

Online Appendix

**Occupation and temperature-related mortality in
Mexico**

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A Regulatory framework for the protection of Mexican workers to temperature changes

Protection for elevated and depressed thermal conditions: A cornerstone of Mexico’s protections is the Official Mexican Standard on “Elevated or Depressed Thermal Conditions – Safety and Hygiene Conditions.” Implemented in 2001, this standard sets maximum permissible exposure limits for high and low-temperature environments at work ([Secretaría de Economía, 2002](#)) . It uses the Wet-Bulb Globe Temperature (WBGT) heat index and categorizes work intensity into three levels (light, moderate, heavy) to determine safe exposure durations. For instance, at 100% continuous exposure, the WBGT limit is 30°C for light work, 26.7°C for moderate work, and 25°C for heavy work. Higher temperatures are allowed only with work-rest cycles (e.g., 25% or 50% hourly rest). The standard also addresses cold stress and specifies when protective measures for low temperatures become necessary.

Employer duties and enforcement: Under this framework, employers must evaluate thermal conditions and implement controls to maintain workers’ core body temperature between 36°C and 38°C. In practice, this involves providing cooling or warming measures as needed, adjusting work schedules, and limiting exposure time. According to NOM-015 and related safety regulations, employers must inform workers about heat risks, conduct risk assessments, and take preventive actions. Notably, if extreme temperatures result from climate conditions (e.g., outdoor summer heat) rather than industrial processes, employers must, at a minimum, inform workers of the risks, provide appropriate PPE (such as sun protection and ample water), and monitor workers’ health.

Adaptation measures and climate policy integration: In recent years, Mexico has increasingly integrated heat protection into its climate adaptation and public health strategies. The National Climate Change Strategy (2007) and the General Law on Climate Change (2012) aimed and reduce the vulnerability of the the population and productive sectors to climate impacts ([United Nations Development Programme \(UNDP\), 2025](#)). At the national and state levels, authorities now issue heatwave alerts and guidelines during extreme heat events, recognizing outdoor laborers as a vulnerable group. For example, during heat waves in 2023, the labor ministry in San Luis Potosí urged all employers to follow NOM-015 and implement extra precautions: ensure rest breaks, maintain water hydration stations at work-sites, and regularly monitor workers’ body temperatures to keep them below 38°C.

B Additional data information

Table A1: Worker classification

Occupation (INEGI)	Time Period
Primary Sector	
Workers in agriculture, livestock, hunting, and fishing activities	1998–2023
Technical/Manual	
Education workers	1998–2012
Workers in the processing industry	1998–2012
Fixed machinery operators	1998–2012
Assistants in the industrial and artisan production process	1998–2012
Drivers of mobile machinery and means of transport	1998–2012
Artisans	2013–2023
Industrial machinery operators, assemblers, and transport drivers	2013–2023
Workers in elementary and support activities	2013–2023
Sales/Personal Services	
Merchants, trade clerks, and sales agents	1998–2012
Vendors	1998–2012
Workers in personal services in establishments	1998–2012
Domestic Workers	1998–2012
Armed Forces, Protection and Surveillance Workers	1998–2012
Merchants, sales clerks, and sales agents	2013–2023
Workers in personal services and surveillance	2013–2023
Professional/Managerial	
Professionals	1998–2012
Technicians	1998–2012
Art, sports and entertainment workers	1998–2012
Officers and managers	1998–2012
Control personnel in the industrial production process	1998–2012
Middle-level administrative workers	1998–2012
Lower-level administrative workers	1998–2012
Officers, directors and heads	2013–2023
Professionals and technicians	2013–2023
Auxiliary workers in administrative activities	2013–2023

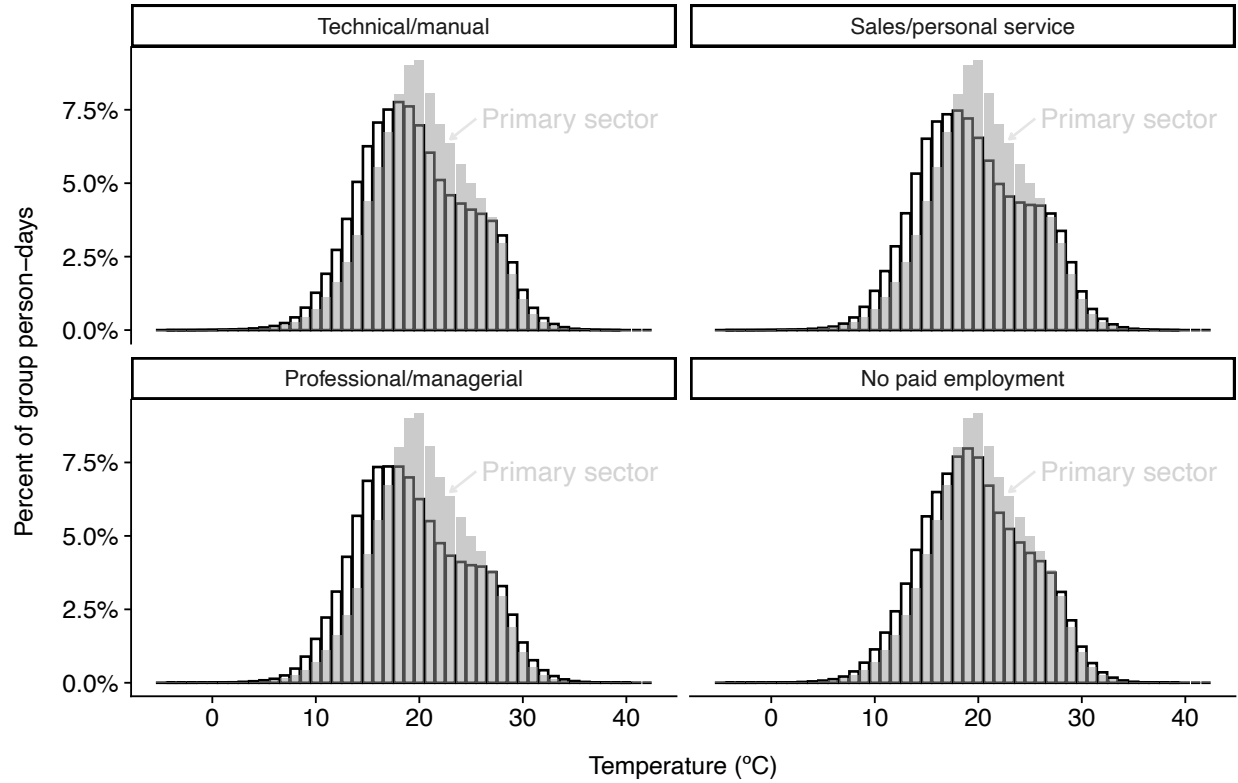
Notes: This table shows the concordance between the classification of occupations in Mexican death certificates and the categories used in this study. The Mexican National Institute of Geography and Statistics (INEGI) is responsible for determining the classification, with a notable break in 2013.

