



# Emerging Evidence Alert February 2021

This Emerging Evidence Alert includes the latest peer-reviewed articles, reports and evidence on a range of workplace health and safety, prevention, recovery at work and return to work topics. It provides a review of recent journal articles and relevant content related to Comcare’s five research themes: Fostering Work Participation; Building Employer Capability; Adapting to the Future of Work; Guiding and Supporting Mental Health and Wellbeing; and Enabling Healthy and Safe Workplaces. Collated articles were published in January 2021 only.

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## Exploring the scientific literature behind wearable devices

The latest research highlights a growing interest from health practitioners and workplaces to have access to real-time data and information about ergonomic risk factors such as poor posture. Wearable devices such as smart watches or other sensor-enabled garments have the potential to improve workers’ physical wellbeing and reduce work-related injuries.

A recent [systematic review](#) examined 24 studies of wearable devices for ergonomic purposes and how they can support the improvement of ergonomic conditions for workers. The results provide an overview of smart wearables available for researchers and practitioners today. The researchers found that most devices use sensors located at relevant body parts to monitor and reduce the risks from awkward postures, manual handling, and repetitive tasks. The research supports the selection of the most suitable devices in industrial and non-industrial settings, such as ergonomic assessments.

For more information about [ergonomic hazards](#) including how to minimise the risk to workers, visit the Comcare website.

## COVID-19: managing risk to COVID safe workplaces

The [latest research on COVID-19](#) highlights the importance of good personal hygiene, physical distancing and staying home when unwell. Researchers are also beginning to explore the importance of improving indoor air quality ventilation in maintaining COVID-safe workplaces —the emerging evidence suggests some strategies for managing physical distancing in workplaces that occupancy and ventilation strategies may support the control of COVID-19 airborne infection risks.

Safe Work Australia recently published guidance for [improving ventilation in indoor workplaces](#). It outlines practical steps to reduce the risk of exposure to COVID-19 and improve ventilation in indoor workplaces. This may include adjusting workstations to maintain physical distancing, relocating work tasks to different workspaces, and supporting workers to work from home.

More information for [transitioning back to usual workplaces](#) is also available on the Comcare website.

For industry specific COVID-19 information, visit the [Safe Work Australia website](#).

## Description of Evidence Levels Definitions Used in this Review

1. **Level of Evidence** – Certain study designs are scientifically stronger at answering a question. The scoring hierarchy we provided is presented below.

Level of Evidence	Description
Level 1	Evidence from a systematic review or meta-analysis of relevant studies.
Level 2	Evidence from a randomised controlled trial
Level 3	Evidence from a controlled intervention trial without randomisation (i.e. quasi-experimental).
Level 4	Evidence from a case-control or cohort study.
Level 5	Evidence from a single case study, a case series, or qualitative study.
Level 6	Evidence from opinion pieces, reports of expert committees and/or from literature reviews (scoping or narrative).

2. **Relevance** – Research carried out in Australia or similar countries is most relevant to Australian readers.

Level	Description
A	Study conducted in Australia or the study has been conducted outside Australia but confounders unlikely to affect relevance
B	Study conducted outside Australia and confounders likely to affect generalisability

## Fostering Work Participation

### Return to Work

#### **Effect of professional certification on employees' return-to-work rate after occupational injuries in Korea: focusing on vulnerable groups**

**Background:** One effective way to improve return-to-work (RTW) performance may be to convince the employer that the worker has the necessary skills. The aim of this paper is to investigate the effect of having a professional certification among workers injured in occupational injuries on their return to work.

**Methods:** The Panel Study of Workers' Compensation Insurance (PSWCI) targets workers who completed medical care in 2012 after an occupational injury. The study population (n = 2000) was stratified by gender, age, region, disability grade, and rehabilitation service use. A total of 1458 workers were finally selected for this study. The effect of having a certification on RTW status was calculated with an odds ratio and 95% confidence intervals using binomial and multinomial logistic regression analyses. In the binomial logistic regression analysis, the RTW group was made up as a combination of the return to original work and the reemployment groups. **Results:** The ORs of RTW among those with a certification compared to those without certification were 1.38 (1.16-1.65) in Model 1, 1.25 (1.05-1.50) in Model 2, and 1.22 (1.01-1.47) in Model 3. Among female workers with a certification, the OR of RTW was 4.60 (2.68-7.91), that of return to original work was 3.21 (1.74-5.91), and that of reemployment was 5.85 (3.34-10.27). Among daily workers with a certification, the OR of RTW was 1.32 (1.03-1.69) and that of reemployment was 1.37 (1.07-1.76).

**Conclusion:** In conclusion, injured workers with a certification generally had a higher RTW rate. In particular, the RTW rate was higher among female workers and daily workers with a certification than among those without.

**Bae et al. 2021.**

**Environmental Health and Preventative Medicine, vol. 26, no. 1.**

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**Keywords:** Certification; occupational injury; return to work; workers' compensation insurance.

**Evidence Level:** 4B

**Link:** <https://environhealthprevmed.biomedcentral.com/articles/10.1186/s12199-020-00930-0>

#### **Return-to-work self-efficacy after occupational rehabilitation for musculoskeletal and common mental health disorders: Secondary outcomes of a randomized clinical trial**

**Objective:** To assess the effects of adding a workplace intervention to inpatient occupational rehabilitation on return-to-work self-efficacy, and whether changes in return-to-work self-efficacy were associated with future work outcomes. **Design:** Randomized clinical trial. **Subjects:** Individuals aged 18-60 years, sick-listed 2-12 months were randomized to multimodal inpatient rehabilitation with (n=188) or without (n=187) a workplace intervention. **Methods:** Between-group differences for 4 months follow-up were assessed using linear mixed models. Associations between self-efficacy scores and future sickness absence days during 12 months of follow-up were assessed by linear regression. **Results:** There were no statistically significant between-group differences in self-efficacy during follow-up. Participants with high or medium self-efficacy scores at the end of rehabilitation had fewer sickness absence days during follow-up compared with participants with low scores. Participants with consistently high scores or an increasing score throughout the programme showed fewer sickness absence days than those with reduced or consistently low scores. **Conclusion:** Receiving an added workplace intervention did not increase return-to-work self-efficacy more than standard inpatient occupational rehabilitation alone. High scores and a positive development in return-to-work self-efficacy were associated with higher work participation. This suggests that return-to-work self-efficacy could be an important factor to consider in the return-to-work process.

**Skagseth et al. 2021.**

**Journal of Rehabilitation Medicine, vol. 53, no. 1.**

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**Keywords:** Mental disorders; musculoskeletal disease; randomized controlled trial; sick leave; sickness absence; workplace intervention.

**Evidence Level:** 2A

**Link:** <https://www.medicaljournals.se/jrm/content/abstract/10.2340/16501977-2787>

## Presenteeism and Absenteeism

### **Efficacy of an indicated prevention strategy on sickness absence and termination of the employment contract: a 5-year follow-up study**

**Objective** It was shown that an indicated prevention strategy (IPS), based on screening and early intervention, can considerably decrease future risk of long-term sickness absence (LTSA>28 days) over one year. Given the nature of the interventions, the potential of an effect extending beyond the original one year of follow-up might be present. This study aims to determine the efficacy of this IPS on LTSA and termination of employment contract over five years by extended follow up of IPS trials. **Methods** Company records on sickness absence and termination of employment contract over five years were used from two randomized controlled trials (RCT) on the efficacy of the IPS (RCT I employees at high-risk for LTSA: intervention: N=263; RCT II high-risk employees with concurrent mild depressive complaints: intervention: N=139). Survival analysis was used to model time until the first LTSA episode and termination of employment contract. **Results** RCT I showed a decrease of 43.2 days of sickness absence (P=0.05) and a lower 5-year risk of LTSA in the intervention, as compared to the control group [hazard ratio (HR) 0.61, 95% confidence interval (CI) 0.41-0.90], however no considerable impact on employment contract (HR 0.85, 95% CI 0.54-1.35) (intention-to-treat, ITT). For RCT II, we found no large difference in days of SA and no difference in LTSA risk over five years (HR 1.31, 95% CI 0.70-2.47), whereas the risk of termination of the employment contract was lower (HR 0.62, 95% CI 0.39-0.99) (ITT). **Conclusion** Effects of the IPS were observed over five years, albeit differential between the two approaches. A combination of elements of both interventions might lead to optimal results but needs further study.

**Klasen et al. 2021.**

**Scandinavian Journal of Work and Environmental Health, vol. 3945.**

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**Keywords:** Indicated prevention strategy; sickness absence; termination; employment; contract.

**Evidence Level:** 4A

**Link:** [https://www.sjweh.fi/show\\_abstract.php?abstract\\_id=3945](https://www.sjweh.fi/show_abstract.php?abstract_id=3945)

### **Incidence and length of sickness absence among hierarchical occupational classes and non-wage-earners: A register study of 1.6 million Finns**

Socioeconomic differences in sickness absence are well known, but previous studies have tended to focus on wage earners only. This study examined incidence and length of sickness absence comparing the employee groups of upper and lower non-manual employees and manual workers, but also entrepreneurs, the unemployed and other non-wage-earners. The study utilized register data on a nationally representative 70% sample of Finns aged 25-62 at the end of year 2012 (N = 1,615,352). Sickness absence spells compensated by sickness allowance and initiated during 2013 were retrieved from the register of the Social Insurance Institution of Finland (SIIF) and followed until the end of each episode and linked to socio-demographic covariates collected from the registers of the SIIF and of Statistics Finland. Zero-inflated negative binomial regression was used in multivariate models. After adjusting for age, marital status, region and income, there were clear differences in the occurrence and length of sickness absence across socioeconomic groups. Compared to upper non-manual employees, lower non-manual employees and especially manual workers had higher cumulative annual incidence of sickness absence among both men and women, but the entrepreneurs, the unemployed and other non-wage-earners had a clearly higher expected number of sickness absence days. Results varied by diagnostic group. The results highlight the importance of different types of preventive measures for reducing the occurrence of sickness absence and for preventing prolongations of sickness absence spells in different socioeconomic groups.

**Blomgren et al. 2021.**

**International Journal of Environmental Research and Public Health, vol. 18, no. 2.**

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**Keywords:** Entrepreneurs; occupational class; sickness absence; social determinants; socioeconomic; unemployed.

**Evidence Level:** 4B

**Link:** <https://www.mdpi.com/1660-4601/18/2/501>

## Building Employer Capability

### Organisational Issues

#### **The impact of job insecurity on organisational citizenship behaviour and task performance: Evidence from robotised furniture sector companies**

Over the past decade, in the light of intensive robotisation, job insecurity referring to the employees' overall concern about the continued availability of their jobs in the future has become a hot topic. A general assumption supported by the findings is that job insecurity causes far-reaching negative consequences for the employee well-being and health, attitudes towards the job and organisation, and behaviours at work. However, the focus on behavioural outcomes, especially on employee performance at work, is still scant. Trying to narrow the gap, the paper aims at revealing the linkage between job insecurity and two dimensions of performance, namely task performance and organisational citizenship behaviour. Building on the hindrance stressor dimension of the stress model, the paper claims that a negative relationship exists between the constructs. Quantitative data were collected in a survey of robotised production lines operators working in the furniture sector in Lithuania. As predicted, the results revealed that job insecurity had a negative impact on both the task performance and organisational citizenship behaviour. These findings affirmed that job insecurity was a hindrance stressor, which needed to be considered when managing human resources in a robotised production environment.

**Stankeviciute et al. 2021.**

**International Journal of Environmental Research and Public Health, vol. 18, no. 2.**

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**Keywords:** Furniture industry; job insecurity; organisational citizenship behaviour; robotisation; robots; task performance.

**Evidence Level:** 4B

**Link:** <https://www.mdpi.com/1660-4601/18/2/515>

#### **Corporate social responsibility and the reciprocity between employee perception, perceived external prestige, and employees' emotional labor**

**Background:** Corporate social responsibility (CSR) is emerging as a relevant subject in the business world and in the field of management research. Therefore, the current study incorporates classifications often used in organizational level CSR research that distinguish social responsibility relevant to its focus (internal and external), in proposing diverse routes that link various CSR practices (ie, internal and external) to employees' choice of emotional labor strategy (i.e., via perceived organizational support and perceived external prestige). **Methods:** Data were collected from front-line employees of banks operating in Pakistan. Due to the study's focus on front-line employees, other personnel were excluded for data collection. We collected data through a self-administered questionnaire. The structural equation model (SEM) was employed on 376 valid responses using Smart-PLS3 to test the study hypotheses. **Results:** After the analysis, we found satisfactory results for the fitness of both measurement and satisfactory models. Moreover, the results strongly support our proposed theoretical framework, and all proposed hypotheses were accepted. **Discussion:** This study confirms that the perception of external prestige is a strong predictor of employees' emotions and relevant behaviors. Moreover, this study discusses under the light of social exchange theory that perceived organizational support strongly predicts employees' emotional labor, which diminishes the myth that prestige is the only factor to influence employees' emotions in the workplace. Moreover, this study negates the findings of Anwar et al that perceived external prestige does not have a significant negative effect on surface acting. It provides an insight not only for managers and researchers but also for society, especially in an Eastern workplace setting like Pakistan's banking sector.



**Khan et al. 2021.**

**Psychology Research Behavior and Management, vol. 14.**

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**Keywords:** CSR; emotional labour; employees' welfare; perceived external prestige; perceived organizational support.

**Evidence Level:** 4B

**Link:** <https://www.dovepress.com/corporate-social-responsibility-and-the-reciprocity-between-employee-p-peer-reviewed-article-PRBM>

## Job Design

### **Office design as a risk factor for disability retirement: A prospective registry study of Norwegian employees**

**Objectives** This aim of this study was to (i) examine differences in risk of subsequent disability retirement between employees working in cellular, shared, and open-plan offices and (ii) determine the contribution of gender, skill-level, work ability, medically certified sickness absence, leadership position, and personality traits (extroversion, agreeableness, conscientiousness, neuroticism, and openness) as confounders.

**Methods** Survey data on predictor variables combined with official objective registry data on disability retirement and sickness absence were extracted from a large Norwegian occupational cohort of office workers (N=6779, 53.5% women). Questionnaire data included the respondents' office designs, comparing cellular, shared, and open-plan offices, demographic characteristics, workability, and personality factors. Objective data on disability retirement and medically certified sickness absence were extracted from the sickness and disability benefit register of the Norwegian Labor and Welfare Administration. **Results** In the final fully adjusted model, employees working in shared [hazard ratio (HR) 1.52, 95% confidence interval (CI) 1.08-2.16] and open-plan (HR 1.95, 95% CI 1.31-2.90) offices had significantly higher risk of subsequent disability retirement compared to employees in cellular offices. Gender, work ability, medically certified sickness absence, and conscientiousness had independent direct effects on risk of disability retirement.

**Conclusion** This study shows that open and shared workspace designs have detrimental effects by increasing risk of disability retirement among office workers, even when taking other known predictive factors into account.

