Title
Associations of job strain, isostrain, and job insecurity with cardiovascular risk factors and productivity in Mexican workers

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Publication Date
2014

Peer reviewed|Thesis/dissertation

UNIVERSITY OF CALIFORNIA

Los Angeles

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A dissertation submitted in partial satisfaction of the requirements for the degree Doctor of Philosophy in Environmental Health Sciences

by

Isabel Judith Garcia Rojas

2014

ABSTRACT OF THE DISSERTATION

Associations of job strain, isostrain, and job insecurity with cardiovascular risk factors and productivity in Mexican workers

by

Isabel Judith Garcia Rojas

Doctor of Philosophy in Environmental Health Sciences

University of California, Los Angeles, 2014

Professor John R. Froines, Chair

Occupational psychosocial factors have been associated in previous research with cardiovascular diseases and low productivity. The paucity of data from developing economies including Mexico hampers the development of worksite intervention efforts in those regions. This study assessed the prevalence of psychosocial job factors (job strain, isostrain, their subdomains, and job insecurity) and their cross-sectional associations with cardiovascular risk factors and productivity in a sample of 2,330 Mexican workers drawn from different companies.

Psychosocial and biological cardiovascular risk factors were evaluated by questionnaire and on-site physical examinations. Psychosocial job factors were ascertained by the Job Content Questionnaire. Sick-leave absenteeism data were collected from personnel records from the Mexican Institute of Social Security and presenteeism was assessed using the eight-item version of the Work Limitations Questionnaire. Associations between psychosocial job factors,

biological cardiovascular risk factors, and productivity indicators were examined in multiple regression models, adjusting for physical workload and socio-demographic factors.

Overall, and in agreement with our hypotheses, psychosocial job factors had a negative impact on blood glucose, total blood cholesterol levels, smoking, leisure-time physical activity, and productivity indicators. Mixed associations were found between psychosocial job factors and overweight/obesity indicators and blood pressure. Social support (in particular supervisor support) was protective against high total blood cholesterol levels, overweight/obesity, and smoking, and promoted leisure-time physical activity.

Our study makes a unique contribution by evaluating within the same study population the effects of alternative operationalizations of psychological demands and decision latitude scales based on factor analysis and addressing the possibility that some of the original scales may have been interpreted as physical rather than psychosocial job factors. In fact, when considering fully adjusted models, the alternative versions predicted the outcomes better than the original versions, and showed better agreement to the literature and to our hypotheses than the original versions.

Taking into consideration the overall results of this study, which point to a harmful effect of psychosocial stressors on cardiovascular risk factors and a protective effect of social support on most outcomes, we conclude that interventions at the worksite level are needed to reduce psychosocial stressors and improve workers' cardiovascular health and productivity.

The dissertation of Isabel Judith Garcia Rojas is approved.

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2014

DEDICATION

I dedicate this dissertation to the One who created me, for the gift of life and all of His uncountable blessings that make everything possible. This work is also dedicated to my amazing husband Osvaldo and to my parents Jose and Judith for their immense love and unconditional support.

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ACKNOWLEDGEMENTS

It is a pleasure to thank those who made this thesis possible. I owe my deepest gratitude to my Committee Chair, Dr. John Froines, for providing financial support through the Fogarty Program, which made it possible for me to complete a PhD program in the United States. His passion for environmental health and his involvement throughout the years in the advancement of academic research in Mexico is truly admirable.

I would like to thank my advisor and mentor Dr. Peter Schnall for introducing me to the concept of psychosocial factors in the worksite. His guidance, knowledge, and expertise have been invaluable in my doctoral career. Thank you for always making yourself available to help me!

It has been an honor to work with those who have served in my Doctoral Committee: Drs. BongKyoo Choi, Wendie Robbins, and Niklas Krause. This thesis would not have been possible without Dr. Choi's deep knowledge on the various characteristics of the Job Content Questionnaire and statistical analysis methods. I thank Dr. Robbins for being involved in my Committee since the very beginning of my research and Dr. Krause for his willingness to serve on my Committee on such a short notice and for his thorough and valuable comments to my dissertation.

I would like to show my gratitude to the Mexican faculty members that were instrumental in the execution of this dissertation. I thank Drs. Victor Borja and Raul Sanchez-Roman for allowing me to work with them at the Mexican Institute of Social Security and to use the data for my dissertation. I would also like to recognize Mrs. Jacqueline Durcudoy, for her involvement and excellent supervision of the fieldwork.

I am grateful for wonderful people that I met at UCLA: Mr. L.B. Tillakaratne, Josie Wei, Elina Nasser, Vi Huynh, Cristina Batteate, Carrie Gibson, Joan Klemstine, and Rebecca Greenberg. They made me feel welcome at UCLA and gave me invaluable help during graduate school.

I am indebted to my friends from the International Church of Christ. Their prayers, encouragement, advice, and love have sustained me through the journey of the doctoral program.

I want to thank all of my family for their support across oceans and national boundaries. Mom and dad, you have taught me by example how to be a conscientious scholar. My academic accomplishments are largely due to you. Thank you for your constant encouragement, sacrifice, and unconditional love and for always believing in me!

Finally, this thesis would not have been possible without the help of my amazing husband Osvaldo Castro. Thank you for being my lifelong companion and for embarking in this adventure with me!

This work was supported by the NIH Fogarty grant 5D43TW000623, by the National Council of Science and Technology (CONACYT, grant Salud-2005-02-14451) in Mexico City, and by the Southern California NIOSH Education and Research Center, Grant Agreement Number T42 OH0084 from the Centers for Disease Control and Prevention (CDC). Its contents are solely the responsibility of the authors and do not necessarily represent the official view of CDC.

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CHAPTER 1. INTRODUCTION

Work provides a means of support and a way to attain a fulfilling life, yet it can also negatively affect workers' health and productivity when adverse conditions such as long work hours and psychosocial stressors (*e.g.*, job strain, isostrain, and job insecurity) are present.[1] Because the occupational setting is where workers spend most of their time, studying the occupational factors that contribute to their health is paramount.

Working conditions in Mexico are often deleterious. Although the Mexican Institute of Social Security (*Instituto Mexicano del Seguro Social*, IMSS) has launched programs to foster worksite health promotion, their effectiveness has been unsatisfactory.[2] For example, eight out of ten employees in Mexico work overtime without compensation.[3] Overtime has been shown to increase adverse health outcomes and promote unhealthy behaviors.[4] Moreover, job insecurity and unemployment, which have also been associated with poor health,[5] are highly prevalent in this country.[6] Mexico's economic crisis has forced workers to emigrate to the United States[7] or to start jobs in the informal economy (*i.e.,* to obtain employment or income outside of the government's taxation, observation, and regulation).[8] Approximately 28% of the economically active population worked in the informal sector by the end of 2011.[9]

During the past few decades, Mexican companies, compelled by regulatory legislation, have made extensive efforts to manage physical work environmental hazards. Indeed, the Department of Labor and Social Welfare has established numerous Mexican Official Standards that, among other things, regulate biological, chemical, and physical exposures in the workplace.[10] However, psychosocial aspects of work have received little attention in research and prevention. This may be due to a lack of awareness of their existence and possible health effects. In fact, from 2002-2012, only 8 publications[11-18] that studied psychosocial job factors among Mexican workers were identified in a literature search in Pubmed-Medline using the terms psychosocial work factors, Mexico, occupational risk factors, and work-related stress. With the exception of one publication, these few Mexican research studies reported the prevalence of psychosocial factors in the worksite but failed to examine their effects on workers' health. Additionally, an assumption that these factors arise from individual characteristics rather than the work environment has hampered research and intervention efforts.[19]

In Mexico, workers are embedded in a different organizational culture and may be exposed to factors distinctive to that culture. In fact, considering variables relevant to a country's specific socioeconomic and cultural situation is important when assessing psychosocial work factors.[20] For example, in developing countries, work stress may be worsened by a myriad of factors outside of the work environment such as illiteracy, poverty, inadequate transportation systems, and gender inequalities, among others.[21] Additionally, job insecurity is more severe in Latin America than in developed countries due to economic instability.[22] In regards to productivity outcomes, presenteeism is a relatively new concept in the literature, and to our knowledge, there is no published literature on this topic among Mexican workers. To fill this research gap and to provide employers with objective data based on a Mexican-working population, this study aims to assess the prevalence of psychosocial job factors (job strain, isostrain, job insecurity and their subdomains) and their associations with cardiovascular risk factors and productivity in a sample of Mexican workers drawn from different companies.

This study used data from the project titled “Mexican Institute of Social Security (IMSS) and companies’ collaboration model to promote workers’ healthy behaviors,” an ongoing cohort study which encompassed a wide range of participants working at eight different companies in Mexico City. It is, to the best of our knowledge, the largest study to date that considers the health effects of psychosocial factors on Mexican workers as well as their consequences on productivity indicators such as presenteeism and absenteeism.

1.1 Specific aims

This study examined associations between psychosocial job factors, cardiovascular risk factors, and productivity among Mexican workers. Specifically, this study aimed to investigate associations between job strain, isostrain (and their subdomains), and job insecurity with:

- Cardiovascular risk factors such as total blood cholesterol, blood glucose, weight indicators (body mass index, waist circumference, and waist-hip ratio), casual blood pressure, smoking, and leisure-time physical activity, and
- Productivity indicators (presenteeism and sick leave absence).

The objective data obtained from this study is also intended to direct Mexican employers' attention on those prevalent cardiovascular disease risk factors that have been neglected due to insufficient local scientific evidence regarding their importance, in order to optimize the effects of any future effort aimed to improve both workers' health and productivity.

1.2 Hypotheses

- Psychosocial job factors such as high job strain, isostrain, job insecurity, and their subdomains are associated with harmful effects on cardiovascular risk factors and productivity with the exception of decision latitude and social support. Specifically, the following associations are hypothesized:

- Positive associations between psychological job demands, job strain, isostrain, and job insecurity and total blood cholesterol levels, blood glucose levels, weight indicators, blood pressure, smoking, presenteeism, and absenteeism
- Negative associations between psychological job demands, job strain, isostrain, and job insecurity and leisure-time physical activity
- Negative associations between decision latitude, social support and total blood cholesterol levels, blood glucose levels, weight indicators, blood pressure, smoking, presenteeism, and absenteeism, and
- Positive associations between decision latitude, social support and leisure-time physical activity

CHAPTER 2. LITERATURE REVIEW

According to the International Labor Office,[23] “work is central to people's well-being” because it not only represents a source of income for families but it also fosters a country’s economic and social development. However, work can also adversely affect health and overall well-being when deleterious conditions in the occupational setting are present.[24]

The National Institute for Occupational Safety and Health (NIOSH) defines a healthy organization as “one that has low rates of illness, injury, and disability in its workforce and is also competitive in the marketplace.” However, healthy work is not just the absence of unhealthy conditions but also the presence of factors that “address the human need for fulfilling work, dignity, creativity, and a sense of purpose.”[25] Numerous research studies report higher levels of productivity and profitability in companies focused on improving workers’ quality of life by implementing wellness programs on-site.[26] According to Hillier et al.[27], “employees’ wellbeing is a general social good, benefiting the individual, their immediate community, and the wider society in terms of quality of life and social integration.” Indeed, a job should represent much more than just a source of income. It should provide a network of social support, friendly interactions, and the opportunity for learning new skills, fulfilling a purpose and being useful to society, thus giving individuals a sense of achievement and self-worth.

Many work-related factors can affect the welfare of an organization and its members. In an attempt to identify those factors, various frameworks in occupational health have been developed, one of which examines the effects of the *physical aspects* of the work environment (chemical, biological, and physical hazards), on the prevalence and severity of workers' diseases. Another framework involves *occupational health psychology*, which examines how the psychosocial aspects of the workplace, such as workload, psychological demands, autonomy, influence, recognition, rewards, and social support, among others, promote or undermine the health and well-being of workers.[28]

The purpose of this study is to examine the association between psychosocial job factors, in particular job strain, isostrain, job insecurity, and their subdomains (job demands, control, and social support) with cardiovascular risk factors and productivity in Mexican workers. Our literature review starts by describing working conditions in Mexico that may account for the presence of deleterious psychosocial job exposures and provide statistics on the general health status of the Mexican working population. Next, we define the concept of psychosocial job factors, referring to some of the theories and instruments used to measure them. We also present an overview of productivity and the different approaches used to define and measure this concept, and, finally, we discuss the literature linking psychosocial job factors with cardiovascular risk factors and productivity, including the few studies performed among Mexican workers.

2.1 Working conditions in Mexico

2.1.1 Demographic factors and their influence on psychosocial working conditions

According to the National Institute of Statistics and Geography (*Instituto Nacional de Estadística y Geografía, INEGI*), almost 116 million people resided in Mexico at the beginning of 2013.[29] Of the entire population, approximately 49% are males and 51% are females. The average age is 30 years old and life expectancy is 75.4 years. The national mortality and fertility rates are 4.8 and 19.3 per 1,000 inhabitants, respectively. Average schooling is 8.1 years.[30,31] Approximately 43% of the Mexican population are employed; 62% of the employed population are males and the remaining 38% are females. The average age of active workers is 38 years old.[29]

In a study analyzing the population and development of Mexico since 1940, Alba and Potter[32] demonstrated the ways in which rapid population growth harmed this country's economic development. They noted that in the 30 years following 1940, the Mexican population increased by 157%, in contrast to an increase in the previous 30 years of only 30%. Indeed, by 1970, Mexico's population numbered 50.7 million – more than twice the size of the 1940 population of 20.2 million – and was growing at a fast rate as a result of a sustained high birth rate and a greatly reduced death rate. The authors explained that in the long term, this situation was detrimental because the overwhelming population growth ended up exceeding the gross domestic product, which not only fostered an increase in unemployment, but also aggravated the economic crisis that Mexico was already facing at that moment. A poor economy coupled with high levels of job insecurity forces Mexican workers to conform and adapt to their working conditions, even though these might be unfair and deleterious, thus failing to attain international goals for decent work.[23]

2.1.2 Neoliberalism and its repercussions in Mexico's psychosocial working conditions

Psychosocial factors are highly associated with working conditions and may appear in the context of certain forms of work organization. In our modern society, forms of work are constantly changing and are increasingly characterized by a focus on productivity growth at the expense of workers' welfare manifested through a reduction in benefits and job stability. For example, instead of internally investing to foster the development and growth of certain departments on site, many companies now prefer to outsource and offshore many of their services so they can cut costs. Moreover, deregulation has led to higher competition and therefore, to an increasing pressure to produce more in order to remain profitable.[33,34] Many of these forms of work are the result of neoliberalism.

Neoliberalism is a political and economical philosophy which "emphasizes the primacy of markets over government, and which advocates policies that have led to the deregulation of labor markets, and the dismantling of the social protections and redistributive policies of the earlier welfare state".[35] In Mexico, this type of organizational change appeared with the introduction of the North American Free Trade Agreement (NAFTA).

Motivated by the successful removal of trade barriers by the European Economic Community, Mexico, the United States, and Canada signed NAFTA in 1992, which began operating in 1994. It is considered the world's largest free-trade area.[36]

Even though NAFTA had some positive effects such as the increase in trade and financial flows, tariff reductions, partial stabilization of some macroeconomic variables and of the exchange rate,[36-38] its negative results have far outweighed its benefits, as we will explain below.

One of the economic sectors most affected by NAFTA was rural agriculture. This sector experienced millions of job losses due to the private acquisition of agricultural lands (formerly called *ejidos*), which used to be the source of living for many rural communities. Deprived of government subsidies, poorly educated farmers were unable to compete with US cheaper prices on crops and were compelled to sell their lands to the giant agribusiness firms that took over this industry. Moreover, in order to survive, many of them were forced to move to Mexico City or to illegally immigrate to the United States,[39] which further aggravated some of the problems associated with "centralization" or migration to the capital city. In Mexico City, for example, centralization has resulted in overpopulation, higher levels of pollution, progressive deficiency of public utilities, (e.g., frequent water, gas, and electricity shortages), and insufficient health care resources to cover the needs of the growing population. At a national level, centralization has caused regional disparities and income inequalities.[40]

Another negative effect of NAFTA happened in regards to employment in other sectors of the economy. Contrary to what was expected, very few jobs were created after NAFTA was launched. For example, in the secondary sector of the economy, the employment rise in export manufacturing was surpassed by the loss of jobs in domestic manufacturing employment resulting from increased import competition, the use of foreign inputs in assembly-line production, and the relocation of maquiladora assembly plants to lower-wage countries, such as

China.[41] According to the National Institute of Geography and Statistics (INEGI), unemployment rates in Mexico have doubled in the last decade.[42] The rise in unemployment has caused an exponential growth of the informal economy in Mexico. The informal sector “includes unofficial self-employed workers whose activities range from street vendors to independent contractors and small family-run businesses.”[43] According to INEGI, approximately 13.4 million people, or 28% of the economically active population, worked in the informal sector by the end of 2011.[9] Other sources, such as the International Labor Office, put the total as high as 25.5 million.[44] Many individuals move to the informal sector not only because of the lack of employment opportunities but also to avoid the excessive regulations and taxation imposed on formal businesses.[45] Although informal workers may experience more job control than those with an official employment because they are usually on their own, their working conditions are very deleterious due to the absence of protection from labor and safety laws, no access to benefits such as retirement pension or health insurance, and job insecurity.[46]

In regards to wages, Polaski et al.[41] reported in their study of Mexican employment, productivity and income after NAFTA, that wages declined and income inequality magnified, indicating that “the top 10% of households increased their income, while the other 90% decreased their income or saw no change”. Furthermore, not only did wages decrease but the purchasing power of the minimum wage was also reduced in half a decade after NAFTA took effect.[47]
Finally, environmental challenges also appeared as a result of trade liberalization in Mexico. Gallagher, a research associate at the Global Development and Environment Institute, indicated that in Mexico, “from 1985 to 1999, rural soil erosion grew by 89%, municipal solid waste by 108%, water pollution by 29%, and urban air pollution by 97%.”[48]

According to Noriega et al.,[6] the emergence of neoliberalism, or new forms of work, are simply "methods of personnel administration, which violate the rights of workers". He further declares that most of these methods are aimed to reduce labor costs, and include the excessive use of employment agencies (outsourcing), unrestrained temporary contracts, increasing pressure for workers to resign, prohibition to unionize, and the cancellation of labor benefits, such as vacation days, severance pay, maternity leave, and profit sharing.

2.1.3 Occupational health legislation and its deficiencies to regulate Mexican working conditions

Mexico's occupational regulatory framework has its origins in Article 123 of the Mexican Constitution and has two main divisions. The National Labor Law or LFT (*Ley Federal del Trabajo*) corresponds to workers in the private sector and "establishes the obligations of employers and workers with respect to basic safety and industrial hygiene conditions in the workplace, and […] it is utilized as a general guide for cases of workers' compensation."[7] The Federal State Workers Law (*Ley Federal de los Trabajadores al Servicio del Estado*) provides the regulatory framework for public or government workers.

Another regulatory policy, the Federal Regulation on Safety, Health and Workplace Environment or RFSH (*Reglamento Federal de Seguridad, Higiene y Medio Ambiente de Trabajo*) "establishes the rules and procedures for the enforcement of safety and health standards, […] known as Official Mexican Standards (NOMs) on a full range of occupational safety and health (OSH) issues."[49]

The Secretariat of Labor and Social Welfare or STPS (*Secretaría del Trabajo y Previsión Social*), is the institution in charge of overseeing compliance with LFT and RFSH. Taking the United States as a reference point, STPS would correspond to the US Department of Labor (DOL) and has also some of the same characteristics and functions as the Occupational Safety and Health Administration.[50]

Unfortunately, even though the Mexican legislation is very thorough and ambitious, its implementation has been a challenge because of the lack of personnel and financial resources to ensure adequate surveillance and to perform adequate monitoring and management of occupational risks such as chemical, physical, and biological hazards, let alone psychosocial exposures.[7,51,52] Another reason for the difficulty in enforcing occupational safety and health (OSH) legislation is the shortage of trained professionals. According to Sanchez et al.,[7] only half of the schools of Medicine in Mexico offer academic programs in occupational health and the majority of physicians who work in private companies are not specialized in this area. Moreover, unlike the United States, there is not a central organization in Mexico focused on performing research in this important area, and financial resources for OSH are scarce.[7,49,53]

This lack of law enforcement in OSH translates into deleterious working conditions; such as low wages, long working hours without overtime compensation, reduction in vacation days, increase in job demands and low control, etc. Moreover, employers generally devote little or minimum financial resources for medical, safety, and hygiene services, not to mention preventive interventions in the worksite.

2.1.4 Occupational health surveillance

Mexico seeks to meet workers' health needs through social security institutions. The Mexican Institute of Social Security (*Instituto Mexicano del Seguro Social,* IMSS) covers workers in the private sector, the Institute for Social Security and Services for State Workers (*Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado,* ISSSTE) is charged with providing health benefits for government workers, and the Secretariat of Health (*Secretaría de Salud,* SSA) serves the uninsured population (i.e., the unemployed and those working in the informal sector). Unlike the first two institutions, SSA neither provides occupational health services nor follows a specific regulatory framework, thus leaving the most vulnerable population deprived of quality health services.[6]

Our study population worked in the private sector and was therefore covered by IMSS. In Mexico, more than 800,000 private companies are affiliated to IMSS, which provides health services for millions of workers and their dependents, totaling up to 40% of the total Mexican population. As a matter of fact, IMSS is considered the largest social security institution in the country.[7,54]

In case of a work-related accident or illness, IMSS' occupational risks insurance provides employees, on the one hand, with medical coverage, and on the other hand, it covers employers' financial liabilities, such as income replacement, disability pensions, and other compensations established by the LFT.[55] Carreon et al.[49] indicated that even though Mexico's social security system was considered in the past "the most effective public health system in Latin America," Mexico's population pyramid inversion and the subsequent growth in the number of pensioners led to this system's unsustainability, which resulted in a reduction of government fund allocation for social security and an enhanced role of private insurance companies. Moreover, because of IMSS' financial crisis, it became a common practice for physicians to deny recognition of an occupational accident or disease, succumbing to the pressure to "save" money to the institution. The main argument is that there are many malingerers and that really sick workers can always appeal to the boards of conciliation and arbitration. However, this is a bureaucratic and time-consuming procedure, and therefore many workers desist in seeking compensation.[6]

2.1.5 Health problems resulting from deleterious working conditions

Both detrimental living and working conditions have had serious health consequences on the Mexican population. In the past couple of decades; Mexico has experienced an epidemiological transition characterized by the rise of chronic and degenerative illnesses, also known as "non-communicable" diseases.[56] Indeed, according to the most recent SSA statistics,[57] the first five causes of mortality in Mexico include diabetes, ischemic heart disease, stroke or cerebrovascular disease, cirrhosis or other chronic hepatic diseases, and chronic obstructive pulmonary disease.

From 2000 to 2008, mortality rates of these illnesses considerably increased by 34.6%, 22%, 10.9%, 5.15%, and 18.13%, respectively. Some of the risks for cardiovascular disease include smoking, hypercholesterolemia, hypertension, and overweight/obesity. In Mexico, the prevalence of smoking and hypercholesterolemia are15.9% and 23.9%, respectively.[58,59] Even though hypertension is not among the first five causes of mortality, it is worth noticing that its mortality rate experienced a sharp increase of 34.1% in the same period of time.[57] Additionally, according to statistics from the Organization for Economic Cooperation and Development

(OECD), Mexico is the second "heaviest" country among the OECD countries, after the United States.[60]

In spite of the deterioration of the work environment (as evidenced by the aforementioned effects of neoliberalism in the country, the increasing unemployment rates and informal economy, as well as the lack of law enforcement in OSH), IMSS registries in the last decade neither reflect this situation nor indicate a reduction in the rate of occupational diseases and deaths and only a slight increment in work accidents.[61,62] According to Sanchez et al.,[7] "this could be interpreted on the one hand as improvement of accident-prevention conditions and on the other as the result of a deficient work-risk recognition and registry."

In a national study that collected information from 27 IMSS district offices, Salinas-Tovar et al.[63] found that there was an average under-estimation of occupational accidents of 26.3%, and up to 68% in certain district offices. They explained that direct medical attention by physicians on-site (and negligence in notifying these cases to IMSS), and deficient knowledge of administrative procedures from company physicians were some of the reasons at the source of this problem. Furthermore, in some instances, workers suffering from a chronic disease may experience early layoffs, which might contribute to the difficulty in establishing the link between their illness and an occupational exposure. It is worth noting that this data only include population affiliated to IMSS; therefore, a higher percentage of underreporting of cases is certain because up to 69% of the economically active population in Mexico do not have social security insurance.[7]

This deficiency in obtaining reliable occupational health data is a serious problem for the country because it obscures the real prevalence of occupational health risks, hinders the setting of priorities for risk management and prevention, and prevents employers and policy makers from taking effective action to counteract those risks.[51,55,56,64]

2.1.6 Costs associated with health care

In Mexico, few studies have reported the financial burden of health problems. In a study of benefit-cost analysis, Hammit and Ibarran[65] indirectly calculated monetary values of mortality and morbidity risks in Mexico City and the Metropolitan area by estimating the "value per statistical life" and the "value per statistical non-fatal injury;" *i.e.*, the approximate appraisal of monetary costs due to either illness in a lifetime or nonfatal injuries. They estimated a "value per statistical life ranging from US$235,000 to US $325,000 and a value per statistical non-fatal injury from US$3,500 to US$11,000," and argued that even though these numbers were much smaller than the ones reported for developed countries, they could be used as a reference point when evaluating the efficiency of occupational or environmental health promotion programs in Mexico or other developing countries. In a study of IMSS estimated health-care costs, high monetary losses associated with occupational injuries were reported: in 2005 almost 8 million workdays were lost due to short-term disability, which resulted in institutional health care expenses of approximately 753 million USD and 578 million USD in workers' financial compensations for the inability to work. The impact of these expenditures is considerable in Mexico, currently undergoing a financial crisis. This impact might be even more significant because these numbers did not include costs associated with occupational illnesses or indirect expenditures such as productivity losses and other personal, family-related disbursements.[55]

2.2 Psychosocial job factors and psycho-physiological effects, cardiovascular risk factors, cardiovascular disease, and productivity

2.2.1 Psychosocial factors in the workplace

According to the International Labor Organization,[66] psychosocial factors are defined as the "interactions between and among work environment, job content, organizational conditions and workers' capacities, needs, culture, personal extra-job considerations that may, through perceptions and experience, influence health, work performance and job satisfaction." Examples of psychosocial work factors and their facets include the following:

- Job demands, which are characterized by quantitative workload, variance in workload, work pressure (such as pacing and timing of the work), and include both physical and psychological demands
- Job content, which refers to task repetitiveness, work challenge, and utilization and development of skills
- Job control, including the ability to make decisions, control over work instruments, tasks, and organizational issues; control over the physical environment and work resources, and control over work pace vs. machine-pacing
- Social interactions, referring to social support from supervisor; *i.e.,* emotional support in the form of care-giving, and affectionate concern, appraisal support in form of evaluative feedback and affirmation, informational support by giving suggestions or guiding, and instrumental support by organizing opportunities. Healthy social interactions among colleagues are important to build group cohesion and avoid interpersonal conflicts such as unhealthy competition, bullying, and psychological harassment.[67]

2.2.2 Job stress/strain theories and measurement instruments

According to the National Institute for Occupational Safety and Health, job stress is defined as "the harmful physical and emotional responses that occur when the requirements of the job do not match the capabilities, resources, or needs of the worker."[25] This concept encompasses not only job strain, but also a wide range of situations in which the amount, intensity, duration, or pace of work exceed workers' physical or psychological abilities and/or interfere with their family or personal lives.[68]

Several theoretical approaches that identify psychosocial factors at work that affect stress and psychological well-being have been described, including the job characteristics model (JCM), the Michigan organization stress (MOS) model, the job demand–control model (DC), the sociotechnical (ST) approach, the action-theoretical (AT) approach, the effort–reward imbalance (ERI) model, and the vitamin model (VM).[69] The demand-control model[70] is among the most widely used in job stress research. According to this model, high strain jobs (characterized by low job control and high psychological job demands) are the most deleterious for health, whereas active jobs (high job control and high psychological job demands) promote learning and feelings of mastery and competence. Passive jobs (low job control and low psychological job demands) induce apathy and a decrease in problem solving ability. The lowest health risk is expected for low strain jobs (high job control and low psychological job demands).[70] This model was later expanded by incorporating work-related social support and became the demand-control-support model.[71] Isostrain is defined as the combination of high job strain and low social support at work. The job content questionnaire (JCQ) is the preferred and most used instrument to measure those constructs.[72]

Several operationalizations of job strain are available. For example, a dichotomous variable of high job strain is obtained by the quadrant method, in which the demand and control scales are divided at the median. The job strain ratio, a continuous variable, results from dividing demands by control (quotient method). Although the most common approach to define high job strain is the quadrant method, it is not considered the most appropriate approach and exploration of different formulations of job strain is recommended.[73] Another reason to explore continuous formulations of a variable is that with categorical measures, continuous exposure information is lost as well as statistical power. Additionally, in categorical analysis, different cut-points will result in different models and risk estimates.[74]

2.2.3 Psychological and physiological effects of stress

Stress may have either physiological or psychological manifestations, or both. Physiological stress is characterized by a stimulation of two neuroendocrine systems, the sympathetic adrenal-medullary system (SAM), which releases catecholamines, adrenaline and noradrenalin into the blood flow, and the hypothalamic-pituitary-adrenocortical axis (HPA), which secretes corticosteroids; e.g., cortisol.[75] The release of such hormones is followed by a myriad of metabolic changes in the body such as increased heart and respiration rate, higher mobilization of blood flow, stimulation of muscle cells, among others. All these reactions mobilize energy and prepare the individual to “fight or flight”. Psychological stress results in similar mechanisms, although responses differ from those in physiological stress in that the reactions are usually prolonged and do not have a clear beginning or end.[75,76]

2.2.4 Job stress and cardiovascular risk factors

Following the pathways mentioned above, chronic exposure to job stress leads to excess cortisol secretion,[77] which produces a range of symptoms and negative outcomes for both individuals and organizations. For example, work stress has been associated with cardiovascular risk factors such as diabetes,[78] dyslipidemia,[79,80] overweight/obesity,[81] hypertension,[82] smoking,[83] and leisure-time physical activity.[84,85]

Diabetes results from insulin resistance and insufficient pancreatic release of compensatory insulin. Cortisol triggers hepatic release of glucose into the blood stream and inhibits the peripheral action of insulin, which may lead to impaired glucose tolerance.[86,87] Chronic elevated cortisol levels can also influence hepatic lipoprotein metabolism, causing lipolysis and increased circulating fat acids (dyslipidemia).[79] In fact, low levels of HDL cholesterol, and high concentrations of LDL cholesterol and triglycerides have been associated with an increased release of cortisol.[80,88] Regarding the potential physiological mechanisms linking job stress and obesity, cortisol has been shown to increase appetite. Moreover, insulin resistance and increased visceral fat deposits due to cortisol-induced dyslipidemia may also contribute to abdominal obesity.[80]

Even though the mechanisms by which stress may affect blood pressure are not fully understood, neural and hormonal mechanisms have been hypothesized. Elevated stimulation of the sympathetic nervous system (and subsequent adrenalin release) may contribute to the development and maintenance of hypertension and may promote structural changes in the vessel walls.[82,89]

High work stress also promotes health-risk behaviors, such as smoking and physical inactivity. Smoking, a habit that people usually adopt during adolescence, is a risk behavior known to mitigate unpleasant emotional states such as anxiety and stress.[90] Occupational factors have been shown to contribute to continue this harmful habit or even increase its frequency.[91,92] In a large sample of Japanese rural workers of both genders, high demands were associated with heavy smoking.[93]

The literature on workplace stress and leisure-time physical activity predominantly relates to the control domain of the job strain model. On-the job learning opportunities and task decision authority have been shown to promote leisure-time physical activity in US workers.[85] On the other hand, lack of control at work may have a spillover effect into other aspects of life, making participation in physical activity more challenging.[94]

2.2.5 Job stress and cardiovascular disease (CVD)

Over the past 20 years, the study of the effects of psychosocial job stressors on cardiovascular disease has gained an increased attention among researchers. In Mexico, since 1970, the rate of CVD has increased 90%.[95] In 2007, the mortality rate of coronary artery disease in this country was 53.1 per 100,000 inhabitants, accounting for 10.9% of total mortality.[96]

Work stress has been associated with myocardial infarction, stroke, and angina pectoris.[97] Although many studies point to a positive association between psychosocial work stressors and cardiovascular disease,[97-101] a recent review from the IPD-consortium indicated only a small association between job strain and an increased risk of an incident event of CVD.[98] However, it is worth noting that the latter study only reported findings associated with job strain without considering other work stressors.

2.2.6 Mechanisms linking job stressors to cardiovascular risk factors or cardiovascular disease

Although many gaps still exist in understanding how job stressors exert their effects on CVD, several pathways have been identified.[102] As mentioned above, the pathological effects of the stress response are linked to the stimulation of the neuroendocrine systems SAM and HPAC. Additionally, adrenaline stimulates platelet activation and adhesiveness, and an increased concentration of fibrinogen, which promote atherosclerosis and acute thrombosis. In a study among civil servants in London, Bruner et al.[103] found that low levels of decision latitude were associated with high plasma fibrinogen and increased coagulation, implying that atherosclerosis may be a pathological pathway for cardiovascular disease. Other effects of the sympatho-adrenal stimulation include an increase of myocardial oxygen demand and decreased myocardial oxygen supply, which may induce angina pectoris due to myocardial ischemia in vulnerable individuals.[102]

The presence of high demands and high control (active state) has been associated with increased levels of adrenaline and reduced cortisol levels whereas high demands coupled with low control (*i.e.*, high job strain) have been associated to elevated levels of both adrenaline and cortisol.[104,105] Because cortisol enhances and prolongs the effect of catecholamines, the chronic hyper-stimulation from both hormones promotes the development of cardiovascular metabolic syndrome (CVMS), characterized by hypertension, dyslipidemia (increased total cholesterol, triglycerides, and decreased high-density lipoprotein cholesterol, also known as “good cholesterol”), central obesity, insulin resistance, glucose intolerance, hypercoagulability and reduced fibrinolysis. These effects are further complicated among workers with repetitive, machine-paced jobs or among those working overtime, because these working conditions prevent “unwinding” or the return of neuroendocrine levels to baseline.

2.2.7 Job stress and productivity

Because psychosocial factors have a serious impact on workers’ health and illness, their presence among employees is costly to employees and employers in terms of health status and health care costs, and it is also responsible for costs associated with a reduction in productivity.[106,107]

2.2.7.1 Definition of productivity

According to the Bureau of Labor Statistics (BLS), “labor productivity is the ratio of the output of goods and services to the labor hours devoted to the production of that output.”[108] The New Oxford American Dictionary defines output as “the amount of something produced by a person, machine, or industry.”[109] Output, from a business perspective, only takes into account approximately 75% of the goods and services included in the gross domestic product because of the impossibility to measure productivity in certain portions of the economy.[108] Hillier et al.[27] argue that “the notion of productivity becomes more complex when one takes into account the effects of mental, motivational, emotional and social factors that influence workers. Issues like morale, autonomy, and team dynamics can affect production autonomy, and team dynamics can affect production in ways similar to physical injury or malfunction. As a result, researchers and practitioners often have difficulty identifying and describing exactly what productivity means, let alone what should be done to optimize it.”

2.2.7.2 Measurement of lost productivity

The American College of Occupational and Environmental Medicine (ACOEM) recruited a panel of experts to establish reliable methods for productivity measurement and to assess the existing tools available for its evaluation. Absenteeism, presenteeism, and employee turnover were identified as the key elements of lost productivity.[110] Absenteeism was defined as "the number of days missed from the workplace" encompassing sick leave, personal time off, absenteeism due to family medical issues, and acute and chronic disability, among others. Presenteeism was described as "the health-related productivity loss while at paid work, including: 1) time not on task, 2) decreased quality of work, 3) decreased quantity of work, 4) unsatisfactory employee interpersonal factors, and 5) unsatisfactory work culture."[110]

To further understand presenteeism, which is a relatively new concept in the literature, it is important to examine its different facets in more depth. According to the definition above, presenteeism may be manifested by *time not on task* (*i.e.*, in the workplace, but not working). This may refer to daydreaming or worrying about important life issues (*e.g.*, a sick child or relative). It may also be due to a health problem. Workers may attend work while sick because of strict attendance policies in the worksite or because they do not wish to lose their day wages. Additionally, workers with high job insecurity are less likely to be absent.

The second and third effects of presenteeism are *decreased quality and quantity of work*. When workers feel sick, their symptoms may prevent them from concentrating on their jobs, which will increase the risk of injury, product defects, and product waste. Sick workers not only produce less, but they also affect the people around them if they carry a contagious condition. Being fit and healthy is associated with higher performance. This is why prevention of chronic conditions at the worksite by means of intervention programs is paramount. Garcia et al.[111] argue that an effective exercise program can stimulate workers' physiological adaptation to their occupational tasks. Even though absenteeism directly affects production quantity, losing a few days of work might prove beneficial over time compared with the less evident, yet more serious loss of production quantity and quality resulting from presenteeism effects (e.g. lack of concentration and focus, increased number of accidents, contagion of infectious conditions, etc.).[112]

The fourth effect of presenteeism is *unsatisfactory employee interpersonal factors*. For example, presenteeism has been associated with negative supervisor behaviors.[113] Additionally, an overtired or sick person may have more difficulty interacting with others. Lastly, presenteeism may lead to an *unsatisfactory work culture*, which might manifest itself with all the characteristics mentioned above: decreased motivation, lack of quality and/or quantity of work, and unsupportive coworkers or employers. If this situation persists, productivity losses may not become evident in the near future, but they will certainly worsen over time.

Due to all its different facets, presenteeism is difficult to measure or evaluate. It is difficult to determine a specific baseline of "good productivity" based on which we can compare the deleterious effects of presenteeism, hence the need of an accurate measurement tool. Some methods for lost productivity measurement include administrative databases, units of production, and self-reports.[114] Administrative databases refer to the data collected in the worksite to measure adverse events, which are the most frequently used and have attained a gold standard status in the field. Examples of such events include number of sick leave days, occupational accidents, disability records, medical care costs, etc. However, administrative databases are only proxies of productivity because they focus on productivity loss due to time away from work but fail to consider on-the-job productivity. Additionally, because not every company collects this information on a consistent basis, using this type of measurement to compare lost productivity among different sites and occupations may not be possible.[114]

Units of production are the outputs resulting from labor, including goods and services. Although these represent an objective and accurate form of measurement, they are not widely applicable due to the large number of occupations for which the results of labor cannot be determined in "units" produced (e.g., many white-collar jobs). It is worth noting that even if one would consider using the monetary value of services, there are many factors influencing the decision on how to price those services,[115] thus making such an approach extremely unreliable.

Finally, self-reports consist on the gathering of information directly from workers by means of questionnaires that inquire into their personal habits, health background, exposures, etc. Self-reports have the advantage of being easily and inexpensively collected and they can be tailored for general working populations, making them available for use among different occupations. However, some employers or decision makers may find it difficult to trust in the results obtained from self-reports due to their inherent subjectivity, the possibility of bias such as recall and reporting bias, and the high costs at stake related with the development of worksite intervention programs. To address these concerns, Allen et al.[114] demonstrated concurrent and predictive validity of self-reports by comparing analyses of self-reports with the gold standard in productivity measurement (administrative databases) among workers from a truck and engine corporation. In their study, 13 of the 14 adverse event variables were positively and significantly associated with self-reported productivity measures (*i.e.*, more adverse events resulted in more self-reported limitations). In their study, employees who reported being limited to work their required number of hours were 1.79 times more likely to have absentee hours above the median compared to those who did not report such limitations. Additionally, employees reporting limitations in regards to their ability to work without mistakes were 1.54 times more likely to file at least one workers compensation claim and 1.5 times more likely to be hospitalized at least once than those who did not report such limitations. Overall, self-reported productivity limitations were associated with 20 to 50% average increase of adverse event measures. Positive and statistically significant relationships between adverse events and self-reported productivity measures were replicated for 9 of the 14 adverse event measures in a second survey, thus increasing confidence in the results.

Many self-reported presenteeism questionnaires have been developed.[116] Some of the most widely used include the Health and Productivity Questionnaire,[117] the Stanford Presenteeism Scale,[118] and the Work Limitations Questionnaire.[119] The Work Limitations Questionnaire (WLQ) inquires about the difficulty to perform certain job demands that are common among various types of jobs, making it useful across different occupations (*cf.* methods section). The WLQ was selected because it has been shown to offer significant advantages over other questionnaires such as extensive testing and compliance with all of ACOEM’s expert panel recommendations for appropriate instrument choice: “scientific evidence of reliability and validity, usefulness across multiple work settings, job types, or disease states, easy application, availability in multiple languages, inexpensive, and providing measurable results to support effective business decision-making."[110,120,121]

Lerner and colleagues[119] created the WLQ to measure the impact of chronic conditions while on the job. The WLQ construct validity and reliability was determined by comparing questionnaire scores of specialty clinic patients with healthy job-matched control subjects. Worse limitations scores were found among patients compared to control subjects. Additionally, WLQ scale scores showed high Cronbach alphas (>0.90) and correlated positively with measures of role disability and self-reported work productivity. The authors of the WLQ also developed a shortened version of this questionnaire[122] by selecting eight out of the 25 original questions adhering to the following criteria:

- They maintained the questionnaire's primary structure (i.e., they preserved its four main dimensions or scales: limitations in managing time, physical, mental/interpersonal, and output demands including two items for each dimension).
- They verified that each scale had adequate levels of reliability by applying the Cronbach's alpha statistic.
- They corroborated, by means of regression models, that the scale scores were significant predictors of "objectively-measured productivity" and that their model results were similar to those obtained with the 25-item questionnaire.[122]

This shortened questionnaire has been successfully applied in other studies to assess the impact of health on presenteeism.[123,124] It is described in more detail in our methods section. The WLQ has been translated into Spanish but to our knowledge, its validity and reliability in Mexican workers has not been established.

2.2.7.3 Research linking psychosocial job factors with productivity

A large number of research studies have focused on the effect of health conditions on absenteeism and more recently, on how those same conditions impair workers' performance while on-the-job.[107,125,126] Fewer studies have examined the effect of organizational and psychosocial factors on productivity, some of which are described below.

With respect to administrative productivity outcome measures, Moreau et al.[127] found that perceived high strain at work especially combined with low social support is predictive of sick leave in both sexes of a large cohort of the Belgian workforce. In a prospective study, Labriola and colleagues[128] identified four workplace psychosocial factors associated with increased risk of long-term sickness absence among Danish workers. With respect to self-reported productivity outcome measures, a study among Australian workers reported significant associations between organizational aspects of work life with self-reported presenteeism.[129]

According to Way and MacNeil,[28] high job strain may also result in lower job satisfaction and commitment. They define commitment as "a strong belief in and acceptance of the organization's goals and values, a willingness to exert effort on behalf of the organization." They assert that without commitment, a company's overall productivity declines. Further, in a study among white-collar workers, Anderzen and Arnetz[33] argued that sickness absenteeism might be a coping mechanism when poor working conditions are present. The same argument was made earlier by Kristensen et al. in a study of blue-collar slaughterhouse workers.[130]

Hillier and colleagues,[27] declared that "unresolved and continuing stress can be costly to employers because it may result in potential long-term illness, reduction in performance, and absence. Even short-term absence may have a negative impact in the workplace as employees attempt to absorb the additional workload."

Finally, in a review study on work disability and chronic conditions, Lerner et al.[131] reported that "jobs with high physical demands and/or certain work conditions, such as inflexible hours, limited work autonomy and control over the pace of work, contribute to disability and consequently, to impaired performance."

2.2.7.4 Studies in Mexico linking psychosocial job factors with health outcomes and productivity

Even though there is extensive literature on the harmful effects of job strain on cardiovascular health, most studies have been performed in North American and European populations.[132] The relationship between psychosocial factors and health outcomes has barely been explored in Mexican workers, who are embedded in a different organizational culture and may experience exposure to factors distinctive to that culture. In fact, Juarez-Garcia[20] indicates that, when assessing psychosocial work factors, it is important to consider variables that are relevant in specific socioeconomic and cultural situations, such as job insecurity, which is an important problem in Latin American countries, mainly due to their overall economic instability.[22]

A search on Pubmed-Medline was performed using the terms psychosocial work factors, Mexico, occupational risk factors, and work-related stress, including a time frame of the past 10 years (from 2002-2012). Only eight articles met these criteria.[11-18] It is worth noting that with the exception of one publication, these few Mexican research studies report the prevalence of psychosocial factors in the worksite but they fail to examine their effects on workers' health. For example, in a study about occupational risk factors among traffic police officers, Aranda-Beltran et al.[11] indicated that these workers were exposed to both ergonomic risk factors and to insufficient levels of social support, concluding that these exposures may have "serious repercussions on their health," without further specification. Another study among telephone service workers performed by Scarone and Cedillo[12] identified customer service provision as a source of conflict and psychological strain. Even though they provided useful recommendations to decrease levels of strain, they also failed to document any physical health indicators associated with their findings.

Other studies indicate some of the psychosocial exposures encountered by health services workers, such as nurses, dentists, and physicians.[13-15,133] These exposures include heavy work schedules, in some cases threat-avoidant vigilant work, and emotional labor, which arises as a result of emotional interaction with their patients. Gonzalez-Muñoz et al.[18] identified working hours and psychological job demands as risk factors for job strain among workers of an electronics company but once again, there is no mention of the effects of those factors on workers' health. Researchers from the National Autonomous University of Mexico conducted a review on psychosocial factors and depression but their research only described general facts about depression and it was neither systematic nor exclusive of the Mexican population.[17]

There is, however, some pioneer work linking psychosocial factors with health outcomes. In a study among Mexican nurses, Juarez-Garcia[16] found a significant positive relationship between job strain, high blood pressure and cardiovascular symptoms and between job insecurity and high blood pressure, after adjusting for age, body mass index, smoking, and alcohol drinking, thus emphasizing the need for further research on this topic in the Mexican working population.

In regards to productivity outcomes, one Mexican study seeking to translate and validate the Stanford Presenteeism Scale is currently in progress but has not yet been published.[134] To our knowledge, our study is the first to investigate the relationship between psychosocial factors and productivity indicators, such as absenteeism and presenteeism.

CHAPTER 3. METHODOLOGY

3.1 Study design and study population

The "Mexican Institute of Social Security (IMSS) and Companies' Collaboration Model to Promote Workers' Healthy Habits" is a prospective study of a six-month worksite wellness intervention program at the individual level. IMSS' researchers promoted participation in this study among affiliated companies located in Mexico City and recruited 2,330 workers from eight different worksites, including a cooking utensils factory, a government public health services department, a metalworking company, a pharmaceutical company, a plastic factory, a printing company, and a tire manufacturing company. Companies were selected on the basis of their willingness to engage in the study's activities and consented to be part of either a control (baseline survey only) or an intervention group (baseline survey plus intervention). A health risk assessment, including a questionnaire and biological measurements, was performed at baseline, 6 months, 1 year, and 2 years after the beginning of the study. We used the baseline data for this cross-sectional study.

Participation rate was 58.5% of 3,985 workers in all eight companies (see **Appendix 1**). Companies with the lowest participation rates included the airline company (37.3%) followed by the tire company (54.7%), while the metalworking company and the plastic factory had complete (100%) participation rates. It is worth noting that the two companies with complete participation rates were among the smallest ones and that directors from those companies were highly motivated to participate because they had not completed their workers' annual medical examinations mandated by law at the time of the baseline survey. Overall, 2330 workers answered a written health risk assessment (HRA) questionnaire that included the Spanish versions of the Job Content Questionnaire (JCQ)[135] and the Work Limitations Questionnaire (WLQ) to evaluate psychosocial job factors and presenteeism, respectively. In addition, the questionnaire provided information on various demographic and organizational characteristics, individual risk factors for cardiovascular disease, and personal history of diabetes, hypertension, cardiovascular disease, and other self-reported medical conditions (see **Appendix 2**). The HRA questionnaire was designed in 2005 at IMSS by experts in several fields (i.e., occupational physicians, nurses, psychologists, nutritionists, sports physicians), including myself. This questionnaire was distributed among participating workers who completed it at home and submitted it to the research team on the day of their physical evaluation. A team of medical doctors, nurses, physical activity experts, and social workers conducted the fieldwork (for a more detailed description of the fieldwork see **Appendix 3**). A research coordinator trained this team for twenty hours before the study's onset.

3.2 Recruitment of workers

IMSS researchers met in person with the directors of each company to present the intervention program and once they obtained authorization to perform the activities, both nurses and social workers were in charge of promoting the intervention throughout the company. They held focused meetings during the day where they talked to workers about the benefits of physical activity, healthy nutrition, and stress management. They also distributed flyers, displayed posters, and carried out one-on-one interactions when possible. As an incentive, they offered workers a complete physical examination and blood work for free and they provided assurance that all information gathered would be strictly confidential. They collected all information during the day shift and remained in each of the companies for about a week in order to include as many participants as possible but no further efforts were made to reach workers on sick leave or disability. In general, workers' participation was voluntary but in the two companies with perfect participation rates, participation was most likely mandatory.

3.3 Measures

3.3.1 Measurement of exposure (psychosocial job factors, independent variables)

3.3.1.1 Description of instrument

To evaluate exposure to psychosocial job factors based on the demand-control-support model,[71,136] a Spanish version of the Job Content Questionnaire (JCQ)[135] was used. Four main scales for job control, job demands, social support, and job insecurity were measured with this questionnaire. Juarez-Garcia has previously used this Spanish version of the JCQ in a Mexican working population.[16,20] To examine construct validity and reliability of this instrument, he applied the JCQ in 671 Mexican workers from diverse occupations. He compared his results with international data and found similar means. He also performed factor analysis and found that most items showed the same factor distribution as the original questionnaire. Finally, he reported Cronbach alpha values ranging from 0.54 to 0.90 for the different factors. His results supported the internal consistency and construct validity of the Spanish version of the JCQ.[137]

3.3.1.2 Job Content Questionnaire (JCQ) scales

The job control scale (nine standard JCQ items), also named “job decision latitude,” incorporates two separate, but complementary subscales: “skill discretion” (six items) and “decision-making authority” (three items). The skill discretion subscale assesses opportunities for learning, developing creativity and skills, and experiencing variety in job tasks. The decision-making authority subscale evaluates autonomy in doing one’s job and the ability to make or participate in work-related decisions. The psychological job demands scale (five standard JCQ items) assesses mental effort, quantity of work, and time restrictions to do one’s job. Four JCQ items each measured social support from coworkers and supervisors. Finally, job insecurity was measured by four JCQ items asking about job stability and frequency of layoffs.

Because the JCQ was originally generated and mainly applied in developed countries, we explored its psychometric properties in this Mexican population. Indeed, in developing countries, the cultural and socioeconomic disparities that play a role in determining an individual’s values and perceptions may yield different results from those obtained in the populations where the JCQ was originally applied. We determined the internal consistency of each scale by calculating Cronbach alpha values and assessed the underlying structure by performing exploratory factor analysis, using principal components analysis and varimax rotation (see results section). We also compared our JCQ means, standard deviations, and Cronbach alpha coefficients with those reported by Gomez[138] and by Juarez[16] among Colombian and Mexican working populations (see **Tables 3** and **6** in the results section). Finally, we calculated correlations between the different job demands/job control items and health outcomes in order to explore the predictive validity of the JCQ scales (see **Appendix 4**).

The JCQ was scored using the formulas described in the JCQ user's guide.[139] Both continuous and categorical variables of job strain, isostrain, and job insecurity were created for this study because continuous variables provide more measurement precision and power to detect associations while categorical variables are useful for comparison with the literature that is based mostly on categorical definitions of job strain. A "job strain ratio" was calculated by multiplying the psychological demands scale score times two and dividing the result by the decision latitude scale score.[139] "High job strain" was defined as the combination of high psychological demands (score above the sample median on job demands) and low decision latitude (score below the sample median on job decision latitude). Two alternative categorical variables of job strain were created: one compared the high job strain group to all other workers ("no high job strain"), the other to the "low strain" group only. The latter provides a stronger contrast but is also based on a smaller sample of workers who fall into the high and low strain quadrants of the JCQ model, excluding workers in the active or passive quadrants. A continuous variable of isostrain was calculated by subtracting decision latitude and total support from psychological demands scores.[140] A categorical variable of isostrain was defined as the combination of high job strain and low social support (score below the sample median of total coworker and supervisor support). Job insecurity was coded as a continuous variable and also as a binary variable based on a median split.

3.3.2 Measurement of outcomes (dependent variables)

3.3.2.1 Biological cardiovascular risk factors

All measurements were conducted at the company's clinic or a specific workstation located inside of each of the company's premises. Throughout the day, workers were authorized to temporarily suspend their activities to participate in the study. To assess blood glucose and total blood cholesterol levels, nurses in the different worksites took a fingerstick capillary sample using an "Accutrend" device (Roche laboratories). All workers were asked to fast for 12 hours. Blood samples were taken before the morning shift (from 6 to 9:00am depending on the company).

To measure height, weight, and waist and hip circumferences, workers stepped on a floor scale with a stadiometer wearing light clothing and no shoes. Body mass index (kg/m^2) was calculated as the weight divided by the square of the height. Nurses used a body tape measure to determine waist circumference at an intermediate line between the costal border and the iliac crests. Hip circumference was measured as the maximum circumference around the gluteus zone.[141] Continuous and dichotomous variables were created from these measures.

Although the World Health Organization (WHO), the National Institutes of Health (NIH), and the Centers for Disease Control and Prevention (CDC) have well-defined cutoffs for increased cardiovascular risk associated with BMI, WC and waist-to-hip ratio (WHR), their measurements are mainly based on measurements of Caucasian people from developed countries and "may not correspond to the same degree of fatness or associated health risk in different individuals."[142,143]

In fact, Okosun et al.[144] highlighted the importance of further research to determine specific cut-points for cardiovascular health risk in different populations. As a result, some researchers redefined new cutoffs more appropriate to their specific research populations. For example, Ko et al.[145] determined that lower BMI, WC, and WHR cutoff values in a Chinese population were associated with a significant risk of chronic conditions compared to those recommended by WHO. Accordingly, a recent review study by Low et al.[146] denoted the need to determine lower BMI cutoffs in Asian populations. In Mexico, Berber[147] and Sanchez-Castillo et al.[148] proposed, on the basis of analyses of a group of adults working in a hospital, and data from a national health survey that the optimum cutoff points to predict cardiovascular risks in the Mexican population were the following:

- BMI higher than 26.2 kg/m^2 for men and 27.7 kg/m^2 for women
- WC higher than 90cm for men and 85cm for women
- WHR higher than 0.90 for men and 0.85 for women

We followed the above cutoff values as well as the ones determined by the World Health Organization[142] to categorize BMI, WC and WHR. Additionally, we used the continuous values of these variables in our analysis.

