previous study (Finance and insurance, Public administration and defense and Other services activities) [13], due to the insufficient number of subjects included in these sectors. However, the ten sectors included represented 87.35% of the total number of respondents in 2018–2019 and 91.3% of them for 2023–2024. Furthermore, the weighting methodology used allowed results to be extrapolated to the French employees, for both periods. Furthermore, despite the decrease in the number of subjects in the second period, most of the differences between the two periods are significant.

A further limitation of the study is that it is longitudinal, but does not follow the same individuals over time. On a global scale, numerous prominent longitudinal cohort studies concentrated on the relationship between the workplace and health. As evidenced by the Whitehall II study in England [24], the French GAZEL cohort [25] and the Finnish Public sector study [26], a number of studies have utilised multiple repeated measures on a range of factors concerning work, private life and health. However, the scope of these studies was limited to specific groups of employees, namely civil servants, employees at a gas or electricity company, or public sector employees, respectively. The present study, grounded in a representative sample, facilitated the comparison of trends across sectors of activity.

We studied 10 sectors of activity, among the 21 registered in the French National Institute of Statistics and Economic Studies database. We had not enough data for the 11 other sectors of activity, which employ a limited number of workers. We set the threshold at 300 questionnaires at least for one sector of activity and for both periods. Furthermore, agricultural sector (sector A 'Agriculture, forestry and fishing') was also very poorly represented (only 77 workers included 2010), as it is subject to specific occupational health monitoring by a special social security system. It was therefore excluded from the survey.

All employees within an industry category were classified according to their primary activity. This suggests that various job tasks, which may impact job demands, control and social support or physical exposure, such as administrators, service workers, managers, or workers engaged in core production, are consolidated. Consequently, the impact of these distinct job tasks remains unevaluated. However, several significant differences between sectors were identified. In order to obtain more precise estimates, it could be possible to utilise information on occupation for the purpose of stratification of workers performing the core tasks from other functions in the production units, for example. This could also take into consideration the employees who transitioned to remote working arrangements.

The measures of the demands, decision authority and support dimensions utilised in the present study are not directly comparable with the standard measures of the demand-control-support model of Karasek and Theorell. Nevertheless, these measures permit the establishment of comparisons between industry categories and over time and previous studies have utilised these measures. [13, 20].

The approach to dichotomising the scales of response for certain working conditions, whereby responses of 'yes' and 'no' are categorised separately, fails to acknowledge the possibility of intra-category fluctuations in response frequency. Specifically, there may be an increase in responses of 'very often' and a decrease in responses of 'quite often' for the variable of time pressure. This could result in a stabilisation of the 'yes' response.

Finally, the present sample was constrained to individuals who were in active employment at the time of the survey. Consequently, those who were self-employed or unemployed were excluded from the study.

Strengths

The following strengths of our study should be underlined.

The main strength is that data were collected before and after COVID-19 pandemic. The state of health emergency caused by the pandemic was officially lifted in May 2023, but the last wave of COVID occurred in France in December 2022. We can therefore consider that the 2023–2024 data correspond effectively to a post-pandemic period. This pandemic changed people's working conditions worldwide, induced income losses, increased work stressors and impaired the mental health of workers [27–29]. However, most published studies on trends in working conditions and health collected data before, or during, the pandemics, due mainly to the delay in collecting and analysing data at a national level [6–8, 10, 12]. Another strength is that we did the same analysis, with the same methodology, between 2010–2011 and 2018–2019, providing a complete picture over 15 years, and a view on trends until and after the pandemic [13].

An extensive measurement process was conducted in order to gauge both the work environment and the health of the subjects and the present study was grounded in a substantial, nationally representative sample of the French working population. The number of employees included, over than 27,000, as compared for example to the 1,558 included in the Swedish study on job loss and job instability during the COVID-19 pandemic or the 18,704 included in a German study [7, 12].

The randomisation of employees included in the study, on the basis of attendance to a periodic medical examination, and the use of sample weights for all the statistical analyses ensured that the results of the study can be extrapolated to the population of salaried workers in France. The random selection of the workers included in the study provided a realistic view of their actual state of health and occupational exposure.

