


RESEARCH ARTICLE

Open Access



Associations between occupational factors and self-rated health in the national Brazilian working population

Nágila Soares Xavier Oenning^{1,2}, Bárbara Niegia Garcia de Goulart¹, Patrícia Klarmann Ziegelmann¹, Jean-François Chastang² and Isabelle Niedhammer^{2*} 

Abstract

Background: The literature remains seldom on the topic of self-rated health (SRH) among the national working populations of emerging countries. The objectives of the study were to examine the associations of occupational factors with SRH in a national representative sample of the working population in Brazil.

Methods: This study relied on a cross-sectional sample of 36,442 workers, 16,992 women and 19,450 men. SRH was the studied health outcome. Sixteen occupational factors related to four topics were studied: employment characteristics, working time/hours, psychosocial work factors and physical and chemical work exposures. The associations between occupational factors and SRH were studied using logistic regression models with adjustment for sociodemographic characteristics (age, ethnicity and marital status). The analyses were performed for each gender separately and using weights.

Results: The prevalence of poor SRH was 26.71%, this prevalence being higher among women (29.77%) than among men (24.23%). The following risk factors for poor SRH were found among men and women: working as a self-employed worker, clerk/service worker, manual worker, part-time (≤ 20 h/week), exposure to work stress, exposure to high physical activity and exposure to sun. The risk factors for poor SRH among women only were: working as a domestic worker and exposure to noise, and among men, working in the agriculture sector.

Conclusions: Our study suggested that occupational factors related to both physical and psychosocial work environment may be associated with SRH in the working population in Brazil. Improving working conditions may be beneficial for health at work in Brazil.

Keywords: Self-rated health, Self-reported health, Workers, Working population, Occupational exposures, working conditions

Background

Self-rated health (SRH) is a measure of the general health condition as self-perceived by individuals, and can be considered as a general indicator of morbidity and a marker of future morbidity and mortality in the general population [1, 2]. SRH is recommended by WHO [3] as a low cost and easy-to-use health measurement tool in population surveys.

SRH has a multifactorial etiology and a large number of factors of different nature may play a role. As work

and occupational exposures are important determinants of health, it may be crucial to identify occupational risk factors for poor SRH. There have been numerous studies exploring occupational factors in association with SRH in various working populations. Among the studied occupational factors, psychosocial work stressors occupy an important place, as almost all studies explored one or more stressors in this topic. For example, studies found the following psychosocial work factors to be associated with SRH: low control or latitude [4–10], high psychological demands [4, 6–12], job strain [13], low social support [4, 9, 10, 14], these factors being related to the job strain model, but also low reward [12, 15], effort-

* Correspondence: isabelle.niedhammer@inserm.fr

²INSERM, Univ Angers, Univ Rennes, EHESP, Irset (Institut de recherche en santé, environnement et travail) - UMR_S 1085, ESTER Team, Angers, France
Full list of author information is available at the end of the article



reward imbalance [15–17], temporary employment [5, 13, 18], job insecurity [4, 8, 11, 14, 19–21], workplace violence/bullying [8, 11, 20], organizational injustice [7, 11], or work-family imbalance [12, 20]. The study of other types of occupational exposures has been more seldom in association with SRH, as around half of the studies also explored factors related to working time/hours or to the physical work environment. Some studies reported that long working hours [5, 22, 23] or shift or night work [22] were associated with poor SRH. Some others showed that exposures related to the physical work environment, such as physical demands, ergonomic or biomechanical exposures, were associated with poor SRH [4, 6, 7, 9, 10, 13, 14, 19, 24].

Although the studies have been numerous on the associations between occupational factors and SRH, gaps remain mainly because most of the studies did not explore the occupational factors related to working time/hours and the physical work environment. Regarding the studied populations, most of the studies focused on specific working populations for example on specific occupations, sectors or areas, making the generalisation of the results difficult to national working populations. Furthermore, only half of the studies were able to examine men and women separately, leading to a lack of information about gender differences in this topic. Finally, the majority of the studies came from the more economically developed countries, in particular Europe, and information may be missing for the rest of the world, especially for Latin America.

In order to fill these gaps, our study aimed at exploring the associations between a wide range of occupational factors and SRH in a large national representative sample of the Brazilian working population.

Methods

This study was based on the cross-sectional data of the Brazilian National Health Survey, called in Portuguese, Pesquisa Nacional de Saúde (PNS), set up in 2013 by the Brazilian Institute of Geography and Statistics (IBGE) and the health ministry [25]. As already described in one of our previous publications [26], this is a household survey among residents 18 years of age and older in Brazil. The three-stage cluster sampling included successive selections of primary sampling units, private households and residents aged 18 years or more using simple random sampling. Details on this survey were published previously [25]. Several questionnaires were used to collect data on household characteristics, and information for all household residents, and more specifically for the selected resident in each household. The total sample of selected residents included 60,202 individuals (response rate: 91.9%). For the purpose of this study, the study sample was restricted to those who were working within

the week of reference, i.e. 36,442 workers, including 16,992 women and 19,450 men.

Self-rated health (SRH)

SRH was used as a general health status measure and based on the following item: “In general, how would you rate your health?” with response categories rated on a five-point Likert scale: “very good”, “good”, “neither good nor poor”, “poor” and “very poor”. This measure is well-known as a general perceived health tool [3]. SRH was dichotomized into: good (very good, good) and poor (fair, poor and very poor). SRH was the outcome of the study.

