

Reducing the health toll from U.S. workplace stress

Joel Goh, Jeffrey Pfeffer, & Stefanos A. Zenios

abstract

Many studies have documented that workplace stress can harm health. But in an open, competitive economy, can these harmful effects realistically be prevented? To find out, we used publicly available data to compare U.S. and European estimates of health care costs and mortality from workplace stress. We found that if the United States had workplace policies that were comparable to those of a European country of similar wealth, it would spend approximately \$40 billion less on health care costs related to potentially preventable workplace stress than it spends now. These results suggest that focusing policy interventions on the workplace could help address soaring U.S. health care costs.

Goh, J., Pfeffer, J., & Zenios, S. A. (2019). Reducing the health toll from U.S. workplace stress. *Behavioral Science & Policy*, 5(1), 1–13.

Www.states have saved lives and slashed costs from on-the-job hazards. In 1970, the year that the Occupational Safety and Health Administration (OSHA) was created, there were 14,000 workplace fatalities from physical injuries and hazards, such as exposure to harmful chemicals, falls, and injuries from equipment such as drill presses and saws. By 2009, as a result of sustained policy attention, workplace fatalities had fallen to 4,400 despite a doubling of the workforce.¹

What is the issue? Psychosocial stressors in the workplace have both direct and indirect negative impacts on U.S. health outcomes. When compared with similarly advanced countries in the European Union, the United States has invested less in mitigating these stressors and so continues to bear costs that can otherwise be prevented.

Core Findings

How can you act?

Selected recommendations include:

 Expanding health insurance coverage to reduce excess workplaceattributable costs and mortality by enabling more people to obtain health care
Enacting policies that mandate a family-friendly workplace to reduce workfamily conflict and job strain

Who should take the lead? Researchers, policymakers, and stakeholders in health care and labor

and human resources

Meanwhile, work-related stress claims far more lives and costs far more money, yet the United States has done little to mitigate those risks. Exposure to workplace stressors, such as long working hours, shift work, the absence of job control (that is, individuals' ability to influence what they do at work), and excessive job demands, causes unhealthy individual behaviors, including smoking, drinking, and overeating. A study found that workplace stressors and an absence of health insurance (which limits access to health care) account for approximately 120,000 theoretically preventable, or excess, deaths in the United States each year, more than deaths from suicide (47,000),² car accidents (32,000),³ and homicide (19,000)⁴ combined. They also accounted for as much as \$190 billion in excess health care costs, approximately 8% of the nation's annual health care cost at the time of the study.5

What's more, these cost estimates are likely substantially understated.⁵ The indirect costs of poor employee health—absenteeism, turnover, burnout, and presenteeism—can be much larger than the direct health care—related costs of illness, according to several industry reports.^{6.7} Moreover, workplace stressors such as economic insecurity and work–family conflict undoubtedly have effects on other family members that have yet to be studied.

In the past, researchers have focused mostly on documenting various health effects of workplace stressors and far less on the possibility of reducing or eliminating these stressors in actual workplaces. However, there is reason to believe that policy changes could help mitigate psychosocial workplace stressors. First, policy interventions have dramatically reduced the toll from physical workplace hazards, as mentioned above. Second, other developed nations have put workplace policies in place that have reduced the prevalence of various workplace stressors, and this, in turn, has diminished their workplace-related health care costs.

Specifically, compared with the United States, equally wealthy and economically developed member nations of the Organisation for Economic Co-operation and Development (OECD) tend to offer their workers shorter working hours, stronger protections against employee dismissals, better provisions for parental leave, and more vacation time and paid sick leave than the United States does for its workers. They also have substantially broader health care coverage.

In addition, the European Agency for Safety and Health at Work, the European equivalent of OSHA, has launched a campaign to help employers recognize and manage work-related stress and psychosocial risks.⁸ This includes measures to mitigate excessively demanding work and lack of job control. In the United States, OSHA has not yet made comparable efforts. However, Europe's success suggests that policy changes in the United States could reduce workplace psychosocial stress and the health burdens it imposes.

To understand the degree to which policy changes to reduce workplace stressors could pay off, it is first necessary to gauge how realistic it is to reduce the health costs and mortality that accompany psychosocial workplace stress. We estimated this by comparing the United States with advanced, industrialized nations from Europe using the aggregate mortality and health care costs associated with nine common psychosocial workplace stressors: unemployment, the absence of health insurance, shift work, long working hours, job insecurity, work–family conflict, low job control, high job demands, and low social support at work.⁹

Our comparison included 23 European OECD countries that have capitalistic, open economies

and have available data that make comparison with the United States feasible. European OECD member nations were particularly suitable because the OECD has a stated mission to support "market economies backed by democratic institutions," which include the United States.¹⁰ By comparing the mortality rate and health costs from psychosocial workplace stressors in the United States with those of countries of the European Union, we sought to identify the extent to which new U.S. workplace policies could prevent harm and thus reduce costs and save lives.