In terms of the reliability of health status assessment, self-rated health status may be influenced by perceived occupational exposures [30]. However, the present study did not solely rely on self-assessment for health status, as this part of the variable

was instead assessed by an occupational health professional.

Main evolutions

Globally, between before and after the pandemic, we observed improvement in workplace exposures but not on psychological and physical health status.

However, psychological issues tended to improve but the trend was significant only for fatigue. This may seem surprising given what has been described during the pandemic, with fatigue linked to working conditions but also to the effects of long COVID (such fatigue, anxiety), which has affected up to 10% of people who have been infected [31]. One explanation may be that the subjects were interviewed at a distance from the pandemic and compared their condition at the time of inclusion with that during the previous months or years, during the pandemic. Another explanation could be that patients with long COVID or other severe, persistent health issues (e.g., chronic fatigue, anxiety, brain fog) who were unable to return to work or were on long-term sick leave had not yet returned to work, at least at the start of enrolment in 2023 [32]. This could have induced a healthy worker effect. However, the unemployment rate stood at 7.9 per cent in mainland France in the final quarter of 2019 and at 7.3 per cent in the final quarter of 2023, making a healthy worker effect unlikely. Finally, some patients may also have been interviewed long after a COVID disease, and fatigue or anxiety become non significantly increase after 2 years [33]. The gross of remote working could also explain the improvements observed for psychological issues. Thus, a longitudinal study performed among public sector employees in Finland observed that working from home during the pandemic was accompanied by small favourable changes in the psychosocial work environment during the pandemic [15].

The present study found a general increase in the prevalence of MSDs over the observed period. This is not consistent with the decrease in exposure to psychosocial risk factors and physical workload, as both of these factors have been linked [26, 34–36]. One possible explanation is that digitalization and telework have increased during the pandemic. This induced the use of home environments as workspaces (areas not adapted for work and with low lighting), inadequate working furniture (non-ergonomic chairs and desks), the use of electronic devices (tablets, cell phones and laptops) and changes of organizational factors (long working hours and sitting time with less active breaks) [37, 38]. Furthermore, COVID-19 related lockdown restrictions may also have had a detrimental effect on the onset of MSDs [39].

Differences between sectors of activity

In addition to the prevailing trends, significant disparities were identified among the various sectors of activity with regard to occupational exposure and the health status of their employees.

Workers in healthcare, social care, education, transport and food production sectors saw elevated

risks of SARS-CoV-2- and COVID-19-related hospitalisation and death compared to others early in

the COVID-19 pandemic but this did not necessarily persist [2]. Conversely, sectors such as food production, warehouse work and transportation were also severely affected, but the incidence remained high throughout the pandemic, often due to unsuitable working conditions (e.g. lack of ventilation, accommodation conditions). However, the impact of the pandemic on workers has gone far beyond the individual consequences of infection, as the pandemic has profoundly disrupted the world of work.

A plethora of studies have demonstrated that exposure to job stressors exhibits variation amongst working population groups in industrialised countries, thereby contributing to occupational health disparities [13, 40, 41]. In our previous study, we also observed major disparities between the different sectors of activity in France [13]. However, the changes we observed between 2010–2011 and 2018–2019 were not always predictive of the changes observed between before and after the pandemic. In the manufacturing sector (C), the proportion of employees declaring that they had insufficient means to perform his task decreased until 2019 but increased with the pandemic, both significantly. Conversely, in the Wholesale and retail trade sector (G), job demand and job resources have seen significant improvement up to 2019, which have persisted during the pandemic.

In the Human health and social work activities sector, which is considered to have been severely impacted by the pandemic, working conditions deteriorated between 2010 and 2019, apart from social support and reward, but there has been a significant improvement in many psychosocial risk factors between before and after the pandemic. In this sector, social support and reward continuously improved between 2010–2011 and 2023–2024.

What could explain the different trends among sectors of activity observed in our study?