**Nielsen et al. 2021.**

**Scandinavian Journal of Work and Environmental Health, vol. 47, no. 1.**

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**Keywords:** Office design; risk factors; disability; retirement

**Evidence Level:** 4B

**Link:** [https://www.sjweh.fi/show\\_abstract.php?abstract\\_id=3907](https://www.sjweh.fi/show_abstract.php?abstract_id=3907)

## Shift Work

### **Night shift work is associated with an increased risk of asthma**

**Introduction:** Shift work causes misalignment between internal circadian time and the external light/dark cycle and is associated with metabolic disorders and cancer. Approximately 20% of the working population in industrialised countries work permanent or rotating night shifts, exposing this large population to the risk of circadian misalignment-driven disease. Analysis of the impact of shift work on chronic inflammatory diseases is lacking. We investigated the association between shift work and asthma. **Methods:** We describe the cross-sectional relationship between shift work and prevalent asthma in >280000 UK Biobank participants, making adjustments for major confounding factors (smoking history, ethnicity, socioeconomic status, physical activity, body mass index). We also investigated chronotype. **Results:** Compared with day workers, 'permanent' night shift workers had a higher likelihood of moderate-severe asthma (OR 1.36 (95% CI 1.03 to 1.8)) and all asthma (OR 1.23 (95% CI 1.03 to 1.46)). Individuals doing any type of shift work had higher adjusted odds of wheeze/whistling in the chest. Shift workers who never or rarely worked on nights and people working permanent nights had a higher adjusted likelihood of having reduced lung function

(FEV<sub>1</sub> <80% predicted). We found an increase in the risk of moderate-severe asthma in morning chronotypes working irregular shifts, including nights (OR 1.55 (95% CI 1.06 to 2.27)). **Conclusions:** The public health implications of these findings are far-reaching due to the high prevalence and co-occurrence of both asthma and shift work. Future longitudinal follow-up studies are needed to determine if modifying shift work schedules to take into account chronotype might present a public health measure to reduce the risk of developing inflammatory diseases such as asthma.

**Maidstone et al. 2021.**

**Thorax, vol. 76, no. 1.**

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**Keywords:** Asthma; asthma epidemiology.

**Evidence Level:** 4B

**Link:** <https://thorax.bmj.com/content/76/1/53.long>

### **A field investigation of the relationship between rotating shifts, sleep, mental health and physical activity of Australian paramedics**

Paramedics working on a rotating shift are at an increased risk of developing chronic health issues due to continuous circadian rhythm disruption. The acute effects of shift rotation and objectively measured sleep have rarely been reported in paramedics. This study investigated the relationships between a rotating shift schedule and sleep (using actigraphy), subjective reports of sleepiness, mood, stress and fatigue. Galvanic Skin Response, energy expenditure and physical activity (BodyMedia SenseWear Armband) were also recorded across the shift schedule. Paramedics were monitored for a period of eight consecutive days across pre-shift, day shift, night shift, and 2 days off. Fifteen paramedics (M age = 39.5 and SD = 10.7 years) who worked rotational shifts experienced sleep restriction during night shift compared to pre-shift, day shift and days off ( $p < 0.001$ ). Night shift was also associated with higher levels of stress ( $p < 0.05$ ), fatigue ( $p < 0.05$ ), and sleepiness ( $p < 0.05$ ). One day off was related to a return to pre-shift functioning. Such shift-related issues have a compounding negative impact on an already stressful occupation with high rates of physical and mental health issues. Therefore, there is an urgent need to investigate methods to reduce rotating shift burden on the health of paramedics. This could be through further research aimed at providing recommendations for shift work schedules with sufficient periods for sleep and recovery from stress.

**Khan et al. 2021.**

**Science Reports, vol. 11, no. 1.**

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**Keywords:** Field investigation; rotating shifts; sleep; mental health; physical activity; paramedics

**Evidence Level:** 5A

**Link:** <https://www.nature.com/articles/s41598-020-79093-5>

### **The impact of a meal, snack, or not eating during the night shift on simulated driving performance post-shift**

**Objective** The commute home following a night shift is associated with an increased risk for accidents. This study investigated the relationship between food intake during the night shift and simulated driving performance post-shift. **Methods** Healthy non-shift working males (N=23) and females (N=16), aged 18-39 years (mean 24.5, standard deviation 5.0, years) participated in a seven-day laboratory study and underwent four simulated night shifts. Participants were randomly allocated to one of three conditions: meal at night (N=12; 7 males), snack at night (N=13; 7 males) or no eating at night (N=14; 9 males). During the night shift at 00:30 hours, participants either ate a large meal (meal at night condition), a snack (snack at night condition), or did not eat during the night shift (no eating at night condition). During the second simulated night shift, participants performed a 40-minute York driving simulation at 20:00, 22:30, 01:30, 04:00, and 07:30 hours (similar time to a commute from work). **Results** The effects of eating condition, drive time, and time-on-task, on driving performance were examined using mixed model analyses. Significant condition×time interactions were found, where at 07:30 hours, those in the meal at night condition displayed significant increases in time spent outside of the safe zone (percentage of time spent outside 10 km/hour of the speed limit and 0.8 meters of the lane center;  $P < 0.05$ ), and greater lane and



speed variability (both  $P < 0.01$ ) compared to the snack and no eating conditions. There were no differences between the snack and no eating conditions. **Conclusion** Driver safety during the simulated commute home is greater following the night shift if a snack, rather than a meal, is consumed during the shift.

**Gupta et al. 2021.**

**Scandinavian Journal of Work and Environmental Health, vol. 47, no. 1.**

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**Keywords:** Meal; snack; not eating; night shift; driving; performance; post-shift.

**Evidence Level:** 3A

**Link:** [https://www.sjweh.fi/show\\_abstract.php?abstract\\_id=3934](https://www.sjweh.fi/show_abstract.php?abstract_id=3934)

### **Differences between fixed day shift workers and rotating shift workers in gastrointestinal problems: a systematic review and meta-analysis**

This study comprised a review and compilation of literature to gain an in-depth understanding of the impact of rotating shift work on gastrointestinal health. PubMed, CINAHL, and the Cochrane Library were searched for studies published between January 1, 1985, and June 30, 2020. Fixed day shifts were defined as work shifts that began between 7:00 and 9:00 in the morning. Shifts beginning at any other time were classified as rotating shifts. A meta-analysis was performed using Comprehensive Meta-Analysis Software (CMA) version 3. In the end, 16 studies were included in the meta-analysis. An odds ratio (OR) of 1.56 (95% confidence interval (CI): 1.24-1.95), indicating that gastrointestinal problems are more common in rotating shift workers than in fixed day shift workers. Four gastrointestinal problems, namely, irritable bowel syndrome, constipation, indigestion, and peptic ulcers, were then analyzed separately. Significant differences between rotating shift workers and fixed day shift workers were found only for indigestion and peptic ulcers. For indigestion, the OR was 1.72 (95% CI: 1.28-2.30). For peptic ulcers, the OR was 1.66 (95% CI: 1.19-2.30). Thus, research indicates that rotating shift work may increase the risk of gastrointestinal problems, particularly indigestion and peptic ulcers.

**Chang et al. 2021.**

**Industrial Health.**

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**Keywords:** Fixed day shift; gastrointestinal problems; meta-analysis; rotating shift; worker.

**Evidence Level:** 1A

**Link:** [https://www.istage.jst.go.jp/article/indhealth/advpub/0/advpub\\_2020-0153/article](https://www.istage.jst.go.jp/article/indhealth/advpub/0/advpub_2020-0153/article)

## **Work Ability**

### **How and when job crafting relates to employee creativity: The important roles of work engagement and perceived work group status diversity**

Creative employees are treasured assets for organizations. However, relatively little is known about what specific actions employees can take to manage their own creative process. Taking a motivational perspective, this study examined how job crafting behaviors positively link to employee creative performance through work engagement, and whether perceived work group status diversity moderates this relationship. We conducted a weekly diary study in which 55 employees from a Chinese energy company were asked to fill in diaries over four consecutive weeks (176 observations in total). Results of the multilevel analyses showed that weekly job crafting behaviors were positively related to weekly creative performance through increasing weekly work engagement. In contrast to our expectation, we found that weekly job crafting behaviors were more positively related to weekly creative performance when perceived work group status diversity was high. In summary, our study suggests that job crafting behaviors are effective actions employees can take to manage their creative processes through increasing work engagement. In addition, we stress that status diversity in existing work environments is an important contextual factor that shapes the job crafting process.

**Tian et al. 2021.**

**International Journal of Environmental Research and Public Health, vol. 18, no. 1.**

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**Keywords:** Creativity; diary study; job crafting; perceived work group member status diversity; work engagement.

**Evidence Level:** 5B

**Link:** <https://www.mdpi.com/1660-4601/18/1/291>

### **Mediational occupational risk factors pertaining to work ability according to age, gender and professional job type**

The predictive value of work ability for several health and occupational outcomes is well known. Maintaining the ability to work of all employees has become an important topic in research although some evidence suggests that some groups of workers need greater attention than others. Healthcare workers ( $\bar{x} = 54.46 \pm 5.64$  years) attending routine occupational health checkups completed their work ability, occupational risk and sociodemographic measures. An analysis examined whether work ability differed according to gender, age and professional category. Mediation of these relationships by occupational risk variables, such as work-family conflict, was examined. Females and older adults had worse work ability than their counterparts. Professional group was not independently associated. Gender-related differences were mediated by current and historic ergonomic risk, psychosocial risk and work-family conflict. Age-related differences were mediated by violence/discrimination at work. All job risk variables, apart from current ergonomic risk, mediated associations between professional category and work ability. The present study identified the importance of risk variables for the work ability of health workers according to gender, age and professional job type. Perceptions of work-family conflict and violence-discrimination seem particularly important and should be considered when targeting improvements in work ability.

**Mateo-Rodriguez et al. 2021.**

**International Journal of Environmental Research and Public Health, vol. 18, no. 3.**

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**Keywords:** Age; gender; healthcare workers; mediation; occupational risk; work ability.

**Evidence Level:** 5B

**Link:** <https://www.mdpi.com/1660-4601/18/3/877>

## **Adapting to the Future of Work**

### **Aging Workforce**

#### **The influence of occupational class and physical workload on working life expectancy among older employees**

**Objective** This study investigates the impact of physical workload factors and occupational class on working life expectancy (WLE) and working years lost (WYL) in a sample of older Finnish workers. **Methods** A 70% random sample of Finns in 2004 was linked to a job exposure matrix for physical workload factors and register information on occupational class and labor market status until 2014. Transitions between being at work, time-restricted work disability, unemployment, economic inactivity, disability retirement, retirement and death were estimated. A multistate Cox regression model with transition-specific covariates was used to estimate the WLE and WYL at age 50 up to 63 years for each occupational class and physical workload factor for men and women (N=415 105). **Results** At age 50, male and female manual workers had a WLE of 10.13 and 10.14 years, respectively. Among both genders, manual workers had one year shorter WLE at age 50 than upper non-manual employees. This difference was largely attributable to unemployment (men: 0.60, women: 0.66 years) and disability retirement (men: 0.28, women: 0.29 years). Self-employed persons had the highest WLE (11.08 years). Men and women exposed to four or five physical workload factors had about one year lower WLE than non-exposed workers. The difference was primarily attributable to ill-health-related reasons, including disability retirement (men: 0.45 years, women: 0.53 years) and time-restricted work disability (men: 0.23, women: 0.33 years). **Conclusions** Manual workers and those exposed to physical workload factors had the lowest WLE. The differences in WYL between exposure groups can primarily be explained by ill-health-based exit routes.

Schram et al. 2021.

**Scandinavian Journal of Work and Environmental Health, vol. 47, no. 1.**

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**Keywords:** Occupational class; physical workload; working life expectancy; older employees.

**Evidence Level:** 4B

**Link:** [https://www.sjweh.fi/show\\_abstract.php?abstract\\_id=3919](https://www.sjweh.fi/show_abstract.php?abstract_id=3919)

### **Work factors facilitating working beyond state pension age: Prospective cohort study with register follow-up**

**Objectives:** The demographic changes in Europe underline the need for an extension of working lives. This study investigates the importance of physical work demands and psychosocial work factors for working beyond the state pension age (65 years). **Methods:** We combined data from three cohorts of the general working population in Denmark (DWECS 2005 and 2010, and DANES 2008), where actively employed workers aged 55-59 years replied to questionnaires about work environment and were followed until the age of 66 years in the Danish AMRun register of paid employment. Using logistic regression analyses, we calculated prevalence ratios (PR) and 95% confidence intervals (CI) for the association between physical and psychosocial work factors and working beyond state pension age, adjusted for age, sex, cohort, cohabiting, sector, income, vocational education, working hours, lifestyle, and previous sickness absence.

**Results:** Of the 2884 workers aged 55-59 years, 1023 (35.5%) worked beyond the state pension age. Higher physical work demands was associated with a lower likelihood (PR 0.69, 95% CI 0.58-0.82) and a good psychosocial work environment was associated with higher likelihood (average of 7 items: PR 1.81, 95% CI 1.49-2.20) of working beyond state pension age. Stratified analyses did not change the overall pattern, ie, a good overall psychosocial work environment - as well as several specific psychosocial factors - increased the likelihood of working beyond state pension age, both for those with physically active and seated work.

**Conclusion:** While high physical work demands was a barrier, a good psychosocial work environment seems to facilitate working beyond state pension age, also for those with physically active work.

**Andersen et al. 2021.**

**Scandinavian Journal of Work and Environmental Health, vol. 47, no. 1.**

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**Keywords:** Work factors; pension; working life's; work demands; pension age.

**Evidence Level:** 4B

**Link:** [https://www.sjweh.fi/show\\_abstract.php?abstract\\_id=3904](https://www.sjweh.fi/show_abstract.php?abstract_id=3904)

### **Older workers with physically demanding jobs and their cognitive functioning**

Although employment can provide older people with both financial and nonfinancial rewards, it is questionable whether those benefits extend to all older workers, particularly those with physically demanding jobs. This study aimed to examine whether the perceived level of physical demands placed on older workers 55 or older is significantly associated with their cognitive function. Using the Health and Retirement Study (HRS) 2010 wave, we analyzed two domains of cognition: verbal episodic memory and reasoning. After controlling for demographics and risk factors for age-related cognitive deterioration, the perceived level of physical demands placed on older workers was still significantly and negatively linked with both memory and reasoning domains of cognition. Older workers with more physically demanding jobs tended to have poorer cognitive function. Further longitudinal studies are needed to confirm this relationship.

**Choi et al. 2021.**

**Aging International.**

**User License:** *PMC Open Access*

**Keywords:** Cognitive function; employment; older workers; physically demanding jobs; productive aging.

**Evidence Level:** 4A

**Link:** <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7791149/>

### **An assessment of the work ability, disability and quality of life of working people of pre-retirement and retirement age in Poland - a cross-sectional pilot study**

**Objectives:** The aim of this work was to assess the work ability, health status, disability and quality of life of working people of pre-retirement and retirement age, as well as to analyze factors affecting the ability to perform work in older age. **Material and methods:** A cross-sectional pilot study was conducted in the Podkarpackie and Świętokrzyskie voivodeships, Poland, in randomly selected workplaces of intellectual nature. It was carried out by means of direct interviews in the workplace of the surveyed people, using the Work Ability Index, a questionnaire based on the WHO Disability Assessment Schedule 2.0, the WHO Quality of Life-BREF questionnaire, the Geriatric Depression Scale, and the Visual Analogue Scale (VAS). The criteria for inclusion were: age 55-75 years and informed consent to participate in the study. Overall, 201 complete questionnaires were included in the analysis. Demographic data is presented using descriptive statistics measurements. The logistic regression model was used to identify factors related to work ability.