Method

Estimating the preventable harm from psychosocial stress in the workplace requires an approach different from that used when measuring the health costs of physical injuries or hazards. Researchers who study physical injuries or hazards have often estimated preventable deaths from a single cause or factor that could conceivably be eliminated. For instance, it is possible to picture a world in which all smoking has been prevented, all bicyclists use helmets, every bed in every malaria-prone area has appropriate mosquito netting, or everyone is vaccinated against the diseases that can be prevented by vaccination. In each of these cases, the preventable death toll is the total number of deaths caused by the behavior in questionsmoking,¹¹ not wearing a bicycle helmet,¹² not using appropriate mosquito netting,¹³ or failing to get everyone vaccinated.

Moreover, in each of these cases, effective policy interventions could directly prevent deaths from the cause in question. And for policy interventions such as bike helmets, antismoking measures, bed netting, or vaccination, it is relatively straightforward to compare the costs and benefits of the intervention using data from real-world cases, such as road-safety programs.¹⁴

Conversely, it is difficult to imagine a work world with no stress, particularly in workplaces operating in competitive environments. Cost and productivity pressures produce stress and help create the layoffs and economic insecurity that "work-related stress claims far more lives and costs far more money, yet the United States has done little to mitigate those risks"

produce more stress. Such economic insecurity is an ever-growing feature of the economic landscape.^{15,16} It is also unclear which policy interventions would directly prevent deaths from workplace stress. For example, there have been few well-designed studies of workplace health-promotion programs or mental health interventions that document whether and to what extent these interventions are effective.

That said, we do know that, on average, health care spending is higher and people live longer in richer countries than in poorer countries.^{17–19} We also know that within a population, wealthier people live longer than poorer people.

Similarly, we reasoned that wealthier nations would have better health outcomes, such as lower death rates and lower rates of infectious diseases, from preventable causes. Government agencies and public officials would know that prevention is almost always more cost-effective than treatment for any health condition, and therefore would invest more to prevent disease or injuries. First, we empirically tested whether this inverse relationship between wealth and preventable environmental causes of ill health held for two conditions for which we had objective, public data-deaths from air pollution and deaths from tuberculosis-using a statistical procedure called linear regression. (See Section 1.6 in the Methods & Analysis Supplemental Material for more on these relationships.)

Further, because workplace stress can be viewed as a preventable environmental driver of poor health outcomes, we expected that government policymakers and private employers in wealthier countries would, as a rule, be more willing and

"Cost and productivity pressures produce stress and help create the layoffs and economic insecurity that produce more stress"

have more resources to invest broadly in policies that promote employee health. Therefore, we expected wealthier countries would have lower rates of workplace-induced ill health. And we wondered whether the United States would fit the typical wealthy country pattern or differ from it.

Estimating Preventable Workplace-Attributable Deaths

We used the following three-step procedure to estimate the number of preventable deaths from exposure to workplace stressors. (For the rest of this article, we will use the term *workplace exposures* to mean exposure to psychosocial stressors in the workplace and the term *workplace-attributable deaths* and *costs* to refer to those that arise from experiencing those stressors.)

Step 1: Estimate deaths from workplace stress for each country.

Step 2: Estimate how relative wealth affected deaths from workplace stress, omitting U.S. data.

Step 3: Estimate U.S. workplaceattributable deaths, then compare that value to the predicted value for an equally wealthy European country.

Next we describe in more detail how we did each step of the analysis for workplace-attributable deaths.

Step 1: Estimate Deaths From Workplace Stress for Each Country. Because the number of workplace-attributable deaths is a statistic that goes unreported, we had to estimate this number. We focused on deaths rather than other health outcomes because countries consistently measure annual deaths and, consequently, relevant data are available. We estimated workplace-attributable deaths by using a mathematical model we had previously developed to capture the effect of workplace stressors on four costly health outcomes, including mortality, as well as to estimate health care costs and health disparities among different demographic groups.^{20,21} (Our empirical approach, model inputs, and data sources are shown diagrammatically in Figure 1. See the Methods & Analysis Supplemental Material for an in-depth description of the modeling.) Here we outline the model's primary data inputs:

Labor force and mortality statistics: We drew the number of workers and overall annual deaths each year in each country from the OECD statistics database.²²

Prevalence of workplace exposures: No single cross-national survey of workplace psychosocial stressors exists for European OECD member nations and the United States, so we matched two surveys with equivalent or closely related questions. For the United States, we drew data from the General Social Survey²¹ and supplemented it with data from the Current Population Survey.²³ For the European OECD nations, we drew data from the Fifth European Working Conditions Survey (EWCS).²⁴ See the Table of Survey Questions Supplemental Material for the survey questions we used. Our final sample included 2010 data for the United States and the 23 European OECD member nations. See Table S1 in the Methods & Analysis Supplemental Material for a list of countries and some descriptive statistics.