Although both waist circumference and waist-hip ratio are closely correlated with body mass index, we used all three measures to facilitate comparisons with other studies. Waist-hip ratio has been considered as the best predictor for mortality from cardiovascular disease associated with obesity[149] and waist circumference provides “an independent prediction of cardiovascular risk over and above that of body mass index.”[143]

Blood pressure was measured manually by two research nurses using a sphygmomanometer and following the National Health and Nutrition Examination Survey (NHANES) protocols.[150] However, only one reading was taken due to time constraints, instead of the three consecutive readings proposed by the NHANES protocol. Workers rested for about 5 minutes before the measurement, which was taken on their left arm while sitting. High blood pressure was determined as a systolic blood pressure greater or equal than 140mm Hg or diastolic blood pressure greater or equal than 90mm Hg. Workers with a history of hypertension were coded as hypertensive regardless of blood pressure measures.

Smoking was assessed by the question “Do you smoke cigarettes?” Possible answers included: “No, I have never smoked”, “Yes, occasionally”, and “Yes, I currently smoke daily” and the latter two were combined as “current smokers”. Leisure-time physical activity was evaluated with a single question “Do you exercise?” Possible answers included “Occasionally or never”, “Daily”, “Two to three times per week”. We built a dichotomous variable collapsing the latter two answer options into one category.

3.3.2.2 Productivity indicators

3.3.2.2.1 <u>Sick leave absenteeism</u>

To complement self-reports and obtain a more reliable assessment of productivity, sick-leave absenteeism data were collected from IMSS' personnel records of each employee from 2004 to 2011. These records included information on workers' sick leave absence days in each of the companies they worked during the aforementioned period but we only considered the days absent during the year IMSS' study was performed.

In Mexico, there are no paid sick days but if an illness persists beyond three days, IMSS reimburses workers 60% of their salary. To obtain this benefit and to avoid dismissal from their jobs, workers need to justify their absence by obtaining an "absenteeism slip" from their family doctor. Very rarely a worker fails to provide such document to their employer. IMSS' personnel records are based on such absenteeism slips.

Absenteeism days due to maternity leave were excluded from analyses because in Mexico, maternity leave is not the result of "sickness" and is usually considered separately in IMSS statistical databases.

3.3.2.2.2 Presenteeism

To measure presenteeism, the eight-item version of the WLQ[124,151] (**Table 1**) was used. The WLQ was originally created by Lerner[119] to evaluate if any physical or emotional conditions affect worker's productivity. This is because many workers, even though they may be physically present at work, might not be as productive because they are suffering from a physical or emotional condition. This is what is called presenteeism; i.e., on-the-job absenteeism.

The original WLQ is worded as to find out if, in the past 2 weeks, the worker feels that any physical or emotional conditions have prevented him to do certain activities related with four work domains: time management, physical work, mental/interpersonal, and output (**Table 1**). Employees rate any impairment on a five-point scale with options of "none of the time (0%)", "some of the time", "half of the time (50%)", "most of the time", and "all of the time (100%)". Additionally, the response option "does not apply to my job" is provided.

Table 1. The eight-item version of the Work Limitations Questionnaire (WLQ)[124]

In the past two weeks, how much of the time did your physical health or emotional problems make it difficult for you to do the following?	
Item	**Subscale**
Work the required number of hours	Time Management
Start on your job as soon as you arrived at work	
Repeat the same hand motions over and over again while working	Physical Work
Use your equipment (i.e., phone, pen, keyboard, computer mouse)	
Concentrate on your work	Mental/Interpersonal
Help other people to get work done	
Do the required amount of work on your job	Work Output
Feel you have done what you are capable of doing	

In this questionnaire, scores of 1, 2, 3, 4, and 5 were assigned to the answers “none of the time”, “some of the time”, “half of the time”, “most of the time”, and “all of the time”, respectively. The answer of “does not apply to my job” was considered a missing answer.[151]

Unfortunately, a questionnaire misprint was discovered after obtaining the databases: The tense of the verb used for the different WLQ items was different from that of the original questionnaire, making them appear as separated items rather than connected to the main question (**Table 2**).

Table 2. Version of the Work Limitations Questionnaire (WLQ) used at the study “Mexican Institute of Social Security and companies’ collaboration model to promote workers’ healthy habits”*

In the past two weeks, how much of the time did your physical health or emotional problems make it difficult for you to do the following?	
Item	**Subscale**
Do you work the required number of hours	Time Management
Do you start on your job as soon as you arrived at work	
Do you repeat the same hand motions over and over again while working	Physical Work
Do you use your equipment (i.e. phone, pen, keyboard, computer mouse)	
Do you concentrate on your work	Mental/Interpersonal
Do you help other people to get work done	
Do you do the required amount of work on your job	Work Output
Do you feel you have done what you are capable of doing	

* Changes from Lerner’s original WLQ in italics

As seen in **Table 2**, in IMSS’ questionnaire the first part of the question was included at the top of the questionnaire but then each subscale was worded as if it was independent from the first part of the question.

In order to compare both questionnaires and verify how much IMSS' modified questionnaire differed from the original one, authorization was granted to access one of the worksites that participated in the overall research project. Both versions of the questionnaire were administered to 28 employees who voluntarily agreed to participate. [Note: Lerner's version of the WLQ will be referred to as the "original" questionnaire (cf. **Table 1**) and the questionnaire applied in this study's sample as "IMSS" questionnaire (cf. **Table 2**)]. Items were abbreviated as follows:

- reqhr: work the required number of hours
- stjob: start on your job as soon as you arrived at work
- rp_hm: repeat the same hand motions over and over again while working
- equip: use your equipment (i.e. phone, pen, keyboard, computer mouse)
- conc: concentrate on your work
- help: help other people to get work done
- reqwk: do the required amount of work on your job
- capab: feel you have done what you are capable of doing

After obtaining the responses to both questionnaires, responses to IMSS' questionnaire were compared to those of the original WLQ by determining the frequencies and percentages of the possible answers (**Table 3**). Percentage of agreement (**Table 4**) and correlations among items from both questionnaires (**Table 5**) were also calculated.

Table 3. Distribution of the different answer options from the original vs. IMSS' Work Limitations Questionnaire.

Item	None of the time		Some of the time		Half of the time		Most of the time		All of the time		Missing	
	n	%	n	%	n	%	n	%	n	%	n	%
reqhr (IMSS)	2	7.1	3	10.7	1	3.6	10	35.7	11	39.3	1	3.6
reqhr (original)	16	57.1	10	35.7	-	-	-	-	-	-	2	7.1
stjob (IMSS)	-	-	2	7.1	-	-	15	53.6	11	39.3	-	-
stjob (original)	22	78.6	4	14.3	-	-	1	3.6	-	-	1	3.6
rp_hm (IMSS)	3	10.7	2	7.1	3	10.7	14	50.0	3	10.7	5	17.9
rp_hm (original)	21	75.0	4	14.3	-	-	1	3.6	-	-	2	7.1
equip (IMSS)	-	-	-	-	1	3.6	17	60.7	10	35.7	-	-
equip (original)	26	92.9	-	-	-	-	-	-	-	-	2	7.1
conc (IMSS)	-	-	1	3.6	-	-	17	60.7	10	35.7	-	-
conc (original)	17	60.7	9	32.1	-	-	-	-	-	-	2	7.1
help (IMSS)	2	7.1	15	53.6	3	10.7	3	10.7	4	14.3	1	3.6
help (original)	23	82.1	3	10.7	-	-	-	-	-	-	2	7.1
reqwk (IMSS)	-	-	1	3.6	-	-	11	39.3	14	50.0	2	7.1
reqwk (original)	21	75	5	17.9	-	-	-	-	-	-	2	7.1
capab (IMSS)	-	-	3	10.7	1	3.6	14	50.0	6	21.4	4	14.3
capab (original)	20	71.4	6	21.4	-	-	-	-	-	-	2	7.1

Abbreviations: reqhr: work the required number of hours; stjob: start on your job as soon as you arrived at work; rp_hm: repeat the same hand motions over and over again while working; equip: use your equipment (i.e. phone, pen, keyboard, computer mouse); conc: concentrate on your work; help: help other people to get work done; reqwk: do the required amount of work on your job; capab: feel you have done what you are capable of doing

Table 4. Percentage of agreement between items from the original and IMSS' Work Limitations Questionnaire.

Items	Agreement (%)	Kappa statistic
Work the required number of hours	15.38	0.07
Start on your job as soon as you arrived at work	7.41	0.04
Repeat the same hand motions over and over again while working	16.67	0.07
Use your equipment (i.e. phone, pen, keyboard, computer mouse)	0.00	0.00
Concentrate on your work	3.85	0.03
Help other people to get work done	15.38	0.06
Do the required amount of work on your job	3.85	0.03
Feel you have done what you are capable of doing	8.33	0.06

Magnitude guidelines in the literature report kappa values < 0 as indicating poor agreement, 0–0.20 as slight, 0.21–0.40 as fair, 0.41–0.60 as moderate, 0.61–0.80 as substantial, and 0.81–1 as almost perfect agreement.[152] In this case, the agreement values obtained only revealed a slight agreement between items from both questionnaires.

Table 5. Correlation between items from the original and IMSS' Work Limitations Questionnaire.

Items	Non-parametric r
Work the required number of hours	-0.252
Start on your job as soon as you arrived at work	-0.4136*
Repeat the same hand motions over and over again while working	-0.0089
Use your equipment	-
Concentrate on your work	-0.4047*
Help other people to get work done	-0.2419
Do the required amount of work on your job	-0.3857*
Feel you have done what you are capable of doing	-0.3596*

* p-value < 0.10

Classification guidelines establish that correlation coefficients ≤ 0.35 represent low or weak correlations, 0.36 to 0.67 modest or moderate correlations, 0.68 to 0.89 strong or high correlations, and ≥ 0.90 very high correlations.[153]

The strongest correlations were found among the following items:

- Start on your job as soon as you arrived at work (non parametric r = -.414 p = .032)
- Concentrate on your work (non parametric r = -.405, p = .040)
- Do the required amount of work on your job (non parametric r = -.386, p = .052)
- Feel you have done what you are capable of doing (non parametric r = -.360, p = .084)

As a reference, these items were henceforth referred to as the "strongest items."

Updated absenteeism records were obtained for workers of this pilot study, which were used to run simple regression analyses between these records and scores from both questionnaires (**Table 6**).

Table 6. Coefficients obtained by simple regression analysis when comparing scores from both versions of the WLQ and absenteeism records (pilot study).

Scores	Beta coefficient	95% CI
Lerner's original WLQ (8 items)	-.015	-.046, .015
IMSS' WLQ (8 items)	.005	-.045, .056
IMSS' WLQ (8 items, reversed scoring)	-.005	-.056, .045
Lerner's original WLQ (strongest items)	-.011	-.031, .009
IMSS' WLQ (strongest items)	.008	-.022, .038
IMSS' WLQ (strongest items, reversed scoring)	-.008	-.038, .022

When using the four items which were most strongly correlated with the original WLQ (see above), the difference of the effect sizes obtained with both versions of the WLQ (|-.011| - |.008| = .003 in absolute values) was smaller than the difference among the effect sizes from both questionnaires when using all items (|-.015| - |.005| = .010 in absolute values) (**Table 6**). The overlap in the confidence intervals from both questionnaires was most likely due to the small sample size. In the overall study population, reliability measurements on these four items showed a Cronbach alpha of 0.66, which can be considered adequate because this is a non-clinical study.[154] Therefore, the four items showing the strongest correlations with the original WLQ were used as proxy measures of presenteeism.

Because the opposite item wordings (do you work versus make it difficult to work) resulted in negative correlations and opposite coefficients (**Tables 5 and 6**), the scoring of items from IMSS' questionnaire was reversed in order to ascribe the highest scores to the highest limitations. For example, if "all of the time" had the highest risk (score = 5) referring to the question in Lerner's original WLQ "in the past two weeks, how much of the time did your physical health or emotional problems make it difficult to concentrate on your work?" in IMSS' questionnaire "all of the time" would get a score of 1, corresponding to the question "how much of the time do you concentrate on your work?" After reversing the item scores, the percentage of agreement between items from both questionnaires increased considerably but remained weak overall (**Tables 7a & 7b**).

Table 7a. Distribution of the different answer options from the original vs. IMSS' Work Limitations Questionnaire using reversed scoring of items.

Item	None of the time		Some of the time		Half of the time		Most of the time		All of the time		Missing	
	n	%	n	%	n	%	n	%	n	%	n	%
reqhr (IMSS)	11	39.3	10	35.7	1	3.6	3	10.7	2	7.1	1	3.6
reqhr (original)	16	57.1	10	35.7	-	-	-	-	-	-	2	7.1
stjob (IMSS)	11	39.3	15	53.6	-	-	2	7.1	-	-	-	-
stjob (original)	22	78.6	4	14.3	-	-	1	3.6	-	-	1	3.6
rp_hm (IMSS)	3	10.7	14	50.0	3	10.7	2	7.1	3	10.7	5	17.9
rp_hm (original)	21	75.0	4	14.3	-	-	1	3.6	-	-	2	7.1
equip (IMSS)	10	35.7	17	60.7	1	3.6	-	-	-	-	-	-
equip (original)	26	92.9	-	-	-	-	-	-	-	-	2	7.1
conc (IMSS)	10	35.7	17	60.7	-	-	1	3.6	-	-	-	-
conc (original)	17	60.7	9	32.1	-	-	-	-	-	-	2	7.1
help (IMSS)	4	14.3	3	10.7	3	10.7	15	53.6	2	7.1	1	3.6
help (original)	23	82.1	3	10.7	-	-	-	-	-	-	2	7.1
reqwk (IMSS)	14	50.0	11	39.3	-	-	1	3.6	-	-	2	7.1
reqwk (original)	21	75	5	17.9	-	-	-	-	-	-	2	7.1
capab (IMSS)	6	21.4	14	50.0	1	3.6	3	10.7	-	-	4	14.3
capab (original)	20	71.4	6	21.4	-	-	-	-	-	-	2	7.1

Abbreviations: reqhr: work the required number of hours; stjob: start on your job as soon as you arrived at work; rp_hm: repeat the same hand motions over and over again while working; equip: use your equipment (i.e. phone, pen, keyboard, computer mouse); conc: concentrate on your work; help: help other people to get work done; reqwk: do the required amount of work on your job; capab: feel you have done what you are capable of doing

Table 7b. Percentage of agreement between IMSS' questionnaire recoded items (reversed scoring) vs. items from the original Work Limitations Questionnaire.

Items	Agreement (%)
Work the required number of hours	38.5
Start on your job as soon as you arrived at work	51.9
Repeat the same hand motions over and over again while working	25
Use your equipment (i.e. phone, pen, keyboard, computer mouse)	38.5
Concentrate on your work	57.7
Help other people to get work done	15.4
Do the required amount of work on your job	61.5
Feel you have done what you are capable of doing	25

3.3.3 Identification and measurement of potential confounders

3.3.3.1 Theory/literature method

We considered as potential confounders variables that are known predictors of our dependent variables and that are also associated with our psychosocial job exposure variables but are not caused by these exposures (or at least there is no conclusive evidence about such causation). These variables were assessed by the health risk assessment questionnaire.

a) Physical workload

Distinguishing between physical and psychological demands is important in psychosocial research. Studies that fail to control for physical demands may not be able to differentiate effects on health outcomes between these two components of the content of work.

- Physical demands: The physical demand item was evaluated by workers' answer to the following question: My job requires lots of physical effort. Answer options included strongly agree, agree, disagree, & strongly disagree.
- Occupational activity level: At the end of the questionnaire, the research team evaluated the type of activity performed by each worker and answered the question "what kind of labor does the worker perform predominantly during his shift? (physical activity)" The options included: Light, Moderate, and Vigorous.

Both physical demands and occupational activity level were included because they are complementary. Since the "occupational activity level" was reported by the research team, it can be viewed as an objective measurement of physical workload that supplements the self-reported appraisal of physical demands. There was a modest correlation coefficient of 0.49, which did not suggest multicollinearity by adding both variables to our models.

b) Individual worker characteristics

a. Demographic

i. Age

Age was measured as a continuous variable. Age is a risk factor for diabetes,[155] hypercholesterolemia,[156] overweight/obesity,[157] hypertension,[158] smoking,[159] and leisure-time physical activity.[160] It is also associated with productivity[161] and psychosocial job factors.[162,163]

ii. Gender

Gender was evaluated as a dichotomous (male/female) variable. Cardiovascular risk factors are generally more prevalent among males.[164] Gender has also an impact on absenteeism[165] and presenteeism.[166] Psychosocial exposures may differ among male and female workers.[163,167]

b. Behavioral

i. Smoking

Smoking was measured by self-report (see description above). Smoking is an independent cardiovascular risk factor and is associated with other cardiovascular risk factors. For example, smoking increases insulin resistance and central fat accumulation, elevating the risk for diabetes and obesity.[168] In contrast, smoking has been shown to suppress appetite and reduce weight.[169] Smoking has also been reported to coexist with hypercholesterolemia.[170] Nicotine stimulates the sympathetic nervous system and has an acute hypertensive effect.[171] Chronic smoking decreases exercise capacity.[172] Additionally, smoking has a negative impact on productivity; higher levels of absenteeism and presenteeism have been reported among smokers.[173,174] Finally, smoking is associated with psychosocial job factors.[175]

ii. Alcohol

Alcohol drinking was defined as "occasionally drinking more than three glasses of alcoholic beverages". According to the National Institute on Alcohol Abuse and Alcoholism (NIAAA),[176] the cut off points for "low risk drinking" are no more than three and four drinks on any single day for women and men, respectively. Drinking above the aforementioned levels, even on a single occasion, may have deleterious health effects on the brain, heart, liver, pancreas, and immune system. Even though moderate consumption of alcohol (up to one drink per day for women and two drinks per day for men)[177] has been linked to reduced coronary heart disease due to increased high-density lipoprotein levels (HDL), a concave relationship between HDL and alcohol has been reported, indicating a threshold effect in this relationship.[178] An increased prevalence of diabetes and hypertension has been reported among heavy drinkers.[179,180] Alcohol has a high caloric content and can enhance appetite, making it a risk factor for overweight/obesity.[181] Alcoholism is closely related to smoking, possibly due to a susceptibility to adopt addictive behaviors and behave irresponsibly.[182] Alcohol has also a negative effect on exercise by decreasing the use of glucose and amino acids by body muscles and altering the metabolic process while exercising.[183] Alcohol has been shown to increase workplace absenteeism but this relationship is attenuated by both coworker and supervisor support.[184] The declined cognitive and motor function among intoxicated workers leads to reduced work output, increased errors on the job, and higher presenteeism.[185] Alcohol drinking seems to have a bidirectional effect on job strain depending on the amount of alcohol consumed.[186] Elevated odds for high-risk alcohol drinking have been found among workers experiencing job insecurity.[187]

iii. Leisure-time physical activity

Leisure-time physical activity was evaluated by self-report (see section "measurement of outcomes (dependent variables)" above). A sedentary lifestyle is a risk factor for hypercholesterolemia, diabetes, overweight/obesity, and hypertension.[188] A negative association between smoking and physical activity has been reported; smokers are less likely to engage in vigorous physical activity compared to non-smokers.[189] In regards to productivity outcomes, physical activity has been linked with decreased absenteeism[190] and presenteeism.[191] Finally, high job strain and job insecurity have been associated with physical inactivity.[84,192]

c. Socio-economic factors

i. Education

Education was determined by self-reported total years of formal education. Education has been inversely associated with blood glucose levels, body mass index, waist circumference, cigarette smoking, alcohol drinking, and blood pressure.[193,194] In contrast, education seems to have a positive association with high-density lipoprotein cholesterol levels and leisure-time physical activity.[193] An inverse association between educational status and absenteeism has been reported. Higher educated workers tend to have well remunerated jobs and higher job satisfaction and aspiration achievement, which prompts less absence.[195] Additionally, educated employees may have better knowledge of health issues and adopt healthier behaviors, which in turn decreases absenteeism.[196,197] In a study exploring factors associated with presenteeism, non-skilled workers showed higher levels of presenteeism compared with professionals.[198] Socioeconomic status, as measured by education level, income, and occupation has been negatively associated with job strain (*i.e.*, low socioeconomic status is associated with higher job strain).[199] Higher education yields more options in the labor market and tends to reduce job insecurity.[200]

ii. Income

Income was determined from a question from the HRA: "What is your monthly income?" The response was reported in Mexican pesos (note: $1 US dollar corresponds to approximately 13 MXN pesos).[201] Options included (1) Less than 1,500; (2) Between 1,501-4,500; (3) Between 4,501-7,500; (4) Between 7,501-10,500; (5) Between 10,501-13,500; (6) Between 13,501-16,500; (7) More than 16,500. We clustered these options in low income (options 1 and 2), medium income (options 3 and 4), and high income (remaining options). As for education, the relationships between income and cardiovascular risk factors are mainly negative; *i.e.*, lower income levels are associated with higher risk.[202] In a study of Norwegian workers, income was negatively associated with sickness absenteeism.[203] Low monthly income has also been associated with high sickness presenteeism.[204] In regards to psychosocial job factors and as mentioned previously, socioeconomic status, as measured by education, income, and occupation, has an inverse relationship with job strain.[199]

iii. Marital status

Marital status was used as a dichotomous variable (married and others: unmarried, single, separated, divorced, or widowed). Never married persons are at a higher risk to experience cardiovascular risk factors because they may lack the social support and motivation to engage in healthy behaviors.[205] In regards to productivity outcomes, absenteeism has been associated with both married[206] and unmarried status.[207] Presenteeism seems to be lower among married persons.[208] Low marital cohesion has been shown to interact with job strain and have deleterious effects on health.[209] Job security seems to increase among married couples.[210]

iv. Worksite

Worksite was used as a categorical variable, each category representing one of the eight companies participating in IMSS study (*cf.* section "study design"). Besides psychosocial factors, other chemical and physical factors at the worksite may be associated with cardiovascular risk factors, absenteeism, and presenteeism.[211,212]

v. Seniority

Seniority was assessed as the number of years the worker had been employed in the company when the study was performed. Seniority has been considered in other research studies as a proxy for cumulative workplace exposure,[213,214] which is an important factor to consider when exploring cardiovascular risk factors in the workplace. Seniority has been positively associated with absenteeism[215] and presenteeism.[216] Seniority may indicate years of exposure to psychosocial job factors, which may have a cumulative effect on workers' health.[217] In a changing economy where a decline in long-term contracts is occurring, seniority may have a protective effect on job insecurity. However, this tendency seems to decrease among workers older than 55 years old.[218]

c) Other cardiovascular risk factors

Statistical models in this study were additionally adjusted for cardiovascular risk factors other than the one considered in the main exposure-outcome relationship (model 4). When several indicators were available for a specific cardiovascular risk factor (*e.g.*, overweight/obesity indicators and blood pressure) adjustment was performed for only one of those indicators to avoid multicollinearity in the different regression models. With respect to overweight/obesity indicators, body mass index was the selected covariate because this indicator is the most widely used in the literature. In regards to blood pressure, models were controlled for systolic rather than diastolic blood pressure because systolic blood pressure has been reported as a better predictor of cardiovascular risk.[219] For example, models exploring the relationship between psychosocial job factors and blood glucose (main relationship) were adjusted by other cardiovascular risk factors including blood cholesterol, systolic blood pressure, body mass index, smoking, and leisure-time physical activity.

Even though over-adjustment may occur if cardiovascular factors are in the intermediate pathway between the exposure-outcome relationship, there is no conclusive evidence in the literature for such mediation. Additional reasons for adjustment included the following:

- Cardiovascular risk factors are associated with both exposure and outcome and may act as confounders (for example, body mass index is associated with both job strain and hypertension).
- In some instances, after controlling for cardiovascular risk factors, effect sizes changed considerably, which may indicate that cardiovascular risk factors other than the one considered as the outcome were confounding the main exposure-outcome relationship.
- Other studies exploring the relationship between psychosocial job factors and cardiovascular disease or cardiovascular risk factors have controlled for other biological cardiovascular risk factors.[220-223]
- Correlations between the different cardiovascular risk factors considered in this study were weak (the highest correlation was found between systolic blood pressure and body mass index, r = 0.27). No clustering of factors was evident. We also discarded multicollinearity by running a VIF test in Stata (Note: VIF = **v**ariance **i**nflation **f**actor-an

indicator of how much of the inflation of the standard error could be caused by multicollinearity. VIF values values above 4 indicate mild collinearity and values above 10 indicate severe collinearity. In this case, VIF = 2.23)

d) Other psychosocial job factors

Other psychosocial job factors were considered in the models to determine whether the effect resulted from the psychosocial factor considered in the main association or if such effect was confounded by other psychosocial factors, as some of these factors act independently (*e.g.,* job strain and job insecurity). Additionally, although social support has been suggested as a buffer for the association between job strain and cardiovascular health outcomes, a debate exists as whether social support should be regarded as an independent risk factor, a buffer, or both.

3.3.3.2 Empirical method

Biostatistically, confounding occurs if there is a significant difference in the strength of the relationship between the exposure (X) and outcome (Y) depending on whether or not the confounder is in the model.

Confounding can do several things:

1. Make an apparent X ←→ Y relationship go away ("classic") – this is the usual reason for "adjustment" (*i.e.*, including additional variables in the model to control for confounding). *Positive* confounding occurs when the observed association is biased away from the null and *negative* confounding arises when the observed association is biased toward the null.[224]

2. Make a relationship appear where originally there was not one.
3. Change the magnitude or direction of association.

Associations between the different main exposures (job strain, isostrain, and job insecurity) and outcomes were explored using multiple linear regression for continuous outcome variables, and logistic regression for binary variables. Cox proportional-hazards regression was used for absenteeism outcomes, operationalized as time to return to work. Unadjusted models were reported first, and adjustment by each separate confounder was included subsequently to evaluate their individual effect on the main exposure-outcome relationship (**Tables 8-10**).

Table 8. Associations between job strain ratio and study outcomes: results (standardized[1] beta coefficients unless stated otherwise) from multiple linear regression, logistic regression, and Cox proportional hazards regression with separate adjustment for potential confounders. Mexican Institute of Social Security Study 2009 (n = 2,330).

	Association between job strain ratio and:							
	Glucose	**Cholesterol**	**BMI**	**SBP**	**Smoking (OR)**	**LTPA (OR)**	**Presenteeism**	**Absenteeism (HR)**
Unadjusted	-0.19	-1.02	-0.06	-0.53*	1.02	0.87*	-0.08	1.02
Adjusted by:								
Physical demands	-0.51	-0.46	-0.05	-0.52*	1.00	0.86*	-0.01	1.03
Occupational activity	-0.10	-1.44	-0.11	-0.50*	1.01	0.86*	-0.05	1.02
Age	-0.11	-0.25	-0.01	-0.45*	1.00	0.86*	-0.10*	1.03
Gender	-0.20	-1.05	-0.06	-0.50*	1.03	0.88*	-0.08	1.02
Smoking	-0.18	-0.98	-0.06	-0.53*	N/A	0.87*	-0.08	1.02
Alcohol	-0.22	-1.09	-0.07	-0.55*	1.05	0.87*	-0.07	1.02
LTPA	-0.25	-1.09	-0.08	-0.55*	1.02	N/A	-0.08	1.03
Education	-0.38	-0.84	-0.08	-0.58*	1.01	0.88*	-0.06	1.03
Income	-0.41	-0.13	-0.03	-0.47*	1.01	0.88*	-0.08	1.03
Marital status	-0.21	-0.83	-0.04	-0.51*	1.02	0.87*	-0.08	1.03
Worksite	0.07	-1.56	-0.10	-0.48*	0.99	0.86*	-0.03	1.03
Seniority	-0.19	-0.47	-0.03	-0.47*	1.01	0.87*	-0.09	1.03
Glucose	N/A	-1.03	-0.06	-0.49*	1.02	0.86*	-0.07	1.03
Cholesterol	-0.21	N/A	-0.05	-0.52*	1.02	0.87*	-0.08	1.02
BMI	-0.15	-0.94	N/A	-0.50*	1.02	0.87*	-0.08	1.02
SBP	0.25	-0.64	0.01	N/A	1.00	0.88*	-0.08	1.04

*p-value < 0.05
[1]Continuous JCQ scales were centered by subtracting the mean to each value and standardized by dividing by the standard deviation
Abbreviations: OR = odds ratios, HR = hazard ratios, LTPA = leisure-time physical activity, BMI = body mass index, SBP = systolic blood pressure

In regards to the relationship between job strain ratio and glucose, most covariates slightly changed the effect size of the main relationship when added to the model and two of those covariates (worksite and systolic blood pressure) changed the direction of the main (unadjusted) association. An eight-fold decrease in effect size was observed when adding income to the job strain and cholesterol unadjusted model. Similarly, a four-fold decrease in effect size was observed when adding age into the latter model. Adding systolic blood pressure into the job strain-body mass index model changed the direction of such association. In the job strain-presenteeism model, physical demands and worksite showed the greatest change in effect size when adding those covariates separately into the unadjusted model. Additionally, including age into the job strain-presenteeism model revealed statistical significance. No substantial changes were observed when adding separate covariates to the remaining models.

Table 9. Associations between isostrain (continuous variable) and study outcomes: results (standardized[1] beta coefficients unless stated otherwise) from multiple linear regression, logistic regression, and Cox proportional hazards regression with separate adjustment for potential confounders. Mexican Institute of Social Security Study 2009 (n = 2,330).

	Association between isostrain and:							
	Glucose	**Cholesterol**	**BMI**	**SBP**	**Smoking (OR)**	**LTPA (OR)**	**Presenteeism**	**Absenteeism (HR)**
Unadjusted	-0.24	0.35	-0.10	-0.44*	1.04	0.85*	0.15*	1.02
Adjusted by:								
Physical demands	-0.44	0.76	-0.09	-0.42	1.03	0.84*	0.20*	1.02
Occupational activity	-0.14	0.20	-0.13	-0.41	1.04	0.83*	0.17*	1.01
Age	-0.15	1.14	-0.04	-0.34	1.03	0.83*	0.12*	1.02
Gender	-0.25	0.25	-0.08	-0.33	1.07	0.87*	0.14*	1.01
Smoking	-0.22	0.44	-0.09	-0.43*	N/A	0.84*	0.15*	1.02
Alcohol	-0.26	0.30	-0.10	-0.45*	1.07	0.85*	0.15*	1.01
LTPA	-0.31	0.27	-0.12	-0.46*	1.05	N/A	0.14*	1.02
Education	-0.52	0.63	-0.13	-0.51*	1.03	0.86*	0.16*	1.02
Income	-0.51	1.68	-0.04	-0.36	1.03	0.86*	0.15*	1.01
Marital status	-0.27	0.74	-0.06	-0.38	1.04	0.84*	0.13*	1.02
Worksite	-0.05	-0.40	-0.14	-0.39	1.03	0.84*	0.19*	1.02
Seniority	-0.24	1.07	-0.05	-0.36	1.03	0.84*	0.13*	1.02
Glucose	N/A	0.42	-0.08	-0.43*	1.05	0.83*	0.15*	1.03
Cholesterol	-0.24	N/A	-0.10	-0.44*	1.05	0.85*	0.15*	1.02
BMI	-0.19	0.51	N/A	-0.40	1.04	0.84*	0.14*	1.02
SBP	0.22	0.78	-0.01	N/A	1.03	0.85*	0.15*	1.03

*p-value < 0.05
[1]Continuous JCQ scales were centered by subtracting the mean to each value and standardized by dividing by the standard deviation
Abbreviations: OR = odds ratios, HR = hazard ratios, LTPA = leisure-time physical activity, BMI = body mass index, SBP = systolic blood pressure

In the isostrain-glucose model, effect sizes changed in most cases when adding the separate covariates. Adding worksite to the unadjusted model showed an approximate five-fold decrease in effect size. Including systolic blood pressure into the model changed the direction of the association. In regards to the isostrain-cholesterol relationship, adding age into the model resulted in a three fold-increase in effect size and including income into the unadjusted model increased the effect size almost five-fold. Worksite changed the direction of the isostrain-cholesterol crude association. Systolic blood pressure showed the greatest effect size reduction when added to the isostrain-body mass index model. Physical demands, occupational activity, age, gender, income, marital status, worksite, seniority, and body mass index resulted in the loss of statistical significance of the isostrain-systolic blood pressure association when added separately to the unadjusted model. No substantial changes were observed when adding separate covariates to the remaining models.

Table 10. Associations between job insecurity (continuous variable) and study outcomes: results (standardized[1] beta coefficients unless stated otherwise) from multiple linear regression, logistic regression, and Cox proportional hazards regression with separate adjustment for potential confounders. Mexican Institute of Social Security Study 2009 (n = 2,330).

	Association between job insecurity and:							
	Glucose	**Cholesterol**	**BMI**	**SBP**	**Smoking (OR)**	**LTPA (OR)**	**Presenteeism**	**Absenteeism (HR)**
Unadjusted	-1.41*	2.05*	-0.26*	-0.61*	1.08	1.10*	0.20*	0.99
Adjusted by:								
Physical demands	-1.42*	2.07*	-0.26*	-0.61*	1.08	1.10*	0.20*	1.00
Occupational activity	-1.47*	1.94	-0.27*	-0.61*	1.09*	1.11*	0.20*	1.00
Age	-1.25*	3.52*	-0.16	-0.39	1.05	1.08	0.16*	0.99
Gender	-1.41*	2.09*	-0.27*	-0.63*	1.08	1.10	0.20*	1.00
Smoking	-1.37*	2.22	-0.26*	-0.59*	N/A	1.10*	0.20*	0.99
Alcohol	-1.36*	2.19*	-0.25*	-0.58*	1.04	1.10*	0.19*	1.00
LTPA	-1.37*	2.10*	-0.25*	-0.60*	1.08	N/A	0.20*	0.99
Education	-1.22*	1.79	-0.23*	-0.58*	1.09*	1.09	0.19*	0.99
Income	-1.37*	2.03*	-0.26*	-0.60*	1.09*	1.10*	0.20*	0.99
Marital status	-1.40*	2.09*	-0.25*	-0.60*	1.08	1.10*	0.20*	1.00
Worksite	-0.41	-0.39	-0.29*	-0.65*	1.10*	1.06	0.24*	1.00
Seniority	-1.40*	2.89*	-0.20*	-0.49*	1.07	1.10*	0.18*	1.00
Glucose	N/A	1.69	-0.25*	-0.54*	1.07	1.10*	0.19*	1.02
Cholesterol	-1.38*	N/A	-0.29*	-0.63*	1.09*	1.11*	0.20*	0.99
BMI	-1.22*	2.46*	N/A	-0.46*	1.08	1.09	0.19*	0.99
SBP	-1.03*	1.83	-0.17	N/A	1.08	1.12*	0.18*	0.99

*p-value < 0.05
[1]Continuous JCQ scales were centered by subtracting the mean to each value and standardized by dividing by the standard deviation
Abbreviations: OR = odds ratios, HR = hazard ratios, LTPA = leisure-time physical activity, BMI = body mass index, SBP = systolic blood pressure

Adding worksite to the job insecurity-glucose association resulted in a three-fold decrease in effect size and a loss of statistical significance. Adjusting for occupational activity, smoking, education, worksite, glucose, and systolic blood pressure separately resulted in the loss of statistical significance of the crude association between job insecurity and total blood cholesterol. Additionally, the direction of the latter association changed when including worksite in the model. In regards to the association between job insecurity and body mass index, statistical significance disappeared when adding age and systolic blood pressure separately into the unadjusted model. The job insecurity-systolic blood pressure association lost statistical significance after adjusting for age. Occupational activity, education, income, worksite, and total blood cholesterol revealed statistical significance of the job insecurity-smoking association when each were added to the unadjusted model. Finally, the association between job insecurity and leisure-time physical activity became non statistically significant after adding age, gender, education, worksite, and body mass index separately into the unadjusted model. No substantial changes were observed in the remaining models.

Although some of the confounding relationships were not evident when following the biostatistical method, only confounding by separate covariates were explored. An alternative strategy would be to explore possible confounding by combination of two or more covariates but this approach was not evaluated due to the complexity of the task involving the high number of different combinations (${}_{16}C_8$ = 12,870 different combinations). For the present study, the theory/literature method took precedence over the biostatistical method when selecting the different confounders that were added to the final models (*cf.* results section).

3.4 Analysis

3.4.1 Data management and missing values

Two clerks performed double data entry and corrected any inconsistencies. The captured data was further scrutinized by pulling out 10% of the original paper questionnaires and comparing them with the electronic files. No remaining data errors were found. Additional range checks on all variables were performed and corrections were made in a few cases. After the sick leave data from each worker was collected, databases were de-identified. Complete case analyses were ran (*i.e.*, no substitution of missing values) [225] because this study's sample size was large and the variables in this study had less than five percent of missing values. The only exception was with WLQ items, where we applied the "half-scale rule" recommended by Lerner et al.[122] to deal with missing values in this questionnaire. According to this author, "for any scale that contains 1 missing response and 1 valid response, […] the half-scale imputation rule [consists on assigning] the valid item score to the missing item."

3.4.2 Descriptive statistics and bivariate analysis

Differences in sociodemographic variables, health outcomes, health behaviors, work limitations, and sick leave between individuals with and without job strain, isostrain, and job insecurity were examined using chi-square tests.

3.4.3 Multivariate analysis

For each psychosocial job factor, we built separate regression models, using linear regression for continuous cardiovascular risk factors, and logistic regression for binary outcomes. To explore associations between absenteeism and psychosocial job factors, cox proportional hazards regression were used because the absenteeism variable residuals violated all of the linear regression assumptions (normal distribution, homoscedasticity, independence, and mean zero). Survival analysis was used instead of logistic regression because continuous measures of absenteeism provide more precision and power. A variable "time to first day back to work after first day of being absent form work" was used to capture duration of time off work in a survival time analysis. We present unadjusted simple regression models (model 1) and models incrementally adjusting for physical workload (as measured by the physical demands item and occupational activity level; model 2), individual worker characteristics (model 3) including demographic (age, gender), behavioral (alcohol, leisure-time physical activity, smoking), and socio-economic factors (education, income, marital status, worksite, seniority). We additionally adjusted for key biological cardiovascular risk factors other than behavioral including blood glucose, total blood cholesterol, body mass index, and systolic blood pressure (model 4). Finally, we controlled for psychosocial job factors other than the one explored in the main association (model 5). The independent effects of the main components of job strain and isostrain, *i.e.,* psychological and physical job demands, job decision latitude, and supervisor and coworker social support were investigated separately. Continuous JCQ scales and subscales were centered by subtracting the mean to each value and standardized by dividing by the standard deviation to increase comparability of effect estimates across psychosocial job factors. The Holm method was applied to adjust for multiple hypothesis testing.[226] This method has been reported as superior to the widely used Bonferroni method and has been adopted as the preferred method for multiple comparisons by the American Journal of Public Health.[227] Such adjustment, however, needs to be considered very conservative. The rationale for adjusting for multiple comparisons is based on avoiding significant findings obtained by "chance," yet empirical research is based on observations and important findings may be missed when these are discarded due to a lack of statistical significance.[228] All analyses were conducted using STATA 12.0 software.

3.5 Ethical procedures

The study titled "Mexican Institute of Social Security (IMSS) and companies' collaboration model to promote workers' healthy habits" was reviewed and approved by IMSS Institutional Review Board (IRB), which has an approved assurance and registration from the Office for Human Research Protections (OHRP), US Department of Heath and Human Services[229] (registry number IORG0002957).

After this project's review from all members of the Doctoral Committee and compliance with necessary procedures, we also obtained approval from UCLA's IRB (IRB#10-000652-CR-00002, expiring on June 2016). The UCLA IRB's Federalwide Assurance (FWA) with the Department of Health and Human Services is FWA00004642.

CHAPTER 4. RESULTS

4.1 Descriptive statistics

4.1.1 Characteristics of the study population

Table 11. Characteristics of Mexican worker sample. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variable	n	Frequency (%)
Socio-demographic		
Worksites		
Public Health	123	5.3
Airline	703	30.2
Pharmaceutical	185	7.9
Tools manufacture	161	6.9
Cooking utensils manufacture	108	4.6
Plastic factory	95	4.1
Printing company	627	26.9
Tire manufacture	328	14.1
Occupation		
Managers	114	4.9
Professionals	365	15.7
Technicians & associated professionals	268	11.5
Clerical support workers	254	10.9
Service & sales workers	17	0.7
Craft & related trades workers	220	9.4
Plant & machine operators & assemblers	342	14.7
Elementary occupations	750	32.2
Labor type		
White-collar	1018	43.7
Blue-collar	1312	56.3
Contract type		
Permanent	1868	80.2
Temporary	457	19.6
Missing	4	0.2
Shift		
Morning	1294	55.5
Evening	53	2.3
Night	20	0.9
Mixed	935	40.1
Double shift	22	0.9
Missing	6	0.3

Table 11. (cont.)

Variable	n	Frequency (%)
Seniority		
5 years or less	1256	53.9
6 to 25 years	966	41.5
More than 25 years	106	4.5
Missing	2	0.1
Gender		
Male	1576	67.6
Female	754	32.4
Age		
≤ 35	1085	46.6
36-45	678	29.1
46-55	444	19.0
≥ 56	121	5.2
Missing	2	0.1
Marital status		
Married	1161	50.1
Non-married	1166	49.8
Missing	3	0.1
Education		
Middle school or less	1036	44.5
High school or technical degree	639	27.4
College or graduate degree	652	28.0
Missing	3	0.1
Monthly income (in Mexican pesos)[1]		
Low (< 4,500)	963	41.3
Medium (4,500-10,500)	737	31.6
High (> 10,500)	624	26.8
Missing	6	0.3
Health behaviors/cardiovascular risk factors		
Alcohol drinking[2]		
Yes	1799	77.2
No	531	22.8
Smoking		
Yes	1087	46.7
No	1243	53.3
Leisure-time physical activity		
Yes	596	25.6
No	1734	74.4
Diabetes[3]		
Yes	160	6.9
No	2170	93.1
Hypercholesterolemia[4]		
Yes	193	8.3
No	2136	91.7

Table 11. (cont.)

Variable	n	Frequency (%)
Overweight/obesity		
WHO cutoffs[5]		
Determined by body mass index		
Yes	1558	66.9
No	772	33.1
Determined by waist circumference		
Yes	1278	54.8
No	1052	45.2
Determined by waist-hip ratio		
Yes	1469	63.1
No	861	36.9
Mexican cutoffs[6]		
Determined by body mass index		
Yes	1163	49.9
No	1167	50.1
Determined by waist circumference		
Yes	1288	55.3
No	1042	44.7
Determined by waist-hip ratio		
Yes	1464	63.0
No	860	37.0
Hypertension[7]		
Yes	403	17.3
No	1927	82.7
Productivity outcomes		
Sick leave absenteeism		
Yes	562	24.1
No	1768	75.9
Work limitations (presenteeism)		
Yes	1743	74.8
No	587	25.2

[1]\$1.00 US dollar ≈ \$13.00 MX pesos. As of January 2013, the minimum wage in Mexico was \$64.76MX per day, which is approximately equivalent to \$5 US dollars [Sistema de Administración Tributaria, 2013]
[2]Occasionally drinking more than three glasses of alcoholic beverages
[3]Determined by self-report and on-site measurement; classified using the World Health Organization cutoff ≥ 126mg/dL
[4]On-site measurement classified using AHA cutoff ≥ 200mg/dL
[5]Overweight/obesity determined using the World Health Organization's cutoffs: Body mass index ≥ 25 kg/m^2, waist circumference > 94cm in men and > 80cm in women, and waist-hip ratio > 1.00 in men and > 0.85 in women
[6]Overweight/obesity determined using Mexican cutoffs: Body mass index ≥ 26.2 kg/m^2 for men and 27.7 kg/m^2 for women, waist circumference > 90cm for men and > 85cm for women, and waist-hip ratio > 0.90 for men and > 0.85 for women
[7]Determined by self-report and on-site measurement; classified using the American Heart Association (AHA) cutoffs (systolic blood pressure ≥ 140mmHg or diastolic blood pressure ≥ 90mmHg)

Most of the study population worked at the airline company (30.2%); followed by the printing company (26.9%), and the tire manufacture company (14.1%). The majority of participants were blue-collar workers (56.3%). The study population was predominantly male (67.6%), younger than 35 years old (46.6%), and married (50.1%). Most workers had a low level of education (middle school or less, 44.5%) and a low monthly income (less than $4,500 MX pesos, approximately equivalent to $346 US dollars, 41.4%).

In regards to health behaviors and cardiovascular risk factors, 77.2% of workers occasionally drank more than three glasses of alcohol, 46.7% smoked cigarettes at the time of the survey, and 25.6% reported exercising at least twice a week. Workers from our study sample had a prevalence of 6.9% diabetes and 8.3% hypercholesterolemia. In regards to weight outcomes, when using cutoffs from the World Health Organization (WHO),[142] we found a 66.9% prevalence of overweight/obesity as measured with body mass index (BMI), 54.8% when measured with waist circumference (WC), and 63.1% when measured with waist-hip ratio (WHR). With cutoffs specific to the Mexican population,[147,148] there was a prevalence of 49.9% overweight/obesity as measured with BMI, 55.3% when using WC, and 63.0% when measured with WHR. Approximately 17.3% of workers had hypertension. Finally, with respect to productivity outcomes, 24.1% had sick leave absenteeism days during the year IMSS' study was performed and almost 74.8% of the sample population reported having working limitations.

4.1.2 Distribution of psychosocial job factors

4.1.2.1 Job content questionnaire (JCQ) psychometric properties

4.1.2.1.1 JCQ factor composition

Table 12. Exploratory factor analysis (principal-component extraction method) with varimax rotation. Mexican Institute of Social Security Study 2009 (n = 2,330).[1]

Variable	Factor 1 DL	Factor 2 JD	Factor 3 SS	Factor 4 CWS	Factor 5 JI
learn (item1-SD)	**0.4953**	0.1527	0.1184	0.0361	0.004
repet (item2-SD)	-0.1428	**0.3905**	0.0325	0.0801	-0.2691
creat (item3-SD)	**0.6656**	0.1345	0.0304	0.0095	0.0079
decis (item4-DMA)	**0.6796**	-0.1328	-0.0371	0.0923	0.0051
skill (item5-SD)	**0.5592**	**0.3379**	0.093	0.0795	-0.0524
f_dec (item6-DMA)	**0.5262**	-0.0491	0.1553	0.2275	-0.183
vary (item7-SD)	**0.5711**	0.0812	0.1422	0.0348	-0.0069
say (item8-DMA)	**0.6705**	-0.1221	0.2454	0.1464	-0.0169
d_ab (item9-SD)	**0.6934**	-0.0768	0.2201	0.1703	-0.0708
fast (item10-PD)	0.2182	**0.6697**	0.045	0.0667	0.0873
hard (item11-PD)	0.2009	**0.7066**	0.0536	0.0438	0.1408
phys (item12-PhsD)	-0.0481	**0.6655**	-0.03	-0.0135	-0.1978
ex_wk (item13-PD)	0.0019	**-0.6381**	0.1899	-0.0365	-0.191
en_tm (item14-PD)	0.0785	0.0434	0.233	0.1644	**-0.4767**
c_dem (item15-PD)	0.0233	**-0.4845**	0.2079	0.0506	-0.0538
secur (item16-JI)	0.2493	-0.0648	**0.3134**	0.2560	-0.2295
comp (item17-CWS)	0.1183	0.0372	0.0938	**0.6748**	-0.0154
p_int (item18-CWS)	0.1541	0.0007	0.1045	**0.6847**	0.0341
frnd (item19-CWS)	0.1172	0.0472	0.1638	**0.7875**	-0.0071
hlpjd (item20-CWS)	0.082	0.0683	0.2599	**0.7291**	-0.0495
s_con (item21-SS)	0.1852	-0.0736	**0.8242**	0.1983	-0.0583
s_attn (item22-SS)	0.236	-0.1206	**0.7931**	0.1656	-0.0395
s_hlp (item23-SS)	0.1552	-0.0518	**0.8388**	0.1676	-0.0398
s_wkt (item24-SS)	0.1763	-0.0421	**0.8608**	0.1644	-0.0499
stead1 (item25-JI)	-0.0745	0.048	0.0792	0.0323	**0.5565**
layof (item26-JI)	0.0379	0.0389	-0.0126	-0.0327	**0.5844**
lose (item27-JI)	-0.067	0.0281	-0.0833	0.091	**0.6381**

[1]Shaded values represent loadings > .3
Abbreviations: SD = skill discretion, DMA = decision-making authority, PD = Psychological demands, PhsD = Physical Demands, JI = Job insecurity, CWS = Coworker support, SS = Supervisor support, DL = decision latitude, JD = Job demands (psychological/physical). For abbreviations on JCQ items, see the end of Appendix 5.

According to Fabrigar et al.,[230] “a researcher should always consider relevant theory and previous research when determining the appropriate number of factors to retain.” For our factor analyses, we decided to retain 5 factors, which would correspond in theory to the following 5 JCQ scales: job control, job demands, supervisor support, coworker support, and job insecurity. These factors also conformed to the Kaiser criterion of eigenvalues > 1 and were included as acceptable factors after performing Horn’s parallel analysis.[231] Additionally, we performed factor analysis in each of the companies separately to examine the clustering effects of our key exposures and to verify if the factor composition found with the overall sample was replicated in each company (see **Appendix 5**).

As seen in **Table 12**, in the overall sample, the factor pattern followed the original JCQ scales with the exception of some items that loaded with other factors (items 2, 14, and 16). Indeed, the “repetitive item” (#2) was not loaded on the job control factor, the “enough time” item (#14) was not loaded on the psychological job demands factor, and the “job security” item (#16) was not loaded on the job insecurity factor. Regarding the factor structure of the 5 psychological job demands in each worksite, we found that the factor composition did not change, with the exception of the plastic factory, where we were only able to identify 4 factors (job control, job demands, and supervisor and coworker support). This might be due to the low sample size of the plastic factory (n = 95). In fact, in a review article on exploratory factor analysis, Fabrigar et al.[230] reported that, when selecting a sample size, some authors recommend having 5 participants per measured variable while others suggest even higher ratios (10 to 1). We also observed that the "enough time" item was seemingly the most problematic (see **Appendix 5**), but in some companies, the “conflicting demands” item (#15) was not loaded on the psychological job demands factor. Finally, the physical job demand item was loaded on the psychological job demand factor in the overall sample and in each of the different companies. In order to differentiate between psychological and physical demands, we decided to evaluate the latter separately from psychological demands.

From our results above, and because the low factor loading of the “repetitive work” item (#2) has been pointed out by many JCQ researchers,[72] it seemed that the best approach was to build a new 8-item job decision latitude scale without the aforementioned item. Also, in a recent study of the occupation-differential construct validity of the JCQ, Choi et al.[232] suggested the use of a new job demands scale without the items “work fast” and “work hard” because these items may be understood as physical demands rather than psychological among physically demanding occupations, and their inclusion in the psychological demands scale has been shown to compromise the validity of this scale. Therefore, these authors recommend either rewording the questions to specify that they refer to intellectual tasks, or separating those two items from the psychological demands scale. Due to the high variety of occupations in this study and the impossibility to reapply the questionnaire, we were unable to reword the questions and therefore, we took the alternative suggestion and considered a psychological demands scale that excluded the items “work fast” and “work hard” in our analyses. Summary statistics of the original and new alternative scales are shown in **Table 13**.

Table 13. Distribution of psychosocial job factors in Mexican worker sample. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variables	Total Mean (SD)	Total Range	Males Mean (SD)	Males Range	Females Mean (SD)	Females Range
Psychological job demands (five items)[1]	31.50 (6.01)	12-48	31.79 (5.88)	12-48	30.90 (6.25)	12-48
Alt. psychological job demands (three items)[2]	32.92 (8.36)	15-60	33.23 (8.24)	15-60	32.28 (8.59)	15-60
Decision latitude (nine items)[3]	73.74 (10.92)	30-96	74.78 (10.75)	30-96	71.57 (10.95)	36-96
Alt. decision latitude (eight items)[4]	76.90 (11.55)	28-96	77.98 (11.35)	28-96	74.65 (11.65)	38-96
Physical demands	2.52 (0.98)	1-4	2.61 (0.96)	1-4	2.31 (0.98)	1-4
Coworker support	12.27 (2.10)	4-16	12.45 (2.05)	4-16	11.92 (2.16)	4-16
Supervisor support	12.31 (2.79)	4-16	12.28 (2.78)	4-16	12.36 (2.80)	4-16
Total support	24.58 (4.13)	8-32	24.73 (4.12)	8-32	24.28 (4.13)	10-32
Job strain ratio	0.87 (0.23)	0.25-2.40	0.87 (0.22)	0.27-2.40	0.88 (0.23)	0.25-1.83
Alt. job strain ratio[5]	0.88 (0.29)	0.31-2.50	0.88 (0.28)	0.31-2.50	0.89 (0.29)	0.312.05
Isostrain	-66.82 (14.53)	-110-(-7)	-67.72 (14.46)	-110-(-7)	-64.95 (14.52)	-109-(-20)
Alt. isostrain[5]	-68.6 (17.50)	-113-(-0.80)	-69.47 (17.50)	-113-(-0.80)	-66.66 (17.40)	-113- -12.8
Job insecurity	5.39 (1.73)	3-12	5.43 (1.72)	3-12	5.31 (1.74)	3-11

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales

4.1.2.1.2 JCQ reliability

Table 14. Cronbach's alpha coefficients of the JCQ scales in Mexican Institute of Social Security Study 2009 (n = 2,330) and other Latin-American studies.[138]

JCQ Scales	Mexican white-collar[&]	Mexican blue-collar[&]	Colombian nurses*	Colombian drivers*	Colombian mixed occupations **	Mexican maquiladora workers~
Psychological demands	0.64	0.59	0.55	0.51	0.64	0.66
Physical demands	NA	NA	-	-	-	-
Decision latitude	0.79	0.74	0.75	0.73	0.67	-
Skill discretion	0.68	0.64	0.75	0.75	0.64	0.64
Decision-making authority	0.71	0.62	0.30	0.42	0.63	0.48
Coworker support	0.78	0.72	0.69	0.68	0.78	0.79
Supervisor support	0.92	0.89	0.72	0.85	0.82	0.85
Job insecurity	0.41	0.34	0.53	0.34	0.40	0.47

Note: Dashes indicate no data available. NA = Not applicable (only one item).
[&] Our study
* Arango 2007[234]
** Marulanda 2007[233]
~ Cedillo & Karasek 2003[135]

With the exception of job insecurity, each of the JCQ scales in our study sample showed adequate reliability coefficients, ranging from 0.59 to 0.92. Job insecurity's Cronbach alpha coefficients for white-collar and blue-collar workers in this study were 0.41 and 0.34, respectively. Finding low reliability values for the job insecurity scale is not uncommon and according to the JCQ Center, this is due to the heterogeneity of the items included in this scale.[235]

Table 15. Cronbach's alpha coefficients of the JCQ scales of workers from the Mexican Institute of Social Security Study 2009 (n = 2,330) and US workers.[72]

JCQ scales	Mexican mixed occupations		US mixed occupations	
	Men	Women	Men	Women
Psychological demands	0.56	0.60	0.63	0.62
Physical demands	NA	NA	NA	NA
Decision latitude	0.75	0.73	0.83	0.80
Skill discretion	0.62	0.60	0.75	0.71
Decision-making authority	0.66	0.64	0.69	0.72
Coworker support	0.74	0.73	0.80	0.81
Supervisor support	0.90	0.91	0.85	0.83
Job insecurity	0.34	0.43	0.53	0.41

NA = Not applicable (only one item).

