Physical inactivity increases the chances of disease-related absenteeism among steel company workers

Inatividade física aumenta as chances de absenteísmo por doença em trabalhadores de empresa siderúrgica

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ABSTRACT

To evaluate the factors associated with absenteeism due to illness in workers at a steel company in Vitória, Espirito Santo, Brazil. This is a cross-sectional epidemiological study, based on information related to the health of employees in a steel company. A total of 317 male employees were evaluated. Variables related to sociodemographic characteristics, lifestyle, work characteristics, and clinical condition were collected. Steelmakers who worked in the operational sector were 3.96 times more likely to leave because of illness (95% CI 1.86–8.44). Likewise, inactive individuals were almost three times as likely to abstain from work (OR 2.92, 95% CI 1.14–7.46) and those who negatively self-rated their health status more than doubled chances of absenteeism due to illness (OR 2.14, 95% CI 1.07–4.29). Companies should develop fitness programs and work plans to minimize factors associated with absenteeism due to illness.

Keywords: Absenteeism. Life style. Occupational groups. Physical inactivity occupational health.

RESUMO

Avaliar os fatores associados ao absenteísmo por doença em trabalhadores de uma siderúrgica em Vitória, Espírito Santo/Brasil. Trata-se de um estudo epidemiológico do tipo transversal, com base na coleta de informações sobre eventos ligados à saúde de colaboradores em uma siderúrgica. Foram avaliados 317 colaboradores do sexo masculino. Para fins deste estudo, foram coletadas variáveis referentes as características sociodemográficas, estilo de vida, características laborais e condição clínica. Os siderúrgicos que trabalhavam no setor operacional apresentaram 3,96 vezes mais chances de se afastarem por doença (IC$_{95\%}$ 1,86–8,44). Da mesma forma, os indivíduos pouco ativos tiveram quase o triplo de chances de se absterem do trabalho (OR 2,92, IC$_{95\%}$ 1,14–7,46) e os que autoavaliaram negativamente o seu estado de saúde apresentaram mais que o dobro de chances de absenteísmo por doença (OR 2,14, IC$_{95\%}$ 1,07–4,29). Sugere-se às empresas desenvolverem programas de condicionamento físico e planos de trabalho para minimizar fatores associados ao absenteísmo por doença.

Palavras-chave: Absenteísmo. Estilo de vida. Categorias de trabalhadores. Inatividade física. Saúde do trabalhador.

INTRODUCTION

The study of absenteeism due to diseases has incorporated a wide range of concepts from different disciplines. This has produced different approaches and explanatory models, resulting in a great variability in the measures of and terms for the same indicator.[1] The positive aspect of this great diversity in measures and approaches is the possibility of expanding the knowledge of the multiple determinations of this phenomenon, in light of different sociological, psychological, economic, and public health perspectives. However, the lack of standardization and the great variability of concepts in the definition of absenteeism due to illness have hindered the comparability of results between different types of studies.[2]

It is important to observe absenteeism as a work indicator related to the employee's lack of work, particularly because its genesis is multifactorial and related to aspects such as work accidents, legal rights, blood donation, jury duty, family reasons, conflicts with the team and / or boss, and locomotion.[3] Other related factors, including lifestyle, socioeconomic level, education, and access to medical care, can favor the development of chronic conditions, culminating in absenteeism due to illness.[4] Despite this, it is difficult to measure the exact proportion of absenteeism related to morbidities and the computation of costs attributed to these shortages, which justifies the need for specific studies that address this issue.[2]

In a recent systematic review, more than seventy articles related to the topic were analyzed. The results showed associations between physical activity and health variables, which affected both the performance of the worker, the risk factors for diseases, and absenteeism. The data indicate that physical activity is one of the factors that contribute to the maintenance of health and the lowest absence rate from the workplace. In addition, it appeared that the development of awareness programs and incentives to practice physical exercises are related to the reduction of absenteeism.[5] Other authors also observed that good physical conditioning, resulting from regular physical activity, is related to better health and the reduction of absenteeism among military police officers.[6] The increase in the prevalence of cardiometabolic diseases in this class of workers raises requests for medical assistance, affecting both the performance of the service and the professional return to the institution and society.

