



Long Working Hour and Cardiovascular Diseases

Are there different thresholds?

(SS 33, April 30, 2024)

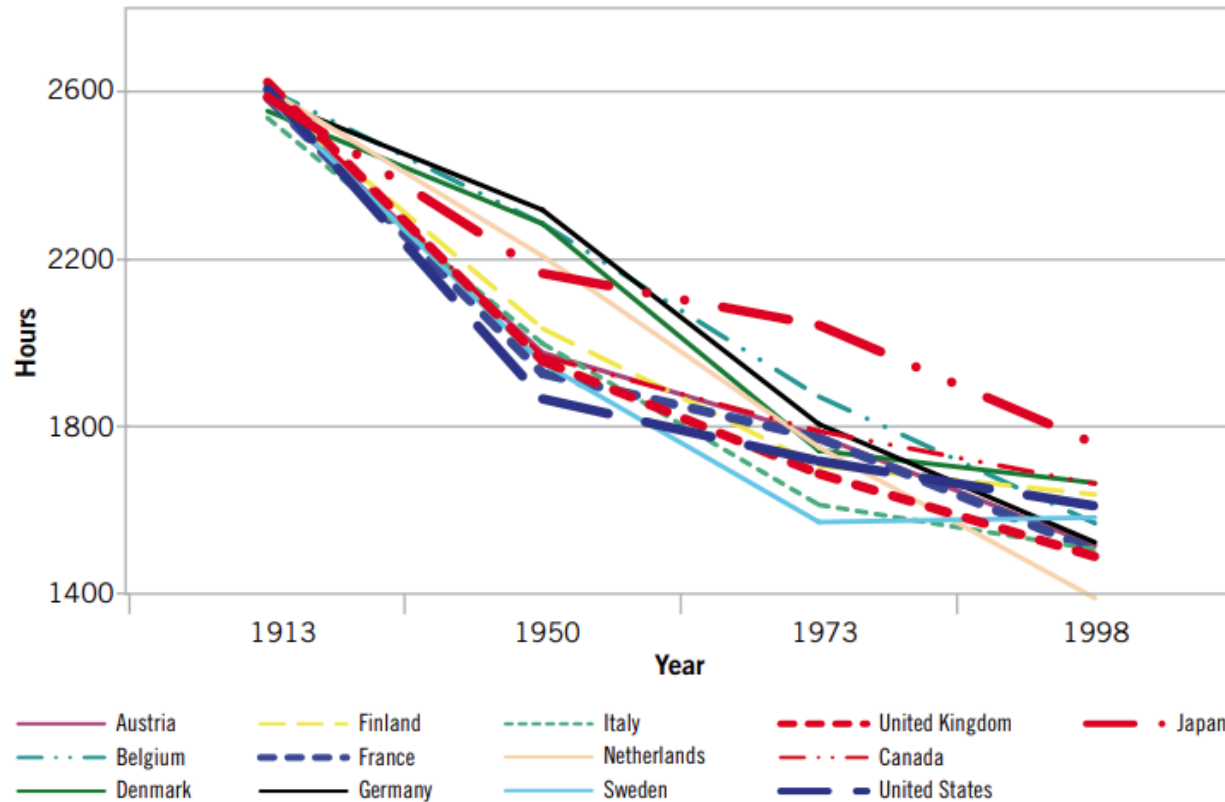
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I have no conflicts of interest to disclose

INTRODUCTION



J. Human Ergol., 20: 147–153, 1991

Center for Academic Publications Japan. Printed in Japan.

LONG WORKING HOURS AND OCCUPATIONAL STRESS-RELATED CARDIOVASCULAR ATTACKS AMONG MIDDLE-AGED WORKERS IN JAPAN

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ILO – Working time and the future of work.

https://www.ilo.org/wcmsp5/groups/public/---dgreports/---cabinet/documents/publication/wcms_649131.pdf

- Long working hours are observed to be related to higher risk of cardiovascular diseases (CVD).
- However, the exposure thresholds are not clear enough.

Aims

- To synthesize existing research evidence for estimating effects of exposures to long working hours on risk of cardiovascular diseases among workers;
- Special attention to exposure thresholds in terms of **intensity** and **duration**.

- Literature search and systematic review were conducted, using the Navigation Guide as a framework.
- Both non-fatal and fatal cardiovascular diseases were included as outcomes.
- Attributable disease burdens were estimated by applying the population-attributable fractions to World Health Organization's Global Health Estimates of total disease burdens.