With the exception of supervisor support, the Cronbach alpha coefficients found in this study were lower than those obtained in Karasek's US national sample (**Table 15**). However, Cronbach alpha coefficients in this study were similar to those obtained in other Latin American studies (**Table 14**).

Additional to factor analysis and Cronbach alpha calculations, correlations between the different job demands/job control items and health outcomes were explored to determine the predictive validity of the JCQ scales (see **Appendix 4**). Interestingly, we found statistically significant negative correlations between body mass index, waist circumference, and item #13 ("I am not asked to do an excessive amount of work") and between body mass index and item #15 ("I am free from conflicting demands others make"). These correlations indicate that excessive amount of work and conflicting demands can increase the risk for body mass index and waist circumference-based obesity and supports Choi et al.'s recommendation to look at the item and scale-level analysis with the psychological job demand scale in relation to health outcomes.[236]

4.1.2.2 Distribution of JCQ scales and subscales

Table 16 below displays mean values and standard deviation for all original and alternative JCQ scales and subscales by worksite. Psychological job demands were highest in the tire factory (mean 32.98, SD 5.92), the printing company (mean 32.92, SD 5.58), and the airline company (mean 31.47, SD 5.91). Physical job demands were highest in the tire factory (mean 3.08, SD 0.91) and the printing company (mean 2.89, SD 0.93). The highest levels of job decision latitude (i.e., job control) were reported at the car tools factory (mean 75.79, SD 10.92), followed by the airline company (mean 75.50, SD 10.23), and the pharmaceutical company (mean 74.57, SD 9.81). Total social support, corresponding to the sum of the scores obtained from coworker and supervisor social support, was highest in the airline company (mean 25.07, SD 4.07), in the car tools factory (mean 25.02, SD 3.92), and the printing company (mean 24.59, SD 4.16). The highest job strain ratios were found in the tire factory (mean 0.95, SD 0.26), the printing company (mean 0.93, SD .23), and the airline company (mean 0.85, SD 0.20). Isostrain was highest in the tire factory (mean -62.29, SD 15.29), followed by the printing (mean -64.66, SD 14.49) and cooking utensils companies (mean -65.42, SD 13.70). Job insecurity scores were highest in the plastic factory (mean 5.89, SD 1.92), the tire factory (mean 5.76, SD 1.73), and the airline company (mean 5.69, SD 1.80). The widest variation of all JCQ scales between companies was found for physical job demands. Overall, the alternative scales yielded higher mean scores and standard deviations across all companies but in general, the highest scores were distributed among the same companies mentioned above.

Table 16. Mean scores (and standard deviations) of original and alternative JCQ scales and subscales by company. Mexican Institute of Social Security Study 2009 (n = 2,330).

JCQ scales	Public Health	Airline	Pharma-ceutical	Car tools factory	Cooking utensils company	Plastic factory	Printing company	Tire factory	Total
Psychological job demands (five items)[1]	28.97 (5.41)	31.47 (5.91)	30.04 (5.67)	30.17 (6.37)	28.66 (6.62)	29.34 (5.81)	32.92 (5.58)	32.98 (5.92)	31.50 (6.01)
Alt. psychological job demands (three items)[2]	30.16 (7.76)	32.71 (8.47)	31.46 (7.73)	32.24 (9.05)	31.99 (8.40)	31.11 (7.26)	33.67 (8.21)	34.97 (8.33)	32.92 (8.36)
Physical demands	1.88 (0.76)	2.07 (0.87)	2.26 (0.81)	2.48 (0.96)	2.56 (0.88)	2.67 (0.86)	2.89 (0.93)	3.08 (0.91)	2.52 (0.98)
Decision latitude (nine items)[3]	74.31 (12.08)	75.50 (10.23)	74.57 (9.81)	75.79 (10.92)	70.09 (10.31)	72.02 (10.02)	73.00 (10.81)	71.45 (12.22)	73.75 (10.92)
Alt. decision latitude (eight items)[4]	76.98 (12.53)	78.35 (10.76)	77.57 (10.07)	79.13 (11.66)	72.87 (11.50)	74.97 (11.10)	76.57 (11.50)	74.83 (13.01)	76.90 (11.55)
Coworker support	12.24 (2.17)	12.58 (2.01)	12.30 (1.76)	11.98 (2.31)	11.47 (2.41)	11.65 (2.07)	12.24 (2.14)	12.28 (2.02)	12.27 (2.10)
Supervisor support	11.85 (3.32)	12.49 (2.72)	12.28 (2.53)	13.04 (2.35)	12.51 (2.76)	12.49 (2.74)	12.35 (2.80)	11.53 (2.88)	12.31 (2.79)
Total social support	24.10 (4.81)	25.07 (4.07)	24.58 (3.67)	25.02 (3.92)	23.98 (4.39)	24.14 (4.12)	24.59 (4.16)	23.81 (4.05)	24.58 (4.13)
Job strain ratio	0.81 (0.23)	0.85 (0.20)	0.82 (0.18)	0.81 (0.21)	0.82 (0.21)	0.83 (0.19)	0.93 (0.23)	0.95 (0.26)	0.88 (0.23)
Alt. job strain ratio[5]	0.82 (0.29)	0.86 (0.27)	0.83 (0.24)	0.84 (0.29)	0.90 (0.26)	0.85 (0.25)	0.91 (0.30)	0.97 (0.32)	0.88 (0.29)
Isostrain	-69.44 (16.21)	-69.15 (13.68)	-69.10 (12.79)	-70.64 (14.46)	-65.42 (13.70)	-66.83 (13.09)	-64.66 (14.49)	-62.29 (15.59)	-66.82 (14.53)
Alt. isostrain[5]	-70.91 (19.12)	-70.71 (16.82)	-70.69 (15.38)	-71.91 (17.78)	-64.86 (16.30)	-68.01 (16.43)	-67.49 (17.73)	-63.67 (18.30)	-68.56 (17.51)
Job insecurity	4.84 (1.60)	5.69 (1.80)	5.60 (1.59)	5.16 (1.83)	4.60 (1.10)	5.89 (1.92)	5.04 (1.58)	5.76 (1.73)	5.39 (1.73)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales

Table 17 shows JCQ scores by type of labor compared with other Mexican and Latin-American working populations. Compared to white-collar workers, blue-collar workers had slightly higher mean levels of psychological demands (31.6 vs. 31.4), higher mean levels of physical demands (2.9 vs. 2.0), lower mean levels of decision latitude (72.1 vs. 75.9), lower total social support (24.3 vs. 24.9), higher scores of job strain ratio (0.9 vs. 0.8), higher scores of isostrain (-64.8 vs. -69.4) and slightly lower scores of job insecurity (5.3 vs. 5.5). Compared with working populations from other studies, our white-collar population seemed to have higher levels of decision latitude and social support.

Psychological demands and job strain ratio in our working population did not seem as high as in other studies. Juarez-Garcia[16] reported the highest levels of psychological demands in his group of Mexican nurses and Marulanda's[233] mixed occupations from Colombia had the highest job strain ratio. The mean scores of job insecurity were also higher in other studies, in particular in Colombian nurses reported by Arango.[234]

Table 17. Means (and standard deviations) of the JCQ-scales of the Mexican Institute of Social Security Study 2009 (n = 2,330) and other Mexican and Latin-American studies[16,138]

JCQ scales	Mexican white-collar[1]	Mexican blue-collar[1]	Colombian Nurses[2]	Colombian Drivers[2]	Colombian mixed occupations[3]	Mexican maquiladora workers[4]	Mexican Nurses[5]
Psychological job demands	31.4 (6.0)	31.6 (6.0)	34.0 (3.7)	32.6 (6.4)	33.7 (4.3)	29.3 (6.4)	28.3
Physical demands	2.0 (0.8)	2.9 (0.9)	-	-	-	-	-
Decision latitude	75.9 (10.6)	72.1 (10.9)	70.6 (9.8)	55.9 (9.7)	69.5 (8.9)	-	75.5
Skill discretion	37.7 (5.0)	36.4 (4.7)	37.3 (4.9)	26.0 (6.2)	36.7 (5.2)	34.5 (4.8)	40.9
Decision-making authority	38.2 (6.8)	35.7 (7.6)	33.3 (6.4)	29.9 (7.2)	32.9 (5.5)	32.4 (7.3)	34.5
Coworker support	12.4 (2.0)	12.1 (2.1)	12.0 (2.0)	11.3 (2.1)	12.3 (2.2)	12.2 (2.1)	12.2
Supervisor support	12.5 (2.7)	12.2 (2.8)	10.9 (2.4)	9.7 (2.8)	11.7 (2.5)	11.2 (2.4)	10
Total social support	24.9 (4.0)	24.3 (4.2)	22.9 (3.5)	20.9 (4.2)	23.9 (4.0)	-	22.2
Job strain ratio	0.8 (0.2)	0.9 (0.2)	1.0 (0.2)	1.2 (0.3)	1.2 (0.3)	-	0.7
Isostrain	-69.4 (14.1)	-64.8 (14.6)	-	-	-	-	-
Job insecurity	5.5 (1.7)	5.3 (1.7)	7.0 (2.3)	6.3 (2.4)	6.0 (2.0)	3.3 (0.9)	4.7

Note: Dashes indicate no data available.
[1]IMSS' study
[2]Arango 2007[234]
[3]Marulanda 2007[233]
[4]Cedillo & Karasek 2003[135]
[5]Juárez-García 2007[16]

Compared with US national averages (**Table 18**), male workers in this study had slightly higher psychological demands. Physical demands were approximately the same among males but lower among women. Decision latitude scores were higher among our overall working population. Total social support scores were lower for both men and women in our sample. Job strain ratio was higher among men but lower among women in our sample. Finally, job insecurity was higher among all workers in our study.

Table 18. Comparison of means (and standard deviations) of the JCQ-scales by gender among workers from the Mexican Institute of Social Security Study 2009 (n = 2,330) and US workers.[72,237]

JCQ scales	Mexican mixed occupations[1]		US mixed occupations[2]	
	Men	Women	Men	Women
Psychological job demands	31.8 (5.9)	30.9 (6.2)	30.1 (7.2)	30.9 (7.0)
Physical demands	2.6 (1.0)	2.3 (1.0)	2.6 (1.2)	2.6 (1.1)
Decision latitude	74.8 (10.7)	71.6 (10.9)	72.6 (15.4)	65.7 (15.8)
Skill discretion	37.4 (4.8)	36.0 (4.9)	35.0 (7.7)	31.9 (7.7)
Decision-making authority	37.4 (7.3)	35.5 (7.5)	37.7 (9.6)	33.8 (10.3)
Coworker support	12.4 (2.0)	11.9 (2.2)	13.2 (2.6)	13.2 (2.6)
Supervisor support	12.3 (2.8)	12.4 (2.8)	12.6 (3.2)	12.8 (3.1)
Total social support	24.7 (4.1)	24.3 (4.1)	25.8 (-)	26.0 (-)
Job strain ratio	0.87 (0.22)	0.88 (0.23)	0.83 (-)	0.94 (-)
Isostrain	-67.7 (14.5)	-64.9 (14.5)	-	-
Job insecurity	5.4 (1.7)	5.3 (1.7)	3.7 (1.5)	3.3 (1.1)

Note: Dashes indicate no data available.
[1]Our study
[2]Karasek et al. 1998[72] & Errata correction[237]

Risk classifications determined with the quadrant method (*cf.* **Appendix 6**, method 1) are shown in **Table 19**. The table shows the number of workers in each company and the corresponding percentages for the different risks: job strain, isostrain, and job insecurity.

Table 19. Distribution (n, %) of job strain, isostrain, and job insecurity by company defined by the quadrant method. Mexican Institute of Social Security Study 2009 (n = 2,330).

Company	**n**	**Job strain**		**Isostrain**		**Job insecurity**	
		Yes	**No**	**Yes**	**No**	**High**	**Low**
		n (%)	**n (%)**	**n (%)**	**n (%)**	**n (%)**	**n (%)**
Public health department	123	13 (10.6)	110 (89.4)	9 (7.3)	114 (92.7)	19 (15.4)	104 (84.6)
Airline company	703	119 (16.9)	584 (83.1)	56 (8.0)	647 (92.0)	296 (42.1)	407 (57.9)
Pharmaceutical company	185	36 (19.5)	149 (80.5)	18 (9.7)	167 (90.3)	77 (41.6)	108 (58.4)
Car tools factory	161	26 (16.1)	135 (83.9)	15 (9.3)	146 (90.7)	53 (32.9)	108 (67.1)
Cooking utensils company	108	24 (22.2)	84 (77.8)	12 (12.6)	96 (87.4)	22 (20.4)	86 (79.6)
Plastic factory	95	17 (17.9)	78 (82.1)	12 (12.6)	83 (87.4)	48 (50.5)	47 (49.5)
Printing company	627	179 (28.5)	448 (71.5)	100 (15.9)	527 (84.1)	178 (28.4)	449 (71.6)
Tire factory	328	97 (29.6)	231 (70.4)	65 (19.8)	263 (80.2)	166 (50.6)	162 (49.4)
Total	2330	511 (21.9)	1819 (78.1)	287 (12.3)	2043 (87.7)	859 (36.9)	1471 (63.1)

Companies with the highest percentage of workers reporting job strain included the tire manufacture company (29.6%) followed by the printing company (28.5%) and the cooking utensils company (22.2%). Isostrain was also highest in the tire factory (19.8%), the printing company (15.9%), and the cooking utensils company and plastic factory (12.6%). High job insecurity was more prevalent in the tire factory (50.6%), the plastic factory (50.5%), and the airline company (42.1%). Interestingly, the airline company went bankrupt a few months after IMSS' study began, which may explain why this company had one of the three highest levels of job insecurity.

4.1.3 Distribution of biological cardiovascular risk factors

The mean, range, and standard deviation values of the different cardiovascular risk factors considered in this study are shown in **Table 20**.

Table 20. Distribution of biological cardiovascular risk factors in Mexican worker sample. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variables	Total		Males		Females	
	Mean (SD)	**Range**	**Mean (SD)**	**Range**	**Mean (SD)**	**Range**
Glucose [mg/dl]	94.26 (27.33)	55-328	93.59 (26.05)	55-327	95.65 (29.81)	55-328
Cholesterol levels [mg/dl]	139.06 (48.30)	50-400	138.29 (50.18)	50-400	140.65 (44.10)	50-400
Overweight/obesity indicators						
Body mass index [kg/m^2]	26.98 (4.31)	17-50	27.10 (4.08)	17-50	26.72 (4.74)	17-50
Waist circumference [cm]	90.85 (10.54)	60-142	92.49 (10.01)	60-132	87.41 (10.81)	63-142
Hip diameter [cm]	100.37 (8.27)	67-159	100.23 (7.40)	71-144	100.66 (9.85)	67-159
Waist-to-hip ratio	0.90 (.06)	0.58-1.15	0.92 (0.05)	0.58, 1.15	0.87 (.06)	0.61-1.13
Blood pressure						
Systolic [mmHg]	118.16 (10.49)	90-190	118.97 (9.99)	90-190	116.48 (11.29)	90-170
Diastolic [mmHg]	78.30 (7.46)	50-130	78.57 (7.52)	50-130	77.75 (7.31)	52-100

4.1.4 Distribution of productivity indicators

Table 21 below indicates that work limitation scores were higher at the Public Health Departments (mean 6.96, SD 2.68), followed by the car tools factory (mean 6.66, SD 2.76), and the cooking utensils company (mean 6.54, SD 2.70). Sick absenteeism days were higher at the tire factory (mean 4.22, SD 13.32), the cooking utensils company (mean 4.17, SD 12.82), and the public health department (mean 3.87, SD 14.10).

Table 21. Distribution of productivity indicators by worksite in Mexican worker sample. Mexican Institute of Social Security Study 2009 (n = 2,330).

Company	**n**	**Presenteeism [work limitations score]**		**Sick leave absenteeism [days]**	
		Mean (SD)	**Range**	**Mean (SD)**	**Range**
Public health department	123	7.0 (2.7)	4-18	3.9 (14.1)	0-109
Airline company	703	6.4 (2.0)	4-20	2.3 (9.5)	0-141
Pharmaceutical company	185	6.5 (2.8)	4-20	3.2 (12.5)	0-145
Car tools manufacture	161	6.7 (2.8)	4-20	3.3 (20.2)	0-243
Cooking utensils company	108	6.5 (2.7)	4-16	4.2 (12.8)	0-92
Plastic factory	95	6.0 (2.3)	4-16	1.5 (3.9)	0-21
Printing company	627	6.3 (2.3)	4-20	3.2 (12.4)	0-113
Tire manufacture factory	328	5.9 (2.4)	4-20	4.2 (13.3)	0-112
Total	2,330	6.3 (2.4)	4-20	3.1 (12.4)	0-243

SD = Standard Deviation

4.2 Bivariate associations of dependent study variables with psychosocial job factors (job strain, isostrain, and job insecurity)

Bivariate associations were investigated based on categorical measures of both independent and dependent variables and chi square tests were used to determine statistical significance of differences in the distribution of study variables between low and high levels of job strain, isostrain, and job insecurity, respectively (**Table 22**).

Table 22. Prevalence of high job strain, isostrain, and job insecurity by study outcomes and covariates. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variable	Job strain (%)	Isostrain (%)	Job insecurity (%)
Socio-demographic			
Worksites			
Public Health	10.6*	7.3*	15.4*
Airline	16.9*	8.0*	42.1*
Pharmaceutical	19.5*	9.7*	41.6*
Tools manufacture	16.1*	9.3*	32.9*
Cooking utensils manufacture	22.2*	11.1*	20.4*
Plastic factory	17.9*	12.6*	50.5*
Printing company	28.5*	15.9*	28.4*
Tire manufacture	29.6*	19.8*	50.6*
Occupation			
Managers	12.3*	8.8*	35.1*
Professionals	21.9*	10.4*	42.7*
Technicians & associated professionals	11.6*	6.3*	38.8*
Clerical support workers	16.1*	9.4*	34.6*
Service & sales workers	23.5*	23.5*	17.6*
Craft & related trades workers	21.4*	11.8*	36.8*
Plant & machine operators & assemblers	23.7*	12.9*	29.5*
Elementary occupations	28.4*	16.9*	38.1*
Labor type			
White-collar	16.7*	8.8*	38.4
Blue-collar	26.0*	15.0*	35.7
Contract type			
Permanent	21.9	12.5	32.7*
Temporary	21.7	11.4	54.0*
Missing	-	-	-

Table 22. (cont.)

Variable	Job strain (%)	Isostrain (%)	Job insecurity (%)
Shift			
Morning	19.3	10.7	36.2
Evening	28.3	15.1	35.8
Night	20.0	20.0	25.0
Mixed	25.2	14.2	38.2
Double shift	13.6	4.5	31.8
Missing	-	-	-
Seniority			
5 years or less	22.5	12.0	36.9
6 to 25 years	21.9	13.5	37.9
More than 25 years	14.1	5.7	26.4
Missing	-	-	-
Gender			
Male	20.8	11.9	38.7*
Female	24.3	13.1	33.0*
Age			
≤ 35	23.1*	13.3*	37.7*
36-45	23.9*	14.3*	41.0*
46-55	15.4*	7.2*	31.1*
≥ 56	23.1*	10.7*	28.1*
Missing	-	-	-
Marital status			
Married	20.7	12.9	38.4
Non-married	23.1	11.7	35.2
Missing	-	-	-
Education			
Middle school or less	27.0*	15.3*	35.7
High school or technical degree	17.7*	11.3*	36.1
College or graduate degree	18.1*	8.6*	39.4
Missing	-	-	-
Monthly income (in Mexican pesos)[1]			
Low (< 4,500)	28.8*	16.6*	37.9
Medium (4,500-10,500)	19.7*	11.1*	36.9
High (> 10,500)	14.1*	7.2*	35.3
Missing	-	-	-
Health behaviors/cardiovascular risk factors			
Alcohol drinking[2]			
Yes	21.1	11.6*	38.5*
No	24.9	14.9*	31.3*
Smoking			
Yes	23.3	13.7	39.3*
No	20.8	11.1	34.7*
Leisure-time physical activity			
Yes	19.0*	10.6	40.3*
No	22.9*	12.9	35.7*

Table 22. (cont.)

Variable	Job strain (%)	Isostrain (%)	Job insecurity (%)
Diabetes[3]			
Yes	23.1	8.7	36.3
No	21.8	12.6	36.9
Hypercholesterolemia[4]			
Yes	26.4	19.2*	48.2*
No	21.5	11.7*	35.9*
Overweight/obesity			
WHO cutoffs[5]			
Determined by body mass index			
Yes	21.2	11.5	36.2
No	23.4	14.0	38.2
Determined by waist circumference			
Yes	21.5	12.0	33.6*
No	22.4	12.7	40.8*
Determined by waist-hip ratio			
Yes	21.4	13.0	36.9
No	22.8	11.1	38.1
Mexican cutoffs[6]			
Determined by body mass index			
Yes	19.4*	10.9*	36.3
No	24.4*	13.7*	37.4
Determined by waist circumference			
Yes	21.6	12.2	35.5
No	22.4	12.5	38.6
Determined by waist-hip ratio			
Yes	21.5	13.0	36.2
No	22.8	11.2	38.1
Hypertension[7]			
Yes	19.1	8.7*	32.3*
No	22.5	13.1*	37.8*
Productivity outcomes			
Sick leave absenteeism			
Yes	23.1	13.9	38.1
No	21.5	11.8	36.5
Work limitations (presenteeism)			
Yes	22.2	12.3	38.1*
No	21.1	12.3	33.2*

*p < 0.05 at chi-square tests
[1]$1.00 US dollar ≈ $13.00 MX pesos. As of January 2013, the minimum wage in Mexico was $64.76MX per day, which is approximately equivalent to $5 US dollars [Sistema de Administración Tributaria, 2012]
[2]Occasionally drinking more than three glasses of alcoholic beverages
[3]Determined by self-report and on-site measurement; classified using the World Health Organization cutoff ≥ 126mg/dL
[4]On-site measurement classified using AHA cutoff ≥ 200mg/dL
[5]Overweight/obesity determined using the World Health Organization's cutoffs: Body mass index ≥ 25 kg/m^2, waist circumference > 94cm in men and > 80cm in women, and waist-hip ratio > 1.00 in men and > 0.85 in women
[6]Overweight/obesity determined using Mexican cutoffs: Body mass index ≥ 26.2 kg/m^2 for men and 27.7 kg/m^2 for women, waist circumference > 90cm for men and > 85cm for women, and waist-hip ratio > 0.90 for men and > 0.85 for women
[7]Determined by self-report and on-site measurement; classified using the American Heart Association (AHA) cutoffs (systolic blood pressure ≥ 140mmHg or diastolic blood pressure ≥ 90mmHg)

Type of worksite, occupation, and age (younger workers) had statistical significant associations with job strain, isostrain, and job insecurity, while type of contract (temporary work) and gender (male workers) were only significantly associated with job insecurity. Education (middle school or less) and income (lower) had a statistical significant relationship with job strain and isostrain. Job insecurity was associated with alcohol drinking and leisure-time physical activity. Being a current smoker was significantly associated with isostrain and job insecurity. High levels of blood cholesterol were positively associated with job strain, isostrain, and job insecurity. Job strain was negatively associated with overweight/obesity. Although not statistically significant, there was a positive relationship between isostrain and overweight/obesity determined with both waist circumference and waist-hip ratio. Isostrain had a negative, statistically significant relationship with hypertension. Finally, reporting work limitations (presenteeism) was positively associated to job insecurity ($p < .05$).

4.3 Multivariate associations of dependent study variables with psychosocial job factors

4.3.1 Psychosocial job factors and biological cardiovascular risk factors

Beta coefficients and 95% confidence intervals of the linear regression models between job strain, isostrain, job insecurity and their subscales, and cardiovascular risk factors are shown in **Tables 23-28** with incremental adjustment for physical workload (model 2), individual worker characteristics (model 3), biological cardiovascular risk factors (model 4), and other psychosocial job factors (model 5). Odds ratios are shown for cardiovascular risk factors with binary outcomes (smoking and leisure-time physical activity).

4.3.1.1 Blood glucose levels

Table 23. Associations between psychosocial job factors and blood glucose levels: results (standardized beta coefficients and 95% confidence intervals) from multiple linear regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variable	Glucose [mg/dL]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	-0.55 (-1.66, 0.57)	-0.97 (-2.19, 0.24)	-0.26 (-1.47, 0.94)	-0.27 (-1.50, 0.97)	-0.32 (-1.54, 0.89)
Alt. psychological job demands (three items)[2]	0.67 (-0.45, 1.78)	0.54 (-0.63, 1.71)	0.61 (-0.51, 1.73)	0.72 (-0.43, 1.87)	0.43 (-0.74, 1.61)
Physical demands	0.95 (-0.16, 2.06)	N/A	0.70 (-0.54, 1.95)	0.64 (-0.64, 1.91)	1.03 (-0.32, 2.38)
Decision latitude (nine items)[3]	-0.06 (-1.18, 1.05)	-0.11 (-1.24, 1.02)	-0.39 (-1.51, 0.73)	-0.75 (-1.89, 0.38)	-0.81 (-2.08, 0.46)
Alt. decision latitude (eight items)[4]	-0.06 (-1.17, 1.05)	-0.12 (-1.25, 1.00)	-0.41 (-1.52, 0.70)	-0.80 (-1.92, 0.33)	-0.85 (-2.12, 0.41)
Coworker support	0.02 (-1.09, 1.14)	-0.10 (-1.23, 1.03)	0.55 (-0.53, 1.63)	0.38 (-0.71, 1.48)	0.96 (-0.18, 2.11)
Supervisor support	0.43 (-0.68, 1.54)	0.33 (-0.80, 1.47)	-0.16 (-1.25, 0.93)	-0.07 (-1.17, 1.04)	0.29 (-0.94, 1.52)
Total support	0.30 (-0.81, 1.41)	0.17 (-0.96, 1.31)	0.17 (-0.91, 1.25)	0.15 (-0.95, 1.25)	0.76 (-0.47, 1.99)
Job strain ratio	-0.69 (-1.80, 0.42)	-0.97 (-2.15, 0.21)	-0.21 (-1.35, 0.93)	0.02 (-1.14, 1.18)	-0.08 (-1.33, 1.17)
Alt. job strain ratio[5]	0.27 (-0.85, 1.38)	0.16 (-0.99, 1.32)	0.37 (-0.72, 1.47)	0.62 (-0.50, 1.75)	0.50 (-0.74, 1.75)
High job strain (categorical, ref. category: no high job strain)	0.09 (-2.60, 2.78)	-0.02 (-2.81, 2.76)	0.51 (-2.14, 3.15)	1.30 (-1.35, 3.96)	0.91 (-1.82, 3.65)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	0.15 (-2.42, 2.72)	0.17 (-2.45, 2.79)	0.31 (-2.18, 2.79)	0.92 (-1.58, 3.42)	0.74 (-1.87, 3.34)

Table 23. (cont.)

Variable	Glucose [mg/dL]				
	Model 1	Model 2	Model 3	Model 4	Model 5
High job strain (categorical, ref. category: low strain)	1.06 (-2.19, 4.31)	0.58 (-2.81, 3.97)	1.33 (-1.91, 4.57)	3.20 (-0.06, 6.46)	2.31 (-1.07, 5.68)
Alt. high job strain[5] (categorical, ref. category: low strain)	1.54 (-1.49, 4.57)	1.49 (-1.61, 4.60)	1.68 (-1.27, 4.64)	2.89 (-0.08, 5.86)	2.42 (-0.76, 5.60)
Isostrain (continuous)	-0.26 (-1.37, 0.85)	-0.33 (-1.48, 0.82)	0.14 (-0.97, 1.26)	0.42 (-0.70, 1.55)	0.08 (-1.07, 1.24)
Alt. isostrain (continuous)[5]	0.28 (-0.83, 1.40)	0.28 (-0.85, 1.42)	0.50 (-0.60, 1.59)	0.79 (-0.31, 1.90)	0.39 (-0.75, 1.52)
Isostrain (categorical)	-2.63 (-6.00, 0.75)	-2.66 (-6.13, 0.81)	-1.46 (-4.76, 1.84)	-0.04 (-3.37, 3.29)	-1.36 (-4.69, 1.98)
Alt. isostrain[5] (categorical)	-2.79 (-5.92, 0.35)	-2.64 (-5.83, 0.55)	-1.70 (-4.74, 1.33)	-0.59 (-3.63, 2.45)	-1.63 (-4.69, 1.44)
Job insecurity (continuous)	-1.35* (-2.46, -0.24)	-1.39* (-2.52, -0.26)	0.55 (-0.55, 1.66)	0.81 (-0.30, 1.93)	0.70 (-0.44, 1.84)
Job insecurity (categorical)	-2.48* (-4.79, -0.18)	-2.58* (-4.92, -0.23)	-0.52 (-1.75, 2.79)	0.74 (-1.55, 3.02)	0.60 (-1.72, 2.91)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

In all models, the original scale of psychological job demands showed a negative association with blood glucose levels but the alternative scale showed a positive association. After adjusting for potential confounders, physical demands and social support at work seemed to have a positive association with blood glucose levels. Both the original and alternative decision latitude subscales were associated with lower blood glucose levels in all models. However, none of these associations were statistically significant.

A consistent pattern of positive associations between the different operationalizations of job strain and blood glucose levels was found when using the alternative psychological demand scale excluding items that may be understood as physical demands. These associations did not reach statistical significance but were confirmed in post-hoc analyses excluding 109 workers with a personal history of diabetes (**Appendix 7**). When excluding such workers, individuals in high strain jobs had 2.37mg/dL higher glucose levels than workers in low strain jobs ($\beta = 2.37$, 95% CI = 0.02, 4.71) after controlling for physical workload, individual worker characteristics, and other cardiovascular risk factors.

Exposure to isostrain (measured as a continuous variable) seemed to increase blood glucose levels, while the categorical measure showed a negative association. However, none of these findings were statistically significant. Job insecurity and blood glucose levels were negatively associated. This association changed direction and lost statistical significance when adjusting for workers' individual characteristics and other cardiovascular risk factors.

4.3.1.2 Total blood cholesterol levels

Table 24. Associations between psychosocial job factors and total blood cholesterol levels: results (standardized beta coefficients and 95% confidence intervals) from multiple linear regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variable	Total blood Cholesterol Levels [mg/dL]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	-1.35 (-3.31, 0.61)	-0.84 (-2.97, 1.28)	-1.28 (-3.29, 0.73)	-1.78 (-3.99, 0.44)	-1.63 (-3.69, 0.42)
Alt. psychological job demands (three items)[2]	0.56 (-1.40, 2.53)	0.92 (-1.13, 2.97)	-0.03 (-1.90, 1.85)	-0.50 (-2.57, 1.56)	-0.85 (-2.84, 1.14)
Physical demands	-2.04* (-4.00, -0.08)	N/A	-1.55 (-3.64, -0.55)	-1.88 (-4.17, 0.41)	-1.00 (-3.29, 1.30)
Decision latitude (nine items)[3]	0.02 (-2.04, 1.91)	-0.06 (-2.04, 1.91)	-0.32 (-2.19, 1.56)	-0.88 (-2.89, 1.22)	1.29 (-0.86, 3.44)
Alt. decision latitude (eight items)[4]	-0.17 (-2.14, 1.79)	-0.22 (-2.19, 1.75)	-0.32 (-2.18, 1.54)	-0.81 (-2.83, 1.21)	1.16 (-0.98, 3.29)
Coworker support	-1.78 (-3.74, 0.18)	-1.70 (-3.68, 0.27)	-2.27* (-4.08, -0.46)	-2.62* (-4.58, -0.67)	-2.45* (-4.38, -0.51)
Supervisor support	-3.46* (-5.41, -1.50)	-3.79* (-5.77, -1.81)	-2.02* (-3.84, 0.20)	-1.91 (-3.87, 0.06)	-2.25* (-4.33, -0.18)
Total support	-3.24* (-5.19, -1.28)	-3.42* (-5.40, -1.44)	-2.50* (-4.31, -0.69)	-2.61* (-4.57, -0.65)	-2.96* (-5.04, -0.88)
Job strain ratio	-1.02 (-2.98, 0.94)	-0.57 (-2.64, 1.50)	-0.88 (-2.79, 1.03)	-0.81 (-2.87, 1.26)	-2.15* (-4.26, -0.03)
Alt. job strain ratio[5]	0.36 (-1.60, 2.33)	0.64 (-1.38, 2.66)	-0.12 (-1.96, 1.71)	-0.26 (-2.27, 1.74)	-1.60 (-3.71, 0.50)
High job strain (categorical, ref. category: no high job strain)	-0.76 (-5.50, 3.98)	-0.13 (-4.99, 4.74)	1.30 (-3.13, 5.74)	1.45 (-3.32, 6.22)	0.02 (-4.60, 4.64)
Alt. high job strain[5] (categ, ref. category: no high job strain)	-0.34 (-4.87, 4.20)	-0.37 (-4.95, 4.21)	1.08 (-3.09, 5.24)	0.51 (-3.97, 4.99)	-0.64 (-5.04, 3.77)

Table 24. (cont.)

Variable	Total blood Cholesterol Levels [mg/dL] Model 1	Model 2	Model 3	Model 4	Model 5
High job strain (categorical, ref. category: low strain)	-0.99 (-6.72, 4.75)	0.03 (-5.91, 5.96)	0.67 (-4.75, 6.10)	0.33 (-5.53, 6.18)	-1.42 (-7.14, 4.30)
Alt. high job strain[5] (categ, ref. category: low strain)	1.34 (-4.02, 6.70)	1.64 (-3.80, 7.08)	1.69 (-3.27, 6.65)	0.95 (-4.37, 6.27)	-1.15 (-6.54, 4.24)
Isostrain (continuous)	0.35 (-1.61, 2.31)	0.73 (-1.28, 2.74)	0.53 (-1.33, 2.40)	0.80 (-1.21, 2.81)	0.27 (-1.69, 2.22)
Alt. isostrain (continuous)[5]	1.14 (-0.82, 3.11)	1.37 (-0.62, 3.36)	0.80 (-1.03, 2.63)	0.92 (-1.06, 2.90)	0.50 (-1.43, 2.43)
Isostrain (categorical)	2.91 (-3.06, 8.88)	3.63 (-2.45, 9.71)	4.52 (-1.01, 10.05)	4.11 (-1.84, 10.05)	4.76 (-0.87, 10.41)
Alt. isostrain[5] (categorical)	1.73 (-3.81, 7.26)	1.57 (-4.02, 7.16)	2.21 (-2.87, 7.29)	0.68 (-4.75, 6.10)	2.18 (-3.01, 7.38)
Job insecurity (continuous)	2.05* (0.09, 4.01)	1.94 (-0.04, 3.92)	0.99 (-0.86, 2.84)	0.99 (-1.01, 2.98)	0.84 (-1.09, 2.77)
Job insecurity (categorical)	4.27* (0.21, 8.34)	4.22* (0.12, 8.32)	1.36 (-2.44, 5.17)	0.86 (-3.24, 4.97)	1.35 (-2.56, 5.26)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (systolic blood pressure, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Psychological and physical job demands were negatively associated with total blood cholesterol but these associations were not statistically significant after adjusting for potential confounders. Additionally, in fully adjusted models, the effects of the alternative psychological demand variable excluding items that could be considered as physical demands showed a weaker relationship (β = -0.85) than the original psychological demands variable including these items (β = -1.63) or the physical demands variable (β = -1.00). Decision latitude and total cholesterol levels had a negative, non-significant association, which became positive after adjusting for other psychosocial job factors. Social support from coworkers and supervisors showed a statistically significant protective effect against high cholesterol levels. After adjusting for potential confounders, workers with high total social support showed a decrease of 2.96mg/dL in total blood cholesterol levels.

Job strain was negatively associated with blood cholesterol but only the original ratio scale was statistically significant. Exposure to isostrain seemed to be associated with higher levels of total blood cholesterol. Interestingly, we observed a discrepancy between results obtained with the categorical isostrain scales. In model 4, when using the original scale, workers exposed to isostrain had an average increase of 4.11mg/dL in blood cholesterol levels compared to those not exposed to isostrain. In contrast, when using the alternative scale, blood cholesterol levels only increased 0.68mg/dL among workers exposed to isostrain (a six-fold change). However, this difference among scales diminished when adjusting for other psychosocial job factors (model 5) and none of these results were statistically significant. Finally, a strong positive and statistically significant relationship between job insecurity and blood cholesterol (β = 4.27) became weaker and was no longer statistically significant in models 3-5 (β between 0.86 and 1.36).

4.3.1.3 Overweight/obesity indicators

Table 25a. Associations between psychosocial job factors and body mass index: results (standardized beta coefficients and 95% confidence intervals) from multiple linear regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n= 2,330).

Variable	Body Mass Index [kg/m^2]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	0.14 (0.03, 0.31)	0.20* (0.01, 0.39)	0.22* (0.03, 0.41)	0.17 (-0.02, 0.37)	0.23* (0.05, 0.42)
Alt. psychological job demands (three items)[2]	0.25* (0.08, 0.43)	0.30* (0.12, 0.48)	0.24* (0.06, 0.41)	0.14 (-0.04, 0.32)	0.24* (0.06, 0.42)
Physical demands	-0.07 (-0.24, 0.10)	N/A	-0.17 (-0.37, 0.03)	-0.24* (-0.44, -0.03)	-0.27* (-0.47, -0.06)
Decision latitude (nine items)[3]	0.26* (0.09, 0.44)	0.27* (0.10, 0.45)	0.19* (0.01, 0.37)	0.19* (0.01, 0.37)	0.32* (0.13, 0.52)
Alt. decision latitude (eight items)[4]	0.25* (0.08, 0.43)	0.26* (0.09, 0.44)	0.19* (0.01, 0.37)	0.19* (0.01, 0.36)	0.35* (0.15, 0.54)
Coworker support	-0.03 (-0.21, 0.14)	-0.01 (-0.18, 0.17)	-0.03 (-0.20, 0.15)	-0.03 (-0.20, 0.14)	-0.13 (-0.31, 0.04)
Supervisor support	-0.20* (-0.38, -0.03)	-0.20* (-0.38, -0.03)	-0.20* (-0.37, -0.02)	-0.22* (-0.39, -0.04)	-0.33* (-0.52, -0.14)
Total support	-0.15 (-0.33, 0.02)	-0.14 (-0.32, 0.03)	-0.14 (-0.32, 0.03)	-0.16 (-0.33, 0.01)	-0.30* (-0.49, -0.11)
Job strain ratio	-0.06 (-0.24, 0.11)	-0.05 (-0.24, 0.13)	0.02 (-0.16, 0.20)	0.00 (-0.18, 0.18)	0.00 (-0.19, 0.19)
Alt. job strain ratio[5]	0.07 (-0.10, 0.25)	0.09 (-0.08, 0.27)	0.09 (-0.09, 0.26)	0.02 (-0.15, 0.20)	0.05 (-0.14, 0.25)
High job strain (categorical, ref. category: no high job strain)	-0.37 (-0.79, 0.06)	-0.39 (-0.83, 0.04)	-0.28 (-0.71, 0.14)	-0.33 (-0.74, 0.09)	-0.44* (-0.86, -0.02)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	-0.28 (-0.68, 0.12)	-0.32 (-0.73, 0.09)	-0.25 (-0.64, 0.15)	-0.26 (-0.65, 0.13)	-0.35 (-0.75, 0.05)

Table 25a. (cont.)

Variable	Body Mass Index [kg/m²] Model 1	Model 2	Model 3	Model 4	Model 5
High job strain (categorical, ref. category: low strain)	-0.42 (-0.93, 0.09)	-0.39 (-0.92, 0.14)	-0.33 (-0.85, 0.18)	-0.41 (-0.92, 0.10)	-0.54* (-1.05, -0.02)
Alt. high job strain[5] (categorical, ref. category: low strain)	-0.18 (-0.66, 0.29)	-0.18 (-0.66, 0.30)	-0.18 (-0.66, 0.29)	-0.31 (-0.77, 0.16)	-0.43 (-0.91, 0.06)
Isostrain (continuous)	-0.10 (-0.27, 0.08)	-0.10 (-0.28, 0.08)	-0.02 (-0.20, 0.16)	-0.03 (-0.21, 0.14)	0.01 (-0.17, 0.18)
Alt. isostrain (continuous)[5]	-0.01 (-0.19, 0.16)	-0.01 (-0.18, 0.17)	0.02 (-0.15, 0.20)	-0.02 (-0.19, 0.15)	0.04 (-0.13, 0.22)
Isostrain (categorical)	-0.54* (-1.07, 0.00)	-0.59* (-1.13, -0.05)	-0.47 (-0.99, 0.06)	-0.37 (-0.89, 0.15)	-0.40 (-0.92, 0.11)
Alt. isostrain[5] (categorical)	-0.32 (-0.81, 0.17)	-0.40 (-0.90, 0.10)	-0.31 (-0.79, 0.18)	-0.16 (-0.63, 0.31)	-0.16 (-0.64, 0.31)
Job insecurity (continuous)	-0.26* (-0.43, -0.09)	-0.27* (-0.44, -0.09)	-0.14 (-0.31, 0.04)	-0.17 (-0.35, 0.00)	-0.15 (-0.33, 0.02)
Job insecurity (categorical)	-0.23 (-0.59, 0.14)	-0.21 (-0.58, -0.15)	-0.11 (-0.48, 0.25)	-0.12 (-0.48, 0.24)	-0.13 (-0.49, 0.22)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other biological cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, and blood glucose levels)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 25b. Associations between psychosocial job factors and waist circumference: results (standardized beta coefficients and 95% confidence intervals) from multiple linear regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n= 2,330).

Variable	Waist Circumference [cm]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	0.26 (-0.17, 0.68)	0.39 (-0.07, 0.85)	0.40 (-0.06, 0.86)	0.35 (-0.12, 0.83)	0.49* (0.04, 0.94)
Alt. psychological job demands (three items)[2]	0.41 (-0.01, 0.84)	0.52* (0.08, 0.97)	0.34 (-0.09, 0.76)	0.19 (-0.25, 0.64)	0.36 (-0.07, 0.79)
Physical demands	-0.22 (-0.65, 0.21)	N/A	-0.38 (-0.86, 0.10)	-0.43 (-0.92, 0.06)	-0.58* (-1.09, -0.08)
Decision latitude (nine items)[3]	0.88* (0.45, 1.31)	0.89* (0.46, 1.31)	0.30 (-0.13, 0.73)	0.32 (-0.11, 0.76)	0.54* (0.07, 1.00)
Alt. decision latitude (eight items)[4]	0.84* (0.41, 1.26)	0.85* (0.42, 1.27)	0.31 (-0.11, 0.74)	0.33 (-0.10, 0.76)	0.60* (0.14, 1.07)
Coworker support	0.13 (-0.30, 0.56)	0.18 (-0.24, 0.61)	-0.05 (-0.46, 0.36)	-0.08 (-0.50, 0.34)	-0.25 (-0.67, 0.17)
Supervisor support	-0.43* (-0.86, -0.01)	-0.45* (-0.88, -0.02)	-0.41 (-0.82, 0.00)	-0.50* -0.92, -0.08)	-0.64* (-1.09, -0.19)
Total support	-0.23 (-0.65, 0.20)	-0.21 (-0.64, 0.22)	-0.30 (-0.71, 0.11)	-0.37 (0.79, 0.05)	-0.58* (-1.03, -0.13)
Job strain ratio	-0.33 (-0.76, 0.09)	-0.31 (-0.76, 0.14)	0.09 (-0.34, 0.53)	0.07 (-0.37, 0.51)	0.10 (-0.36, 0.56)
Alt. job strain ratio[5]	-0.04 (-0.46, 0.39)	0.01 (-0.43, 0.49)	0.13 (-0.29, 0.54)	0.03 (-0.39, 0.46)	0.08 (-0.38, 0.54)
High job strain (categorical, ref. category: no high job strain)	-0.82 (-1.85, 0.21)	-0.88 (-1.94, 0.18)	-0.16 (-1.17, 0.85)	-0.36 (-1.38, 0.66)	-0.44 (-1.45, 0.56)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	-0.70 (-1.69, 0.28)	-0.80 (-1.79, 0.20)	-0.37 (-1.32, 0.57)	-0.42 (-1.38, 0.53)	-0.53 (-1.49, 0.43)

Table 25b. (cont.)

Variable	Waist Circumference [cm]				
	Model 1	Model 2	Model 3	Model 4	Model 5
High job strain (categorical, ref. category: low strain)	-1.42* (-2.66, -0.17)	-1.32* (-2.61, -0.04)	-0.44 (-1.67, 0.79)	-0.66 (-1.91, 0.59)	-0.77 (-2.01, 0.48)
Alt. high job strain[5] (categorical, ref. category: low strain)	-0.94 (-2.11, 0.22)	-0.93 (-2.11, 0.25)	-0.44 (-1.57, 0.69)	-0.77 (-1.91, 0.37)	-0.88 (-2.05, 0.30)
Isostrain (continuous)	-0.49* (-0.92, -0.06)	-0.49* (-0.92, -0.05)	0.01 (-0.42, 0.43)	-0.01 (-0.44, 0.42)	0.10 (-0.33, 0.52)
Alt. isostrain (continuous)[5]	-0.30 (-0.73, 0.13)	-0.28 (-0.72, 0.15)	0.02 (-0.39, 0.44)	-0.03 (-0.46, 0.39)	0.09 (-0.33, 0.51)
Isostrain (categorical)	-0.73 (-2.04, 0.57)	-0.80 (-2.12, 0.52)	-0.12 (-1.38, 1.14)	-0.07 (-1.34, 1.21)	0.06 (-1.17, 1.29)
Alt. isostrain[5] (categorical)	-0.13 (-1.34, 1.08)	-0.28 (-1.50, 0.93)	0.07 (-1.09, 1.23)	0.25 (-0.92, 1.41)	0.43 (-0.70, 1.56)
Job insecurity (continuous)	-0.62* (-1.04, -0.19)	-0.63* (-1.06, -0.21)	-0.45* (-0.87, -0.02)	-0.55* (-0.98, -0.12)	-0.48* (-0.90, -0.06)
Job insecurity (categorical)	-0.63 (-1.52, 0.26)	-0.63 (-1.52, -0.26)	-0.62 (-1.49, 0.25)	-0.75 (-1.63, 0.12)	-0.65 (-1.50, 0.20)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other biological cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, and blood glucose levels)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 25c. Associations between psychosocial job factors and waist-hip ratio: results (standardized beta coefficients and 95% confidence intervals) from multiple linear regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n= 2,330).

Variable	**Waist-Hip Ratio [10 units]**				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	0.02 (0.00, 0.05)	0.01 (-0.01, 0.04)	0.02 (-0.01, 0.04)	0.02 (-0.01, 0.05)	0.02 (-0.00, 0.05)
Alt. psychological job demands (three items)[2]	0.03* (0.01, 0.06)	0.03* (0.00, 0.05)	0.01 (-0.01, 0.04)	0.02 (-0.01, 0.04)	0.02 (-0.01, 0.04)
Physical demands	0.03* (0.00, 0.05)	N/A	-0.01 (-0.04, 0.02)	0.00 (-0.03, 0.02)	-0.02 (-0.05, 0.01)
Decision latitude (nine items)[3]	0.05* (0.02, 0.07)	0.05* (0.03, 0.08)	0.00 (-0.02, 0.03)	0.01 (-0.02, 0.03)	0.01 (-0.02, 0.03)
Alt. decision latitude (eight items)[4]	0.05* (0.02, 0.06)	0.05* (0.03, 0.08)	0.01 (-0.02, 0.03)	0.01 (-0.01, 0.03)	0.01 (-0.01, 0.04)
Coworker support	0.02 (0.00, 0.05)	0.02 (0.00, 0.05)	0.00 (-0.02, 0.02)	0.00 (-0.02, 0.02)	-0.01 (-0.03, 0.02)
Supervisor support	-0.02 (-0.05, 0.00)	-0.02 (-0.04, 0.01)	-0.02 (-0.04, 0.00)	-0.02 (-0.04, 0.00)	-0.02 (-0.05, 0.00)
Total support	0.00 (-0.03, 0.02)	0.00 (-0.03, 0.03)	-0.01 (-0.03, 0.01)	-0.01 (-0.04, 0.01)	-0.02 (-0.04, 0.01)
Job strain ratio	-0.02 (-0.04, 0.01)	-0.03* (-0.06, 0.00)	0.01 (-0.02, 0.03)	0.01 (-0.02, 0.03)	0.01 (-0.02, 0.03)
Alt. job strain ratio[5]	0.00 (-0.02, 0.03)	-0.00 (-0.03, 0.02)	0.01 (-0.02, 0.03)	0.01 (-0.02, 0.03)	0.01 (-0.02, 0.03)
High job strain (categorical, ref. category: no high job strain)	-0.03 (-0.09, 0.03)	-0.05 (-0.12, 0.01)	0.01 (-0.05, 0.06)	0.00 (-0.06, 0.06)	0.00 (-0.05, 0.06)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	-0.02 (-0.08, 0.03)	-0.04 (-0.10, 0.02)	0.00 (-0.06, 0.05)	0.00 (-0.05, 0.06)	0.00 (-0.06, 0.05)

Table 25c. (cont.)

Variable	Waist-Hip Ratio [10 units]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
High job strain (categorical, ref. category: low strain)	-0.04 (-0.11, 0.03)	-0.06 (-0.14, 0.02)	0.02 (-0.05, 0.09)	0.02 (-0.05, 0.09)	0.02 (-0.05, 0.09)
Alt. high job strain[5] (categorical, ref. category: low strain)	-0.02 (-0.09, 0.05)	-0.03 (-0.10, 0.04)	0.01 (-0.04, 0.08)	0.01 (-0.06, 0.07)	0.01 (-0.06, 0.07)
Isostrain (continuous)	-0.03* (-0.05, 0.00)	-0.04* (-0.06, -0.01)	0.01 (-0.02, 0.03)	0.00 (-0.02, 0.03)	0.01 (-0.04, 0.01)
Alt. isostrain (continuous)[5]	-0.02 (-0.04, 0.01)	-0.02 (-0.05, 0.00)	0.00 (-0.02, 0.03)	0.00 (-0.02, 0.03)	0.01 (-0.01, 0.03)
Isostrain (categorical)	0.00 (-0.08, 0.07)	-0.02 (-0.10, 0.05)	0.04 (-0.03, 0.11)	0.03 (-0.04, 0.11)	0.05 (-0.02, 0.12)
Alt. isostrain[5] (categorical)	0.03 (-0.03, 0.10)	0.02 (-0.05, 0.09)	0.05 (-0.01, 0.12)	0.05 (-0.02, 0.12)	0.07* (0.01, 0.14)
Job insecurity (continuous)	-0.03* (-0.06, -0.01)	-0.03* (-0.06, -0.01)	-0.03* (-0.05, -0.00)	-0.04* (-0.06, -0.01)	-0.03* (-0.05, -0.01)
Job insecurity (categorical)	-0.02 (-0.07, 0.03)	-0.03 (-0.08, 0.02)	-0.04 (-0.09, 0.01)	-0.07* (-0.12, -0.02)	-0.05* (-0.10, 0.00)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: "I am not asked to do an excessive amount of work", "I have enough time to get the job done", "I am free from conflicting demands others make")
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other biological cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, and blood glucose levels)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Psychological job demands had a positive association with weight indicators. However, after adjusting for all potential confounders (model 5) these associations were statistically significant only for body mass index and waist circumference (original subscale). Physical job demands and supervisor support appeared to be protective against overweight/obesity. In fully adjusted models, each additional standard deviation in physical job demands was associated with a 0.27kg/m^2 decrease in body mass index (β = -0.27, 95% CI -0.47, -0.06) and one standard deviation increase in supervisor support was associated with 0.33kg/m^2 lower body mass index (β = -0.33, 95% CI -0.52, -0.14) and with 0.64cm reduced waist circumference (β = -0.64, 95% CI -1.09, -0.19).

Decision latitude was positively associated with weight indicators. This association was statistically significant for body mass index and waist circumference after controlling for potential confounders. Most continuous measures of job strain and isostrain showed small positive associations with weight indicators in fully adjusted models; however, inverse associations were observed between categorical operationalizations of job strain/isostrain and body mass index and between categorical measures of job strain and waist circumference. Only the negative association between high job strain (using the original scale) and body mass index was statistically significant. Exposure to isostrain (as measured with the categorical alternative subscales) was significantly associated with higher waist-hip ratio in model 5 (β = 0.07, 95% CI 0.01, 0.14). Job insecurity and weight indicators showed a negative relationship, which was statistically significant for waist circumference (β = -0.48, 95% CI -0.90, -0.06) and waist-hip ratio (β = -0.03, 95% CI -0.05, -0.01) after controlling for all potential confounders.