**Results:** The vast majority (69.66%) of employees performing intellectual work had moderate or poor work ability. The average level of general disability in the studied group was mild (20.65), and the quality of life was quite good (64.73). A significant problem among the surveyed people was a quite high average level of pain (VAS = 3.99), the occurrence of depression (73.63%), as well as musculoskeletal (64.18%) and cardiovascular diseases (52.24%). The most important factor contributing to a better work ability was the adaptation of the workplace to functional and health related needs (OR = 7.79). Psychological well-being (OR = 1.12), cognitive performance (OR = 0.97) and a smaller number of chronic diseases (OR = 0.58) were also important factors. **Conclusions:** Preparation of elderly people for professional activity should be conducted in 2 different ways, i.e., by means of education and implementation of an active, healthy lifestyle, and increasing control over one's own health and factors determining it, as well as by the proper organization of working space, and quick access to treatment and rehabilitation, especially in the case of musculoskeletal and cardiovascular diseases.

**Cwirlej-Sozanska et al. 2021.**

**International Journal of Occupational Medicine and Environmental Health, vol. 34, no. 1.**

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**Keywords:** Work Ability Index; disability; older workers; pre-retirement and retirement age; quality of life; work ability.

**Evidence Level:** 4B

**Link:** <http://ijomeh.eu/An-assessment-of-the-work-ability-disability-and-quality-of-life-of-working-people,126620,0,2.html>

## **Technology**

### **A practical experience on the Amazon Alexa integration in smart offices**

Smart offices are dynamically evolving spaces meant to enhance employees' efficiency, but also to create a healthy and proactive working environment. In a competitive business world, the challenge of providing a balance between the efficiency and wellbeing of employees may be supported with new technologies. This paper presents the work undertaken to build the architecture needed to integrate voice assistants into smart offices in order to support employees in their daily activities, like ambient control, attendance system and reporting, but also interacting with project management services used for planning, issue tracking, and reporting. Our research tries to understand what are the most accepted tasks to be performed with the help of voice assistants in a smart office environment, by analyzing the system based on task completion and sentiment analysis. For the experimental setup, different test cases were developed in order to interact with the office environment formed by specific devices, as well as with the project management tool tasks. The obtained results demonstrated that the interaction with the voice assistant is reasonable, especially for easy and moderate utterances.

**Bogdan et al. 2021.**

**Sensors (Basel), vol. 21, no. 3.**

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**Keywords:** Amazon Alexa; Jira; internet-of-things; project management tool; sentiment analysis; smart office; usability; voice assistant.

**Evidence Level:** 6A

**Link:** <https://www.mdpi.com/1424-8220/21/3/734>

## Guiding and Supporting Mental Health and Wellbeing

### Mental Health

**The potential of using hair cortisol to measure chronic stress in occupational healthcare; a scoping review**

**Objectives:** Workplace-based selective prevention of mental health problems currently relies on subjective evaluation of stress complaints. Hair cortisol captures chronic stress responses and could be a promising biomarker for the early identification of mental health problems. The objective was to provide an overview of the state-of-the-art knowledge on the practical value of hair cortisol in the occupational setting.

**Methods:** We performed a scoping review of cross-sectional and longitudinal studies in PubMed, Embase, and PsycINFO up to November 2019 assessing the relations of hair cortisol with work-related stressors, perceived stress, and mental health outcomes in healthy workers. **Results:** We found five longitudinal studies, of which two observed an increase in work-related stressors to be associated with higher hair cortisol, one found a relation with lower hair cortisol and one did not find a relationship. Findings of cross-sectional studies were also mixed. The one available longitudinal study regarding mental health showed that hair cortisol was not related to depressive symptoms. **Conclusions:** Hair cortisol measurement within occupational health research is still in its early stage and more longitudinal studies are urgently needed to clarify its relationship with work-related stressors and perceived stress before hair cortisol can be used to identify workers at risk for mental health problems.

**Schaafsma et al. 2021.**

**Journal of Occupational Health, vol. 63, no. 1.**

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**Keywords:** Disease prevention; glucocorticoids; mental stress; work related.

**Evidence Level:** 6A

**Link:** <https://onlinelibrary.wiley.com/doi/10.1002/1348-9585.12189>

### Increased risk of suicide after occupational injury in Korea

**Objectives:** This study sought to investigate the association between occupational injury and subsequent risk of suicide in Korea. **Methods:** We linked compensation data for 775 537 workers injured at work during 2003-2014 with National Death Registry through 2015. Suicide among injured workers was compared with the economically active population in Korea separately for men and women by calculating SMRs, with 95% CIs. **Results:** Injured workers showed higher mortality from suicide for both men (SMR=2.22, 95% CI 2.14 to 2.31) and women (SMR=2.11, 95% CI 1.81 to 2.45) compared with the economically active population in Korea. **Conclusions:** Occupational injuries are associated with substantially elevated suicide risk in Korea. The results suggest the importance of social policies to protect and support injured workers as well as intensifying efforts to prevent workplace injuries.

**Lee et al. 2021.**

**Occupational and Environmental Medicine, vol. 78, no. 1.**

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**Keywords:** Accident; disability; mortality; occupational safety.

**Evidence Level:** 4B

**Link:** <https://oem.bmj.com/content/78/1/43.long>



### **Predictors of psychological distress and mental health resource utilization among employees in Malaysia**

We sought to examine predictors of psychological distress among employees as well as the level of awareness and usage of available mental health resources by employees through their own organizations. The Malaysian Healthiest Workplace survey cross-sectional dataset was used to explore the association between psychological distress, a range of health conditions, as well as mental health resource awareness and usage in a sample of 11,356 working Malaysian adults. A multivariate logistic regression was conducted to determine predictors of high psychological distress. Comorbid illnesses that were associated with psychological distress were mental illness (OR 6.7, 95% CI 4.39-10.14,  $p = 0.001$ ), heart conditions (OR 2.17, 95% CI 1.18-3.99,  $p = 0.012$ ), migraines (OR 1.59, 95% CI 1.33-1.90,  $p = 0.001$ ), bronchial asthma (OR 1.43, 95% CI 1.11-1.85,  $p = 0.006$ ), and hypertension (OR 1.42, 95% CI 1.07-1.88,  $p = 0.016$ ) compared to individuals with no comorbid conditions. A total of 14 out of 17 comorbid medical illnesses were associated with elevated levels of psychological distress among employees. Awareness and usage of support services and resources for mental health were associated with lower psychological distress. These findings extend the literature by providing further evidence on the link between chronic illness, occupational type, as well as awareness and use of mental health resources by psychological distress status.

**Chan et al. 2021.**

**International Journal of Environmental Research and Public Health, vol. 18, no. 1.**

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**Keywords:** Employee resource utilization; psychological distress; workplace health; workplace mental health.

**Evidence Level:** 4B

**Link:** <https://www.mdpi.com/1660-4601/18/1/314>

### **Interrelationships between job demands, low back pain and depression: A four-way decomposition analysis of direct and indirect effects of job demands through mediation and/or interaction**

**Background:** Psychosocial work stressors may lead to low back pain (LBP) through depressive symptoms or to depression through LBP. Depressive symptoms or LBP may also modify these associations. **Methods:** We examined prospective interrelationships between job demands, LBP and depressive symptoms. We used comparable data from three consecutive biennial surveys in 2010-2016, from the Swedish Longitudinal Occupational Survey of Health (SLOSH) and the Work Environment and Health in Denmark (WEHD) cohorts, broadly representative of the working populations in Sweden and Denmark. We conducted multivariate counterfactual based mediation analyses allowing for four-way decomposition of the total effect of job demands, on incident LBP (N=2813, 2701) and incident major depression (N=3707, 5496). The four components estimated direct and indirect effects through mediation and/or interaction. **Results:** We observed no association between job demands and incident LBP four years later, but job demands was associated with later major depression (relative risks=1.88, 95% confidence interval=1.45-2.31 in SLOSH and 1.64, 1.18-2.11 in WEHD, adjusted for age, sex, panel (SLOSH data), education, cohabitation, physically strenuous work and chronic diseases. About 37% of the association was attributed to interaction between job demands and LBP in SLOSH. No interaction was found in WEHD. LBP partly mediated the relationship, by 14% in SLOSH and 2%, while statistically insignificant in WEHD. **Limitations:** Possible limitations include lack of comparable data on disabling low back pain, different scales for depressive symptoms, misclassification and residual confounding. **Conclusions:** This suggests mainly a direct effect of job demands on major depression, or through other pathways than LBP.

**Ahlin et al. 2021.**

**Journal of Affective Disorder, vol. 282, no. 219.**

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**Keywords:** Depression; interaction; job demands; low back pain; mediation; psychosocial working conditions.

**Evidence Level:** 4B

**Link:** <https://www.sciencedirect.com/science/article/pii/S0165032720331517?via%3Dihub>



### **The health-related quality of life, work productivity, healthcare resource utilization, and economic burden associated with levels of suicidal ideation among patients self-reporting moderately severe or severe major depressive disorder in a national survey**

**Background:** Suicidal ideation (SI) is a cardinal aspect of major depressive disorder (MDD); however, patient-reported outcomes data from large-scale surveys are limited concerning SI in the context of MDD. This study aims to understand the association between varying levels of SI and health-related quality of life (HRQoL), work productivity, healthcare resource utilization (HRU), and associated costs in patients with moderately severe/severe MDD. **Methods:** This was a retrospective, cross-sectional analysis of 2013 national survey data. Patients who self-reported moderately severe or severe MDD and completed the Short Form Survey Version 2 (SF-36v2), Work Productivity Loss and Activity Impairment questionnaire (WPAI), and questions related to HRU were analyzed. Direct and indirect costs were calculated. Patients were categorized and analyzed by the level of SI (no SI, low, moderate, and high) based on their response to Item 9 of the Patient Health Questionnaire-9. **Results:** Among 75,000 respondents, 15.3% self-reported receiving a physician diagnosis of moderately severe or severe MDD and 2.8% of the total sample endorsed some level of SI. Patients with high SI showed a higher burden than patients with no SI, reporting lower mean SF-36v2 mental component summary scores ( $p<0.001$ ), higher work productivity loss ( $p=0.039$ ), and higher numbers of per patient per month hospitalizations ( $p=0.002$ ) and emergency room visits ( $p=0.011$ ). High SI was associated with greater per patient per month direct costs (\$1220 vs \$796;  $p=0.002$ ) and indirect costs (\$1449 vs \$1058;  $p=0.001$ ) compared with no SI. When patients with low or moderate SI were compared with patients with no SI, the results were mixed. **Conclusion:** Higher levels of SI were associated with lower HRQoL, greater HRU, and more work impairment resulting in higher direct and indirect costs compared with patients with MDD but no SI. These results highlight the need to implement effective treatment models and interventions in the employed population.

**Benson et al. 2021.**

**Neuropsychiatric Disease and Treatment, vol. 17.**

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**Keywords:** Economic burden; health-related quality of life; major depression; suicidal ideation.

**Evidence Level:** 4A

**Link:** <https://www.dovepress.com/the-health-related-quality-of-life-work-productivity-healthcare-resource-peer-reviewed-article-NDT>

### **Bullying and Harassment**

#### **Exposure to bullying behaviours, resilience, and return to work self-efficacy in patients on or at risk of sick leave**

The study investigated relationships between exposure to bullying behaviours, return to work self-efficacy (RTW-SE) and resilience, and if resilience moderates the bullying-RTW-SE relationship among patients on sick leave or at risk of sick leave due to common mental disorders (CMD). A sample of 675 patients treated in an outpatient clinic was analysed using regressions and moderation analyses by employing SPSS and the Process macro SPSS supplement. The results showed a negative relationship between exposure to bullying behaviours and RTW-SE. There was also a positive main effect for resilience, as patients with high resilience score significantly higher on RTW-SE than patients with low resilience irrespective of levels of bullying. Further, the resilience sub-dimension personal resilience moderated the bullying-RTW-SE relationship, while the sub-dimension interpersonal resilience did not. Patients high on personal resilience showed relatively lower RTW-SE scores when exposed to bullying behaviours, compared to those that were not bullied with high personal resilience levels. Hence, one should take note of the fact that even if resilience may strengthen RTW-SE, bullying is an adverse event which particularly affects individuals who present with relatively high levels of resilience resources, at least when it comes to RTW-SE.

**Aarestad et al. 2021.**

**Industrial Health.**

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**Keywords:** Common mental disorders; resilience; return to work self-efficacy; sick leave; workplace bullying.

**Evidence Level:** 4A

**Link:** [https://www.istage.jst.go.jp/article/indhealth/advpub/0/advpub\\_2020-0064/article](https://www.istage.jst.go.jp/article/indhealth/advpub/0/advpub_2020-0064/article)

## Psychosocial Issues – Risk Factors

### Impact of work-family balance results on employee work engagement within the organization: The case of Slovenia

**Background and purpose:** Organizations strive to increase the work engagement of their employees, as engaged employees are more productive employees, but often neglect the significant effects of work-family balance on work engagement. Numerous studies confirm the importance of work-family balance and work engagement, but there is lack of research that explores the relationship between the concepts. Our research fills a research gap in investigating the impact of work-family balance on work engagement, both directly and through individual perceptions of organizational support for work-family balance. The main aim of our research is to empirically test the relationships between the policies and practices of organizations regarding work-family balance, work-life balance and work engagement. **Methods:** Using validated questionnaires, we collected data on organizational support for work-family balance (family-friendly policies and practices, support by leader, support by co-workers, working hours and complexity of work), work-family balance and work engagement. The quantitative data for our analysis was collected through a survey of 343 online participants who were employees in various positions in companies in Slovenia. **The results:** Our results show that the organization's work-family balance policies and practices, such as support by leader, co-workers, and family-friendly policies and practices, have a positive impact on the individual's work-family balance, that work-family balance leads to an increase in work engagement, and that the individual's perception of the organization's work-family balance support leads to an increase in work engagement. **Conclusion:** Knowledge of important work-family balance implications with an understanding of organizational support for work-family balance and the relationships between the constructs of work-family balance and work engagement can be beneficial to business leaders. This understanding can help them to strengthen employee work engagement through family-friendly policies and practices, and thereby contributing to the area of employee behavior and improving employee productivity.

**Znidarsic et al. 2021.**

**PLoS One, vol. 16, no. 1.**

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**Keywords:** Work-family balance; employee; work engagement; organization.