- **Intensity** of exposure to working hours was defined as
 - 35-40 hours/week (reference group)
 - 41-48 hours/week
 - 49-54 hours/week
 - ≥ 55 hours/week
- **Duration** of exposure to long working hours was
 - <10 years
 - ≥ 10 years.

The WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury (**long working hours and CVD**)

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The effect of exposure to long working hours on ischaemic heart disease: A systematic review and meta-analysis from the WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury



Jian Li^{a,*,1}, Frank Pega^b, Yuka Ujita^c, Chantal Brisson^d, Els Clays^e, Alexis Descatha^{f,g,h}, Marco M. Ferrarioⁱ, Lode Godderis^{j,k}, Sergio Iavicoli^l, Paul A. Landsbergis^m, Maria-Inti Metzendorfⁿ, Rebecca L. Morgan^o, Daniela V. Pachito^p, Hynek Pikhart^q, Bernd Richterⁿ, Mattia Roncaioliⁱ, Reiner Rugulies^{r,s,t}, Peter L. Schnall^u, Grace Sembajwe^{v,w}, Xavier Trudel^d, Akizumi Tsutsumi^x, Tracey J. Woodruff^y, Johannes Siegrist^{z,1}

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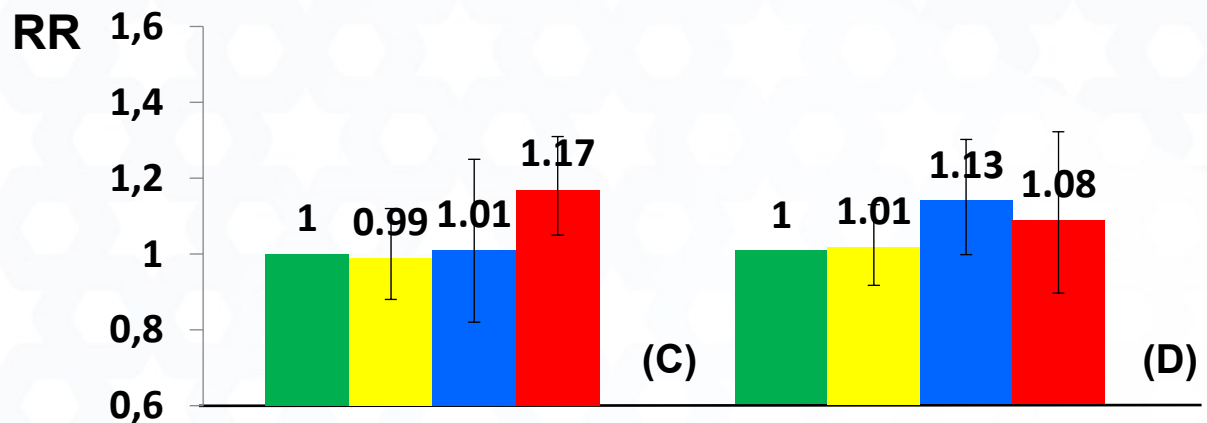
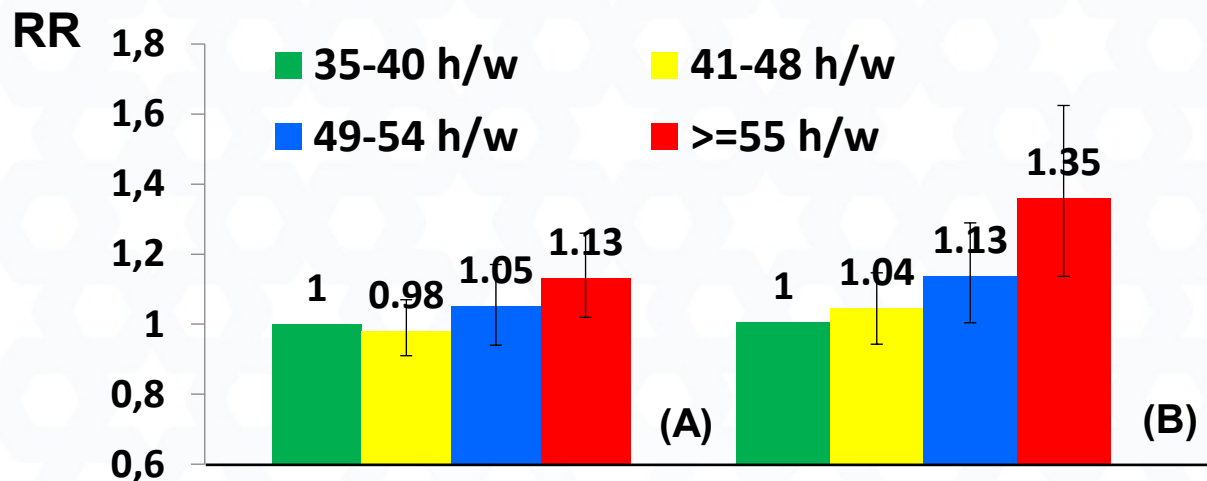