Estimates of deaths from each workplace stressor: We obtained this information from a published meta-analysis of 228 studies that estimated the effects of the nine psychosocial stressors considered in this study on four different costly health outcomes, including mortality.⁹

Observed prevalence of these poor-health categories: This information was obtained from the





Note. OECD = Organisation of Economic Co-operation and Development; EWCS = Fifth European Working Conditions Survey; GSS = General Social Survey; MEPS = Medical Expenditure Panel Survey.

A. Data were retrieved from the statistical database of the Organisation for Economic Co-operation and Development, found at https://stats.oecd.org. We used the *Population and Vital Statistics* table to extract population and death rates for each country and the *LFS by Sex and Age* table to extract labor force and unemployment numbers for each country; in both cases, 2010 data were extracted separately by sex.

B. European Foundation for the Improvement of Living and Working Conditions. (2012). European working conditions survey, 2010 [Data set]. http://doi.org/10.5255/UKDA-SN-6971-1

We extracted data on the prevalence of workplace stressors separately by sex for each country in 2010. Specific questions are listed in the Table of Survey Questions Supplemental Material.

C. National Opinion Research Center. (n.d.). General social survey. Retrieved from http://www3.norc.org/GSS+Website/23 We extracted data on the prevalence of workplace stressors separately by sex for the United States, pooling data from 2002, 2006, and 2010. Specific questions are listed in the Table of Survey Questions Supplemental Material. For additional details about the data used, see Section 4.1 in "The Relationship Between Workplace Stressors and Mortality and Health Costs in the United States," by J. Goh, J. Pfeffer, and S. A. Zenios, 2016, *Management Science, 62*, 608–628 (https://doi.org/10.1287/mnsc.2014.2115).

D. Goh, J., Pfeffer, J., & Zenios, S. A. (2015). Workplace stressors & health outcomes: Health policy for the workplace. *Behavioral Science & Policy, 1*(1), 43–52. This reference served as the source of meta-analytic estimates of the relative risks of four health outcomes on 10 workplace exposures.

E. Agency for Healthcare Research and Quality. (2010). *Data table: MEPS HC-121: 2008 full year consolidated data file*. Retrieved from https://meps.ahrq.gov/mepsweb/data_stats/download_data_files_detail.jsp?cboPufNumber=HC-121 We extracted data on 2008 health care expenditures for men and women separately.

nationally representative Medical Expenditure Panel Survey.²⁵ (We looked beyond death alone because we wanted to use the added information in analyses related to costs.)

We then calculated per capita workplaceattributable deaths in each country—that is, the total number of deaths from workplace exposure divided by the population of each country in 2010. The "per capita death" figure, then, is essentially the proportion of people who died in 2010 from workplace-related exposures.

Step 2: Estimate How Relative Wealth Affected Deaths From Workplace Stress, Omitting U.S.

Data. We plotted each European country's wealth, as measured by its per capita gross domestic product (GDP; the average wealth of each individual), against its workplace-attributable deaths using linear regression. We included 23 European countries in the final analysis. These were the OECD member nations included in the EWCS in 2010.

Step 3: Estimate U.S. Workplace-Attributable Deaths, Then Compare That to the Expected Value if the United States Were an Equally Wealthy European Country. From the mathematical expression in Step 2, we predicted the number of workplace deaths the United States

"the United States experiences 17,000 preventable workplaceattributable deaths per year"

would have if its policies were like those of an OECD country of comparable wealth. We then compared that number with actual estimates of per capita workplace-attributable deaths in the United States. A significant difference would reveal how much of an outlier the United States was relative to its OECD European counterparts: if industrialized nations of equivalent wealth (equivalent per capita GDP) had fewer workplace-attributable deaths, the differences would indicate the extent of workplaceattributable deaths in the United States that might be prevented.