**Evidence Level:** 5B

**Link:** <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0245078>

### Associations between physical and psychosocial work environment factors and sickness absence incidence depend on the lengths of the sickness absence episodes: a prospective study of 27 678 Danish employees

**Objectives:** This study examined if the association between work environment factors and sickness absence (SA) depended on the inclusion or exclusion of short-term SA episodes. **Methods:** We linked the 'Work Environment and Health in Denmark' survey with the 'Danish Register of Work Absences' (n=27 678). Using covariate adjusted Cox regression, we examined the associations between work environment factors and SA by changing the cut-off points for the length of the SA episodes, for example, episodes  $\geq 1$  day,  $\geq 6$  days and  $\geq 21$  days. We examined three physical work environment factors: 'Back bend or twisted', 'Lifting or carrying', 'Wet hands' and three psychosocial work environment factors: 'Poor influence', 'Role conflicts' and 'Bullying'. **Results:** 'Back bend or twisted' and 'Lifting or carrying' had small significant HRs for SA episodes  $\geq 1$  day and large and highly significant HRs for SA episodes  $\geq 6$  days and  $\geq 21$  days. 'Wet hands' had

small significant HRs for SA episodes  $\geq 1$  day for both sexes and large and highly significant HR for  $\geq 6$  days for women. HRs of all three psychosocial factors were highly significant for SA episodes  $\geq 1$  day and  $\geq 6$  days for both sexes, and 'Poor influence' and 'Role conflicts' were significant for SA episodes  $\geq 21$  days for women. **Conclusions:** The physical work factors had higher associations with SA when SA episodes of 1-5 days were excluded and focus was on SA episodes  $\geq 6$  days. The psychosocial work factors were strongly associated with SA both with and without SA episodes of 1-5 days included in the analyses.

**Thorsen et al. 2021.**

**Occupational and Environmental Medicine, vol. 78, no. 1.**

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**Keywords:** Longitudinal studies; physical work; sickness absence.

**Evidence Level:** 4B

**Link:** <https://oem.bmj.com/content/78/1/46.long>

### **Using residual dynamic structural equation modeling to explore the relationships among employees' Self-reported health, daily positive mood, and daily emotional exhaustion**

This study examined the relationships among self-reported health, daily positive mood, and daily emotional exhaustion among employees in health and fitness clubs using residual dynamic structural equation modeling (RDSEM). A questionnaire was completed by 179 employees at recruitment and then a diary survey over 10 consecutive workdays. Results of RDSEM analyses revealed that daily positive mood was negatively associated with daily emotional exhaustion at both within-person and between-person levels. Self-reported health was positively related to the person's mean of daily positive mood and negatively associated with the person's mean of daily emotional exhaustion. Self-reported health moderated the relationship between daily positive mood and daily emotional exhaustion; employees with higher self-reported health levels tend to respond with larger changes in their daily emotional exhaustion when their daily positive mood changes. These findings provide important insights for organizations aiming at their employees' health, happiness, and job burnout.

**Kung et al. 2021.**

**Healthcare (Basel), vol. 9, no. 1.**

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**Keywords:** Daily emotional exhaustion; daily positive mood; residual dynamic; self-reported health; structural equation modeling.

**Evidence Level:** 5A

**Link:** <https://www.mdpi.com/2227-9032/9/1/93>

### **The impact of work hours on depressive symptoms among Koreans aged 45 and over**

**Background:** Given the documented importance of employment for middle-aged and older adults' mental health, studies of the association between their number of work hours and depressive symptoms are needed. **Objectives:** To examine the association between the number of work hours and depressive symptoms in Korean aged 45 and over. **Methods:** We used data from the first wave to fourth wave of the Korea Longitudinal Study of Aging. Using the first wave at baseline, data included 9845 individuals. Depressive symptoms were measured using the 10-item Center for Epidemiological Studies Depression scale. We performed a longitudinal analysis to estimate the prevalence of depressive symptoms by work hours. **Results:** Both unemployed males and females aged 45-65 years were associated with higher depressive symptoms ( $\beta = 0.59, p < 0.001$ ;  $\beta = 0.32, p < 0.001$ ). Females working  $\geq 69$  h were associated with higher depressive symptoms compared to those working 41-68 h ( $\beta = 0.25, p = 0.013$ ). Among those both middle-aged and older adults, both males and females unemployed were associated with higher depressive symptoms. Those middle-aged female working  $\geq 69$  h were associated with higher depressive symptoms. **Conclusions:** An increase in depressive symptoms was associated with unemployed males and females working  $\geq 69$  h compared to those working 41-68 h. Although this association was found among middle-aged individuals, a decrease in depressive symptoms in both sexes was associated with working 1-40 h. Depressive symptoms should decrease by implementing employment policies and social services to

encourage employers to support middle-aged and older adults in the workforce considering their sex and age differences.

**Kim et al. 2021.**

**International Journal of Environmental Research and Public Health, vol. 18, no. 3.**

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**Keywords:** Depressive symptoms; females; males; middle-aged and older adults; unemployment; workforce.

**Evidence Level:** 4B

**Link:** <https://www.mdpi.com/1660-4601/18/3/853>

## Enabling Healthy and Safe Workplaces

### Health and Wellbeing

#### **Smoking and long-term sick leave in a Japanese working population: Findings of the Japan epidemiology collaboration on occupational health study**

**Background:** Few studies have investigated the association between tobacco smoking and sick leave (SL) in Japan. **Methods:** We followed 70 896 workers aged 20-59 years (60 133 males, 10 763 females) between April 2012 and March 2017. A Cox proportional hazards model was used to investigate the associations between smoking (smoking status and intensity) and long-term SL (ie, SL lasting  $\geq 30$  consecutive days). Cause-specific analyses were also conducted. **Results:** A total of 1777 people took long-term SL during a follow-up of 307 749 person years. Compared with never-smokers, current smokers were at a higher risk of long-term SL (hazard ratio [HR] = 1.32; 95% confidence interval [CI] = 1.19 to 1.48). Cause-specific analyses revealed that current smoking was associated with a higher risk of SL due to all physical disorders (HR = 1.44, 95% CI = 1.22 to 1.69), cancer (HR = 1.49, 95% CI = 1.10 to 2.01), cardiovascular disease (CVD; HR = 2.16, 95% CI = 1.31 to 3.55), and injuries/external causes (HR = 1.83, 95% CI = 1.31 to 2.58). Former smokers were at a higher risk of SL due to cancer at a borderline significance level (HR = 1.38, 95% CI = 0.99 to 1.92). Low-intensity smoking (ie, 1-10 cigarettes smoked per day) was associated with all-cause SL, SL due to CVD, and SL due to injuries/external causes compared with never-smokers. **Conclusion:** In a large cohort of working-age Japanese, smoking was associated with a greater risk of long-term SL. Greater effort is needed to mitigate disease burden associated with smoking at workplace in Japan. **Implications:** Our study contributes to the literature on the association between smoking and SL in several ways. First, the study was conducted among a Japanese working population. While the association has been extensively studied in Western setting, few attempts have been made elsewhere. Second, cause-specific analyses were undertaken in our study. Third, we paid attention to the effect of low-intensity smoking on SL given that there is growing evidence of an elevated health risk associated with low-intensity smoking.

**Hori et al. 2021.**

**Nicotine and Tobacco Research, vol. 23, no. 1.**

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**Keywords:** Smoking; sick leave; long term; working population; Japan.

**Evidence Level:** 4A

**Link:** <https://academic.oup.com/ntr/article/23/1/135/5611317>

#### **Alterations in the intestinal microbiome and mental health status of workers in an underground tunnel environment**

**Background:** Working in an underground tunnel environment is unavoidable in professions such as miners and tunnel workers, and there is a concern about the health of these workers. Few studies have addressed alterations in the intestinal microbiome of workers within that environment. **Results:** Fecal samples were collected from the workers before they entered the tunnel (baseline status, BS) and after they left the tunnel (exposed status, ES), respectively (a time period of 3 weeks between them). We analyzed 16S rRNA sequencing to show the changes in microbial composition and self-evaluation of mental health

questionnaire was also performed. The results showed that Shannon and Simpson indices decreased significantly from BS to ES. A higher abundance was found in the phylum Actinobacteria, classes Actinobacteria and Deltaproteobacteria, orders Bifidobacteriales, Coriobacteriales, and Desulfovibrionales, families Bifidobacteriaceae, Peptostreptococcaceae, Coriobacteriaceae, Clostridiaceae\_1, Desulfovibrionaceae, Pseudomonadaceae, and Microbacteriaceae, and genera Bifidobacterium, Romboutsia, Clostridium sensu stricto, and Leucobacter in ES, while BS showed greater levels of genera Faecalibacterium and Roseburia. The self-evaluation showed that at least one-half of the tunnel workers experienced one or more symptoms of mental distress (inattention, sleeplessness, loss of appetite, headache or dizziness, irritability) after working in the underground tunnel environment.

**Conclusions:** Collectively, the underground tunnel environment led to alterations in the intestinal microbiome, which might be relevant to symptoms of mental distress in underground-tunnel workers.

**Lu et al. 2021.**

**BMC Microbiology, vol. 21, no. 1.**

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**Keywords:** 16S rRNA; Brain-gut-microbiota axis; Gut microbiome; Mental distress; Underground tunnel environment.

**Evidence Level:** 5A

**Link:** <https://bmcmicrobiol.biomedcentral.com/articles/10.1186/s12866-020-02056-3>

### **Dogs at the workplace: A multiple case study**

As the work environment is increasing in competitiveness and stressfulness, more and more companies try to increase employee well-being. One option is allowing employees to bring their dogs to work, building on the considerable evidence that dogs have a positive influence on people's well-being. However, little is known about how a dog's presence influences the employees and the companies in offices. Therefore, we empirically scrutinize the presence of dogs in organizations and the impact of pet-friendly organizational policies, with multiple case studies with semi-structured interviews as their foundation. Based on an inductive approach for the data analysis, we found that organizational members consider that dogs can lower their stress, improve communication, and foster social cohesion when a flexible organizational culture is in place. This includes the following: Problems in the company are openly addressed; employees have job autonomy, with flexibility to take breaks; and mistakes and errors are allowed to be made by employees and their companions alike, and room to find solutions is given. The inflexible permission of pets at work can, on the contrary, create pressure and stress in employees. For the business world, this implicates that this kind of incentive only leads to success if the right framework and culture is in place, and it cannot only be seen as an instrument to increase employee well-being.

**Wagner et al. 2021.**

**Animals, vol. 11, no. 1.**

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**Keywords:** Dogs in organizations; human–dog relationship; pet-friendly policies.

**Evidence Level:** 4A

**Link:** <https://www.mdpi.com/2076-2615/11/1/89>

## **Work Health and Safety**

### **Where to find evidence-based information on occupational safety and health?**

**Background:** Occupational Safety and Health (OSH) professionals must base their advice and interventions on evidence from science, in balance with their expertise, and with workers' and other stakeholders' values and preferences. Evidence-based professional practice is one of the remedies against misinformation creating confusion and distrust in the society. **Objectives:** To present, for OSH professionals, an overview and critical considerations about concepts, strategies, and tools needed for an accurate search for evidence-based information. **Methods:** Information sources have been collected and discussed as a base for a documented vision on knowledge questions, online information sources, search engines, databases, and tools. **Results:** Every search should start with a carefully phrased question. To help finding a reliable



answer, potential evidence-based online sources are presented. Systematic reviews and original scientific articles are regarded as primary sources. Secondary and tertiary sources are discussed, such as practice guidelines, point-of-care summaries, advisory reports, quality websites or apps, Wikipedia, quality videos, and e-lessons. To find sources, adequate use of search engines and databases is required. Examples are discussed briefly, such as PubMed/MEDLINE, Virtual Health Library, NICE, Cochrane Library, Cochrane Work, Google (Scholar), and YouTube. **Conclusions:** Evidence-based practice in OSH must be stimulated, relying mainly on trusted online sources. The breadth of appropriate information sources is wider than described in most publications. Search engines facilitate the finding of quality reports, videos, e-courses, and websites. Such sources can be explored by well-trained professionals to complement the use of scientific articles, reviews, point-of-care summaries, and guidelines. Adequate use of online information sources requires awareness, motivation, and skills in professionals and educators. To date, the quality of skills in searching is low, thus a more adequate education is crucial. The quality of sources, search engines, and databases will be considered more thoroughly in another study. International collaboration is profitable and needs new drivers.

**Dijk et al. 2021.**

**Annals of Global Health, vol. 87, no. 1.**

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**Keywords:** Evidence-based; information; occupational safety; occupational health.

**Evidence Level:** 6A

**Link:** <https://annalsofglobalhealth.org/articles/10.5334/aogh.3131/>

### **Economic burden of work injuries and diseases: a framework and application in five European Union countries**

**Background:** Estimates of the economic burden of work injuries and diseases can help policymakers prioritize occupational health and safety policies and interventions in order to best allocate scarce resources. Several attempts have been made to estimate these economic burdens at the national level, but most have not included a comprehensive list of cost components, and none have attempted to implement a standard approach across several countries. The aim of our study is to develop a framework for estimating the economic burden of work injuries and diseases and implement it for selected European Union countries. **Methods:** We develop an incidence cost framework using a bottom-up approach to estimate the societal burden of work injuries and diseases and implement it for five European Union countries. Three broad categories of costs are considered—direct healthcare, indirect productivity and intangible health-related quality of life costs. We begin with data on newly diagnosed work injuries and diseases from calendar year 2015. We consider lifetime costs for cases across all categories and incurred by all stakeholders. Sensitivity analysis is undertaken for key parameters. **Results:** Indirect costs are the largest part of the economic burden, then direct costs and intangible costs. As a percentage of GDP, the highest overall costs are for Poland (10.4%), then Italy (6.7%), The Netherlands (3.6%), Germany (3.3%) and Finland (2.7%). The Netherlands has the highest per case costs (€75,342), then Italy (€58,411), Germany (€44,919), Finland (€43,069) and Poland (€38,918). Costs per working-age population are highest for Italy (€4956), then The Netherlands (€2930), Poland (€2793), Germany (€2527) and Finland (€2331). **Conclusions:** Our framework serves as a template for estimating the economic burden of work injuries and diseases across countries in the European Union and elsewhere. Results can assist policymakers with identifying health and safety priority areas based on the magnitude of components, particularly when stratified by key characteristics such as industry, injury/disease, age and sex. Case costing can serve as an input into the economic evaluation of prevention initiatives. Comparisons across countries provide insights into the relevant performance of health and safety systems.

**Tompa et al. 2021.**

**BMC Public Health, vol. 21, no. 1.**

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**Keywords:** Attributable fractions; bottom-up; eurostat; incidence; national-level; stakeholders; underestimation.

**Evidence Level:** 5B

**Link:** <https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-020-10050-7>



### **The future of research on work, safety, health and wellbeing: A guiding conceptual framework**

Work plays a central role in health. A conceptual model can help frame research priorities and questions to explore determinants of workers' safety, health, and wellbeing. A previous conceptual model focused on the workplace setting to emphasize the role of conditions of work in shaping workers' safety, health and wellbeing. These conditions of work include physical, organizational, and psychosocial factors. This manuscript presents and discusses an updated and expanded conceptual model, placing the workplace and the conditions of work within the broader context of socio-political-economic environments and consequent trends in employment and labor force patterns. Social, political and economic trends, such as growing reliance on technology, climate change, and globalization, have significant implications for workers' day-to-day experiences. These structural forces in turn shape employment and labor patterns, with implications for the availability and quality of jobs; the nature of relationships between employers and workers; and the benefits and protections available to workers. Understanding these patterns will be critical for anticipating the consequences of future changes in the conditions of work, and ultimately help inform decision-making around policies and practices intended to protect and promote worker safety, health, and wellbeing. This model provides a structure for anticipating research needs in response to the changing nature of work, including the formation of research priorities, the need for expanded research methods and measures, and attention to diverse populations of enterprises and workers. This approach anticipates changes in the way work is structured, managed, and experienced by workers and can effectively inform policies and practices needed to protect and promote worker safety, health and wellbeing.