The effect of exposure to long working hours on stroke: A systematic review and meta-analysis from the WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury



Alexis Descatha^{a,b,c,d,*,1}, Grace Sembajwe^{e,1}, Frank Pega^f, Yuka Ujita^g, Michael Baer^h, Fabio Boccuniⁱ, Cristina Di Teccoⁱ, Clement Duret^b, Bradley A. Evanoff^d, Diana Gagliardiⁱ, Lode Godderis^{k,1}, Seong-Kyu Kang^m, Beon Joon Kimⁿ, Jian Li^o, Linda L. Magnusson Hanson^p, Alessandro Marinaccioⁱ, Anna Ozguler^{h,q}, Daniela Pachito^r, John Pell^s, Fernando Pico^t, Matteo Ronchettiⁱ, Yves Roquelaure^a, Reiner Rugulies^{u,v,w}, Martijn Schouteden^l, Johannes Siegrist^x, Akizumi Tsutsumi^y, Sergio Iavicoli^{i,1}

The WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury (**long working hours and CVD**)



- (A) WHO/ILO review: Associations of long working hours and acquired ischemic heart disease;
 (B) WHO/ILO review: Associations of long working hours and acquired stroke;
 (C) WHO/ILO review: Associations of long working hours and dying from ischemic heart disease;
 (D) WHO/ILO review: Associations of long working hours and dying from stroke.

Judgement:
sufficient evidence of harmfulness

Li J, et al. The effect of exposure to long working hours on ischaemic heart disease: A systematic review and meta-analysis from the WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury. *Environ Int*, 2020, 142: 105739.

Descatha A, et al. The effect of exposure to long working hours on stroke: A systematic review and meta-analysis from the WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury. *Environ Int*, 2020, 142: 105746.

Threshold (**intensity**) of long work hours for predicting risk of self-reported CVD (United States)

Table 2. Measures^a of Model Fit, Calibration, and Model Discrimination for Long Work Hours and Incident Cardiovascular Disease ($n = 1,698$; Cases^b = 777), Panel Study of Income Dynamics, United States, 1986–2011