4.3.1.4 Blood pressure

Table 26a. Associations between psychosocial job factors and systolic blood pressure: results (standardized beta coefficients and 95% confidence intervals) from multiple linear regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variable	Systolic Blood Pressure [mmHg]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	- 0.47* (-0.88, -0.06)	-0.38 (-0.82, 0.06)	-0.31 (-0.76, 0.13)	-0.41 (-0.84, 0.02)	-0.34 (-0.78, 0.09)
Alt. psychological job demands (three items)[2]	- 0.07 (-0.48, 0.34)	0.00 (-0.43, 0.42)	-0.10 (-0.52, 0.31)	-0.25 (-0.65, 0.15)	-0.18 (-0.60, 0.24)
Physical demands	-0.20 (-0.61, 0.21)	N/A	-0.28 (-0.74, 0.19)	-0.21 (-0.66, 0.24)	0.01 (-0.48, 0.50)
Decision latitude (nine items)[3]	0.40 (-0.01, 0.81)	0.35 (-0.06, 0.77)	-0.09 (-0.51, 0.32)	-0.18 (-0.59, 0.22)	-0.40 (-0.85, 0.06)
Alt. decision latitude (eight items)[4]	0.39 (-0.02, 0.80)	0.35 (-0.06, 0.77)	-0.06 (-0.47, 0.35)	-0.15 (-0.55, 0.25)	-0.39 (-0.85, 0.06)
Coworker support	0.31 (-0.10, 0.72)	0.35 (-0.06, 0.76)	0.18 (-0.22, 0.58)	0.22 (-0.16, 0.61)	0.30 (-0.11, 0.71)
Supervisor support	0.17 (-0.24, 0.58)	0.15 (-0.26, 0.57)	0.08 (-0.32, 0.48)	0.23 (-0.15, 0.62)	0.29 (-0.15, 0.73)
Total support	0.27 (-0.14, 0.68)	0.28 (-0.13, 0.69)	0.15 (-0.25, 0.55)	0.27 (-0.12, 0.66)	0.37 (-0.07, 0.81)
Job strain ratio	-0.66* (-1.07, -0.24)	-0.57* (-1.01, -0.14)	-0.21 (-0.64, 0.22)	-0.20 (-0.62, 0.21)	-0.08 (-0.53, 0.36)
Alt. job strain ratio[5]	-0.29 (-0.71, 0.12)	-0.23 (-0.66, 0.20)	-0.11 (-0.53, 0.30)	-0.17 (-0.57, 0.22)	-0.03 (-0.48, 0.41)
High job strain (categorical, ref. category: no high job strain)	-0.61 (-1.60, 0.38)	-0.32 (-1.34, 0.69)	0.23 (-0.75, 1.21)	0.44 (-0.50, 1.39)	0.68 (-0.29, 1.66)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	-0.68 (-1.63, 0.26)	-0.59 (-1.55, 0.36)	-0.13 (-1.05, 0.78)	-0.01 (-0.89, 0.88)	0.24 (-0.69, 1.17)

Table 26a. (cont.)

Variable	Systolic Blood Pressure [mmHg]				
	Model 1	Model 2	Model 3	Model 4	Model 5
High job strain (categorical, ref. category: low strain)	-1.33 (-2.53, 0.14)	-1.01 (-2.25, 0.23)	-0.26 (-1.46, 0.93)	-0.07 (-1.23, 1.19)	0.33 (-0.88, 1.53)
Alt. high job strain[5] (categorical, ref. category: low strain)	-0.74 (-1.85, 0.38)	-0.57 (-1.70, 0.56)	-0.03 (-1.12, 1.06)	0.02 (-1.03, 1.08)	0.46 (-0.68, 1.60)
Isostrain (continuous)	-0.58* (-0.99, -0.17)	-0.50* (-0.93, -0.08)	-0.09 (-0.50, 0.33)	-0.09 (-0.49, 0.31)	-0.03 (-0.44, 0.39)
Alt. isostrain (continuous)[5]	-0.36 (-0.77, 0.05)	-0.31 (-0.73, 0.11)	-0.04 (-0.45, 0.36)	-0.08 (-0.47, 0.31)	-0.02 (-0.42, 0.39)
Isostrain (categorical)	-1.14 (-2.39, 0.11)	-0.98 (-2.25, 0.29)	-0.17 (-1.39, 1.06)	0.13 (-1.05, 1.31)	0.25 (-0.94, 1.45)
Alt. isostrain[5] (categorical)	-1.34* (-2.50, -0.19)	-1.34* (-2.51, -0.17)	-0.68 (-1.80, 0.44)	-0.51 (-1.59, 0.57)	-0.41 (-1.50, 0.69)
Job insecurity (continuous)	-0.70* (-1.11, -0.29)	-0.69* (-1.10, -0.28)	-0.32 (-0.73, 0.08)	-0.25 (-0.64, 0.14)	-0.20 (-0.61, 0.20)
Job insecurity (categorical)	-1.00* (-1.84, -0.15)	-0.93* (-1.78, -0.07)	-0.57 (-1.41, 0.27)	-0.46 (-1.26, 0.35)	-0.37 (-1.19, 0.46)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (total blood cholesterol levels, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 26b. Associations between psychosocial job factors and diastolic blood pressure: results (standardized beta coefficients and 95% confidence intervals) from multiple linear regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variable	Diastolic Blood Pressure [mmHg]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	-0.38* (-0.67, -0.09)	-0.31 (-0.63, 0.00)	-0.32* (-0.63, 0.00)	-0.39* (-0.69, -0.08)	-0.34* (-0.64, -0.03)
Alt. psychological job demands (three items)[2]	-0.17 (-0.46, 0.12)	-0.10 (-0.41, 0.20)	-0.15 (-0.44, 0.15)	-0.24 (-0.52, 0.04)	-0.17 (-0.47, 0.13)
Physical demands	-0.27 (-0.56, 0.02)	N/A	-0.07 (-0.39, 0.26)	-0.02 (-0.33, 0.30)	0.13 (-0.22, 0.47)
Decision latitude (nine items)[3]	0.48* (0.19, 0.78)	0.44* (0.15, 0.73)	0.14 (-0.16, 0.43)	0.09 (-0.20, 0.37)	0.04 (-0.28, 0.36)
Alt. decision latitude (eight items)[4]	0.48* (0.19, 0.77)	0.45* (0.16, 0.74)	0.17 (-0.12, 0.46)	0.12 (-0.16, 0.40)	0.04 (-0.27, 0.36)
Coworker support	-0.04 (-0.33, 0.25)	-0.05 (-0.35, 0.24)	-0.07 (-0.36, 0.21)	-0.04 (-0.32, 0.23)	-0.11 (-0.40, 0.18)
Supervisor support	0.22 (-0.07, 0.51)	0.19 (-0.11, 0.48)	0.03 (-0.26, 0.31)	0.13 (-0.14, 0.41)	0.00 (-0.31, 0.31)
Total support	0.13 (-0.16, 0.42)	0.10 (-0.20, 0.39)	-0.02 (-0.30, 0.26)	0.07 (-0.21, 0.34)	-0.07 (-0.38, 0.24)
Job strain ratio	-0.66* (-0.95, -0.37)	-0.60* (-0.91, -0.29)	-0.36* (-0.67, -0.06)	-0.37* (-0.66, -0.08)	-0.32* (-0.64, 0.00)
Alt. job strain ratio[5]	-0.41* (-0.70, -0.12)	-0.35* (-0.65, -0.05)	-0.23 (-0.53, 0.06)	-0.27 (-0.56, 0.00)	-0.21 (-0.53, 0.10)
High job strain (categorical, ref. category: no high job strain)	-0.76* (-1.46, -0.06)	-0.51 (-1.24, 0.21)	-0.23 (-0.93, 0.46)	-0.11 (-0.79, 0.56)	0.02 (-0.68, 0.71)
Alt. high job strain[5] (categ., ref. category: no high job strain)	-0.78* (-1.45, -0.11)	-0.66 (-1.34, 0.01)	-0.37 (-1.03, 0.28)	-0.30 (-0.93, 0.33)	-0.18 (-0.84, 0.48)

Table 26b. (cont.)

Variable	Diastolic Blood Pressure [mmHg]				
	Model 1	Model 2	Model 3	Model 4	Model 5
High job strain (categorical, ref. category: low strain)	-1.50* (-2.34, -0.65)	-1.25* (-2.13, -0.37)	-0.83 (-1.68, 0.02)	-0.74 (-1.56, 0.08)	-0.56 (-1.42, 0.30)
Alt. high job strain[5] (categorical, ref. category: low strain)	-1.14* (-1.93, -0.34)	-0.98* (-1.79, -0.18)	-0.58 (-1.36, 0.19)	-0.54 (-1.29, 0.20)	-0.39 (-1.20, 0.42)
Isostrain (continuous)	-0.56* (-0.85, -0.27)	-0.49* (-0.79, -0.19)	-0.21 (-0.50, 0.08)	-0.22 (-0.51, 0.06)	-0.11 (-0.40, 0.18)
Alt. isostrain (continuous)[5]	-0.43* (-0.72, -0.14)	-0.38* (-0.67, -0.08)	-0.17 (-0.46, 0.12)	-0.20 (-0.48, 0.07)	-0.08 (-0.37, 0.20)
Isostrain (categorical)	-1.52* (-2.40, -0.64)	-1.34* (-2.24, -0.43)	-0.85 (-1.72, 0.02)	-0.68 (-1.52, 0.16)	-0.48 (-1.33, 0.37)
Alt. isostrain[5] (categorical)	-1.55* (-2.37, -0.73)	-1.45* (-2.28, -0.62)	-0.96* (-1.76, -0.17)	-0.86* (-1.63, -0.09)	-0.67 (-1.45, 0.11)
Job insecurity (continuous)	-0.85* (-1.14, -0.56)	-0.83* (-1.12, -0.54)	-0.50* (-0.79, -0.22)	-0.46* (-0.74, -0.18)	-0.43* (-0.72, -0.14)
Job insecurity (categorical)	-1.47* (-2.07, -0.87)	-1.42* (-2.03, -0.82)	-0.87* (-1.47, -0.28)	-0.79* (-1.37, -0.22)	-0.72* (-1.30, -0.13)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: "I am not asked to do an excessive amount of work", "I have enough time to get the job done", "I am free from conflicting demands others make")
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (total blood cholesterol levels, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Psychological job demands were negatively associated with blood pressure; however, results were statistically significant only for the original scale and for diastolic blood pressure. After controlling for potential confounders, physical job demands showed a small, not statistically significant, positive association blood pressure. In fully adjusted models, decision latitude was negatively associated with systolic blood pressure but showed a small, positive association with diastolic blood pressure. Inconsistent associations were observed for social support. On the one hand, social support seemed to increase systolic blood pressure and on the other hand, it seemed to decrease diastolic blood pressure. However, none of these associations were statistically significant. Continuous measures of job strain showed a negative association with blood pressure. One standard deviation increase in job strain ratio was associated with 0.32mmHg decrease in diastolic blood pressure (β = -0.32, 95% CI – 0.64, 0.00). However, all categorical measures of job strain were positively associated with systolic blood pressure after adjusting for all potential confounders (model 5). On the other hand, all categorical measures of job strain were negatively associated with diastolic blood pressure but statistical significance was lost in models 3, 4, and 5 and the association using no high job strain as a reference became slightly positive in model 5. The negative, statistically significant relationship between the alternative categorical isostrain scale and diastolic blood pressure in models 1-4 lost statistical significance when adjusting for other psychosocial job factors (social support and job insecurity). Job insecurity was negatively associated with systolic blood pressure but statistical significance of this relationship was lost in models 3, 4, and 5. Job insecurity showed a negative, statistically significant association with diastolic blood pressure in all models. All else equal, for every standard deviation increase in job insecurity, diastolic blood pressure decreased 0.43mmHg (β = -0.43, 95% CI -0.72, -0.14).

4.3.1.5 Smoking

Table 27. Associations between psychosocial job factors and current smoking: results (standardized odds ratios and 95% confidence intervals) from multiple logistic regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n= 2,330).

Variable	Current smoking [yes/no]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	1.01 (0.93, 1.10)	0.98 (0.90, 1.07)	1.00 (0.91, 1.11)	0.98 (0.88, 1.09)	0.98 (0.89, 1.09)
Alt. psychological job demands (three items)[2]	1.01 (0.93, 1.10)	0.98 (0.90, 1.07)	1.00 (0.91, 1.09)	1.00 (0.90, 1.11)	0.96 (0.87, 1.06)
Physical demands	1.06 (0.97, 1.14)	N/A	0.95 (0.86, 1.05)	1.00 (0.89, 1.12)	0.95 (0.85, 1.06)
Decision latitude (nine items)[3]	0.97 (0.90, 1.06)	0.98 (0.90, 1.06)	0.98 (0.90, 1.07)	0.97 (0.88, 1.07)	1.02 (0.92, 1.13)
Alt. decision latitude (eight items)[4]	0.98 (0.91, 1.07)	0.98 (0.90, 1.07)	0.98 (0.90, 1.08)	0.98 (0.88, 1.08)	1.02 (0.92, 1.14)
Coworker support	0.97 (0.90, 1.05)	0.98 (0.90, 1.06)	0.95 (0.87, 1.04)	0.95 (0.86, 1.05)	0.96 (0.87, 1.05)
Supervisor support	0.92 (0.85, 1.00)	0.93 (0.85, 1.01)	0.90* (0.82, 0.99)	0.93 (0.84, 1.03)	0.90* (0.81, 0.99)
Total support	0.93 (0.86, 1.01)	0.94 (0.86, 1.02)	0.91* (0.83, 0.99)	0.93 (0.84, 1.02)	0.90 (0.82, 1.00)
Job strain ratio	1.02 (0.94, 1.11)	1.00 (0.92, 1.09)	1.02 (0.93, 1.12)	1.01 (0.91, 1.12)	0.98 (0.89, 1.09)
Alt. job strain ratio[5]	1.02 (0.94, 1.11)	1.00 (0.92, 1.09)	1.02 (0.93, 1.11)	1.02 (0.92, 1.12)	0.97 (0.87, 1.07)
High job strain (categorical, ref. category: no high job strain)	1.16 (0.95, 1.41)	1.14 (0.93, 1.40)	1.18 (0.95, 1.47)	1.23 (0.97, 1.56)	1.14 (0.91, 1.44)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	1.19 (0.99, 1.44)	1.19 (0.98, 1.44)	1.17 (0.95, 1.44)	1.22 (0.98, 1.52)	1.12 (0.90, 1.39)

Table 27. (cont.)

Variable	Current smoking [yes/no]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
High job strain (categorical, ref. category: low strain)	1.04 (0.82, 1.32)	0.99 (0.77, 1.27)	1.02 (0.78, 1.33)	1.06 (0.80, 1.41)	0.96 (0.72, 1.27)
Alt. high job strain[5] (categorical, ref. category: low strain)	1.16 (0.93, 1.44)	1.13 (0.90, 1.41)	1.14 (0.90, 1.46)	1.19 (0.92, 1.55)	1.05 (0.81, 1.37)
Isostrain (continuous)	1.04 (0.96, 1.13)	1.03 (0.95, 1.12)	1.05 (0.96, 1.15)	1.04 (0.94, 1.14)	1.05 (0.95, 1.15)
Alt. isostrain (continuous)[5]	1.03 (0.95, 1.12)	1.02 (0.94, 1.11)	1.03 (0.94, 1.13)	1.03 (0.94, 1.14)	1.03 (0.94, 1.13)
Isostrain (categorical)	1.27 (0.99, 1.63)	1.25 (0.97, 1.62)	1.35* (1.03, 1.78)	1.33 (0.99, 1.79)	1.33* (1.01, 1.77)
Alt. isostrain[5] (categorical)	1.43* (1.13, 1.80)	1.42* (1.13, 1.80)	1.44* (1.12, 1.86)	1.42* (1.08, 1.85)	1.43* (1.10, 1.85)
Job insecurity (continuous)	1.08 (1.00, 1.18)	1.09* (1.00, 1.18)	1.04 (0.95, 1.14)	1.04 (0.95, 1.15)	1.03 (0.93, 1.13)
Job insecurity (categorical)	1.21* (1.03, 1.44)	1.22* (1.03, 1.45)	1.14 (0.95, 1.38)	1.16 (0.95, 1.42)	1.12 (0.92, 1.35)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple logistic regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (leisure-time physical activity and alcohol) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Neither psychological nor physical job demands nor decision latitude showed any associations with smoking. One standard deviation increase in supervisor support was associated with 10% reduced risk of smoking in fully adjusted models (OR = 0.90, 95% CI 0.81, 0.99). High job strain seemed to increase the risk of smoking but this association was not statistically significant. However, the original isostrain variable showed a statistically significant 33% higher risk of smoking compared to workers not exposed to isostrain (OR = 1.33, 95% CI 1.01, 1.77) after adjusting for all potential confounders. The alternative isostrain variable based on categorical measures of job strain and low support showed an even stronger, statistically significant effect (OR = 1.43, 95% CI 1.10, 1.85). Job insecurity also seemed to increase the risk of smoking. However, this last association lost statistical significance after adjusting for individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors.

4.3.1.6 Leisure-time physical activity

Table 28. Associations between psychosocial job factors and leisure-time physical activity: results (standardized odds ratios and 95% confidence intervals) from multiple logistic regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n= 2,330).

Variable	**Leisure-time physical activity [yes/no]**				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	0.93 (0.85, 1.02)	0.94 (0.85, 1.04)	0.89* (0.80, 0.99)	0.94 (0.83, 1.05)	0.90 (0.80, 1.01)
Alt. psychological job demands (three items)[2]	0.90* (0.81, 0.98)	0.91* (0.82, 1.00)	0.88* (0.80, 0.98)	0.91 (0.82, 1.02)	0.91 (0.82, 1.02)
Physical demands	1.00 (0.91, 1.10)	N/A	1.03 (0.92, 1.15)	1.04 (0.92, 1.17)	1.09 (0.96, 1.23)
Decision latitude (nine items)[3]	1.14* (1.03, 1.25)	1.15* (1.04, 1.26)	1.11* (1.01, 1.24)	1.16* (1.04, 1.29)	1.07 (0.95, 1.20)
Alt. decision latitude (eight items)[4]	1.14* (1.03, 1.25)	1.15* (1.04, 1.26)	1.12* (1.01, 1.24)	1.17* (1.05, 1.31)	1.06 (0.95, 1.20)
Coworker support	1.16* (1.06, 1.28)	1.18* (1.08, 1.30)	1.15* (1.04, 1.27)	1.16* (1.05, 1.29)	1.14* (1.04, 1.27)
Supervisor support	1.10* (1.00, 1.21)	1.12* (1.02, 1.23)	1.15* (1.03, 1.27)	1.15* (1.03, 1.27)	1.10 (0.98, 1.23)
Total support	1.16* (1.05, 1.27)	1.18* (1.07, 1.30)	1.17* (1.06, 1.30)	1.18* (1.06, 1.31)	1.15* (1.02, 1.29)
Job strain ratio	0.87* (0.79, 0.96)	0.87* (0.78, 0.96)	0.86* (0.77, 0.95)	0.86* (0.77, 0.96)	0.88* (0.78, 0.99)
Alt. job strain ratio[5]	0.87* (0.79, 0.96)	0.87* (0.79, 0.96)	0.87* (0.78, 0.96)	0.87* (0.78, 0.97)	0.90 (0.80, 1.01)
High job strain (categorical, ref. category: no high job strain)	0.78* (0.62, 0.99)	0.78* (0.61, 0.99)	0.80 (0.62, 1.03)	0.81 (0.63, 1.05)	0.87 (0.67, 1.13)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	0.94 (0.76, 1.17)	0.94 (0.76, 1.18)	0.95 (0.76, 1.20)	0.94 (0.74, 1.19)	1.05 (0.82, 1.34)

Table 28. (cont.)

Variable	Leisure-time physical activity [yes/no]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
High job strain (categorical, ref. category: low strain)	0.77 (0.58, 1.01)	0.77 (0.58, 1.03)	0.81 (0.60, 1.09)	0.84 (0.61, 1.15)	0.92 (0.87, 1.13)
Alt. high job strain[5] (categorical, ref. category: low strain)	0.79 (0.62, 1.02)	0.79 (0.61, 1.02)	0.82 (0.63, 1.07)	0.82 (0.62, 1.09)	0.94 (0.70, 1.25)
Isostrain (continuous)	0.85* (0.77, 0.93)	0.84* (0.76, 0.92)	0.84* (0.76, 0.94)	0.83* (0.75, 0.93)	0.82* (0.74, 0.92)
Alt. isostrain (continuous)[5]	0.84* (0.77, 0.93)	0.84* (0.76, 0.92)	0.85* (0.76, 0.93)	0.83* (0.75, 0.93)	0.83* (0.74, 0.92)
Isostrain (categorical)	0.80 (0.59, 1.07)	0.78 (0.58, 1.06)	0.75 (0.55, 1.03)	0.77 (0.56, 1.07)	0.72* (0.52, 0.99)
Alt. isostrain[5] (categorical)	0.92 (0.70, 1.20)	0.90 (0.69, 1.18)	0.88 (0.66, 1.16)	0.90 (0.67, 1.20)	0.84 (0.63, 1.12)
Job insecurity (continuous)	1.10* (1.01, 1.21)	1.11* (1.01, 1.21)	1.03 (0.93, 1.14)	1.06 (0.96, 1.18)	1.08 (0.97, 1.19)
Job insecurity (categorical)	1.21* (1.00, 1.47)	1.21* (1.00, 1.46)	1.09 (0.89, 1.34)	1.14 (0.92, 1.41)	1.18 (0.95, 1.46)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple logistic regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking and alcohol) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Psychological job demands seemed to negatively affect leisure-time physical activity but this relationship was statistically significant only in models 1-3. Decision latitude appeared to promote physical activity but statistical significance of this association was lost after adjusting for other psychosocial job factors. One standard deviation increase in total support at work was associated with 15% higher odds of leisure-time physical activity (OR = 1.15, 95% CI 1.02, 1.29). Both job strain and isostrain seemed to hinder leisure-time physical activity; one standard deviation increase in job strain and isostrain was associated with 12% and 18% lower odds of leisure-time physical activity, respectively. These results remained statistically significant after adjusting for all potential confounders. Job insecurity had a positive effect on leisure-time physical activity but the statistical significance of this association disappeared after adjusting for individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors.

4.3.2 Psychosocial job factors and productivity indicators

4.3.2.1 Sick-leave absenteeism

Table 29a. Associations between psychosocial job factors and sick-leave absenteeism days: results (standardized hazard ratios and 95% confidence intervals) from Cox proportional hazard regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variable	Sick-leave absenteeism [days]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	1.00 (0.92, 1.08)	1.00 (0.92, 1.09)	1.04 (0.94, 1.15)	1.03 (0.94, 1.14)	1.04 (0.94, 1.15)
Alt. psychological job demands (three items)[2]	1.03 (0.95, 1.11)	1.04 (0.95, 1.13)	1.06 (0.97, 1.16)	1.06 (0.97, 1.16)	1.08 (0.98, 1.18)
Physical demands	0.98 (0.90, 1.06)	N/A	0.99 (0.90, 1.10)	0.99 (0.89, 1.10)	0.97 (0.86, 1.09)
Decision latitude (nine items)[3]	0.98 (0.90, 1.06)	0.98 (0.90, 1.07)	1.02 (0.93, 1.11)	1.02 (0.93, 1.12)	1.01 (0.90, 1.12)
Alt. decision latitude (eight items)[4]	0.97 (0.90, 1.06)	0.98 (0.90, 1.07)	1.02 (0.93, 1.11)	1.02 (0.94, 1.12)	1.01 (0.91, 1.13)
Coworker support	1.02 (0.94, 1.11)	1.03 (0.95, 1.11)	1.04 (0.96, 1.14)	1.04 (0.96, 1.14)	1.04 (0.95, 1.14)
Supervisor support	0.98 (0.91, 1.07)	0.99 (0.91, 1.07)	1.01 (0.93, 1.09)	1.01 (0.93, 1.10)	1.01 (0.92, 1.11)
Total support	1.00 (0.92, 1.08)	1.01 (0.93, 1.09)	1.02 (0.94, 1.11)	1.03 (0.95, 1.12)	1.03 (0.93, 1.13)
Job strain ratio	1.02 (0.94, 1.12)	1.03 (0.93, 1.13)	1.04 (0.94, 1.14)	1.02 (0.93, 1.13)	1.05 (0.94, 1.17)
Alt. job strain ratio[5]	1.03 (0.95, 1.12)	1.03 (0.95, 1.12)	1.04 (0.95, 1.13)	1.04 (0.95, 1.13)	1.07 (0.97, 1.18)
High job strain (categorical, ref. category: no high job strain)	1.04 (0.85, 1.26)	1.03 (0.84, 1.26)	1.03 (0.84, 1.27)	1.00 (0.80, 1.23)	1.02 (0.82, 1.28)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	0.91 (0.75, 1.11)	0.91 (0.75, 1.11)	0.92 (0.75, 1.12)	0.89 (0.73, 1.09)	0.90 (0.73, 1.12)

Table 29a. (cont.)

Variable	Sick-leave absenteeism [days]				
	Model 1	Model 2	Model 3	Model 4	Model 5
High job strain (categorical, ref. category: low strain)	1.02 (0.80, 1.30)	1.02 (0.79, 1.32)	1.01 (0.78, 1.32)	0.94 (0.71, 1.24)	0.96 (0.72, 1.27)
Alt. high job strain[5] (categorical, ref. category: low strain)	0.98 (0.78, 1.24)	0.99 (0.79, 1.25)	0.97 (0.77, 1.24)	0.95 (0.74, 1.21)	0.96 (0.74, 1.25)
Isostrain (continuous)	1.02 (0.94, 1.10)	1.01 (0.93, 1.10)	0.99 (0.91, 1.08)	0.98 (0.90, 1.08)	0.99 (0.90, 1.08)
Alt. isostrain (continuous)[5]	1.03 (0.95, 1.12)	1.03 (0.95, 1.11)	1.01 (0.93, 1.10)	1.01 (0.92, 1.10)	1.01 (0.92, 1.10)
Isostrain (categorical)	1.10 (0.86, 1.39)	1.09 (0.85, 1.41)	1.08 (0.83, 1.39)	1.04 (0.80, 1.36)	1.05 (0.81, 1.37)
Alt. isostrain[5] (categorical)	1.07 (0.85, 1.34)	1.07 (0.85, 1.35)	1.08 (0.85, 1.36)	1.06 (0.84, 1.35)	1.07 (0.84, 1.36)
Job insecurity (continuous)	0.99 (0.92, 1.07)	1.00 (0.92, 1.08)	0.99 (0.91, 1.07)	0.99 (0.91, 1.07)	0.99 (0.91, 1.08)
Job insecurity (categorical)	0.97 (0.81, 1.15)	0.96 (0.81, 1.14)	0.94 (0.78, 1.12)	0.94 (0.78, 1.13)	0.94 (0.78, 1.13)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Psychological job demands seemed to increase the risk of being absent. After adjusting for potential confounders, one standard deviation increase in psychological job demands (alternative subscale) was associated with 8% increased risk of total absenteeism. A slightly negative association was found between physical demands and total number of absenteeism days in model 5. No association was found between decision latitude and total absenteeism. After adjusting for all potential confounders, coworker and total support had a slightly positive association with absenteeism.

Continuous measures of job strain seemed to increase the risk of being absent while most categorical measures of high job strain showed a slightly negative association with absenteeism. Categorical operationalizations of isostrain showed a positive association with absenteeism. Workers exposed to isostrain (as measured with alternative subscales) had a 7% higher risk of being absent compared with those not exposed to isostrain. Job insecurity seemed to reduce the risk of total number of absenteeism days. None of these associations were statistically significant.

Table 29b. Associations between psychosocial job factors and acute (1-30) absenteeism days: results (standardized hazard ratios and 95% confidence intervals) from Cox proportional hazard regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variable	Acute (1-30 days) sick-leave absenteeism [days]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	0.99 (0.91, 1.08)	1.01 (0.92, 1.11)	1.03 (0.92, 1.14)	1.03 (0.93, 1.15)	1.05 (0.94, 1.17)
Alt. psychological job demands (three items)[2]	1.00 (0.92, 1.10)	1.02 (0.93, 1.12)	1.05 (0.97, 1.16)	1.05 (0.95, 1.16)	1.09 (0.98, 1.21)
Physical demands	0.98 (0.90, 1.08)	N/A	1.01 (0.90, 1.13)	0.99 (0.98, 1.11)	0.98 (0.86, 1.11)
Decision latitude (nine items)[3]	1.00 (0.91, 1.10)	1.00 (0.91, 1.09)	1.03 (0.93, 1.15)	1.04 (0.93, 1.16)	0.98 (0.87, 1.11)
Alt. decision latitude (eight items)[4]	1.01 (0.92, 1.10)	1.00 (0.91, 1.10)	1.04 (0.94, 1.16)	1.05 (0.94, 1.17)	1.00 (0.89, 1.13)
Coworker support	1.09 (1.00, 1.20)	1.09 (0.99, 1.19)	1.10 (1.00, 1.21)	1.10* (1.00, 1.22)	1.10 (1.00, 1.22)
Supervisor support	1.08 (0.99, 1.17)	1.07 (0.98, 1.17)	1.09 (0.99, 1.19)	1.09 (0.99, 1.20)	1.10 (0.99, 1.21)
Total support	1.09* (1.00, 1.19)	1.09 (1.00, 1.19)	1.10* (1.01, 1.21)	1.11* (1.01, 1.22)	1.12* (1.01, 1.24)
Job strain ratio	1.00 (0.91, 1.10)	1.02 (0.92, 1.13)	1.02 (0.91, 1.13)	1.01 (0.91, 1.13)	1.07 (0.95, 1.20)
Alt. job strain ratio[5]	1.00 (0.91, 1.09)	1.01 (0.92, 1.11)	1.03 (0.93, 1.13)	1.02 (0.93, 1.13)	1.08 (0.97, 1.21)
High job strain (categorical, ref. category: no high job strain)	0.97 (0.78, 1.21)	0.99 (0.79, 1.24)	0.97 (0.77, 1.22)	0.94 (0.74, 1.20)	1.00 (0.78, 1.28)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	0.93 (0.75, 1.15)	0.95 (0.77, 1.18)	0.94 (0.75, 1.18)	0.92 (0.73, 1.16)	0.99 (0.78, 1.26)
High job strain (categorical, ref. category: low strain)	0.91 (0.69, 1.19)	0.92 (0.69, 1.22)	0.90 (0.67, 1.22)	0.86 (0.64, 1.17)	0.92 (0.67, 1.26)

Table 29b. (cont.)

Variable	Acute (1-30 days) sick-leave absenteeism [days]				
	Model 1	Model 2	Model 3	Model 4	Model 5
Alt. high job strain[5] (categorical, ref. category: low strain)	0.95 (0.73, 1.22)	0.98 (0.75, 1.26)	0.97 (0.73, 1.28)	0.94 (0.71, 1.25)	1.05 (0.78, 1.42)
Isostrain (continuous)	0.97 (0.88, 1.06)	0.98 (0.89, 1.07)	0.95 (0.86, 1.06)	0.95 (0.85, 1.05)	0.95 (0.85, 1.05)
Alt. isostrain (continuous)[5]	0.97 (0.89, 1.06)	0.98 (0.90, 1.08)	0.97 (0.88, 1.07)	0.96 (0.87, 1.07)	0.97 (0.87, 1.07)
Isostrain (categorical)	0.92 (0.70, 1.22)	0.95 (0.72, 1.26)	0.94 (0.70, 1.25)	0.90 (0.67, 1.21)	0.91 (0.67, 1.22)
Alt. isostrain[5] (categorical)	0.91 (0.70, 1.17)	0.93 (0.72, 1.20)	0.93 (0.72, 1.22)	0.92 (0.70, 1.20)	0.92 (0.70, 1.21)
Job insecurity (continuous)	0.99 (0.91, 1.08)	1.00 (0.92, 1.09)	0.99 (0.90, 1.08)	0.99 (0.90, 1.08)	1.00 (0.91, 1.09)
Job insecurity (categorical)	0.95 (0.79, 1.15)	0.98 (0.81, 1.19)	0.95 (0.78, 1.17)	0.95 (0.78, 1.17)	0.97 (0.78, 1.20)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Psychological job demands seemed to increase the risk of acute absenteeism. Physical demands showed a small, negative association with acute absenteeism after adjusting for potential confounders. Overall, no associations were found between decision latitude and acute absenteeism. Social support seemed to increase the risk of acute absenteeism. After adjusting for all potential confounders, one standard deviation increase in total support was associated with 12% higher risk of having 1 to 30 absenteeism days (HR = 1.12, 95% CI 1.01, 1.24).

Mixed associations between job strain and acute absenteeism were found depending on different operationalizations. For example, continuous measures of job strain were positively associated with acute absenteeism while categorical operationalizations using no high strain as a reference showed no association and categorical operationalizations using low strain as a reference showed both negative (original scale) and positive (alternative scale) associations. Isostrain seemed to reduce the risk of being absent less than 30 days. Job insecurity (categorical measure) showed a small, negative association with acute absenteeism. With the exception of social support, none of these associations were statistically significant.

Table 29c. Associations between psychosocial job factors and chronic (>30) sick-leave absenteeism days: results (standardized hazard ratios and 95% confidence intervals) from Cox proportional hazard regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variable	Chronic (> 30 days) sick-leave absenteeism [days]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	1.02 (0.77, 1.34)	0.94 (0.69, 1.29)	1.06 (0.65, 1.71)	0.93 (0.58, 1.47)	0.96 (0.59, 1.55)
Alt. psychological job demands (three items)[2]	0.93 (0.71, 1.20)	0.89 (0.68, 1.17)	1.09 (0.75, 1.60)	1.21 (0.83, 1.76)	1.19 (0.80, 1.77)
Physical demands	1.21 (0.91, 1.61)	N/A	1.40 (0.92, 2.15)	1.24 (0.79, 1.95)	1.19 (0.67, 2.13)
Decision latitude (nine items)[3]	1.19 (0.90, 1.58)	1.24 (0.91, 1.69)	1.07 (0.72, 1.57)	0.92 (0.59, 1.43)	1.33 (0.65, 2.73)
Alt. decision latitude (eight items)[4]	1.18 (0.89, 1.55)	1.21 (0.90, 1.64)	1.02 (0.70, 1.49)	0.88 (0.57, 1.36)	1.26 (0.61, 2.57)
Coworker support	1.07 (0.81, 1.41)	1.09 (0.81, 1.47)	0.92 (0.63, 1.33)	1.01 (0.65, 1.58)	1.05 (0.62, 1.77)
Supervisor support	1.01 (0.74, 1.38)	1.01 (0.73, 1.40)	0.90 (0.64, 1.27)	0.77 (0.54, 1.10)	0.66 (0.39, 1.10)
Total support	1.05 (0.78, 1.41)	1.06 (0.77, 1.46)	0.89 (0.63, 1.27)	0.81 (0.54, 1.21)	0.66 (0.33, 1.31)
Job strain ratio	0.88 (0.64, 1.21)	0.78 (0.55, 1.12)	1.00 (0.62, 1.62)	1.00 (0.60, 1.66)	0.84 (0.46, 1.53)
Alt. job strain ratio[5]	0.86 (0.66, 1.13)	0.83 (0.62, 1.10)	1.05 (0.72, 1.52)	1.22 (0.83, 1.81)	1.13 (0.71, 1.80)
High job strain (categorical, ref. category: no high job strain)	0.91 (0.46, 1.80)	0.82 (0.36, 1.87)	1.59 (0.60, 4.25)	1.27 (0.43, 3.72)	0.91 (0.22, 3.74)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	0.54 (0.28, 1.04)	0.52 (0.26, 1.03)	0.76 (0.32, 1.82)	0.83 (0.31, 2.20)	0.42 (0.12, 1.43)
High job strain (categorical, ref. category: low strain)	0.97 (0.42, 2.26)	0.91 (0.35, 2.38)	2.07 (0.69, 6.24)	1.16 (0.33, 4.02)	0.83 (0.18, 3.90)

Table 29c. (cont.)

Variable	Chronic (> 30 days) sick-leave absenteeism [days]				
	Model 1	Model 2	Model 3	Model 4	Model 5
Alt. high job strain[5] (categorical, ref. category: low strain)	0.62 (0.29, 1.33)	0.60 (0.27, 1.30)	0.88 (0.35, 2.23)	0.98 (0.35, 2.70)	0.54 (0.14, 2.03)
Isostrain (continuous)	0.87 (0.67, 1.15)	0.82 (0.61, 1.11)	1.00 (0.70, 1.44)	1.09 (0.72, 1.64)	1.06 (0.70, 1.62)
Alt. isostrain (continuous)[5]	0.87 (0.68, 1.13)	0.84 (0.64, 1.11)	1.04 (0.75, 1.44)	1.21 (0.84, 1.76)	1.18 (0.81, 1.74)
Isostrain (categorical)	1.22 (0.52, 2.88)	0.93 (0.32, 2.71)	1.89 (0.52, 6.83)	1.48 (0.31, 7.05)	2.41 (0.41, 14.09)
Alt. isostrain[5] (categorical)	0.94 (0.40, 2.21)	0.80 (0.32, 2.00)	1.32 (0.41, 4.25)	1.98 (0.57, 6.90)	2.12 (0.61, 7.43)
Job insecurity (continuous)	0.95 (0.73, 1.25)	0.92 (0.69, 1.22)	0.77 (0.49, 1.23)	0.78 (0.46, 1.30)	0.77 (0.46, 1.31)
Job insecurity (categorical)	0.81 (0.47, 1.41)	0.72 (0.39, 1.31)	0.63 (0.27, 1.43)	0.50 (0.20, 1.24)	0.45 (0.18, 1.13)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: "I am not asked to do an excessive amount of work", "I have enough time to get the job done", "I am free from conflicting demands others make")
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

The original psychological job demands scale was negatively associated with chronic absenteeism while the alternative scale showed a positive association with chronic absenteeism. Workers with high physical demands showed 19% increased risk to go off work for more than 30 days after taking into account all potential confounders. In fully adjusted models, decision latitude showed a positive association with chronic absenteeism. Supervisor and total support seemed to reduce the risk of chronic absenteeism. After adjusting for potential confounders, one standard deviation increase in total support was associated with a 34% decrease risk of chronic absenteeism.

The original job strain ratio scale showed a negative association with chronic absenteeism while the alternative scale showed an association in the opposite direction. Categorical measures of high job strain showed a negative association with chronic absenteeism in fully adjusted models. Being exposed to isostrain more than doubled the risk to go off work for more than 30 days (HR = 2.41 for the categorical, original isostrain scale) after adjusting for potential confounders. Workers exposed to job insecurity were 55% less likely to take long periods of sickness absence after taking into account potential confounders. However, none of these associations were statistically significant.

4.3.2.2 Presenteeism

Table 30. Associations between psychosocial job factors and work limitations score (presenteeism) using selected WLQ items[1]: results (standardized beta coefficients and 95% confidence intervals) from multiple linear regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n= 2,330).

Variable	**Work limitations [total score of selected items][1]**				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[2]	-0.30* (-0.39, -0.20)	-0.24* (-0.34, -0.13)	-0.23* (-0.34, -0.12)	-0.22* (-0.35, -0.11)	-0.26* (-0.37, -0.15)
Alt. psychological job demands (three items)[3]	-0.03 (-0.13, 0.06)	0.03 (-0.07, 0.13)	0.05 (-0.05, 0.15)	0.06 (-0.04, 0.16)	-0.03 (-0.14, 0.07)
Physical demands	-0.24* (-0.33, -0.14)	N/A	-0.23* (-0.34, -0.11)	-0.22* (-0.33, -0.10)	-0.10 (-0.22, 0.02)
Decision latitude (nine items)[4]	-0.27* (-0.37, -0.18)	-0.28* (-0.38, -0.19)	-0.26* (-0.36, -0.16)	-0.26* (-0.37, -0.16)	-0.16* (-0.27, -0.04)
Alt. decision latitude (eight items)[5]	-0.32* (-0.41, -0.22)	-0.32* (-0.41, -0.22)	-0.29* (-0.39, -0.19)	-0.30* (-0.40, -0.20)	-0.23* (-0.34, -0.11)
Coworker support	-0.19* (-0.29, -0.10)	-0.19* (-0.29, -0.09)	-0.17* (-0.27, -0.07)	-0.16* (-0.26, -0.07)	-0.07 (-0.18, 0.03)
Supervisor support	-0.19* (-0.29, -0.09)	-0.20* (-0.30, -0.11)	-0.21* (-0.31, -0.11)	-0.22* (-0.31, -0.12)	-0.15* (-0.26, -0.04)
Total support	-0.22* (-0.32, -0.13)	-0.23* (-0.33, -0.14)	-0.23* (-0.33, -0.13)	-0.23* (-0.33, -0.13)	-0.14* (-0.25, -0.03)
Job strain ratio	-0.08 (-0.17, 0.02)	0.00 (-0.10, 0.10)	-0.01 (-0.12, 0.09)	0.00 (-0.11, 0.10)	-0.14* (-0.25, -0.02)
Alt. job strain ratio[6]	0.10 (0.00, 0.19)	0.15* (0.05, 0.25)	0.15* (0.05, 0.25)	0.16* (0.06, 0.27)	0.05 (-0.06, 0.16)
High job strain (categorical, ref. category: no high job strain)	-0.08 (-0.32, 0.15)	0.02 (-0.22, 0.26)	-0.03 (-0.27, 0.21)	-0.03 (-0.27, 0.21)	-0.21 (-0.46, 0.04)
Alt. high job strain[6] (categorical, ref. category: no high job strain)	0.20 (-0.03, 0.42)	0.26* (0.03, 0.48)	0.19 (-0.03, 0.42)	0.19 (-0.03, 0.43)	0.01 (-0.22, 0.25)

Table 30. (cont.)

Variable	Work limitations [total score of selected items][1]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
High job strain (categorical, ref. category: low strain)	0.07 (-0.20, 0.35)	0.21 (-0.08, 0.50)	0.19 (-0.10, 0.48)	0.21 (-0.08, 0.51)	0.01 (-0.30, 0.31)
Alt. high job strain[6] (categorical, ref. category: low strain)	0.37* (0.10, 0.63)	0.45* (0.19, 0.72)	0.43* (0.17, 0.70)	0.44* (0.17, 0.71)	0.22 (-0.07, 0.51)
Isostrain (continuous)	0.15* (0.05, 0.24)	0.20* (0.10, 0.30)	0.18* (0.08, 0.28)	0.18* (0.08, 0.29)	0.14* (0.04, 0.25)
Alt. isostrain (continuous)[6]	0.24* (0.15, 0.34)	0.28* (0.18, 0.38)	0.26* (0.17, 0.36)	0.27* (0.17, 0.37)	0.24* (0.13, 0.34)
Isostrain (categorical)	-0.07 (-0.36, 0.22)	0.05 (-0.25, 0.35)	-0.03 (-0.33, 0.27)	-0.04 (-0.34, 0.26)	-0.13 (-0.44, 0.17)
Alt. isostrain[5] (categorical)	0.17 (-0.10, 0.44)	0.24 (-0.03, 0.52)	0.17 (-0.10, 0.44)	0.18 (-0.10, 0.46)	0.09 (-0.19, 0.37)
Job insecurity (continuous)	0.20* (0.10, 0.30)	0.20* (0.10, 0.30)	0.20* (0.10, 0.30)	0.20* (0.10, 0.30)	0.17* (0.06, 0.27)
Job insecurity (categorical)	0.19 (-0.01, 0.39)	0.19 (-0.01, 0.39)	0.23* (0.02, 0.43)	0.22* (0.02, 0.43)	0.17 (-0.04, 0.38)

[1]Reversed score based on the following four items selected from IMSS' WLQ: Start on your job as soon as you arrived at work, concentrate on your work, do the required amount of work on your job, and feel you have done what you are capable of doing. These items showed the highest correlations with the original (Lerner's) WLQ (*cf.* methods section).
[2]Five-item psychological demands (original JCQ psychological demand subscale)
[3]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: "I am not asked to do an excessive amount of work", "I have enough time to get the job done", "I am free from conflicting demands others make")
[4]Nine-item decision latitude (original JCQ decision latitude subscale)
[5]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[6]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Psychological job demands was negatively associated with presenteeism as determined by the work limitations score but this association was statistically significant only for the original JCQ subscale. Physical job demands were negatively associated with presenteeism but this association lost statistical significance after adjusting for other psychosocial job factors (model 5). After adjusting for all potential confounders, both the original (β = - 0.16, 95% CI -0.27, -0.04) and alternative (β = - 0.23, 95% CI -0.34, -0.11) subscales of decision latitude showed a statistically significant, negative relationship with work limitations. Social support at work seemed to reduce presenteeism. One standard deviation increase in supervisor and total support was associated with 0.15 and 0.14 decrease in work limitations score, respectively. These associations remained statistically significant after controlling for all potential confounders.

In regards to job strain, original scales showed negative or no associations with presenteeism while alternative scales showed positive associations. However, only the negative association between the original job strain ratio scale and presenteeism remained statistically significant after adjusting for all potential confounders (model 5). Continuous measures of isostrain showed a positive association with presenteeism. One standard deviation increase in isostrain (continuous variable measured with the alternative scale) was associated with a 0.24 increase in work limitations score after taking into account all potential confounders. Finally, job insecurity (continuous variable) showed a statistically significant, positive relationship with work limitations (β = 0.17, 95% CI 0.06, 0.27) after adjusting for all potential confounders.

CHAPTER 5. DISCUSSION

This cross-sectional study, building on the baseline assessment of a prospective health promotion intervention program, aimed to examine associations between psychosocial job factors, biological cardiovascular risk factors, and productivity among Mexican workers. We hypothesized that job strain, isostrain, and job insecurity and their subdomains would be associated with detrimental effects on six cardiovascular risk factors (*i.e.,* blood glucose, total blood cholesterol, weight indicators (body mass index, waist circumference, and waist-hip ratio), blood pressure, smoking, and leisure-time physical activity), and productivity indicators (*i.e.,* sick leave absenteeism and presenteeism) among workers of eight Mexican employers.

Overall, and in agreement with our hypotheses, we found numerous positive associations between psychosocial job factors, biological cardiovascular risk factors, and productivity indicators. High job strain was associated with increased blood glucose levels and reduced leisure-time physical activity. Workers in isostrain jobs showed higher odds of smoking and lower odds of leisure-time physical activity. Social support seemed to protect against high blood cholesterol levels, overweight/obesity as measured by body mass index and waist circumference, smoking, and a sedentary lifestyle. On the other hand, psychosocial job factors showed mixed associations with weight outcomes and blood pressure. In regards to productivity outcomes, job strain had mixed associations with absenteeism and presenteeism, and isostrain was positively associated with chronic absenteeism and presenteeism. Finally, job insecurity decreased the risk of absenteeism but was associated with higher presenteeism.

5.1 Associations between psychosocial job factors and biological cardiovascular risk factors

5.1.1 Blood glucose levels

After controlling for potential confounders, positive, non-statistically significant relationships between psychological job demands, job strain, isostrain, job insecurity and blood glucose levels were observed, in agreement with this study's hypotheses. Consistent with our results, a positive association between job strain and diabetes or high glucose levels has been reported in the literature.[238-240] The pathways by which job stressors may contribute to elevated blood glucose levels have been linked to cortisol levels, which are chronically elevated in stressful situations. Cortisol enhances liver stimulation and decreases pancreatic insulin secretion, thus promoting the hepatic release of glucose, reducing the cellular absorption of glucose, and causing an increase in blood glucose levels.[238]

On the other hand, contrary to this study's hypothesis and previous research,[239] a positive, not statistically significant association between workplace social support and glucose was found. Although some research has suggested a negative effect of social support on health,[241] a substantial protective effect of social support was found with other cardiovascular risk factors in this study. Therefore, social support does not appear to have a negative connotation in this working population and the mechanism for the positive association between social support and glucose remains unclear.

5.1.2 Total blood cholesterol levels

Contrary to this study's hypotheses, psychological job demands were negatively associated with total blood cholesterol levels while decision latitude showed a positive association in fully adjusted models. However, none of these associations were statistically significant. Interestingly, and according to our hypotheses, coworker and supervisor support were protective against increased cholesterol levels. Workers with high total social support showed a decrease of 2.96mg/dl in total blood cholesterol levels. This effect was independent of physical workload, individual worker characteristics, biological cardiovascular risk factors and other psychosocial job factors. Positive effects of social support systems on cholesterol levels have been reported in previous studies,[242,243] in agreement with our findings. Such studies suggest that social support can mitigate the harmful effects of daily stressful stimuli.

In regards to the association between job strain and total blood cholesterol, the literature is inconclusive and shows both positive[80,244-246] and negative[247,248] findings. Contrary to our hypothesis, results in this study point to a negative association. However, the positive association we found between all measures of isostrain and blood cholesterol emphasizes the important effect of social support at work, which not only buffers but seems to revert the negative association between job strain and cholesterol. The assumption of a noxious effect of work stressors on blood cholesterol was also indirectly supported by the positive association between job insecurity and blood cholesterol.

The mechanisms by which occupational stressors may lead to an increase in serum cholesterol remain to be fully elucidated. Some hypothesized mechanisms include unhealthy behaviors such as smoking, sedentary lifestyle, and high-calorie intake,[249] suppression of LDL ("bad cholesterol") liver receptors resulting in an increase of endogenous cholesterol in the plasma,[250] and excessive stimulation of the sympathetic nervous system, which may lead to an increased mobilization of fatty acids from the adipose tissue into the blood stream.[251]

5.1.3 Overweight/obesity indicators

In this study, psychological job demands seemed to contribute to obesity, in agreement with our hypotheses and previous research.[252,253] As expected, physical job demands and supervisor support showed a protective effect against overweight/obesity, which was statistically significant for body mass index and waist circumference. Obesity has previously been associated with low physical job demands or sedentary work[254] and may be reduced when supervisors not only support workers but also take a leadership role in promoting physical activity at work.[255,256]

Contrary to our hypothesis, job strain was negatively associated with overweight/obesity indicators. This association was statistically significant only for body mass index and the two original, categorical scales of high job strain (comparing high job strain with all other workers and with those in low strain jobs). Social support seems to exert a buffering effect on job strain as evidenced by the positive association between isostrain and overweight/obesity indicators, which was statistically significant for waist-hip ratio in fully adjusted models.

The literature on job strain and overweight/obesity is inconclusive: positive[253,257] and negative[258,259] associations have been described. The inconsistencies in the literature regarding the association of adverse psychosocial factors and weight change may be due to the following:

- Individual susceptibility. Genetic uniqueness or environmental exposures may induce different responses to stress in each individual.[260]
- Physiological responses to stress. Stress may induce an increase in glucocorticoids, which may cause an individual to increase his consumption of “comfort food” (food with high

fat and caloric content) to cope with unpleasant situations. However, stress can also inhibit appetite in some people by activating the sympathetic nervous system, which releases epinephrines that suppress motility in the upper gastrointestinal system.[260]

- Baseline body mass index. Job strain can have different effects on body weight depending on baseline body mass index (tendency to weight gain among obese/overweight workers and weight loss among lean workers).[258,261]
- Coping factors that may help workers manage job stressors. Examples of such factors include social support in and outside the work environment.[257] In our study, these factors do not seem to drive our inconsistent results as we were able to control for workplace social support.
- Cultural and economical differences between Western and developing countries. In developing countries, high social class groups may be more vulnerable to cardiovascular disease than low social class groups.[262] Likewise, the effect of job strain on obesity may be different in developing countries.

Finally, both positive[263] and negative[264] associations between job insecurity and overweight/obesity have been reported in the literature. Contrary to expectation, our results are consistent with a negative association. To our knowledge, no studies have explored the relationship between job insecurity and abdominal obesity as measured by either waist-hip ratio or waist circumference, which are deemed to be more predictive of cardiovascular disease risk than traditional measures of obesity based on body mass index.[149]

Weight fluctuations observed in our results do not seem to be related to physical activity or sedentary behavior. In fact, decision latitude appeared to promote leisure-time physical activity (*cf.* results section). We hypothesize that the changes in weight may be associated with eating behaviors, which we were unable to identify in this study. As mentioned previously, stress has been shown to have a dual effect on eating patterns, depending on the stressor's severity and chronicity. On the one hand, stress may suppress appetite and on the other hand, it may induce consumption of energy-dense food.[265] However, because there is no logical explanation as to how decision latitude may lead to increased weight, this puzzle remains unresolved.

5.1.4 Blood pressure

Mixed associations were observed between job strain and blood pressure. On the one hand, and according to our hypotheses, all categorical measures of job strain were positively associated with systolic blood pressure after adjusting for all potential confounders (model 5). On the other hand, and contrary to expectation, continuous and categorical measures of job strain were negatively associated with diastolic blood pressure but statistical significance was lost after adjusting for potential confounders, with the exception of job strain ratio (original scale). Interestingly, the association between the categorical version of isostrain and systolic blood pressure was positive as well as the association between diastolic blood pressure and high job strain using no high job strain as a reference.

In the literature, many studies have reported a positive association between job strain and blood pressure,[99,101] but null or inverse associations have also been reported [221,266-268] especially when using subjective assessments of job stress based on self-report. In fact, in a study of bus drivers, investigators found an inverse relationship between self-reported job strain and blood pressure and a positive association between objective measurements of job stressors and blood pressure.[269]

In the unstable Mexican economy, workers may just be grateful to have a job and their appraisal of the work environment may be colored by this appreciation of having any work. Therefore, psychosocial stress may be underreported by Mexican workers. A similar pattern has previously been described among non-Western immigrants in Denmark.[221] Additionally, emotional states or coping mechanisms may repress anger and hostility, which may influence the pathogenesis of hypertension and reduce the perception and self-reporting of job stressors.[269] Similarly, negative affectivity may color the perception of working conditions as undesirable or stressful.[270] Another possibility is that Mexican workers in this study reported a psychosocial work environment different from their perception for fear of being penalized by employers in spite of confidentiality assurance. However, psychosocial job factors were associated with other cardiovascular risk factors in the expected directions (*e.g.*, glucose, smoking, leisure-time physical activity) and therefore do not point to a systematic perception or reporting bias. Also, our Job Content Questionnaire followed the same factor structure as the original questionnaire by Karasek et al.,[72] which provides additional evidence for the validity of our psychosocial scales. Altered perception may also result from physiological changes caused by high blood pressure.[268] Indeed, animal models have shown that hypertension reduces reactivity to noxious stimuli by modifying certain areas of the brain.[271]

Information about anti-hypertensive medication was not collected in IMSS' study. To prevent misclassification of cases as non-hypertensive resulting from workers' medically controlled blood pressure levels, we considered a personal history of hypertension as a proxy measure for anti-hypertensive medication. In a post-hoc analysis, workers with a personal history of hypertension (*i.e.*, self-reported hypertension) were excluded from our linear regression models. However, inverse associations remained, suggesting that medication did not differentially influence our results. We also checked for the potential impact of influential outliers and ran the linear regression models with and without outliers identified by studentized residuals, leverage values, dfbetas, dffits, and Cook's distances.[272] When dropping outliers (13 observations out of

2,330), mean systolic and diastolic blood pressure decreased 0.22 mmHg and 0.08 mmHg, respectively but the associations remained negative and statistically significant.