Estimating Preventable Costs

We estimated costs using the same threestep procedure, except that we added into the model's calculations the health care costs of each health outcome, as obtained from a nationwide survey of U.S. medical expenditures.²⁵ We estimated country-specific data on the prevalence of workplace stressors for the European nations from the EWCS.²⁴

Step 1: Estimate Health Care Costs From Workplace Stress for Each Country. We obtained these figures by dividing total health care costs from workplace exposure by the population of each country in 2010. (The "per capita health care cost" is the average cost per person.) We report all estimated health costs in 2010 U.S. dollars, adjusted using the medical component of the Consumer Price Index.²⁶

Step 2: Estimate the Relationship Between Relative Wealth & Workplace-Attributable Health Costs, Omitting U.S. Data. We plotted each European country's wealth, as measured by its per capita GDP, against its costs attributable to the workplace. We used linear regression to model the relationship between the per capita workplace-attributable costs and each nation's per capita GDP. Step 3: Estimate U.S. Workplace-Attributable Costs & Compare the Result to the Value That Would Be Expected if the U.S. Figures Were Extrapolated From the European Data. As with deaths, we predicted the costs the United States would have if its policies were like those of an OECD country of comparable wealth and then compared that figure with its actual costs.

Results

How Wealth Influences Death From Environmental Sources

To test whether our approach made sense, we considered deaths from two environmental sources of mortality-air pollution and tuberculosis. We hypothesized that the death rates for these conditions would fall as a nation got wealthier, as measured by its per capita GDP. We found for European OECD countries that they did, and they did so in a statistically significant manner (p = .03 for air pollution and p < .03.01 for tuberculosis; see note A.) What's more, the United States conformed to this trend: When U.S. death rates from these conditions were compared with the rates in OECD countries, the differences were not significant (p = .40 for air pollution and p = .67 for tuberculosis), indicating that the United States was not an outlier. These results gave us confidence that our analytical strategy made sense.

Preventable Workplace-Attributable Deaths & Costs

In European OECD countries, we expected and found a similar relationship between per capita GDP and workplace-attributable mortality or costs. As per capita GDP rose, per capita workplace-attributable mortality (p < .01) and per capita workplace-attributable costs (p < .01) fell.

By measuring how much the United States deviated from the general trend line, known as a *regression line*, which we constructed from the data from the European OECD countries, we estimated that the United States experiences 17,000 preventable workplace-attributable deaths per year, as well as \$44 billion in preventable workplace-attributable health care costs. However, only the health care cost difference between the United States and the OECD countries was statistically significant (p = .03).

In fact, these figures are probably an underestimate, because some of the European countries in our sample were outliers with regard to the overall trend. To gauge how sensitive our results were to such outliers, we progressively removed countries with the smallest populations from our analysis. When we did that, our estimates of preventable workplace-attributable deaths and costs in the United States rose substantially, fluctuating between 40,000 and 63,000 preventable workplace-attributable deaths per year and between \$55 billion and \$65 billion in preventable costs (see Table 1). As before, only the estimates of preventable costs were statistically significant.

Discussion

Our analysis provides the first estimate of the preventable deaths and preventable health care costs from psychosocial workplace stress in the United States. The preventable costs, as shown in Figure 2, are substantial—the most conservative estimate is approximately \$44 billion per year, or \$156 per American per year. This estimate of preventable cost only includes the direct cost of health care and does not account for the indirect cost of absenteeism and reduced productivity. To put this estimate in context, the Society of Actuaries has estimated that secondhand smoke, a well-known environmental exposure, costs the United States approximately \$10 billion per year in both direct and indirect costs.²⁷ However, although our point estimates for preventable deaths were substantial in magnitude and remained robust when small-population outliers were removed from the set of European countries, they were not statistically significant. The lack of statistical significance could stem from a wider range of mortality estimates in the different European nations. In sum, these findings provide evidence that psychosocial workplace stressors impose an unnecessary economic toll on Americans, but they are not conclusive about whether such stressors contribute excessive deaths that are preventable.

Although useful as a preliminary estimate, our modeling has several limitations. It uses different surveys—the General Social Survey for the United States and the EWCS for the European countries—to estimate the prevalence of

Number of European OECD countries in sample	Preventable deaths (thousands)	Preventable cost (billions USD)
23	16.5	44.2*
22	40.9	55.4**
21	41.1	55.4**
20	41.1	55.4**
19	52.1	58.5**
18	62.2 [†]	64.4**
17	56.7	64.0**
16	55.4	63.8**
15	43.7	57.9**
14	43.5	57.1**

Table 1. Sensitivity analysis of preventable workplaceattributable deaths & costs in the United States per year

Note. Sensitivity analysis tests the robustness of one's results and is also known as the what-if analysis. Here, we examined the estimates of preventable deaths or costs that our model would produce if we sequentially removed from our sample European Organisation for Economic Co-operation and Development (OECD) countries with the lowest populations (which are least like the United States). The estimates of preventable costs are statistically significant. The U.S. death rates were higher than OECD rates in absolute terms but the differences did not reach statistical significance. Larger sample sizes could help to establish whether the U.S. death rate differs at a statistically significant level. USD = U.S. dollars.