Although there is legislation in Brazil that establishes guidelines and recommendations for companies regarding issues of Worker's Health and Safety, rates of absence from work and leave from work increase every year.[7] Despite this trend, some professional categories receive little attention for factors related to absenteeism due to illnesses, and it is necessary to include actions that promote health, quality of life, and safety at work in the routine of companies.[8]

The steel industry is an important sector for the Brazilian economy. Although

the world market is led by China, Brazil is the largest steel producer in Latin America. The main steel and metallurgical companies are concentrated in the Southeast region, employing 105,476 workers in 2016. Of these employees, 92% were male and 61% were self-employed.[9] Although absenteeism due to illness is recurrent among these workers,[10] mainly due to musculoskeletal disorders,[11] little is known about the factors associated with absenteeism in the steel sector. Thus, the present study evaluated the factors associated with absenteeism due to illness among workers at a steel company in the city of Vitória, in the state of Espírito Santo, Brazil.

METHODOLOGY

This study is an observational, analytical, and cross-sectional investigation that assessed the association between independent variables (sociodemographic characteristics, work characteristics, lifestyle, and health conditions) and absenteeism among steel workers in the city of Vitória, Espírito Santo, Brazil (Figure 1). This study complied with the standards for conducting research on human beings in Resolution 466/12 of the National Health Council and the Declaration of Helsinki. Study participants agreed to sign the Free and Informed Consent Form. In addition, an Information Statement was prepared for the Institution in which the research was carried out. The study was approved by the Research Ethics Committee Involving Humans of the Euro-American Network of Human Motricity - REMH (n. 002-2011).
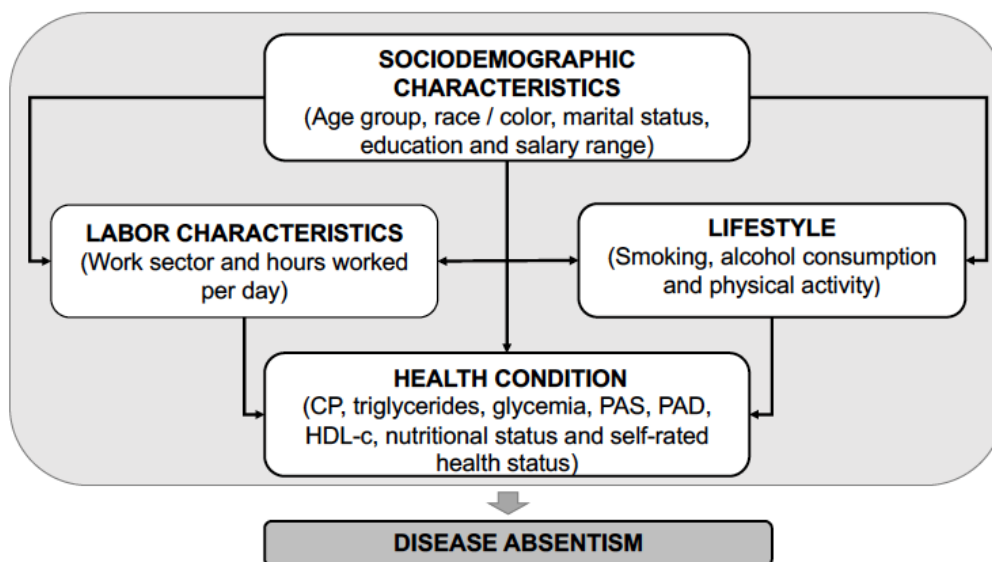
Figure 1. Analysis model of the association between the independent variables (sociodemographic, work, lifestyle, and health) and absenteeism of steel workers
Caption: PC: Waist Circumference; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure; HDL-c: High Density Lipoprotein cholesterol (high density lipoprotein).

The necessary sample was calculated using the Epidat 4.2 software. Considering the sample universe of 4,500 employees of a company in the steel sector, located in the city of Vitória, Espirito Santo, Brazil (period from December 2011 to January 2012), the minimum sample number was calculated considering an error of 5.5 % and a 95% confidence interval (CI); this totaled 297 individuals, but 317 individuals were evaluated, which represented an accuracy of 5.3%. The sample was non-probabilistic and based on subjects who met the inclusion criteria.

As part of the inclusion criteria, individuals underwent the company's periodic examinations and clinical laboratory examination for analysis. In addition, a lecture was held with the participants to provide information about the study, how to answer the questionnaires, and what data would be used. Employees who did not participate in the lecture were excluded from the study. Non-full participation in the company's periodic examinations was an exclusion criterion. Thus, after this stage, the final sample was composed of 317 male employees.