**Sorensen et al. 2021.**

**Social Science and Medicine.**

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(<https://creativecommons.org/licenses/by-nc-nd/4.0/>)

**Keywords:** Conceptual model; future of work; total worker health; work organization; worker health and safety; worker well-being; working conditions.

**Evidence Level:** 6A

**Link:** <https://www.sciencedirect.com/science/article/pii/S0277953620308121?via%3Dihub>

### **Vaping in the workplace: Prevalence and attitudes among employed US adults**

**Objective:** Describe workplace vaping, prevalence of observed use, attitudes, and perceptions among US adults. **Methods:** Employees of companies with more than 150 employees, drawn from an opt-in national online panel (N = 1607), ages 18 to 65, completed an online survey in November 2019. **Results:** Majority (61.6%) observed coworkers vaping at work and 19.1% reported vaping at work themselves. Participants perceived workplace vaping as moderately harmful (M = 1.9 out of 3), 63.2% were bothered by workplace vaping and 52.1% thought it decreased workplace productivity among non-users. Multiple regression models found workplace vaping prevalence varied by industry and participant characteristics, and attitudes about it varied by tobacco use status. **Conclusions:** Workplace vaping and vaping exposure is common in US workplaces. Employees, particularly non-users, hold generally negative perceptions of workplace vaping. Comprehensive policies to prevent workplace vaping are needed to protect workers.

**Romberg et al. 2021.**

**Journal of Occupational and Environmental Medicine, vol. 63, no. 1.**

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(<https://creativecommons.org/licenses/by-nc-nd/4.0/>)

**Keywords:** Vaping; workplace; use; attitudes; perceptions.

**Evidence Level:** 4A

**Link:**

[https://journals.lww.com/joem/Fulltext/2021/01000/Vaping\\_in\\_the\\_Workplace\\_Prevalence\\_and\\_Attitudes.2.aspx](https://journals.lww.com/joem/Fulltext/2021/01000/Vaping_in_the_Workplace_Prevalence_and_Attitudes.2.aspx)

### **Medical unfitness for work at sea: causes and incidence rate over a 12-year period in France**

**Background:** The purposes of the study were first to determine the incidence rate of medical unfitness for work at sea among French seafarers, second to identify the conditions (diseases or accidents) causing such incapacity so as to set up prevention measures where possible and third to ascertain whether there were any overrepresentations of diseases according to category of unfit seafarers (fishers, merchant seafarers, shellfish farmers and professional sailors). **Methods:** An exhaustive, observational, descriptive, retrospective epidemiological and nosological study was carried out based on the medical coding of files stored in the Aesculapius® national database, which registers all medical data regarding seafarers presenting at the French seafarers' health services. The increasing rate of permanent medical unfitness for work at sea was calculated in relation to the annual number of registered seafarers. A 12-year span was chosen in an attempt to ascertain the different sociodemographic categories associated with incapacity. **Results:** In all, 2392 seafarers were declared unfit for work at sea. This represents a permanent medical unfitness for work at sea incidence rate of below 1% for all French seafarers examined for medical fitness between 2005 and 2016. The average age of the population of unfit seafarers was 48. The average time spent at sea before being declared unfit for work at sea was 15.5 years. Sixty-seven percent of the seafarers declared unfit had been working in the fishing sector. The main reasons for deciding permanent unfitness for work at sea were: rheumatological conditions associated specifically with the spine; injuries relating to accidents or other external causes, mostly affecting the upper limbs; mental and behavioural disorders, including mood disorders and particularly addictions; and diseases of the circulatory system, namely coronopathies. The incidence rate of medical unfitness for work at sea was seen to increase between 2005 and 2016, but a decrease due to the dilution effect was noted in 2015. **Conclusions:** Permanent unfitness seldom occurs among French professional seafarers. Prevention measures must be focused on musculoskeletal disorders, psychiatric affections and coronary conditions as well as on combatting maritime accidents, especially in the professional fishing sector, where such affections and accidents are overrepresented.

**Lodde et al. 2021.**

**Journal of Occupational Medicine and Toxicology, vol. 16, no. 1.**

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**Keywords:** Accident; cardiovascular; disease; incapacity; incidence; maritime; mental; musculoskeletal disorder; neurological; seafarer; unfitness.

**Evidence Level:** 4B

**Link:** <https://occup-med.biomedcentral.com/articles/10.1186/s12995-021-00291-6>

### **Risk Assessment**

#### **Routine pre-employment echocardiography assessment in young adults: cost and benefits**

**Background:** Conventional echocardiography is a safe, available, and accurate tool for cardiac structural and functional evaluation, but it should not cancel clinical assessment and history taking, and indeed both are complementary. A pre-employment assessment is important for employees and community safety and suitability for a specific work requirement. **Results:** Aiming to assess the value of routine pre-employment echocardiography for the detection of cardiac abnormalities, we examined seven hundred ninety-five persons who were routinely referred to us for pre-employment conventional echocardiography. Only 9 persons had structural cardiac abnormalities (1.3%) and distributed as follows: two had bicuspid aortic valve with isolated aortic regurgitation, one of them had mild AR, and the other had moderate AR. Two cases had mitral valve prolapse, one of them had trivial MR, while the other had a flail anterior leaflet with severe MR. One patient had atrial septal defect 1.5 cm with mild pulmonary hypertension and right-sided chambers dilatation. One patient had dextrocardia (situs inversus totalis) without other cardiac problems. One had moderate pulmonary hypertension and modest right-sided chambers dilation. Two patients had left ventricular hypertrophy. Surprisingly, we did not detect rheumatic valvular heart disease. The money cost of echocardiography tests for those 795 persons was 198,750 Egyptian pounds (LE); their transportation cost was about 19,800LE. The total group time cost of the tests was 265 h, total time lost at the waiting room was 1590 h, total transportation time loss was 2385 h, so the total time cost was about

4000 h. Using psychological stress questionnaire, 33 participants (4.2%) had results suggestive of a low sense of psychological pressure due to echocardiography examination, 221 participants (27.8%) had results suggestive of a moderate feeling of stress, while 541 participants (68%) had results suggestive of a high sense of stress. **Conclusion:** We recommend against routine echocardiography for cardiac assessment in pre-employment assessment and to do it only for persons with abnormal clinical or ECG findings.

**Gaafar et al. 2021.**

**Egyptian Health Journal, vol. 73, no. 1.**

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**Keywords:** Echocardiography; money cost; pre-employment assessment psychological stress.

**Evidence Level:** 5A

**Link:** <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7788111/>

## Ergonomics

### **Wearable devices for ergonomics: A systematic literature review**

Wearable devices are pervasive solutions for increasing work efficiency, improving workers' well-being, and creating interactions between users and the environment anytime and anywhere. Although several studies on their use in various fields have been performed, there are no systematic reviews on their utilisation in ergonomics. Therefore, we conducted a systematic review to identify wearable devices proposed in the scientific literature for ergonomic purposes and analyse how they can support the improvement of ergonomic conditions. Twenty-eight papers were retrieved and analysed thanks to eleven comparison dimensions related to ergonomic factors, purposes, and criteria, populations, application and validation. The majority of the available devices are sensor systems composed of different types and numbers of sensors located in diverse body parts. These solutions also represent the technology most frequently employed for monitoring and reducing the risk of awkward postures. In addition, smartwatches, body-mounted smartphones, insole pressure systems, and vibrotactile feedback interfaces have been developed for evaluating and/or controlling physical loads or postures. The main results and the defined framework of analysis provide an overview of the state of the art of smart wearables in ergonomics, support the selection of the most suitable ones in industrial and non-industrial settings, and suggest future research directions.

**Stefana et al. 2021.**

**Sensors (Basel), vol. 21, no. 3.**

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**Keywords:** Industry 4.0; biomechanical risk; human factors; real-time measurement; risk factor; sensor; wearable technology; work-related musculoskeletal disorder.

**Evidence Level:** 1A

**Link:** <https://www.mdpi.com/1424-8220/21/3/777>

### **Evaluation of newly developed easy-open assistive devices for pneumatic tube system carriers for the reduction of work-related musculoskeletal disorders**

Musculoskeletal disorders may affect labor efficiency, cause disability, impair one's work ability, and lower one's quality of life. This consequently leads to a larger expenditure of medical resources. We aimed to design easy-to-open assistive devices for pneumatic tube systems to improve ergonomics and reduce musculoskeletal complaints of workers. We followed a design control process, including designs of motors, gears, sensors, and V-shaped connecting rods. Efficacy was evaluated by examining risks based on job strain index, user satisfaction, and musculoskeletal complaints of operators before and after the system's implementation on a Nordic musculoskeletal questionnaire. We designed three assistive devices: two semiautomatic and one automatic. Each semiautomatic device costs about 300 US dollars and required space of  $10 \times 18 \times 38 \text{ cm}^3$ . The automatic device costs about 3000 US dollars and required space of  $28 \times 38 \times 50 \text{ cm}^3$ . The job strain index score decreased from 36 (very high risk) to 3 (low risk) with the semiautomatic devices and to 0 with the automatic device. Musculoskeletal complaints in the neck and upper limbs were reduced, with a significantly higher satisfaction rate for female operators. Our novel

design of an automatic cap opening device for a pneumatic tube system was effective in improving ergonomics and reducing musculoskeletal complaints.

**Chien et al. 2021.**

**BioMed Research International.**

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**Keywords:** Easy-open assistive devices; pneumatic tube system carriers; work-related musculoskeletal disorders

**Evidence Level:** 5A

**Link:** <https://www.hindawi.com/journals/bmri/2021/8853602/>

## Chronic Health Issues

### **Is job strain associated with a higher risk of type 2 diabetes mellitus? A systematic review and meta-analysis of prospective cohort studies**

**Objectives** Epidemiological studies have explored the relationship between work-related stress and the risk of type 2 diabetes mellitus (T2DM), but it remains unclear on whether work-related stress could increase the risk of T2DM. We aimed to evaluate the association between job strain and the risk of T2DM. **Methods** We searched PubMed and Web of Science up to April 2019. Summary risk estimates were calculated by random-effect models. And the analysis was also conducted stratifying by gender, study location, smoking, drinking, body mass index, physical activity, family history of T2DM, education and T2DM ascertainment. Studies with binary job strain and quadrants based on the job strain model were analyzed separately.

**Results** A total of nine studies with 210 939 participants free of T2DM were included in this analysis. High job strain (high job demands and low control) was associated with the overall risk of T2DM compared with no job strain (all other combinations) [relative risk (RR) 1.16, 95% confidence interval (CI) 1.03-1.31], and the association was more evident in women (RR 1.48, 95% CI 1.02-2.14). A statistically significant association was also observed when using high strain as a category (job strain quadrants) rather than binary variable (RR 1.62, 95% CI 1.04-2.55) in women but not men. **Conclusions** Our study suggests that job strain is an important risk factor for T2DM, especially among women. Appropriate preventive interventions in populations with high job strain would contribute to a reduction in T2DM risk.

**Li et al. 2021.**

**Scandinavian Journal of Work and Environmental Health.**

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**Keywords:** Job strain; risk; type 2 diabetes mellitus; work related stress.

**Evidence Level:** 1A

**Link:** [https://www.sjweh.fi/show\\_abstract.php?abstract\\_id=3938](https://www.sjweh.fi/show_abstract.php?abstract_id=3938)

### **From environmental to possible occupational exposure to risk factors: What role do they play in the etiology of Endometriosis?**

Endometriosis is a gynecological disorder characterized by the presence of endometrial stroma and glands outside the uterine cavity. A systematic review of the literature was conducted to clarify, starting from environmental exposure data, whether possible occupational risk factors may correlate with the onset of the disease. The guidelines for reporting systematic reviews of the "PRISMA" statement were followed and two databases, Scopus and PubMed, were used. Of the 422 studies selected with specific keywords, 32 publications were eligible, 28 of which referred to chemical agents and 4 related to night work. Conflicting data emerged among these studies. Although some compounds seemed to be more involved than others in the onset of endometriosis. Association with exposure to organochlorine compounds is the most supported by the epidemiological data, while other pesticide exposure did not show any clear correlation. Likewise, the hypothesis of a correlation with perfluoroalkyls exposure is not currently supported by data. The involvement of metals as risk factors has not been confirmed, while the role of night work, in the case of long service, seems to play an etiological role. In order to clarify the potential occupational risk of endometriosis development, well-designed studies are needed to evaluate the potential association between chemical compounds and disease etiology.

**Caporossi et al. 2021.**

**International Journal of Environmental Research and Public Health, vol. 18, no. 2.**

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**Keywords:** Effects at low doses; endocrine disrupters; endometriosis; night shift; workers.

**Evidence Level:** 1A

**Link:** <https://www.mdpi.com/1660-4601/18/2/532>

## Occupational Exposure

### **Heat-related illness risk and associated personal and environmental factors of construction workers during work in summer**

Heat-related illness (HRI) is a common occupational injury, especially in construction workers. To explore the factors related to HRI risk in construction workers under hot outdoor working conditions, we surveyed vital and environmental data of construction workers in the summer season. Sixty-one workers joined the study and the total number of days when their vital data during working hours and environmental data were recorded was 1165. Heart rate with high-risk HRI was determined using the following formula:  $180 - 0.65 \times \text{age}$ . As a result of the logistic regression analysis, age, working area, maximum skin temperature, and heart rate immediately after warming up were significantly positively related, and experience of construction was significantly negatively related to heart rate with high-risk HRI. Heart rate immediately after warming up may indicate morning fatigue due to reasons such as insufficient sleep, too much alcohol intake the night before, and sickness. Asking morning conditions may lead to the prevention of HRI. For occupational risk management, monitoring of environmental and personal conditions is required.

**Kakamu et al. 2021.**

**Science Reports, vol. 11, no. 1.**

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**Keywords:** Heat-related illness; risk; personal factors; environmental factors; construction workers; summer

**Evidence Level:** 5A

**Link:** <https://www.nature.com/articles/s41598-020-79876-w>

### **Development and usability of educational material about workplace particulate matter exposure**

**Background:** Particulate matter (PM) exposure is an important health risk, both in daily life and in the workplace. It causes respiratory and cardiovascular diseases and results in 800,000 premature deaths per year worldwide. In earlier research, we assessed workers' information needs regarding workplace PM exposure, the properties and effects of PM, and the rationale behind various means of protection. We also concluded that workers do not always receive appropriate risk communication tools with regards to PM, and that their PM knowledge appears to be fragmented and incomplete. **Methods:** We considered several concepts for use as an educational material based on evaluation criteria: ease of use, costs, appropriateness for target audiences and goals, interactivity, implementation issues, novelty, and speed. We decided to develop an educational folder, which can be used to inform employees about the properties, effects and prevention methods concerning PM. Furthermore, we decided on a test setup of a more interactive way of visualisation of exposure to PM by means of exposimeters. For the development of the folder, we based the information needs on our earlier mental models-based research. We adjusted the folder based on the results of ten semi-structured interviews evaluating its usability. **Results:** The semi-structured interviews yielded commentaries and suggestions for further improvement, which resulted in a number of alterations to the folder. However, in most cases the folder was deemed satisfactory.