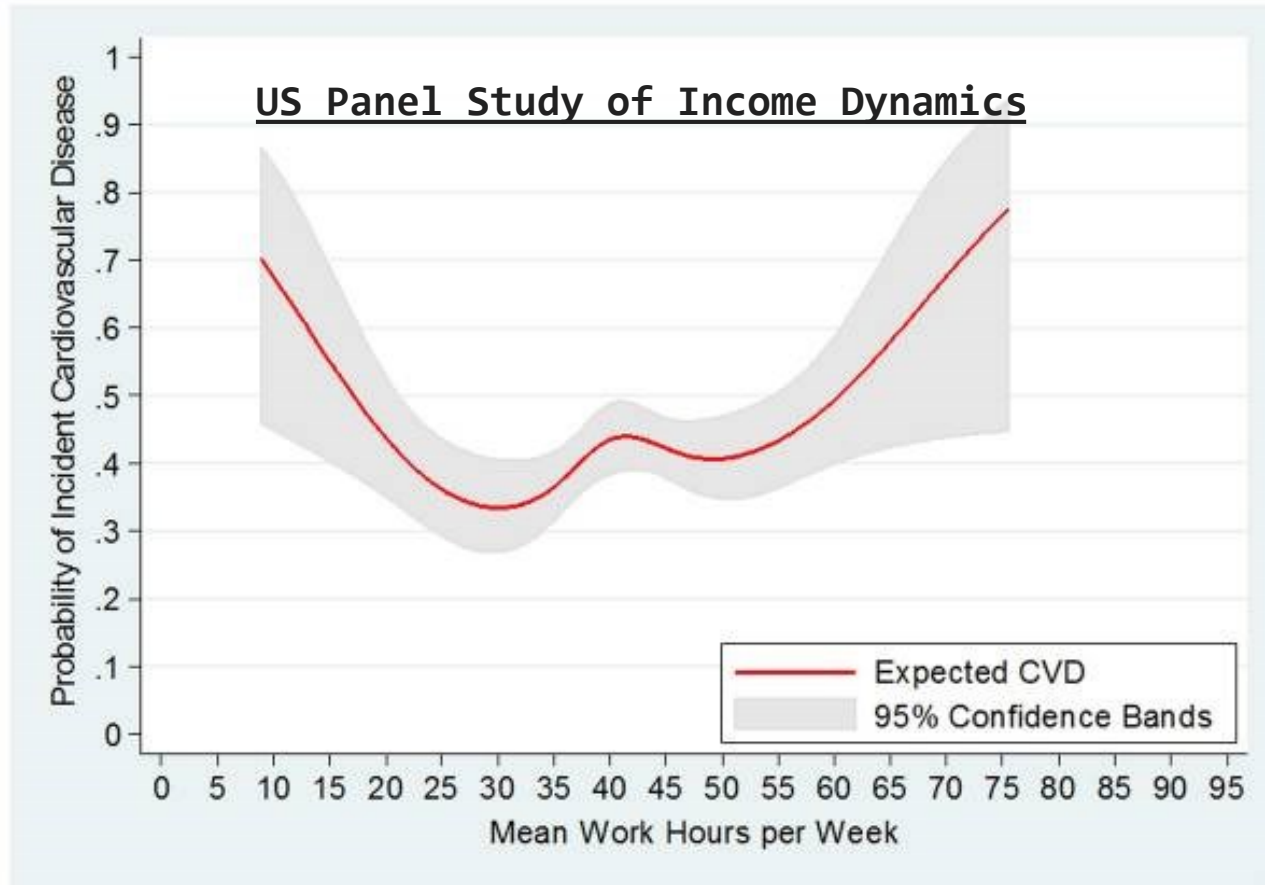
Cutpoint (Weekly Work Hours)	Proportion Above Cutpoint, %	Measure of Model Fit and Calibration				Model Discrimination							
		Bayesian Information Criterion	RR ^c	95% CI ^c	Somers D Statistic	Youden Index (J)	Sensitivity, %	Specificity, %	AUC (c)	LR (+)	LR (-)	% PPV	% NPV
36	94.6	5.66e+07	1.30	0.94, 1.81	0.0225	0.015	95.5	6.0	0.51	1.02	0.75	46.1	61.1
37	87.4	5.66e+07	1.13	0.92, 1.39	0.0278	0.028	89.7	13.1	0.51	1.03	0.78	46.6	60.2
38	79.6	5.66e+07	1.14	0.96, 1.34	0.0439	0.032	82.4	20.8	0.52	1.04	0.85	46.7	58.4
39	71.9	5.66e+07	1.14	0.99, 1.31	0.0538	0.046	75.7	28.9	0.52	1.06	0.84	47.3	58.5
40	63.4	5.66e+07	1.14	1.01, 1.30	0.0623	0.056	68.7	36.9	0.53	1.09	0.85	47.9	58.3
41	55.6	5.66e+07	1.06	0.94, 1.19	0.0395	0.025	58.3	44.2	0.51	1.04	0.94	46.8	55.7
42	48.5	5.66e+07	1.07	0.96, 1.20	0.0413	0.027	52.3	50.5	0.51	1.06	0.95	43.7	52.2
43	42.7	5.66e+07	1.09	0.97, 1.22	0.0494	0.028	46.6	56.2	0.51	1.06	0.95	47.3	55.5
44	37.9	5.66e+07	1.04	0.93, 1.17	0.0312	0.024	41.6	60.8	0.51	1.06	0.96	47.2	55.2
45	34.2	5.66e+07	1.02	0.90, 1.14	0.0191	0.009	36.6	64.4	0.50	1.03	0.99	46.4	54.6
46	30.1	5.66e+07	1.01	0.89, 1.14	0.0158	0.012	31.9	69.3	0.51	1.04	0.98	46.7	54.7
47	26.3	5.66e+07	1.03	0.91, 1.16	0.0196	0.023	29.1	73.2	0.51	1.08	0.97	47.8	55.0
48	22.8	5.66e+07	1.09	0.97, 1.24	0.0387	0.033	26.0	77.3	0.52	1.15	0.96	49.1	55.3