Occupational factors

These factors were already constructed and used in our previous publication [26]. A total of 16 variables were used to measure occupational factors that were grouped into:

- Employment characteristics: work status, occupation and economic activities that were coded using standard classifications (ISCO and ISIC respectively), and multiple job-holder (i.e. worker having more than one job).
- Working time/hours: night/shift work (one item related to night work and one filter item related to shift work for the workers exposed to night work, making 3 categories: no exposure, night without shift work, and night with shift work) and working hours a week (collected as a continuous variable and studied in 3 categories).
- Psychosocial work factors: workplace violence (2 items on violence at the workplace from known or unknown people) and work stress (1 item on stressful work activities).
- Physical/chemical exposures (1 item each): high physical activity, chemical agents, radioactive agents, urban waste (i.e. waste, garbage and exposure related to sewage and refuse disposal, sanitation and similar activities), biological agents, marble dust, noise, and sun.

Covariates

Four groups of adjustment variables included:

- Sociodemographic characteristics: age, ethnicity (white vs non-white, i.e. all others), and marital status.
- Health behaviours: physical activity (1 item on activity within the past 3 months), smoking (1 item on current status) and binge drinking (5 doses or more for men and 4 doses or more for women on one occasion within the past 30 days).

- Health-related variables: private health insurance plan (1 item) and disability (1 item on disability such as physical, hearing or visual disability).
- Educational level (3 categories: primary, secondary or university)

Statistical analysis

Firstly, a description of the sample was performed for all studied variables. Differences between men and women were tested using Rao-Scott chi-square test.

Secondly, the associations of occupational factors with SRH were studied with weighted logistic regression models, using three types of models:

- Unadjusted bivariate models between each occupational factor and SRH,
- Multivariate models with all the occupational factors together (model 1),
- Multivariate models with all the occupational factors together plus sociodemographic characteristics (model 2).

The following sensitivity analyses explored the robustness of the results:

- With additional adjustment for health behaviours, private health insurance plan and disability,
- With additional adjustment for education,
- With the SRH outcome dichotomized into poor ('poor/very poor') versus good ('fair/good/very good').

We performed all the statistical analyses for each gender separately, using weights that took the sampling characteristics, non-response and calibration into account, and using SAS 9.4 software.

Results

The prevalence of poor SRH was 26.7% (95% CI: 25.9–27.5%) among the total study sample, with a higher prevalence among women than among men: 29.8% versus 24.2% (Table 1).

Bivariate associations are presented in Table 2. The associations were significant with poor SRH for the following factors: self-employed and domestic workers, agriculture workers, construction workers (among men only), manual and clerks/service workers, part time work, long working hours (among women only), high physical activity, exposure to chemical agents (among women only), exposure to sun, and urban waste. Several protective associations were observed with service workers (among women only), night work (among men only), exposure to radioactive agents (among women only) and biological agents (among women only). Older age, being non-white and alone (among men only) were associated with poor SRH. Smoking and physical inactivity were risk factors for poor SRH for both genders, whereas binge drinking was a protective factor. No private health insurance plan and disability were associated with poor SRH for men and women. Regarding education, primary and secondary levels were associated with poor SRH for both genders.

Multivariate associations for women are presented in Table 3 (model 1 and 2). The associations were significant with poor SRH for the following factors: being domestic and self-employed workers, clerks/service workers and manual workers, working part time (≤ 20 h/week), work stress, high physical activity, sun exposure and noise. Urban waste was significant in model 1 but borderline significant in model 2.

Multivariate associations for men are presented in Table 4 (model 1 and 2). The associations were significant with poor SRH for the following factors: being self-employed workers, agriculture workers, clerks/service workers and manual workers, working part time (≤ 20 h/week), work stress, high physical activity and sun exposure. Urban waste was significant in model 1 but borderline significant in model 2.

Sensitivity analyses showed no change in the results after additional adjustment for health behaviours, private health insurance plan and disability, except for the exposure to noise, that was no longer significant among women. The results were also unchanged after additional adjustment for education, except noise that was not significant anymore among women. The sensitivity analysis

Table 1 Description of the study population according Self-Rated Health (SRH) and other health-related variables in 2013, PNS, Brazil

| | Women (N = 16,992) | | | Men (N = 19,450) | | | p-value |
|--------------------------------|--------------------|--------|--------|------------------|--------|--------|---------|
| | n | % | %w | n | % | %w | |
| Poor Self-Rated health (SRH) | 5164 | 30.391 | 29.770 | 4960 | 25.501 | 24.228 | <.0001 |
| Other health-related variables | | | | | | | |
| No private health insurance | 11,348 | 66.784 | 63.472 | 13,936 | 71.650 | 68.685 | 0.0000 |
| Disability | 927 | 5.456 | 5.679 | 1281 | 6.586 | 6.204 | 0.2257 |