For the purposes of this study, variables were collected regarding sociodemographic characteristics, lifestyle, work characteristics, and clinical condition (Figure 1). Sociodemographic characteristics were age group, race/ethnicity, marital status, education, and salary range. The age groups were categorized as "20 to 30 years old", "between 31 to 40 years old," and "older than 40 years old"; race/ethnicity at "white" and "non-white"; marital situation as "married" and "unmarried"; schooling as "≤ 11 years" and "> 11 years"; and wage range of "<5 salary, "from 5 to 7 times minimum

wage" and "> 7 times minimum wage" based on the Brazilian Economic Classification Criteria.[12]

In relation to work characteristics, the work sector ("administrative" or "operational") and workload ("<12 hours/day" and "12 hours/day or more") were assessed through self-report. In the lifestyle assessment, self-report of habitual consumption of alcoholic beverages ("consumes" and "does not consume") and smoking ("does not smoke" and "smokes") were also considered. To measure the level of physical activity, the long version of the International Physical Activity Questionnaire (IPAQ) validated for the Brazilian population was used, with individuals being considered sufficiently active who reported at least 150 minutes of activities with a frequency ≥ 5 days a week, taking into account the sum of the sessions related to leisure and transportation to avoid overestimating the level of physical activity.[13]

Health status was assessed by several parameters, which included the classification criteria for metabolic syndrome, self-assessment of health status, and classification of nutritional status. The waist circumference (CP) was collected with an inextensible anthropometric tape positioned in the middle horizontal point between the lower margin of the last costal arch and the iliac crest. The measure was categorized as adequate or elevated, considering a cutoff point of BW ≥ 94 cm for men and BW ≥ 80 cm for women.[14] Values for triglycerides, glycemia, and low HDL-c (high density lipoprotein cholesterol) were collected in the company's periodic examinations, and classified according to the Brazilian Guidelines on Diagnosis and Treatment of

Metabolic Syndrom.[15] Individuals with high blood pressure were those using antihypertensive drugs and/or who had systolic blood pressure (SBP) were considered) ≥ 140 mmHg and/or Diastolic Blood Pressure (DBP) ≥ 90 mmHg.[16]

Nutritional status was assessed by the Body Mass Index (BMI = weight in kg/height in m²) and grouped under low weight/eutrophic (BMI <24.99 kg/m²) and overweight/obesity (BMI> 25 kg/m²).[16] Self-rated health status was assessed by the question: "In general, how would you rate your health status in relation to other individuals of the same age?" The responses were rated as "very good/good" and "fair/poor".

Finally, the dependent variable of interest (absenteeism) was evaluated according to the records of the company's medicine and health department, obeying the classification of Quick and Lapertoso.[3]

Statistical analyses were performed using IBM SPSS Statistics for Windows, version 22.0 (Armonk, NY: IBM Corp), adopting a significance level of 5%. To describe the study variables, absolute frequency and percentages were used for categorical variables. Regarding the association tests between the independent variables and the outcome, Pearson's chi-square test was used. When the expected values in the table cells were less than five or when the sum of the column value was less than twenty, Fisher's exact test was used. The binary logistic regression model with the Enter selection method was used to test associations between independent variables and absenteeism. The variables that were statistically significant with the outcome of up to 20% in the association analyses were tested in the multiple model. For this model, the assumptions of absence of multicollinearity, minimum sample size for the number of variables in the model, absence of outliers, and adjustment of the model according to Hosmer–Lemeshow were taken into account.

RESULTS

Of the 317 participants, most were white (n = 231; 72.9%), and just over half were married (n = 171; 54.0%). Roughly a third were over 40 years of age (n = 114; 36.0%), and most had 11 years or more of schooling (n = 268; 84.5%). A little more than half worked in the company's operating sector 51.4% (n = 163), with a predominant salary range of 5 to 7 times minimum wage (n = 268; 45.1%). In addition, 71.9% (n = 228) worked less than 12 hours / day.