 $^{\dagger}p < .10. *p < .05. **p < .01.$



Figure 2. How European OECD nations & the United States compare in deaths from tuberculosis & estimated costs related to workplace stressors

Note. The United States is not an outlier compared with European Organisation for Economic Co-operation and Development (OECD) nations with respect to deaths from tuberculosis (as is true for other disorders not related to workplace stress). But it is an outlier with respect to estimated costs from workplace stressors, indicating that investments in reducing workplace stress could not only help workers in the United States but also save money. USD = U.S. dollars; GDP = gross domestic product.

workplace stressors. To make the responses comparable, we identified matching questions across these two surveys (see the Table of Survey Questions Supplemental Material). Going forward, a standardized survey that compares workplace stressors and corresponding health outcomes across nations would enable even more reliable comparisons. Those surveys would ideally include non-European OECD countries such as Australia, Canada, and New Zealand, which may be more similar to the United States than some European countries are. A larger sample of nations would also lead to more precise and conclusive estimates of the number of preventable deaths from workplace stressors, which we were not able to obtain with our current data.

Although we did not directly examine how specific workplace policies affect workplace stress, we did show that when considered collectively, workplace policies matter. Therefore, if a workplace policy is associated with one or more workplace stressors and if U.S. policy differs significantly from the policies of its European OECD counterparts, then changing U.S. policy to resemble those of its European counterparts could reduce the health toll in the United States.

The examples that follow illustrate policies other nations have implemented and the United States has not. Changing U.S. policy to resemble these European policies could potentially reduce adverse health consequences from workplace stress.

Health Insurance Coverage

Our data showed that wealthier countries, as measured by higher per capita GDP, had higher rates of health insurance. The United States was an outlier, having significantly lower health insurance coverage than a comparably wealthy European country. Our statistical analyses gave us strong confidence in both of these conclusions (p < .01).

It seems reasonable to predict that policies that help expand health insurance coverage would reduce excess workplace-attributable costs and mortality by enabling more people to obtain health care before small problems become big ones. Other research findings support this conclusion. A review of several major empirical studies recently concluded that "health insurance saves lives."²⁸ A Kaiser Family Foundation analysis revealed the primary reason why uninsured people did not take up health insurance was its prohibitive cost.²⁹ It also found that more than half of uninsured people were eligible for some form of financial assistance.³⁰

These findings suggest that efforts to step up outreach to educate the uninsured about their options would help to improve coverage nationwide. One method would be to use social media and other forms of advertising. Another would be to use retailers such as drugstores that people visit somewhat regularly for supplies. A third method would be to use other providers of social services, such as unemployment and welfare offices and even schools, to inform families about the availability of and benefits from having health insurance and, thereby, access to health care.

Reducing Job Strain Through Increased Awareness

Our analysis included the three main components of job strain: low job control, which refers to control over how one's job is done; high job demands; and low social support at work. Effective remediation of these stressors typically involves redesigning a task or a job. For example, allowing flexible work arrangements such as telecommuting could increase job control. But redesigning a job or task requires awareness, acceptance, and buy-in from employers or employer associations.

Awareness of job strain, a construct comprising three of the nine psychosocial stressors we considered, is more common in Europe than in the United States, and European policymakers are taking actions to remediate it. In 2004, several of the largest European trade unions achieved a key milestone when they signed the Autonomous Framework Agreement on Work-Related Stress.³¹ Since then, Austria, Denmark, the United Kingdom, and other countries have published nonbinding standards on psychosocial risks such as job strain and have developed and disseminated tools to help organizations identify and reduce the prevalence of these stressors. For example, Austria has developed a guide for labor inspectors that includes elements of the psychosocial work environment that they should monitor, as well as information on how to support companies in reducing job-strain-related stressors. In addition, Belgium, Slovakia, and other countries have passed laws requiring employers to conduct proper risk assessments for such stressors.³²

U.S. employers, in contrast, are much less aware of job strain than European employers are. The National Institute for Occupational Safety and Health (NIOSH) has published advice for employers about job strain and has coordinated research on this subject for some time, but if it adopted some ideas from its European counterparts, it could raise awareness in the United States about job strain and reduce its prevalence. We have some suggestions of where to start.

First, NIOSH could be more effective by simply renewing its focus on job strain. At present, NIOSH does not appear to be working actively on the subject: Its latest publication related to job strain was published in 2004,^{33,34} and its web page titled "Organization of Work," which provides a list of resources that could be useful to employers and researchers, is no longer actively maintained.³⁵ A key first step for NIOSH would be to recognize and reprioritize job strain as an important workplace hazard that can contribute to poor worker health. Currently, the hazards and exposures NIOSH lists on its website include heat stress, indoor environment quality, and tobacco in the workplace, but not job strain.