Table A2: Share of mortality records: sociodemographic characteristics by labor groups

	No Work	Work	Primary Sector	Technical Manual	Sales Personal Services	Professional Managerial
<i>Sex</i>						
Male (%)	28.24	89.25	98.76	94.04	85.32	78.86
Female (%)	71.76	10.75	1.24	5.96	14.68	21.14
<i>Age</i>						
[13, 20) (%)	1.97	1.22	1.03	1.60	0.82	1.44
[20, 40) (%)	5.26	16.22	8.30	19.62	15.75	21.20
[40, 60) (%)	15.09	29.93	16.90	34.28	31.71	36.84
[60, 120] (%)	77.69	52.63	73.77	44.50	51.72	40.52
<i>Education</i>						
Unknown Education (%)	3.43	2.61	2.84	2.71	2.80	2.06
Professional (%)	5.02	14.26	0.42	4.63	6.17	45.82
High School (%)	15.25	23.31	5.59	25.84	32.71	29.10
No Education (%)	25.45	14.95	36.59	11.31	9.72	2.20
Primary School (%)	50.85	44.87	54.56	55.52	48.59	20.81

Notes: Each value represents the percentage share of mortality within the specified sociodemographic category and labor group. Data for sex, age, and education are derived from mortality records.

Figure A1: Distribution of temperature exposures by occupation group



Notes: Percent of person-days in each 1°C temperature bin across all municipalities and days by occupation group, 1990–2023. Within each subpanel, the distribution of exposures for primary sector workers is shown for comparison.

Table A3: Worker characteristics by occupation and age group, part I

Age Group	Occupational Group			
	Primary Sector	Technical/Manual	Sales/Personal Services	Professional/Managerial
Rural Share (% of Workers)				
15-24	94.2%	39.2%	33.3%	24.7%
25-34	93.0%	36.9%	32.1%	23.1%
35-44	91.9%	34.9%	31.5%	23.7%
45-54	90.1%	31.5%	29.0%	21.9%
55-64	88.9%	29.9%	28.9%	19.2%
65-74	87.9%	32.4%	31.9%	18.8%
75+	86.1%	34.2%	33.5%	19.0%
Literacy (% Illiterate)				
15-24	3.3%	0.7%	0.5%	0.1%
25-34	7.1%	1.2%	1.1%	0.1%
35-44	10.0%	1.6%	2.0%	0.1%
45-54	14.5%	2.6%	3.7%	0.1%
55-64	22.9%	5.0%	7.1%	0.2%
65-74	32.4%	11.0%	14.5%	0.7%
75+	41.1%	17.7%	20.9%	1.5%
Sole Breadwinner (% Only Employed in HH)				
15-24	16.2%	12.9%	11.2%	11.7%
25-34	38.0%	29.5%	23.7%	20.6%
35-44	32.4%	28.0%	23.2%	27.4%
45-54	26.2%	21.0%	19.4%	23.9%
55-64	31.1%	24.4%	25.3%	27.0%
65-74	38.9%	31.6%	34.6%	36.7%
75+	40.0%	32.8%	38.2%	37.4%
Income Support (% Receiving Income Support)				
15-24	9.7%	3.4%	6.2%	6.4%
25-34	7.6%	3.0%	6.5%	3.1%
35-44	11.4%	3.6%	9.0%	3.2%
45-54	13.3%	3.2%	8.0%	2.5%
55-64	15.5%	4.6%	9.6%	2.8%
65-74	43.7%	26.7%	30.8%	13.9%
75+	64.2%	39.9%	43.4%	21.7%
Outdoor Exposure (% Working Outside)				
15-24	52.2%	9.4%	8.3%	3.0%
25-34	48.3%	12.6%	9.0%	2.8%
35-44	45.2%	13.8%	8.6%	2.6%
45-54	42.9%	14.8%	7.8%	2.4%
55-64	40.9%	15.8%	7.2%	2.7%
65-74	38.2%	15.0%	6.9%	3.1%
75+	33.8%	11.1%	6.8%	2.8%

Notes: All values represent means by age group and occupation type. Outdoor exposure is inferred based on reported locations for work. Calculated using ENOE data from 2005-2024.

Table A4: Worker characteristics by occupation and age group, part II

Age Group	Occupational Group			
	Primary Sector	Technical/Manual	Sales/Personal Services	Professional/Managerial
Formality (% Informal)				
15-24	92.6%	56.6%	65.7%	39.4%
25-34	86.5%	43.1%	49.2%	19.3%
35-44	85.5%	41.4%	51.6%	12.7%
45-54	85.6%	42.1%	53.8%	10.9%
55-64	87.6%	50.2%	59.3%	14.8%
65-74	90.8%	73.4%	75.4%	27.3%
75+	90.6%	77.4%	79.3%	34.1%
Contract Status (% No Contract)				
15-24	88.1%	56.5%	60.6%	31.1%
25-34	84.9%	45.6%	46.8%	15.8%
35-44	84.9%	43.5%	48.8%	12.3%
45-54	84.4%	43.2%	49.8%	11.4%
55-64	84.8%	49.1%	53.2%	14.8%
65-74	85.0%	64.4%	65.0%	24.0%
75+	81.6%	65.9%	67.9%	29.9%
Work Schedule (% No Set Hours)				
15-24	20.3%	8.7%	7.9%	7.3%
25-34	19.4%	8.3%	7.2%	6.9%
35-44	20.8%	8.8%	7.7%	7.0%
45-54	21.1%	9.3%	8.1%	7.2%
55-64	21.6%	10.5%	8.7%	8.0%
65-74	22.3%	12.6%	10.1%	9.4%
75+	22.0%	14.5%	10.6%	9.8%
Flexibility Index				
15-24	1.04	0.67	0.72	0.37
25-34	1.01	0.54	0.55	0.19
35-44	1.01	0.52	0.58	0.15
45-54	1.00	0.51	0.59	0.14
55-64	1.00	0.58	0.63	0.18
65-74	1.01	0.76	0.77	0.28
75+	0.97	0.78	0.80	0.35
Mean Job Experience (Years)				
15-24	4.05	2.41	2.27	2.03
25-34	6.75	4.58	4.19	4.65
35-44	9.43	7.10	6.35	10.13
45-54	12.30	9.69	8.29	15.47
55-64	14.14	11.42	9.68	17.07
65-74	15.50	11.71	10.13	18.02
75+	15.93	12.09	11.21	19.02

Notes: All values represent means by age group and occupation type. Flexibility index is a composite measure of employment formality, contract status, and work schedule flexibility and is normalized to the 45-54 age group primary workers. Calculated using ENOE data from 2005-2024.

Table A5: Average annual number of deaths by occupation with columns as causes and subcolumns as age groups, 1990–2023. Percent below each value is the share of deaths by cause within occupation–age group.