%: raw frequency

%w: weighted frequency

p-value: Rao-Scott χ^2 test p-value for the comparison between genders

Table 2 Bivariate associations between occupational factors, covariates and Self-Rated Health (SRH) stratified by gender, 2013, PNS, Brazil

| | Women (N = 16,992) | | | Men (N = 19,450) | | | | |
|--|--------------------|-------|---------|------------------|-------|---------|-------|--------|
| | OR | 95%CI | p-value | OR | 95%CI | p-value | | |
| Employment characteristics | | | | | | | | |
| Work status (ref: private employee) | | | <.0001 | | | <.0001 | | |
| Self-employed | 1.977 | 1.716 | 2.278 | <.0001 | 1.817 | 1.615 | 2.045 | <.0001 |
| Public employee | 1.143 | 0.956 | 1.368 | 0.1420 | 1.032 | 0.835 | 1.277 | 0.7699 |
| Domestic worker | 2.313 | 1.936 | 2.763 | <.0001 | 2.131 | 1.184 | 3.836 | 0.0117 |
| Economic activities (ref: manufacturing) | | | <.0001 | | | | | <.0001 |
| Agriculture | 1.793 | 1.356 | 2.370 | <.0001 | 2.743 | 2.229 | 3.376 | <.0001 |
| Construction | 0.750 | 0.388 | 1.452 | 0.3940 | 1.601 | 1.291 | 1.985 | <.0001 |
| Services | 0.822 | 0.682 | 0.990 | 0.0390 | 1.167 | 0.979 | 1.391 | 0.0839 |
| Occupation (ref: managers/professionals) | | | <.0001 | | | | | <.0001 |
| Clerks/service workers | 1.767 | 1.442 | 2.164 | <.0001 | 1.584 | 1.265 | 1.984 | <.0001 |
| Manual workers | 2.877 | 2.363 | 3.505 | <.0001 | 2.334 | 1.903 | 2.864 | <.0001 |
| Technicians/associate professionals | 0.986 | 0.721 | 1.348 | 0.9280 | 1.147 | 0.854 | 1.542 | 0.3613 |
| Multiple job-holder | 0.804 | 0.604 | 1.069 | 0.1330 | 0.833 | 0.648 | 1.072 | 0.1552 |
| Working time/hours | | | | | | | | |
| Working hours a week (ref: 21–44) | | | <.0001 | | | | | <.0001 |
| ≤ 20 | 1.245 | 1.067 | 1.453 | 0.0050 | 1.657 | 1.345 | 2.043 | <.0001 |
| ≥ 45 | 1.621 | 1.393 | 1.886 | <.0001 | 1.022 | 0.901 | 1.159 | 0.7363 |
| Night/shift work (ref: no) | | | 0.8682 | | | | | 0.0160 |
| Night work | 0.949 | 0.778 | 1.157 | 0.6041 | 0.806 | 0.684 | 0.951 | 0.0106 |
| Night work and shift work | 0.958 | 0.549 | 1.672 | 0.8803 | 0.756 | 0.528 | 1.083 | 0.1268 |
| Psychosocial work factors | | | | | | | | |
| Work stress | 1.078 | 0.954 | 1.217 | 0.2271 | 1.119 | 0.988 | 1.267 | 0.0772 |
| Workplace violence | 1.540 | 0.945 | 2.509 | 0.0833 | 1.263 | 0.833 | 1.917 | 0.2722 |
| Physico-chemical exposures | | | | | | | | |
| High physical activity | 1.811 | 1.566 | 2.095 | <.0001 | 1.532 | 1.364 | 1.721 | <.0001 |
| Chemical agents | 1.270 | 1.083 | 1.488 | <.0001 | 1.119 | 0.972 | 1.288 | 0.1167 |
| Noise | 1.118 | 0.964 | 1.298 | 0.1404 | 1.016 | 0.897 | 1.151 | 0.8048 |
| Exposure to sun | 1.936 | 1.642 | 2.283 | <.0001 | 2.024 | 1.807 | 2.266 | <.0001 |
| Radioactive agents | 0.517 | 0.332 | 0.805 | 0.0044 | 0.986 | 0.632 | 1.540 | 0.9522 |
| Urban waste | 1.820 | 1.486 | 2.228 | <.0001 | 1.394 | 1.136 | 1.710 | 0.0015 |
| Biological agents | 0.634 | 0.498 | 0.808 | 0.0003 | 0.761 | 0.546 | 1.060 | 0.1064 |
| Marble dust | 1.185 | 0.872 | 1.610 | 0.2791 | 1.069 | 0.914 | 1.250 | 0.4054 |
| Sociodemographic characteristics | | | | | | | | |
| Age (ref: < 30) | | | <.0001 | | | | | <.0001 |
| 30–39 | 1.157 | 0.972 | 1.378 | 0.1013 | 1.591 | 1.334 | 1.898 | <.0001 |
| 40–49 | 1.877 | 1.562 | 2.257 | <.0001 | 2.421 | 2.044 | 2.867 | <.0001 |
| ≥ 50 | 3.000 | 2.511 | 3.586 | <.0001 | 4.112 | 3.457 | 4.891 | <.0001 |
| Ethnicity (ref: white) | 1.712 | 1.508 | 1.944 | <.0001 | 1.453 | 1.294 | 1.632 | <.0001 |
| Marital status (ref: live alone) | 1.014 | 0.896 | 1.148 | 0.8235 | 1.352 | 1.205 | 1.516 | <.0001 |
| Health-related variables | | | | | | | | |
| Binge drinking | 0.733 | 0.597 | 0.899 | 0.0035 | 0.86 | 0.754 | 0.98 | 0.0244 |