49	19.6	5.66e+07	1.12	0.98, 1.27	0.0416 ^d	0.036	23.0	80.6	0.52	1.19	0.96	50.0	55.4
50	16.2	5.66e+07	1.21 ^d	1.06, 1.38	0.0594	0.045	20.2	84.3	0.52	1.28	0.95	52.0	55.6
51	13.4	5.65e+07	1.28 ^e	1.12, 1.47	0.0672 ^e	0.051	17.8	87.3	0.53	1.40	0.94	54.1	55.7
52	11.1	5.64e+07	1.42 ^e	1.24, 1.63	0.0827 ^e	0.058	15.7	90.1	0.53	1.59	0.94	57.3	55.9
53	9.7	5.64e+07	1.41 ^e	1.21, 1.63	0.0699 ^e	0.048	13.3	91.5	0.52	1.57	0.95	56.9	55.6
54	8.3	5.64e+07	1.45 ^e	1.25, 1.69	0.0695 ^e	0.051	12.1	93.1	0.53	1.74	0.94	59.5	55.6
55	6.7	5.64e+07	1.50 ^e	1.28, 1.77	0.0629 ^e	0.050	10.3	94.7	0.52	1.94	0.95	62.0	55.6
56	5.6	5.64e+07	1.49 ^e	1.26, 1.76	0.0563 ^e	0.046	9.1	95.4	0.52	2.00	0.95	62.8	55.5
57	4.7	5.66e+07	1.37 ^e	1.12, 1.66	0.0344 ^d	0.029	6.7	96.2	0.51	1.76	0.97	59.8	55.0
58	3.6	5.66e+07	1.35 ^d	1.09, 1.67	0.0272 ^d	0.022	5.5	96.6	0.51	1.64	0.98	58.1	54.8
59	3.1	5.66e+07	1.44 ^e	1.15, 1.80	0.0285 ^d	0.023	4.8	97.5	0.51	1.91	0.98	61.7	54.8
60	2.6	5.66e+07	1.37 ^d	1.07, 1.76	0.0222 ^d	0.018	4.1	97.7	0.51	1.81	0.98	60.4	54.7
61	2.4	5.66e+07	1.40 ^d	1.09, 1.80	0.0221 ^d	0.018	3.9	97.9	0.51	1.87	0.98	61.2	54.7
62	2.1	5.66e+07	1.42 ^d	1.08, 1.87	0.0174 ^d	0.013	3.0	98.4	0.51	1.82	0.99	60.5	54.6
63	1.8	5.66e+07	1.38 ^d	1.02, 1.87	0.0137	0.011	2.6	98.5	0.51	1.69	0.99	58.8	54.5
64	1.7	5.66e+07	1.29	0.91, 1.82	0.0089	0.006	2.1	98.6	0.50	1.46	0.99	55.2	54.4
65	1.5	5.66e+07	1.38	0.97, 1.96	0.0101	0.007	1.9	98.8	0.50	1.62	0.99	57.7	54.4