Another explanation includes the possibility of measurement error. The one published Mexican study analyzing the association between psychosocial job factors and cardiovascular outcomes reported a positive association between high job strain and blood pressure.[16] This study included only female nurses and used Schnall et al.'s protocol for obtaining a "point estimate" of work time blood pressure,[273] which includes the average of several blood pressure readings taken at each employee's workstation. In IMSS' study, due to time constraints, only one measurement of blood pressure was made at the worksite clinic. However, there is no reason to believe that a measurement error would systematically differ among subjects with and without job stress and would have biased results in one direction. Finally, unlike other studies with positive associations between job strain and blood pressure,[16,217,274] this study did not evaluate ambulatory blood pressure (ABP). ABP is a better predictor of cardiovascular risk than casual blood pressure (CBP) measurement because CBP measurements may over- or underestimate true blood pressure levels, due to a "white-coat effect,"[275] "masked hypertension,"[276] non-compliance with antihypertensive medication, or individual fluctuations of the day-night blood pressure patterns. In fact, a higher prevalence of white-coat effect has been reported among workers without job strain,[277] whereas masked hypertension has been associated with job strain in men.[278] If such was the case in our study population, workers without job strain could show higher levels of blood pressure and workers with high job strain could show lower levels, thus possibly explaining inverse associations. However, this argument is speculative and the inverse associations between blood pressure and psychosocial job factors found in this study warrant further research in Mexican working populations using a longitudinal design[279] and preferably repeat ambulatory blood pressure measurements.[280]

In regards to job insecurity, the inverse relationship observed with blood pressure in this study differs from previous research.[281,282] Job insecurity has been associated with adverse health consequences.[283-285] There is, however, some evidence of lower blood pressure measurements among workers anticipating job loss in a company undergoing massive layoffs.[286] The latter study hypothesizes that responses of blood pressure to job insecurity may depend on workers' perceived control; *i.e.*, when job loss becomes an uncontrollable event, it may no longer be perceived as a threat and workers may stop worrying about it. Interestingly, the company with the largest number of participants in our study (airline company) went bankrupt shortly after the onset of the study and closed down, leaving thousands of workers unemployed. Knowledge of this imminent closure may have influenced workers' blood pressure.

It is worth mentioning that this single study does not prove (as no single study alone does) a negative relationship between psychosocial job factors and blood pressure. In spite of some of the negative associations found between psychosocial job factors and blood pressure, the effect sizes of such associations were very small and most of those associations were not statistically significant, which may indicate a lack of clinical significance. Furthermore, some positive, albeit non-significant associations were observed for systolic blood pressure, which is considered a better predictor of cardiovascular disease risk than diastolic blood pressure.[219,287]

5.1.5 Smoking

Contrary to expectation, very small positive and negative associations were found between smoking and psychological job demands and decision latitude, respectively. However, these associations were not statistically significant and when considering all models, results point to no association.

According to this study's hypotheses, we found that every standard deviation increase in supervisor support was associated with 10% less odds of smoking (OR = 0.90, 95% CI 0.81, 0.99), consistent with findings from other researchers who reported that female smokers in low-support jobs smoked more.[288] After controlling for potential confounders, workers exposed to isostrain (as measured with the alternate subscales) had a 43% increase in the odds of smoking compared to workers not exposed to isostrain (OR = 1.43, 95% CI 1.10, 1.85).

In Mexico, as in other countries, smoking habit is mostly acquired at an early age before workers enter the labor market.[289] The main reported effect of job strain on smoking is through increasing smoking intensity in light smokers.[92,290,291] Smoking may also arise from the need to counteract negative emotions provoked by high strain jobs,[292] in particular those with low levels of social support (nicotine is mainly a stimulant). Nevertheless, inconsistent results have been reported when exploring the association between smoking and job characteristics;[293] therefore, further investigations are required in this area.

5.1.6 Leisure-time physical activity

According to this study's hypotheses, decision latitude and total support at work were positively associated with leisure-time physical activity, whereas psychological job demands and job strain had a negative effect on leisure-time physical activity. All else equal, one standard deviation increase in total social support was associated with 15% increased odds of leisure-time physical activity (OR = 1.15, 95% CI 1.02, 1.29) and one standard deviation increase in job strain ratio was associated with 12% reduced odds in leisure-time physical activity (OR = 0.88, 95% CI 0.78, 0.99). Furthermore, the combination of low social support with high job strain (*i.e.*, isostrain) resulted in stronger negative associations, indicating the negative impact of the lack of social support when high job strain is present. All these findings were in accordance to the literature on the association of psychosocial job factors and physical activity.[84,85,294]

Even though more research is needed on this topic, this study's findings highlight the importance of promoting job control and social support in the worksite so workers may adopt healthy behaviors such as leisure-time physical activity. To adopt and maintain physical activity, high levels of motivation are needed, which can be promoted by social support at work. Also, having high levels of job control may provide workers the freedom to take time off work to exercise and could promote active behaviors at work and beyond.

5.2 Associations between psychosocial job factors and productivity

5.2.1 Sick-leave absenteeism

According to our expectations, workers exposed to psychological or physical job demands seemed to be at higher risk for being absent. One standard deviation increase in physical demands as measured with the alternative subscale was associated with 19% increased risk of chronic absenteeism after taking into account potential confounders. However, this association was not statistically significant (HR = 1.19, 95% CI 0.80, 1.77). Previous research has reported increased sickness absence among workers with high work demands,[295,296] in agreement with our findings.

Opposite to this study's hypothesis, no association between decision latitude and acute absenteeism was found. Also, contrary to findings described in other studies,[127,297,298] decision latitude was associated with an increased risk of chronic absenteeism. Employees with higher levels of job control tend to have more freedom to organize and manage their jobs so they may feel more comfortable taking more days off compared with workers with low levels of decision latitude.

Unexpectedly, social support seemed to increase the risk of acute absenteeism. After adjusting for all potential confounders, one standard deviation increase in total support was associated with 12% higher risk of having 1 to 30 absenteeism days (HR = 1.12, 95% CI 1.01, 1.24). In contrast, and according to our hypotheses, social support (in particular supervisor support) seemed to reduce the risk of chronic absenteeism, but this association was not statistically significant. One standard deviation increase in total support was associated with a 34% decreased risk of chronic absenteeism after taking into account potential confounders (HR = 0.66, 95% CI 0.33, 1.31). These findings suggest that workers with high social support may feel at ease taking a few days off to recover from sickness, which may be beneficial to avoid presenteeism. On the other hand, previous research has shown that workers with high social support may feel motivated to come back to work and to not take more days off than needed,[299] which may explain the negative association we found between social support and chronic absenteeism. Additionally, social support at work has been shown to attenuate adverse psychosocial exposures,[299,300] which may reduce health conditions associated with such exposures and therefore, decrease sickness absenteeism. Perceived social support has also been reported as a relevant predictor for return to work.[301,302]

Sickness absenteeism has been associated with high job strain[127,296,298] and isostrain.[127,300] In this study, mixed associations between job strain and absenteeism were found depending on different operationalizations and length of absenteeism. Unexpectedly, isostrain seemed to reduce the risk of acute absenteeism (hazard ratios were negative for all measures of isostrain but did not reach statistical significance). In contrast, and according to our hypotheses, being exposed to isostrain more than doubled the risk to go off work for more than 30 days (HR = 2.41 for the categorical, original isostrain scale).

Job insecurity seemed to reduce the risk of absenteeism, and in particular chronic absenteeism. Workers exposed to job insecurity were 55% less likely to take long periods of sickness absence after taking into account potential confounders. This finding is consistent with other studies that have reported increased levels of presenteeism associated with job insecurity and thus, decreased absenteeism.[303,304] Workers who fear loosing their jobs are more likely to go to work while sick. In Latin America, studies on job insecurity are scarce and only a few have been performed in Argentina, Mexico, and Brazil.[22] However, none of them have explored the relationship between job insecurity and productivity, which is why this study brings an important contribution to Mexican research.

Interestingly, stronger relationships were observed in chronic absenteeism models, which may indicate that psychosocial job factors act mostly on the chronic phase of absenteeism but not so much in the beginning. The physical pain, the injury, or the illness may determine the number of absenteeism days during the acute phase. If the sickness or injury is severe and requires the worker to stay off work more days, in the chronic or recuperating absenteeism phase the decision to go back to work may be influenced by the psychosocial characteristics of the job that the worker is returning to (*e.g.*, if the worker is exposed to adverse psychosocial job factors he might decide to stay absent for a longer period of time). In agreement with our results, previous research has shown that job control, job strain, and work schedule flexibility determined return-to-work during the subacute/chronic disability phase but not during the acute phase.[301]

5.2.2 Presenteeism (work limitations)

Psychological job demands (as measured with the original JCQ subscale) showed a negative, statistically significant relationship with presenteeism contrary to our hypothesis and to what has been reported in the literature.[305] On the other hand, the alternative psychological demands variable (which excludes items that could be considered as physical demands) showed positive associations in models 2, 3, and 4 and a weaker negative association (β = -0.03) than the original subscale (β = -0.26) in model 5. These results may indicate that the physical demands scale, which also showed a negative association with presenteeism, may be at least partially driving the negative association observed between the original psychological job demands subscale and presenteeism. A similar pattern occurred regarding the association between job strain and presenteeism. The original job strain ratio scale showed a negative association with presenteeism while the alternative scale showed positive, statistically significant associations between job strain and presenteeism in models 2, 3, and 4. Even though original scales showed more statistically significant associations, the alternative scales throughout this study showed better prediction of outcomes and agreement to the literature (see **Appendix 8**). Therefore, preference was given to results with alternative scales but original scales were also included for comparison with other studies in the literature. Regarding presenteeism, this study suggests a positive association between presenteeism and job strain as measured with the alternative scales, in agreement with our hypothesis.

To our knowledge, the only article analyzing the relationship between job strain and presenteeism using concomitantly the JCQ and the WLQ is a study from Lerner,[306] who found that presenteeism was associated with high job strain, in agreement with our findings. Other studies have also reported a positive association between adverse psychosocial job factors and presenteeism.[305,307-309]

Regarding social support at work, the negative relationship found in this study between supervisor support and presenteeism indicates that when sick, workers are more likely to take days off when they perceive support from their supervisors,[305] which would explain the reduced presenteeism. Additionally, an attenuating effect of supervisor support between job demands and presenteeism has been reported in the literature.[113,305] Positive behaviors from supervisors such as effective management of work demands, equitable balancing of workloads, and empathy towards employees have been associated with workers' better psychological health and lower perception of job stress.[113,310]

The protective effect of social support is further illustrated by the negative effect of isostrain (the combination of high job strain with low social support) on presenteeism. One standard deviation increase in isostrain (as measured with alternative subscales) was associated with 0.24 increase in presenteeism score. This positive association remained statistically significant after adjusting for potential confounders.

Finally, in accordance to our findings, job insecurity has been shown to increase presenteeism.[303,304] However, in a study among German employees, Staufenbiel and König[311] argue that job insecurity can have both positive and negative effects on work productivity and that job insecurity can be considered either as a hindrance or as a challenge. On the one hand, negative effects of job insecurity include lower performance due to effort withdrawal, increased turnover intention and absenteeism. On the other hand, positive effects may arise because workers, in fear of losing their jobs, increase their efforts in being productive. Nonetheless, in their study, the authors indicated that the hindrance effects were stronger than the challenge effects, which is why employers should strive to reduce job insecurity rather than promoting it.

Interestingly, in this study job insecurity was associated with lower absenteeism but higher presenteeism. Even though going to work while sick prevents loss of income and the possibility of dismissal in companies with strict attendance policies, presenteeism might entail a higher risk for accidents, worsening health, and a longer time for recovery.[312] However, these data must be interpreted with caution due to the transcription error of IMSS' questionnaire and its low correlations with the original (Lerner's) WLQ (*cf.* methods section).

5.2.3 Association between presenteeism and sick leave absenteeism

Although this was not part of our initial objectives, we explored the relationship between absenteeism and presenteeism. Interestingly, we found a negative association, contrary to what other authors have reported.[313,314] This finding might be due to the cross-sectional nature of the present study; a positive relationship may appear later if we follow-up workers in time. In fact, presenteeism has been shown to be a predictor of sick leave absenteeism. Leineweber et al.[315] argue that although presenteeism has been considered as an alternative to absenteeism, the relationship between absenteeism and presenteeism is more complex. It is thought that there is a negative relationship between presenteeism and absenteeism because the higher the presenteeism, the lower the absenteeism rates. This is true in particular in companies where absenteeism is penalized. In these companies, low absenteeism rates are a reflection of a company's severe policies rather than workers' good health. In contrast, several studies have shown that there is a positive relationship between presenteeism and absenteeism. Using a population of 8,304 Swedish workers, Leineweber and colleagues demonstrated that sickness presenteeism is predictive of absenteeism even after adjusting for age, sex, work environment, self-rated health, chronic diseases, and work capacity; i.e. going to work while being sick is positively associated with higher absenteeism rates. The causes for this positive relationship remain to be fully elucidated. Family and personal factors as well as seasonal diseases (which were not explored in their study) could influence both the prevalence of absenteeism and presenteeism. Even though presenteeism may bring short-term "savings" for the company because replacements for the sick person are not necessary; in the long term, presenteeism results in negative consequences regarding workers' health and productivity.[316-318]

5.3 Alternative operationalizations of psychosocial job factors

In this study, the following operationalizations of job strain were used:

- A continuous variable of “job strain ratio” was calculated by multiplying the psychological demands scale score times two and dividing the result by the decision latitude scale score.[139] This variable was created additional to the standard high strain variable obtained with the quadrant method because continuous variables provide more measurement precision and power to detect associations.
- “High job strain” was defined as the combination of high psychological demands (score above the sample median on job demands) and low decision latitude (score below the sample median on job decision latitude). Two alternative categorical variables of job strain were created: one compared the high job strain group to all other workers (“no high job strain”), the other to the “low strain” group only. The latter provides a stronger contrast but is also based on a smaller sample of workers who fall into the high and low strain quadrants of the JCQ model, excluding workers in the active or passive quadrants. These variables are useful for comparison with the literature that is based mostly on categorical definitions of job strain.
- Isostrain (the combination of high job strain with low social support) was also explored because previous research has indicated a buffering effect of work-related social support on perceived job stress.[71] A continuous variable of isostrain was calculated by subtracting decision latitude and total support from psychological demands scores.[140] A categorical variable of isostrain was defined as the combination of high job strain and low social support (score below the sample median of total coworker and supervisor support).

- Additional formulations for each of the aforementioned variables were created using alternative scales for psychological job demands and decision latitude. The alternative job demands scale excluded items that could be interpreted as physical instead of psychological ("work fast" and "work hard")[232] and the alternative decision latitude scale excluded the "repetitive work" item, which did not load on the decision latitude scale in the JCQ factor analysis.

In general, associations using continuous exposures better predicted this study's outcomes and reached statistical significance more often than associations using categorical exposure variables, which justifies the use of continuous variables additional to the more traditional and most widely used categorical operationalizations of job strain. As expected, categorical measures of high job strain using low strain as a reference showed stronger associations with the study outcomes than those using no high strain as a reference due to the higher contrast among exposure categories.

Interestingly, alternative formulations of the job demand and control scales resulted in up to six-fold changes in effect sizes or changed the statistical significance of results when compared with the original scales. In some instances, alternative scales yielded smaller effect sizes and less statistically significant results in line with the expectation that fewer scale items may pick up less variation. In other instances, the alternative scales resulted in greater precision, larger effect sizes, and increased statistical significance as would be expected from an improved scale. Also, the dropped items seemed to account for part of the negative associations observed for blood pressure, and presenteeism. For example, we found a stronger negative association between job strain and diastolic blood pressure with the original scales, which may result from using ambiguous psychological demands items that could be misunderstood as questions about physical demands. In fact, the original JCQ physical demand item was negatively associated with blood pressure in models 1, 3, and 4.

Overall, using the alternative scales proved to be useful to determine associations due to psychological rather than physical demands. When considering fully adjusted models, associations using the alternative versions predicted the outcomes better than the original versions and showed better agreement to the literature and to this study's hypotheses than the original versions (*cf.* **Appendix 8**). If rewording the "work fast" and "work hard" items to differentiate mental and physical job demands is not possible, a three-item psychological demands scale should be considered in future occupational epidemiologic studies.

5.4 Study limitations

The cross-sectional design of the study limits causal inferences although it is unlikely that non-symptomatic cardiovascular risk factors would result in reverse causation, *i.e.* in job strain, low support, or job insecurity. The convenience sample of worksites with unknown representativeness limits generalizability of study results. However, the inclusion of different industries and occupations needs to be considered an advantage of this study compared to single occupation studies that suffer from lack of variation in working conditions. Our study shows wide variations in psychosocial job factors across companies and individuals necessary for detecting effects.

5.4.1 Participation rate

Even though the lack of information on non-respondents raises the question of nonparticipation bias, many studies with low participation rates show little evidence of substantial bias.[319] In fact, differences among participants and non-participants in regards to study outcomes are more important in determining the influence of a possible bias, rather than the total number of participants *per se*. In this study, the modest participation rate (58.5% overall) was mostly due to an inability of workers to take time off to participate in the study, which may reflect low job control (specifically low control over one's work schedule). If such was the case, exposure estimates to this adverse psychosocial job factor may have been underestimated in this study. Unfortunately, occupational health research is characterized by low participation rates due to multiple factors, both at the employer and employee levels, which are mostly out of the hands of researchers.[320] Additionally, fearing peer rejection due to "low" participation rates, many researchers fail to report participation rates.[319,321,322]

5.4.2 Over-adjustment

Over-adjustment may have occurred in models 4 and 5. However, including all psychosocial factors in the models was essential because it demonstrated whether the reported association reflects an independent effect of the psychosocial factor and not a confounding effect due to other psychosocial factors. Other cardiovascular risk factors were also important to consider as they are associated with both exposure and outcome and may act as confounders. Additionally, controlling for these factors allows comparability with other studies that followed the same approach. In some instances, statistical significance was revealed in models 4 and 5. On the other hand, multicollinearity was discarded; correlations between the different cardiovascular risk factors considered in this study were weak and no clustering of factors was evident.

5.4.3 Questionnaires

The job content questionnaire used in this study showed acceptable levels of reliability, compared with other studies in Latin America.[138] Even though several items did not load on their corresponding factors, the factor pattern in the overall sample followed the original pattern of Karasek's JCQ, which includes the components of job decision latitude, psychological demands, coworker and supervisor support, and job insecurity. A study with Colombian workers[138] also found ambiguous loadings with three items: “repetitive work” (#2), “enough time” (#14), and “conflicting demands” (#15), which is consistent with this study's findings. In order to improve the problematic items in Latin America working populations in the future, the author of the aforementioned study recommends rewording item #2 to better explain the concept of repetitive work and to compose the “enough time” item “in the same positive direction that it has in the original English questionnaire.” Another approach (the one we followed in this study) in regards to item #2 would be to build a new 8-item job decision scale without the "repetitive work" item. Unlike the Colombian sample mentioned above, item #15 "conflicting demands" adequately loaded on the psychological demands factor in our study, therefore, no further adjustment regarding this factor was needed.

In regards to the WLQ, the transcription error of IMSS' questionnaire and the use of proxy measures of presenteeism prevent us from comparing our scores with other articles where the WLQ was used. Additionally, these data must be interpreted with caution due to the low correlations between the inverse-coded scales of this study and the original (Lerner's) WLQ scales (*cf.* methods section). However, the rational and highly significant results obtained in our study linking presenteeism with adverse psychosocial factors and absenteeism (*i.e.*, adverse psychosocial job factors and lower absenteeism were associated with higher levels of presenteeism) justify further research on this topic among the Mexican working population.

5.4.4 Other limitations

Information on dietary habits was not available and we were thus unable to control for this potential confounder, particularly in our models for weight outcomes, total blood cholesterol, and blood pressure.

In this study, no efforts were made to reach workers on sick leave or disability. Additionally, recognition and registry of work-related accidents has been reported as highly deficient in Mexican companies.[7,63] Therefore, underestimation of risks associated with absenteeism may have occurred.

5.5 Study strengths

Advantages of this study include its large sample size, the consideration of workers from all socioeconomic strata, age, and gender, and the use of both categorical and continuous variables for exposures and most outcomes. While categorical measures are helpful for comparisons with the literature, continuous measures retain more information, reduce misclassification, and increase the power to detect effects. In fact, most associations with dichotomous outcomes were in the same direction but, with few exceptions, statistical significance disappeared (*cf.* **Appendix 9**). The use of different measures of exposure may be in part responsible for inconsistent findings in the job strain literature.

Lack of control for physical workload or occupational physical activity has been a major limitation in the existing literature. In this study, not only did we account for a subjective appraisal of physical job demands, but we also considered a more objective assessment of occupational physical activity made by the research team. Our study also makes a unique contribution by evaluating within the same study population the effects of alternative operationalizations of psychological demands and decision latitude scales based on factor analysis and addressing the possibility that some of the original scales may have been interpreted as physical rather than psychosocial job factors. Our study demonstrates that the choice of scale may lead to up to six-fold changes in effect sizes, and change in direction or statistical significance of effects.

Another advantage of this study is that we examined associations between psychosocial job stressors and waist circumference and waist-hip ratio, which are deemed to be more predictive of cardiovascular disease risk than traditional measures of obesity based on body mass index.[149] This is also one of the few studies in Mexico to simultaneously explore associations of job strain, isostrain, job insecurity, and their subscales with several cardiovascular risk factors in the same population sample, which is beneficial because we can compare the effect sizes directly, after standardization of the exposure variables.

5.6 Future research

Future research on the effect of adverse psychosocial exposures in Mexican workers should include prospective studies and the use of better measurement methods (*e.g.*, ambulatory blood pressure measurement, original work limitations questionnaire). Other factors that may influence the relationship between exposure to psychosocial factors and absenteeism that should be considered in future studies include absenteeism regulations at work, work-home interference, and individual psychological traits. To increase participation rate, participatory action research (PAR) is recommended. PAR is defined as a "systematic investigation, with the collaboration of those affected by the issue being studied, for the purposes of education and taking action or effecting social change."[323] Such approach is beneficial because it engages community members to contribute equally with researchers in regards to decisions concerning their health and empowers participants to take control over their own lives, thus increasing their ability to solve problems.[323]

Additionally, because using alternative scales proved to be useful to determine associations due to psychological rather than physical demands and if rewording ambiguous JCQ items is not possible, a three-item psychological demands scale should be considered in future occupational epidemiologic studies.

CHAPTER 6. CONCLUSION

This study showed an overall negative impact of psychosocial job factors on cardiovascular risk factors and productivity indicators. It is worth noting that social support (in particular supervisor support) seems to play an important role in this population sample because there was a consistent reduction of most cardiovascular risk factors, absenteeism, and presenteeism among workers with higher levels of social support. Overall, using alternative scales for job demands and decision latitude (excluding ambiguous items) proved to be useful to determine associations due to psychological rather than physical demands. In some instances, alternative operationalizations resulted in substantial changes in effect sizes or statistical significance of results when compared with the original scales.

Taking into consideration the overall results of this study, which point to a harmful effect of psychosocial stressors on cardiovascular risk factors and a protective effect of social support on most outcomes, we conclude that interventions at the worksite level are needed to reduce psychosocial stressors and improve workers' cardiovascular health and productivity. The mixed results in regards to overweight/obesity indicators and blood pressure should not detract from research findings on the potential negative health impacts of psychosocial job stressors. To our knowledge, this study is the first in Mexico to explore the effects of psychosocial factors on productivity. We expect our findings will allow employers understand the importance of psychosocial work exposures and encourage them to implement interventions to control and prevent these exposures, thus optimizing the effects of any future effort aimed to improve workers' health and productivity.

APPENDICES

Appendix 1

Description of participating companies

	Public Health (Epidemiology Dept.)	**Public Health (Occupational Health Dept.)**	**Airline company: Services' Dept.**	**Airline company: Maintenance & Repair shop Depts.**	**Laboratory**	**Total**
Field of the company/ Economic Activity	Epidemiological vigilance and regulation; support during disasters	Occupational Health Regulation	Passengers' air traffic and administrative personnel	Administrative personnel on land and platforms. Plane maintenance repairshops.	Pharmaceutical company	
Total # of workers	68	73	376	1506	231	2,254
N° of participating workers	**63**	**60**	**195**	**508**	**185**	**1,011**
N° of non-participating workers	5	13	181	998	46	1,243
Participation rate (%)	92.6	82.2	51.9	33.7	80.1	44.8

	Tool's manufacture	**Manufacture of cooking utensils**	**Plastic company**	**Lithography company**	**Tire manufacture**	**Total**
Field of the company/ Economic Activity	Manufacture of metallic tools with different characteristics and sizes, hydraulic, car sets, plastic trunks, roof racks, etc.	Manufacture of metallic baking pans and griddles, with and without nonstick surfaces, spoons, ladles, skimmers, etc. Metallic and plastic. Potato peelers, cutting boards.	Manufacture of elastomers, and plastic raw material.	Printing of academic and cultural books.	Manufacture of tires	
Total # of workers	161	117	95	758	600	1,731
N° of participating workers	**161**	**108**	**95**	**627**	**328**	**1,319**
N° of non-participating workers	0	9	0	131	272	412
Participation rate	100	92.3	100	82.7	54.7	76.2

Total number of workers: 3985; participating workers: 2330; overall participation rate: 58.5%

Appendix 2

DIAGNOSTIC EVALUATION OF WORKERS' HEALTH STATUS AND LIFESTYLES

(HEALTH RISK ASSESSMENT)

I. Worker's identification

Name of worker: ____

IMSS affiliation number:__________________________________

Name of the company: ____

Department where you currently work: _____________________________________

1. Gender:

(1) Male
(2) Female

2. Date of birth (age): ______________ (Day/Month/Year)

3. Occupation: __________________________

4. Date of enrollment (seniority): _______________________

5. Working shift:

(1) Morning
(2) Evening
(3) Night
(4) Mixed
(5) Accumulated

6. Contract type:

(1) Temporary
(2) Permanent

7. Job type:

(1) Non-unionized
(2) Unionized
(3) Contractor

8. What's your level of education?

(1) No education
(2) Elementary school
(3) Middle school
(4) Technical school
(5) High school
(6) College degree
(7) Graduate school

9. What is your marital status?

(1) Single
(2) Married
(3) Divorced
(4) Separated
(5) Living with someone as married
(6) Widowed

10. What is your monthly income?

(1) Less than 1,500
(2) Between 1,501-4,500
(3) Between 4,501-7,500
(4) Between 7,501-10,500
(5) Between 10,501-13,500
(6) Between 13,501-16,500
(7) More than 16,500

II. Lifestyles

11. Do you exercise?

(1) Occasionally or never
(2) Daily
(3) Two to three times per week

12. In your daily meals, what kind of food do you eat more frequently? (choose only one option)

(1) Fruits and vegetables
(2) Cereal, tortilla, bread, pasta
(3) Foods of animal origin (meat, milk, cheese, yogurt, others).

13. In the past 12 months, have you had three or more alcoholic drinks?

(0) No, I never drink
(1) Occasionally (2 to 5 times per year)
(2) Yes, frequently, at least once per month

If you answered yes, frequently, at least once per month, answer questions 14 to 23. If not, go to question 24.

14. How often do you drink alcoholic beverages?

(0) Never
(1) Once or less than once per month
(2) Two to four times per month
(3) Two to three times per week
(4) Four or more times per week

15. How many alcoholic beverages do you usually have when you drink?

(0) 1 or 2 beverages
(1) 3 or 4 beverages
(2) 5 or 6 beverages
(3) 7 or 9 beverages
(4) 10 or more beverages

16. How often do you drink 6 or more alcoholic beverages in a single day?

(0) Never
(1) Less than once per month
(2) Monthly
(3) Weekly
(4) Daily or almost daily

17. How often throughout last year, have you been unable to stop drinking once you have started?

(0) Never
(1) Less than once per month
(2) Monthly
(3) Weekly
(4) Daily or almost daily

18. How often, throughout last year, have you been unable to fulfill your obligations because you had been drinking?

    (0) Never
    (1) Less than once per month
    (2) Monthly
    (3) Weekly
    (4) Daily or almost daily

19. How often, throughout last year, did you have to drink in the morning to recover after a hangover from the previous day?

    (0) Never
    (1) Less than once per month
    (2) Monthly
    (3) Weekly
    (4) Daily or almost daily

20. How often, throughout last year, have you experienced remorse or guilty feelings after drinking?

    (0) Never
    (1) Less than once per month
    (2) Monthly
    (3) Weekly
    (4) Daily or almost daily

21. How often, throughout last year, have you been unable to remember what happened the previous night because you had been drinking?

    (0) Never
    (1) Less than once per month
    (2) Monthly
    (3) Weekly
    (4) Daily or almost daily

22. Have you or anybody else been injured as a result of your drinking habits?

    (0) No
    (1) Yes, but not throughout last year

(2) Yes, last year

23. Has any relative, friend, doctor or health professional shown concern about your drinking habits or have they advised you to stop drinking?

    (0) No
    (1) Yes, but not throughout last year
    (2) Yes, last year

24. Does your job promote or cause stress in you (tension, tiredness, fatigue)?

    (0) Never
    (1) Less than once per month
    (2) Monthly
    (3) Weekly
    (4) Daily or almost daily

25. Do you smoke commercial cigarettes?

    (0) No, I have never smoked
    (1) Occasionally (2 to 5 times per year)
    (2) Yes, I currently smoke daily

If you answered YES, I currently smoke daily, answer questions 26 to 31. If not, go to question 32

26. How many cigarettes do you smoke per day?

    (1) 31 or more
    (2) 21 to 30
    (3) 11 to 20
    (4) Less than 10

27. Do you smoke more cigarettes in the morning compared to the afternoon?

    (1) Yes
    (2) No

28. How long does it take to get your first cigarette from the moment you wake up in the morning?

    (1) Less than 5 minutes
    (2) 6 to 30 minutes
    (3) 31 to 60 minutes

(4) More than 60 minutes

29. In what moment of the day is it most difficult to stop having a cigarette?

(1) The first cigarette of the morning
(2) Any moment during the day

30. Is it difficult not to smoke where smoking is forbidden?

(1) Yes
(2) No

31. Do you smoke when you are sick?

(1) Yes
(2) No

32. How many sexual partners have you had in the past 10 years?

(1) 1 or none
(2) 2 to 3
(3) More than 3

33. Do you use any drugs? (marijuana, cocaine, methamphetamine)

(1) Never
(2) Once or twice per year
(3) More than twice per year

Physical activity: exercise regularly three or more times per week. It includes activities such as energetic walking, jogging, swimming, aerobic dancing, spinning, cycling, rowing, etc.

34. Currently I don't exercise

(1) True (2) False

35. I plan to start exercising in the following 6 months

(1) True (2) False

36. I exercise regularly at present

(1) True (2) False

37. I have exercised regularly in the last 6 months

(1) True (2) False

III. Family and personal history

38. Do you have first degree relatives with diabetes? (father, mother, siblings)

    (1) Yes (2) No

39. Do you have first degree relatives that suffer from high blood pressure? (father, mother, siblings)

    (1) Yes (2) No

40. Do you weigh more than 10 lbs from your ideal weight?

    (1) Yes (2) No

41. Do you suffer from high blood pressure?

    (1) Yes (2) No

42. Diabetes?

    (1) Yes (2) No

In the past 6 months has a doctor diagnosed any of the following diseases?

43. Heart disease? (1) Yes (2) No

44. Low back pain or sciatica? (1) Yes (2) No

45. Gastritis, ulcer, or colitis? (1) Yes (2) No

46. Acute, chronic bronchitis or asthma? (1) Yes (2) No

47. Tuberculosis? (1) Yes (2) No

48. Sexually transmitted diseases? (1) Yes (2) No

49. Hearing loss, vertigo, or balance disorder? (1) Yes (2) No

50. Neurosis, anxiety disorders, or depression? (1) Yes (2) No

51. Another disease? Write it down: ________________

In the past two weeks, how much of the time did your physical health or emotional problems make it difficult for you to do the following? (WORK LIMITATIONS QUESTIONNAIRE)

52. Do you work the required number of hours?

(1) All of the time
(2) Most of the time
(3) Half of the time (50%)
(4) Some of the time
(5) None of the time
(6) Does not apply to my job

53. Do you start on your job as soon as you arrived at work?

(1) All of the time
(2) Most of the time
(3) Half of the time (50%)
(4) Some of the time
(5) None of the time
(6) Does not apply to my job

54. Do you repeat the same hand motions over and over again while working?

(1) All of the time
(2) Most of the time
(3) Half of the time (50%)
(4) Some of the time
(5) None of the time
(6) Does not apply to my job

55. Do you use your equipment (i.e. phone, pen, keyboard, computer mouse)?

(1) All of the time
(2) Most of the time
(3) Half of the time (50%)
(4) Some of the time

(5) None of the time
(6) Does not apply to my job

56. Do you concentrate on your job?

(1) All of the time
(2) Most of the time
(3) Half of the time (50%)
(4) Some of the time
(5) None of the time
(6) Does not apply to my job

57. Do you help other people to get work done?

(1) All of the time
(2) Most of the time
(3) Half of the time (50%)
(4) Some of the time
(5) None of the time
(6) Does not apply to my job

58. Do you do the required amount of work on your job?

(1) All of the time
(2) Most of the time
(3) Half of the time (50%)
(4) Some of the time
(5) None of the time
(6) Does not apply to my job

59. Do you feel you have done what you are capable of doing?

(1) All of the time
(2) Most of the time
(3) Half of the time (50%)
(4) Some of the time
(5) None of the time
(6) Does not apply to my job

IV. Characterization of work (JOB CONTENT QUESTIONNAIRE)

Mark with an X the correct answer:

	(1) Strongly agree	**(2) Agree**	**(3) Disagree**	**(4) Strongly disagree**
60. My job requires that I learn new things				
61. My job involves a lot of repetitive work				
62. My job requires me to be creative				
63. My job allows me to make a lot of decisions on my own				
64. My job requires a high level of skill				
65. On my job, I am given a small amount of freedom to decide how I do my work				
66. I get to do a variety of things on my job				
67. I have a lot to say about what happens on my job				
68. I have an opportunity to develop my own special abilities				
69. On my job, I am constantly learning new things				
70. My job is boring				
71. On my job, I am given a lot of freedom to decide how I do my work				
72. My job requires working very fast				
73. My job requires working very hard				
74. My job requires lots of physical effort				
75. I am asked to do an excessive amount of work				
76. I have enough time to get the job done				
77. On my job I have to face conflicting demands others make				
78. My job security is good				
79. I don’t have enough time to get the job done				
80. People I work with are competent in doing their jobs				

81. People I work with take a personal interest in me				
82. People I work with are friendly				
83. People I work with are helpful in getting the job done				
84. My supervisor is concerned about the welfare of those under him				
85. My supervisor pays attention to what you are saying				
86. My supervisor is helpful in getting the job done				
87. My supervisor is successful in getting people to work together				

Mark with an X the statement that corresponds to your case

	(1) Regular and steady	**(2) Seasonal**	**(3) Frequent layoffs**	**(4) Both seasonal and frequent layoffs**
88. How steady is your work?				
	(1) I was not in that situation	**(2) A few times**	**(3) Sometimes**	**(4) Constantly**
89. During the past year, how often were you in a situation where you faced job loss or layoff?				
	(1) Not at all likely	**(2) Not too likely**	**(3) Somewhat likely**	**(4) Very likely**
90. Sometimes people permanently lose jobs they want to keep. How likely is it that during the next couple of years you will lose your present job with your employer?				

Thank you very much for participating!

Tell us about what aspects of your life you would like to improve and how you think you could achieve your goals.

Registration sheet

Name of worker: ____

Registration number: ___________________

Anthropometric and physiological indicators

Date: _____________

Weight: ________ Kg

Height without shoes: ___________cm

Sitting height: ____________cm

Waist diameter: ____________cm

Hip diameter: ___________cm

Arm circumference: ___________cm

Leg circumference: ____________cm

Folds:

Bicipital: ___________mm

Tricipital: ___________mm

Subscapular: _________mm

Transverse suprailiac: _______mm

Vertical suprailiac: _________mm

Leg: _________mm

Elbow diameter: __________cm

Knee diameter: __________cm

What kind of labor does the worker perform predominantly during his shift? (Physical activity)

____ Light _____Moderate _____Vigorous

Resting heart rate: __________

Heart rate after exercise: ________

Blood pressure: __________mm/Hg

Trunk flexion: __________cm

Hyperextension of trunk: ______cm

Sitting trunk flexion: _________cm

Sit-ups per minute: ________

Metabolic syndrome:

Glucose: _________ml/dl

Cholesterol: ________mg/dl

Triglycerides: _________mg/dl

Appendix 3

Measurements performed in the Mexican Institute of Social Security Study

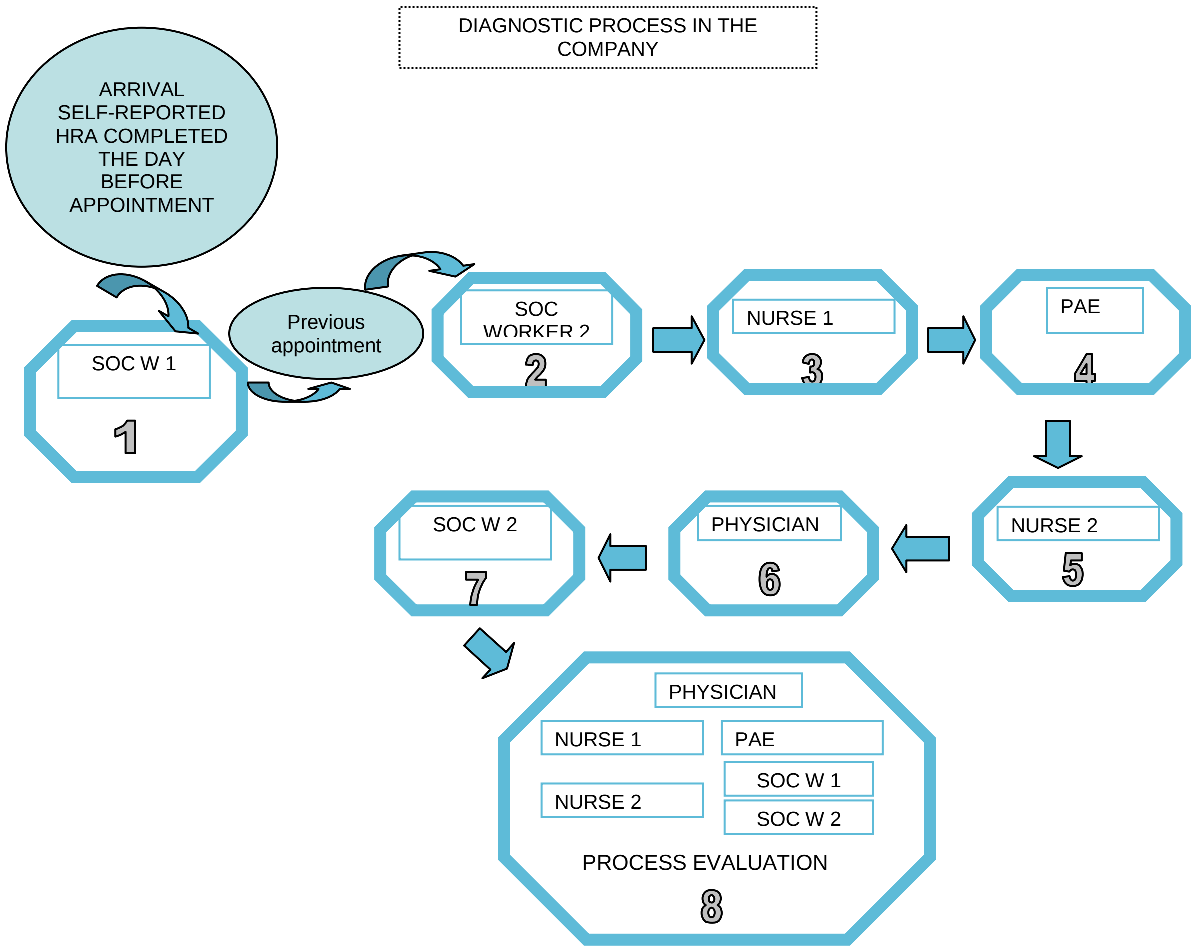
Diagnostic stations

Work stations refer to the coordinated action of the team members to perform the workers' health diagnosis. The station location was determined by the company, adjusting to the spaces given by the companies. Each station was in charge of performing the following activities:

- Questionnaire distribution and appointment setting with the workers
- Worker's reception, consent letter distribution, and brief explanation of the study's objectives.
- Registry sheet distribution (including evaluation route)
- Information to workers in case of any questions
- Referral to the nurse to take anthropometric measurements
- Height, weight, sitting height, waist and hip diameter, arm and leg circumference, elbow and knee diameter, blood pressure and heart rate measurements
- Bicipital, tricipital, subscapular, transverse and vertical suprailiac, and leg folds measurements; trunk and sitting trunk flexion, trunk hyperextension, and heart rate before and after the modified Manero's test (see below).
- Capillary measurements to determine glucose, cholesterol and triglycerides; written and printed reports of each worker's results.

- HRA (survey) data entering, transcription of the physical and anthropometric evaluation results, printing and distribution of results to workers with an explanation of their general health status, promoting the adoption of healthy behaviors and transfer to social worker.
- General orientation about nutrition, physical activity, health promotion, and addiction control groups according to the specific case. At the end of the evaluation, orientation about intervention groups and registration to different activities. If necessary, worker's referral to their family clinic for their treatment.

Diagnostic process in the work stations:



Abbreviations:

SOC W: social worker

PAE: physical activity expert

Measurements

Evaluation was performed in all workers, inside the company's facilities. A physical area of 40m2 was designated to place the material required for the test. The following material was used:

- Wood bench with two steps
- Tape measures
- Vernier
- Plicometer
- Chronometer
- Floor scales with stadiometer
- Heart rate monitor
- Sphygmomanometer
- Electronic metronome
- Computer

The material's characteristics and applications are specified in each procedure. Requested data and measurements for each worker are described below:

Weight and height: A floor scale with stadiometer was used. The measurements were taken without shoes and with the worker's usual clothes or uniform. Weight was recorded in kilograms, writing only integers, e.g. 80 and height was recorded in centimeters, e.g. 180

Waist and hip diameter: A flexible tape measure was used. The abdominal circumference was measured at the navel level or at an intermediate line between the costal border and the iliac crests.

Hip: the hip circumference was measured at the widest part of the gluteus zone.

Partial weight and body surface: these were directly calculated by the software according to the following formulas:

- Partial weight = corresponds to 74% of total body weight
- Body surface was calculated according to Du Bois formula:

$$m^2 = (\text{weight} * 0.425) * (\text{height} * 0.725) * 71.84$$

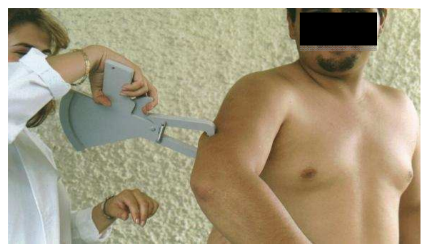
Sitting height: A fixed wooden chair was set against the wall, placing a tape measure with its zero starting point at the sitting level of the chair. The worker sat on the chair and with a ruler over his head the height in centimeters marked by the tape measure corresponding to the individual.

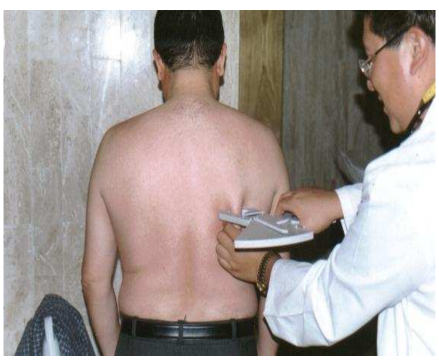
Arm circumference: Using a tape measure and placing the arm flexed at 45^{o}, the length of the arm was measured from the elbow's outer inferior border to the shoulder's outer superior border. The tape measure was placed around the arm at the middle point of that distance to measure the arm circumference in centimeters.

Leg circumference: Using a tape measure and with the worker standing, the length of the leg was measured from the ankle's outer border (peroneal outer malleolus) to the knee's outer border (femoral lateral condyle). The tape measure was placed around the leg at the middle of that distance to measure the leg circumference in centimeters.

Bicipital fold: taking as a reference the anterior line dividing the arm in two equal halves, the plicometer was placed in the middle point of such line, on the anterior surface of the brachial biceps. The skin fold was measured in millimeters.

Triceps skin fold: taking as a reference an imaginary posterior line dividing the arm in two equal halves, the plicometer was placed at the middle of such distance, over the posterior surface of the brachial triceps. The skin fold was measured in millimeters.





Subscapular fold: Taking as a reference the inferior vertex of the scapula, the measurement was taken under the immediate inferior border of the scapula. The plicometer was placed horizontally and the measurement was made in millimeters.

Transverse suprailiac fold: Taking as a reference an imaginary axillary middle line and its crossing with the upper border of the iliac crest, the plicometer was placed transversally and the measurement was taken in millimeters.

Vertical suprailiac fold: Taking as a reference the middle axillary line and its crossing with the upper border of the iliac crest, the plicometer was placed vertically and the measurement was taken in millimeters.

Foot fold: Taking as a reference an imaginary posterior middle line of the leg, the plicometer was placed half distance between the tibial and fibular malleolus. The skin fold was taken at the surface of the gastrocnemius with the plicometer in a vertical position. The measurement was taken in millimeters.

Elbow diameter: The worker was asked to flex his forearm at 45º. After the humeral epicondyles were identified, the elbow diameter was measured using the Vernier (measure taken in millimeters).

Knee diameter: With the worker seated and his knee flexed at 90^{o}, the femoral epicondyles were identified. The Vernier was used to measure the knee diameter in millimeters.

Arm muscle area: The software program calculated it automatically using the following formula, which was also used to calculate other indicators:

$$AMA = \frac{[ARMC - (TSF * \pi)]^2}{4\pi}$$

Abbreviations:

AMA = arm muscle area

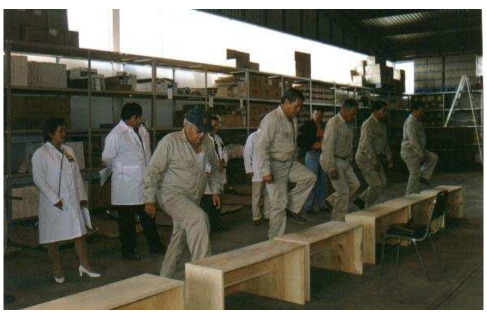
ARMC = arm circumference

TSF = triceps skin fold

Physiological data

For most of these measurements the worker actively participated, which gave to this part of the diagnosis a dynamic and motivational character because the worker himself when he performs the tests was comparing himself with the performance of his other colleagues.

Resting heart rate and blood pressure: Heart rate was measured with a monitor and auscultated with a stethoscope. This allowed to filter some workers with hypertension, murmurs, or arrhythmias, who did not participate in the exercise part of the test. Blood pressure was measured manually by two research nurses using a sphygmomanometer and following the National Health and Nutrition Examination Survey (NHANES) protocols.[150] However, only one reading was taken due to time constraints, instead of the three consecutive readings proposed by the NHANES protocol. Workers rested for about 5 minutes before the measurement, which was taken on their left arm while sitting.



Submaximum heart rate: It's the heart rate obtained when applying Manero's protocol[1] that consisted on stepping up and down an ergometric bench having the following measurements: 1 meter wide, 50 centimeters high, and 70 centimeters deep. The steps were 25 centimeters high by 35 centimeters wide. The frequency of each ascent was calculated in 90 for active workers and 84 for sedentary workers. One minute training was given to workers before the exercise to explain how to step up the bench (six steps to go up and six to come back down). The test lasted 5 minutes guided by an electronic metronome or musical rhythm that marks the frequency of going up and down. Immediately after the 5 minute exercise the heart rate was taken by direct auscultation in the cardiac area during the first 15 seconds. This frequency was multiplied by 4 to obtain the sub-maximum heart rate. Another method was to read the heart rate

[1] Manero R et al. "Metodos practicos para estimar la capacidad física del trabajo". *Bol. sanit. Panam.* 100: 1986, pp. 170-180

monitor that was applied to the worker before the exercise (the strap was firmly adhered to the worker's thorax with the receptor close to the xiphoid process and the complementary watch around the wrist. Their correct functioning was verified. The designed software made the calculations to obtain the oxygen uptake, applied the correction factor by age and made group comparisons in Manero's nomograph, giving automatically as a result the oxygen uptake in liters per minute.

Trunk flexion: With the worker standing and on top of the ergometric bench, a ruler was adhered to the front of the bench. Its basal line or zero was located corresponding to the bench platform. The worker was asked to flex the trunk without bending the knees and the distance between the basal line or zero and the border of the worker's fingers. The units can be either positive or negative, i.e. if the worker did not reach the zero the units were considered negative and if the finger point went over the basal line, the units were considered positive. The measurements are expressed in centimeters.

Sitting flexion of the trunk: The worker seated on a mat and was asked to place his feet on a wood bench and perform a trunk flexion trying to reach the tip of his feet with the tip of his hands. The measurement was made taking as a basal line or zero the support point to the plantar region, taking as values the distance existing between this line and the hands' fingertips. The results were negative if the basal line was not reached and positive if it was exceeded.

Trunk hyper-extension: the worker lied down in a prone position with the back of his (her) hands on his (her) gluteus, the heels together and the legs stretched. He (she) was asked to raise slowly the head, trying to move away from the floor as much as possible. The distance between the chin and the floor was recorded in centimeters.

Sit-ups per minute: Lying in a supine position, the worker was asked to make complete sit-ups for a minute. Only complete sit-ups were recorded in absolute units. The designed software automatically identified the "s factor" and calculated the "w factor" using the following formula: W = partial weight * (s factor * Nº of sit-ups). These elements were used later on to calculate the general strength index.

Formulas:

The program automatically used the following formulas to calculate the results of the general strength and flexibility indexes:

General strength index:

GSI = W/muscular mass

W = partial weight * (s factor * nº of sit-ups)

Muscle mass = height in cm [0.0125 + (0.0034*AMA)]

$$AMA = \frac{[ARMC - (TSF * \pi)]^2}{4\pi}$$

General flexibility index:

$$GFI = (\sum 3F)(BS)$$

Σ3F= sum of trunk flexion, sitting trunk flexion, and trunk hyperextension.

BS = body surface

The program grouped the data and made the necessary comparisons with Manero's nomograph to calculate oxygen uptake. It automatically determined the percentage of fat, muscle, and bone with Von Dublein methods modified by Rocha, Durnin and it compared them using Durnin and Womersley's table.[2]

Standardizing mathematical calculations allowed a uniform and systematic method that avoided errors in the manual calculations and mainly optimized the time used in each evaluation. Its structure allowed making progressive adjustments to the formulas and even including in the future other procedures proposed by different authors.

[2] I.M.S.S, 1990 Manual to determine anthropometric measurements when evaluating positive health indicators

Appendix 4

Correlation of JCQ components with health outcomes

Correlation matrix between job demands items and health outcomes

	Systolic blood pressure	Diastolic blood pressure	Body Mass Index	Waist Circumference	Waist-Hip Ratio
fast	-0.04	-0.03	0.00	0.00	0.00
hard	-0.05*	-0.06*	0.00	0.00	-0.02
ex_wk	-0.01	0.03	-0.05*	-0.04*	-0.02
en_tm	0.01	0.02	-0.02	-0.02	-0.02
c_dem	0.01	0.00	-0.05*	-0.02	-0.01
jd	-0.04	-0.05*	0.03	0.02	0.00
phys	-0.01	-0.04*	-0.02	-0.02	-0.01

* $p < 0.05$

Abbreviations:
fast: My job requires working very fast (JCQ item #10), hard: My job requires working very hard (JCQ item #11), ex_wk: I am NOT asked to do an excessive amount of work (JCQ item #13) , en_tm: I have enough time to get the job done (JCQ item #14), c_dem: I am free from conflicting demands others make (JCQ item #15), jd: standard 5-item psychological job demands scale, phys: My job requires lots of physical effort (JCQ item #12)

When comparing each of the job demands items with health outcomes we found a small but statistically significant negative correlation between the "working hard" item and both systolic and diastolic blood pressure (-0.05 and -0.06, respectively). The "physical effort" item and the overall job demands scale were negatively correlated with diastolic blood pressure (-0.04 and -0.05, respectively).

Interestingly, we found statistically significant negative correlations between body mass index, waist circumference, and item #13 ("I am not asked to do an excessive amount of work") and between body mass index and item #15 (“I am free from conflicting demands others make”). These correlations indicate that excessive amount of work and conflicting demands can increase the risk for body mass index and waist circumference-based obesity and supports Choi et al.’s recommendation to look at the item and scale-level analysis with the psychological job demand scale in relation to health outcomes.[236]

Correlation matrix between job control items and health outcomes

	Systolic blood pressure	Diastolic blood pressure	Body Mass Index	Waist Circumference	Waist-Hip Ratio
learn	0.0136	0.0524*	-0.0141	0.0037	-0.0070
repet	-0.0069	-0.0053	-0.013*	-0.0379*	-0.0017*
creat	0.0310	0.0293	0.0578*	0.0773*	0.0578*
decis	0.0205	0.0562*	0.068*	0.0738*	0.0450*
skill	0.0167	0.0283	0.0399	0.0622*	0.0558*
f_dec	0.0563*	0.0616*	0.0539*	0.0461*	0.0421*
vary	0.0283	0.0382	0.0210	0.0274	0.0140
say	0.0416*	0.0559*	0.0266	0.0500*	0.0546*
d_ab	0.0283	0.0651*	0.0240	0.0316	0.0178

* $p < 0.05$

Abbreviations:
JCQ control items #1-9: learn: my job requires that I learn new things, repet: my job involves a lot of repetitive work, creat: my job requires me to be creative, decis: my job allows me to make a lot of decisions on my own, skill: my job requires a high level of skill, f_dec: on my job, I am given a lot of freedom to decide how I do my work, vary: I get to do a variety of things on my job, say: I have a lot to say about what happens on my job, d_ab: I have an opportunity to develop my own special abilities

When correlating the job control items with health outcomes, we found many small, and statistically significant positive associations with the exception of the “repetitive” item (#2) that was negatively and significantly correlated with weight outcomes.

Appendix 5

JCQ factor analysis in the different companies with a fixed number of factors (5)

Exploratory factor analysis (principal-component extraction method) with varimax rotation in the public health company. Mexican Institute of Social Security Study 2009 (n = 123).[1]

Variable	Factor 1 DL	Factor 2 JD	Factor 3 SS	Factor 4 CWS	Factor 5 JI
learn	**0.4524**	**0.4533**	-0.0900	0.1202	0.1607
repet	-0.0931	-0.0286	**-0.7062**	0.1220	-0.0154
creat	**0.7034**	0.1667	0.1300	-0.0656	0.1930
decis	**0.8043**	-0.1366	0.0468	0.0312	-0.1177
skill	**0.6142**	**0.3666**	0.1804	0.1122	0.0424
f_dec	**0.6440**	-0.0894	0.0671	0.1618	-0.1336
vary	**0.6335**	0.0983	0.2784	0.0788	-0.0359
say	**0.7840**	-0.0531	0.1759	0.1410	-0.0675
d_ab	**0.7613**	-0.0638	-0.0643	0.2200	0.0302
fast	0.0327	**0.7344**	-0.0228	0.1715	-0.0255
hard	0.1647	**0.6312**	0.0857	-0.1326	0.0097
phys	0.0168	**0.3733**	**-0.3624**	0.0958	**-0.4123**
ex_wk	0.1303	**-0.6324**	0.2215	-0.0077	0.0252
en_tm	**0.3215**	**-0.4714**	-0.2118	0.2492	-0.2513
c_dem	0.1830	-0.1894	**0.5996**	0.2073	-0.1426
secur	0.2486	-0.2224	0.2339	0.2871	-0.1489
comp	0.1046	0.0363	0.0672	**0.7436**	0.0276
p_int	0.0217	0.1176	-0.0872	**0.6195**	-0.0362
frnd	0.0359	-0.0878	-0.1767	**0.8226**	0.0685
hlpjd	0.0625	-0.0759	-0.0153	**0.8180**	0.0599
s_con	0.1914	0.0094	**0.5358**	**0.6407**	-0.0533
s_attn	**0.3130**	-0.0782	**0.4873**	**0.6196**	0.0258
s_hlp	0.2162	0.0741	**0.4847**	**0.7039**	0.0215
s_wkt	0.2778	0.0849	**0.5190**	**0.6379**	-0.0605
stead1	0.0363	-0.0061	-0.1610	-0.0052	**0.7766**
layof	-0.0446	0.0143	-0.0838	0.0790	**0.7250**
lose	-0.0344	0.0918	0.1033	0.0233	**0.7785**

[1]Shaded values represent loadings > .3
Abbreviations: SD = skill discretion, DMA = decision-making authority, PD = Psychological demands, PhsD = Physical Demands, JI = Job insecurity, CWS = Coworker support, SS = Supervisor support, DL = decision latitude, JD = Job demands (psychological/physical). For abbreviations on JCQ items, see the end of Appendix 5.