Firstly, it could be hypothesised that occupational health policies or interventions specific to certain sectors of activity could explain why some sectors demonstrated improvement while others did not. Nevertheless, we are unaware of any specific interventions in the period under study, with the exception of social support and rewards in the healthcare sector during the initial year of the pandemic in France (every evening, citizens applauded healthcare workers from their windows, and COVID bonuses were widely awarded). Furthermore, the regulatory framework governing occupational health in France is characterised by its meticulous and stringent nature, applicable to all employees. Consequently, it seems implausible that such actions could have been implemented at a national level without our awareness. While local actions may have occurred, they are insufficient to explain changes at a national level. It is hypothesised that the observed changes are likely to be associated with economic shifts that transpired during the pandemic.

A potential correlation exists between disparities observed across various sectors of activity and the differential composition of demographics, including but not limited to gender, age, employment status, socioeconomic status, social class, and occupational skill level [40–44]. In our study, the proportion of employees and manual workers or the sex ratio in the 2023–2024 was similar to the 2018–2019 cohort. A further potential factor contributing to these variations may be the disparate allocation of organisational attributes, including the commercial activities of the enterprise and their subsequent effect on market volatility for its products or services. Additionally, distinctions in employment practices associated with varying ownership structures and disparities in human resource policies pertaining to organisational size may also be considered [45, 46]. This has probably been exacerbated by the pandemic.

Conclusion

Although the COVID-19 pandemic has been associated with a number of negative consequences on working conditions and employee health, a comparison of exposure to psychosocial risk factors and physical constraints before and after the pandemic in a representative sample of French employees shows a decrease in exposure. However, this has not translated into an improvement in the physical health of these employees.

Nevertheless, this overall trend masks significant disparities between different sectors of activity, and it is important to monitor trends closely to determine whether the significant changes in the world of work brought about by the pandemic will have negative consequences for the health of certain employees, and to identify those who will be affected at an early stage.

Declarations

Ethics approval and consent to participate

This research was conducted in accordance with the Declaration of Helsinki. Before participation, employees were informed of their rights in writing and they had the choice to decline completing the questionnaire and participating to the study. No minor was included in the study. All personal data are anonymized in the database. The observatory and the database obtained authorization from the French Data Protection Authority (Commission nationale de l'informatique et des libertés, CNIL, Authorization number 906290V1) and the National Advisory Committee on the Processing of Health Research Information (Authorization number 06.390) in 2006. The observatory and the database comply with the European General Data Protection Regulation (EU 2016/679).

Consent for publication

Not applicable

Competing interests statement

The authors declare that they have no competing interests.

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Author Contribution

Conceptualization: JFG, LRMethodology: JFG, AL, MN, SV, LRData curation: JFG, AL, MN, LRFormal analysis: JFG, AL, MN, SV, LRProject administration: JFGSupervision: LRWriting – original draft: JFG, LRWriting – review & editing: JFG, AL, MN, SV, LR

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Availability of data and materials

Data cannot be shared publicly due to legal reasons related to data protection and confidentiality. The data of the EVREST French observatory can be accessed on the basis of a research project submitted to the executive committee. The contact point for accessing the data is the Data Protection Officer of the University of Rouen: dpo@univ-rouen.fr. More information can be found on the following website: https://evrest.istnf.fr/_docs/Fichier/2017/4-170512013717.pdf