threshold

Conway SH, et al. *Am J Epidemiol*, 2017, 186 (2): 173-183.

RESULTS

Threshold (duration) of long working hours and risk of self-reported CVD (United States)

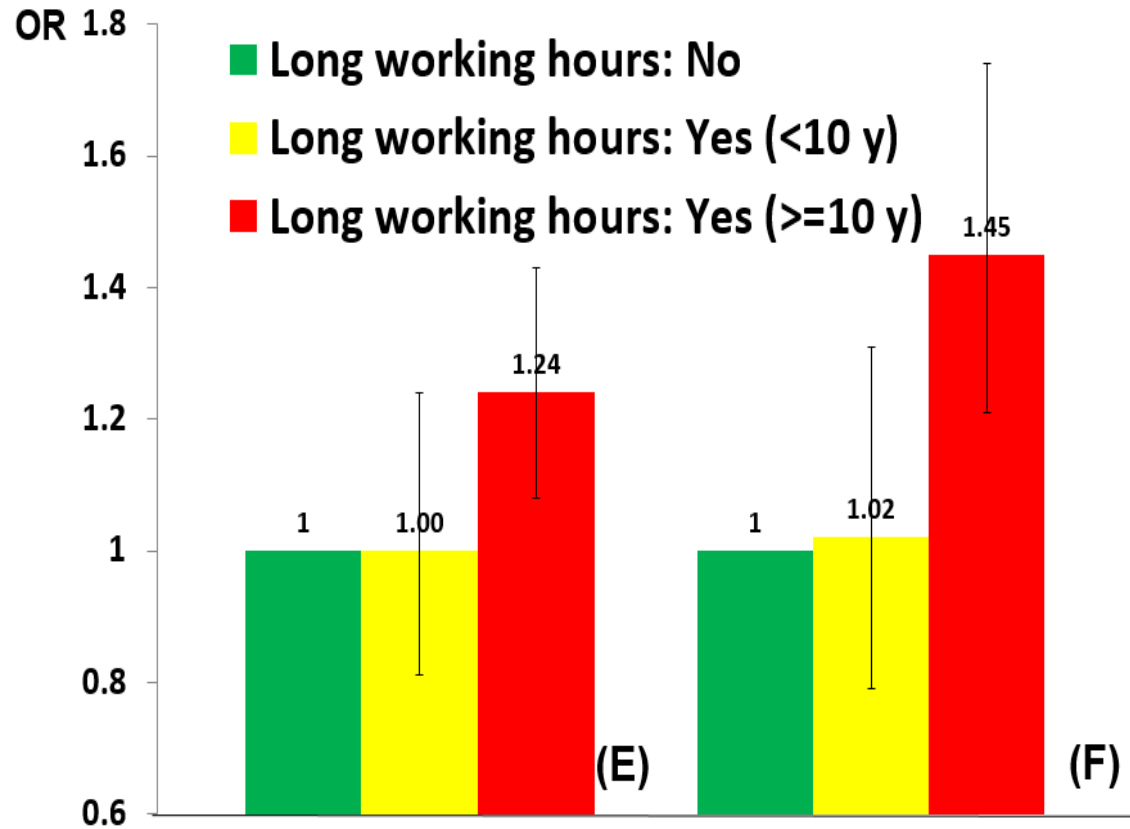


“Working more than 45 work hours per week for at least 10 years may be an independent risk factor for CVD.”

Conway SH, et al. *J Occup Environ Med*, 2016, 58 (3): 221-226.

RESULTS

Threshold (duration) of long working hours and CVD occurrence (France)



(E) French CONSTANCES study:

Associations of cumulative long working hours and occurrence of ischemic heart disease

(F) French CONSTANCES study:

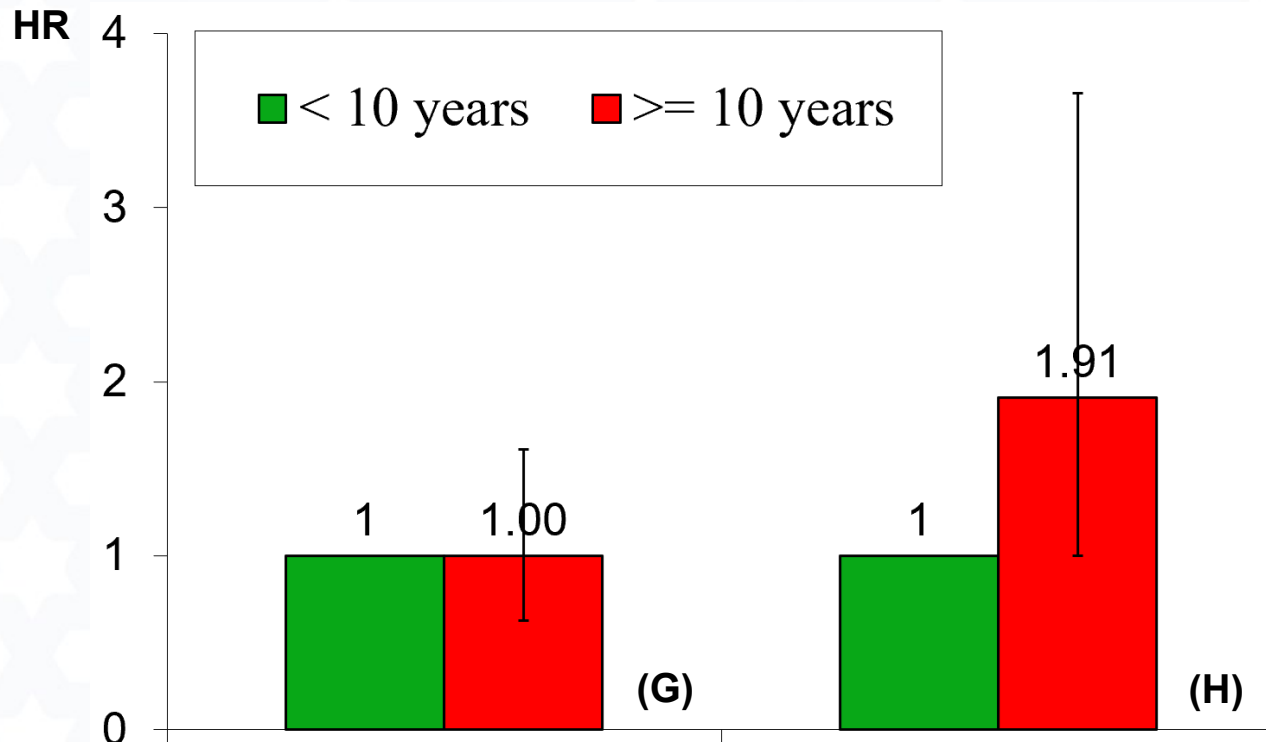
Associations of cumulative long working hours and occurrence of stroke

Fadel M, et al. Cumulative Exposure to Long Working Hours and Occurrence of Ischemic Heart Disease: Evidence From the CONSTANCES Cohort at Inception, J Am Heart Assoc, 2020, 9 (12): e015753.