Table 2 Bivariate associations between occupational factors, covariates and Self-Rated Health (SRH) stratified by gender, 2013, PNS, Brazil (Continued)

| | Women (N = 16,992) | | | Men (N = 19,450) | | | |
|----------------------------------|--------------------|-------|---------|------------------|-------|---------|--------|
| | OR | 95%CI | p-value | OR | 95%CI | p-value | |
| Smoking (ref: no) | | | <.0001 | | | <.0001 | |
| Ex | 1.645 | 1.384 | 1.955 | 1.961 | 1.706 | 2.254 | <.0001 |
| Yes | 1.831 | 1.548 | 2.164 | 2.033 | 1.750 | 2.360 | <.0001 |
| No physical activity | 1.596 | 1.387 | 1.836 | 2.294 | 2.022 | 2.603 | <.0001 |
| No private health insurance plan | 2.311 | 2.017 | 2.648 | 2.292 | 1.981 | 2.652 | <.0001 |
| Disability | 2.573 | 2.001 | 3.309 | 2.727 | 2.245 | 3.313 | <.0001 |
| Education (ref: University) | | | <.0001 | | | | <.0001 |
| Secondary | 1.773 | 1.475 | 2.131 | 1.451 | 1.173 | 1.795 | 0.0002 |
| Primary | 4.067 | 3.376 | 4.900 | 3.165 | 2.576 | 3.887 | <.0001 |

Results from weighted logistic regression analysis

using SRH into poor ('poor/very poor') versus good ('fair/good/very good') showed that some factors were no longer significant, which was expected given the reduced statistical power (the prevalence of poor SRH, using this definition, was 2.7% (95% CI: 2.3–3.0%) among men and 3.7% (95% CI: 3.3–4.2%) among women).

Discussion

Main results

Strong differences were observed between genders. Women had a higher prevalence of poor SRH than men and gender-related differences were also observed for almost all studied variables, occupational factors and covariates. Several occupational factors were associated with poor SRH among men and women: being self-employed workers, clerks/service workers, manual workers, working part time (≤ 20 h/week), exposure to work stress, high physical activity and sun. Gender-specific associations were also observed, for women, between working as domestic workers and exposure to noise and poor SRH, and for men, between working in the agriculture sector and poor SRH.

Comparison with the literature

The prevalence of poor SRH was 26.7% (95% CI: 25.9–27.5%) in our study sample; 29.8% for women and 24.2% for men. Previous studies among working populations also observed gender-related differences in the prevalence of poor SRH, women having a higher prevalence than men [8, 9, 12, 14, 16, 19, 22]. The gender difference in SRH is well-known and has been found in all regions of the world [27]. Numerous factors of various nature (biological, behavioural, psychological and social) have been suspected to play a role in explaining this difference. Some authors however underlined that chronic conditions may play an important role in explaining the

higher prevalence of poor SRH among women, especially musculoskeletal, mental and other pain disorders, which may be 'less considered in favour of disorders with greater impact on mortality' [28].

Working as a clerk/service worker or manual worker was associated with poor SRH, in line with previous studies, including studies exploring social or occupational differences in SRH, that showed that low-skilled occupational or social groups were more likely to have poor SRH [4, 13, 19, 29–31]. In China, a study showed that civil servants from government departments had significantly better SRH than workers from high-tech enterprises [32]. In contrast, in our study we did not find strong differences in SRH between private and public employees, but self-employed workers had a higher prevalence of poor SRH compared to private employees.

Part-time work was associated with poor SRH in our study, in agreement with the findings from a North American study [20]. This result might be related to a healthy worker effect, that may select healthy workers into full time jobs. However, we did not find a robust association between long working hours and SRH, in line with the results from previous studies [6, 11–14, 19, 20] but contrarily to the results observed in Korea or Japan [5, 22, 23]. Our study did not provide any significant result on the association between shift/night work and SRH. In line with our results, previous studies did not report associations between shift or night work and SRH [5, 11, 13, 14, 20]. However, one study found a significant association between shift/night work and SRH [22].

In the present study, the association between work stress and poor SRH was observed for both genders. One item (stressful work activities) was used to measure work stress. Job strain, from the job strain model, is related to the combination of high job demands and low decision latitude, and is a well-known measure of work stress. Previous studies showed significant associations

Table 3 Associations between occupational factors and Self-Rated Health (SRH) adjusted for covariates in women, 2013, PNS, Brazil