In the public health company, the factor pattern followed Karasek's JCQ's original pattern, *i.e.*, five distinctive factors were observed, including job decision latitude, psychological demands, supervisor and coworker support, and job insecurity. The "repet" item did not load on the decision latitude factor but it negatively loaded on the supervisor support factor. In this company, repetitive tasks may be associated with supervisor demands. The "phys" item loaded on the psychological demands factor. Instead of loading on psychological demands, the "c_dem" item was included in the supervisor support factor (in this case, being free from conflicting demands seemed to be associated with supervisor support). The "secur" item did not load on any of the factors.

Exploratory factor analysis (principal-component extraction method) with varimax rotation in the airline company. Mexican Institute of Social Security Study 2009 (n = 703).[1]

Variable	Factor 1 DL	Factor 2 JD	Factor 3 SS	Factor 4 CWS	Factor5 JI
learn	**0.4543**	0.1381	0.1933	-0.0240	-0.0213
repet	-0.2482	0.1709	-0.0938	0.2210	-0.2561
creat	**0.6628**	0.1095	-0.0127	0.0458	0.0146
decis	**0.7006**	0.0174	-0.0474	0.1197	0.0143
skill	**0.6043**	0.2616	0.0905	0.1037	-0.0941
f_dec	**0.5215**	-0.0651	0.0994	0.2397	-0.1021
vary	**0.6670**	0.0317	0.1337	-0.0485	0.0362
say	**0.6791**	-0.0390	0.1923	0.1945	-0.0965
d_ab	**0.7181**	-0.0769	0.2252	0.2240	-0.0261
fast	0.1942	**0.6757**	-0.0156	0.1524	0.0385
hard	0.1989	**0.7029**	0.0268	0.0930	0.0146
phys	0.1146	**0.3326**	-0.1339	-0.1443	**-0.3043**
ex_wk	-0.0100	**-0.7443**	0.1571	0.0231	-0.0504
en_tm	0.1449	**-0.5127**	0.0989	0.1458	-0.1973
c_dem	0.0458	**-0.3484**	**0.4035**	0.1439	-0.0374
secur	0.2578	-0.2388	0.1071	**0.4430**	-0.0930
comp	0.1257	-0.0748	0.1656	**0.6275**	0.1633
p_int	0.1028	0.1324	0.1760	**0.7056**	-0.0425
frnd	0.1125	0.0459	0.1808	**0.8032**	0.0160
hlpjd	0.1115	-0.0011	0.2890	**0.7242**	-0.0354
s_con	0.1604	-0.1060	**0.8598**	0.2064	-0.0479
s_attn	0.2041	-0.0691	**0.8328**	0.2145	-0.0462
s_hlp	0.1492	-0.0618	**0.8569**	0.2220	-0.0329
s_wkt	0.2000	-0.0753	**0.8552**	0.2124	-0.0621
stead1	-0.1123	0.0909	-0.0314	0.0447	**0.6265**
layof	0.0079	0.1204	-0.0322	-0.1105	**0.6253**
lose	-0.0139	0.0233	-0.1378	0.0808	**0.6905**

[1]Shaded values represent loadings > .3
Abbreviations: SD = skill discretion, DMA = decision-making authority, PD = Psychological demands, PhsD = Physical Demands, JI = Job insecurity, CWS = Coworker support, SS = Supervisor support, DL = decision latitude, JD = Job demands (psychological/physical). For abbreviations on JCQ items, see the end of Appendix 5.

In the airline company, we observed five factors corresponding to Karasek's JCQ's original pattern: job decision latitude, psychological demands, supervisor and coworker support, and job insecurity. The "repet" item neither loaded on the decision latitude factor nor on any of the other factors. The "phys" item loaded on the psychological demands factor. The "c_dem" item loaded on the psychological demands factor; however, it showed a higher loading in the supervisor support factor (as mentioned previously, being free from conflicting demands seemed to be associated with supervisor support). Finally, the "secur" item loaded on the coworker support factor, which may indicate that in this company, workers perceived coworker support as an element of job security.

Exploratory factor analysis (principal-component extraction method) with varimax rotation in the pharmaceutical company. Mexican Institute of Social Security Study 2009 (n = 185).[1]

Variable	Factor 1 DL	Factor 2 JD	Factor 3 SS	Factor 4 CWS	Factor 5 JI
learn	**0.4482**	0.2471	0.0678	0.0085	0.0117
repet	**-0.3466**	**0.4293**	0.0392	0.2786	0.2558
creat	**0.6647**	0.0872	0.2410	-0.1543	0.0587
decis	**0.6233**	**-0.3157**	0.1194	-0.0387	-0.0146
skill	**0.4288**	**0.3466**	0.0985	0.1048	0.0615
f_dec	**0.5920**	-0.1089	0.0161	0.2773	-0.0128
vary	**0.5301**	0.0830	0.0586	0.0841	-0.1156
say	**0.7169**	0.0333	0.1464	0.0654	0.1337
d_ab	**0.6697**	0.1233	0.0353	**0.3463**	0.0494
fast	0.1117	**0.7121**	-0.0438	0.0009	0.0886
hard	**0.3844**	**0.6735**	0.1725	-0.0397	0.0175
phys	-0.0631	**0.4673**	-0.1027	0.1683	-0.2618
ex_wk	-0.0517	**-0.6526**	0.0975	0.2785	0.0740
en_tm	-0.0156	-0.2283	0.0897	**0.6533**	0.1728
c_dem	0.0083	**-0.3299**	0.1571	0.2764	-0.0767
secur	0.1500	-0.2609	0.1095	**0.4856**	-0.0418
comp	0.2055	0.1866	0.1251	**0.6540**	-0.0096
p_int	0.2630	0.0075	0.2514	**0.3244**	**-0.3186**
frnd	0.1168	0.0575	0.1928	**0.6098**	-0.1850
hlpjd	-0.0223	0.0746	0.2656	**0.6961**	-0.1307
s_con	0.1340	-0.0459	**0.8424**	0.1522	-0.1277
s_attn	0.2156	0.0149	**0.8438**	0.2162	-0.0359
s_hlp	0.1266	-0.0649	**0.8181**	0.2422	0.0596
s_wkt	0.1413	-0.0806	**0.8577**	0.1793	-0.0026
stead1	0.0798	0.0783	0.0026	0.0287	**0.5072**
layof	0.0065	-0.2317	-0.0306	-0.1618	**0.5423**
lose	-0.0122	0.0988	-0.0488	-0.0130	**0.7861**

[1]Shaded values represent loadings > .3
Abbreviations: SD = skill discretion, DMA = decision-making authority, PD = Psychological demands, PhsD = Physical Demands, JI = Job insecurity, CWS = Coworker support, SS = Supervisor support, DL = decision latitude, JD = Job demands (psychological/physical). For abbreviations on JCQ items, see the end of Appendix 5.

The pharmaceutical company also showed five distinctive factors according to the original JCQ factor pattern including job decision latitude, psychological demands, supervisor and coworker support, and job insecurity. The “repet” item loaded negatively on the decision latitude factor but it showed a stronger, positive loading on the job demands factor. The “decis” and “skill” items also loaded on the job demands factor but they had stronger loadings on the corresponding decision latitude factor. In this company, repetitive tasks may be associated with job demands. The “phys” item loaded on the psychological demands factor. Instead of loading on psychological demands, the “en_tm” item was included in the coworker support factor (in this case, having enough time to get the job done seemed to be associated with coworker support). The “secur” item loaded on coworker support, which may indicate that in this company, workers having coworker support perceived more job security.

Exploratory factor analysis (principal-component extraction method) with varimax rotation in the tools manufacture company. Mexican Institute of Social Security Study 2009 (n = 161).[1]

Variable	Factor 1 DL	Factor 2 JD	Factor 3 SS	Factor 4 CWS	Factor 5 JI
learn	**0.4778**	0.1250	0.0379	0.0914	-0.0038
repet	-0.0200	0.2723	0.1101	0.0926	**0.4663**
creat	**0.5639**	0.2003	**0.3110**	-0.2306	0.1727
decis	**0.6624**	-0.1432	0.0799	0.0855	-0.0380
skill	**0.6283**	0.1479	0.2079	-0.1989	0.1236
f_dec	**0.6168**	-0.1156	-0.0250	**0.4278**	0.2479
vary	**0.6561**	0.0458	0.1246	0.1502	-0.0624
say	**0.6502**	-0.0448	0.2123	**0.3059**	-0.0917
d_ab	**0.7083**	-0.0879	0.0453	**0.3096**	0.0658
fast	**0.4348**	**0.4927**	0.0452	-0.1279	0.0532
hard	0.1669	**0.6975**	0.1328	-0.1570	-0.0903
phys	0.0345	**0.4806**	-0.1248	0.1745	-0.0803
ex_wk	0.0586	**-0.6897**	0.1286	-0.0547	0.0661
en_tm	0.2405	-0.2441	-0.0510	**0.4082**	0.1558
c_dem	0.0506	**-0.6110**	-0.0594	0.0145	-0.0386
secur	**0.3487**	-0.1520	0.2295	**0.3744**	**0.4387**
comp	0.0673	0.0587	-0.0796	**0.6938**	0.2938
p_int	0.0803	0.1117	0.2866	**0.6526**	-0.2402
frnd	0.2377	-0.0255	**0.3557**	**0.5738**	0.0891
hlpjd	0.0796	0.0864	**0.3025**	**0.7138**	0.0507
s_con	0.1962	0.0809	**0.6978**	**0.3715**	0.0848
s_attn	0.1845	-0.0604	**0.8113**	0.0879	0.2167
s_hlp	0.1624	-0.0733	**0.8451**	0.1130	0.1267
s_wkt	0.1218	-0.0126	**0.8890**	0.0950	-0.0414
stead1	-0.0282	0.2002	0.1274	-0.1104	**-0.5878**
layof	0.0449	-0.0152	-0.1645	-0.0206	**-0.6189**
lose	-0.1149	0.2764	-0.1430	0.0246	**-0.4059**

[1]Shaded values represent loadings > .3

Abbreviations: SD = skill discretion, DMA = decision-making authority, PD = Psychological demands, PhsD = Physical Demands, JI = Job insecurity, CWS = Coworker support, SS = Supervisor support, DL = decision latitude, JD = Job demands (psychological/physical). For abbreviations on JCQ items, see the end of Appendix 5.

In the tools manufacture company, the factor pattern followed Karasek's JCQ's original pattern, *i.e.*, five distinctive factors were observed, including job decision latitude, psychological demands, supervisor and coworker support, and job insecurity. The "repet" item loaded on the job insecurity factor, which may indicate that for workers in this company, having a job involving a lot of repetitive work was associated with job insecurity. The items "creat," "f_dec," "say," and "d_ab" loaded on the supervisor and coworker support factors but they had higher loadings on their corresponding decision latitude factor. The "phys" item loaded on the psychological demands factor. The "en_tm" item loaded in the coworker support factor (in this company, having enough time to get the job done seemed to be associated with coworker support). The item "secur" loaded on the decision latitude and coworker support factors but showed a higher loading on the job insecurity factor. However, the latter was in an opposite direction than expected.

Exploratory factor analysis (principal-component extraction method) with varimax rotation in the cooking utensils manufacture company. Mexican Institute of Social Security Study 2009 (n = 108).[1]

Variable	Factor 1 DL	Factor 2 JD	Factor 3 SS	Factor 4 CWS	Factor 5 JI
learn	**0.3119**	-0.0468	**0.3311**	-0.1435	0.1163
repet	0.1876	0.1978	**0.4124**	-0.1332	0.2222
creat	**0.5979**	0.1025	0.2276	-0.0207	-0.0942
decis	**0.6218**	0.0977	0.1443	-0.0957	0.0769
skill	**0.5904**	0.1705	0.1200	-0.0397	**0.3543**
f_dec	**0.5080**	0.1842	0.1656	0.2146	0.2384
vary	**0.5249**	-0.0087	-0.0563	0.1638	-0.2122
say	**0.5063**	0.0621	**0.4383**	0.0995	-0.0564
d_ab	**0.6622**	-0.0369	0.1107	0.1175	0.0951
fast	0.2006	**0.6597**	-0.0277	-0.1793	0.1879
hard	0.1280	**0.7905**	0.0474	-0.0641	-0.0915
phys	-0.0253	**0.6720**	0.0085	0.0565	0.0765
ex_wk	-0.0662	**-0.7134**	0.0526	**-0.3445**	-0.0083
en_tm	**0.3096**	0.0507	**0.3112**	0.1527	**0.5258**
c_dem	0.0525	**-0.5913**	-0.0061	-0.0856	-0.0712
secur	**0.3157**	0.2097	**0.3929**	-0.0754	**-0.3850**
comp	0.1955	-0.0532	**0.5317**	0.2565	0.2895
p_int	0.0748	0.1841	-0.0053	**0.7769**	-0.0776
frnd	0.0264	-0.0746	0.1398	**0.8372**	0.0345
hlpjd	0.0944	-0.0445	**0.4019**	**0.7260**	0.1223
s_con	0.0646	0.0810	**0.7844**	0.0012	-0.0072
s_attn	0.1815	-0.1398	**0.7736**	0.0637	0.0435
s_hlp	0.0811	0.1297	**0.8136**	0.1931	0.0391
s_wkt	0.1512	-0.0255	**0.7788**	0.2918	0.0255
stead1	-0.0509	-0.2524	-0.0495	0.0329	0.0306
layof	0.0412	0.0484	-0.0457	0.0266	**-0.7711**
lose	-0.0601	-0.1554	-0.0481	0.0096	**-0.6537**

[1]Shaded values represent loadings > .3
Abbreviations: SD = skill discretion, DMA = decision-making authority, PD = Psychological demands, PhsD = Physical Demands, JI = Job insecurity, CWS = Coworker support, SS = Supervisor support, DL = decision latitude, JD = Job demands (psychological/physical). For abbreviations on JCQ items, see the end of Appendix 5.

The cooking utensils manufacture company showed a factor pattern similar to Karasek's JCQ; *i.e.*, five distinctive factors were observed, including job decision latitude, psychological demands, supervisor and coworker support, and job insecurity. The "learn" and "repet" items loaded on the supervisor support factor. In this company, learning new things and repetitive tasks may be associated with supervisor demands. The "skill" and "say" items loaded on the job insecurity and supervisor support factors, respectively, but their higher loadings were on the decision latitude factor, where they belonged. The "phys" item loaded on the psychological demands factor. Instead of loading on psychological demands, the "en_tm" item was included in the decision latitude and supervisor support factors but it had the highest loading on the job insecurity factor. The "secur" item negatively loaded on the job insecurity factor as expected but it showed a slightly higher loading on the supervisor support factor which may indicate that in this company, workers may link supervisor support with job security. Finally, the "stead1" item did not load on any of the factors.

Exploratory factor analysis (principal-component extraction method) with varimax rotation in the plastic factory. Mexican Institute of Social Security Study 2009 (n = 95).[1]

Variable	Factor 1 DL	Factor 2 JD	Factor 3 SS	Factor 4 CWS	Factor5
learn	**0.5858**	0.0138	0.0271	0.0236	0.1338
repet	**0.6207**	-0.1332	0.1136	-0.0033	0.0466
creat	**0.4486**	0.1254	-0.0618	0.0455	**0.4045**
decis	**0.4045**	0.0453	-0.1460	**0.3909**	**0.3845**
skill	0.1774	0.0354	0.0206	**0.3967**	**0.7075**
f_dec	**0.3708**	-0.1476	0.1350	**0.6622**	0.0169
vary	**0.4422**	0.1577	0.0402	**0.5124**	0.0579
say	**0.5500**	-0.0132	**0.3962**	0.2389	0.1832
d_ab	**0.4882**	0.0600	**0.4438**	0.2890	0.2244
fast	0.1985	0.2484	0.0094	-0.0206	**0.7115**
hard	0.2130	**0.5501**	0.0025	-0.0746	**0.5213**
phys	0.0330	**0.6285**	0.0649	0.0283	0.2460
ex_wk	0.2534	**-0.6872**	-0.0093	-0.0740	-0.1241
en_tm	0.2436	-0.2230	0.2650	**0.5937**	-0.1085
c_dem	-0.0812	**-0.7205**	-0.0206	0.0044	0.0343
secur	0.0081	-0.0665	**0.5471**	**0.5429**	0.1221
comp	0.0749	-0.0275	0.0771	**0.7509**	-0.0391
p_int	0.0148	**0.3011**	0.2597	**0.4090**	-0.2280
frnd	-0.1223	0.1806	**0.4116**	**0.6230**	0.0726
hlpjd	-0.1109	0.0481	0.1911	**0.6169**	0.2200
s_con	0.1734	0.1014	**0.8063**	0.2043	0.0807
s_attn	0.0698	-0.1062	**0.8631**	0.1867	0.0063
s_hlp	-0.0156	-0.1136	**0.8775**	0.0829	-0.0221
s_wkt	0.0342	0.0139	**0.8986**	0.1401	-0.1049
stead1	0.0547	**0.3534**	-0.0888	0.1881	**-0.3675**
layof	**0.4956**	0.2233	-0.1724	0.0625	**-0.3882**
lose	0.0393	**0.4441**	-0.2553	-0.1525	-0.0560

[1]Shaded values represent loadings > .3

Abbreviations: SD = skill discretion, DMA = decision-making authority, PD = Psychological demands, PhsD = Physical Demands, JI = Job insecurity, CWS = Coworker support, SS = Supervisor support, DL = decision latitude, JD = Job demands (psychological/physical). For abbreviations on JCQ items, see the end of Appendix 5.

Contrary to the other companies, the plastic factory only showed four distinctive factors corresponding to Karasek's JCQ's original factor pattern, including decision latitude, psychological demands, and supervisor and coworker support. The last factor was composed of mixed items from the decision latitude, psychological job demands, and job insecurity scales. The "f_dec" and "vary" items loaded on the decision latitude factor but they showed higher loadings on the coworker support factor. The "physical demands item" loaded on the psychological demands factor. Instead of loading on psychological demands, the "en_tm" item was included in the coworker support factor (in this case, having enough time to get the job done seemed to be associated with coworker support). The "secur" item loaded on the coworker and supervisor support factors, which may reflect a higher sense of job security when coworker and supervisor support are present. Items from the job insecurity scale loaded on the decision latitude and psychological demands factors.

Exploratory factor analysis (principal-component extraction method) with varimax rotation in the printing company. Mexican Institute of Social Security Study 2009 (n = 627).[1]

Variable	Factor 1 DL	Factor 2 JD	Factor 3 SS	Factor4 CWS	Factor5 JI
learn	**0.5070**	0.2015	0.1290	0.0566	-0.0240
repet	0.0805	0.2429	-0.0712	0.0464	**-0.3634**
creat	**0.6136**	0.1875	0.0834	0.0103	-0.0022
decis	**0.7049**	-0.2072	-0.1216	0.1376	-0.0860
skill	**0.5136**	**0.3907**	0.1303	0.0802	0.0520
f_dec	**0.5628**	-0.0140	0.2266	0.1707	-0.1153
vary	**0.3563**	0.2835	**0.3606**	-0.0953	0.1057
say	**0.5848**	-0.1173	**0.3196**	0.1949	-0.0129
d_ab	**0.6330**	-0.1015	**0.3374**	0.0967	-0.0566
fast	0.2214	**0.6261**	0.0366	0.1616	-0.0422
hard	0.0899	**0.7405**	0.0859	0.0762	-0.0346
phys	-0.0792	**0.7197**	0.0368	0.0097	-0.0308
ex_wk	0.0520	**-0.5957**	0.2917	-0.0482	-0.0671
en_tm	0.1613	**0.3068**	**0.3674**	0.1142	-0.2748
c_dem	0.0192	**-0.4758**	0.1220	-0.0719	-0.0958
secur	0.1110	0.0729	**0.3717**	0.2644	-0.2187
comp	0.1314	0.0995	0.0599	**0.6177**	0.0271
p_int	0.1466	0.0317	0.0865	**0.7065**	-0.0260
frnd	0.1063	0.1472	0.2354	**0.7231**	-0.0295
hlpjd	0.0271	0.1139	**0.3582**	**0.6698**	0.1006
s_con	0.2133	-0.1096	**0.7740**	0.2323	0.0087
s_attn	0.2470	-0.1481	**0.7478**	0.1680	0.0032
s_hlp	0.1312	-0.0544	**0.7797**	0.1456	-0.0166
s_wkt	0.1465	-0.0239	**0.8530**	0.1526	0.0069
stead1	-0.1217	0.0961	0.1318	-0.0183	**0.5613**
layof	0.0225	0.1138	-0.0663	0.0001	**0.6699**
lose	0.0675	-0.0012	-0.2185	0.1165	**0.5857**

[1]Shaded values represent loadings > .3
Abbreviations: SD = skill discretion, DMA = decision-making authority, PD = Psychological demands, PhsD = Physical Demands, JI = Job insecurity, CWS = Coworker support, SS = Supervisor support, DL = decision latitude, JD = Job demands (psychological/physical). For abbreviations on JCQ items, see the end of Appendix 5.

In the printing company, we found a factor pattern similar to Karasek's JCQ's original pattern, *i.e.*, five distinctive factors were observed, including decision latitude, psychological demands, supervisor and coworker support, and job insecurity. The "repet" item negatively loaded on the job insecurity factor. The "phys" item loaded on the psychological demands factor. Instead of loading on psychological demands, the "secur" item was included in the supervisor support factor (as in other companies in this study, supervisor support seemed to be associated with job security).

Exploratory factor analysis (principal-component extraction method) with varimax rotation in the tire manufacture company. Mexican Institute of Social Security Study 2009 (n = 328).[1]

Variable	Factor 1 DL	Factor 2 JD	Factor 3 SS	Factor 4 CWS	Factor 5 JI
learn	**0.5920**	0.1777	-0.0361	0.1159	0.2059
repet	-0.1288	**0.4113**	-0.0689	0.2099	0.2788
creat	**0.7783**	0.1533	-0.0500	0.0840	0.0024
decis	**0.6513**	-0.0080	0.1479	0.0497	-0.1311
skill	**0.4434**	**0.5549**	0.0861	0.0967	0.0785
f_dec	**0.4129**	0.0567	**0.3788**	0.2104	-0.0035
vary	**0.6343**	-0.0354	0.0447	0.1837	-0.0194
say	**0.6332**	-0.1131	**0.4050**	-0.0003	-0.0228
d_ab	**0.6769**	0.0390	**0.3653**	0.0350	0.0248
fast	0.0846	**0.7317**	0.0261	0.0166	-0.1381
hard	0.1328	**0.8229**	0.0128	-0.0178	-0.0783
phys	-0.0988	**0.7625**	-0.0596	0.0862	0.1348
ex_wk	-0.0176	**-0.5486**	0.2038	-0.0526	**0.3263**
en_tm	0.0061	0.2243	0.2121	0.1412	**0.4743**
c_dem	-0.1925	-0.2034	**0.5122**	-0.1055	0.1203
secur	0.2661	0.0286	**0.4771**	0.0554	**0.3253**
comp	0.0424	0.1006	0.0736	**0.7431**	0.0530
p_int	0.2103	-0.0358	0.2080	**0.5873**	-0.0871
frnd	0.0924	0.0450	0.1243	**0.8028**	0.0069
hlpjd	0.1277	0.1330	0.1056	**0.7140**	0.1180
s_con	0.1203	-0.0356	**0.8209**	0.2068	0.0423
s_attn	0.1974	-0.0070	**0.7678**	0.1374	0.0525
s_hlp	0.1432	0.0316	**0.7800**	0.1744	0.0239
s_wkt	0.1356	-0.0213	**0.8400**	0.1207	-0.0114
stead1	-0.0636	0.0984	-0.0484	0.0045	**-0.4686**
layof	0.1375	0.0142	0.0186	0.0117	**-0.6507**
lose	**-0.3562**	0.2012	-0.0331	0.0136	**-0.4083**

[1]Shaded values represent loadings > .3
Abbreviations: SD = skill discretion, DMA = decision-making authority, PD = Psychological demands, PhsD = Physical Demands, JI = Job insecurity, CWS = Coworker support, SS = Supervisor support, DL = decision latitude, JD = Job demands (psychological/physical). For abbreviations on JCQ items, see the end of Appendix 5.

In the tire manufacture company, five distinctive factors were observed corresponding to the original JCQ's factor pattern, including decision latitude, psychological demands, supervisor and coworker support, and job insecurity. As with other companies, the "repet" item did not load on the decision latitude factor. Instead, it loaded on psychological demands factor. The "skill" item loaded on the decision latitude factor, as expected but it showed a higher loading on the physical demands factor. The items "f_dec," "say," and "d_ab" loaded on the supervisor support factor but their higher loadings were on the decision latitude factor, as expected. The "phys" item loaded on the psychological demands factor. Instead of loading on psychological demands, the "en_tm" and "c_dem" items loaded on the job insecurity and the supervisor support factors, respectively. The "secur" item was included on the job insecurity factor but it showed a higher loading on the supervisor support factor.

Abbreviations:

learn (item1-SD)	My job requires that I learn new things
repet (item2-SD)	My job involves a lot of repetitive work
creat (item3-SD)	My job requires me to be creative
decis (item4-DMA)	My job allows me to make a lot of decisions on my own
skill (item5-SD)	My job requires a high level of skill
f_dec (item6-DMA)	On my job, I am given a lot of freedom to decide how I do my work
vary (item7-JSD)	I get to do a variety of things on my job
say (item8-DMA)	I have a lot to say about what happens on my job
d_ab (item9-SD)	I have an opportunity to develop my own special abilities
fast (item10-PD)	My job requires working very fast
hard (item11-PD)	My job requires working very hard
phys (item12-PhsD)	My job requires lots of physical effort
ex_wk (item13-PD)	I am NOT asked to do an excessive amount of work
en_tm (item14-PD)	I have enough time to get the job done
c_dem (item15-PD)	I am free from conflicting demands others make
secur (item16-JI)	My job security is good
comp (item17-CWS)	People I work with are competent in doing their jobs
p_int (item18-CWS)	People I work with take a personal interest in me
frnd (item19-CWS)	People I work with are friendly
hlpjd (item20-CWS)	People I work with are helpful in getting the job done
s_con (item21-SS)	My supervisor is concerned about the welfare of those under him
s_attn (item22-SS)	My supervisor pays attention to what you are saying
s_hlp (item23-SS)	My supervisor is helpful in getting the job done
s_wkt (item24-SS)	My supervisor is successful in getting people to work together
stead1 (item25-JI)	How steady is your work?
layof (item26-JI)	During the past year, how often were you in a situation where you faced job loss?
lose (item27-JI)	How likely is it that during the next couple of years you will lose your present job with your employer?

SD = Skill discretion
DMA = decision-making authority
PD = Psychological demands
PhsD = Physical Demands
SS = Supervisor support
CWS = Coworker support
JI = Job insecurity.

Appendix 6

Job content questionnaire[72] (selected items)

	(1) Strongly disagree	(2) Disagree	(3) Agree	(4) Strongly agree
1. My job requires that I learn new things				
2. My job involves a lot of repetitive work				
3. My job requires me to be creative				
4. My job allows me to make a lot of decisions on my own				
5. My job requires a high level of skill				
6. On my job, I am given a lot of freedom to decide how I do my work				
7. I get to do a variety of things on my job				
8. I have a lot to say about what happens on my job				
9. I have an opportunity to develop my own special abilities				
10. My job requires working very fast				
11. My job requires working very hard				
12. My job requires lots of physical effort				
13. I am not asked to do an excessive amount of work				
14. I have enough time to get the job done				
15. I am free from conflicting demands others make				
16. My job security is good				
17. People I work with are competent in doing their jobs				
18. People I work with take a personal interest in me				
19. People I work with are friendly				
20. People I work with are helpful in getting the job done				
21. My supervisor is concerned about the welfare of those under him				
22. My supervisor pays attention to what you are saying				
23. My supervisor is helpful in getting the job done				
24. My supervisor is successful in getting people to work together				

Mark with an X the statement that corresponds to your case

	(1) Regular and steady	(2) Seasonal	(3) Frequent layoffs	(4) Both seasonal and frequent layoffs
25. How steady is your work?				
	(1) I was not in that situation	**(2) A few times**	**(3) Sometimes**	**(4) Constantly**
26. During the past year, how often were you in a situation where you faced job loss or layoff?				
	(1) Not at all likely	**(2) Not too likely**	**(3) Somewhat likely**	**(4) Very likely**
27. Sometimes people permanently lose jobs they want to keep. How likely is it that during the next couple of years you will lose your present job with your employer?				

Formulas for JCQ scale scores[139]

Possible range

Job skill discretion = [q1+q3+q5+q7+q9+5-q2]*2. 12-48

Job decision-making authority = [2*(q4+q6+q8)]*2. 12-48

Job demands = 3*(q10+q11)+2*(15-q13-q14-q15) 12-48***

Job decision latitude = skill discretion + decision-making authority. 24-96

We combine skill discretion scale and decision-making authority scale to create a new scale - Job decision latitude (range 24-96). In addition job demands (range 12-48) is calculated from items 10,11,13,14,15 as above.

“Job strain" can then be defined in three different ways:

<u>Method 1:</u>

A score above the sample median on job demands as well as below the sample median on job decision latitude.

<u>Method 2:</u>

A score above the national average on job demands as well as below the national average on job decision latitude. To determine ‘job strain’ using this method, it is necessary to use population averages (only available for the US population).

<u>Method 3:</u>

A job strain ratio term: (Demands*2)/Decision-Latitude.

<u>Additional scale formulas for social support:</u>

Co-worker support = q17+q18+q19+q20.	4-16
Supervisor support = q21+q22+q23+q24.	4-16

Appendix 7

Table 31. Associations between psychosocial job factors and blood glucose levels excluding workers with a personal history of diabetes: results (standardized beta coefficients and 95% confidence intervals) from multiple linear regression with incremental adjustment for physical workload, individual worker characteristics, and biological cardiovascular risk factors. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variable	Glucose [mg/dL]			
	Model 1	**Model 2**	**Model 3**	**Model 4**
Psychological job demands (five items)[1]	0.22 (-0.60, 1.05)	-0.07 (-0.97, 0.82)	0.22 (-0.67, 1.10)	0.35 (-0.54, 1.24)
Alt. psychological job demands (three items)[2]	0.72 (-0.10, 1.55)	0.59 (-0.27, 1.46)	0.65 (-0.17, 1.47)	0.87* (0.04, 1.69)
Physical demands	0.95* (0.13, 1.77)	N/A	0.89 (-0.03, 1.80)	0.99* (0.08, 1.91)
Decision latitude (nine items)[3]	0.30 (-0.52, 1.12)	0.27 (-0.56, 1.10)	-0.11 (-0.93, 0.70)	-0.51 (-1.33, 0.30)
Alt. decision latitude (eight items)[4]	0.30 (-0.52, 1.12)	0.24 (-0.59, 1.07)	-0.16 (-0.97, 0.65)	-0.60 (-1.41, 0.21)
Coworker support	-0.01 (-0.83, 0.81)	-0.11 (-0.84, 0.72)	0.13 (-0.66, 0.92)	0.07 (-0.72, 0.85)
Supervisor support	0.57 (-0.24, 1.39)	0.52 (-0.31, 1.36)	-0.04 (-0.83, 0.75)	0.00 (-0.79, 0.79)
Total support	0.38 (-0.43, 1.20)	0.30 (-0.53, 1.13)	0.04 (-0.75, 0.83)	0.04 (-0.75, 0.82)
Job strain ratio	-0.19 (-1.01, 0.62)	-0.42 (-1.29, 0.44)	0.08 (-0.74, 0.91)	0.45 (-0.38, 1.28)
Alt. job strain ratio[5]	0.26 (-0.55, 1.07)	0.15 (-0.69, 1.00)	0.40 (-0.40, 1.19)	0.78 (-0.02, 1.59)
High job strain (categorical, ref. category: no high job strain)	-0.02 (-2.00, 1.96)	-0.19 (-2.23, 1.86)	0.15 (-1.78, 2.09)	1.36 (-0.55, 3.28)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	-0.05 (-1.94, 1.84)	-0.04 (-1.97, 1.88)	0.15 (-1.67, 1.97)	1.30 (-0.49, 3.10)

Table 31. (cont.)

Variable	Glucose [mg/dL] Model 1	Model 2	Model 3	Model 4
High job strain (categorical, ref. category: low strain)	0.29 (-2.10, 2.69)	-0.10 (-2.60, 2.39)	0.44 (-1.93, 2.81)	2.37* (0.02, 4.71)
Alt. high job strain[5] (categorical, ref. category: low strain)	0.24 (-1.98, 2.47)	0.17 (-2.10, 2.44)	0.67 (-1.49, 2.82)	2.23* (0.10, 4.36)
Isostrain (continuous)	-0.24 (-1.06, 0.57)	-0.32 (-1.16, 0.52)	0.15 (-0.66, 0.96)	0.48 (-0.32, 1.29)
Alt. isostrain (continuous)[5]	0.05 (-0.76, 0.87)	0.03 (-0.80, 0.87)	0.38 (-0.41, 1.17)	0.75 (-0.04, 1.54)
Isostrain (categorical)	-0.98 (-3.46, 1.49)	-1.05 (-3.59, 1.49)	-0.42 (-2.82, 1.98)	0.84 (-1.55, 3.23)
Alt. isostrain[5] (categorical)	-0.84 (-3.14, 1.45)	-0.73 (-3.06, 1.60)	-0.09 (-2.30, 2.11)	1.02 (-1.15, 3.20)
Job insecurity (continuous)	-1.41* (-2.22, -0.59)	-1.47* (-2.30, -0.64)	-0.12 (-0.93, 0.69)	0.17 (-0.64, 0.97)
Job insecurity (categorical)	-2.58* (-4.28, -0.88)	-2.74* (-4.46, -1.01)	-0.25 (-1.91, 1.41)	0.00 (-1.65, 1.65)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, and body mass index)
* p-value < 0.05

Appendix 8

Comparison of alternative vs. original versions of JCQ scales and subscales in multivariate associations

Meaning of highlights:

Yellow: Associations using the **alternative** version show agreement with the literature and this study's hypotheses in contrast to the original version → 5 total (5.5%)
Blue: Associations using the **original** version show agreement with the literature and this study's hypotheses in contrast to the alternative version → 5 total (5.5%)
Grey: No change between alternative and original versions → 9 total (9.9%)
Green: Associations using the **alternative** version show better agreement to the literature and to this study's hypotheses than the associations found with the original version (*e.g.*, associations using the **alternative** version showed larger effect sizes with exposure to job strain, and a greater protective effect of decision latitude. On the other hand, when associations between psychosocial factors and outcomes were contrary to the literature and this study's hypotheses, the effect sizes of associations using the **alternative** version were smaller than those used with the original version) → 43 total (47.2%)
Pink: Associations using the **original** version show better agreement to the literature and to this study's hypotheses than the associations found with the original version (*e.g.*, associations using the **original** version showed larger effect sizes with exposure to job strain, and a greater protective effect of decision latitude. On the other hand, when associations between psychosocial factors and outcomes were contrary to the literature and this study's hypotheses, the effect sizes of associations using the **original** version were smaller than those used with the alternative version)→ 29 total (31.9%)
Red: Instances where **original** scale was statistically significant and alternative scale was not → 9 total (9.9%)
There was only one instance where the **alternative** scale was statistically significant and the alternative scale was not (association between isostrain (categorical) and waist-hip ratio).

Table 23. Associations between psychosocial job factors and blood glucose levels: results (standardized beta coefficients and 95% confidence intervals) from multiple linear regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variable	Glucose [mg/dL]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	-0.55 (-1.66, 0.57)	-0.97 (-2.19, 0.24)	-0.26 (-1.47, 0.94)	-0.27 (-1.50, 0.97)	-0.32 (-1.54, 0.89)
Alt. psychological job demands (three items)[2]	0.67 (-0.45, 1.78)	0.54 (-0.63, 1.71)	0.61 (-0.51, 1.73)	0.72 (-0.43, 1.87)	0.43 (-0.74, 1.61)
Physical demands	0.95 (-0.16, 2.06)	N/A	0.70 (-0.54, 1.95)	0.64 (-0.64, 1.91)	1.03 (-0.32, 2.38)
Decision latitude (nine items)[3]	-0.06 (-1.18, 1.05)	-0.11 (-1.24, 1.02)	-0.39 (-1.51, 0.73)	-0.75 (-1.89, 0.38)	-0.81 (-2.08, 0.46)
Alt. decision latitude (eight items)[4]	-0.06 (-1.17, 1.05)	-0.12 (-1.25, 1.00)	-0.41 (-1.52, 0.70)	-0.80 (-1.92, 0.33)	-0.85 (-2.12, 0.41)
Coworker support	0.02 (-1.09, 1.14)	-0.10 (-1.23, 1.03)	0.55 (-0.53, 1.63)	0.38 (-0.71, 1.48)	0.96 (-0.18, 2.11)
Supervisor support	0.43 (-0.68, 1.54)	0.33 (-0.80, 1.47)	-0.16 (-1.25, 0.93)	-0.07 (-1.17, 1.04)	0.29 (-0.94, 1.52)
Total support	0.30 (-0.81, 1.41)	0.17 (-0.96, 1.31)	0.17 (-0.91, 1.25)	0.15 (-0.95, 1.25)	0.76 (-0.47, 1.99)
Job strain ratio	-0.69 (-1.80, 0.42)	-0.97 (-2.15, 0.21)	-0.21 (-1.35, 0.93)	0.02 (-1.14, 1.18)	-0.08 (-1.33, 1.17)
Alt. job strain ratio[5]	0.27 (-0.85, 1.38)	0.16 (-0.99, 1.32)	0.37 (-0.72, 1.47)	0.62 (-0.50, 1.75)	0.50 (-0.74, 1.75)
High job strain (categorical, ref. category: no high job strain)	0.09 (-2.60, 2.78)	-0.02 (-2.81, 2.76)	0.51 (-2.14, 3.15)	1.30 (-1.35, 3.96)	0.91 (-1.82, 3.65)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	0.15 (-2.42, 2.72)	0.17 (-2.45, 2.79)	0.31 (-2.18, 2.79)	0.92 (-1.58, 3.42)	0.74 (-1.87, 3.34)

Variable	Glucose [mg/dL]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
High job strain (categorical, ref. category: low strain)	1.06 (-2.19, 4.31)	0.58 (-2.81, 3.97)	1.33 (-1.91, 4.57)	3.20 (-0.06, 6.46)	2.31 (-1.07, 5.68)
Alt. high job strain[5] (categorical, ref. category: low strain)	1.54 (-1.49, 4.57)	1.49 (-1.61, 4.60)	1.68 (-1.27, 4.64)	2.89 (-0.08, 5.86)	2.42 (-0.76, 5.60)
Isostrain (continuous)	-0.26 (-1.37, 0.85)	-0.33 (-1.48, 0.82)	0.14 (-0.97, 1.26)	0.42 (-0.70, 1.55)	0.08 (-1.07, 1.24)
Alt. isostrain (continuous)[5]	0.28 (-0.83, 1.40)	0.28 (-0.85, 1.42)	0.50 (-0.60, 1.59)	0.79 (-0.31, 1.90)	0.39 (-0.75, 1.52)
Isostrain (categorical)	-2.63 (-6.00, 0.75)	-2.66 (-6.13, 0.81)	-1.46 (-4.76, 1.84)	-0.04 (-3.37, 3.29)	-1.36 (-4.69, 1.98)
Alt. isostrain[5] (categorical)	-2.79 (-5.92, 0.35)	-2.64 (-5.83, 0.55)	-1.70 (-4.74, 1.33)	-0.59 (-3.63, 2.45)	-1.63 (-4.69, 1.44)
Job insecurity (continuous)	-1.35* (-2.46, -0.24)	-1.39* (-2.52, -0.26)	0.55 (-0.55, 1.66)	0.81 (-0.30, 1.93)	0.70 (-0.44, 1.84)
Job insecurity (categorical)	-2.48* (-4.79, -0.18)	-2.58* (-4.92, -0.23)	-0.52 (-1.75, 2.79)	0.74 (-1.55, 3.02)	0.60 (-1.72, 2.91)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 24. Associations between psychosocial job factors and total blood cholesterol levels: results (standardized beta coefficients and 95% confidence intervals) from multiple linear regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variable	**Total blood Cholesterol Levels [mg/dL]**				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	-1.35 (-3.31, 0.61)	-0.84 (-2.97, 1.28)	-1.28 (-3.29, 0.73)	-1.78 (-3.99, 0.44)	-1.63 (-3.69, 0.42
Alt. psychological job demands (three items)[2]	0.56 (-1.40, 2.53)	0.92 (-1.13, 2.97)	-0.03 (-1.90, 1.85)	-0.50 (-2.57, 1.56)	-0.85 (-2.84, 1.14)
Physical demands	-2.04* (-4.00, -0.08)	N/A	-1.55 (-3.64, -0.55)	-1.88 (-4.17, 0.41)	-1.00 (-3.29, 1.30)
Decision latitude (nine items)[3]	0.02 (-2.04, 1.91)	-0.06 (-2.04, 1.91)	-0.32 (-2.19, 1.56)	-0.88 (-2.89, 1.22)	1.29 (-0.86, 3.44)
Alt. decision latitude (eight items)[4]	-0.17 (-2.14, 1.79)	-0.22 (-2.19, 1.75)	-0.32 (-2.18, 1.54)	-0.81 (-2.83, 1.21)	1.16 (-0.98, 3.29)
Coworker support	-1.78 (-3.74, 0.18)	-1.70 (-3.68, 0.27)	-2.27* (-4.08, -0.46)	-2.62* (-4.58, -0.67)	-2.45* (-4.38, -0.51)
Supervisor support	-3.46* (-5.41, -1.50)	-3.79* (-5.77, -1.81)	-2.02* (-3.84, 0.20)	-1.91 (-3.87, 0.06)	-2.25* (-4.33, -0.18)
Total support	-3.24* (-5.19, -1.28)	-3.42* (-5.40, -1.44)	-2.50* (-4.31, -0.69)	-2.61* (-4.57, -0.65)	-2.96* (-5.04, -0.88)
Job strain ratio	-1.02 (-2.98, 0.94)	-0.57 (-2.64, 1.50)	-0.88 (-2.79, 1.03)	-0.81 (-2.87, 1.26)	-2.15* (-4.26, -0.03)
Alt. job strain ratio[5]	0.36 (-1.60, 2.33)	0.64 (-1.38, 2.66)	-0.12 (-1.96, 1.71)	-0.26 (-2.27, 1.74)	-1.60 (-3.71, 0.50)
High job strain (categorical, ref. category: no high job strain)	-0.76 (-5.50, 3.98)	-0.13 (-4.99, 4.74)	1.30 (-3.13, 5.74)	1.45 (-3.32, 6.22)	0.02 (-4.60, 4.64)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	-0.34 (-4.87, 4.20)	-0.37 (-4.95, 4.21)	1.08 (-3.09, 5.24)	0.51 (-3.97, 4.99)	-0.64 (-5.04, 3.77)

Variable	Total blood Cholesterol Levels [mg/dL]				
	Model 1	Model 2	Model 3	Model 4	Model 5
High job strain (categorical, ref. category: low strain)	-0.99 (-6.72, 4.75)	0.03 (-5.91, 5.96)	0.67 (-4.75, 6.10)	0.33 (-5.53, 6.18)	-1.42 (-7.14, 4.30)
Alt. high job strain[5] (categorical, ref. category: low strain)	1.34 (-4.02, 6.70)	1.64 (-3.80, 7.08)	1.69 (-3.27, 6.65)	0.95 (-4.37, 6.27)	-1.15 (-6.54, 4.24)
Isostrain (continuous)	0.35 (-1.61, 2.31)	0.73 (-1.28, 2.74)	0.53 (-1.33, 2.40)	0.80 (-1.21, 2.81)	0.27 (-1.69, 2.22)
Alt. isostrain (continuous)[5]	1.14 (-0.82, 3.11)	1.37 (-0.62, 3.36)	0.80 (-1.03, 2.63)	0.92 (-1.06, 2.90)	0.50 (-1.43, 2.43)
Isostrain (categorical)	2.91 (-3.06, 8.88)	3.63 (-2.45, 9.71)	4.52 (-1.01, 10.05)	4.11 (-1.84, 10.05)	4.76 (-0.87, 10.41)
Alt. isostrain[5] (categorical)	1.73 (-3.81, 7.26)	1.57 (-4.02, 7.16)	2.21 (-2.87, 7.29)	0.68 (-4.75, 6.10)	2.18 (-3.01, 7.38)
Job insecurity (continuous)	2.05* (0.09, 4.01)	1.94 (-0.04, 3.92)	0.99 (-0.86, 2.84)	0.99 (-1.01, 2.98)	0.84 (-1.09, 2.77)
Job insecurity (categorical)	4.27* (0.21, 8.34)	4.22* (0.12, 8.32)	1.36 (-2.44, 5.17)	0.86 (-3.24, 4.97)	1.35 (-2.56, 5.26)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (systolic blood pressure, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 25a. Associations between psychosocial job factors and body mass index: results (standardized beta coefficients and 95% confidence intervals) from multiple linear regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n= 2,330).

Variable	Body Mass Index [kg/m^2]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	0.14 (0.03, 0.31)	0.20* (0.01, 0.39)	0.22* (0.03, 0.41)	0.17 (-0.02, 0.37)	0.23* (0.05, 0.42)
Alt. psychological job demands (three items)[2]	0.25* (0.08, 0.43)	0.30* (0.12, 0.48)	0.24* (0.06, 0.41)	0.14 (-0.04, 0.32)	0.24* (0.06, 0.42)
Physical demands	-0.07 (-0.24, 0.10)	N/A	-0.17 (-0.37, 0.03)	-0.24* (-0.44, -0.03)	-0.27* (-0.47, -0.06)
Decision latitude (nine items)[3]	0.26* (0.09, 0.44)	0.27* (0.10, 0.45)	0.19* (0.01, 0.37)	0.19* (0.01, 0.37)	0.32* (0.13, 0.52)
Alt. decision latitude (eight items)[4]	0.25* (0.08, 0.43)	0.26* (0.09, 0.44)	0.19* (0.01, 0.37)	0.19* (0.01, 0.36)	0.35* (0.15, 0.54)
Coworker support	-0.03 (-0.21, 0.14)	-0.01 (-0.18, 0.17)	-0.03 (-0.20, 0.15)	-0.03 (-0.20, 0.14)	-0.13 (-0.31, 0.04)
Supervisor support	-0.20* (-0.38, -0.03)	-0.20* (-0.38, -0.03)	-0.20* (-0.37, -0.02)	-0.22* (-0.39, -0.04)	-0.33* (-0.52, -0.14)
Total support	-0.15 (-0.33, 0.02)	-0.14 (-0.32, 0.03)	-0.14 (-0.32, 0.03)	-0.16 (-0.33, 0.01)	-0.30* (-0.49, -0.11)
Job strain ratio	-0.06 (-0.24, 0.11)	-0.05 (-0.24, 0.13)	0.02 (-0.16, 0.20)	0.00 (-0.18, 0.18)	0.00 (-0.19, 0.19)
Alt. job strain ratio[5]	0.07 (-0.10, 0.25)	0.09 (-0.08, 0.27)	0.09 (-0.09, 0.26)	0.02 (-0.15, 0.20)	0.05 (-0.14, 0.25)
High job strain (categorical, ref. category: no high job strain)	-0.37 (-0.79, 0.06)	-0.39 (-0.83, 0.04)	-0.28 (-0.71, 0.14)	-0.33 (-0.74, 0.09)	-0.44* (-0.86, -0.02)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	-0.28 (-0.68, 0.12)	-0.32 (-0.73, 0.09)	-0.25 (-0.64, 0.15)	-0.26 (-0.65, 0.13)	-0.35 (-0.75, 0.05)

Variable	Body Mass Index [kg/m²]				
	Model 1	Model 2	Model 3	Model 4	Model 5
High job strain (categorical, ref. category: low strain)	-0.42 (-0.93, 0.09)	-0.39 (-0.92, 0.14)	-0.33 (-0.85, 0.18)	-0.41 (-0.92, 0.10)	-0.54* (-1.05, -0.02)
Alt. high job strain[5] (categorical, ref. category: low strain)	-0.18 (-0.66, 0.29)	-0.18 (-0.66, 0.30)	-0.18 (-0.66, 0.29)	-0.31 (-0.77, 0.16)	-0.43 (-0.91, 0.06)
Isostrain (continuous)	-0.10 (-0.27, 0.08)	-0.10 (-0.28, 0.08)	-0.02 (-0.20, 0.16)	-0.03 (-0.21, 0.14)	0.01 (-0.17, 0.18)
Alt. isostrain (continuous)[5]	-0.01 (-0.19, 0.16)	-0.01 (-0.18, 0.17)	0.02 (-0.15, 0.20)	-0.02 (-0.19, 0.15)	0.04 (-0.13, 0.22)
Isostrain (categorical)	-0.54* (-1.07, 0.00)	-0.59* (-1.13, -0.05)	-0.47 (-0.99, 0.06)	-0.37 (-0.89, 0.15)	-0.40 (-0.92, 0.11)
Alt. isostrain[5] (categorical)	-0.32 (-0.81, 0.17)	-0.40 (-0.90, 0.10)	-0.31 (-0.79, 0.18)	-0.16 (-0.63, 0.31)	-0.16 (-0.64, 0.31)
Job insecurity (continuous)	-0.26* (-0.43, -0.09)	-0.27* (-0.44, -0.09)	-0.14 (-0.31, 0.04)	-0.17 (-0.35, 0.00)	-0.15 (-0.33, 0.02)
Job insecurity (categorical)	-0.23 (-0.59, 0.14)	-0.21 (-0.58, -0.15)	-0.11 (-0.48, 0.25)	-0.12 (-0.48, 0.24)	-0.13 (-0.49, 0.22)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: "I am not asked to do an excessive amount of work", "I have enough time to get the job done", "I am free from conflicting demands others make")
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other biological cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, and blood glucose levels)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 25b. Associations between psychosocial job factors and waist circumference: results (standardized beta coefficients and 95% confidence intervals) from multiple linear regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n= 2,330).

Variable	Waist Circumference [cm]				
	Model 1	Model 2	Model 3	Model 4	Model 5
Psychological job demands (five items)[1]	0.26 (-0.17, 0.68)	0.39 (-0.07, 0.85)	0.40 (-0.06, 0.86)	0.35 (-0.12, 0.83)	0.49* (0.04, 0.94)
Alt. psychological job demands (three items)[2]	0.41 (-0.01, 0.84)	0.52* (0.08, 0.97)	0.34 (-0.09, 0.76)	0.19 (-0.25, 0.64)	0.36 (-0.07, 0.79)
Physical demands	-0.22 (-0.65, 0.21)	N/A	-0.38 (-0.86, 0.10)	-0.43 (-0.92, 0.06)	-0.58* (-1.09, -0.08)
Decision latitude (nine items)[3]	0.88* (0.45, 1.31)	0.89* (0.46, 1.31)	0.30 (-0.13, 0.73)	0.32 (-0.11, 0.76)	0.54* (0.07, 1.00)
Alt. decision latitude (eight items)[4]	0.84* (0.41, 1.26)	0.85* (0.42, 1.27)	0.31 (-0.11, 0.74)	0.33 (-0.10, 0.76)	0.60* (0.14, 1.07)
Coworker support	0.13 (-0.30, 0.56)	0.18 (-0.24, 0.61)	-0.05 (-0.46, 0.36)	-0.08 (-0.50, 0.34)	-0.25 (-0.67, 0.17)
Supervisor support	-0.43* (-0.86, -0.01)	-0.45* (-0.88, -0.02)	-0.41 (-0.82, 0.00)	-0.50* -0.92, -0.08)	-0.64* (-1.09, -0.19)
Total support	-0.23 (-0.65, 0.20)	-0.21 (-0.64, 0.22)	-0.30 (-0.71, 0.11)	-0.37 (0.79, 0.05)	-0.58* (-1.03, -0.13)
Job strain ratio	-0.33 (-0.76, 0.09)	-0.31 (-0.76, 0.14)	0.09 (-0.34, 0.53)	0.07 (-0.37, 0.51)	0.10 (-0.36, 0.56)
Alt. job strain ratio[5]	-0.04 (-0.46, 0.39)	0.01 (-0.43, 0.49)	0.13 (-0.29, 0.54)	0.03 (-0.39, 0.46)	0.08 (-0.38, 0.54)
High job strain (categorical, ref. category: no high job strain)	-0.82 (-1.85, 0.21)	-0.88 (-1.94, 0.18)	-0.16 (-1.17, 0.85)	-0.36 (-1.38, 0.66)	-0.44 (-1.45, 0.56)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	-0.70 (-1.69, 0.28)	-0.80 (-1.79, 0.20)	-0.37 (-1.32, 0.57)	-0.42 (-1.38, 0.53)	-0.53 (-1.49, 0.43)

Variable	Waist Circumference [cm]				
	Model 1	Model 2	Model 3	Model 4	Model 5
High job strain (categorical, ref. category: low strain)	-1.42* (-2.66, -0.17)	-1.32* (-2.61, -0.04)	-0.44 (-1.67, 0.79)	-0.66 (-1.91, 0.59)	-0.77 (-2.01, 0.48)
Alt. high job strain[5] (categorical, ref. category: low strain)	-0.94 (-2.11, 0.22)	-0.93 (-2.11, 0.25)	-0.44 (-1.57, 0.69)	-0.77 (-1.91, 0.37)	-0.88 (-2.05, 0.30)
Isostrain (continuous)	-0.49* (-0.92, -0.06)	-0.49* (-0.92, -0.05)	0.01 (-0.42, 0.43)	-0.01 (-0.44, 0.42)	0.10 (-0.33, 0.52)
Alt. isostrain (continuous)[5]	-0.30 (-0.73, 0.13)	-0.28 (-0.72, 0.15)	0.02 (-0.39, 0.44)	-0.03 (-0.46, 0.39)	0.09 (-0.33, 0.51)
Isostrain (categorical)	-0.73 (-2.04, 0.57)	-0.80 (-2.12, 0.52)	-0.12 (-1.38, 1.14)	-0.07 (-1.34, 1.21)	0.06 (-1.17, 1.29)
Alt. isostrain[5] (categorical)	-0.13 (-1.34, 1.08)	-0.28 (-1.50, 0.93)	0.07 (-1.09, 1.23)	0.25 (-0.92, 1.41)	0.43 (-0.70, 1.56)
Job insecurity (continuous)	-0.62* (-1.04, -0.19)	-0.63* (-1.06, -0.21)	-0.45* (-0.87, -0.02)	-0.55* (-0.98, -0.12)	-0.48* (-0.90, -0.06)
Job insecurity (categorical)	-0.63 (-1.52, 0.26)	-0.63 (-1.52, -0.26)	-0.62 (-1.49, 0.25)	-0.75 (-1.63, 0.12)	-0.65 (-1.50, 0.20)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other biological cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, and blood glucose levels)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 25c. Associations between psychosocial job factors and waist-hip ratio: results (standardized beta coefficients and 95% confidence intervals) from multiple linear regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n= 2,330).