Regarding lifestyle habits, 85.4% (n = 270) reported not being smokers, but only 23.3% (n = 74) did not consume alcoholic beverages. Nearly two-thirds could be considered physically inactive (n = 206; 65.0%). Perhaps not surprisingly, 69.1% (n = 219) were overweight and 35.7% (n = 113) rated their health as fair or poor. In terms of the results of the physical assessment, 15.8% (n = 50) presented inadequate values for triglycerides, 3.2% (n = 10) for blood glucose, 5.4% (n = 17) for PAS, 6.9% (n = 22) for PAD, and 12.3% (n = 39) for HDL-c, while high blood pressure was present in 8.8% (n = 28) of respondents. Furthermore, in the analyzed period, 17.7% (n = 56) of participants had been on sick leave (Table 1).

Table 1. Sociodemographic characteristics of steel workers

Variables		Total n (%)
Age range	20 to 30 years	97 (30.6)
	31 to 40 years	106 (33.4)
	Over 40 years	114 (36.0)
Race/ethnicity	White	231 (72.9)
	Not white	86 (27.1)
Marital situation	Unmarried	146 (46.0)
	Married	171 (54.0)
Education	≤ 11 years	49 (15.5)
	> 11 years	268 (84.5)
Salary range[*]	< 5 salary	129 (40.7)
	5 to 7 salary	143 (45.1)
	> 7 salary	45 (14.2)
Work sector	Administrative	154 (48.6)
	Operational	163 (51.4)
Working time[1]	< 12 years	228 (71.9)
	12 years or more	88 (27.8)
Smoking[2]	Does not smoke	270 (85.4)
	Smokes	33 (13.6)
Alcohol consumption	Does not consume	74 (23.3)
	Consumes	243 (76.7)
Physical activity	Little active	206 (65.0)
	Active	111 (35.0)
Waist Circumference	Adequate	216 (68.1)
	High	101 (31.9)
Triglycerides	Proper	267 (84.2)
	High	50 (15.8)
Glucose	Proper	307 (96.8)
	High	10 (3.2)
PAS	Proper	300 (94.6)
	High	17 (5.4)
PAD	Proper	295 (98.1)
	High	22 (6.9)
Blood pressure	Proper	289 (91.2)
	High	28 (8.8)
HDL-c	Adequate	278 (87.7)
	Low	39 (12.3)
Nutritional status	Eutrophy / low weight	98 (30.9)
	Overweight / obesity	219 (69.1)
Self-assessment of health status	Very good / good	204 (64.3)
	Fair / poor	113 (35.7)
Absenteeism due to illness	Away	56 (17.7)
	Not away	261 (82.3)

N = 317. [1] N = 316. [2] N = 313. Legend: SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure; HDL-c: High Density Lipoprotein cholesterol. * Salary range in 2011: $294.60.

When assessing the association between absenteeism and sociodemographic variables, it was found that individuals who received less than 5 times minimum wage showed greater sick leave (P = 0.048). Likewise, employees who worked in the operational sector showed greater absenteeism (P <0.001; Table 2). Similarly, steel workers considered to be physically inactive showed greater absenteeism (P <0.001), as well as those who self-rated themselves as having a regular or poor state of health (P <0.001; Table 3).

Table 2. Association between absenteeism due to illness and socioeconomic and labor characteristics of steel workers

Variables		Absenteeism due to illness		p value
		Away	Not away	
		n (%)	n (%)	
Age range	20 to 30 years	18 (32.1)	79 (30,3)	0.957
	31 to 40 years	18 (32.1)	88 (33,7)	
	More than 40 years	20 (35.7)	94 (36,0)	
Race/ethnicity*	White	40 (71.4)	191 (73,2)	0.869
	Not white	16 (28.6)	70 (26,8)	
Marital situation*	Unmarried	26 (46,4)	120 (46,0)	0.999
	Married	30 (53.6)	141 (54,0)	
Education*	≤ 11 years	13 (23.2)	36 (13,8)	0.101
	> 11 years	43 (76.8)	225 (86,2)	
Salary range	< 5 times minimum wage	31 (55.4)	98 (37,5)	**0.048**
	5 to 7 times minimum wage	19 (33.9)	124 (47,5)	
	> 7 times minimum wage	6 (10.7)	39 (14,9)	
Work sector*	Administrative	13 (23.2)	141 (54,0)	**<0.001**
	Operational	43 (76.8)	120 (46,0)	
Working time[1]*	< 12 years	38 (67.9)	190 (73,1)	0.417
	12 years or more	18 (32.1)	70 (26,9)	

Chi-square test. * Fisher's exact test. N = 317. [1] N = 316.

