Appendix A: Methods for the comparison between the American Working Conditions Survey (AWCS) and European Working Conditions Surveys (EWCS)

Data Sources and Samples

The EU data are from the 6th European Working Conditions Survey (EWCS6) conducted in 2015, organized by the European Foundation for the Improvement of Living and Working Conditions (Eurofound) and administered in 35 countries, including the 28 EU member states. In addition to various aspects of work, the EWCS addresses a wide range of potentially work-related health outcomes as detailed below. Respondents were selected through multi-stage, stratified random sampling to represent, when weighted, the working population in each of the participating states. In the 28 EU states, a total of 33,487 respondents provided data. All respondents were 15 years of age or older (≥16 in Bulgaria, Spain, and UK), and worked at least 1 hour for pay or profit in the previous week. The data were collected in in-home interviews by trained interviewers who speak the respondent's preferred language. More details of data collection can be found in the EWCS6 report (Ipsos, 2016).

The US data are from the 1st American Working Conditions Survey (AWCS) collected in 2015 (Maestas et al., 2017), which was coordinated with the EWCS to allow comparisons. Respondents were part of the American Life Panel (ALP), a cohort of adults (≥18 years old) recruited from multiple previously formed probability samples to participate in regular online surveys. When weighted, the ALP sample was nationally representative. Of the 3,131 AWCS participants, 2,112 reported that they were currently working for pay. Of those, 2,078 who agreed to answer work-related questions were included in the current analysis. Data were collected through an online self-administered questionnaire in English. For those who had

difficulty accessing the Internet, a computer and hotspot access were provided. More details of data collection can be found in the ALP technical report (Pollard & Baird, 2017)

Measures

Poor Health Indicators

EWCS and AWCS both included 11 indicators of poor health: self-rated general health, chronic health problems, overall fatigue, anxiety, headache and eyestrain, backache, muscular pain in upper limbs and lower limbs, hearing problems, skin problems, and injuries (not necessarily work-related). The respondents were asked if during the past 12 months they had experienced each of these conditions (1=yes, 0=no). Self-rated general health was asked with a single item, "In general, how would you rate your health? Would you say excellent, very good, good, fair, or poor?" The lowest two responses indicated poor health. Although the response options were worded differently in the 27 languages used, we assumed the scales equivalent when dichotomized based on previous data from the US (National Health Interview Survey, 2018) and European countries (Jürges et al., 2008).

Exposure to Occupational Hazards

Physical, chemical, and biological hazards. Nine types of hazards under this category were included in both surveys: vibrations, noise, high and low temperatures, fumes, vapers, skin contact with chemical substances, infectious materials, and second-hand smoke. The respondents reported the amount of time they were exposed to these hazards on a 7-point response scale: 1=All of the time, 2=Almost all of the time, 3=Around ¾ of the time, 4=Around half of the time, 5=around ¼ of the time, 6=Almost never, 7=Never. Following the Eurofound-ILO joint report (2019), we calculated the proportion who reported exposure at least a quarter of the time (i.e., ≥5).

Ergonomic hazards. Five types of posture-related hazards were asked: tiring or painful posture, lifting or moving people, carrying or moving heavy loads, sitting, and repetitive hand or arm motion. The same 7-point scale were provided, and the proportion of reporting at least a quarter of the time was calculated.

Work intensity and lack of control. These are two commonly studied psychosocial hazards. Two items addressed work intensity: work at very high speed and work to tight deadline. These items had the 7-point response scale, and we calculated the proportion of at least a quarter of the time experiencing the high intensity. For lack of control, four items are relevant: the ability to take a break when needed, and to be able to change task order, methods, and pace. For being able to take a break, a 5-point scale was used (1=Always, 2=most of the time, 3=Sometimes, 4=Rarely, 5=Never). We combined "rarely" and "never" and reported the proportion. Control over task order, methods, and pace were asked as yes-no questions (e.g., "Are you able to choose or change your order of tasks?" Yes/no).

Work hours and schedules. Respondents reported if they work more than 48 hours per week, more than 10 hours per day, work at night (i.e., at least two hours between 10 pm and 5 am), and work outside regular day shift (i.e., daily split shifts, permanent shifts, alternating/rotating shifts). These were all asked as yes-no questions. In addition, respondents were asked if their working time arrangements were set by the employer or could be adapted by themselves.