Variable	Waist-Hip Ratio [10 units]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	0.02 (0.00, 0.05)	0.01 (-0.01, 0.04)	0.02 (-0.01, 0.04)	0.02 (-0.01, 0.05)	0.02 (-0.00, 0.05)
Alt. psychological job demands (three items)[2]	0.03* (0.01, 0.06)	0.03* (0.00, 0.05)	0.01 (-0.01, 0.04)	0.02 (-0.01, 0.04)	0.02 (-0.01, 0.04)
Physical demands	0.03* (0.00, 0.05)	N/A	-0.01 (-0.04, 0.02)	0.00 (-0.03, 0.02)	-0.02 (-0.05, 0.01)
Decision latitude (nine items)[3]	0.05* (0.02, 0.07)	0.05* (0.03, 0.08)	0.00 (-0.02, 0.03)	0.01 (-0.02, 0.03)	0.01 (-0.02, 0.03)
Alt. decision latitude (eight items)[4]	0.05* (0.02, 0.06)	0.05* (0.03, 0.08)	0.01 (-0.02, 0.03)	0.01 (-0.01, 0.03)	0.01 (-0.01, 0.04)
Coworker support	0.02 (0.00, 0.05)	0.02 (0.00, 0.05)	0.00 (-0.02, 0.02)	0.00 (-0.02, 0.02)	-0.01 (-0.03, 0.02)
Supervisor support	-0.02 (-0.05, 0.00)	-0.02 (-0.04, 0.01)	-0.02 (-0.04, 0.00)	-0.02 (-0.04, 0.00)	-0.02 (-0.05, 0.00)
Total support	0.00 (-0.03, 0.02)	0.00 (-0.03, 0.03)	-0.01 (-0.03, 0.01)	-0.01 (-0.04, 0.01)	-0.02 (-0.04, 0.01)
Job strain ratio	-0.02 (-0.04, 0.01)	-0.03* (-0.06, 0.00)	0.01 (-0.02, 0.03)	0.01 (-0.02, 0.03)	0.01 (-0.02, 0.03)
Alt. job strain ratio[5]	0.00 (-0.02, 0.03)	-0.00 (-0.03, 0.02)	0.01 (-0.02, 0.03)	0.01 (-0.02, 0.03)	0.01 (-0.02, 0.03)
High job strain (categorical, ref. category: no high job strain)	-0.03 (-0.09, 0.03)	-0.05 (-0.12, 0.01)	0.01 (-0.05, 0.06)	0.00 (-0.06, 0.06)	0.00 (-0.05, 0.06)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	-0.02 (-0.08, 0.03)	-0.04 (-0.10, 0.02)	0.00 (-0.06, 0.05)	0.00 (-0.05, 0.06)	0.00 (-0.06, 0.05)

Variable	Waist-Hip Ratio [10 units]				
	Model 1	Model 2	Model 3	Model 4	Model 5
High job strain (categorical, ref. category: low strain)	-0.04 (-0.11, 0.03)	-0.06 (-0.14, 0.02)	0.02 (-0.05, 0.09)	0.02 (-0.05, 0.09)	0.02 (-0.05, 0.09)
Alt. high job strain[5] (categorical, ref. category: low strain)	-0.02 (-0.09, 0.05)	-0.03 (-0.10, 0.04)	0.01 (-0.04, 0.08)	0.01 (-0.06, 0.07)	0.01 (-0.06, 0.07)
Isostrain (continuous)	-0.03* (-0.05, 0.00)	-0.04* (-0.06, -0.01)	0.01 (-0.02, 0.03)	0.00 (-0.02, 0.03)	0.01 (-0.04, 0.01)
Alt. isostrain (continuous)[5]	-0.02 (-0.04, 0.01)	-0.02 (-0.05, 0.00)	0.00 (-0.02, 0.03)	0.00 (-0.02, 0.03)	0.01 (-0.01, 0.03)
Isostrain (categorical)	0.00 (-0.08, 0.07)	-0.02 (-0.10, 0.05)	0.04 (-0.03, 0.11)	0.03 (-0.04, 0.11)	0.05 (-0.02, 0.12)
Alt. isostrain[5] (categorical)	0.03 (-0.03, 0.10)	0.02 (-0.05, 0.09)	0.05 (-0.01, 0.12)	0.05 (-0.02, 0.12)	0.07* (0.01, 0.14)
Job insecurity (continuous)	-0.03* (-0.06, -0.01)	-0.03* (-0.06, -0.01)	-0.03* (-0.05, -0.00)	-0.04* (-0.06, -0.01)	-0.03* (-0.05, -0.01)
Job insecurity (categorical)	-0.02 (-0.07, 0.03)	-0.03 (-0.08, 0.02)	-0.04 (-0.09, 0.01)	-0.07* (-0.12, -0.02)	-0.05* (-0.10, 0.00)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other biological cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, and blood glucose levels)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 26a. Associations between psychosocial job factors and systolic blood pressure: results (standardized beta coefficients and 95% confidence intervals) from multiple linear regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variable	Systolic Blood Pressure [mmHg]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	- 0.47* (-0.88, -0.06)	-0.38 (-0.82, 0.06)	-0.31 (-0.76, 0.13)	-0.41 (-0.84, 0.02)	-0.34 (-0.78, 0.09)
Alt. psychological job demands (three items)[2]	- 0.07 (-0.48, 0.34)	0.00 (-0.43, 0.42)	-0.10 (-0.52, 0.31)	-0.25 (-0.65, 0.15)	-0.18 (-0.60, 0.24)
Physical demands	-0.20 (-0.61, 0.21)	N/A	-0.28 (-0.74, 0.19)	-0.21 (-0.66, 0.24)	0.01 (-0.48, 0.50)
Decision latitude (nine items)[3]	0.40 (-0.01, 0.81)	0.35 (-0.06, 0.77)	-0.09 (-0.51, 0.32)	-0.18 (-0.59, 0.22)	-0.40 (-0.85, 0.06)
Alt. decision latitude (eight items)[4]	0.39 (-0.02, 0.80)	0.35 (-0.06, 0.77)	-0.06 (-0.47, 0.35)	-0.15 (-0.55, 0.25)	-0.39 (-0.85, 0.06)
Coworker support	0.31 (-0.10, 0.72)	0.35 (-0.06, 0.76)	0.18 (-0.22, 0.58)	0.22 (-0.16, 0.61)	0.30 (-0.11, 0.71)
Supervisor support	0.17 (-0.24, 0.58)	0.15 (-0.26, 0.57)	0.08 (-0.32, 0.48)	0.23 (-0.15, 0.62)	0.29 (-0.15, 0.73)
Total support	0.27 (-0.14, 0.68)	0.28 (-0.13, 0.69)	0.15 (-0.25, 0.55)	0.27 (-0.12, 0.66)	0.37 (-0.07, 0.81)
Job strain ratio	-0.66* (-1.07, -0.24)	-0.57* (-1.01, -0.14)	-0.21 (-0.64, 0.22)	-0.20 (-0.62, 0.21)	-0.08 (-0.53, 0.36)
Alt. job strain ratio[5]	-0.29 (-0.71, 0.12)	-0.23 (-0.66, 0.20)	-0.11 (-0.53, 0.30)	-0.17 (-0.57, 0.22)	-0.03 (-0.48, 0.41)
High job strain (categorical, ref. category: no high job strain)	-0.61 (-1.60, 0.38)	-0.32 (-1.34, 0.69)	0.23 (-0.75, 1.21)	0.44 (-0.50, 1.39)	0.68 (-0.29, 1.66)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	-0.68 (-1.63, 0.26)	-0.59 (-1.55, 0.36)	-0.13 (-1.05, 0.78)	-0.01 (-0.89, 0.88)	0.24 (-0.69, 1.17)

Variable	Systolic Blood Pressure [mmHg]				
	Model 1	Model 2	Model 3	Model 4	Model 5
High job strain (categorical, ref. category: low strain)	-1.33 (-2.53, 0.14)	-1.01 (-2.25, 0.23)	-0.26 (-1.46, 0.93)	-0.07 (-1.23, 1.19)	0.33 (-0.88, 1.53)
Alt. high job strain[5] (categorical, ref. category: low strain)	-0.74 (-1.85, 0.38)	-0.57 (-1.70, 0.56)	-0.03 (-1.12, 1.06)	0.02 (-1.03, 1.08)	0.46 (-0.68, 1.60)
Isostrain (continuous)	-0.58* (-0.99, -0.17)	-0.50* (-0.93, -0.08)	-0.09 (-0.50, 0.33)	-0.09 (-0.49, 0.31)	-0.03 (-0.44, 0.39)
Alt. isostrain (continuous)[5]	-0.36 (-0.77, 0.05)	-0.31 (-0.73, 0.11)	-0.04 (-0.45, 0.36)	-0.08 (-0.47, 0.31)	-0.02 (-0.42, 0.39)
Isostrain (categorical)	-1.14 (-2.39, 0.11)	-0.98 (-2.25, 0.29)	-0.17 (-1.39, 1.06)	0.13 (-1.05, 1.31)	0.25 (-0.94, 1.45)
Alt. isostrain[5] (categorical)	-1.34* (-2.50, -0.19)	-1.34* (-2.51, -0.17)	-0.68 (-1.80, 0.44)	-0.51 (-1.59, 0.57)	-0.41 (-1.50, 0.69)
Job insecurity (continuous)	-0.70* (-1.11, -0.29)	-0.69* (-1.10, -0.28)	-0.32 (-0.73, 0.08)	-0.25 (-0.64, 0.14)	-0.20 (-0.61, 0.20)
Job insecurity (categorical)	-1.00* (-1.84, -0.15)	-0.93* (-1.78, -0.07)	-0.57 (-1.41, 0.27)	-0.46 (-1.26, 0.35)	-0.37 (-1.19, 0.46)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: "I am not asked to do an excessive amount of work", "I have enough time to get the job done", "I am free from conflicting demands others make")
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (total blood cholesterol levels, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 26b. Associations between psychosocial job factors and diastolic blood pressure: results (standardized beta coefficients and 95% confidence intervals) from multiple linear regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variable	Diastolic Blood Pressure [mmHg]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	-0.38* (-0.67, -0.09)	-0.31 (-0.63, 0.00)	-0.32* (-0.63, 0.00)	-0.39* (-0.69, -0.08)	-0.34* (-0.64, -0.03)
Alt. psychological job demands (three items)[2]	-0.17 (-0.46, 0.12)	-0.10 (-0.41, 0.20)	-0.15 (-0.44, 0.15)	-0.24 (-0.52, 0.04)	-0.17 (-0.47, 0.13)
Physical demands	-0.27 (-0.56, 0.02)	N/A	-0.07 (-0.39, 0.26)	-0.02 (-0.33, 0.30)	0.13 (-0.22, 0.47)
Decision latitude (nine items)[3]	0.48* (0.19, 0.78)	0.44* (0.15, 0.73)	0.14 (-0.16, 0.43)	0.09 (-0.20, 0.37)	0.04 (-0.28, 0.36)
Alt. decision latitude (eight items)[4]	0.48* (0.19, 0.77)	0.45* (0.16, 0.74)	0.17 (-0.12, 0.46)	0.12 (-0.16, 0.40)	0.04 (-0.27, 0.36)
Coworker support	-0.04 (-0.33, 0.25)	-0.05 (-0.35, 0.24)	-0.07 (-0.36, 0.21)	-0.04 (-0.32, 0.23)	-0.11 (-0.40, 0.18)
Supervisor support	0.22 (-0.07, 0.51)	0.19 (-0.11, 0.48)	0.03 (-0.26, 0.31)	0.13 (-0.14, 0.41)	0.00 (-0.31, 0.31)
Total support	0.13 (-0.16, 0.42)	0.10 (-0.20, 0.39)	-0.02 (-0.30, 0.26)	0.07 (-0.21, 0.34)	-0.07 (-0.38, 0.24)
Job strain ratio	-0.66* (-0.95, -0.37)	-0.60* (-0.91, -0.29)	-0.36* (-0.67, -0.06)	-0.37* (-0.66, -0.08)	-0.32* (-0.64, 0.00)
Alt. job strain ratio[5]	-0.41* (-0.70, -0.12)	-0.35* (-0.65, -0.05)	-0.23 (-0.53, 0.06)	-0.27 (-0.56, 0.00)	-0.21 (-0.53, 0.10)
High job strain (categorical, ref. category: no high job strain)	-0.76* (-1.46, -0.06)	-0.51 (-1.24, 0.21)	-0.23 (-0.93, 0.46)	-0.11 (-0.79, 0.56)	0.02 (-0.68, 0.71)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	-0.78* (-1.45, -0.11)	-0.66 (-1.34, 0.01)	-0.37 (-1.03, 0.28)	-0.30 (-0.93, 0.33)	-0.18 (-0.84, 0.48)

Variable	Diastolic Blood Pressure [mmHg]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
High job strain (categorical, ref. category: low strain)	-1.50* (-2.34, -0.65)	-1.25* (-2.13, -0.37)	-0.83 (-1.68, 0.02)	-0.74 (-1.56, 0.08)	-0.56 (-1.42, 0.30)
Alt. high job strain[5] (categorical, ref. category: low strain)	-1.14* (-1.93, -0.34)	-0.98* (-1.79, -0.18)	-0.58 (-1.36, 0.19)	-0.54 (-1.29, 0.20)	-0.39 (-1.20, 0.42)
Isostrain (continuous)	-0.56* (-0.85, -0.27)	-0.49* (-0.79, -0.19)	-0.21 (-0.50, 0.08)	-0.22 (-0.51, 0.06)	-0.11 (-0.40, 0.18)
Alt. isostrain (continuous)[5]	-0.43* (-0.72, -0.14)	-0.38* (-0.67, -0.08)	-0.17 (-0.46, 0.12)	-0.20 (-0.48, 0.07)	-0.08 (-0.37, 0.20)
Isostrain (categorical)	-1.52* (-2.40, -0.64)	-1.34* (-2.24, -0.43)	-0.85 (-1.72, 0.02)	-0.68 (-1.52, 0.16)	-0.48 (-1.33, 0.37)
Alt. isostrain[5] (categorical)	-1.55* (-2.37, -0.73)	-1.45* (-2.28, -0.62)	-0.96* (-1.76, -0.17)	-0.86* (-1.63, -0.09)	-0.67 (-1.45, 0.11)
Job insecurity (continuous)	-0.85* (-1.14, -0.56)	-0.83* (-1.12, -0.54)	-0.50* (-0.79, -0.22)	-0.46* (-0.74, -0.18)	-0.43* (-0.72, -0.14)
Job insecurity (categorical)	-1.47* (-2.07, -0.87)	-1.42* (-2.03, -0.82)	-0.87* (-1.47, -0.28)	-0.79* (-1.37, -0.22)	-0.72* (-1.30, -0.13)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: "I am not asked to do an excessive amount of work", "I have enough time to get the job done", "I am free from conflicting demands others make")
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (total blood cholesterol levels, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 27. Associations between psychosocial job factors and current smoking: results (standardized odds ratios and 95% confidence intervals) from multiple logistic regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n= 2,330).

Variable	Current smoking [yes/no]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	1.01 (0.93, 1.10)	0.98 (0.90, 1.07)	1.00 (0.91, 1.11)	0.98 (0.88, 1.09)	0.98 (0.89, 1.09)
Alt. psychological job demands (three items)[2]	1.01 (0.93, 1.10)	0.98 (0.90, 1.07)	1.00 (0.91, 1.09)	1.00 (0.90, 1.11)	0.96 (0.87, 1.06)
Physical demands	1.06 (0.97, 1.14)	N/A	0.95 (0.86, 1.05)	1.00 (0.89, 1.12)	0.95 (0.85, 1.06)
Decision latitude (nine items)[3]	0.97 (0.90, 1.06)	0.98 (0.90, 1.06)	0.98 (0.90, 1.07)	0.97 (0.88, 1.07)	1.02 (0.92, 1.13)
Alt. decision latitude (eight items)[4]	0.98 (0.91, 1.07)	0.98 (0.90, 1.07)	0.98 (0.90, 1.08)	0.98 (0.88, 1.08)	1.02 (0.92, 1.14)
Coworker support	0.97 (0.90, 1.05)	0.98 (0.90, 1.06)	0.95 (0.87, 1.04)	0.95 (0.86, 1.05)	0.96 (0.87, 1.05)
Supervisor support	0.92 (0.85, 1.00)	0.93 (0.85, 1.01)	0.90* (0.82, 0.99)	0.93 (0.84, 1.03)	0.90* (0.81, 0.99)
Total support	0.93 (0.86, 1.01)	0.94 (0.86, 1.02)	0.91* (0.83, 0.99)	0.93 (0.84, 1.02)	0.90 (0.82, 1.00)
Job strain ratio	1.02 (0.94, 1.11)	1.00 (0.92, 1.09)	1.02 (0.93, 1.12)	1.01 (0.91, 1.12)	0.98 (0.89, 1.09)
Alt. job strain ratio[5]	1.02 (0.94, 1.11)	1.00 (0.92, 1.09)	1.02 (0.93, 1.11)	1.02 (0.92, 1.12)	0.97 (0.87, 1.07)
High job strain (categorical, ref. category: no high job strain)	1.16 (0.95, 1.41)	1.14 (0.93, 1.40)	1.18 (0.95, 1.47)	1.23 (0.97, 1.56)	1.14 (0.91, 1.44)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	1.19 (0.99, 1.44)	1.19 (0.98, 1.44)	1.17 (0.95, 1.44)	1.22 (0.98, 1.52)	1.12 (0.90, 1.39)

Variable	Current smoking [yes/no]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
High job strain (categorical, ref. category: low strain)	1.04 (0.82, 1.32)	0.99 (0.77, 1.27)	1.02 (0.78, 1.33)	1.06 (0.80, 1.41)	0.96 (0.72, 1.27)
Alt. high job strain[5] (categorical, ref. category: low strain)	1.16 (0.93, 1.44)	1.13 (0.90, 1.41)	1.14 (0.90, 1.46)	1.19 (0.92, 1.55)	1.05 (0.81, 1.37)
Isostrain (continuous)	1.04 (0.96, 1.13)	1.03 (0.95, 1.12)	1.05 (0.96, 1.15)	1.04 (0.94, 1.14)	1.05 (0.95, 1.15)
Alt. isostrain (continuous)[5]	1.03 (0.95, 1.12)	1.02 (0.94, 1.11)	1.03 (0.94, 1.13)	1.03 (0.94, 1.14)	1.03 (0.94, 1.13)
Isostrain (categorical)	1.27 (0.99, 1.63)	1.25 (0.97, 1.62)	1.35* (1.03, 1.78)	1.33 (0.99, 1.79)	1.33* (1.01, 1.77)
Alt. isostrain[5] (categorical)	1.43* (1.13, 1.80)	1.42* (1.13, 1.80)	1.44* (1.12, 1.86)	1.42* (1.08, 1.85)	1.43* (1.10, 1.85)
Job insecurity (continuous)	1.08 (1.00, 1.18)	1.09* (1.00, 1.18)	1.04 (0.95, 1.14)	1.04 (0.95, 1.15)	1.03 (0.93, 1.13)
Job insecurity (categorical)	1.21* (1.03, 1.44)	1.22* (1.03, 1.45)	1.14 (0.95, 1.38)	1.16 (0.95, 1.42)	1.12 (0.92, 1.35)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: "I am not asked to do an excessive amount of work", "I have enough time to get the job done", "I am free from conflicting demands others make")
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple logistic regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (leisure-time physical activity and alcohol) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 28. Associations between psychosocial job factors and leisure-time physical activity: results (standardized odds ratios and 95% confidence intervals) from multiple logistic regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n= 2,330).

Variable	Leisure-time physical activity [yes/no]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	0.93 (0.85, 1.02)	0.94 (0.85, 1.04)	0.89* (0.80, 0.99)	0.94 (0.83, 1.05)	0.90 (0.80, 1.01)
Alt. psychological job demands (three items)[2]	0.90* (0.81, 0.98)	0.91* (0.82, 1.00)	0.88* (0.80, 0.98)	0.91 (0.82, 1.02)	0.91 (0.82, 1.02)
Physical demands	1.00 (0.91, 1.10)	N/A	1.03 (0.92, 1.15)	1.04 (0.92, 1.17)	1.09 (0.96, 1.23)
Decision latitude (nine items)[3]	1.14* (1.03, 1.25)	1.15* (1.04, 1.26)	1.11* (1.01, 1.24)	1.16* (1.04, 1.29)	1.07 (0.95, 1.20)
Alt. decision latitude (eight items)[4]	1.14* (1.03, 1.25)	1.15* (1.04, 1.26)	1.12* (1.01, 1.24)	1.17* (1.05, 1.31)	1.06 (0.95, 1.20)
Coworker support	1.16* (1.06, 1.28)	1.18* (1.08, 1.30)	1.15* (1.04, 1.27)	1.16* (1.05, 1.29)	1.14* (1.04, 1.27)
Supervisor support	1.10* (1.00, 1.21)	1.12* (1.02, 1.23)	1.15* (1.03, 1.27)	1.15* (1.03, 1.27)	1.10 (0.98, 1.23)
Total support	1.16* (1.05, 1.27)	1.18* (1.07, 1.30)	1.17* (1.06, 1.30)	1.18* (1.06, 1.31)	1.15* (1.02, 1.29)
Job strain ratio	0.87* (0.79, 0.96)	0.87* (0.78, 0.96)	0.86* (0.77, 0.95)	0.86* (0.77, 0.96)	0.88* (0.78, 0.99)
Alt. job strain ratio[5]	0.87* (0.79, 0.96)	0.87* (0.79, 0.96)	0.87* (0.78, 0.96)	0.87* (0.78, 0.97)	0.90 (0.80, 1.01)
High job strain (categorical, ref. category: no high job strain)	0.78* (0.62, 0.99)	0.78* (0.61, 0.99)	0.80 (0.62, 1.03)	0.81 (0.63, 1.05)	0.87 (0.67, 1.13)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	0.94 (0.76, 1.17)	0.94 (0.76, 1.18)	0.95 (0.76, 1.20)	0.94 (0.74, 1.19)	1.05 (0.82, 1.34)
High job strain (categorical, ref. category: low strain)	0.77 (0.58, 1.01)	0.77 (0.58, 1.03)	0.81 (0.60, 1.09)	0.84 (0.61, 1.15)	0.92 (0.87, 1.13)

Variable	Leisure-time physical activity [yes/no]				
	Model 1	Model 2	Model 3	Model 4	Model 5
Alt. high job strain[5] (categorical, ref. category: low strain)	0.79 (0.62, 1.02)	0.79 (0.61, 1.02)	0.82 (0.63, 1.07)	0.82 (0.62, 1.09)	0.94 (0.70, 1.25)
Isostrain (continuous)	0.85* (0.77, 0.93)	0.84* (0.76, 0.92)	0.84* (0.76, 0.94)	0.83* (0.75, 0.93)	0.82* (0.74, 0.92)
Alt. isostrain (continuous)[5]	0.84* (0.77, 0.93)	0.84* (0.76, 0.92)	0.85* (0.76, 0.93)	0.83* (0.75, 0.93)	0.83* (0.74, 0.92)
Isostrain (categorical)	0.80 (0.59, 1.07)	0.78 (0.58, 1.06)	0.75 (0.55, 1.03)	0.77 (0.56, 1.07)	0.72* (0.52, 0.99)
Alt. isostrain[5] (categorical)	0.92 (0.70, 1.20)	0.90 (0.69, 1.18)	0.88 (0.66, 1.16)	0.90 (0.67, 1.20)	0.84 (0.63, 1.12)
Job insecurity (continuous)	1.10* (1.01, 1.21)	1.11* (1.01, 1.21)	1.03 (0.93, 1.14)	1.06 (0.96, 1.18)	1.08 (0.97, 1.19)
Job insecurity (categorical)	1.21* (1.00, 1.47)	1.21* (1.00, 1.46)	1.09 (0.89, 1.34)	1.14 (0.92, 1.41)	1.18 (0.95, 1.46)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: "I am not asked to do an excessive amount of work", "I have enough time to get the job done", "I am free from conflicting demands others make")
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple logistic regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking and alcohol) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 29a. Associations between psychosocial job factors and sick-leave absenteeism days: results (standardized hazard ratios and 95% confidence intervals) from Cox proportional hazard regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variable	Sick-leave absenteeism [days]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	1.00 (0.92, 1.08)	1.00 (0.92, 1.09)	1.04 (0.94, 1.15)	1.03 (0.94, 1.14)	1.04 (0.94, 1.15)
Alt. psychological job demands (three items)[2]	1.03 (0.95, 1.11)	1.04 (0.95, 1.13)	1.06 (0.97, 1.16)	1.06 (0.97, 1.16)	1.08 (0.98, 1.18)
Physical demands	0.98 (0.90, 1.06)	N/A	0.99 (0.90, 1.10)	0.99 (0.89, 1.10)	0.97 (0.86, 1.09)
Decision latitude (nine items)[3]	0.98 (0.90, 1.06)	0.98 (0.90, 1.07)	1.02 (0.93, 1.11)	1.02 (0.93, 1.12)	1.01 (0.90, 1.12)
Alt. decision latitude (eight items)[4]	0.97 (0.90, 1.06)	0.98 (0.90, 1.07)	1.02 (0.93, 1.11)	1.02 (0.94, 1.12)	1.01 (0.91, 1.13)
Coworker support	1.02 (0.94, 1.11)	1.03 (0.95, 1.11)	1.04 (0.96, 1.14)	1.04 (0.96, 1.14)	1.04 (0.95, 1.14)
Supervisor support	0.98 (0.91, 1.07)	0.99 (0.91, 1.07)	1.01 (0.93, 1.09)	1.01 (0.93, 1.10)	1.01 (0.92, 1.11)
Total support	1.00 (0.92, 1.08)	1.01 (0.93, 1.09)	1.02 (0.94, 1.11)	1.03 (0.95, 1.12)	1.03 (0.93, 1.13)
Job strain ratio	1.02 (0.94, 1.12)	1.03 (0.93, 1.13)	1.04 (0.94, 1.14)	1.02 (0.93, 1.13)	1.05 (0.94, 1.17)
Alt. job strain ratio[5]	1.03 (0.95, 1.12)	1.03 (0.95, 1.12)	1.04 (0.95, 1.13)	1.04 (0.95, 1.13)	1.07 (0.97, 1.18)
High job strain (categorical, ref. category: no high job strain)	1.04 (0.85, 1.26)	1.03 (0.84, 1.26)	1.03 (0.84, 1.27)	1.00 (0.80, 1.23)	1.02 (0.82, 1.28)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	0.91 (0.75, 1.11)	0.91 (0.75, 1.11)	0.92 (0.75, 1.12)	0.89 (0.73, 1.09)	0.90 (0.73, 1.12)

Variable	Sick-leave absenteeism [days]				
	Model 1	Model 2	Model 3	Model 4	Model 5
High job strain (categorical, ref. category: low strain)	1.02 (0.80, 1.30)	1.02 (0.79, 1.32)	1.01 (0.78, 1.32)	0.94 (0.71, 1.24)	0.96 (0.72, 1.27)
Alt. high job strain[5] (categorical, ref. category: low strain)	0.98 (0.78, 1.24)	0.99 (0.79, 1.25)	0.97 (0.77, 1.24)	0.95 (0.74, 1.21)	0.96 (0.74, 1.25)
Isostrain (continuous)	1.02 (0.94, 1.10)	1.01 (0.93, 1.10)	0.99 (0.91, 1.08)	0.98 (0.90, 1.08)	0.99 (0.90, 1.08)
Alt. isostrain (continuous)[5]	1.03 (0.95, 1.12)	1.03 (0.95, 1.11)	1.01 (0.93, 1.10)	1.01 (0.92, 1.10)	1.01 (0.92, 1.10)
Isostrain (categorical)	1.10 (0.86, 1.39)	1.09 (0.85, 1.41)	1.08 (0.83, 1.39)	1.04 (0.80, 1.36)	1.05 (0.81, 1.37)
Alt. isostrain[5] (categorical)	1.07 (0.85, 1.34)	1.07 (0.85, 1.35)	1.08 (0.85, 1.36)	1.06 (0.84, 1.35)	1.07 (0.84, 1.36)
Job insecurity (continuous)	0.99 (0.92, 1.07)	1.00 (0.92, 1.08)	0.99 (0.91, 1.07)	0.99 (0.91, 1.07)	0.99 (0.91, 1.08)
Job insecurity (categorical)	0.97 (0.81, 1.15)	0.96 (0.81, 1.14)	0.94 (0.78, 1.12)	0.94 (0.78, 1.13)	0.94 (0.78, 1.13)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 29b. Associations between psychosocial job factors and acute (1-30) absenteeism days: results (standardized hazard ratios and 95% confidence intervals) from Cox proportional hazard regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variable	Acute (1-30 days) sick-leave absenteeism [days]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	0.99 (0.91, 1.08)	1.01 (0.92, 1.11)	1.03 (0.92, 1.14)	1.03 (0.93, 1.15)	1.05 (0.94, 1.17)
Alt. psychological job demands (three items)[2]	1.00 (0.92, 1.10)	1.02 (0.93, 1.12)	1.05 (0.97, 1.16)	1.05 (0.95, 1.16)	1.09 (0.98, 1.21)
Physical demands	0.98 (0.90, 1.08)	N/A	1.01 (0.90, 1.13)	0.99 (0.98, 1.11)	0.98 (0.86, 1.11)
Decision latitude (nine items)[3]	1.00 (0.91, 1.10)	1.00 (0.91, 1.09)	1.03 (0.93, 1.15)	1.04 (0.93, 1.16)	0.98 (0.87, 1.11)
Alt. decision latitude (eight items)[4]	1.01 (0.92, 1.10)	1.00 (0.91, 1.10)	1.04 (0.94, 1.16)	1.05 (0.94, 1.17)	1.00 (0.89, 1.13)
Coworker support	1.09 (1.00, 1.20)	1.09 (0.99, 1.19)	1.10 (1.00, 1.21)	1.10* (1.00, 1.22)	1.10 (1.00, 1.22)
Supervisor support	1.08 (0.99, 1.17)	1.07 (0.98, 1.17)	1.09 (0.99, 1.19)	1.09 (0.99, 1.20)	1.10 (0.99, 1.21)
Total support	1.09* (1.00, 1.19)	1.09 (1.00, 1.19)	1.10* (1.01, 1.21)	1.11* (1.01, 1.22)	1.12* (1.01, 1.24)
Job strain ratio	1.00 (0.91, 1.10)	1.02 (0.92, 1.13)	1.02 (0.91, 1.13)	1.01 (0.91, 1.13)	1.07 (0.95, 1.20)
Alt. job strain ratio[5]	1.00 (0.91, 1.09)	1.01 (0.92, 1.11)	1.03 (0.93, 1.13)	1.02 (0.93, 1.13)	1.08 (0.97, 1.21)
High job strain (categorical, ref. category: no high job strain)	0.97 (0.78, 1.21)	0.99 (0.79, 1.24)	0.97 (0.77, 1.22)	0.94 (0.74, 1.20)	1.00 (0.78, 1.28)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	0.93 (0.75, 1.15)	0.95 (0.77, 1.18)	0.94 (0.75, 1.18)	0.92 (0.73, 1.16)	0.99 (0.78, 1.26)

Variable	Acute (1-30 days) sick-leave absenteeism [days]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
High job strain (categorical, ref. category: low strain)	0.91 (0.69, 1.19)	0.92 (0.69, 1.22)	0.90 (0.67, 1.22)	0.86 (0.64, 1.17)	0.92 (0.67, 1.26)
Alt. high job strain[5] (categorical, ref. category: low strain)	0.95 (0.73, 1.22)	0.98 (0.75, 1.26)	0.97 (0.73, 1.28)	0.94 (0.71, 1.25)	1.05 (0.78, 1.42)
Isostrain (continuous)	0.97 (0.88, 1.06)	0.98 (0.89, 1.07)	0.95 (0.86, 1.06)	0.95 (0.85, 1.05)	0.95 (0.85, 1.05)
Alt. isostrain (continuous)[5]	0.97 (0.89, 1.06)	0.98 (0.90, 1.08)	0.97 (0.88, 1.07)	0.96 (0.87, 1.07)	0.97 (0.87, 1.07)
Isostrain (categorical)	0.92 (0.70, 1.22)	0.95 (0.72, 1.26)	0.94 (0.70, 1.25)	0.90 (0.67, 1.21)	0.91 (0.67, 1.22)
Alt. isostrain[5] (categorical)	0.91 (0.70, 1.17)	0.93 (0.72, 1.20)	0.93 (0.72, 1.22)	0.92 (0.70, 1.20)	0.92 (0.70, 1.21)
Job insecurity (continuous)	0.99 (0.91, 1.08)	1.00 (0.92, 1.09)	0.99 (0.90, 1.08)	0.99 (0.90, 1.08)	1.00 (0.91, 1.09)
Job insecurity (categorical)	0.95 (0.79, 1.15)	0.98 (0.81, 1.19)	0.95 (0.78, 1.17)	0.95 (0.78, 1.17)	0.97 (0.78, 1.20)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 29c. Associations between psychosocial job factors and chronic (>30) sick-leave absenteeism days: results (standardized hazard ratios and 95% confidence intervals) from Cox proportional hazard regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variable	Chronic (> 30 days) sick-leave absenteeism [days]				
	Model 1	Model 2	Model 3	Model 4	Model 5
Psychological job demands (five items)[1]	1.02 (0.77, 1.34)	0.94 (0.69, 1.29)	1.06 (0.65, 1.71)	0.93 (0.58, 1.47)	0.96 (0.59, 1.55)
Alt. psychological job demands (three items)[2]	0.93 (0.71, 1.20)	0.89 (0.68, 1.17)	1.09 (0.75, 1.60)	1.21 (0.83, 1.76)	1.19 (0.80, 1.77)
Physical demands	1.21 (0.91, 1.61)	N/A	1.40 (0.92, 2.15)	1.24 (0.79, 1.95)	1.19 (0.67, 2.13)
Decision latitude (nine items)[3]	1.19 (0.90, 1.58)	1.24 (0.91, 1.69)	1.07 (0.72, 1.57)	0.92 (0.59, 1.43)	1.33 (0.65, 2.73)
Alt. decision latitude (eight items)[4]	1.18 (0.89, 1.55)	1.21 (0.90, 1.64)	1.02 (0.70, 1.49)	0.88 (0.57, 1.36)	1.26 (0.61, 2.57)
Coworker support	1.07 (0.81, 1.41)	1.09 (0.81, 1.47)	0.92 (0.63, 1.33)	1.01 (0.65, 1.58)	1.05 (0.62, 1.77)
Supervisor support	1.01 (0.74, 1.38)	1.01 (0.73, 1.40)	0.90 (0.64, 1.27)	0.77 (0.54, 1.10)	0.66 (0.39, 1.10)
Total support	1.05 (0.78, 1.41)	1.06 (0.77, 1.46)	0.89 (0.63, 1.27)	0.81 (0.54, 1.21)	0.66 (0.33, 1.31)
Job strain ratio	0.88 (0.64, 1.21)	0.78 (0.55, 1.12)	1.00 (0.62, 1.62)	1.00 (0.60, 1.66)	0.84 (0.46, 1.53)
Alt. job strain ratio[5]	0.86 (0.66, 1.13)	0.83 (0.62, 1.10)	1.05 (0.72, 1.52)	1.22 (0.83, 1.81)	1.13 (0.71, 1.80)
High job strain (categorical, ref. category: no high job strain)	0.91 (0.46, 1.80)	0.82 (0.36, 1.87)	1.59 (0.60, 4.25)	1.27 (0.43, 3.72)	0.91 (0.22, 3.74)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	0.54 (0.28, 1.04)	0.52 (0.26, 1.03)	0.76 (0.32, 1.82)	0.83 (0.31, 2.20)	0.42 (0.12, 1.43)

Variable	Chronic (> 30 days) sick-leave absenteeism [days]				
	Model 1	Model 2	Model 3	Model 4	Model 5
High job strain (categorical, ref. category: low strain)	0.97 (0.42, 2.26)	0.91 (0.35, 2.38)	2.07 (0.69, 6.24)	1.16 (0.33, 4.02)	0.83 (0.18, 3.90)
Alt. high job strain[5] (categorical, ref. category: low strain)	0.62 (0.29, 1.33)	0.60 (0.27, 1.30)	0.88 (0.35, 2.23)	0.98 (0.35, 2.70)	0.54 (0.14, 2.03)
Isostrain (continuous)	0.87 (0.67, 1.15)	0.82 (0.61, 1.11)	1.00 (0.70, 1.44)	1.09 (0.72, 1.64)	1.06 (0.70, 1.62)
Alt. isostrain (continuous)[5]	0.87 (0.68, 1.13)	0.84 (0.64, 1.11)	1.04 (0.75, 1.44)	1.21 (0.84, 1.76)	1.18 (0.81, 1.74)
Isostrain (categorical)	1.22 (0.52, 2.88)	0.93 (0.32, 2.71)	1.89 (0.52, 6.83)	1.48 (0.31, 7.05)	2.41 (0.41, 14.09)
Alt. isostrain[5] (categorical)	0.94 (0.40, 2.21)	0.80 (0.32, 2.00)	1.32 (0.41, 4.25)	1.98 (0.57, 6.90)	2.12 (0.61, 7.43)
Job insecurity (continuous)	0.95 (0.73, 1.25)	0.92 (0.69, 1.22)	0.77 (0.49, 1.23)	0.78 (0.46, 1.30)	0.77 (0.46, 1.31)
Job insecurity (categorical)	0.81 (0.47, 1.41)	0.72 (0.39, 1.31)	0.63 (0.27, 1.43)	0.50 (0.20, 1.24)	0.45 (0.18, 1.13)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 30. Associations between psychosocial job factors and work limitations score (presenteeism) using selected WLQ items[1]: results (standardized beta coefficients and 95% confidence intervals) from multiple linear regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n= 2,330).

Variable	Work limitations [score of selected items][1]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[2]	-0.30* (-0.39, -0.20)	-0.24* (-0.34, -0.13)	-0.23* (-0.34, -0.12)	-0.22* (-0.35, -0.11)	-0.26* (-0.37, -0.15)
Alt. psychological job demands (three items)[3]	-0.03 (-0.13, 0.06)	0.03 (-0.07, 0.13)	0.05 (-0.05, 0.15)	0.06 (-0.04, 0.16)	-0.03 (-0.14, 0.07)
Physical demands	-0.24* (-0.33, -0.14)	N/A	-0.23* (-0.34, -0.11)	-0.22* (-0.33, -0.10)	-0.10 (-0.22, 0.02)
Decision latitude (nine items)[4]	-0.27* (-0.37, -0.18)	-0.28* (-0.38, -0.19)	-0.26* (-0.36, -0.16)	-0.26* (-0.37, -0.16)	-0.16* (-0.27, -0.04)
Alt. decision latitude (eight items)[5]	-0.32* (-0.41, -0.22)	-0.32* (-0.41, -0.22)	-0.29* (-0.39, -0.19)	-0.30* (-0.40, -0.20)	-0.23* (-0.34, -0.11)
Coworker support	-0.19* (-0.29, -0.10)	-0.19* (-0.29, -0.09)	-0.17* (-0.27, -0.07)	-0.16* (-0.26, -0.07)	-0.07 (-0.18, 0.03)
Supervisor support	-0.19* (-0.29, -0.09)	-0.20* (-0.30, -0.11)	-0.21* (-0.31, -0.11)	-0.22* (-0.31, -0.12)	-0.15* (-0.26, -0.04)
Total support	-0.22* (-0.32, -0.13)	-0.23* (-0.33, -0.14)	-0.23* (-0.33, -0.13)	-0.23* (-0.33, -0.13)	-0.14* (-0.25, -0.03)
Job strain ratio	-0.08 (-0.17, 0.02)	0.00 (-0.10, 0.10)	-0.01 (-0.12, 0.09)	0.00 (-0.11, 0.10)	-0.14* (-0.25, -0.02)
Alt. job strain ratio[6]	0.10 (0.00, 0.19)	0.15* (0.05, 0.25)	0.15* (0.05, 0.25)	0.16* (0.06, 0.27)	0.05 (-0.06, 0.16)
High job strain (categorical, ref. category: no high job strain)	-0.08 (-0.32, 0.15)	0.02 (-0.22, 0.26)	-0.03 (-0.27, 0.21)	-0.03 (-0.27, 0.21)	-0.21 (-0.46, 0.04)
Alt. high job strain[6] (categorical, ref. category: no high job strain)	0.20 (-0.03, 0.42)	0.26* (0.03, 0.48)	0.19 (-0.03, 0.42)	0.19 (-0.03, 0.43)	0.01 (-0.22, 0.25)

Variable	Work limitations [score of selected items][1]				
	Model 1	Model 2	Model 3	Model 4	Model 5
High job strain (categorical, ref. category: low strain)	0.07 (-0.20, 0.35)	0.21 (-0.08, 0.50)	0.19 (-0.10, 0.48)	0.21 (-0.08, 0.51)	0.01 (-0.30, 0.31)
Alt. high job strain[6] (categorical, ref. category: low strain)	0.37* (0.10, 0.63)	0.45* (0.19, 0.72)	0.43* (0.17, 0.70)	0.44* (0.17, 0.71)	0.22 (-0.07, 0.51)
Isostrain (continuous)	0.15* (0.05, 0.24)	0.20* (0.10, 0.30)	0.18* (0.08, 0.28)	0.18* (0.08, 0.29)	0.14* (0.04, 0.25)
Alt. isostrain (continuous)[6]	0.24* (0.15, 0.34)	0.28* (0.18, 0.38)	0.26* (0.17, 0.36)	0.27* (0.17, 0.37)	0.24* (0.13, 0.34)
Isostrain (categorical)	-0.07 (-0.36, 0.22)	0.05 (-0.25, 0.35)	-0.03 (-0.33, 0.27)	-0.04 (-0.34, 0.26)	-0.13 (-0.44, 0.17)
Alt. isostrain[5] (categorical)	0.17 (-0.10, 0.44)	0.24 (-0.03, 0.52)	0.17 (-0.10, 0.44)	0.18 (-0.10, 0.46)	0.09 (-0.19, 0.37)
Job insecurity (continuous)	0.20* (0.10, 0.30)	0.20* (0.10, 0.30)	0.20* (0.10, 0.30)	0.20* (0.10, 0.30)	0.17* (0.06, 0.27)
Job insecurity (categorical)	0.19 (-0.01, 0.39)	0.19 (-0.01, 0.39)	0.23* (0.02, 0.43)	0.22* (0.02, 0.43)	0.17 (-0.04, 0.38)

[1]Reversed score based on the following four items selected from IMSS' WLQ: Start on your job as soon as you arrived at work, concentrate on your work, do the required amount of work on your job, and feel you have done what you are capable of doing. These items showed the highest correlations with the original (Lerner's) WLQ (*cf.* methods section).
[2]Five-item psychological demands (original JCQ psychological demand subscale)
[3]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: "I am not asked to do an excessive amount of work", "I have enough time to get the job done", "I am free from conflicting demands others make")
[4]Nine-item decision latitude (original JCQ decision latitude subscale)
[5]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[6]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Appendix 9

Comparison of continuous vs. categorical versions of JCQ scales in multivariate associations

Meaning of highlights:

Yellow: continuous measures predicted the outcomes better than the categorical measures → 26 total
Blue: categorical measures predicted the outcomes better than the continuous measures → 20 total
Gray: continuous measures reached statistical significance while categorical did not → 7 total
Gray underlined: categorical measures reached statistical significance while categorical did not → 4 total
Green: categorical high strain scales using low strain as a reference showed stronger effect sizes than those using no high strain as a reference → 20 total
Pink: categorical high strain scales using no high strain as a reference showed stronger effect sizes than those using low strain as a reference → 6 total
Red: better prediction of outcomes according to the literature → 3 total, 2 favoring the categorical high strain scale using no high strain as a reference

Table 23. Associations between psychosocial job factors and blood glucose levels: results (standardized beta coefficients and 95% confidence intervals) from multiple linear regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variable	**Glucose [mg/dL]**				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	-0.55 (-1.66, 0.57)	-0.97 (-2.19, 0.24)	-0.26 (-1.47, 0.94)	-0.27 (-1.50, 0.97)	-0.32 (-1.54, 0.89)
Alt. psychological job demands (three items)[2]	0.67 (-0.45, 1.78)	0.54 (-0.63, 1.71)	0.61 (-0.51, 1.73)	0.72 (-0.43, 1.87)	0.43 (-0.74, 1.61)
Physical demands	0.95 (-0.16, 2.06)	N/A	0.70 (-0.54, 1.95)	0.64 (-0.64, 1.91)	1.03 (-0.32, 2.38)
Decision latitude (nine items)[3]	-0.06 (-1.18, 1.05)	-0.11 (-1.24, 1.02)	-0.39 (-1.51, 0.73)	-0.75 (-1.89, 0.38)	-0.81 (-2.08, 0.46)
Alt. decision latitude (eight items)[4]	-0.06 (-1.17, 1.05)	-0.12 (-1.25, 1.00)	-0.41 (-1.52, 0.70)	-0.80 (-1.92, 0.33)	-0.85 (-2.12, 0.41)
Coworker support	0.02 (-1.09, 1.14)	-0.10 (-1.23, 1.03)	0.55 (-0.53, 1.63)	0.38 (-0.71, 1.48)	0.96 (-0.18, 2.11)
Supervisor support	0.43 (-0.68, 1.54)	0.33 (-0.80, 1.47)	-0.16 (-1.25, 0.93)	-0.07 (-1.17, 1.04)	0.29 (-0.94, 1.52)
Total support	0.30 (-0.81, 1.41)	0.17 (-0.96, 1.31)	0.17 (-0.91, 1.25)	0.15 (-0.95, 1.25)	0.76 (-0.47, 1.99)
Job strain ratio	-0.69 (-1.80, 0.42)	-0.97 (-2.15, 0.21)	-0.21 (-1.35, 0.93)	0.02 (-1.14, 1.18)	-0.08 (-1.33, 1.17)
Alt. job strain ratio[5]	0.27 (-0.85, 1.38)	0.16 (-0.99, 1.32)	0.37 (-0.72, 1.47)	0.62 (-0.50, 1.75)	0.50 (-0.74, 1.75)
High job strain (categorical, ref. category: no high job strain)	0.09 (-2.60, 2.78)	-0.02 (-2.81, 2.76)	0.51 (-2.14, 3.15)	1.30 (-1.35, 3.96)	0.91 (-1.82, 3.65)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	0.15 (-2.42, 2.72)	0.17 (-2.45, 2.79)	0.31 (-2.18, 2.79)	0.92 (-1.58, 3.42)	0.74 (-1.87, 3.34)

Variable	Glucose [mg/dL]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
High job strain (categorical, ref. category: low strain)	1.06 (-2.19, 4.31)	0.58 (-2.81, 3.97)	1.33 (-1.91, 4.57)	3.20 (-0.06, 6.46)	2.31 (-1.07, 5.68)
Alt. high job strain[5] (categorical, ref. category: low strain)	1.54 (-1.49, 4.57)	1.49 (-1.61, 4.60)	1.68 (-1.27, 4.64)	2.89 (-0.08, 5.86)	2.42 (-0.76, 5.60)
Isostrain (continuous)	-0.26 (-1.37, 0.85)	-0.33 (-1.48, 0.82)	0.14 (-0.97, 1.26)	0.42 (-0.70, 1.55)	0.08 (-1.07, 1.24)
Alt. isostrain (continuous)[5]	0.28 (-0.83, 1.40)	0.28 (-0.85, 1.42)	0.50 (-0.60, 1.59)	0.79 (-0.31, 1.90)	0.39 (-0.75, 1.52)
Isostrain (categorical)	-2.63 (-6.00, 0.75)	-2.66 (-6.13, 0.81)	-1.46 (-4.76, 1.84)	-0.04 (-3.37, 3.29)	-1.36 (-4.69, 1.98)
Alt. isostrain[5] (categorical)	-2.79 (-5.92, 0.35)	-2.64 (-5.83, 0.55)	-1.70 (-4.74, 1.33)	-0.59 (-3.63, 2.45)	-1.63 (-4.69, 1.44)
Job insecurity (continuous)	-1.35* (-2.46, -0.24)	-1.39* (-2.52, -0.26)	0.55 (-0.55, 1.66)	0.81 (-0.30, 1.93)	0.70 (-0.44, 1.84)
Job insecurity (categorical)	-2.48* (-4.79, -0.18)	-2.58* (-4.92, -0.23)	-0.52 (-1.75, 2.79)	0.74 (-1.55, 3.02)	0.60 (-1.72, 2.91)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 24. Associations between psychosocial job factors and total blood cholesterol levels: results (standardized beta coefficients and 95% confidence intervals) from multiple linear regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variable	Total blood Cholesterol Levels [mg/dL]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	-1.35 (-3.31, 0.61)	-0.84 (-2.97, 1.28)	-1.28 (-3.29, 0.73)	-1.78 (-3.99, 0.44)	-1.63 (-3.69, 0.42
Alt. psychological job demands (three items)[2]	0.56 (-1.40, 2.53)	0.92 (-1.13, 2.97)	-0.03 (-1.90, 1.85)	-0.50 (-2.57, 1.56)	-0.85 (-2.84, 1.14)
Physical demands	-2.04* (-4.00, -0.08)	N/A	-1.55 (-3.64, -0.55)	-1.88 (-4.17, 0.41)	-1.00 (-3.29, 1.30)
Decision latitude (nine items)[3]	0.02 (-2.04, 1.91)	-0.06 (-2.04, 1.91)	-0.32 (-2.19, 1.56)	-0.88 (-2.89, 1.22)	1.29 (-0.86, 3.44)
Alt. decision latitude (eight items)[4]	-0.17 (-2.14, 1.79)	-0.22 (-2.19, 1.75)	-0.32 (-2.18, 1.54)	-0.81 (-2.83, 1.21)	1.16 (-0.98, 3.29)
Coworker support	-1.78 (-3.74, 0.18)	-1.70 (-3.68, 0.27)	-2.27* (-4.08, -0.46)	-2.62* (-4.58, -0.67)	-2.45* (-4.38, -0.51)
Supervisor support	-3.46* (-5.41, -1.50)	-3.79* (-5.77, -1.81)	-2.02* (-3.84, 0.20)	-1.91 (-3.87, 0.06)	-2.25* (-4.33, -0.18)
Total support	-3.24* (-5.19, -1.28)	-3.42* (-5.40, -1.44)	-2.50* (-4.31, -0.69)	-2.61* (-4.57, -0.65)	-2.96* (-5.04, -0.88)
Job strain ratio	-1.02 (-2.98, 0.94)	-0.57 (-2.64, 1.50)	-0.88 (-2.79, 1.03)	-0.81 (-2.87, 1.26)	-2.15* (-4.26, -0.03)
Alt. job strain ratio[5]	0.36 (-1.60, 2.33)	0.64 (-1.38, 2.66)	-0.12 (-1.96, 1.71)	-0.26 (-2.27, 1.74)	-1.60 (-3.71, 0.50)
High job strain (categorical, ref. category: no high job strain)	-0.76 (-5.50, 3.98)	-0.13 (-4.99, 4.74)	1.30 (-3.13, 5.74)	1.45 (-3.32, 6.22)	0.02 (-4.60, 4.64)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	-0.34 (-4.87, 4.20)	-0.37 (-4.95, 4.21)	1.08 (-3.09, 5.24)	0.51 (-3.97, 4.99)	-0.64 (-5.04, 3.77)

Variable	Total blood Cholesterol Levels [mg/dL]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
High job strain (categorical, ref. category: low strain)	-0.99 (-6.72, 4.75)	0.03 (-5.91, 5.96)	0.67 (-4.75, 6.10)	0.33 (-5.53, 6.18)	-1.42 (-7.14, 4.30)
Alt. high job strain[5] (categorical, ref. category: low strain)	1.34 (-4.02, 6.70)	1.64 (-3.80, 7.08)	1.69 (-3.27, 6.65)	0.95 (-4.37, 6.27)	-1.15 (-6.54, 4.24)
Isostrain (continuous)	0.35 (-1.61, 2.31)	0.73 (-1.28, 2.74)	0.53 (-1.33, 2.40)	0.80 (-1.21, 2.81)	0.27 (-1.69, 2.22)
Alt. isostrain (continuous)[5]	1.14 (-0.82, 3.11)	1.37 (-0.62, 3.36)	0.80 (-1.03, 2.63)	0.92 (-1.06, 2.90)	0.50 (-1.43, 2.43)
Isostrain (categorical)	2.91 (-3.06, 8.88)	3.63 (-2.45, 9.71)	4.52 (-1.01, 10.05)	4.11 (-1.84, 10.05)	4.76 (-0.87, 10.41)
Alt. isostrain[5] (categorical)	1.73 (-3.81, 7.26)	1.57 (-4.02, 7.16)	2.21 (-2.87, 7.29)	0.68 (-4.75, 6.10)	2.18 (-3.01, 7.38)
Job insecurity (continuous)	2.05* (0.09, 4.01)	1.94 (-0.04, 3.92)	0.99 (-0.86, 2.84)	0.99 (-1.01, 2.98)	0.84 (-1.09, 2.77)
Job insecurity (categorical)	4.27* (0.21, 8.34)	4.22* (0.12, 8.32)	1.36 (-2.44, 5.17)	0.86 (-3.24, 4.97)	1.35 (-2.56, 5.26)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (systolic blood pressure, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 25a. Associations between psychosocial job factors and body mass index: results (standardized beta coefficients and 95% confidence intervals) from multiple linear regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n= 2,330).