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Figures

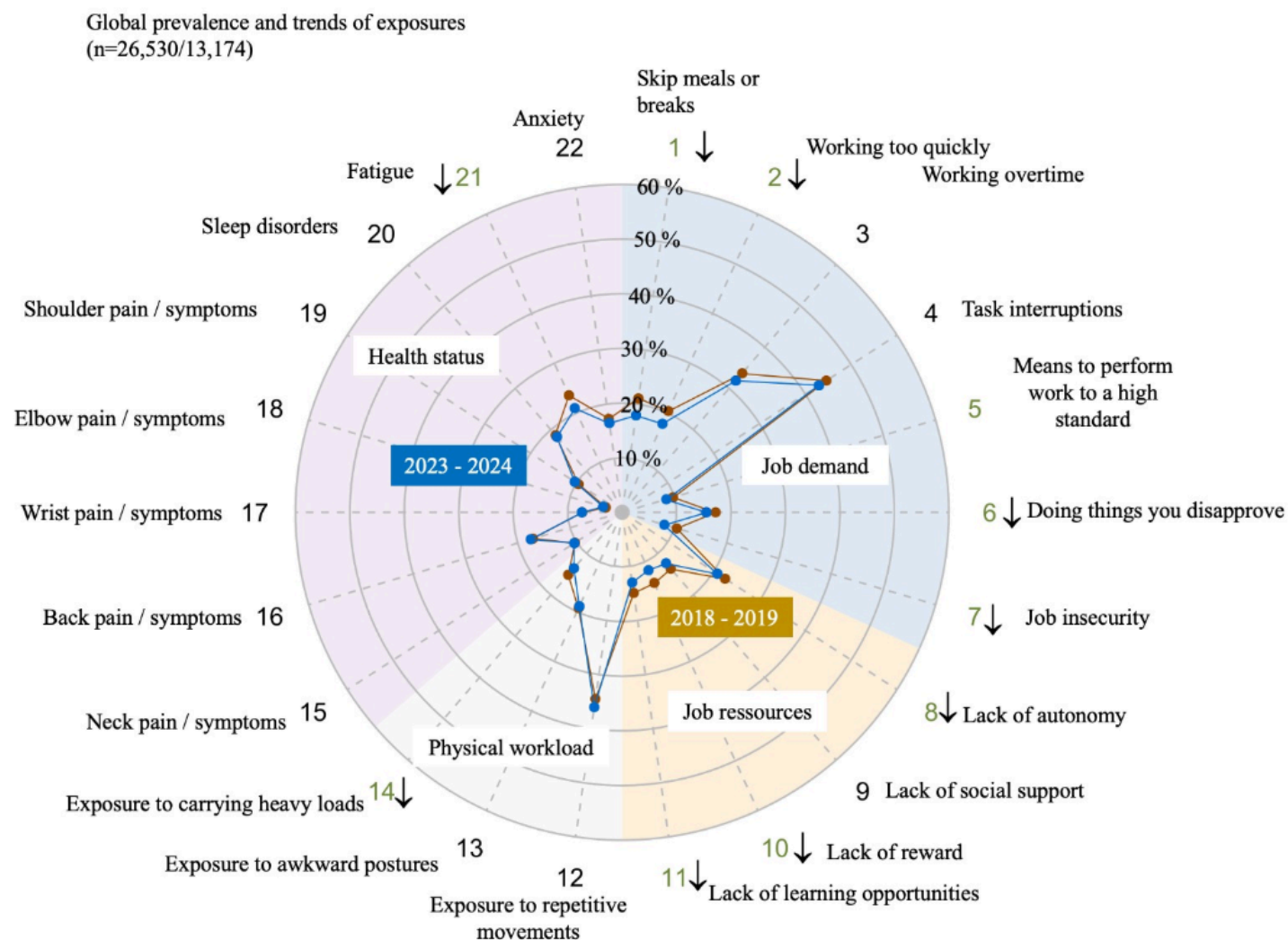


Figure 1

Global prevalence and trends of exposures and health issues for 2018-2019 and 2023-2024 periods, respectively.