Block 1: Accident, Neurodegenerative, Cancer, Cardiovascular, Homicide

Occupation	Accident			Neurodeg.			Cancer			Cardio			Homicide		
	15–34	35–54	55–74	15–34	35–54	55–74	15–34	35–54	55–74	15–34	35–54	55–74	15–34	35–54	55–74
Agriculture	1228.1 (35.8%)	632.8 (15%)	177.4 (5.4%)	16.2 (0.5%)	24.2 (0.6%)	19.7 (0.6%)	268.6 (7.8%)	752.1 (17.8%)	679.8 (20.7%)	194.4 (5.7%)	682.8 (16.2%)	839.7 (25.5%)	635.6 (18.5%)	283.5 (6.7%)	41.7 (1.3%)
Industry	1550.9 (28.4%)	1363 (12.8%)	1255.4 (5.4%)	72.5 (1.3%)	89 (0.8%)	198.7 (0.9%)	281.3 (5.2%)	828.6 (7.8%)	3488.2 (14.9%)	285 (5.2%)	1326.6 (12.5%)	5669.3 (24.3%)	1279.4 (23.4%)	1003.4 (9.4%)	417 (1.8%)
Unknown	626.2 (23.3%)	642.9 (9.2%)	389.4 (3.5%)	12 (0.4%)	31.8 (0.5%)	62.4 (0.6%)	137.7 (5.1%)	741.4 (10.6%)	1771.8 (15.9%)	153.9 (5.7%)	1101.6 (15.8%)	2761.7 (24.7%)	867.5 (32.2%)	811.6 (11.7%)	182.5 (1.6%)
Construction	1103.3 (27%)	994.2 (12.4%)	439.3 (4.5%)	17.4 (0.4%)	42.3 (0.5%)	59.9 (0.6%)	189.5 (4.6%)	727.3 (9.1%)	1331.6 (13.6%)	219.5 (5.4%)	1199.1 (14.9%)	2346 (23.9%)	1289.7 (31.5%)	829.2 (10.3%)	123.7 (1.3%)
Commercial	51.5 (28.3%)	77.6 (11.8%)	28.3 (3.6%)	0.7 (0.4%)	2.4 (0.4%)	4.9 (0.6%)	18.9 (10.4%)	111 (16.9%)	185.2 (23.6%)	13.1 (7.2%)	112.4 (17.1%)	197.4 (25.2%)	34.9 (19.2%)	71.5 (10.9%)	18.5 (2.4%)
Professional/technician	1948.5 (31.5%)	1423.4 (13.6%)	563.4 (4.9%)	27.1 (0.4%)	49.4 (0.5%)	61.6 (0.5%)	349.4 (5.7%)	995.6 (9.5%)	1794.7 (15.7%)	303.5 (4.9%)	1473.1 (14.1%)	2691.9 (23.5%)	1486.6 (24.1%)	850.7 (8.1%)	149.9 (1.3%)
Administrative	2308 (15.4%)	1088.7 (3.6%)	1802.4 (1.8%)	543.3 (3.6%)	491 (1.6%)	924.4 (0.9%)	1971 (13.1%)	6738.5 (22%)	17075.4 (17.5%)	1228.1 (8.2%)	4936.7 (16.1%)	24023.9 (24.6%)	1515.8 (10.1%)	545.4 (1.8%)	286.5 (0.3%)
Service	615.4 (28%)	596.1 (9.5%)	212.1 (2.7%)	12.3 (0.6%)	42.9 (0.7%)	72.1 (0.9%)	257.4 (11.7%)	1187.5 (18.9%)	1683.1 (21.3%)	163.4 (7.4%)	1025.9 (16.4%)	1913.5 (24.3%)	354.9 (16.1%)	374.6 (6%)	78 (1%)
Executive	270.6 (23%)	211.2 (9.6%)	115.2 (4.8%)	5.3 (0.5%)	12.4 (0.6%)	12.9 (0.5%)	73.7 (6.3%)	259 (11.7%)	356 (15%)	64.2 (5.5%)	324.9 (14.7%)	576.2 (24.2%)	299.1 (25.4%)	204.3 (9.2%)	39.8 (1.7%)
No work	2185.4 (29.3%)	1469.2 (15.5%)	715.3 (6.6%)	175.6 (2.4%)	90.9 (1%)	96.3 (0.9%)	333.5 (4.5%)	897.7 (9.5%)	1412.8 (13.1%)	381.4 (5.1%)	1311.6 (13.9%)	2537.7 (23.6%)	1940.1 (26%)	1087.5 (11.5%)	231.2 (2.1%)

Block 2: Infections, Endocrine, Birth/Blood/Bone/Gastro (BBBBG), Nutrition-related, Other

Occupation	Infections			Endocrine			BBBBG			Nutrition			Other		
	15–34	35–54	55–74	15–34	35–54	55–74	15–34	35–54	55–74	15–34	35–54	55–74	15–34	35–54	55–74
Agriculture	302 (8.8%)	313.7 (7.4%)	100.2 (3%)	61.2 (1.8%)	74 (1.8%)	69.1 (2.1%)	272.6 (8%)	577.1 (13.7%)	387.2 (11.8%)	71.7 (2.1%)	396.9 (9.4%)	550.4 (16.7%)	81.4 (2.4%)	146.3 (3.5%)	105.6 (3.2%)
Industry	324.8 (5.9%)	502.9 (4.7%)	761.7 (3.3%)	92.1 (1.7%)	188.9 (1.8%)	570 (2.4%)	744.3 (13.6%)	3016.1 (28.4%)	4001.6 (17.1%)	167.5 (3.1%)	1074.7 (10.1%)	3716.7 (15.9%)	150.9 (2.8%)	341.6 (3.2%)	724.6 (3.1%)
Unknown	173.4 (6.4%)	328.3 (4.7%)	276.8 (2.5%)	46.8 (1.7%)	123.9 (1.8%)	247.9 (2.2%)	276.8 (10.3%)	1159.8 (16.7%)	1256.4 (11.2%)	87.1 (3.2%)	965.9 (13.9%)	2442.4 (21.9%)	61.1 (2.3%)	237.4 (3.4%)	338.1 (3%)

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Block 2: Infections, Endocrine, Birth/Blood/Bone/Gastro (BBBG), Nutrition-related, Other