Variable	**Body Mass Index [kg/m²]**				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	0.14 (0.03, 0.31)	0.20* (0.01, 0.39)	0.22* (0.03, 0.41)	0.17 (-0.02, 0.37)	0.23* (0.05, 0.42)
Alt. psychological job demands (three items)[2]	0.25* (0.08, 0.43)	0.30* (0.12, 0.48)	0.24* (0.06, 0.41)	0.14 (-0.04, 0.32)	0.24* (0.06, 0.42)
Physical demands	-0.07 (-0.24, 0.10)	N/A	-0.17 (-0.37, 0.03)	-0.24* (-0.44, -0.03)	-0.27* (-0.47, -0.06)
Decision latitude (nine items)[3]	0.26* (0.09, 0.44)	0.27* (0.10, 0.45)	0.19* (0.01, 0.37)	0.19* (0.01, 0.37)	0.32* (0.13, 0.52)
Alt. decision latitude (eight items)[4]	0.25* (0.08, 0.43)	0.26* (0.09, 0.44)	0.19* (0.01, 0.37)	0.19* (0.01, 0.36)	0.35* (0.15, 0.54)
Coworker support	-0.03 (-0.21, 0.14)	-0.01 (-0.18, 0.17)	-0.03 (-0.20, 0.15)	-0.03 (-0.20, 0.14)	-0.13 (-0.31, 0.04)
Supervisor support	-0.20* (-0.38, -0.03)	-0.20* (-0.38, -0.03)	-0.20* (-0.37, -0.02)	-0.22* (-0.39, -0.04)	-0.33* (-0.52, -0.14)
Total support	-0.15 (-0.33, 0.02)	-0.14 (-0.32, 0.03)	-0.14 (-0.32, 0.03)	-0.16 (-0.33, 0.01)	-0.30* (-0.49, -0.11)
Job strain ratio	-0.06 (-0.24, 0.11)	-0.05 (-0.24, 0.13)	0.02 (-0.16, 0.20)	0.00 (-0.18, 0.18)	0.00 (-0.19, 0.19)
Alt. job strain ratio[5]	0.07 (-0.10, 0.25)	0.09 (-0.08, 0.27)	0.09 (-0.09, 0.26)	0.02 (-0.15, 0.20)	0.05 (-0.14, 0.25)
High job strain (categorical, ref. category: no high job strain)	-0.37 (-0.79, 0.06)	-0.39 (-0.83, 0.04)	-0.28 (-0.71, 0.14)	-0.33 (-0.74, 0.09)	-0.44* (-0.86, -0.02)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	-0.28 (-0.68, 0.12)	-0.32 (-0.73, 0.09)	-0.25 (-0.64, 0.15)	-0.26 (-0.65, 0.13)	-0.35 (-0.75, 0.05)

Variable	Body Mass Index [kg/m²]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
High job strain (categorical, ref. category: low strain)	-0.42 (-0.93, 0.09)	-0.39 (-0.92, 0.14)	-0.33 (-0.85, 0.18)	-0.41 (-0.92, 0.10)	-0.54* (-1.05, -0.02)
Alt. high job strain[5] (categorical, ref. category: low strain)	-0.18 (-0.66, 0.29)	-0.18 (-0.66, 0.30)	-0.18 (-0.66, 0.29)	-0.31 (-0.77, 0.16)	-0.43 (-0.91, 0.06)
Isostrain (continuous)	-0.10 (-0.27, 0.08)	-0.10 (-0.28, 0.08)	-0.02 (-0.20, 0.16)	-0.03 (-0.21, 0.14)	0.01 (-0.17, 0.18)
Alt. isostrain (continuous)[5]	-0.01 (-0.19, 0.16)	-0.01 (-0.18, 0.17)	0.02 (-0.15, 0.20)	-0.02 (-0.19, 0.15)	0.04 (-0.13, 0.22)
Isostrain (categorical)	-0.54* (-1.07, 0.00)	-0.59* (-1.13, -0.05)	-0.47 (-0.99, 0.06)	-0.37 (-0.89, 0.15)	-0.40 (-0.92, 0.11)
Alt. isostrain[5] (categorical)	-0.32 (-0.81, 0.17)	-0.40 (-0.90, 0.10)	-0.31 (-0.79, 0.18)	-0.16 (-0.63, 0.31)	-0.16 (-0.64, 0.31)
Job insecurity (continuous)	-0.26* (-0.43, -0.09)	-0.27* (-0.44, -0.09)	-0.14 (-0.31, 0.04)	-0.17 (-0.35, 0.00)	-0.15 (-0.33, 0.02)
Job insecurity (categorical)	-0.23 (-0.59, 0.14)	-0.21 (-0.58, -0.15)	-0.11 (-0.48, 0.25)	-0.12 (-0.48, 0.24)	-0.13 (-0.49, 0.22)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: "I am not asked to do an excessive amount of work", "I have enough time to get the job done", "I am free from conflicting demands others make")
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other biological cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, and blood glucose levels)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 25b. Associations between psychosocial job factors and waist circumference: results (standardized beta coefficients and 95% confidence intervals) from multiple linear regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n= 2,330).

Variable	Waist Circumference [cm]				
	Model 1	Model 2	Model 3	Model 4	Model 5
Psychological job demands (five items)[1]	0.26 (-0.17, 0.68)	0.39 (-0.07, 0.85)	0.40 (-0.06, 0.86)	0.35 (-0.12, 0.83)	0.49* (0.04, 0.94)
Alt. psychological job demands (three items)[2]	0.41 (-0.01, 0.84)	0.52* (0.08, 0.97)	0.34 (-0.09, 0.76)	0.19 (-0.25, 0.64)	0.36 (-0.07, 0.79)
Physical demands	-0.22 (-0.65, 0.21)	N/A	-0.38 (-0.86, 0.10)	-0.43 (-0.92, 0.06)	-0.58* (-1.09, -0.08)
Decision latitude (nine items)[3]	0.88* (0.45, 1.31)	0.89* (0.46, 1.31)	0.30 (-0.13, 0.73)	0.32 (-0.11, 0.76)	0.54* (0.07, 1.00)
Alt. decision latitude (eight items)[4]	0.84* (0.41, 1.26)	0.85* (0.42, 1.27)	0.31 (-0.11, 0.74)	0.33 (-0.10, 0.76)	0.60* (0.14, 1.07)
Coworker support	0.13 (-0.30, 0.56)	0.18 (-0.24, 0.61)	-0.05 (-0.46, 0.36)	-0.08 (-0.50, 0.34)	-0.25 (-0.67, 0.17)
Supervisor support	-0.43* (-0.86, -0.01)	-0.45* (-0.88, -0.02)	-0.41 (-0.82, 0.00)	-0.50* -0.92, -0.08)	-0.64* (-1.09, -0.19)
Total support	-0.23 (-0.65, 0.20)	-0.21 (-0.64, 0.22)	-0.30 (-0.71, 0.11)	-0.37 (0.79, 0.05)	-0.58* (-1.03, -0.13)
Job strain ratio	-0.33 (-0.76, 0.09)	-0.31 (-0.76, 0.14)	0.09 (-0.34, 0.53)	0.07 (-0.37, 0.51)	0.10 (-0.36, 0.56)
Alt. job strain ratio[5]	-0.04 (-0.46, 0.39)	0.01 (-0.43, 0.49)	0.13 (-0.29, 0.54)	0.03 (-0.39, 0.46)	0.08 (-0.38, 0.54)
High job strain (categorical, ref. category: no high job strain)	-0.82 (-1.85, 0.21)	-0.88 (-1.94, 0.18)	-0.16 (-1.17, 0.85)	-0.36 (-1.38, 0.66)	-0.44 (-1.45, 0.56)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	-0.70 (-1.69, 0.28)	-0.80 (-1.79, 0.20)	-0.37 (-1.32, 0.57)	-0.42 (-1.38, 0.53)	-0.53 (-1.49, 0.43)

Variable	Waist Circumference [cm]				
	Model 1	Model 2	Model 3	Model 4	Model 5
High job strain (categorical, ref. category: low strain)	-1.42* (-2.66, -0.17)	-1.32* (-2.61, -0.04)	-0.44 (-1.67, 0.79)	-0.66 (-1.91, 0.59)	-0.77 (-2.01, 0.48)
Alt. high job strain[5] (categorical, ref. category: low strain)	-0.94 (-2.11, 0.22)	-0.93 (-2.11, 0.25)	-0.44 (-1.57, 0.69)	-0.77 (-1.91, 0.37)	-0.88 (-2.05, 0.30)
Isostrain (continuous)	-0.49* (-0.92, -0.06)	-0.49* (-0.92, -0.05)	0.01 (-0.42, 0.43)	-0.01 (-0.44, 0.42)	0.10 (-0.33, 0.52)
Alt. isostrain (continuous)[5]	-0.30 (-0.73, 0.13)	-0.28 (-0.72, 0.15)	0.02 (-0.39, 0.44)	-0.03 (-0.46, 0.39)	0.09 (-0.33, 0.51)
Isostrain (categorical)	-0.73 (-2.04, 0.57)	-0.80 (-2.12, 0.52)	-0.12 (-1.38, 1.14)	-0.07 (-1.34, 1.21)	0.06 (-1.17, 1.29)
Alt. isostrain[5] (categorical)	-0.13 (-1.34, 1.08)	-0.28 (-1.50, 0.93)	0.07 (-1.09, 1.23)	0.25 (-0.92, 1.41)	0.43 (-0.70, 1.56)
Job insecurity (continuous)	-0.62* (-1.04, -0.19)	-0.63* (-1.06, -0.21)	-0.45* (-0.87, -0.02)	-0.55* (-0.98, -0.12)	-0.48* (-0.90, -0.06)
Job insecurity (categorical)	-0.63 (-1.52, 0.26)	-0.63 (-1.52, -0.26)	-0.62 (-1.49, 0.25)	-0.75 (-1.63, 0.12)	-0.65 (-1.50, 0.20)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: "I am not asked to do an excessive amount of work", "I have enough time to get the job done", "I am free from conflicting demands others make")
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other biological cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, and blood glucose levels)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 25c. Associations between psychosocial job factors and waist-hip ratio: results (standardized beta coefficients and 95% confidence intervals) from multiple linear regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n= 2,330).

Variable	Waist-Hip Ratio [10 units]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	0.02 (0.00, 0.05)	0.01 (-0.01, 0.04)	0.02 (-0.01, 0.04)	0.02 (-0.01, 0.05)	0.02 (-0.00, 0.05)
Alt. psychological job demands (three items)[2]	0.03* (0.01, 0.06)	0.03* (0.00, 0.05)	0.01 (-0.01, 0.04)	0.02 (-0.01, 0.04)	0.02 (-0.01, 0.04)
Physical demands	0.03* (0.00, 0.05)	N/A	-0.01 (-0.04, 0.02)	0.00 (-0.03, 0.02)	-0.02 (-0.05, 0.01)
Decision latitude (nine items)[3]	0.05* (0.02, 0.07)	0.05* (0.03, 0.08)	0.00 (-0.02, 0.03)	0.01 (-0.02, 0.03)	0.01 (-0.02, 0.03)
Alt. decision latitude (eight items)[4]	0.05* (0.02, 0.06)	0.05* (0.03, 0.08)	0.01 (-0.02, 0.03)	0.01 (-0.01, 0.03)	0.01 (-0.01, 0.04)
Coworker support	0.02 (0.00, 0.05)	0.02 (0.00, 0.05)	0.00 (-0.02, 0.02)	0.00 (-0.02, 0.02)	-0.01 (-0.03, 0.02)
Supervisor support	-0.02 (-0.05, 0.00)	-0.02 (-0.04, 0.01)	-0.02 (-0.04, 0.00)	-0.02 (-0.04, 0.00)	-0.02 (-0.05, 0.00)
Total support	0.00 (-0.03, 0.02)	0.00 (-0.03, 0.03)	-0.01 (-0.03, 0.01)	-0.01 (-0.04, 0.01)	-0.02 (-0.04, 0.01)
Job strain ratio	-0.02 (-0.04, 0.01)	-0.03* (-0.06, 0.00)	0.01 (-0.02, 0.03)	0.01 (-0.02, 0.03)	0.01 (-0.02, 0.03)
Alt. job strain ratio[5]	0.00 (-0.02, 0.03)	-0.00 (-0.03, 0.02)	0.01 (-0.02, 0.03)	0.01 (-0.02, 0.03)	0.01 (-0.02, 0.03)
High job strain (categorical, ref. category: no high job strain)	-0.03 (-0.09, 0.03)	-0.05 (-0.12, 0.01)	0.01 (-0.05, 0.06)	0.00 (-0.06, 0.06)	0.00 (-0.05, 0.06)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	-0.02 (-0.08, 0.03)	-0.04 (-0.10, 0.02)	0.00 (-0.06, 0.05)	0.00 (-0.05, 0.06)	0.00 (-0.06, 0.05)

Variable	Waist-Hip Ratio [10 units]				
	Model 1	Model 2	Model 3	Model 4	Model 5
High job strain (categorical, ref. category: low strain)	-0.04 (-0.11, 0.03)	-0.06 (-0.14, 0.02)	0.02 (-0.05, 0.09)	0.02 (-0.05, 0.09)	0.02 (-0.05, 0.09)
Alt. high job strain[5] (categorical, ref. category: low strain)	-0.02 (-0.09, 0.05)	-0.03 (-0.10, 0.04)	0.01 (-0.04, 0.08)	0.01 (-0.06, 0.07)	0.01 (-0.06, 0.07)
Isostrain (continuous)	-0.03* (-0.05, 0.00)	-0.04* (-0.06, -0.01)	0.01 (-0.02, 0.03)	0.00 (-0.02, 0.03)	0.01 (-0.04, 0.01)
Alt. isostrain (continuous)[5]	-0.02 (-0.04, 0.01)	-0.02 (-0.05, 0.00)	0.00 (-0.02, 0.03)	0.00 (-0.02, 0.03)	0.01 (-0.01, 0.03)
Isostrain (categorical)	0.00 (-0.08, 0.07)	-0.02 (-0.10, 0.05)	0.04 (-0.03, 0.11)	0.03 (-0.04, 0.11)	0.05 (-0.02, 0.12)
Alt. isostrain[5] (categorical)	0.03 (-0.03, 0.10)	0.02 (-0.05, 0.09)	0.05 (-0.01, 0.12)	0.05 (-0.02, 0.12)	0.07* (0.01, 0.14)
Job insecurity (continuous)	-0.03* (-0.06, -0.01)	-0.03* (-0.06, -0.01)	-0.03* (-0.05, -0.00)	-0.04* (-0.06, -0.01)	-0.03* (-0.05, -0.01)
Job insecurity (categorical)	-0.02 (-0.07, 0.03)	-0.03 (-0.08, 0.02)	-0.04 (-0.09, 0.01)	-0.07* (-0.12, -0.02)	-0.05* (-0.10, 0.00)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other biological cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, and blood glucose levels)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 26a. Associations between psychosocial job factors and systolic blood pressure: results (standardized beta coefficients and 95% confidence intervals) from multiple linear regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variable	Systolic Blood Pressure [mmHg]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	- 0.47* (-0.88, -0.06)	-0.38 (-0.82, 0.06)	-0.31 (-0.76, 0.13)	-0.41 (-0.84, 0.02)	-0.34 (-0.78, 0.09)
Alt. psychological job demands (three items)[2]	- 0.07 (-0.48, 0.34)	0.00 (-0.43, 0.42)	-0.10 (-0.52, 0.31)	-0.25 (-0.65, 0.15)	-0.18 (-0.60, 0.24)
Physical demands	-0.20 (-0.61, 0.21)	N/A	-0.28 (-0.74, 0.19)	-0.21 (-0.66, 0.24)	0.01 (-0.48, 0.50)
Decision latitude (nine items)[3]	0.40 (-0.01, 0.81)	0.35 (-0.06, 0.77)	-0.09 (-0.51, 0.32)	-0.18 (-0.59, 0.22)	-0.40 (-0.85, 0.06)
Alt. decision latitude (eight items)[4]	0.39 (-0.02, 0.80)	0.35 (-0.06, 0.77)	-0.06 (-0.47, 0.35)	-0.15 (-0.55, 0.25)	-0.39 (-0.85, 0.06)
Coworker support	0.31 (-0.10, 0.72)	0.35 (-0.06, 0.76)	0.18 (-0.22, 0.58)	0.22 (-0.16, 0.61)	0.30 (-0.11, 0.71)
Supervisor support	0.17 (-0.24, 0.58)	0.15 (-0.26, 0.57)	0.08 (-0.32, 0.48)	0.23 (-0.15, 0.62)	0.29 (-0.15, 0.73)
Total support	0.27 (-0.14, 0.68)	0.28 (-0.13, 0.69)	0.15 (-0.25, 0.55)	0.27 (-0.12, 0.66)	0.37 (-0.07, 0.81)
Job strain ratio	-0.66* (-1.07, -0.24)	-0.57* (-1.01, -0.14)	-0.21 (-0.64, 0.22)	-0.20 (-0.62, 0.21)	-0.08 (-0.53, 0.36)
Alt. job strain ratio[5]	-0.29 (-0.71, 0.12)	-0.23 (-0.66, 0.20)	-0.11 (-0.53, 0.30)	-0.17 (-0.57, 0.22)	-0.03 (-0.48, 0.41)
High job strain (categorical, ref. category: no high job strain)	-0.61 (-1.60, 0.38)	-0.32 (-1.34, 0.69)	0.23 (-0.75, 1.21)	0.44 (-0.50, 1.39)	0.68 (-0.29, 1.66)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	-0.68 (-1.63, 0.26)	-0.59 (-1.55, 0.36)	-0.13 (-1.05, 0.78)	-0.01 (-0.89, 0.88)	0.24 (-0.69, 1.17)

Variable	Systolic Blood Pressure [mmHg]				
	Model 1	Model 2	Model 3	Model 4	Model 5
High job strain (categorical, ref. category: low strain)	-1.33 (-2.53, 0.14)	-1.01 (-2.25, 0.23)	-0.26 (-1.46, 0.93)	-0.07 (-1.23, 1.19)	0.33 (-0.88, 1.53)
Alt. high job strain[5] (categorical, ref. category: low strain)	-0.74 (-1.85, 0.38)	-0.57 (-1.70, 0.56)	-0.03 (-1.12, 1.06)	0.02 (-1.03, 1.08)	0.46 (-0.68, 1.60)
Isostrain (continuous)	-0.58* (-0.99, -0.17)	-0.50* (-0.93, -0.08)	-0.09 (-0.50, 0.33)	-0.09 (-0.49, 0.31)	-0.03 (-0.44, 0.39)
Alt. isostrain (continuous)[5]	-0.36 (-0.77, 0.05)	-0.31 (-0.73, 0.11)	-0.04 (-0.45, 0.36)	-0.08 (-0.47, 0.31)	-0.02 (-0.42, 0.39)
Isostrain (categorical)	-1.14 (-2.39, 0.11)	-0.98 (-2.25, 0.29)	-0.17 (-1.39, 1.06)	0.13 (-1.05, 1.31)	0.25 (-0.94, 1.45)
Alt. isostrain[5] (categorical)	-1.34* (-2.50, -0.19)	-1.34* (-2.51, -0.17)	-0.68 (-1.80, 0.44)	-0.51 (-1.59, 0.57)	-0.41 (-1.50, 0.69)
Job insecurity (continuous)	-0.70* (-1.11, -0.29)	-0.69* (-1.10, -0.28)	-0.32 (-0.73, 0.08)	-0.25 (-0.64, 0.14)	-0.20 (-0.61, 0.20)
Job insecurity (categorical)	-1.00* (-1.84, -0.15)	-0.93* (-1.78, -0.07)	-0.57 (-1.41, 0.27)	-0.46 (-1.26, 0.35)	-0.37 (-1.19, 0.46)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (total blood cholesterol levels, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 26b. Associations between psychosocial job factors and diastolic blood pressure: results (standardized beta coefficients and 95% confidence intervals) from multiple linear regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variable	Diastolic Blood Pressure [mmHg]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	-0.38* (-0.67, -0.09)	-0.31 (-0.63, 0.00)	-0.32* (-0.63, 0.00)	-0.39* (-0.69, -0.08)	-0.34* (-0.64, -0.03)
Alt. psychological job demands (three items)[2]	-0.17 (-0.46, 0.12)	-0.10 (-0.41, 0.20)	-0.15 (-0.44, 0.15)	-0.24 (-0.52, 0.04)	-0.17 (-0.47, 0.13)
Physical demands	-0.27 (-0.56, 0.02)	N/A	-0.07 (-0.39, 0.26)	-0.02 (-0.33, 0.30)	0.13 (-0.22, 0.47)
Decision latitude (nine items)[3]	0.48* (0.19, 0.78)	0.44* (0.15, 0.73)	0.14 (-0.16, 0.43)	0.09 (-0.20, 0.37)	0.04 (-0.28, 0.36)
Alt. decision latitude (eight items)[4]	0.48* (0.19, 0.77)	0.45* (0.16, 0.74)	0.17 (-0.12, 0.46)	0.12 (-0.16, 0.40)	0.04 (-0.27, 0.36)
Coworker support	-0.04 (-0.33, 0.25)	-0.05 (-0.35, 0.24)	-0.07 (-0.36, 0.21)	-0.04 (-0.32, 0.23)	-0.11 (-0.40, 0.18)
Supervisor support	0.22 (-0.07, 0.51)	0.19 (-0.11, 0.48)	0.03 (-0.26, 0.31)	0.13 (-0.14, 0.41)	0.00 (-0.31, 0.31)
Total support	0.13 (-0.16, 0.42)	0.10 (-0.20, 0.39)	-0.02 (-0.30, 0.26)	0.07 (-0.21, 0.34)	-0.07 (-0.38, 0.24)
Job strain ratio	-0.66* (-0.95, -0.37)	-0.60* (-0.91, -0.29)	-0.36* (-0.67, -0.06)	-0.37* (-0.66, -0.08)	-0.32* (-0.64, 0.00)
Alt. job strain ratio[5]	-0.41* (-0.70, -0.12)	-0.35* (-0.65, -0.05)	-0.23 (-0.53, 0.06)	-0.27 (-0.56, 0.00)	-0.21 (-0.53, 0.10)
High job strain (categorical, ref. category: no high job strain)	-0.76* (-1.46, -0.06)	-0.51 (-1.24, 0.21)	-0.23 (-0.93, 0.46)	-0.11 (-0.79, 0.56)	0.02 (-0.68, 0.71)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	-0.78* (-1.45, -0.11)	-0.66 (-1.34, 0.01)	-0.37 (-1.03, 0.28)	-0.30 (-0.93, 0.33)	-0.18 (-0.84, 0.48)

Variable	Diastolic Blood Pressure [mmHg]				
	Model 1	Model 2	Model 3	Model 4	Model 5
High job strain (categorical, ref. category: low strain)	-1.50* (-2.34, -0.65)	-1.25* (-2.13, -0.37)	-0.83 (-1.68, 0.02)	-0.74 (-1.56, 0.08)	-0.56 (-1.42, 0.30)
Alt. high job strain[5] (categorical, ref. category: low strain)	-1.14* (-1.93, -0.34)	-0.98* (-1.79, -0.18)	-0.58 (-1.36, 0.19)	-0.54 (-1.29, 0.20)	-0.39 (-1.20, 0.42)
Isostrain (continuous)	-0.56* (-0.85, -0.27)	-0.49* (-0.79, -0.19)	-0.21 (-0.50, 0.08)	-0.22 (-0.51, 0.06)	-0.11 (-0.40, 0.18)
Alt. isostrain (continuous)[5]	-0.43* (-0.72, -0.14)	-0.38* (-0.67, -0.08)	-0.17 (-0.46, 0.12)	-0.20 (-0.48, 0.07)	-0.08 (-0.37, 0.20)
Isostrain (categorical)	-1.52* (-2.40, -0.64)	-1.34* (-2.24, -0.43)	-0.85 (-1.72, 0.02)	-0.68 (-1.52, 0.16)	-0.48 (-1.33, 0.37)
Alt. isostrain[5] (categorical)	-1.55* (-2.37, -0.73)	-1.45* (-2.28, -0.62)	-0.96* (-1.76, -0.17)	-0.86* (-1.63, -0.09)	-0.67 (-1.45, 0.11)
Job insecurity (continuous)	-0.85* (-1.14, -0.56)	-0.83* (-1.12, -0.54)	-0.50* (-0.79, -0.22)	-0.46* (-0.74, -0.18)	-0.43* (-0.72, -0.14)
Job insecurity (categorical)	-1.47* (-2.07, -0.87)	-1.42* (-2.03, -0.82)	-0.87* (-1.47, -0.28)	-0.79* (-1.37, -0.22)	-0.72* (-1.30, -0.13)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: "I am not asked to do an excessive amount of work", "I have enough time to get the job done", "I am free from conflicting demands others make")
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (total blood cholesterol levels, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 27. Associations between psychosocial job factors and current smoking: results (standardized odds ratios and 95% confidence intervals) from multiple logistic regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n= 2,330).

Variable	Current smoking [yes/no]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	1.01 (0.93, 1.10)	0.98 (0.90, 1.07)	1.00 (0.91, 1.11)	0.98 (0.88, 1.09)	0.98 (0.89, 1.09)
Alt. psychological job demands (three items)[2]	1.01 (0.93, 1.10)	0.98 (0.90, 1.07)	1.00 (0.91, 1.09)	1.00 (0.90, 1.11)	0.96 (0.87, 1.06)
Physical demands	1.06 (0.97, 1.14)	N/A	0.95 (0.86, 1.05)	1.00 (0.89, 1.12)	0.95 (0.85, 1.06)
Decision latitude (nine items)[3]	0.97 (0.90, 1.06)	0.98 (0.90, 1.06)	0.98 (0.90, 1.07)	0.97 (0.88, 1.07)	1.02 (0.92, 1.13)
Alt. decision latitude (eight items)[4]	0.98 (0.91, 1.07)	0.98 (0.90, 1.07)	0.98 (0.90, 1.08)	0.98 (0.88, 1.08)	1.02 (0.92, 1.14)
Coworker support	0.97 (0.90, 1.05)	0.98 (0.90, 1.06)	0.95 (0.87, 1.04)	0.95 (0.86, 1.05)	0.96 (0.87, 1.05)
Supervisor support	0.92 (0.85, 1.00)	0.93 (0.85, 1.01)	0.90* (0.82, 0.99)	0.93 (0.84, 1.03)	0.90* (0.81, 0.99)
Total support	0.93 (0.86, 1.01)	0.94 (0.86, 1.02)	0.91* (0.83, 0.99)	0.93 (0.84, 1.02)	0.90 (0.82, 1.00)
Job strain ratio	1.02 (0.94, 1.11)	1.00 (0.92, 1.09)	1.02 (0.93, 1.12)	1.01 (0.91, 1.12)	0.98 (0.89, 1.09)
Alt. job strain ratio[5]	1.02 (0.94, 1.11)	1.00 (0.92, 1.09)	1.02 (0.93, 1.11)	1.02 (0.92, 1.12)	0.97 (0.87, 1.07)
High job strain (categorical, ref. category: no high job strain)	1.16 (0.95, 1.41)	1.14 (0.93, 1.40)	1.18 (0.95, 1.47)	1.23 (0.97, 1.56)	1.14 (0.91, 1.44)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	1.19 (0.99, 1.44)	1.19 (0.98, 1.44)	1.17 (0.95, 1.44)	1.22 (0.98, 1.52)	1.12 (0.90, 1.39)

Variable	Current smoking [yes/no]				
	Model 1	Model 2	Model 3	Model 4	Model 5
High job strain (categorical, ref. category: low strain)	1.04 (0.82, 1.32)	0.99 (0.77, 1.27)	1.02 (0.78, 1.33)	1.06 (0.80, 1.41)	0.96 (0.72, 1.27)
Alt. high job strain[5] (categorical, ref. category: low strain)	1.16 (0.93, 1.44)	1.13 (0.90, 1.41)	1.14 (0.90, 1.46)	1.19 (0.92, 1.55)	1.05 (0.81, 1.37)
Isostrain (continuous)	1.04 (0.96, 1.13)	1.03 (0.95, 1.12)	1.05 (0.96, 1.15)	1.04 (0.94, 1.14)	1.05 (0.95, 1.15)
Alt. isostrain (continuous)[5]	1.03 (0.95, 1.12)	1.02 (0.94, 1.11)	1.03 (0.94, 1.13)	1.03 (0.94, 1.14)	1.03 (0.94, 1.13)
Isostrain (categorical)	1.27 (0.99, 1.63)	1.25 (0.97, 1.62)	1.35* (1.03, 1.78)	1.33 (0.99, 1.79)	1.33* (1.01, 1.77)
Alt. isostrain[5] (categorical)	1.43* (1.13, 1.80)	1.42* (1.13, 1.80)	1.44* (1.12, 1.86)	1.42* (1.08, 1.85)	1.43* (1.10, 1.85)
Job insecurity (continuous)	1.08 (1.00, 1.18)	1.09* (1.00, 1.18)	1.04 (0.95, 1.14)	1.04 (0.95, 1.15)	1.03 (0.93, 1.13)
Job insecurity (categorical)	1.21* (1.03, 1.44)	1.22* (1.03, 1.45)	1.14 (0.95, 1.38)	1.16 (0.95, 1.42)	1.12 (0.92, 1.35)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: "I am not asked to do an excessive amount of work", "I have enough time to get the job done", "I am free from conflicting demands others make")
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple logistic regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (leisure-time physical activity and alcohol) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 28. Associations between psychosocial job factors and leisure-time physical activity: results (standardized odds ratios and 95% confidence intervals) from multiple logistic regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n= 2,330).

Variable	Leisure-time physical activity [yes/no]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	0.93 (0.85, 1.02)	0.94 (0.85, 1.04)	0.89* (0.80, 0.99)	0.94 (0.83, 1.05)	0.90 (0.80, 1.01)
Alt. psychological job demands (three items)[2]	0.90* (0.81, 0.98)	0.91* (0.82, 1.00)	0.88* (0.80, 0.98)	0.91 (0.82, 1.02)	0.91 (0.82, 1.02)
Physical demands	1.00 (0.91, 1.10)	N/A	1.03 (0.92, 1.15)	1.04 (0.92, 1.17)	1.09 (0.96, 1.23)
Decision latitude (nine items)[3]	1.14* (1.03, 1.25)	1.15* (1.04, 1.26)	1.11* (1.01, 1.24)	1.16* (1.04, 1.29)	1.07 (0.95, 1.20)
Alt. decision latitude (eight items)[4]	1.14* (1.03, 1.25)	1.15* (1.04, 1.26)	1.12* (1.01, 1.24)	1.17* (1.05, 1.31)	1.06 (0.95, 1.20)
Coworker support	1.16* (1.06, 1.28)	1.18* (1.08, 1.30)	1.15* (1.04, 1.27)	1.16* (1.05, 1.29)	1.14* (1.04, 1.27)
Supervisor support	1.10* (1.00, 1.21)	1.12* (1.02, 1.23)	1.15* (1.03, 1.27)	1.15* (1.03, 1.27)	1.10 (0.98, 1.23)
Total support	1.16* (1.05, 1.27)	1.18* (1.07, 1.30)	1.17* (1.06, 1.30)	1.18* (1.06, 1.31)	1.15* (1.02, 1.29)
Job strain ratio	0.87* (0.79, 0.96)	0.87* (0.78, 0.96)	0.86* (0.77, 0.95)	0.86* (0.77, 0.96)	0.88* (0.78, 0.99)
Alt. job strain ratio[5]	0.87* (0.79, 0.96)	0.87* (0.79, 0.96)	0.87* (0.78, 0.96)	0.87* (0.78, 0.97)	0.90 (0.80, 1.01)
High job strain (categorical, ref. category: no high job strain)	0.78* (0.62, 0.99)	0.78* (0.61, 0.99)	0.80 (0.62, 1.03)	0.81 (0.63, 1.05)	0.87 (0.67, 1.13)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	0.94 (0.76, 1.17)	0.94 (0.76, 1.18)	0.95 (0.76, 1.20)	0.94 (0.74, 1.19)	1.05 (0.82, 1.34)
High job strain (categorical, ref. category: low strain)	0.77 (0.58, 1.01)	0.77 (0.58, 1.03)	0.81 (0.60, 1.09)	0.84 (0.61, 1.15)	0.92 (0.87, 1.13)

Variable	Leisure-time physical activity [yes/no]				
	Model 1	Model 2	Model 3	Model 4	Model 5
Alt. high job strain[5] (categorical, ref. category: low strain)	0.79 (0.62, 1.02)	0.79 (0.61, 1.02)	0.82 (0.63, 1.07)	0.82 (0.62, 1.09)	0.94 (0.70, 1.25)
Isostrain (continuous)	0.85* (0.77, 0.93)	0.84* (0.76, 0.92)	0.84* (0.76, 0.94)	0.83* (0.75, 0.93)	0.82* (0.74, 0.92)
Alt. isostrain (continuous)[5]	0.84* (0.77, 0.93)	0.84* (0.76, 0.92)	0.85* (0.76, 0.93)	0.83* (0.75, 0.93)	0.83* (0.74, 0.92)
Isostrain (categorical)	0.80 (0.59, 1.07)	0.78 (0.58, 1.06)	0.75 (0.55, 1.03)	0.77 (0.56, 1.07)	0.72* (0.52, 0.99)
Alt. isostrain[5] (categorical)	0.92 (0.70, 1.20)	0.90 (0.69, 1.18)	0.88 (0.66, 1.16)	0.90 (0.67, 1.20)	0.84 (0.63, 1.12)
Job insecurity (continuous)	1.10* (1.01, 1.21)	1.11* (1.01, 1.21)	1.03 (0.93, 1.14)	1.06 (0.96, 1.18)	1.08 (0.97, 1.19)
Job insecurity (categorical)	1.21* (1.00, 1.47)	1.21* (1.00, 1.46)	1.09 (0.89, 1.34)	1.14 (0.92, 1.41)	1.18 (0.95, 1.46)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple logistic regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking and alcohol) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 29a. Associations between psychosocial job factors and sick-leave absenteeism days: results (standardized hazard ratios and 95% confidence intervals) from Cox proportional hazard regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variable	**Sick-leave absenteeism [days]**				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	1.00 (0.92, 1.08)	1.00 (0.92, 1.09)	1.04 (0.94, 1.15)	1.03 (0.94, 1.14)	1.04 (0.94, 1.15)
Alt. psychological job demands (three items)[2]	1.03 (0.95, 1.11)	1.04 (0.95, 1.13)	1.06 (0.97, 1.16)	1.06 (0.97, 1.16)	1.08 (0.98, 1.18)
Physical demands	0.98 (0.90, 1.06)	N/A	0.99 (0.90, 1.10)	0.99 (0.89, 1.10)	0.97 (0.86, 1.09)
Decision latitude (nine items)[3]	0.98 (0.90, 1.06)	0.98 (0.90, 1.07)	1.02 (0.93, 1.11)	1.02 (0.93, 1.12)	1.01 (0.90, 1.12)
Alt. decision latitude (eight items)[4]	0.97 (0.90, 1.06)	0.98 (0.90, 1.07)	1.02 (0.93, 1.11)	1.02 (0.94, 1.12)	1.01 (0.91, 1.13)
Coworker support	1.02 (0.94, 1.11)	1.03 (0.95, 1.11)	1.04 (0.96, 1.14)	1.04 (0.96, 1.14)	1.04 (0.95, 1.14)
Supervisor support	0.98 (0.91, 1.07)	0.99 (0.91, 1.07)	1.01 (0.93, 1.09)	1.01 (0.93, 1.10)	1.01 (0.92, 1.11)
Total support	1.00 (0.92, 1.08)	1.01 (0.93, 1.09)	1.02 (0.94, 1.11)	1.03 (0.95, 1.12)	1.03 (0.93, 1.13)
Job strain ratio	1.02 (0.94, 1.12)	1.03 (0.93, 1.13)	1.04 (0.94, 1.14)	1.02 (0.93, 1.13)	1.05 (0.94, 1.17)
Alt. job strain ratio[5]	1.03 (0.95, 1.12)	1.03 (0.95, 1.12)	1.04 (0.95, 1.13)	1.04 (0.95, 1.13)	1.07 (0.97, 1.18)
High job strain (categorical, ref. category: no high job strain)	1.04 (0.85, 1.26)	1.03 (0.84, 1.26)	1.03 (0.84, 1.27)	1.00 (0.80, 1.23)	1.02 (0.82, 1.28)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	0.91 (0.75, 1.11)	0.91 (0.75, 1.11)	0.92 (0.75, 1.12)	0.89 (0.73, 1.09)	0.90 (0.73, 1.12)

Variable	Sick-leave absenteeism [days]				
	Model 1	Model 2	Model 3	Model 4	Model 5
High job strain (categorical, ref. category: low strain)	1.02 (0.80, 1.30)	1.02 (0.79, 1.32)	1.01 (0.78, 1.32)	0.94 (0.71, 1.24)	0.96 (0.72, 1.27)
Alt. high job strain[5] (categorical, ref. category: low strain)	0.98 (0.78, 1.24)	0.99 (0.79, 1.25)	0.97 (0.77, 1.24)	0.95 (0.74, 1.21)	0.96 (0.74, 1.25)
Isostrain (continuous)	1.02 (0.94, 1.10)	1.01 (0.93, 1.10)	0.99 (0.91, 1.08)	0.98 (0.90, 1.08)	0.99 (0.90, 1.08)
Alt. isostrain (continuous)[5]	1.03 (0.95, 1.12)	1.03 (0.95, 1.11)	1.01 (0.93, 1.10)	1.01 (0.92, 1.10)	1.01 (0.92, 1.10)
Isostrain (categorical)	1.10 (0.86, 1.39)	1.09 (0.85, 1.41)	1.08 (0.83, 1.39)	1.04 (0.80, 1.36)	1.05 (0.81, 1.37)
Alt. isostrain[5] (categorical)	1.07 (0.85, 1.34)	1.07 (0.85, 1.35)	1.08 (0.85, 1.36)	1.06 (0.84, 1.35)	1.07 (0.84, 1.36)
Job insecurity (continuous)	0.99 (0.92, 1.07)	1.00 (0.92, 1.08)	0.99 (0.91, 1.07)	0.99 (0.91, 1.07)	0.99 (0.91, 1.08)
Job insecurity (categorical)	0.97 (0.81, 1.15)	0.96 (0.81, 1.14)	0.94 (0.78, 1.12)	0.94 (0.78, 1.13)	0.94 (0.78, 1.13)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: "I am not asked to do an excessive amount of work", "I have enough time to get the job done", "I am free from conflicting demands others make")
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 29b. Associations between psychosocial job factors and acute (1-30) absenteeism days: results (standardized hazard ratios and 95% confidence intervals) from Cox proportional hazard regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variable	Acute (1-30 days) sick-leave absenteeism [days]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	0.99 (0.91, 1.08)	1.01 (0.92, 1.11)	1.03 (0.92, 1.14)	1.03 (0.93, 1.15)	1.05 (0.94, 1.17)
Alt. psychological job demands (three items)[2]	1.00 (0.92, 1.10)	1.02 (0.93, 1.12)	1.05 (0.97, 1.16)	1.05 (0.95, 1.16)	1.09 (0.98, 1.21)
Physical demands	0.98 (0.90, 1.08)	N/A	1.01 (0.90, 1.13)	0.99 (0.98, 1.11)	0.98 (0.86, 1.11)
Decision latitude (nine items)[3]	1.00 (0.91, 1.10)	1.00 (0.91, 1.09)	1.03 (0.93, 1.15)	1.04 (0.93, 1.16)	0.98 (0.87, 1.11)
Alt. decision latitude (eight items)[4]	1.01 (0.92, 1.10)	1.00 (0.91, 1.10)	1.04 (0.94, 1.16)	1.05 (0.94, 1.17)	1.00 (0.89, 1.13)
Coworker support	1.09 (1.00, 1.20)	1.09 (0.99, 1.19)	1.10 (1.00, 1.21)	1.10* (1.00, 1.22)	1.10 (1.00, 1.22)
Supervisor support	1.08 (0.99, 1.17)	1.07 (0.98, 1.17)	1.09 (0.99, 1.19)	1.09 (0.99, 1.20)	1.10 (0.99, 1.21)
Total support	1.09* (1.00, 1.19)	1.09 (1.00, 1.19)	1.10* (1.01, 1.21)	1.11* (1.01, 1.22)	1.12* (1.01, 1.24)
Job strain ratio	1.00 (0.91, 1.10)	1.02 (0.92, 1.13)	1.02 (0.91, 1.13)	1.01 (0.91, 1.13)	1.07 (0.95, 1.20)
Alt. job strain ratio[5]	1.00 (0.91, 1.09)	1.01 (0.92, 1.11)	1.03 (0.93, 1.13)	1.02 (0.93, 1.13)	1.08 (0.97, 1.21)
High job strain (categorical, ref. category: no high job strain)	0.97 (0.78, 1.21)	0.99 (0.79, 1.24)	0.97 (0.77, 1.22)	0.94 (0.74, 1.20)	1.00 (0.78, 1.28)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	0.93 (0.75, 1.15)	0.95 (0.77, 1.18)	0.94 (0.75, 1.18)	0.92 (0.73, 1.16)	0.99 (0.78, 1.26)

Variable	Acute (1-30 days) sick-leave absenteeism [days]				
	Model 1	Model 2	Model 3	Model 4	Model 5
High job strain (categorical, ref. category: low strain)	0.91 (0.69, 1.19)	0.92 (0.69, 1.22)	0.90 (0.67, 1.22)	0.86 (0.64, 1.17)	0.92 (0.67, 1.26)
Alt. high job strain[5] (categorical, ref. category: low strain)	0.95 (0.73, 1.22)	0.98 (0.75, 1.26)	0.97 (0.73, 1.28)	0.94 (0.71, 1.25)	1.05 (0.78, 1.42)
Isostrain (continuous)	0.97 (0.88, 1.06)	0.98 (0.89, 1.07)	0.95 (0.86, 1.06)	0.95 (0.85, 1.05)	0.95 (0.85, 1.05)
Alt. isostrain (continuous)[5]	0.97 (0.89, 1.06)	0.98 (0.90, 1.08)	0.97 (0.88, 1.07)	0.96 (0.87, 1.07)	0.97 (0.87, 1.07)
Isostrain (categorical)	0.92 (0.70, 1.22)	0.95 (0.72, 1.26)	0.94 (0.70, 1.25)	0.90 (0.67, 1.21)	0.91 (0.67, 1.22)
Alt. isostrain[5] (categorical)	0.91 (0.70, 1.17)	0.93 (0.72, 1.20)	0.93 (0.72, 1.22)	0.92 (0.70, 1.20)	0.92 (0.70, 1.21)
Job insecurity (continuous)	0.99 (0.91, 1.08)	1.00 (0.92, 1.09)	0.99 (0.90, 1.08)	0.99 (0.90, 1.08)	1.00 (0.91, 1.09)
Job insecurity (categorical)	0.95 (0.79, 1.15)	0.98 (0.81, 1.19)	0.95 (0.78, 1.17)	0.95 (0.78, 1.17)	0.97 (0.78, 1.20)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 29c. Associations between psychosocial job factors and chronic (>30) sick-leave absenteeism days: results (standardized hazard ratios and 95% confidence intervals) from Cox proportional hazard regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n = 2,330).

Variable	Chronic (> 30 days) sick-leave absenteeism [days]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[1]	1.02 (0.77, 1.34)	0.94 (0.69, 1.29)	1.06 (0.65, 1.71)	0.93 (0.58, 1.47)	0.96 (0.59, 1.55)
Alt. psychological job demands (three items)[2]	0.93 (0.71, 1.20)	0.89 (0.68, 1.17)	1.09 (0.75, 1.60)	1.21 (0.83, 1.76)	1.19 (0.80, 1.77)
Physical demands	1.21 (0.91, 1.61)	N/A	1.40 (0.92, 2.15)	1.24 (0.79, 1.95)	1.19 (0.67, 2.13)
Decision latitude (nine items)[3]	1.19 (0.90, 1.58)	1.24 (0.91, 1.69)	1.07 (0.72, 1.57)	0.92 (0.59, 1.43)	1.33 (0.65, 2.73)
Alt. decision latitude (eight items)[4]	1.18 (0.89, 1.55)	1.21 (0.90, 1.64)	1.02 (0.70, 1.49)	0.88 (0.57, 1.36)	1.26 (0.61, 2.57)
Coworker support	1.07 (0.81, 1.41)	1.09 (0.81, 1.47)	0.92 (0.63, 1.33)	1.01 (0.65, 1.58)	1.05 (0.62, 1.77)
Supervisor support	1.01 (0.74, 1.38)	1.01 (0.73, 1.40)	0.90 (0.64, 1.27)	0.77 (0.54, 1.10)	0.66 (0.39, 1.10)
Total support	1.05 (0.78, 1.41)	1.06 (0.77, 1.46)	0.89 (0.63, 1.27)	0.81 (0.54, 1.21)	0.66 (0.33, 1.31)
Job strain ratio	0.88 (0.64, 1.21)	0.78 (0.55, 1.12)	1.00 (0.62, 1.62)	1.00 (0.60, 1.66)	0.84 (0.46, 1.53)
Alt. job strain ratio[5]	0.86 (0.66, 1.13)	0.83 (0.62, 1.10)	1.05 (0.72, 1.52)	1.22 (0.83, 1.81)	1.13 (0.71, 1.80)
High job strain (categorical, ref. category: no high job strain)	0.91 (0.46, 1.80)	0.82 (0.36, 1.87)	1.59 (0.60, 4.25)	1.27 (0.43, 3.72)	0.91 (0.22, 3.74)
Alt. high job strain[5] (categorical, ref. category: no high job strain)	0.54 (0.28, 1.04)	0.52 (0.26, 1.03)	0.76 (0.32, 1.82)	0.83 (0.31, 2.20)	0.42 (0.12, 1.43)

Variable	Chronic (> 30 days) sick-leave absenteeism [days]				
	Model 1	Model 2	Model 3	Model 4	Model 5
High job strain (categorical, ref. category: low strain)	0.97 (0.42, 2.26)	0.91 (0.35, 2.38)	2.07 (0.69, 6.24)	1.16 (0.33, 4.02)	0.83 (0.18, 3.90)
Alt. high job strain[5] (categorical, ref. category: low strain)	0.62 (0.29, 1.33)	0.60 (0.27, 1.30)	0.88 (0.35, 2.23)	0.98 (0.35, 2.70)	0.54 (0.14, 2.03)
Isostrain (continuous)	0.87 (0.67, 1.15)	0.82 (0.61, 1.11)	1.00 (0.70, 1.44)	1.09 (0.72, 1.64)	1.06 (0.70, 1.62)
Alt. isostrain (continuous)[5]	0.87 (0.68, 1.13)	0.84 (0.64, 1.11)	1.04 (0.75, 1.44)	1.21 (0.84, 1.76)	1.18 (0.81, 1.74)
Isostrain (categorical)	1.22 (0.52, 2.88)	0.93 (0.32, 2.71)	1.89 (0.52, 6.83)	1.48 (0.31, 7.05)	2.41 (0.41, 14.09)
Alt. isostrain[5] (categorical)	0.94 (0.40, 2.21)	0.80 (0.32, 2.00)	1.32 (0.41, 4.25)	1.98 (0.57, 6.90)	2.12 (0.61, 7.43)
Job insecurity (continuous)	0.95 (0.73, 1.25)	0.92 (0.69, 1.22)	0.77 (0.49, 1.23)	0.78 (0.46, 1.30)	0.77 (0.46, 1.31)
Job insecurity (categorical)	0.81 (0.47, 1.41)	0.72 (0.39, 1.31)	0.63 (0.27, 1.43)	0.50 (0.20, 1.24)	0.45 (0.18, 1.13)

[1]Five-item psychological demands (original JCQ psychological demand subscale)
[2]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: “I am not asked to do an excessive amount of work”, “I have enough time to get the job done”, “I am free from conflicting demands others make”)
[3]Nine-item decision latitude (original JCQ decision latitude subscale)
[4]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[5]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

Table 30. Associations between psychosocial job factors and work limitations score (presenteeism) using selected WLQ items[1]: results (standardized beta coefficients and 95% confidence intervals) from multiple linear regression with incremental adjustment for physical workload, individual worker characteristics, biological cardiovascular risk factors, and other psychosocial job factors. Mexican Institute of Social Security Study 2009 (n= 2,330).

Variable	Work limitations [score of selected items][1]				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Psychological job demands (five items)[2]	-0.30* (-0.39, -0.20)	-0.24* (-0.34, -0.13)	-0.23* (-0.34, -0.12)	-0.22* (-0.35, -0.11)	-0.26* (-0.37, -0.15)
Alt. psychological job demands (three items)[3]	-0.03 (-0.13, 0.06)	0.03 (-0.07, 0.13)	0.05 (-0.05, 0.15)	0.06 (-0.04, 0.16)	-0.03 (-0.14, 0.07)
Physical demands	-0.24* (-0.33, -0.14)	N/A	-0.23* (-0.34, -0.11)	-0.22* (-0.33, -0.10)	-0.10 (-0.22, 0.02)
Decision latitude (nine items)[4]	-0.27* (-0.37, -0.18)	-0.28* (-0.38, -0.19)	-0.26* (-0.36, -0.16)	-0.26* (-0.37, -0.16)	-0.16* (-0.27, -0.04)
Alt. decision latitude (eight items)[5]	-0.32* (-0.41, -0.22)	-0.32* (-0.41, -0.22)	-0.29* (-0.39, -0.19)	-0.30* (-0.40, -0.20)	-0.23* (-0.34, -0.11)
Coworker support	-0.19* (-0.29, -0.10)	-0.19* (-0.29, -0.09)	-0.17* (-0.27, -0.07)	-0.16* (-0.26, -0.07)	-0.07 (-0.18, 0.03)
Supervisor support	-0.19* (-0.29, -0.09)	-0.20* (-0.30, -0.11)	-0.21* (-0.31, -0.11)	-0.22* (-0.31, -0.12)	-0.15* (-0.26, -0.04)
Total support	-0.22* (-0.32, -0.13)	-0.23* (-0.33, -0.14)	-0.23* (-0.33, -0.13)	-0.23* (-0.33, -0.13)	-0.14* (-0.25, -0.03)
Job strain ratio	-0.08 (-0.17, 0.02)	0.00 (-0.10, 0.10)	-0.01 (-0.12, 0.09)	0.00 (-0.11, 0.10)	-0.14* (-0.25, -0.02)
Alt. job strain ratio[6]	0.10 (0.00, 0.19)	0.15* (0.05, 0.25)	0.15* (0.05, 0.25)	0.16* (0.06, 0.27)	0.05 (-0.06, 0.16)
High job strain (categorical, ref. category: no high job strain)	-0.08 (-0.32, 0.15)	0.02 (-0.22, 0.26)	-0.03 (-0.27, 0.21)	-0.03 (-0.27, 0.21)	-0.21 (-0.46, 0.04)
Alt. high job strain[6] (categorical, ref. category: no high job strain)	0.20 (-0.03, 0.42)	0.26* (0.03, 0.48)	0.19 (-0.03, 0.42)	0.19 (-0.03, 0.43)	0.01 (-0.22, 0.25)

Variable	Work limitations [score of selected items][1]				
	Model 1	Model 2	Model 3	Model 4	Model 5
High job strain (categorical, ref. category: low strain)	0.07 (-0.20, 0.35)	0.21 (-0.08, 0.50)	0.19 (-0.10, 0.48)	0.21 (-0.08, 0.51)	0.01 (-0.30, 0.31)
Alt. high job strain[6] (categorical, ref. category: low strain)	0.37* (0.10, 0.63)	0.45* (0.19, 0.72)	0.43* (0.17, 0.70)	0.44* (0.17, 0.71)	0.22 (-0.07, 0.51)
Isostrain (continuous)	0.15* (0.05, 0.24)	0.20* (0.10, 0.30)	0.18* (0.08, 0.28)	0.18* (0.08, 0.29)	0.14* (0.04, 0.25)
Alt. isostrain (continuous)[6]	0.24* (0.15, 0.34)	0.28* (0.18, 0.38)	0.26* (0.17, 0.36)	0.27* (0.17, 0.37)	0.24* (0.13, 0.34)
Isostrain (categorical)	-0.07 (-0.36, 0.22)	0.05 (-0.25, 0.35)	-0.03 (-0.33, 0.27)	-0.04 (-0.34, 0.26)	-0.13 (-0.44, 0.17)
Alt. isostrain[5] (categorical)	0.17 (-0.10, 0.44)	0.24 (-0.03, 0.52)	0.17 (-0.10, 0.44)	0.18 (-0.10, 0.46)	0.09 (-0.19, 0.37)
Job insecurity (continuous)	0.20* (0.10, 0.30)	0.20* (0.10, 0.30)	0.20* (0.10, 0.30)	0.20* (0.10, 0.30)	0.17* (0.06, 0.27)
Job insecurity (categorical)	0.19 (-0.01, 0.39)	0.19 (-0.01, 0.39)	0.23* (0.02, 0.43)	0.22* (0.02, 0.43)	0.17 (-0.04, 0.38)

[1]Reversed score based on the following four items selected from IMSS' WLQ: Start on your job as soon as you arrived at work, concentrate on your work, do the required amount of work on your job, and feel you have done what you are capable of doing. These items showed the highest correlations with the original (Lerner's) WLQ (*cf.* methods section).
[2]Five-item psychological demands (original JCQ psychological demand subscale)
[3]Alternative three-item psychological demands (this subscale does not include physical demands, it is based solely on the following three items: "I am not asked to do an excessive amount of work", "I have enough time to get the job done", "I am free from conflicting demands others make")
[4]Nine-item decision latitude (original JCQ decision latitude subscale)
[5]Alternative eight-item decision latitude (the repetitive item was dropped because it was not confirmed in factor analysis)
[6]Alternative scale calculated using three-item psychological job demands and eight-item decision latitude subscales
Model 1: simple linear regression model (unadjusted)
Model 2: adjusted by physical workload (physical demands and occupational activity level)
Model 3: additionally adjusted by individual worker characteristics including demographic (age, gender), behavioral (smoking, alcohol, leisure-time physical activity) and socio-economic factors (education, income, marital status, worksite, seniority)
Model 4: additionally adjusted by other cardiovascular risk factors (systolic blood pressure, total blood cholesterol levels, blood glucose levels, and body mass index)
Model 5: additionally adjusted for psychological factors other than the one in the main association (for example, job demands models were adjusted by decision latitude, total support, and job insecurity; decision latitude models were adjusted by job demands, total support, and job insecurity; social support models were adjusted by job demands, decision latitude, and job insecurity, etc.)
* p-value < 0.05

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