Fadel M, et al. Association Between Reported Long Working Hours and History of Stroke in the CONSTANCES Cohort. Stroke, 2019, 50 (7): 1879-1882.

RESULTS

Threshold (duration) of long working hours and risk of stroke (France)



- (G) French CONSTANCES study:
Associations of cumulative long working hours and risk of ischaemic stroke
- (H) French CONSTANCES study:
Associations of cumulative long working hours and risk of haemorrhagic of stroke

Fadel M, et al. Association between prolonged exposure to long working hours and stroke subtypes in the CONSTANCES cohort. Occup Environ Med, 2023, 80 (4): 196-201.

The WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury (**long working hours and CVD**)

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Global, regional, and national burdens of ischemic heart disease and stroke attributable to exposure to long working hours for 194 countries, 2000–2016: A systematic analysis from the WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury

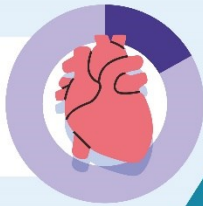
Frank Pega^{a,*}, Bálint Náfrádi^b, Natalie C. Momen^a, Yuka Ujita^b, Kai N. Streicher^a, Annette M. Prüss-Üstün^a, Technical Advisory Group: Alexis Descatha^{c,d,e,f}, Tim Driscoll^g, Frida M. Fischer^h, Lode Godderisⁱ, Hannah M. Kiiver^j, Jian Li^k, Linda L. Magnusson Hanson^l, Reiner Rugulies^{m,n,o}, Kathrine Sørensen^m, Tracey J. Woodruff^p

RESULTS

The WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury (**long working hours and CVD**)

Working **55** or more hours per week increases the risk of

heart disease by **17%**



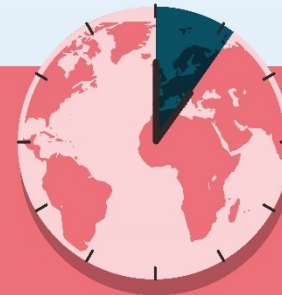
This applies to **1 in 10** of the global population