Occupation	Infections			Endocrine			BBBG			Nutrition			Other		
	15–34	35–54	55–74	15–34	35–54	55–74	15–34	35–54	55–74	15–34	35–54	55–74	15–34	35–54	55–74
Construction	196.6 (4.8%)	375 (4.7%)	253.4 (2.6%)	66.1 (1.6%)	136.6 (1.7%)	215.5 (2.2%)	377.4 (9.2%)	1558.5 (19.4%)	1385.8 (14.1%)	97 (2.4%)	963.7 (12%)	1987.9 (20.2%)	79.9 (2%)	279.7 (3.5%)	322.1 (3.3%)
Commercial	20.5 (11.3%)	40.7 (6.2%)	20.8 (2.7%)	2.3 (1.3%)	8.1 (1.2%)	14.3 (1.8%)	12.9 (7.1%)	65.8 (10%)	69.5 (8.9%)	4.3 (2.4%)	51.5 (7.9%)	107.8 (13.8%)	4.4 (2.4%)	21.4 (3.3%)	23.8 (3%)
Professional/technician	441.3 (7.1%)	621.4 (5.9%)	350.3 (3.1%)	103.8 (1.7%)	181.5 (1.7%)	273.4 (2.4%)	658.8 (10.7%)	2359.7 (22.6%)	1795.4 (15.7%)	141.3 (2.3%)	1131.7 (10.8%)	2168.6 (19%)	129.3 (2.1%)	338.8 (3.2%)	352.7 (3.1%)
Administrative	1239.6 (8.3%)	1667.2 (5.5%)	3004.7 (3.1%)	590 (3.9%)	953.4 (3.1%)	2527.6 (2.6%)	2238.3 (14.9%)	4326 (14.2%)	9798.9 (10%)	819.6 (5.5%)	5654.2 (18.5%)	23949.4 (24.5%)	916.1 (6.1%)	1448 (4.7%)	3372.1 (3.4%)
Service	220.5 (10%)	418.8 (6.7%)	220.8 (2.8%)	34.3 (1.6%)	104.6 (1.7%)	157.6 (2%)	192.4 (8.7%)	832.4 (13.3%)	813.3 (10.3%)	60.9 (2.8%)	662.4 (10.6%)	1357 (17.2%)	68.2 (3.1%)	237 (3.8%)	261.7 (3.3%)
Executive	153.5 (13%)	199.6 (9%)	86.5 (3.6%)	20 (1.7%)	37.8 (1.7%)	50.4 (2.1%)	108.7 (9.2%)	349.8 (15.8%)	319.3 (13.4%)	28.1 (2.4%)	234.2 (10.6%)	395.2 (16.6%)	26.2 (2.2%)	82.4 (3.7%)	88.6 (3.7%)
No work	382.3 (5.1%)	479.1 (5.1%)	362.8 (3.4%)	116.1 (1.6%)	139 (1.5%)	234.6 (2.2%)	687.1 (9.2%)	1392.3 (14.7%)	1220 (11.3%)	185.8 (2.5%)	835.9 (8.8%)	1815.9 (16.9%)	261.3 (3.5%)	362.3 (3.8%)	452 (4.2%)

Block 3: Poisoning, Respiratory, Unexplained, Suicide, Cause missing

Occupation	Poisoning			Respiratory			Unexplained			Suicide			Cause missing		
	15–34	35–54	55–74	15–34	35–54	55–74	15–34	35–54	55–74	15–34	35–54	55–74	15–34	35–54	55–74
Agriculture	8.1 (0.2%)	15.4 (0.4%)	5.6 (0.2%)	81.8 (2.4%)	155.8 (3.7%)	205 (6.2%)	4.9 (0.1%)	6 (0.1%)	3.6 (0.1%)	188.2 (5.5%)	73.1 (1.7%)	13.3 (0.4%)	12.9 (0.4%)	90 (2.1%)	92.8 (2.8%)
Industry	45.8 (0.8%)	161.9 (1.5%)	151.4 (0.6%)	144.1 (2.6%)	400.6 (3.8%)	1821.6 (7.8%)	26.2 (0.5%)	55.8 (0.5%)	138.3 (0.6%)	289.3 (5.3%)	179.9 (1.7%)	102.4 (0.4%)	7.8 (0.1%)	92.6 (0.9%)	339.2 (1.5%)
Unknown	7.8 (0.3%)	27.8 (0.4%)	16.2 (0.1%)	70.1 (2.6%)	287.1 (4.1%)	719.3 (6.4%)	4 (0.1%)	10.7 (0.2%)	14.6 (0.1%)	124.2 (4.6%)	122.1 (1.8%)	53.7 (0.5%)	44.5 (1.7%)	371.5 (5.3%)	638.3 (5.7%)
Construction	7.5 (0.2%)	20.9 (0.3%)	8.7 (0.1%)	94 (2.3%)	362.1 (4.5%)	724.3 (7.4%)	7.7 (0.2%)	13.9 (0.2%)	17.6 (0.2%)	305.6 (7.5%)	197.3 (2.5%)	43.9 (0.4%)	38.5 (0.9%)	331.2 (4.1%)	563.7 (5.7%)
Commercial	0.2 (0.1%)	0.9 (0.1%)	0.6 (0.1%)	5.6 (3.1%)	28.5 (4.3%)	50.3 (6.4%)	0.2 (0.1%)	0.8 (0.1%)	1 (0.1%)	6 (3.3%)	11.4 (1.7%)	5.3 (0.7%)	6.2 (3.4%)	51.9 (7.9%)	56 (7.1%)
Professional/technician	39.8 (0.6%)	107.9 (1%)	51.5 (0.5%)	141.9 (2.3%)	417.3 (4%)	827.1 (7.2%)	9 (0.1%)	15.6 (0.1%)	18 (0.2%)	371.6 (6%)	198.3 (1.9%)	43.5 (0.4%)	27.9 (0.5%)	280.4 (2.7%)	298.9 (2.6%)

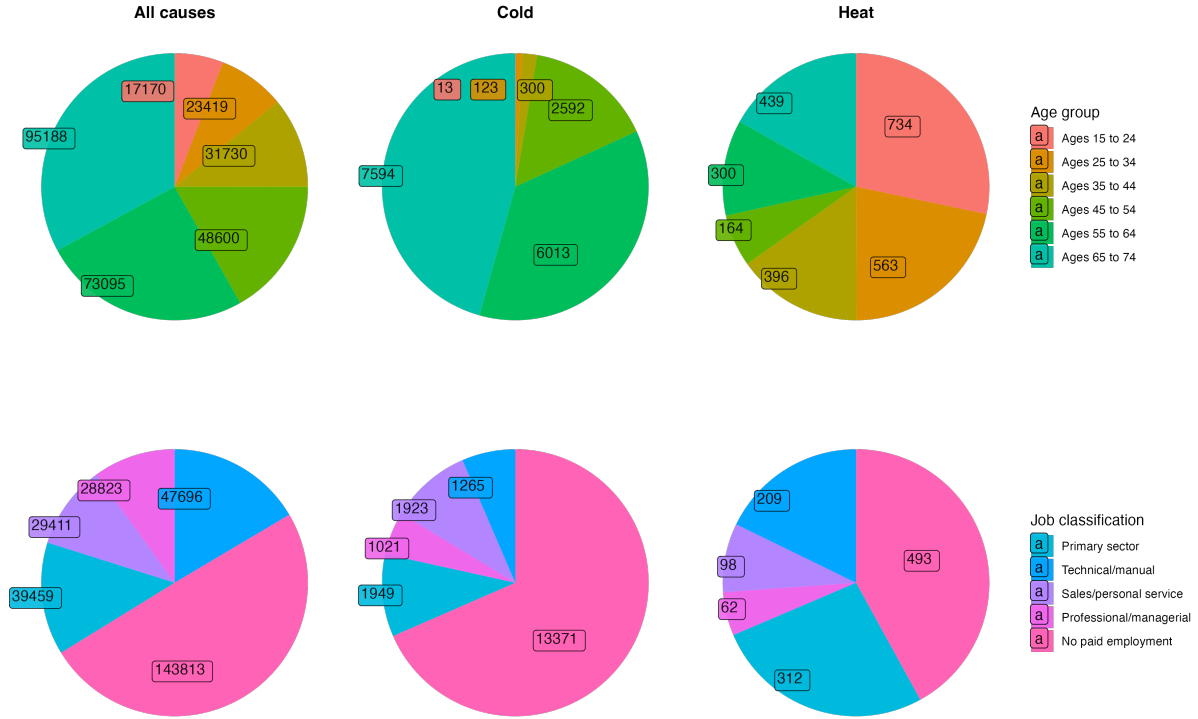
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Block 3: Poisoning, Respiratory, Unexplained, Suicide, Cause missing