Table 3. Association between absenteeism due to illness and lifestyle and health of steel workers

Variables		Absenteeism due to illness		p value
		Away	Not away	
		n (%)	n (%)	
Smoking[1]	Does not smoke	45 (95.7)	225 (96.2)	0.503
	Smokes	2 (4.3)	9 (3,8)	
Alcohol consumption*	Does not consume	8 (14.3)	66 (25.3)	0.084
	Consumes	48 (85.7)	195 (74.7)	
Physical activity*	Inactive	49 (87.5)	157 (60.2)	**<0.001**
	Active	7 (12.5)	104 (39.8)	
Waist circumference	Adequate	35 (62.5)	181 (69.3)	0.344
	High	21 (37.5)	80 (30.7)	
Triglycerides*	Proper	43 (76.8)	224 (85.8)	0.106
	High	13 (23.2)	37 (14.2)	
Glucose*	Proper	55 (98.2)	252 (96.6)	0.999
	High	1 (1.8)	9 (3.4)	
PAS*	Proper	53 (94.6)	247 (94.6)	0.999
	High	3 (5.4)	14 (5.4)	
PAD*	Proper	52 (92.9)	243 (93.1)	0.999
	High	4 (7.1)	18 (6.9)	
Blood pressure*	Proper	50 (89.3)	239 (91.6)	0.604
	High	6 (10.7)	22 (8.4)	
HDL-c*	Adequate	46 (82.1)	232 (88.9)	0.179
	Low	10 (17.9)	29 (11.1)	
Nutritional status	Eutrophy / low weight	17 (30.4)	81 (31.0)	0.999
	Overweight / obesity	39 (69.6)	180 (69.0)	
Self-assessment of heath status*	Very good / good	24 (42.9)	180 (69.0)	**<0.001**
	Fair / poor	32 (57.1)	81 (31.0)	

Chi-square test. * Fisher's exact test. N = 317. [1] N = 313. Legend: SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure; HDL-c: High Density Lipoprotein cholesterol.

After multiple analyses, greater absenteeism remained associated with working in the operational sector, being inactive, and negatively self-assessing health (Table 4). Steel workers in the operational sector were almost four times more likely to leave because of illness (OR 3.96, 95% CI 1.86–8.44, P <0.001). Likewise, physically inactive individuals had almost three times the chance of abstaining from work (OR 2.92, 95% CI 1.14–7.46, P = 0.025), and those who self-rated themselves as having a state of health regular or bad had more than twice the chances of absenteeism due to illness in the analyzed period (OR 2.14, 95% CI 1.07–4.29, P = 0.032).

Table 4. Binary logistic regression for multiple analysis of absenteeism in steel workers and associated factors

Variables	Gross values			Multiple		
	p value	OR	IC$_{95\%}$	p value	OR	IC$_{95\%}$
Education						
≤ 11 years		1			1	
> 11 years	**<0.001**	0.19	(0.14–0.26)	0.354	0.68	(0.31–1.53)
Salary range						
< 5 times minimum wage		1			1	
5 to 7 times minimum wage	**<0.001**	0.15	(0.09–0.25)	0.087	0.55	(0.28–1.09)
> 7 times minimum wage	**<0.001**	0,15	(0.06–0.36)	0.789	1.16	(0.39–3.47)
Work sector						
Administrative		1			1	
Operational	**<0.001**	0.36	(0.25–0.51)	**<0.001**	3.96	(1.86–8.44)
Alcohol consumption						
Does not consume		1			1	
Consumes	**<0.001**	0.25	(0.18–0.34)	0.239	1.69	(0.71–4.03)
Physical activity						
Inactive	**<0.001**	4.64	(2.02–10.63)	**0.025**	2.92	(1.14–7.46)
Active		1			1	
Triglycerides						
Adequate		1			1	
High	**0.001**	0.35	(0.19–0.66)	0.195	1.73	(0.75–3.99)
HDL-c						
Adequate		1			1	
Low	**0.004**	0.34	(0.17–0.71)	0.326	1.58	(0.63–3.96)
Self-assessment of health status						
Very good / good		1			1	
Fair / poor	**<0.001**	0.39	(0.26–0.59)	**0.032**	2.14	(1.07–4.29)

Binary logistic regression. Multiple model with variables of p <0.2 in binary analyzes. Inclusion of variables by the Enter method. Hosmer and Lemeshow test = 0.274. Legend: OR: odds ratio; 95% CI: 95% confidence interval; HDL-c: High Density Lipoprotein cholesterol.