**Conclusion:** Based on this study, the folder we developed is suitable for a larger-scale experiment and a practical test. Further research is needed to investigate the efficacy of the folder and the application of the exposimeter in a PM risk communication system.

**Stege et al. 2021.**

**BMC Public Health, vol. 22, no. 1.**

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**Keywords:** Educational folder; occupational exposure; particulate matter; risk communication.

**Evidence Level:** 5A

**Link:** <https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-021-10197-x>

### **Occupational exposure to whole body vibrations and birth outcomes - A nationwide cohort study of Swedish women**

**Background:** More women in reproductive ages are entering occupations where exposure to whole body vibrations (WBV) is common (e.g. in transportation and construction). Previous studies based on self-assessed exposure suggest increased risks of adverse birth outcomes, but it is unclear at what exposure levels and if the current exposure guidelines are appropriate during pregnancy. **Objectives:** To investigate whether occupational WBV-exposure increases the risk of preterm birth, low birth weight, and/or small-for-gestational age, in a large, nationwide, prospective, cohort study. **Design:** The Fetal Air Pollution Exposure cohort (FAIR) was formed by merging data from multiple, national registers, and the present study includes singletons born 1994-2014 to working women in Sweden (n = 1,091,080 births). WBV-exposure was assessed quantitatively using a job-exposure matrix based on measurements, and calculated odds ratios were adjusted for potential confounders such as smoking and BMI, and other occupational exposures like noise, combustion particles, and physically and psychologically strenuous work. Data on absence from work (full-/part time, sick leave, parental leave, etc.) was also used. **Results:** Exposure to WBV during pregnancy, among women with low absence from work (n = 476,419), was associated with an increased risk of preterm birth, below the occupational exposure limit (1.15 m/s<sup>2</sup>). Compared to unexposed mothers, the OR was 1.38 (95% CI: 1.05, 1.83) for exposure  $\geq 0.5$  m/s<sup>2</sup>, corresponding to an increase from 47/1000 cases to 65/1000 cases. No increased risk was found for small-for-gestational age.

**Conclusions:** Exposure to WBV was associated with an increased risk of preterm birth. The results suggest that the current permissible exposure and action levels for WBV-exposure do not adequately protect pregnant women with continuous exposure.

**Skroder et al. 2021.**

**The Science of the Total Environment, vol. 751.**

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**Keywords:** Fetal development; gestation; LBW; oscillation; PTB; SGA; work.

**Evidence Level:** 4A

**Link:** <https://www.sciencedirect.com/science/article/pii/S0048969720350051?via%3Dihub>

### **Chronic exposure of humans to high level natural background radiation leads to robust expression of protective stress response proteins**

Understanding exposures to low doses of ionizing radiation are relevant since most environmental, diagnostic radiology and occupational exposures lie in this region. However, the molecular mechanisms that drive cellular responses at these doses, and the subsequent health outcomes, remain unclear. A local monazite-rich high level natural radiation area (HLNRA) in the state of Kerala on the south-west coast of Indian subcontinent show radiation doses extending from  $\leq 1$  to  $\geq 45$  mGy/y and thus, serve as a model resource to understand low dose mechanisms directly on healthy humans. We performed quantitative discovery proteomics based on multiplexed isobaric tags (iTRAQ) coupled with LC-MS/MS on human peripheral blood mononuclear cells from HLNRA individuals. Several proteins involved in diverse biological processes such as DNA repair, RNA processing, chromatin modifications and cytoskeletal organization showed distinct expression in HLNRA individuals, suggestive of both recovery and adaptation to low dose radiation. In protein-protein interaction (PPI) networks, YWHAZ (14-3-3 $\zeta$ ) emerged as the top-most hub protein that may direct phosphorylation driven pro-survival cellular processes against radiation stress. PPI networks also identified an integral role for the cytoskeletal protein ACTB, signaling protein PRKACA; and the molecular chaperone HSPA8. The data will allow better integration of radiation biology and epidemiology for risk assessment.

**Nishad et al. 2021.**

**Scientific Reports, vol. 11, no. 1.**

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**Keywords:** Chronic exposure; humans; natural background radiation; protective stress response proteins

**Evidence Level:** 5B



Link: <https://www.nature.com/articles/s41598-020-80405-y>

### **Parental occupational exposure pre- and post-conception and development of asthma in offspring**

**Background:** While direct effects of occupational exposures on an individual's respiratory health are evident, a new paradigm is emerging on the possible effects of pre-conception occupational exposure on respiratory health in offspring. We aimed to study the association between parental occupational exposure starting before conception and asthma in their offspring (at 0-15 years of age). **Methods:** We studied 3985 offspring participating in the Respiratory Health in Northern Europe, Spain and Australia (RHINESSA) generation study. Their mothers or fathers (n = 2931) previously participated in the European Community Respiratory Health Survey (ECRHS). Information was obtained from questionnaires on parental job history pre- and post-conception which was linked to an asthma-specific job-exposure matrix (JEM). We assessed the association between parental occupational exposure and offspring asthma, applying logistic regression models, clustered by family and adjusted for study centre, offspring sex, parental characteristics (age, asthma onset, place of upbringing, smoking) and grandparents' level of education. **Results:** Parental occupational exposure to microorganisms, pesticides, allergens or reactive chemicals pre-conception or both pre- and post-conception was not related to offspring asthma; in general, subgroup analyses confirmed this result. However, maternal exposure both pre- and post-conception to allergens and reactive chemicals was associated with increased odds for early-onset asthma in offspring (0-3 years of age); odds ratio 1.70 (95% CI: 1.02-2.84) and 1.65 (95% CI: 0.98-2.77), respectively. **Conclusions:** This study did not find evidence that parental occupational exposure, defined by an asthma JEM before conception only or during pre- and post-conception vs non-exposed, was associated with offspring asthma.

**Pape et al. 2021.**

**International Journal of Epidemiology, vol. 49, no. 6.**

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**Keywords:** Job-exposure matrices; epidemiology; air pollutants; asthma; generation study; occupation; occupational exposure.

**Evidence Level:** 4A

Link: <https://academic.oup.com/ije/article/49/6/1856/5871506>

### **Investigating multi-mycotoxin exposure in occupational settings: A biomonitoring and airborne measurement approach**

Investigating workplace exposure to mycotoxins is of the utmost importance in supporting the implementation of preventive measures for workers. The aim of this study was to provide tools for measuring mycotoxins in urine and airborne samples. A multi-class mycotoxin method was developed in urine for the determination of aflatoxin B1, aflatoxin M1, ochratoxin A, ochratoxin  $\alpha$ , deoxynivalenol, zearalenone,  $\alpha$ -zearalenol,  $\beta$ -zearalenol, fumonisin B1, HT2-toxin and T2-toxin. Analysis was based on liquid chromatography-high resolution mass spectrometry. Sample pre-treatments included enzymatic digestion and an online or offline sample clean-up step. The method was validated according to the European Medicines Agency guidance procedures. In order to estimate external exposure, air samples collected with a CIP 10 (Capteur Individuel de Particules 10) personal dust sampler were analyzed for the quantification of up to ten mycotoxins, including aflatoxins, ochratoxin A, deoxynivalenol, zearalenone, fumonisin B1 and HT-2 toxin and T-2 toxin. The method was validated according to standards for workplace exposure to chemical and biological agents EN 482. Both methods, biomonitoring and airborne mycotoxin measurement, showed good analytical performances. They were successfully applied in a small pilot study to assess mycotoxin contamination in workers during cleaning of a grain elevator. We demonstrated that this approach was suitable for investigating occupational exposure to mycotoxins.

**Ndaw et al. 2021.**

**Toxins, vol. 13, no. 1.**

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**Keywords:** HR-MS/MS; air; biomonitoring; dust; exposure assessment; mycotoxins; occupational exposure.

**Evidence Level:** 5A

Link: <https://www.mdpi.com/2072-6651/13/1/54>

### **Occupational exposure to noise in relation to pregnancy-related hypertensive disorders and diabetes**

**Objectives** Exposure to environmental noise has been associated with an increased risk of cardiovascular diseases and diabetes, but evidence for occupational noise is limited and conflicting, especially related to pregnancy outcomes. This study aimed to evaluate the association of occupational noise exposure with hypertensive disorders of pregnancy (HDP) and gestational diabetes. **Methods** Our population-based cohort study utilized data on 1 109 516 singletons born to working mothers in Sweden between 1994-2014 from the Medical Birth Register and the Longitudinal Integration Database for Health Insurance and Labor Market Studies. Noise exposure came from a job exposure matrix (JEM) in five categories <70, 70-74, 75-80, 80-85, >85 dB(A). Relative risks (RR), adjusted for confounders and other job exposures, were calculated by modified Poisson regressions for the full sample and a subsample of first-time mothers reporting full-time work. **Results** Exposure to 80-85 dB(A) of noise was associated with an increased risk of all HDP [RR 1.12, 95% confidence interval (CI) 1.05-1.18] and preeclampsia alone (RR 1.14, 95% CI 1.07-1.22) in the full sample. Results were similar for first-pregnancy, full-time workers. Exposure to >85 dB(A) of noise was also associated with an increased risk of gestational diabetes (RR 1.57, 95% CI 1.10-2.24) in the analysis restricted to first-time mothers working full-time. **Conclusion** In this study, exposure to noise was associated with an increased risk for HDP and gestational diabetes, particularly in first-time mothers who work full-time. Further research is needed to confirm findings and identify the role of hearing protection on this association so prevention policies can be implemented.

**Lissaker et al. 2021.**

**Scandinavian Journal of Work and Environmental Health, vol. 47, no. 1.**

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**Keywords:** Pregnancy-related; hypertensive disorders; diabetes; occupational exposure; noise.

**Evidence Level:** 4A

**Link:** [https://www.sjweh.fi/show\\_abstract.php?abstract\\_id=3913](https://www.sjweh.fi/show_abstract.php?abstract_id=3913)

### **Extreme heat and occupational injuries in different climate zones: A systematic review and meta-analysis of epidemiological evidence**

**Background:** The link between heat exposure and adverse health outcomes in workers is well documented and a growing body of epidemiological evidence from various countries suggests that extreme heat may also contribute to increased risk of occupational injuries (OI). Previously, there have been no comparative reviews assessing the risk of OI due to extreme heat within a wide range of global climate zones. The present review therefore aims to summarise the existing epidemiological evidence on the impact of extreme heat (hot temperatures and heatwaves (HW)) on OI in different climate zones and to assess the individual risk factors associated with workers and workplace that contribute to heat-associated OI risks.

**Methods:** A systematic review of published peer-reviewed articles that assessed the effects of extreme heat on OI among non-military workers was undertaken using three databases (PubMed, Embase and Scopus) without temporal or geographical limits from database inception until July 2020. Extreme heat exposure was assessed in terms of hot temperatures and HW periods. For hot temperatures, the effect estimates were converted to relative risks (RR) associated with 1 °C increase in temperature above reference values, while for HW, effect estimates were RR comparing heatwave with non-heatwave periods. The patterns of heat associated OI risk were investigated in different climate zones (according to Köppen Geiger classification) based on the study locations and were estimated using random-effects meta-analysis models. Subgroup analyses according to workers' characteristics (e.g. gender, age group, experience), nature of work (e.g. physical demands, location of work i.e. indoor/outdoor) and workplace characteristics (e.g. industries, business size) were also conducted. **Results:** A total of 24 studies published between 2005 and 2020 were included in the review. Among these, 22 studies met the eligibility criteria, representing almost 22 million OI across six countries (Australia, Canada, China, Italy, Spain, and USA) and were included in the meta-analysis. The pooled results suggested that the overall risk of OI increased by 1% (RR 1.010, 95% CI: 1.009-1.011) for 1 °C increase in temperature above reference values and 17.4% (RR 1.174, 95% CI: 1.057-1.291) during HW. Among different climate zones, the highest risk of OI during hot temperatures was identified in Humid Subtropical Climates (RR 1.017, 95% CI: 1.014-1.020) followed by Oceanic (RR 1.010, 95% CI: 1.008-1.012) and Hot Mediterranean Climates (RR 1.009, 95% CI: 1.008-1.011). Similarly, Oceanic (RR 1.218, 95% CI: 1.093-1.343) and Humid Subtropical Climates (RR 1.213, 95% CI: 0.995-1.431) had the

highest risk of OI during HW periods. No studies assessing the risk of OI in Tropical regions were found. The effects of hot temperatures on the risk of OI were acute with a lag effect of 1-2 days in all climate zones. Young workers (age < 35 years), male workers and workers in agriculture, forestry or fishing, construction and manufacturing industries were at high risk of OI during hot temperatures. Further young workers (age < 35 years), male workers and those working in electricity, gas and water and manufacturing industries were found to be at high risk of OI during HW. **Conclusions:** This review strengthens the evidence on the risk of heat-associated OI in different climate zones. The risk of OI associated with extreme heat is not evenly distributed and is dependent on underlying climatic conditions, workers' attributes, the nature of work and workplace characteristics. The differences in the risk of OI across different climate zones and worker subgroups warrant further investigation along with the development of climate and work-specific intervention strategies.

**Fatima et al. 2021.**

**Environment International, vol. 148.**

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**Keywords:** Climate zones; heatwaves; hot temperatures; occupation injuries.

**Evidence Level:** 1A

**Link:** <https://www.sciencedirect.com/science/article/pii/S0160412021000088?via%3Dihub>

### **Factors associated with elevated alanine aminotransferase in employees of a German chemical company: results of a large cross-sectional study**

**Background:** We aimed to determine the prevalence of elevated alanine aminotransferase (eALT) in employees of a German chemical company, and analyze its association with sociodemographic, work- and lifestyle-related factors. **Methods:** The cross-sectional study is based on data surveyed from occupational health check-ups between 2013 and 2018 at the site clinic of a chemical company based in Ludwigshafen, Germany. We used logistic regression analyses to assess the association between sociodemographic, work- and lifestyle-related characteristics and eALT. Quantile regression technique was applied to investigate if associations vary across different quantiles of the ALT distribution. **Results:** Participants (n = 15,348) were predominantly male (78.3%) with a mean age of 42.2 years (SD 10.7). The prevalence of eALT was 18.5% (21.6% in men/7.2% in women) with a geometric mean of 28.9 U/L (32.8 U/L in men/18.5 U/L in women). In the multivariable logistic regression model, odds of eALT were significantly higher for males (OR 2.61; 95%-CI 2.24-3.05), manual workers (OR 1.23; 95%-CI 1.06-1.43), overweight (OR 2.66; 95%-CI 2.36-3.00) or obese respondents (e.g. OR 7.88; 95%-CI 5.75-10.80 for obesity class III), employees who consume any number of alcoholic drinks/week (e.g. OR 1.32; 95%-CI 1.16-1.49 for ≥ 3 drinks per week) and diabetics (OR 1.47; 95%-CI 1.22-1.78). Additionally, season of participation was significantly associated with eALT, with odds being higher for participation in spring, fall or winter, as compared to summer. A significant interaction between age and gender ( $p_{\text{interaction}} < 0.001$ ) was found, showing approximately a u-shaped age/ALT relationship in women and an inversely u-shaped relationship in men. Quantile regression showed an increasing positive effect of male gender, overweight/obesity, and for diabetics on ALT level when moving from the lowest (q0.1) to the highest (q0.9) considered quantile. Additionally, from the lowest to the highest quantile an increasing negative effect on ALT for older age was observed.