Occupation	Poisoning			Respiratory			Unexplained			Suicide			Cause missing		
	15-34	35-54	55-74	15-34	35-54	55-74	15-34	35-54	55-74	15-34	35-54	55-74	15-34	35-54	55-74
Administrative	21 (0.1%)	52.7 (0.2%)	59.1 (0.1%)	695 (4.6%)	1553 (5.1%)	7039.3 (7.2%)	45.4 (0.3%)	70.7 (0.2%)	210.2 (0.2%)	720 (4.8%)	246.6 (0.8%)	163.7 (0.2%)	146.4 (1%)	799.3 (2.6%)	3532.1 (3.6%)
Service	3.4 (0.2%)	14.8 (0.2%)	6.5 (0.1%)	70.6 (3.2%)	267.5 (4.3%)	502.2 (6.4%)	4.2 (0.2%)	8.4 (0.1%)	9 (0.1%)	89.2 (4.1%)	97.7 (1.6%)	29 (0.4%)	53.7 (2.4%)	396.9 (6.3%)	573.2 (7.3%)
Executive	3.6 (0.3%)	8.4 (0.4%)	4.6 (0.2%)	34.4 (2.9%)	109.4 (4.9%)	185.1 (7.8%)	2 (0.2%)	2.6 (0.1%)	2.8 (0.1%)	69.5 (5.9%)	40.9 (1.8%)	9.9 (0.4%)	17.6 (1.5%)	134.5 (6.1%)	136.2 (5.7%)
No work	16.1 (0.2%)	42.4 (0.4%)	28.1 (0.3%)	244.1 (3.3%)	464 (4.9%)	812.7 (7.5%)	54.3 (0.7%)	89.1 (0.9%)	135.3 (1.3%)	396.2 (5.3%)	191.5 (2%)	51.1 (0.5%)	102.8 (1.4%)	602.4 (6.4%)	669.5 (6.2%)

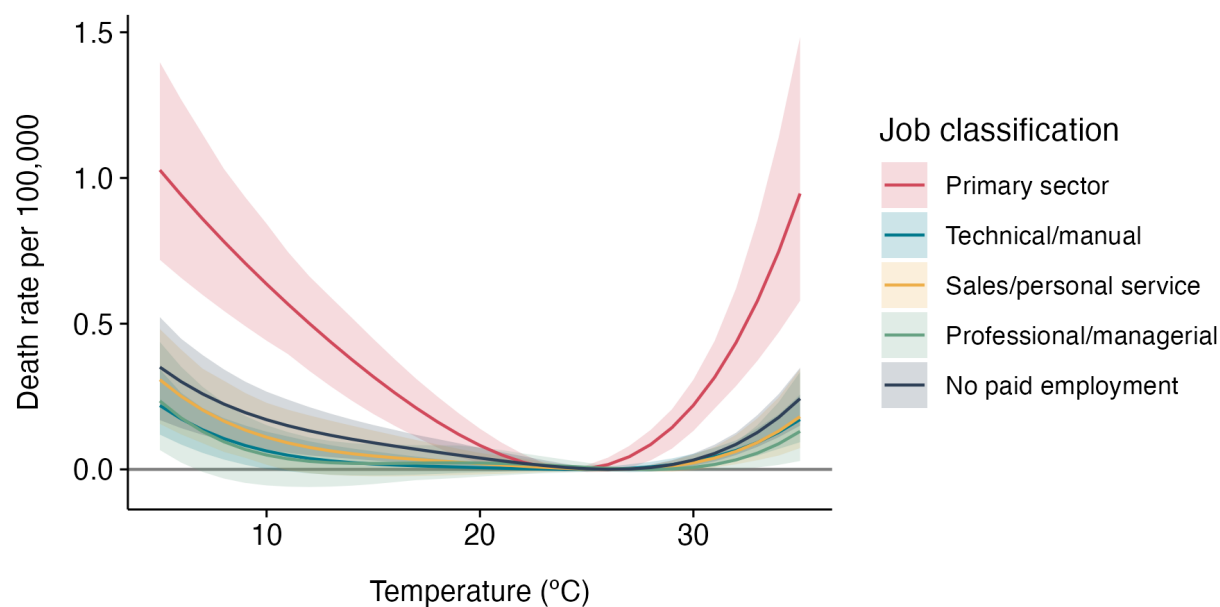
C Additional results

Figure A2: Total annual cold- and heat-related deaths by age and occupation groups



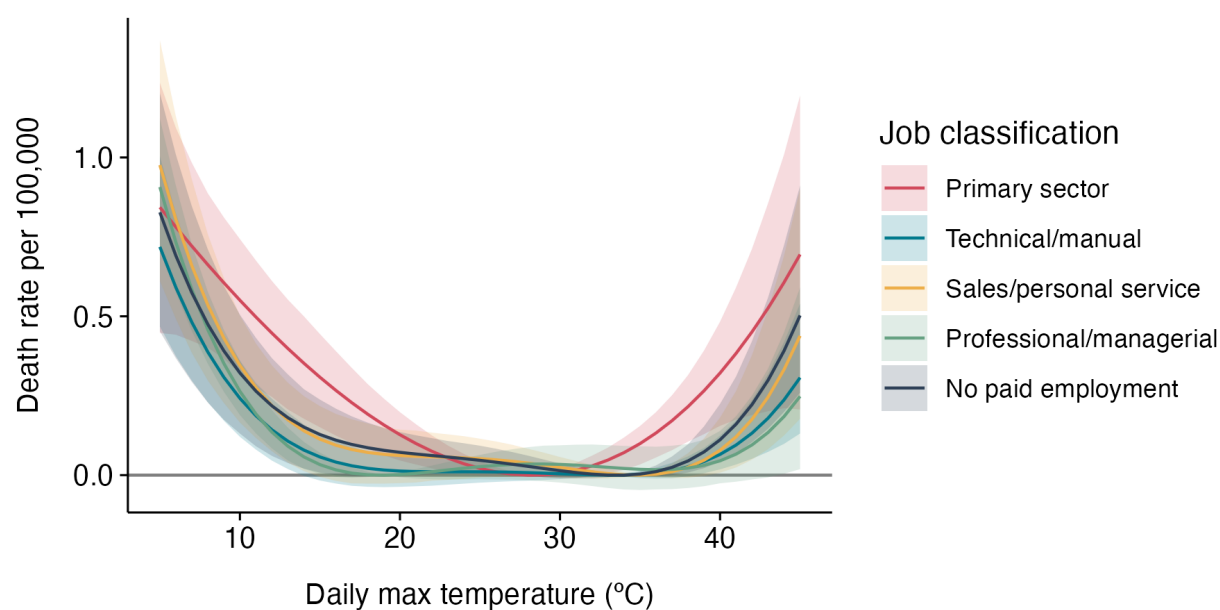
Notes: The left column shows the average annual count of all-cause deaths in the data for each age group or job classification. The center and right columns show the estimated average number of annual deaths due to cold and heat exposure, respectively. The top subpanels fit versions of Equation (1) for each age subgroup (as in Figure A6). The bottom subpanels separately fit versions of Equation (1) for each occupation subgroup (as in Figure 1).