| Women | Model 1 (N = 16,992) | | | Model 2 (N = 16,992) | | | | |
|--|-------------------------|--------------|--------------|-------------------------|--------------|--------------|------------------|------------------|
| | OR | 95% CI | p-value | OR | 95% CI | p-value | | |
| Employment characteristics | | | | | | | | |
| Work status (ref: private employee) | | | <.0001 | | | <.0001 | | |
| Public employee | 1.487 | 1.228 | 1.801 | 1.161 | 0.953 | 1.414 | 0.1376 | |
| Domestic worker | 1.850 | 1.515 | 2.259 | 1.534 | 1.248 | 1.887 | <.0001 | |
| Self-employed | 1.738 | 1.488 | 2.031 | 1.369 | 1.164 | 1.611 | 0.0002 | |
| Economic activity (ref: manufacturing) | | | 0.1893 | | | | 0.2977 | |
| Agriculture | 1.111 | 0.800 | 1.543 | 0.5285 | 1.149 | 0.820 | 1.611 | 0.4193 |
| Construction | 0.935 | 0.482 | 1.815 | 0.8423 | 1.008 | 0.491 | 2.067 | 0.9832 |
| Services | 0.852 | 0.693 | 1.047 | 0.1283 | 0.884 | 0.713 | 1.097 | 0.2629 |
| Occupation (ref: managers/professionals) | | | <.0001 | | | | <.0001 | |
| Technicians/associate professionals | 1.043 | 0.762 | 1.427 | 0.7937 | 1.026 | 0.751 | 1.402 | 0.8713 |
| Clerks/service workers | 1.863 | 1.515 | 2.290 | <.0001 | 1.859 | 1.505 | 2.297 | <.0001 |
| Manual workers | 2.155 | 1.724 | 2.693 | <.0001 | 2.008 | 1.594 | 2.529 | <.0001 |
| Multiple job-holder | 0.833 | 0.611 | 1.135 | 0.2472 | 0.865 | 0.636 | 1.177 | 0.3571 |
| Working time/hours | | | | | | | | |
| Working hours (ref: 21–44) | | | 0.0020 | | | | 0.0070 | |
| ≤ 20 | 1.333 | 1.134 | 1.566 | 0.0005 | 1.291 | 1.098 | 1.517 | 0.0020 |
| ≥ 45 | 1.136 | 0.965 | 1.337 | 0.1262 | 1.130 | 0.958 | 1.332 | 0.1483 |
| Night/shift work (ref: no) | | | 0.8589 | | | | 0.8595 | |
| Night work | 1.052 | 0.857 | 1.291 | 0.6280 | 1.062 | 0.856 | 1.317 | 0.5841 |
| Night work and shift work | 1.108 | 0.582 | 2.108 | 0.7553 | 1.037 | 0.544 | 1.977 | 0.9115 |
| Psychosocial work factors | | | | | | | | |
| Work stress | 1.345 | 1.183 | 1.530 | <.0001 | 1.453 | 1.276 | 1.655 | <.0001 |
| Workplace violence | 1.629 | 0.942 | 2.817 | 0.0807 | 1.405 | 0.773 | 2.552 | 0.2643 |
| Physico-chemical exposures | | | | | | | | |
| High physical activity | 1.275 | 1.088 | 1.494 | 0.0027 | 1.284 | 1.091 | 1.510 | 0.0026 |
| Chemical agents | 1.012 | 0.849 | 1.207 | 0.8909 | 0.996 | 0.829 | 1.197 | 0.9682 |
| Noise | 1.157 | 0.978 | 1.369 | 0.0885 | 1.190 | 1.002 | 1.414 | 0.0480 |
| Exposure to sun | 1.338 | 1.092 | 1.641 | 0.0051 | 1.331 | 1.079 | 1.640 | 0.0075 |
| Radioactive agents | 0.730 | 0.454 | 1.173 | 0.1935 | 0.739 | 0.452 | 1.209 | 0.2282 |
| Urban waste | 1.396 | 1.095 | 1.779 | 0.0071 | 1.301 | 0.993 | 1.705 | 0.0564 |
| Biological agents | 0.807 | 0.616 | 1.058 | 0.1207 | 0.844 | 0.640 | 1.113 | 0.2288 |
| Marble dust | 1.006 | 0.735 | 1.378 | 0.9691 | 1.031 | 0.752 | 1.413 | 0.8489 |

Results from weighted logistic regression analysis

Model 1: all occupational factors simultaneously

Model 2: model 1 + sociodemographic characteristics

Values in bold: significant at $p < 0.05$

of job strain or its components (high demands and low latitude) with SRH [4–13]; our findings are thus in agreement with the literature. Our study did not display a significant association between workplace violence and SRH, contrarily to some rare previous studies [8, 11, 20].

In the present study, a number of occupational physico-chemical exposures, high physical activity and

exposure to sun for both genders and exposure to noise among women, were associated with poor SRH. Exposure to high physical activity was associated with poor SRH in our study. Previous studies showed similar results using various measures related to physical demands or ergonomic exposures [4, 6, 7, 9, 10, 13, 14, 19]. Only one previous study among Brazilian

Table 4 Associations between occupational factors and Self-Rated Health (SRH) adjusted for covariates in men, 2013, PNS, Brazil