Second, NIOSH could pivot from its traditional research and advisory role toward a more active role in advocating for reducing job strain. NIOSH knows how to measure job strain: In 2000, the S444b Estimated preventable workplace health care costs to the US per year

L/K Estimated preventable workplace-attributable deaths per year

19k Homicide deaths per year agency developed the Quality of Worklife Questionnaire, ³⁶ which included measures that can be used to assess job strain. But that questionnaire was intended primarily as a research tool; in fact, it was included in the General Social Survey. NIOSH also provides advice on how to measure job strain (among other constructs), although the web page with that advice is no longer actively maintained.³⁵ NIOSH could streamline these measurement tools into a single tool or suite of tools that employers as well as researchers could use. NIOSH could also develop up-to-date guidelines of best practices related to reducing job strain.

By taking responsibility for resources and streamlining them, NIOSH could then better advocate with employers, trade associations, and labor unions to encourage them to adopt these resources and use them to help manage workers. For example, NIOSH could maintain an active presence in industry colloguia or in academic conferences that focus on occupational stress and health. Alternatively, the organization could partner with other interest groups in reaching out to employers. For example, in the health care industry, the American Medical Association has been grappling with occupational burnout, 37, 38 which is one of the possible negative outcomes of high levels of job strain. Industry associations like the American Medical Association that are already actively working to reduce job strain would likely be receptive to NIOSH's outreach and use its resources.

Family-Friendly Work Policies

Published studies show that employees think their workplaces support families when they perceive little work–family conflict.^{39–44} Work– family conflict is an important workplace stressor that occurs when employees' work and family roles interfere with each other.

A family-friendly work environment is more than the sum of its family-friendly policies.^{45,46} However, studies of individual policies can nonetheless guide employers toward concrete actions they can implement to reduce workplace stressors. Flexible work schedules⁴¹⁻⁴³ and paid sick and parental leave,^{43,44} for example, reduce work–family conflict, research has found. And vacation leave reduces job strain.^{47,48} The United States, unlike its European OECD counterparts, does not have any federal policies guaranteeing sick and parental leave or a minimum number of annual vacation days. Policies that mandate these changes could reduce work–family conflict and job strain, diminishing their toll.

Costs of Inaction

Policymakers and others have talked for years about bringing U.S. workplace policy more in line with the policies of other advanced industrialized countries. This would mean better access to health care, more paid time off for sickness and vacation, improved policies for work–family balance, and more. Such changes could reduce the health-related costs of workplace stress.

Our analysis did not consider the costs of implementing the policies, as this task is beyond the scope of this article. Nonetheless, by estimating that the United States spends \$44 billion on health care for potentially preventable problems related to workplace stress, we have provided U.S. policymakers a rough estimate of how serious the problem is. We hope that this finding will stimulate policy action by revealing the costs of continued inaction and reminding policymakers that investing in prevention can save money on workplace health costs.

Conclusion

In this study, we find that U.S. workers pay a higher price from workplace stressors, in terms of health costs and possibly mortality, than do workers in comparable OECD countries in Europe. Taken together with other research, our study suggests that expanding health insurance coverage, adopting family-friendly work policies more widely, and raising awareness about the costs of workplace stress could significantly benefit U.S. workers. Doing so could help reduce exposure to workplace stressors, improve the nation's work climate, and reduce the health burden imposed by U.S. workplaces.

endnote

A. From the editors to nonscientists: For any given data set, the statistical test used depends on the number of data points and the type of measurement, such as proportions or means. The *p* value of a statistical test is the probability of obtaining a result equal to or more extreme than would be observed merely by chance, assuming that there are no true differences between groups under study (the null hypothesis). Researchers traditionally view p < .05 as the cutoff for statistical significance, with lower values indicating a stronger basis for rejecting the null hypothesis.

author affiliation

Goh: National University of Singapore and Harvard University. Pfeffer and Zenios: Stanford University. Corresponding author's e-mail: joelgoh@nus.edu.sg.