Figure A3: Temperature–mortality relationship by occupation classification, quasi-Poisson GLM



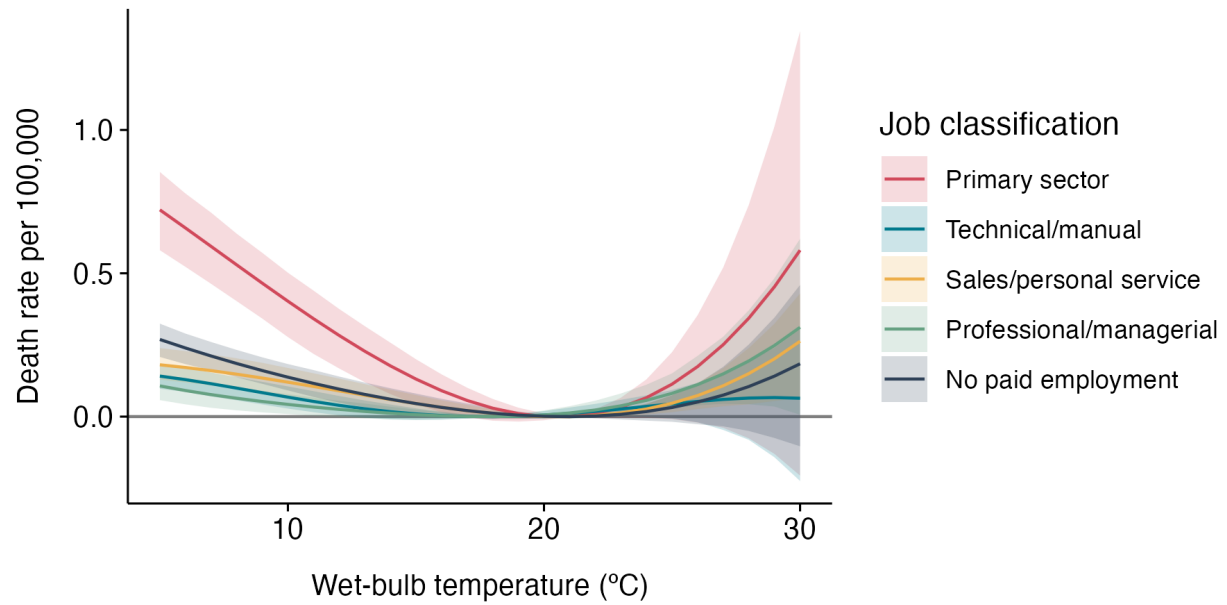
Notes: The figure shows estimates from fitting versions of Equation (1) separately for each of the given occupation groups using the baseline sample. The right-hand-side variable is temperature as in Figure 1, but here, we fit a quasi-Poisson GLM to death rates. The estimates are conditional on controls for precipitation as well as fixed effects for municipality by year and municipality by month. Shaded areas show 95% confidence intervals based on bootstrapped standard errors clustered at the state level.

Figure A4: Mortality–daily maximum temperature relationship by occupation classification



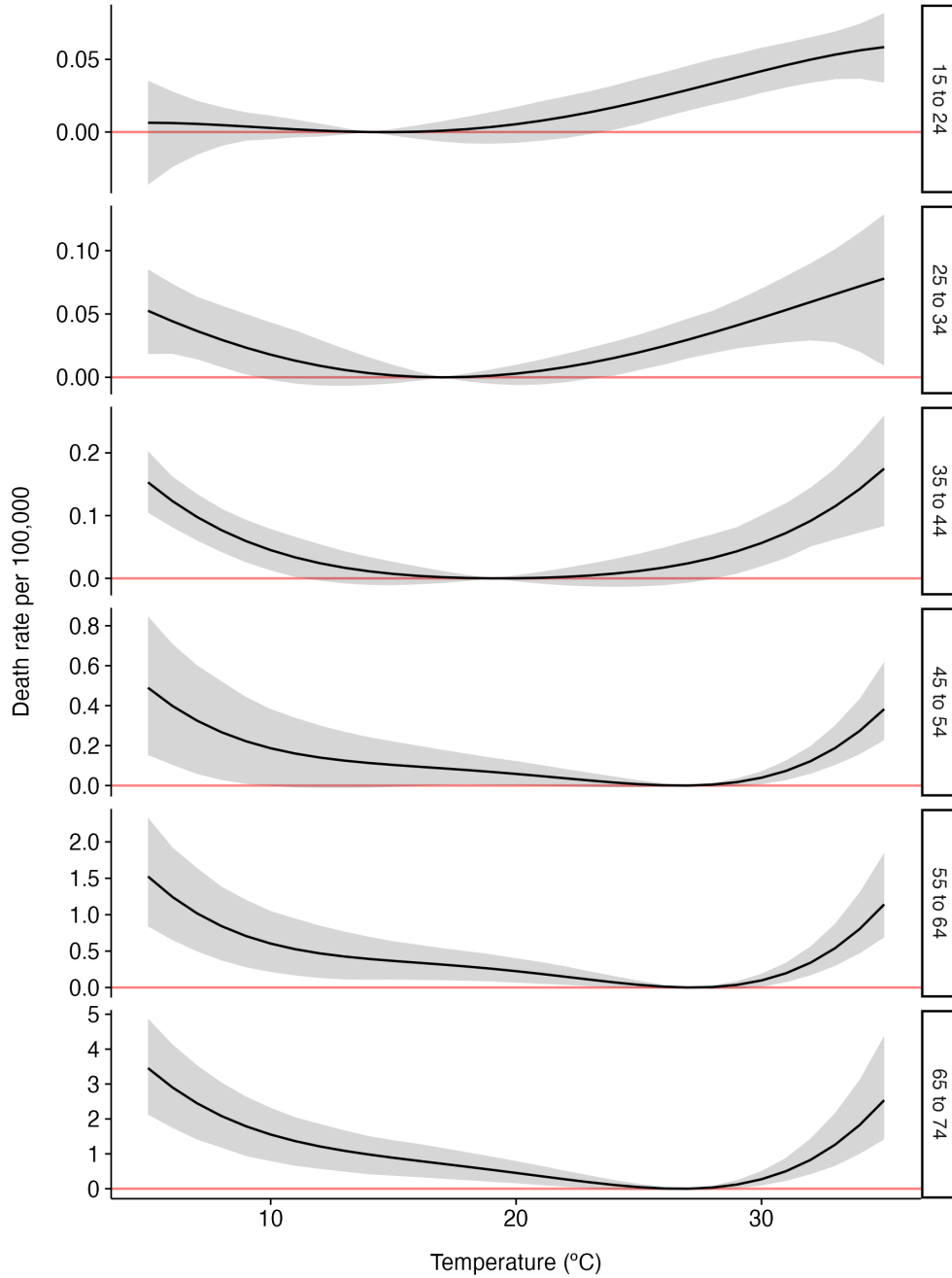
Notes: The figure shows estimates from fitting versions of Equation (1) separately for each of the given occupation groups using the baseline sample. The right-hand-side variable is daily maximum temperature, in contrast to daily average temperature results shown in Figure 1. The estimates are conditional on controls for precipitation as well as fixed effects for municipality by year and municipality by month. Shaded areas show 95% confidence intervals based on bootstrapped standard errors clustered at the state level.