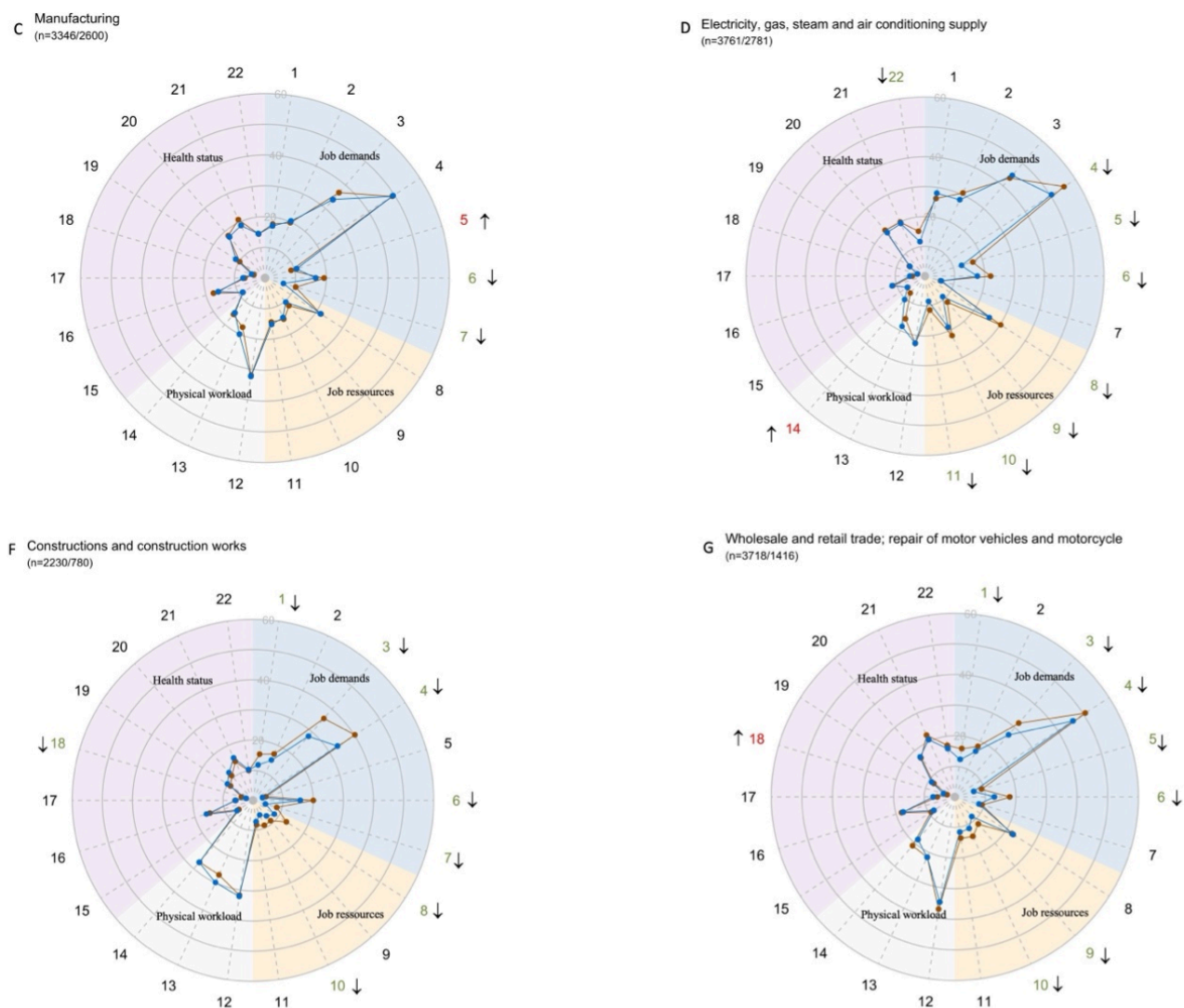
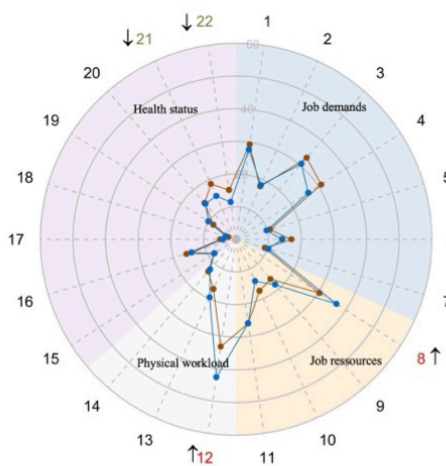


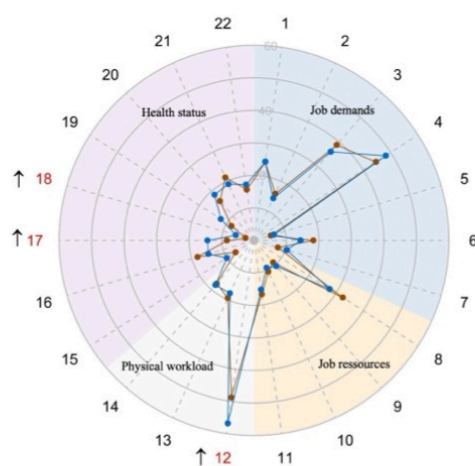
Figure 2

Prevalence and trends of exposures and health issues for sectors of activity C, D, F and G.