DISCUSSION

Absenteeism due to illnesses in the steel industry was associated with work in the operational sector, being inactive, and negatively self-assessing health. The condition of family members, administrative work, and financial status are factors that influence absenteeism, especially in certain sectors, where the

worker is overloaded with the demand for overtime and has no opportunity health care, as is case of the operational sector identified in the present study.[5,17]

The causes of absenteeism can vary according to the different occupations and are also associated with life habits,[18] as well as working in extreme shifts, stress, sleep disorders,[19] labor conflicts, risk of contamination, accidents,[11,12,20,21] and mental disorders.[20,22] Such factors may affect different classes of workers differently, and may or may not be present in the steel sector, which indicates the need for more in-depth analysis in each field of work.[21.]

Working conditions can lead to physical and mental wear, and may affect the potential of employees and the productivity of the company, and thus cost effectiveness.[5,6,17] Absenteeism can thus lead to economic impacts in several sectors of the economy, health, and social security,[5,23,24] which illustrates the importance of drawing up actions for valuing professionals, as well as for improving the relationship between work groups and observing employee satisfaction while promoting a healthy lifestyle.[8]

Steel workers who were physically active showed a lower rate of absenteeism, and this is a factor that remained associated even after adjustments. Ferraz and colleagues also observed that good physical fitness was related to a lower absenteeism rate of military police officers,[6] so physical activity performed with load control and prescribed based on the results of physical fitness tests may help workers[5,6,25] both in relation to control and relationships at work, as well as to overall satisfaction and quality of life.[25] Encouraging the practice of physical activity, guided by a planned, replicable, and sustainable process, may guarantee the promotion, participation, and autonomy of individuals.[26] The offer in the company of a systematic physical exercise program, associated with a control program nutritional and healthy habits, could be a way to reduce costs associated with absenteeism.

Abstaining from work was associated with the poor self-perceived health. Self-rated health is an interesting marker, as it goes beyond the strict meaning of health and reflects not only exposure to diseases, but also the individual's perception. A negative self-assessment of health is associated with the socioeconomic, psychosocial, health status, and lifestyle conditions of workers in the metal-mechanical industry.[27] Thus, a higher frequency of negative health self-assessment was found in workers in the area of health who had missed work due to illness (38%).[28] Still, experiencing negative feelings about life was also reflected in a higher prevalence of presenteeism (being at work even with physical or psychological limitations that reduce working capacity) in this industry in Bahia/Brazil.[29]

As possible limitations of this study, we can mention its transversal character, which may limit the causal interpretations among the factors associated with absenteeism due to illness. In fact, non-

probabilistic sampling and the effects of the healthy worker could also have reinforced the selection of the healthiest individuals for this study, because the workers most apt for work are those who are active in the labor market and in full employment.

CONCLUSION

In view of the above, it can be concluded that absenteeism in this company in the steel sector was multifactorial, however some factors were more relevant, such as operational work, negative health perception, and physical inactivity, with a positive relationship of physical activity in reducing the absenteeism. Few studies dealing with this topic as related to steel workers are available in the literature. Thus, this study contributes with information about the steel sector and similar sectors, stimulating possible interventions for prevention and health promotion and, consequently, reduced absenteeism. It is therefore suggested that companies develop physical conditioning programs to improve factors related to absenteeism due to illness. In addition, it is important that companies develop specific work plans with continuing education and career plans to promote a healthy work environment. In this way, workers will be able to assess their health positively under the influence of the physical, mental, and social contexts in which they are inserted.

EPIDEMIOLOGICAL OR SOCIAL APPLICATIONS

Studies with this design are relevant for the identification of problems, and facilitate the development and execution of strategies to monitor these problems and mitigate their harmful effects. The results obtained also support the development of hypotheses for possible longitudinal studies. As this is an observational, analytical, and cross-sectional study, new studies should be carried out, especially on cohorts and interventions combined with a physical activity program in the steel industry, to observe the behavior in the dependent variable (absenteeism due to illness) and the independent variables (sociodemographic characteristics, work characteristics, lifestyle, and health condition). This would supplement an economic analysis, which is increasingly a focus in scientific articles.

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