Figure A5: Mortality–wet-bulb temperature relationship by occupation classification



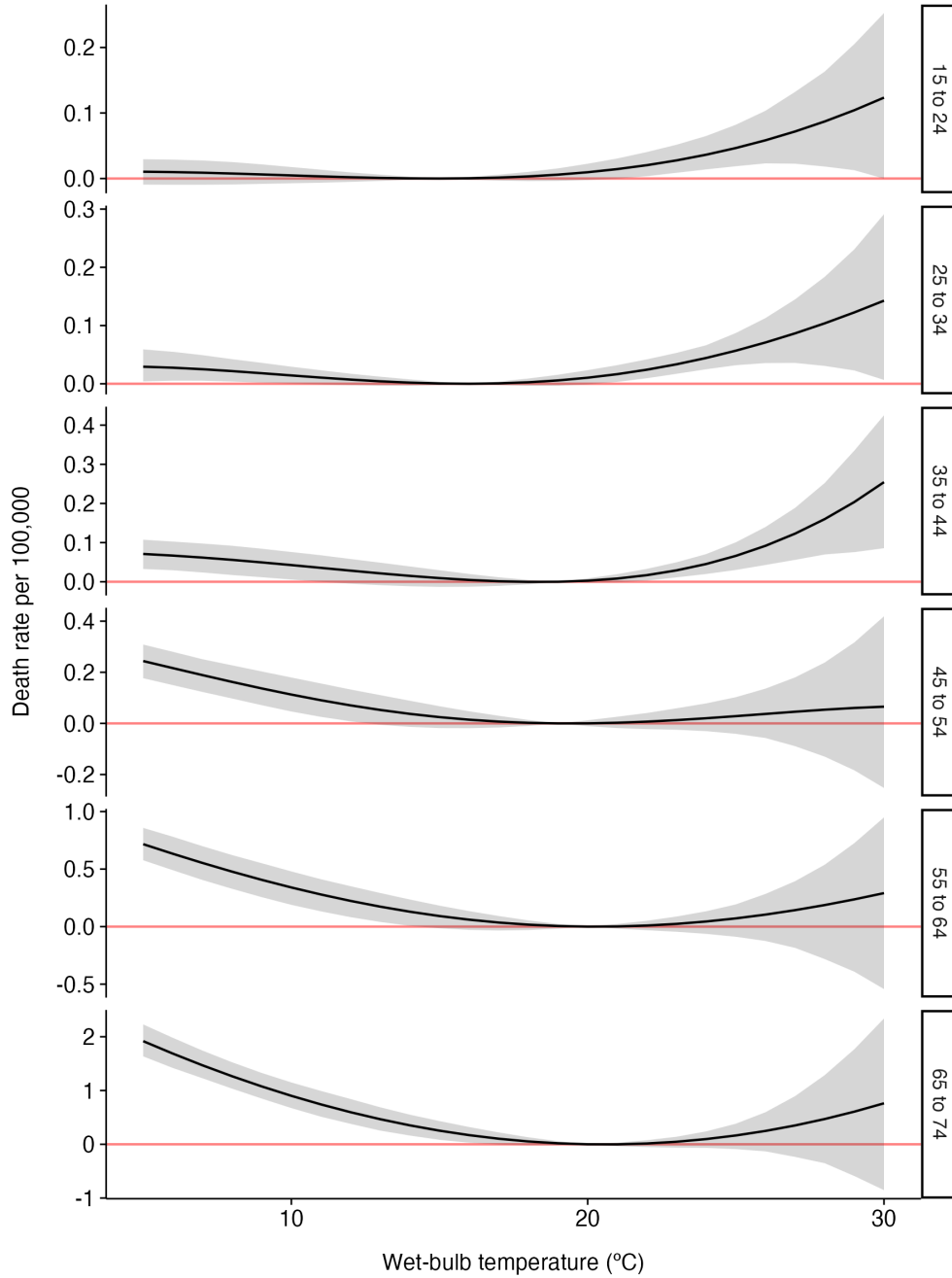
Notes: The figure shows estimates from fitting versions of Equation (1) separately for each of the given occupation groups using the baseline sample. The right-hand-side variable is wet-bulb temperature, in contrast to dry-bulb temperature results shown in Figure 1. The estimates are conditional on controls for precipitation as well as fixed effects for municipality by year and municipality by month. Shaded areas show 95% confidence intervals based on bootstrapped standard errors clustered at the state level.

Figure A6: Mortality–temperature relationship by age



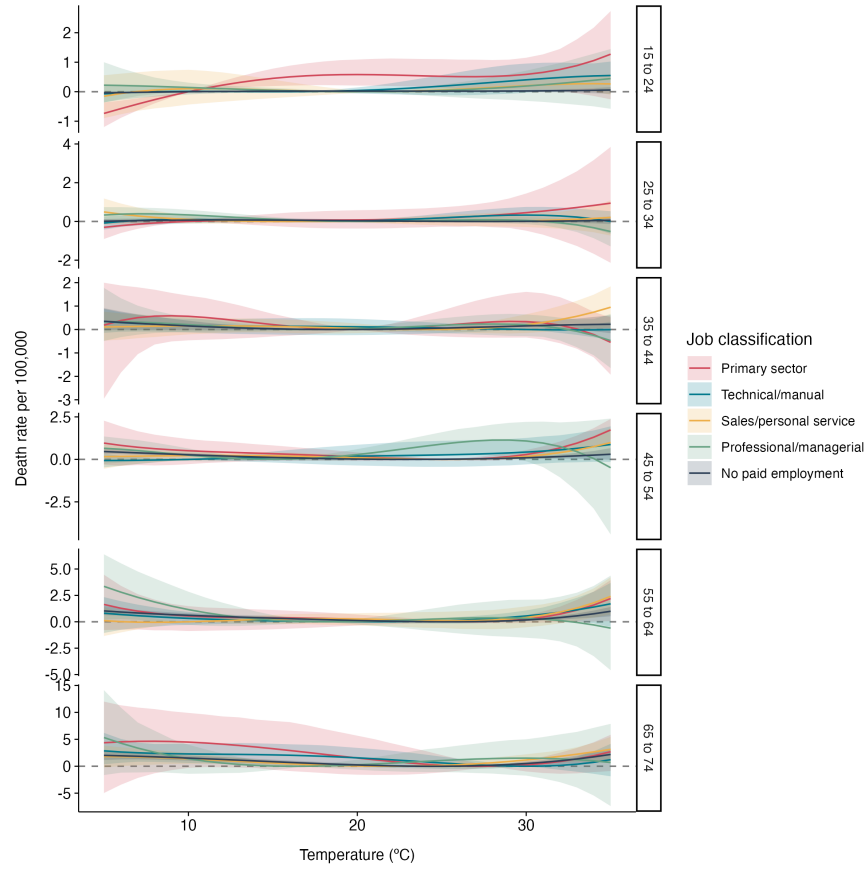
Notes: The figure shows estimates from fitting versions of Equation (1) separately for each of the given age groups using the baseline sample. The right-hand-side variable of interest is dry-bulb temperature (compare with Figure A7). The estimates are conditional on controls for precipitation as well as fixed effects for municipality by year and municipality by month. Shaded areas show 95% confidence intervals based on bootstrapped standard errors clustered at the state level.