Demographic Characteristics

Self-reported information was collected in each WCS regarding the respondent's age, gender, nativity, educational attainment, and occupational category. Age was categorized as <25 years of age, 25 to 54, and 55 and older. The respondent was recorded either as a man or a

woman. If the respondent's current country of residence differed from the country of origin, the person was identified as foreign-born. EWCS included the education code based on the International Standard Classification of Education (ISCED) for all respondents. For AWCS respondents, we applied the ISCED levels guided by the US National Center for Education Statistics [https://nces.ed.gov/pubs/eiip/eiip1s01.asp]. Occupational categories for EWCS respondents were included as the International Standard Classification of Occupations (ISCO) Major Groups. In AWSC, respondents chose 2- and 6-digit Standard Occupational Classification (SOC) system codes that fit their own description of their job. Using both the 2- and 6-digit SOC codes, we assigned the ISCO codes to AWSC respondents.

Statistical Analysis

In order to pool the two surveys, we calculated cross-national sample weights for AWCS. To do so, we adjusted the existing sample weights in AWCS so that the sample was proportional to the US workforce in 2014 (Bureau of Labor Statistics, 2015). The new weights for AWCS were equivalent to the cross-national raked weights in EWCS. Before generating the sample weights, we applied the same trimming method used in EWCS to AWCS to prevent variability resulting from greater weights in the right-tailed weight distribution. The sample weights were used in all analyses.

All analyses were conducted on SAS version 9.4 (SAS Institute, Cary, NC). For demographic characteristics, we used PROC SURVEYFREQ to estimate the proportion of men and women in EU28 and US who have certain demographic characteristics. Next, using PROC SURVEYREG, we calculated age-adjusted proportions and corresponding 95% confidence intervals of workers in each region by gender who reported poor health and working conditions. We reported the p-value for the difference between regions in each gender group. Because

EWCS included a total of 35 nations, workers in EU28 and US formed a subpopulation of the AWCS-EWCS pooled data set. We used the DOMAIN statement in SAS to identify the region of interest (EU28 or US) and gender (men or women) in all analyses so that the sample weights were properly applied and that the variance of each estimate for the subpopulation incorporated the variability of the subpopulation sample size.

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Appendix B

Table B1. Demographic characteristics of the survey respondents, the 1st American Working Conditions Survey (2015) and the 6th European Working Conditions Survey (2015)

	Men		Women	
Demographic characteristic	USA	EU28	USA	EU28
Age, mean (SD)	43.1 (0.6)	42.9 (0.2)	43.3 (0.6)	42.6 (0.2)
Age category				
<25 years	7.1 (1.8)	7.0 (0.4)	10.4 (2.1)	6.5 (0.4)
25-54 years	71.7 (2.2)	76.2 (0.5)	67.1 (2.1)	78.6 (0.6)
55 years or older	21.1 (1.6)	16.8 (0.5)	22.5 (1.4)	15.0 (0.4)
Foreign-born	9.2 (1.4)	3.7 (0.3)	9.6 (1.3)	5.7 (0.5)
Education[1]				
Low (ISCED level 2 or less)	1.3 (0.7)	17.4 (0.5)	1.1 (0.5)	15.0 (0.5)
Medium (ISCED level 3 or 4)	55.0 (2.4)	52.8 (0.6)	49.2 (2.1)	50.0 (0.6)
High (ISCED level 5 or higher)	43.8 (2.4)	29.8 (0.6)	49.7 (2.0)	35.1 (0.6)
Occupational Category[2]				
1. Managers	11.0 (1.4)	6.6 (0.3)	10.9 (1.1)	4.5 (0.3)
2. Professionals	18.3 (1.5)	16.1 (0.5)	23.5 (1.6)	22.5 (0.6)
3. Technicians and associated professionals	10.8 (1.4)	14.0 (0.5)	18.4 (1.6)	15.5 (0.5)
4. Clerical support workers	5.9 (1.2)	6.5 (0.3)	18.0 (1.7)	14.6 (0.5)
5. Service and sales workers	13.3 (1.8)	12.4 (0.4)	20.0 (1.9)	25.1 (0.5)
6. Skilled agricultural, forestry, fishery workers	0.5 (0.4)	3.4 (0.2)	0.0 (0.0)	1.9 (0.2)
7. Craft and related trades workers	15.0 (2.0)	21.0 (0.5)	1.9 (0.8)	2.9 (0.2)
8. Plant and machine operators, assemblers	9.9 (1.8)	12.0 (0.4)	1.3 (0.5)	2.4 (0.2)
9. Elementary	14.2 (2.0)	7.5 (0.3)	5.7 (1.1)	10.5 (0.4)
0. Military	1.1 (0.6)	0.6 (0.1)	0.2 (0.2)	0.0 (0.0)

Notes. Weighted percentage (standard error of percentage) unless otherwise noted. Unweighted N = 2078 for USA and 33487 for EU28. Weighted percentages and standard error were calculated with sampling weights that accounted for the relative size of the workforce in each of the countries and thus were appropriate for aggregated analyses.