| Men | Model 1 (N = 19,450) | | | Model 2 (N = 19,450) | | | | |
|--|-------------------------|--------------|--------------|-------------------------|--------------|--------------|--------------|------------------|
| | OR | 95% CI | p-value | OR | 95% CI | p-value | | |
| Employment characteristics | | | | | | | | |
| Work status (ref: private employee) | | | <.0001 | | | 0.0776 | | |
| Public employee | 1.190 | 0.942 | 1.503 | 0.1452 | 0.972 | 0.779 | 1.214 | 0.8031 |
| Domestic worker | 1.792 | 0.948 | 3.387 | 0.0723 | 1.211 | 0.594 | 2.466 | 0.5985 |
| Self-employed | 1.521 | 1.342 | 1.723 | <.0001 | 1.172 | 1.034 | 1.328 | 0.0128 |
| Economic activity (ref: manufacturing) | | | <.0001 | | | | | <.0001 |
| Agriculture | 1.760 | 1.377 | 2.250 | <.0001 | 1.708 | 1.337 | 2.181 | <.0001 |
| Construction | 1.089 | 0.860 | 1.380 | 0.4800 | 1.072 | 0.842 | 1.365 | 0.5735 |
| Services | 1.109 | 0.917 | 1.341 | 0.2852 | 1.157 | 0.950 | 1.408 | 0.1460 |
| Occupation (ref: managers/professionals) | | | <.0001 | | | | | <.0001 |
| Technicians/associate professionals | 1.186 | 0.880 | 1.599 | 0.2616 | 1.244 | 0.917 | 1.687 | 0.1609 |
| Clerks/service workers | 1.681 | 1.327 | 2.130 | <.0001 | 1.702 | 1.334 | 2.172 | <.0001 |
| Manual workers | 1.777 | 1.417 | 2.227 | <.0001 | 1.852 | 1.464 | 2.344 | <.0001 |
| Multiple job-holder | 0.909 | 0.700 | 1.182 | 0.4780 | 0.911 | 0.696 | 1.192 | 0.4973 |
| Working time/hours | | | | | | | | |
| Working hours (ref: 21–44) | | | 0.0007 | | | | | 0.0041 |
| ≤ 20 | 1.436 | 1.164 | 1.771 | 0.0007 | 1.389 | 1.112 | 1.736 | 0.0038 |
| ≥ 45 | 0.931 | 0.817 | 1.061 | 0.2827 | 0.930 | 0.816 | 1.061 | 0.2814 |
| Night/shift work (ref: no) | | | 0.3238 | | | | | 0.3483 |
| Night work | 0.966 | 0.808 | 1.156 | 0.7079 | 0.960 | 0.800 | 1.152 | 0.6616 |
| Night work and shift work | 0.746 | 0.507 | 1.098 | 0.1378 | 0.760 | 0.521 | 1.109 | 0.1546 |
| Psychosocial work factors | | | | | | | | |
| Work stress | 1.359 | 1.184 | 1.559 | <.0001 | 1.387 | 1.207 | 1.592 | <.0001 |
| Workplace violence | 1.311 | 0.847 | 2.030 | 0.2239 | 1.231 | 0.793 | 1.910 | 0.3540 |
| Physico-chemical exposures | | | | | | | | |
| High physical activity | 1.153 | 1.013 | 1.312 | 0.0310 | 1.223 | 1.070 | 1.397 | 0.0031 |
| Chemical agents | 0.958 | 0.819 | 1.121 | 0.5924 | 0.976 | 0.830 | 1.148 | 0.7689 |
| Noise | 0.972 | 0.843 | 1.120 | 0.6909 | 0.999 | 0.864 | 1.154 | 0.9870 |
| Exposure to sun | 1.398 | 1.214 | 1.610 | <.0001 | 1.335 | 1.155 | 1.544 | <.0001 |
| Radioactive agents | 1.170 | 0.721 | 1.898 | 0.5254 | 1.295 | 0.797 | 2.103 | 0.2966 |
| Urban waste | 1.252 | 1.007 | 1.558 | 0.0436 | 1.262 | 0.999 | 1.593 | 0.0508 |
| Biological agents | 0.805 | 0.545 | 1.189 | 0.2754 | 0.764 | 0.507 | 1.149 | 0.1958 |
| Marble dust | 0.995 | 0.826 | 1.197 | 0.9562 | 1.026 | 0.848 | 1.241 | 0.7912 |

Results from weighted logistic regression analysis

Model 1: all occupational factors simultaneously

Model 2: model 1 + sociodemographic characteristics

Values in bold: significant at $p < 0.05$

industrial workers was found and reported that high physical demands were associated with poor SRH [24]. To our knowledge, no previous study in the literature reported an association between exposure to sun at work and SRH. A previous study showed no association between outdoor work and SRH among US workers [20]. We found no study on the

association between workplace noise and SRH. However, some previous studies included noise at work in a general measure of exposure to physical demands [19] and found significant associations between physical demands and SRH. Furthermore, environmental noise (related to traffic) was associated with poor SRH [33].

Strengths and limitations

The study included the following strengths. It relied on a very large representative national sample of the working population in Brazil, providing reliable findings on occupational exposures and SRH in this country. Our study is also one of the first studies exploring these associations in working populations of Latin America. The response rate was high (92%) and as the survey was national and weights were available and used, a generalisation of the results may be possible to the target population, i.e. the national working population in Brazil. The statistical analyses were done for each gender separately, following the best practices [34]. Differences between genders were observed for SRH, occupational factors and covariates, as already reported in our previous publication [26], however, most of the associations between occupational factors and SRH were found to be the same for men and women. Many occupational exposures were explored, including physico-chemical exposures which are less studied in the literature than psychosocial work factors in association with SRH. The outcome (SRH) is a recognized and widely used measure of health status. In our statistical analyses, adjustment was made for socio-demographic characteristics, which are known to be associated with SRH and further adjustment for health behaviours, health-related variables and education was also made in sensitivity analyses and confirmed the results. All these strengths improved our knowledge on SRH in the Brazilian working population, an understudied population in this topic.

Our study also included a number of limitations. The study was cross-sectional, consequently no conclusion about causality can be made, and reverse causation may be possible. A healthy worker effect is also conceivable, that may lead to select healthy people at the workplace and/or at the most exposed jobs, and may lead to an underestimation of the observed associations. The occupational exposures were measured using few items and without validated scales or instruments, something that may lead to potential imprecision and a bias towards the null hypothesis. For example, for the measurement of night/shift work, no precision was given regarding the definition of exposure in the questionnaire (time schedules, for example). Another example is the measurement of work stress and workplace violence that were not based on validated questionnaires. As the selection of the studied occupational factors relied on the availability of the items in the survey questionnaire, some factors such as job insecurity, temporary employment or work-life conflict may be missing [4, 5, 8, 11–14, 18–21, 35]. Exposures and outcome relied on self-reports (common method variance), leading to a potential reporting bias and potential inflated associations.