supplemental material

- https://behavioralpolicy.org/publications/
- Methods & Analysis
- Table of Survey Questions

references

- 1. Walter, L. (2012). OSHA's role in reducing occupational injuries, fatalities [Infographic]. Retrieved from https://www.ehstoday.com/osha/ osha-s-role-reducing-occupationalinjuries-fatalities-infographic
- 2. Centers for Disease Control and Prevention. (2019). Suicide and selfinflicted injury. Retrieved from https:// www.cdc.gov/nchs/fastats/suicide.htm
- 3. Centers for Disease Control and Prevention. (2016). Motor vehicle crash deaths. Retrieved from https://www.cdc. gov/vitalsigns/motor-vehicle-safety/ index.html
- Centers for Disease Control and Prevention. (2019). Assault or homicide. Retrieved from https://www.cdc.gov/ nchs/fastats/homicide.htm
- Goh, J., Pfeffer, J., & Zenios, S. A. (2016). The relationship between workplace stressors and mortality and health costs in the United States. *Management Science*, 62, 608–628. https://doi. org/10.1287/mnsc.2014.2115
- 6. Smith, S. (2016). Presenteeism costs business 10 times more than absenteeism. Retrieved from https:// www.ehstoday.com/print/17278
- 7. Otto, N. (2019). Employee stress costing employers billions in lost productivity. Retrieved from https:// www.benefitnews.com/news/ employee-stress-lost-productivitycosting-employers-billions
- 8. European Agency for Safety and Health at Work. (2015). *Annual report 2014*. Retrieved from https:// osha.europa.eu/en/publications/ annual-report-2014-improvingworking-conditions-across-europe
- Goh, J., Pfeffer, J., & Zenios, S. A. (2015). Workplace stressors & health outcomes: Health policy for the workplace. Behavioral Science & Policy, 1(1), 43–52.
- Organisation for Economic Co-operation and Development. (2009). Retrieved from https:// socialprotection.org/institutions/ organisation-economic-co-operationand-development-oecd
- 11. Centers for Disease Control and Prevention. (2018). Tobacco-related mortality. Retrieved from https://www. cdc.gov/tobacco/data_statistics/ fact_sheets/health_effects/tobacco_ related_mortality/index.htm
- Bíl, M., Dobiáš, M., Andrášik, R., Bílová, M., & Hejna, P. (2018). Cycling fatalities: When a helmet is useless and when it might save your life. *Safety Science*, 105, 71–76.

- Selemani, M., Msengwa, A. S., Mrema, S., Shamte, A., Mahande, M. J., Yeates, K., . . . Lutambi, A. M. (2016). Assessing the effects of mosquito nets on malaria mortality using a space time model: A case study of Rufiji and Ifakara Health and Demographic Surveillance System sites in rural Tanzania. *Malaria Journal*, 15, Article 257. https://doi.org/10.1186/ s12936-016-1311-9
- Elvik, R. (2003). How would setting policy priorities according to cost– benefit analyses affect the provision of road safety? Accident Analysis & Prevention, 35, 557–570.
- 15. Hollister, M. (2011). Employment stability in the US labor market: Rhetoric versus reality. *Annual Review of Sociology, 37,* 305–324.
- 16. Uchitelle, L. (2007). *The disposable American: Layoffs and their consequences*. New York, NY: Vintage.
- Pritchett, L., & Summers, L. H. (1996). Wealthier is healthier. *Journal of Human Resources*, *31*, 841–868.
- 18. Bloom, D. E., & Canning, D. (2000, February 18). The health and wealth of nations. *Science*, *287*, 1207–1209.
- 19. Deaton, A. (2002). Policy implications of the gradient of health and wealth. *Health Affairs, 21*(2), 13–30.
- Goh, J., Pfeffer, J., & Zenios, S. (2015). Exposure to harmful workplace practices could account for inequality in life spans across different demographic groups. *Health Affairs*, *34*, 1761–1768.
- National Opinion Research Center. (n.d.). General social survey. Retrieved from http://www3.norc.org/ GSS+Website/23
- 22. Organisation for Economic Co-operation and Development. (n.d.). Welcome to OECD.Stat. Retrieved from https://stats.oecd.org/
- 23. United States Census. (n.d.). Current population survey (CPS). Retrieved from http://www.census.gov/cps/data/ cpstablecreator.html
- European Foundation for the Improvement of Living and Working Conditions. (2012). European working conditions survey, 2010 [Data set]. http://doi.org/10.5255/UKDA-SN-6971-1
- 25. Agency for Healthcare Research and Quality. (2010). *Data table: MEPS HC-121: 2008 full year consolidated data file*. Retrieved from https:// meps.ahrq.gov/mepsweb/data_stats/ download_data_files_detail. jsp?cboPufNumber=HC-121