[1]ISCED=International Standard Classification of Education

Level 2: lower secondary education, US 9th grade equivalent

Level 3: Upper secondary education, US 10th through 12th grade equivalent

Level 4: Post-secondary non-tertiary education, US some college after high school but no degree

Level 5: Short-cycle tertiary education, US Associate degree, occupational vocational program

[2]ISCO (International Standard Classification of Occupations) Major Groups

Table 2. Age-adjusted weighted proportions (%) and 95% Confidence Intervals (95%CI) of poor health indicators in USA and EU28 workers by gender, 2015.

Poor health indicators	Women				
	EU28 % (95%CI)	*p-value*[2]	USA % (95%CI)	EU28 % (95%CI)	*p-value*[2]
Poor self-perceived health	2.4 (1.6 - 3.2)	<.0001	9.7 (5.4 - 14.1)	2.5 (2.0 – 3.0)	<.0001
Chronic (≥6 months) health problems	17.5 (16.0 – 19.0)	<.0001	34.5 (27.0 – 42.0)	19.3 (17.6 - 20.9)	<.0001
Overall fatigue[1]	28.7 (27.1 - 30.4)	<.0001	16.6 (11.4 - 21.8)	35.9 (33.7 – 38.0)	<.0001
Anxiety[1]	11.4 (10.2 - 12.6)	0.773	23.1 (15.7 - 30.4)	17.8 (16.0 - 19.5)	0.581
Headache, eyestrain problems[1]	27.7 (25.8 - 29.5)	<.0001	23.0 (16.0 - 30.1)	40.7 (38.4 – 43.0)	<.0001
Backache[1]	40.3 (38.4 - 42.2)	<.0001	23.7 (16.7 - 30.6)	44.4 (42.1 - 46.7)	<.0001
Muscular pain in shoulders/neck/upper limbs[1]	36.5 (34.7 - 38.4)	<.0001	22.4 (15.9 – 29.0)	42.7 (40.5 - 44.9)	<.0001
Muscular pain in lower limbs[1]	28.0 (26.2 - 29.7)	<.0001	15.8 (11.3 - 20.3)	32.2 (30.1 - 34.4)	<.0001
Hearing problems[1]	6.8 (5.9 - 7.6)	<.0001	28.9 (21.7 - 36.1)	4.8 (3.9 - 5.7)	<.0001
Skin problems[1]	6.5 (5.6 - 7.4)	<.0001	28.3 (20.9 - 35.7)	8.6 (7.3 - 9.8)	<.0001
Injuries[1] (not necessarily work-related)	10.4 (9.0 - 11.8)	<.0001	18.8 (13.0 - 24.6)	6.2 (5.0 - 7.4)	<.0001

Notes. Unweighted N = 2078 for USA and 33487 for EU28. Prevalence and 95%CI were calculated with sampling weights that accounted for the relative size of the workforce in each of the countries and thus were appropriate for aggregated analyses. [1] in the past 12 months. [2] for the difference between the regions within the gender group.

Table 3. Age-adjusted weighted proportions (%) and 95% Confidence Intervals (95%CI) of selected occupational exposure reported by USA and EU28 workers by gender, 2015.

Occupational exposure	Men		Women		
	USA	EU28	USA	EU28	*p-value*[2]
Physical/chemical/ biological[1]					
Vibrations from hand tools, machinery etc.	28.8 (20.2 - 37.4)	30.4 (28.5 - 32.3)	22.4 (15.3 - 29.6)	7.9 (6.8 – 9.0)	<.0001
Noise so loud that you would have to raise your voice to talk to people	26.6 (18.1 - 35.1)	35.8 (33.8 - 37.9)	12.6 (8.1 - 17.1)	19.8 (18.0 - 21.7)	0.015
High temperatures which make you perspire even when not working	23.2 (15.6 - 30.8)	28.9 (27.0 - 30.8)	13.2 (8.8 - 17.7)	17.3 (15.6 - 18.9)	0.601
Low temperatures whether indoors or outdoors	26.6 (18.1 - 35.1)	28.6 (26.6 - 30.5)	10.1 (7.3 - 12.9)	13.7 (12.0 - 15.4)	0.709
Breathing in smoke, fumes, powder or dust etc.	22.8 (15.4 - 30.2)	25.2 (23.3 - 27.1)	8.9 (7.1 - 10.8)	4.8 (4.1 - 5.5)	<.0001
Breathing in vapors such as solvents and thinners	20.6 (13.2 – 28.0)	15.4 (13.8 - 17.1)	14.1 (8.1 - 20.2)	6.8 (5.7 - 7.8)	<.0001
Handling or being in skin contact with chemical products or substances	27.7 (18.6 - 36.7)	21.2 (19.4 - 23.1)	15.6 (9.2 - 22.1)	15.9 (14.1 - 17.7)	0.862
Tobacco smoke from other people	29.3 (20.1 - 38.6)	13.4 (11.9 – 15.0)	9.2 (5.3 - 13.1)	6.6 (5.4 - 7.8)	<.0001