Conclusion

We found significant associations between various occupational factors and poor SRH, especially factors related to work status, occupation, economic activity, work stress and some physico-chemical exposures. More studies may be needed on these associations, especially among the Brazilian working population. Our study suggests that preventive measures oriented towards the reduction of occupational exposures might be beneficial for SRH among working populations. Finally, our study is an attempt to contribute to the literature by addressing these issues among the working populations of Latin America.

Abbreviations

IBGE: Brazilian Institute of Geography and Statistics; ISCO: International Standard Classification of Occupations; ISIC: International Standard Industrial Classification of all economic activities; PNS: Pesquisa Nacional de Saúde; SRH: Self-rated health

Acknowledgements

The study and data analysis were performed using data from the Brazilian Institute of Geography and Statistics (IBGE). However, the opinions and views expressed do not represent those of IBGE. This article is a condensed version of the first author's PhD thesis from University Federal of Rio Grande do Sul (Brazil) and product of research internship at INSERM and University of Angers (France). The authors would like to thank Julie Bodin, Julien Dugas and Sylvaine Jego for their help with the SAS coding.

Authors' contributions

NSXO conceived the study protocol. NSXO and IN performed the literature review and drafted and revised the manuscript. NSXO performed the statistical analysis. IN and JFC made contributions to the statistical analysis and interpretation of results. BNGG, PKZ and JFC made contributions to manuscript revisions. All authors read and approved the final manuscript.

Funding

The study was funded by the Coordination of Improvement of Higher Level Personnel (CAPES, Brazil) and National Council for Scientific and Technological Development (CNPq, Brazil). CAPES and CNPq had no role in the design of the study and collection, analysis, and interpretation of data and in writing the manuscript.

Availability of data and materials

The dataset analysed during the current study is available in the Brazilian Institute of Geography and Statistics (IBGE) repository (<https://www.ibge.gov.br>). The data are publically available.

Ethics approval and consent to participate

Ethical approval was granted by the National Commission of Ethics in Research (CONEP) in June 2013 (n° 328.159). All people who were included in the sample agreed to participate in the survey and signed the informed consent form.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests. Isabelle Niedhammer is a Section Editor for BMC Public Health but had no role in the editorial process.

Author details

¹Epidemiology Graduate Program, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil. ²INSERM, Univ Angers, Univ Rennes, EHESP, Irset (Institut de recherche en santé, environnement et travail) - UMR_S 1085, ESTER Team, Angers, France.