**Conclusions:** Prevalence of eALT in our sample of employees can be considered as high, with almost one in five participants affected. Identification of risk groups allows the implementation of targeted preventive measures in order to avoid transition to severe morbidity.

**Claus et al. 2021.**

**BMC Gastroenterology, vol. 21, no. 1.**

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**Keywords:** Alanine aminotransferase; cross-sectional study; employees; liver enzymes; non-alcoholic fatty liver disease; prevalence; quantile regression; serum transaminase; social determinants.

**Evidence Level:** 4B

**Link:** <https://bmcgastroenterol.biomedcentral.com/articles/10.1186/s12876-021-01601-2>

### **Peak inhalation exposure metrics used in occupational epidemiologic and exposure studies**

Peak exposures are of concern because they can potentially overwhelm normal defense mechanisms and induce adverse health effects. Metrics of peak exposure have been used in epidemiologic and exposure studies, but consensus is lacking on its definition. The relevant characteristics of peak exposure are dependent upon exposure patterns, biokinetics of exposure, and disease mechanisms. The objective of this review was to summarize the use of peak metrics in epidemiologic and exposure studies. A comprehensive search of Medline, Embase, Web of Science, and NIOSHTIC-2 databases was conducted using keywords related to peak exposures. The retrieved references were reviewed and selected for indexing if they included a peak metric and met additional criteria. Information on health outcomes and peak exposure metrics was extracted from each reference. A total of 1,215 epidemiologic or exposure references were identified, of which 182 were indexed and summarized. For the 72 epidemiologic studies, the health outcomes most frequently evaluated were: chronic respiratory effects, cancer and acute respiratory symptoms. Exposures were frequently assessed using task-based and full-shift time-integrated methods, qualitative methods, and real-time instruments. Peak exposure summary metrics included the presence or absence of a peak event, highest exposure intensity and frequency greater than a target. Peak metrics in the 110 exposure studies most frequently included highest exposure intensity, average short-duration intensity, and graphical presentation of the real-time data (plots). This review provides a framework for considering biologically relevant peak exposure metrics for epidemiologic and exposure studies to help inform risk assessment and exposure mitigation.

**Virji et al. 2021.**

**Frontiers of Public Health, vol. 8.**

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**Keywords:** Acute effects; chronic effects; epidemiologic studies; exposure assessment (EA); peak metrics.

**Evidence Level:** 1A

**Link:** <https://www.frontiersin.org/articles/10.3389/fpubh.2020.611693/full>

### **Occupational exposure to organic dust and risk of lymphoma subtypes in the EPILYMPH case-control study**

**Objectives** This study aimed to estimate the risk of lymphoma and its major subtypes in relation to occupational exposure to specific organic dusts. **Methods** We explored the association in 1853 cases and 1997 controls who participated in the EpiLymph case-control study, conducted in six European countries in 1998-2004. Based on expert assessment of lifetime occupational exposures, we calculated the risk of the major lymphoma subtypes associated with exposure to six specific organic dusts, namely, flour, hardwood, softwood, natural textile, synthetic textile, and leather, and two generic (any types) groups: wood and textile dusts. Risk was predicted with unconditional regression modeling, adjusted by age, gender, study center, and education. **Results** We observed a 2.1-fold increase in risk of follicular lymphoma associated with ever exposure to leather dust [95% confidence interval (CI) 1.01-4.20]. After excluding subjects who ever worked in a farm or had ever been exposed to solvents, risk of B-cell lymphoma was elevated in relation to ever exposure to leather dust [odds ratio (OR) 2.2, 95% CI 1.00-4.78], but it was not supported by increasing trends with the exposure metrics. Risk of Hodgkin lymphoma was elevated (OR 2.0, 95% CI 0.95-4.30) for exposure to textile dust, with consistent upward trends by cumulative exposure and three independent exposure metrics combined (P=0.023, and P=0.0068, respectively). **Conclusions** Future, larger studies might provide further insights into the nature of the association we observed between exposure to textile dust and risk of Hodgkin lymphoma.

**Cocco et al. 2021.**

**Scandinavian Journal of Work and Environmental Health, vol. 47, no. 1.**

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**Keywords:** Occupational exposure; organic dust; risk; lymphoma subtypes.

**Evidence Level:** 4A

**Link:** [https://www.sjweh.fi/show\\_abstract.php?abstract\\_id=3925](https://www.sjweh.fi/show_abstract.php?abstract_id=3925)

## Sedentary Practices

### **Associations of objectively measured total duration and maximum bout length of standing at work with lower-extremity pain intensity: a 2-year follow-up of construction and healthcare workers**

**Background:** Musculoskeletal disorders are among the major reasons for years lived with disability.

Approximately one third of the European working population report lower-extremity discomfort and many attribute these discomforts to work-related factors. Employees in the healthcare and construction sectors reports high levels of lower-extremity pain and commonly relate the pain to their profession. These workers spend a large part of their workday standing. Periods of prolonged standing is suggested to increase lower-extremity symptoms, but this cannot be concluded on, since limited evidence is available from longitudinal studies using objective measures. This study aimed to determine possible associations between objectively measured total duration and maximum bout length of static- and dynamic standing at work and lower-extremity pain intensity (LEPi) among Norwegian construction- and healthcare workers.

**Methods:** One-hundred and twenty-three construction and healthcare workers wore two accelerometers for up to four consecutive days, to establish standing behavior at baseline. The participants reported LEPi (Likert scale 0-9) for the preceding 4 weeks at baseline and after 6, 12, 18, and 24 months. We investigated associations between standing at work and average and change in LEPi using linear mixed models with significance level  $p \leq 0.05$ . **Results:** Total duration of static- and dynamic standing showed weak associations with average LEPi, for the total sample and for construction workers. Maximum bout of static- and dynamic standing was associated with average LEPi in construction workers, but not in healthcare workers. Furthermore, we found no associations between standing and change in LEPi over the 2-year follow-up in any of our analyses. **Conclusions:** This study indicate that objectively measured standing is associated with average LEPi over 2-years follow-up in construction workers, and that maximal bout of standing have a stronger association to LEPi than total duration. For every 10 min added to the maximal length of continuous standing during an average workday, we found approximately one unit increase in pain on a 0-9 scale. The lack of significant findings in analyses on healthcare workers suggest that the association between standing and LEPi depend on work-tasks, gender and/or other sector-specific factors.

**Lunde et al. 2021.**

**BMC Musculoskeletal Disorders, vol. 22, no. 1.**

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**Keywords:** Accelerometers; construction work; healthcare work; lower-extremity pain; musculoskeletal disorders; objective measures; physical work exposures; prospective design; standing.

**Evidence Level:** 5A

**Link:** <https://bmcmusculoskeletdisord.biomedcentral.com/articles/10.1186/s12891-020-03868-0>

### **A qualitative study of the feasibility and acceptability of implementing 'sit-to-stand' desks in vocational education and training**

While it has been shown that interrupting a person's sedentary behaviour has the potential to improve cognitive, physical and mental health, a large part of time that students spend in school is sedentary. As research has shown that approximately 80% of vocational education and training (VET) students have an unhealthy sedentary lifestyle, implementing "sit-to-stand" (StS) desks could interrupt sedentary behaviour and promote healthier behaviour. Therefore, the acceptability and feasibility of using such desks in the VET setting should be investigated. Using semi-structured focus group interviews analysed via deductive content analysis, the opinions of 33 students for the following topics were assessed: (1) usage of the standing option of the desks (2) reasons for standing in class (3) experienced effect of standing behind the desk, and (4) fostering future StS desks usage. Although VET students are aware of the potential benefits of using StS desks, they need to be actively stimulated and motivated by teachers to use them. In addition, time is needed to get into the habit of standing. Thus, for successful implementation of StS desks in the VET setting, all stakeholders (i.e., students, teachers, schoolboards) should be actively involved in stimulating the healthy behaviour of VET students.

**Kirschner et al. 2021.**

**International Journal of Environmental Research and Public Health, vol. 18, no. 3.**

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**Keywords:** Focus group interviews; qualitative research; sedentary behaviour; sit-to-stand desks; vocational education and training.

**Evidence Level:** 5A

**Link:** <https://www.mdpi.com/1660-4601/18/3/849>

### **A qualitative analysis of barriers and facilitators to reducing sedentary time in adults with chronic low back pain**

**Background:** Sedentary time (SED) is associated with many detrimental health outcomes, yet little is known about what factors influence one's ability to reduce SED. Even less is known about these factors in specific patient populations for whom high levels of SED may influence symptoms, such as those with chronic low back pain (cLBP). The purpose of this study was to qualitatively explore participants' perceptions of factors that influenced their ability to reduce SED across an 8-week intervention to reduce SED in adults with cLBP and elevated depressive symptoms. **Methods:** Three months after a theory-based intervention to break up and reduce sitting, semi-structured interviews explored factors that influenced reducing SED. Three researchers independently coded each conversation. Codes were charted and mapped with participants reviewing their own transcripts and the merged codes. The research team then defined key themes. Factors that were perceived to either facilitate behavior change or acted as barriers were identified and thematized as positive or negative determinants. **Results:** Common barriers for reducing SED included environmental constraints, opposing social norms, and productivity; these barriers were frequently encountered in the workplace. Common facilitators for reducing SED included habit development, self-monitoring tools, restructuring the physical environment, and social accountability. Notably, back pain was not a frequently reported barrier or facilitator for reducing SED. **Conclusion:** This sample of patients with cLBP and elevated depressive symptoms had similar determinants for reducing SED as previously reported in non-patient populations and did not appear to need strategies specific to dealing with chronic pain. Since work-related social norms and environmental factors were perceived as significant barriers to sitting less, workplace interventions that provide standing desks, offer standing meetings rooms, and/or institution-wide standing breaks may help reduce SED at work. The use of an activity monitor with sitting reminders and education regarding how to use the reminders as external cues to develop new sitting habits may also aid in adoption and adherence to this behavior change across settings. Developing coping plans and restructuring physical environments were perceived as successful strategies for overcoming social and environmental barriers. Future interventions targeting SED reductions may benefit from incorporating these strategies.

**Lansing et al. 2021.**

**BMC Public Health, vol. 21, no. 1.**

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**Keywords:** Chronic low back pain; qualitative analysis; sedentary behaviour.

**Evidence Level:** 4A

**Link:** <https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-021-10238-5>

### **Physical Activity**

#### **Effects of 2 physical exercise programs (circuit training and brisk walk) carried out during working hours on multidimensional components of workers' health: a pilot study**

**Objectives:** The objective of this study was to determine the effects of 2 physical exercise programs carried out during working hours in an office work environment on health-related parameters of employees.

**Material and methods:** The participants included 47 healthy office worker volunteers (aged 45±11.95 years, 27% males) who formed 3 groups: circuit training (CT), brisk walk (BW), and control (C) groups. The interventions lasted 12 weeks with a weekly frequency of three 30-minute sessions in the middle of the workday. All employees were evaluated with a multicomponent battery test which included: anthropometric and body composition measurements, a cardiorespiratory fitness test, lipid profile, blood pressure, and mental health (depression, anxiety, and stress). Basic descriptive statistics were calculated. A repeated measures ANOVA was performed to summarize changes in the variables studied after the



application of the physical exercise programs. **Results:** Generally, both exercise programs (CT and BW) maintained the body weight and body mass index while reducing body fat mass (a group × time interaction;  $4.864 \leq F \leq 6.524$ ,  $0.001 \leq p \leq 0.015$ ), although the CT intervention also showed relevant (inter-group) reductions in the waist-hip ratio ( $F = 11.311$ ,  $p = 0.007$ ) and increased skeletal muscle mass ( $F = 15.062$ ,  $p = 0.003$ ). Both exercise programs (CT and BW) improved the cardiorespiratory fitness test scores (a group × time interaction;  $F = 18.054$ ,  $p < 0.001$ ). There were no changes in the lipid profile or blood pressure after the interventions, but there was an improvement in mental health ( $4.760 \leq F \leq 8.087$ ,  $0.008 \leq p \leq 0.037$ ). **Conclusions:** The findings suggest that both types of programs could be implemented in the employees' daily routine in order to improve their overall health. Nevertheless, studies with larger samples are necessary before the conclusions can be generalized.

**Saavedra et al. 2021.**

**International Journal of Occupational Medicine and Environmental Health, vol. 34, no. 1.**

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**Keywords:** Blood pressure; body composition; cardiorespiratory fitness test; lipid profile; mental health; physical activity.

**Evidence Level:** 3A

**Link:** <http://ijomeh.eu/Effects-of-2-physical-exercise-programs-circuit-training-and-brisk-walk-carried-out,125854,0,2.html>

## Musculoskeletal Health

### **Prevalence and risk factors of self-reported wrist and hand symptoms and clinically confirmed carpal tunnel syndrome among office workers in China: a cross-sectional study**

**Background:** Carpal tunnel syndrome (CTS) is a common cause of pain, numbness and tingling in the wrist and hand region and is associated with repetitive wrist and hand use in office workers. However, scarce knowledge exists about the epidemiology of clinically confirmed CTS among Chinese office workers. This study aimed to investigate the prevalence of wrist/hand symptoms and CTS in office workers in China and to identify associated risk factors. **Methods:** A cross-sectional survey was carried out in a metropolitan city in China involving 969 respondents (aged 17-49 years) from 30 workplaces. A questionnaire was distributed to each participant to collect their demographic, work-related physical and psychosocial factors, and wrist and hand symptoms. The wrist and hand pain/numbness symptoms were marked on a body chart and the nature and intensity of symptoms, nocturnal symptoms, as well as aggravating activities were also recorded. Clinically confirmed CTS cases were screened based on the history, Phalen's test, Tinel Sign and skin sensation testing among symptomatic respondents. Logistic regression was employed to estimate the odds ratio (OR) and 95% confidence interval (95% CI) for the occurrence of self-reported wrist and hand symptoms and clinically confirmed CTS. **Results:** The clinically confirmed CTS prevalence was 9.6%. The prevalence of wrist and hand symptoms were 22 and 15%, respectively. Frequently working in pain was associated with higher odds of CTS. Multivariate modelling adjusted for age and gender showed that prolonged computer use time and working without breaks were associated with presence of wrist/hand symptoms (adjusted ORs: 1.11 (95% CI 1.02-1.22) and 1.88 (95% CI 1.12-3.14)). Educational level was inversely associated with CTS and smoking was associated with wrist/hand complaints (adjusted OR: 2.20 (95% CI 1.19-4.07)). **Conclusions:** The prevalence of work-related clinically confirmed CTS symptoms among young office workers in China is high. Frequently working in pain is closely associated with clinically confirmed CTS. Intense computer use and no breaks at work are associated with wrist and hand symptoms.