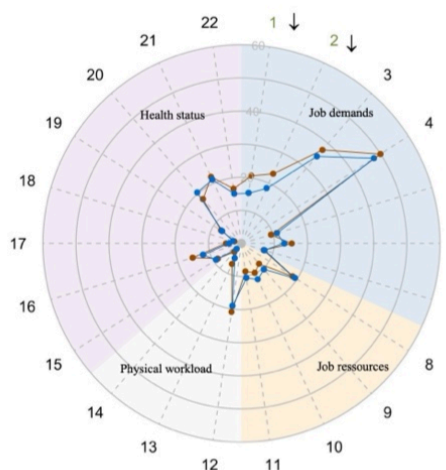
H Transportation and storage services
(n=1467/647)



I Accommodation and food service activities
(n=1017/317)



J Information and communication services
(n=903/705)



M Professional, scientific and technical services
(n=1481/872)

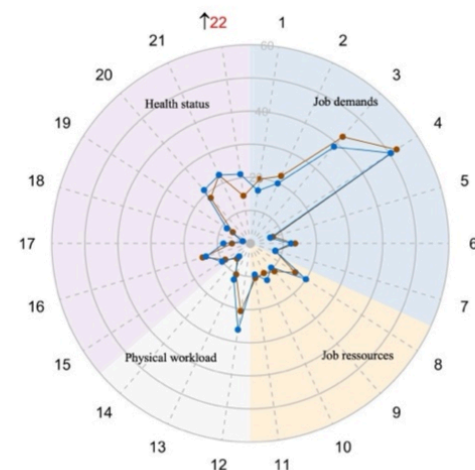
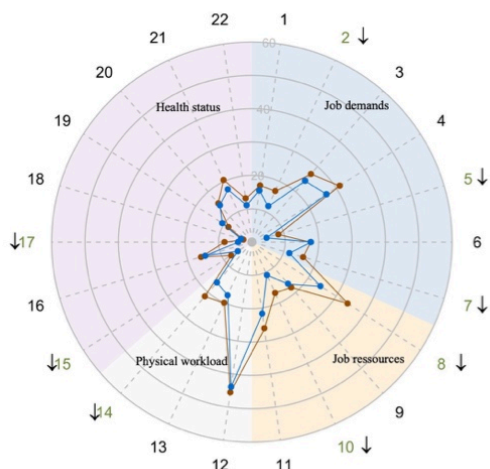


Figure 3

Prevalence and trends of exposures and health issues for sectors of activity H, I, J and M.

N Administrative and support service activities
(n=1848/664)



Q Human health and social work activities
(n=3436/1251)

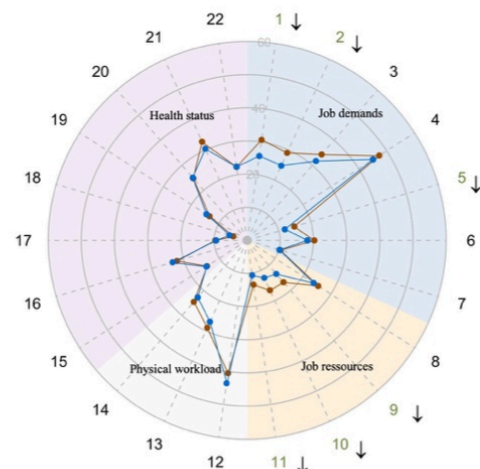


Figure 4

Prevalence and trends of exposures and health issues for sectors of activity N and Q.