Received: 1 March 2019 Accepted: 3 October 2019

Published online: 26 October 2019

References

- DeSalvo KB, Bloser N, Reynolds K, He J, Muntner P. Mortality prediction with a single general self-rated health question. A meta-analysis *J Gen Intern Med*. 2006;21(3):267–75.
- Idler EL, Benyamini Y. Self-rated health and mortality: a review of twenty-seven community studies. *J Health Soc Behav*. 1997;38(1):21–37.
- de Bruin A, Picavet H, Nossikov A. Health interview surveys: towards international harmonization of methods and instruments. In: WHO regional publications - European Series no 58. Copenhagen: World Health Organization, Regional Office for Europe; 1996.
- Borg V, Kristensen TS, Burr H. Work environment and changes in self-rated health: a five year follow-up study. *Stress Medicine*. 2000;16:37–47.
- Cho SS, Ju YS, Paek D, Kim H, Jung-Choi K. The combined effect of long working hours and low job control on self-rated health: an interaction analysis. *J Occup Environ Med*. 2018;60(5):475–80.
- Kim H, Kim JH, Jang YJ, Bae JY. Gender differences in the effects of job control and demands on the health of Korean manual workers. *Health Care Women Int*. 2016;37(3):288–300.
- Laaksonen M, Rahkonen O, Martikainen P, Lahelma E. Associations of psychosocial working conditions with self-rated general health and mental health among municipal employees. *Int Arch Occup Environ Health*. 2006; 79(3):205–12.
- Lesuffleur T, Chastang JF, Cavet M, Niedhammer I. Psychosocial work factors and self-reported health in the French national SUMER survey. *Sante Publique*. 2015;27(2):177–86.
- Niedhammer I, Chea M. Psychosocial factors at work and self reported health: comparative results of cross sectional and prospective analyses of the French GAZEL cohort. *Occup Environ Med*. 2003;60(7):509–15.
- Schrijvers CT, van de Mheen HD, Stronks K, Mackenbach JP. Socioeconomic inequalities in health in the working population: the contribution of working conditions. *Int J Epidemiol*. 1998;27(6):1011–8.
- Liu HC, Cheng Y. Psychosocial work hazards, self-rated health and burnout: a comparison study of public and private sector employees. *J Occup Environ Med*. 2018;60(4):e193–8.
- Schutte S, Chastang JF, Parent-Thirion A, Vermeylen G, Niedhammer I. Association between socio-demographic, psychosocial, material and occupational factors and self-reported health among workers in Europe. *J Public Health (Oxf)*. 2014;36(2):194–204.
- Bambra C, Lunau T, Van der Wel KA, Eikemo TA, Dragano N. Work, health, and welfare: the association between working conditions, welfare states, and self-reported general health in Europe. *Int J Health Serv*. 2014;44(1):113–36.
- Hammig O, Gutzwiller F, Kawachi I. The contribution of lifestyle and work factors to social inequalities in self-rated health among the employed population in Switzerland. *Soc Sci Med*. 2014;121:74–84.
- Magnavita N, Garbarino S, Siegrist J. The use of parsimonious questionnaires in occupational health surveillance: psychometric properties of the short Italian version of the effort/reward imbalance questionnaire. *ScientificWorldJournal*. 2012;2012:372852.
- Niedhammer I, Tek ML, Starke D, Siegrist J. Effort-reward imbalance model and self-reported health: cross-sectional and prospective findings from the GAZEL cohort. *Soc Sci Med*. 2004;58(8):1531–41.
- Pikhart H, Bobak M, Siegrist J, Pajak A, Rywik S, Kyshegyi J, Gostautas A, Skodova Z, Marmot M. Psychosocial work characteristics and self rated health in four post-communist countries. *J Epidemiol Community Health*. 2001;55(9):624–30.
- Kwon K, Park JB, Lee KJ, Cho YS. Association between employment status and self-rated health: Korean working conditions survey. *Ann Occup Environ Med*. 2016;28(1):43.
- Borrell C, Muntaner C, Benach J, Artazcoz L. Social class and self-reported health status among men and women: what is the role of work organisation, household material standards and household labour? *Soc Sci Med*. 2004;58(10):1869–87.
- Luckhaupt SE, Alterman T, Li J, Calvert GM. Job characteristics associated with self-rated fair or poor health among U.S. workers. *Am J Prev Med*. 2017;53(2):216–24.
- Rugulies R, Aust B, Burr H, Bultmann U. Job insecurity, chances on the labour market and decline in self-rated health in a representative sample of the Danish workforce. *J Epidemiol Community Health*. 2008;62(3):245–50.
- Cho SS, Ki M, Kim KH, Ju YS, Paek D, Lee W. Working hours and self-rated health over 7 years: gender differences in a Korean longitudinal study. *BMC Public Health*. 2015;15:1287.
- Nakata A. Investigating the associations between work hours, sleep status, and self-reported health among full-time employees. *Int J Public Health*. 2012;57(2):403–11.
- Fonseca SA, Blank VL, Barros MV, Nahas MV. Self-perceived health and associated factors in industrial workers from Santa Catarina state, Brazil. *Cad Saude Publica*. 2008;24(3):567–76.
- Borges de Souza-Júnior P, Soares de Freitas M, de Abreu AG, Landmann Szwarcwald C. Sampling Design for the National Health Survey, Brazil 2013. *Epidemiol Serv Saúde*. 2015;24(2):207.
- Oenning NSX, Ziegelmann PK, Goulart BNG, Niedhammer I. Occupational factors associated with major depressive disorder: a Brazilian population-based study. *J Affect Disord*. 2018;240:48–56.
- Boerma T, Hosseini AR, Verdes E, Chatterji S. A global assessment of the gender gap in self-reported health with survey data from 59 countries. *BMC Public Health*. 2016;16:675.
- Malmusi D, Artazcoz L, Benach J, Borrell C. Perception or real illness? How chronic conditions contribute to gender inequalities in self-rated health. *Eur J Pub Health*. 2012;22(6):781–6.
- Kjellsson S. Accumulated occupational class and self-rated health. Can information on previous experience of class further our understanding of the social gradient in health? *Soc Sci Med*. 2013;81:26–33.
- Murcia M, Chastang JF, Cohidon C, Niedhammer I. Contribution of occupational factors to social inequalities in self-reported health among French employees. *Int Arch Occup Environ Health*. 2013;86(5):541–52.
- Niedhammer I, Chastang JF, David S, Kelleher C. The contribution of occupational factors to social inequalities in health: findings from the national French SUMER survey. *Soc Sci Med*. 2008;67(11):1870–81.
- Jia Y, Gao J, Dai J, Zheng P, Wu X, Li G, Fu H. Difference of the associations between self-rated health and demographic characteristics, lifestyle, and psychosocial work environment between two types of Chinese worksite. *BMC Public Health*. 2014;14:851.
- Riedel N, Loerbroks A, Bolte G, Li J. Do perceived job insecurity and annoyance due to air and noise pollution predict incident self-rated poor health? A prospective analysis of independent and joint associations using a German national representative cohort study. *BMJ Open*. 2017;7(1):e012815.
- Niedhammer I, Saurel-Cubizolles MJ, Piciotti M, Bonenfant S. How is sex considered in recent epidemiological publications on occupational risks? *Occup Environ Med*. 2000;57(8):521–7.
- Griep RH, Toivanen S, van Diepen C, Guimarães JMN, Camelo LV, Juvanhol LL, Aquino EM, Chor M. Work-family conflict and self-rated health: the role of gender and educational level. Baseline data from the Brazilian longitudinal study of adult health (ELSA-Brasil). *Int J Behav Med*. 2016;23(3): 372–82.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Ready to submit your research? Choose BMC and benefit from:

- fast, convenient online submission
- thorough peer review by experienced researchers in your field
- rapid publication on acceptance
- support for research data, including large and complex data types
- gold Open Access which fosters wider collaboration and increased citations
- maximum visibility for your research: over 100M website views per year

At BMC, research is always in progress.

Learn more biomedcentral.com/submissions