**Feng et al. 2021.**

**BMC Public Health, vol. 21, no. 1.**

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**Keywords:** Computer use; median nerve; office workplace; work in pain; work-related musculoskeletal disorder; wrist and hand complaint.

**Evidence Level:** 4B

**Link:** <https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-020-10137-1>

## Physical workload and increased frequency of musculoskeletal pain: a cohort study of employed men and women with baseline occasional pain

**Objectives:** Musculoskeletal pain (MSP) is prevalent among the workforce. This study investigates the long-term association between physical workload (PWL) and increased frequency of MSP among male and female employees with pre-existing occasional MSP. **Methods:** This study uses the Stockholm Public Health cohort survey data from the baseline 2006. The sample includes 5715 employees with baseline occasional MSP (no more than a few days per month). Eight PWL exposures and overall PWL were estimated using a job-exposure matrix (JEM). The JEM was assigned to occupational titles from a national register in 2006. Follow-up survey data on frequent MSP (a few or more times a week) were collected from 2010. Logistic regressions produced sex-specific ORs with 95% CIs and were adjusted for education, health conditions, psychological distress, smoking, BMI, leisure-time physical activity and decision authority.

**Results:** Associations were observed between several aspects of heavy PWL and frequent MSP for men (eg, OR 1.57, 95% CI 1.13 to 2.20, among those in the highest exposure quartile compared with those in the lowest quartile for heavy lifting) and women (eg, OR 1.76, 95% CI 1.35 to 2.29, among those in the highest exposure quartile compared with those in the the lowest quartile for physically strenuous work). Small changes were observed in the OR after adjustment, but most of the ORs for PWL exposures among the men were no longer statistically significantly increased. **Conclusion:** A high level of exposure to heavy PWL was associated with increased frequency of MSP 4 years later for men and women with baseline occasional pain.

**Badarin et al. 2021.**

**Occupational and Environmental Medicine.**

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[\(https://creativecommons.org/licenses/by-nc/4.0/\)](https://creativecommons.org/licenses/by-nc/4.0/)

**Keywords:** Epidemiology; longitudinal studies; musculoskeletal system; physical exertion; workload.

**Evidence Level:** 4B

**Link:** <https://oem.bmj.com/content/early/2021/02/04/oemed-2020-107094>

## COVID 19

### Adapting to the Future of Work

#### Is digital technology the magic bullet for performing work at home? Lessons learned for post COVID-19 recovery in hospitality management

**Purpose:** The COVID-19 pandemic has suddenly brought about a number of disruptions to when and where work is undertaken for hospitality employees. The rapid spread of COVID-19 forced many hospitality managers to use digital technologies to perform work from home, termed digital work connectivity. Yet little is known about how hospitality employees cope with it. The purpose of this study is to investigate an important yet underspecified issue as to how digital work connectivity can be detrimental for employees' work behavior. **Design/methodology/approach:** We test our hypotheses using multi-wave and multi-source data collected from 467 middle managerial-level hospitality employees in China. **Findings:** The findings show that digital work connectivity can lead to self-control depletion, which in turn is associated with disengagement from work. Further, the findings show that relational energy is an important resource that can buffer the detrimental effects of digital work connectivity on hospitality employees. **Practical implications:** The association of digital work connectivity with employee withdrawal behavior highlights the urgent need for hospitality enterprises to have clear guidelines that regulate technology use at home for work purposes. **Social implications:** Our research shows that the absence of clear guidelines in relation to the use of digital technology for work at home risks producing unintended consequences for both hospitality employees and their enterprises. **Originality/value:** Our research draws from recent advances in resource allocation theories of self-control and adopts a more nuanced approach to uncover a counterintuitive reality that while people use digital technology to remain connected with work, doing so can actually contribute to their withdrawal behavior.

**Chadee et al. 2021.**

**International Journal of Hospitality Management, vol. 92.**

**User License:** Elsevier COVID-19 resource centre

**Keywords:** COVID-19; digital technology; hospitality; relational energy; withdrawal behavior; work at home.

**Evidence Level:** 5B

**Link:** <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7552983/>

## Guiding and Supporting Mental Health and Wellbeing

### COVID-19 anxiety - A longitudinal survey study of psychological and situational risks among Finnish workers

**Background:** The COVID-19 crisis has changed the conditions of many all over the globe. One negative consequence of the ongoing pandemic is anxiety brought about by uncertainty and the COVID-19 disease. Increased anxiety is a potential risk factor for wellbeing at work. This study investigated psychological, situational, and socio-demographic predictors of COVID-19 anxiety using longitudinal data. **Methods:** A nationally representative sample of Finnish workers (N = 1308) was collected before and during the COVID-19 crisis. Eighty percent of the participants responded to the follow-up study (N = 1044). COVID-19 anxiety was measured with a modified Spielberger State-Trait Anxiety Inventory. Psychological and situational predictors included perceived loneliness, psychological distress, technostress, personality, social support received from the work community, and remote working. A number of socio-demographic factors were also investigated. **Results:** Perceived loneliness, psychological distress, technostress, and neuroticism were identified as robust psychological predictors of COVID-19 anxiety. Increase in psychological distress and technostress during the COVID-19 crisis predicted higher COVID-19 anxiety. A recent change in their field of work and decreased social support from work communities predicted COVID-19 anxiety. Women and young people experienced higher anxiety. **Conclusions:** Different factors explain workers' COVID-19 anxiety. Increased anxiety can disrupt wellbeing at work, emphasizing the organizations' role in maintaining an inclusive and caring work culture and providing technical and psychological support to workers during crisis.

**Savolainen et al. 2021.**

**International Journal of Environmental Research and Public Health, vol. 18, no. 2.**

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**Keywords:** COVID-19; anxiety; loneliness; mental health; personality; stress; work.

**Evidence Level:** 4B

**Link:** <https://www.mdpi.com/1660-4601/18/2/794>

## Enabling Healthy and Safe Workplaces

### Occupancy-aided ventilation for both airborne infection risk control and work productivity

Reducing airborne infectious risk is crucial for controlling infectious respiratory diseases (e.g., COVID-19). The airborne transmissibility of COVID-19 is high so that the common ventilation rate may be insufficient to dilute the airborne pathogens, particularly in public buildings with a relatively large occupancy density. Reducing occupancy can reduce the pathogen load thereby reducing airborne infection risk. However, reduced occupancy deteriorates work productivity due to the lost hours of work. This study proposes an occupancy-aided ventilation strategy for constraining the airborne infection risk and minimizing the loss of work productivity. Firstly, two mechanisms of occupancy schedule (alternative changeovers between normal occupancy and reduced occupancy) for reducing the airborne infection risk and loss of work productivity are revealed based on analyzing features of the indoor concentration profile of exhaled aerosols. Secondly, optimization of the occupancy schedule is developed to maximize the total time length of normal occupancy for the minimum loss in work productivity while satisfying the constraint on airborne infection risk (e.g., with the reproduction number less than one). The airborne infection risk is evaluated with the rebreathed fraction model. Case studies on COVID-19 in a classroom demonstrate that the proposed occupancy-aided ventilation is effective with an earning ratio of 1.67 (the ratio of the improvement in health outcome to the loss in work productivity) and is robust to the variable occupancy loads and occupancy flexibilities.

**Zhang et al. 2021.**

**Building and Environment, vol. 188.**

**User License:** Elsevier COVID-19 resource centre

**Keywords:** Airborne infection risk; occupancy schedule; occupancy-aided ventilation; rebreathed fraction; work productivity.

**Evidence Level:** 6A

**Link:** <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7718782/>

### **Healthcare workers who work with COVID-19 patients are more physically exhausted and have more sleep problems**

In this survey study of 7,208 Dutch healthcare workers, we investigate whether healthcare workers dealing with COVID-19 patients experience lower general health, more physical and mental exhaustion and more sleep problems than other healthcare workers. Additionally, we study whether there are differences in well-being within the group of healthcare workers working with COVID-19 patients, based on personal and work characteristics. We find healthcare workers who are in direct contact with COVID-19 patients report more sleep problems and are more physically exhausted than those who are not in direct contact with COVID-19 patients. Mental exhaustion and general health do not significantly differ between healthcare workers who are in direct contact with COVID-19 patients and those who are not. Among healthcare workers in direct contact with COVID-19 patients, lower well-being on one or more indicators is reported by those who are female, living alone, without leadership role, or without sufficient protective equipment. Regarding age, physical exhaustion is more prevalent under healthcare workers older than 55 years, whereas mental exhaustion is more prevalent under healthcare workers younger than 36 years. These results stress the need of mental and physical support of healthcare workers during a pandemic, catered to the needs of healthcare workers themselves.

**Roekel et al. 2021.**

**Frontiers of Psychology, vol. 11.**

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**Keywords:** COVID-19; general health; healthcare workers; mental exhaustion; physical exhaustion; sleep problems.

**Evidence Level:** 4B

**Link:** <https://www.frontiersin.org/articles/10.3389/fpsyg.2020.625626/full>

### **Lessons from movement ecology for the return to work: Modeling contacts and the spread of COVID-19**

Human behavior (movement, social contacts) plays a central role in the spread of pathogens like SARS-CoV-2. The rapid spread of SARS-CoV-2 was driven by global human movement, and initial lockdown measures aimed to localize movement and contact in order to slow spread. Thus, movement and contact patterns need to be explicitly considered when making reopening decisions, especially regarding return to work. Here, as a case study, we consider the initial stages of resuming research at a large research university, using approaches from movement ecology and contact network epidemiology. First, we develop a dynamical pathogen model describing movement between home and work; we show that limiting social contact, via reduced people or reduced time in the workplace are fairly equivalent strategies to slow pathogen spread. Second, we develop a model based on spatial contact patterns within a specific office and lab building on campus; we show that restricting on-campus activities to labs (rather than labs and offices) could dramatically alter (modularize) contact network structure and thus, potentially reduce pathogen spread by providing a workplace mechanism to reduce contact. Here we argue that explicitly accounting for human movement and contact behavior in the workplace can provide additional strategies to slow pathogen spread that can be used in conjunction with ongoing public health efforts.

**Shaw et al. 2021.**

**PLoS One, vol. 16, no. 1.**

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**Keywords:** Movement ecology; return to work; contacts; spread; COVID-19.

**Evidence Level:** 6A

**Link:** <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0242955>

### **Jobs, housing, and mask wearing: Cross-sectional study of risk factors for COVID-19**

**Background:** Many studies have focused on the characteristics of symptomatic patients with COVID-19 and clinical risk factors. This study reports the prevalence of COVID-19 in an asymptomatic population of a hospital service area (HSA) and identifies factors that affect exposure to the virus. **Objective:** The aim of this study is to measure the prevalence of COVID-19 in an HSA, identify factors that may increase or decrease the risk of infection, and analyze factors that increase the number of daily contacts.

**Methods:** This study surveyed 1694 patients between April 30 and May 13, 2020, about their work and living situations, income, behavior, sociodemographic characteristics, and prepandemic health characteristics. This data was linked to testing data for 454 of these patients, including polymerase chain reaction test results and two different serologic assays. Positivity rate was used to calculate approximate prevalence, hospitalization rate, and infection fatality rate (IFR). Survey data was used to analyze risk factors, including the number of contacts reported by study participants. The data was also used to identify factors increasing the number of daily contacts, such as mask wearing and living environment. **Results:** We found a positivity rate of 2.2%, a hospitalization rate of 1.2%, and an adjusted IFR of 0.55%. A higher number of daily contacts with adults and older adults increases the probability of becoming infected. Occupation, living in an apartment versus a house, and wearing a face mask outside work increased the number of daily contacts. **Conclusions:** Studying prevalence in an asymptomatic population revealed estimates of unreported COVID-19 cases. Occupational, living situation, and behavioral data about COVID-19-protective behaviors such as wearing a mask may aid in the identification of nonclinical factors affecting the number of daily contacts, which may increase SARS-CoV-2 exposure.

**Broek-Altenburg et al. 2021.**

**JMIR Public Health Surveillance, vol. 7, no. 1.**

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**Keywords:** COVID-19; SARS-CoV-2; community exposure; exposure; fatality rate; infection; infection fatality rate; mask; mask wearing; risk of infection; self-protecting; self-protecting behavior; virus.

**Evidence Level:** 4A

**Link:** <https://publichealth.jmir.org/2021/1/e24320/>

### **Vulnerable workers and COVID-19: Insights from a survey of members of the international commission for occupational health**

The COVID-19 pandemic has negatively impacted on the health and wellbeing of populations directly through infection, as well as through serious societal and economic consequences such as unemployment and underemployment. The consequences could be even more severe for those more vulnerable to the disease, such as the elderly and those with underlying health conditions. Indeed, there is evidence that such vulnerable populations are disproportionately affected in terms of both, their health and the socioeconomic impact. The aim of our study was to determine whether occupational health (OH) professionals thought that the COVID-19 pandemic might further disadvantage any particular group(s) of vulnerable workers globally, and if so, which group(s). A cross-sectional study was carried out with a sample of OH professionals by means of an online questionnaire which was shared via email within the ICOH (International Commission for Occupational Health) community. Data was collected over a period of two weeks in May 2020 and 165 responses from 52 countries were received. In this paper, the responses relating to questions about vulnerable workers are reported and discussed. Globally, our responders felt that those in less secure jobs (precarious employment (79%) and informal work (69%)), or unemployed (63%), were the most at risk of further disadvantage from this pandemic. The majority felt that their governments could act to mitigate these effects. There were suggestions of short-term alleviation such as financial and social support, as well as calls for fundamental reviews of the underlying inequalities that leave populations so vulnerable to a crisis such as COVID-19.

**Tamin et al. 2021.**

**International Journal of Environmental Research and Public Health, vol. 18, no. 1.**

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**Keywords:** COVID-19 pandemic; disadvantaged populations; poverty; public health practice; social determination of health; social justice; vulnerable populations; workers.



**Evidence Level:** 4A

**Link:** <https://www.mdpi.com/1660-4601/18/1/346>

### **Considerations for Pooled Testing of Employees for SARS-CoV-2**

**Objectives:** To identify important background information on pooled testing of employees that employers, workers, and health authorities should consider. **Methods:** This paper is a commentary based on the review by the authors of pertinent literature generally from preprints in medrxiv.org prior to August 2020.

**Results/conclusions:** Pooled testing may be particularly useful to employers in communities with low prevalence of COVID-19. It can be used to reduce the number of tests and associated financial costs. For effective and efficient pooled testing employers should consider it as part of a broader, more comprehensive workplace COVID-19 prevention and control program. Pooled testing of asymptomatic employees can prevent transmission of SARS-CoV-2 and help assure employers and customers that employees are not infectious.

**Schulte et al. 2021.**

**Journal of Occupational and Environmental Medicine, vol. 63, no. 1.**

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(<https://creativecommons.org/licenses/by-nc-nd/4.0/>)

**Keywords:** Pooled testing; employees; health; SARS-CoV-2.

**Evidence Level:** 6A

**Link:**

[https://journals.lww.com/joem/Fulltext/2021/01000/Considerations\\_for\\_Pooled\\_Testing\\_of\\_Employees\\_for.1.aspx](https://journals.lww.com/joem/Fulltext/2021/01000/Considerations_for_Pooled_Testing_of_Employees_for.1.aspx)