#WorkersHealth



Working **55** or more hours per week increases the risk of

stroke by **35%**



This applies to **1 in 10** of the global population

#WorkersHealth

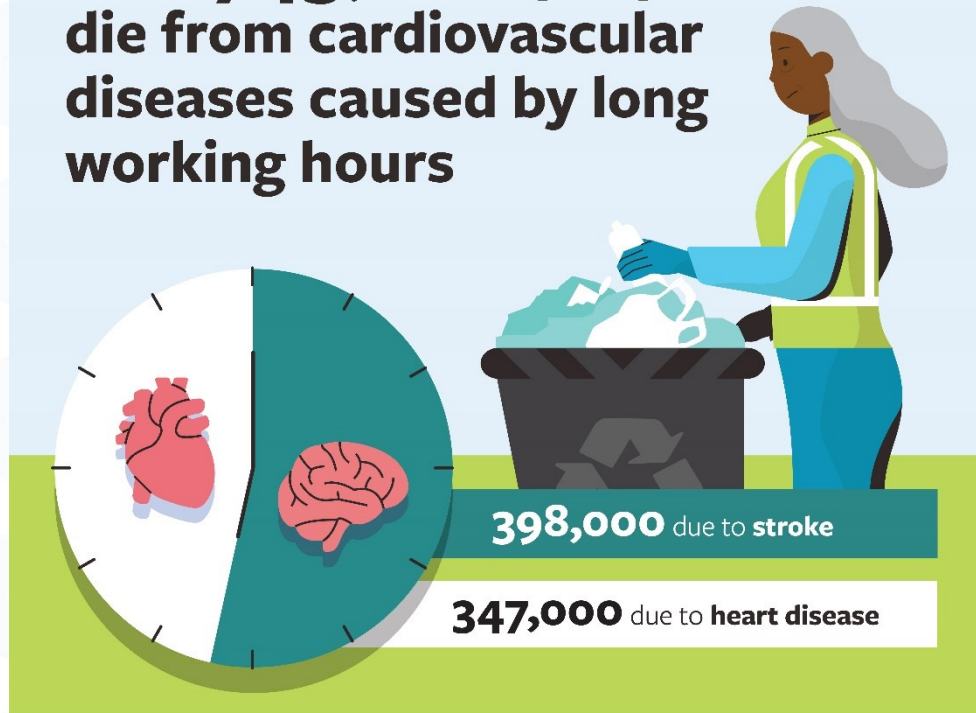


<https://www.who.int/teams/environment-climate-change-and-health/monitoring/who-ilo-joint-estimates>

RESULTS

The WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury (**long working hours and CVD**)

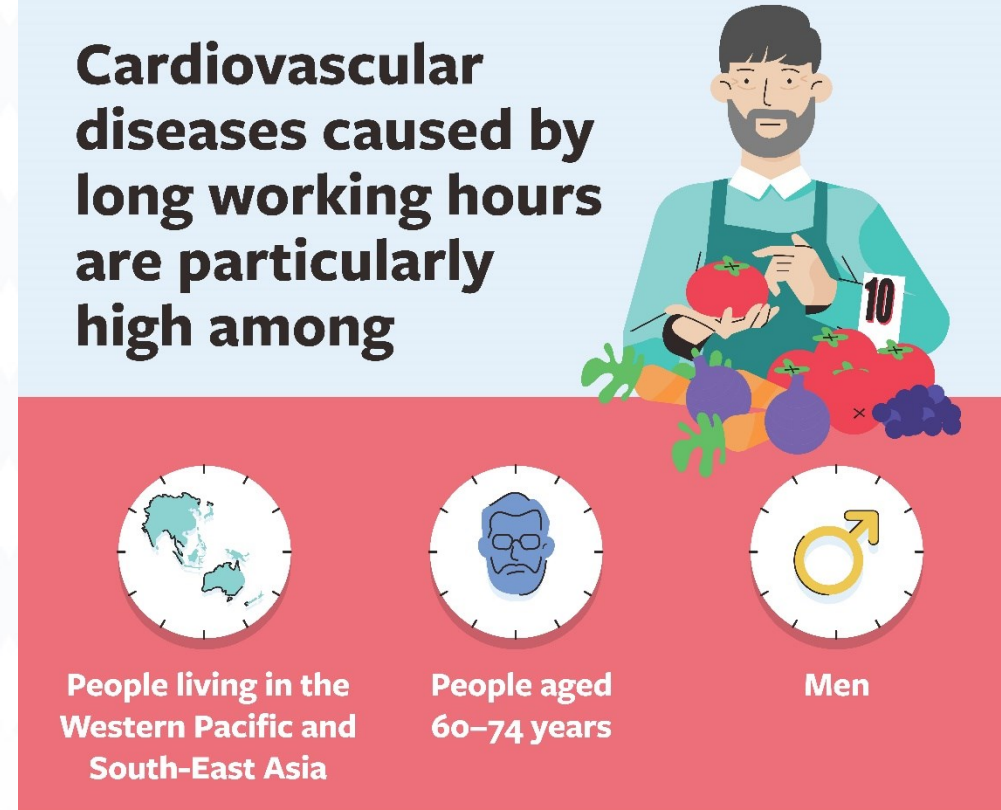
Over 745,000 people die from cardiovascular diseases caused by long working hours



#WorkersHealth



Cardiovascular diseases caused by long working hours are particularly high among



#WorkersHealth



<https://www.who.int/teams/environment-climate-change-and-health/monitoring/who-ilo-joint-estimates>

- Exposure to long working hours (≥ 55 hours/week) more than 10 years is identified as an important risk factor for cardiovascular diseases.
- Given the high prevalence of long working hours and their large burden on health, working hours management and intervention are urgently needed.

- The WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury
 - Li J, et al. The effect of exposure to long working hours on ischaemic heart disease: A systematic review and meta-analysis from the WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury. *Environ Int.* 2020 Sep;142:105739.
 - Descatha A, et al. The effect of exposure to long working hours on stroke: A systematic review and meta-analysis from the WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury. *Environ Int.* 2020 Sep;142:105746.
 - Pega F, et al. Global, regional, and national burdens of ischemic heart disease and stroke attributable to exposure to long working hours for 194 countries, 2000-2016: A systematic analysis from the WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury. *Environ Int.* 2021 Sep;154:106595.
- The French CONSTANCES study
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