Handling or being in direct contact with potentially infectious materials	22.6 (15.0 - 30.2)	10.7 (9.5 - 11.9)	7.1 (5.5 - 8.6)	15.2 (13.6 - 16.8)	0.000
Ergonomic[1]					
Tiring or painful positions	62.8 (54.2 - 71.4)	44.2 (42.1 - 46.3)	60.2 (53.2 - 67.2)	40.6 (38.4 - 42.8)	<.0001
Lifting or moving people	64.0 (57.0 - 71.1)	5.5 (4.5 - 6.5)	59.3 (52.0 - 66.6)	14.6 (13.0 - 16.2)	<.0001
Carrying or moving heavy loads	53.3 (44.1 - 62.4)	41.7 (39.7 - 43.8)	57.6 (50.1 - 65.2)	25.1 (23.0 - 27.2)	<.0001
Sitting	61.6 (52.4 - 70.8)	55.3 (53.2 - 57.4)	62.8 (56.1 - 69.5)	56.7 (54.4 - 59.1)	0.617
Repetitive hand or arm movements	66.1 (57.5 - 74.8)	62.0 (59.9 - 64)	59.2 (51.9 - 66.5)	62.4 (60.1 - 64.6)	0.462
Psychosocial:					
Work intensity[1]					
Work at very high speed	81.6 (75.0 - 88.3)	61.3 (59.3 - 63.3)	77.9 (71.7 – 84.0)	60.1 (57.9 - 62.4)	<.0001
Work to tight deadlines	82.8 (76.8 - 88.7)	66.9 (64.9 - 68.8)	74.1 (67.2 - 81.1)	58.2 (55.8 - 60.5)	<.0001
Lack of Task Discretion					
Rarely/never able to take a break when needed	37.2 (27.9 - 46.4)	28.7 (26.8 - 30.6)	27.1 (19.9 - 34.3)	38.6 (36.3 – 41.0)	0.000
Not able to choose or change order of tasks	26.8 (18.3 - 35.4)	34.2 (32.2 - 36.2)	24.5 (18.3 - 30.6)	35.1 (32.8 - 37.4)	0.111
Not able to choose or change methods of work	28.6 (19.4 - 37.7)	32.3 (30.3 - 34.4)	26.0 (18.8 - 33.1)	32.5 (30.3 - 34.7)	0.000
Not able to choose or change speed or rates of	24.6 (16.3 - 32.9)	29.7 (27.7 - 31.7)	23.3 (16.3 - 30.3)	30.3 (28.1 - 32.4)	0.000

work					
Work hours and schedules					
Work ≥48 hours/week	22.6 (15.4 - 29.8)	18.3 (17.0 - 19.7)	8.9 (7.0 - 10.7)	8.0 (7.1 - 8.9)	0.015
Work ≥10 hours/day	54.6 (45.2 – 64.0)	35.4 (33.5 - 37.3)	47.7 (40.2 - 55.3)	22.6 (20.7 - 24.6)	<.0001
Work at night (i.e., ≥2 hours between 10 pm and 5 am)	34.4 (25.3 - 43.5)	23.0 (21.2 - 24.7)	21.9 (15.8 – 28.0)	14.5 (12.8 - 16.2)	<.0001
Shifts (i.e., split shifts, permanent shifts, alternating/rotating shifts)	40.6 (31.7 - 49.5)	21.3 (19.5 - 23.1)	47.0 (41.6 - 52.4)	21.9 (20.0 - 23.9)	<.0001
Working time arrangements determined entirely by the employer	48.8 (39.5 - 58.2)	62.2 (60.2 - 64.2)	37.2 (30.5 - 43.8)	68.6 (66.7 - 70.6)	<.0001

Notes. Unweighted N = 2078 for USA and 33487 for EU28. Prevalence and 95%CI were calculated with sampling weights that accounted for the relative size of the workforce in each of the countries and thus were appropriate for aggregated analyses. [1]At least ¼ of the time. [2] for the difference between the regions within the gender group.