- 26. U.S. Bureau of Labor Statistics. (2019). Consumer price index: Medical care in U.S. city average, all urban consumers (CPIMEDSL). Retrieved from https://fred. stlouisfed.org/series/CPIMEDS
- Behan, D. F., Eriksen, M. P., & Lin, Y. (2005). Economic effects of environmental tobacco smoke. Retrieved from Society of Actuaries website: https://www.soa.org/ globalassets/assets/files/research/ projects/etsreportfinaldraftfinal-3.pdf
- Woolhandler, S., & Himmelstein, D. U. (2017). The relationship of health insurance and mortality: Is lack of insurance deadly? *Annals of Internal Medicine*, *167*, 424–431.
- 29. Garfield, R., & Young, K. (2015). Adults who remained uninsured at the end of 2014 [Issue brief]. Retrieved from http://files.kff.org/attachment/ issue-brief-adults-who-remaineduninsured-at-the-end-of-2014
- Garfield, R., Damico, A., Orgera, K., Claxton, G., & Levitt, L. (2018). Estimates of eligibility for ACA coverage among the uninsured in 2016 [Issue brief]. Retrieved from https://web.archive.org/ web/20190315164753/https://www.kff. org/uninsured/issue-brief/estimatesof-eligibility-for-aca-coverage-amongthe-uninsured-in-2016/
- 31. European Social Partners. (2008). Implementation of the European Autonomous Framework Agreement on Work-Related Stress. Retrieved from https://ec.europa.eu/social/ BlobServlet?langId=en&docId=2730&
- Eurofound & EU-OSHA. (2014). Psychosocial risks in Europe: Prevalence and strategies for prevention. Luxembourg City, Luxembourg: Publications Office of the European Union.
- 33. National Institute for Occupational Safety and Health. (2013). Stress at work. Retrieved from https://www.cdc.gov/ niosh/topics/stress/
- 34. National Institute for Occupational Safety and Health. (2004). Worker health chartbook, 2004 (DHHS Publication No. 2004-146). Retrieved from https:// www.cdc.gov/niosh/docs/2004-146/ pdfs/2004-146.pdf
- 35. National Institute for Occupational Safety and Health. (2017). Organization of work: Measurement tools for research and practice. Retrieved from https://www.cdc.gov/niosh/topics/ workorg/

- 36. National Institute for Occupational Safety and Health. (2013). Quality of worklife questionnaire. Retrieved from https://www.cdc.gov/niosh/topics/ stress/qwlquest.html
- 37. American Medical Association. (n.d.). Physician burnout. Retrieved from https://www.ama-assn.org/topics/ physician-burnout
- West, C. P., Dyrbye, L. N., Erwin, P. J., & Shanafelt, T. D. (2016). Interventions to prevent and reduce physician burnout: A systematic review and meta-analysis. *The Lancet, 388,* 2272–2281.
- Allen, T. D. (2001). Family-supportive work environments: The role of organizational perceptions. *Journal of Vocational Behavior, 58*, 414–435.
- Allard, K., Haas, L., & Hwang, C. P. (2011). Family-supportive organizational culture and fathers' experiences of work–family conflict in Sweden. *Gender*, *Work & Organization*, 18, 141–157.
- Russell, H., O'Connell, P. J., & McGinnity, F. (2008). The impact of flexible working arrangements on work–life conflict and work pressure in Ireland. *Gender, Work & Organization*, 16, 73–97.
- Major, V. S., Klein, K. J., & Ehrhart, M. G. (2002). Work time, work interference with family, and psychological distress. *Journal of Applied Psychology, 87*, 427–436.
- 43. Voydanoff, P. (2004). The effects of work demands and resources on work-to-family conflict and facilitation. *Journal of Marriage and Family, 66,* 398–412.
- 44. Allen, T.D., Lapierre, L. M., Spector, P. E., Poelmans, S. A. Y., O'Driscoll, M., Sanchez, J. I., ... Woo, J.-M. (2014). The link between national paid leave policy and work–family conflict among married working parents. *Applied Psychology*, 63, 5–28.
- Lapierre, L. M., Spector, P. E., Allen, T. D., Poelmans, S., Cooper, C. L., O'Driscoll, M. P., . . . Kinnunen, U. (2008). Familysupportive organization perceptions, multiple dimensions of work–family conflict, and employee satisfaction: A test of model across five samples. *Journal of Vocational Behavior, 73*, 92–106.
- 46. Thompson, C. A., Beauvais, L. L., & Lyness, K. S. (1999). When work–family benefits are not enough: The influence of work–family culture on benefit utilization, organizational attachment, and work–family conflict. *Journal of Vocational Behavior, 54*, 392–415.

- 47. Etzion, D. (2003). Annual vacation: Duration of relief from job stressors and burnout. *Anxiety, Stress, and Coping, 16,* 213–226.
- Westman, M., & Etzion, D. (2001). The impact of vacation and job stress on burnout and absenteeism. *Psychology & Health*, 16, 595–606.