Figure A7: Mortality–wet-bulb temperature relationship by age



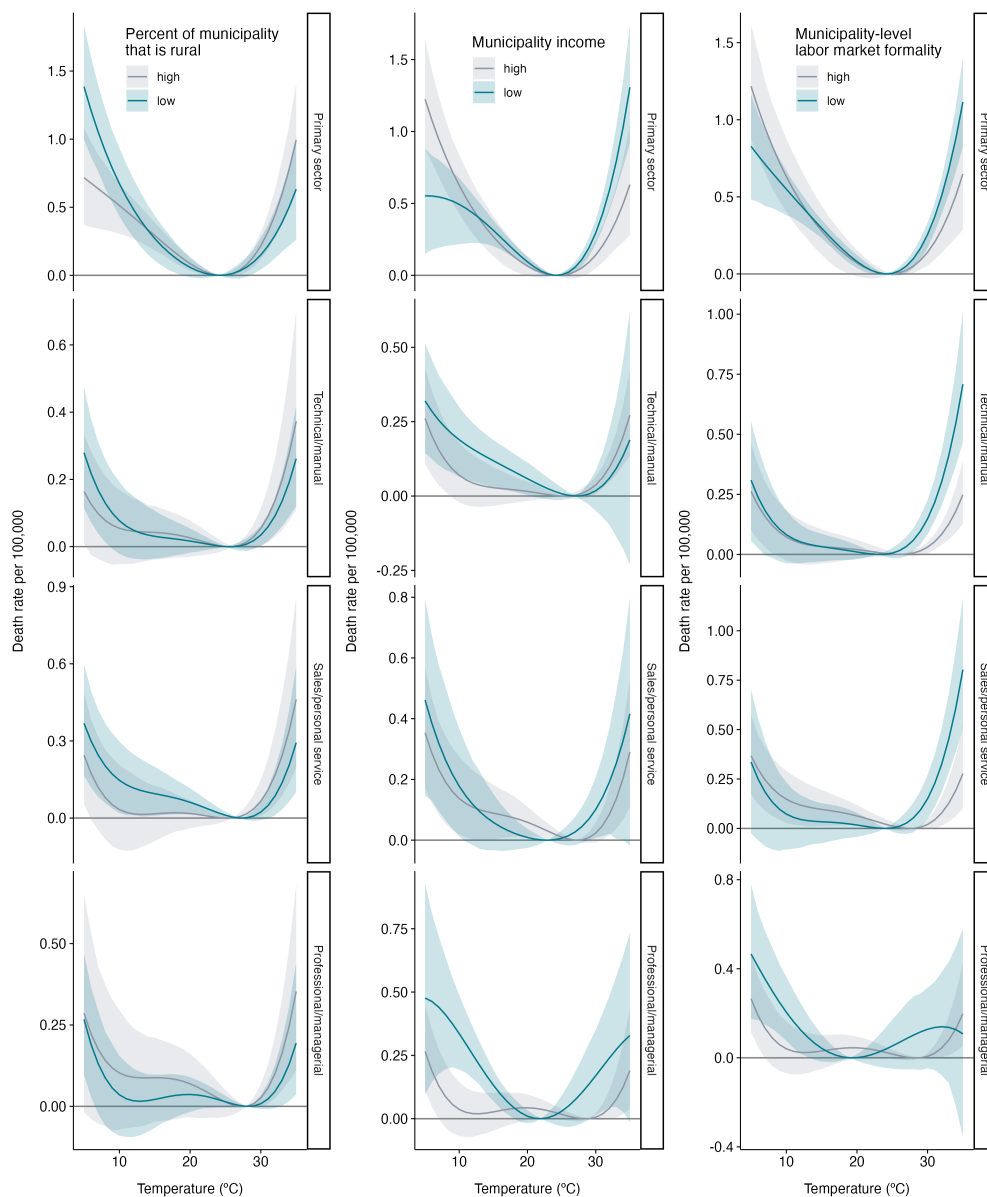
Notes: The figure shows estimates from fitting versions of Equation (1) separately for each of the given age groups using the baseline sample. The right-hand-side variable of interest is wet-bulb temperature (compare with Figure A6). The estimates are conditional on controls for precipitation as well as fixed effects for municipality by year and municipality by month. Shaded areas show 95% confidence intervals based on bootstrapped standard errors clustered at the state level.

Figure A8: Mortality–temperature exposure response functions by age and occupation



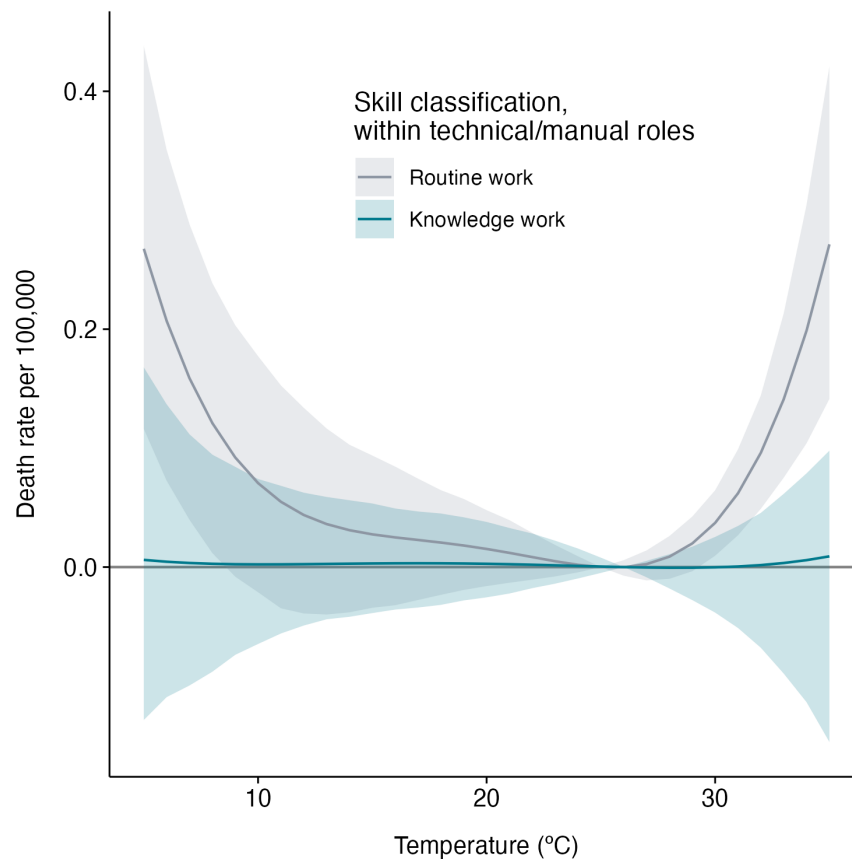
Notes: The figure shows estimates from fitting versions of Equation (1) separately for each of the given age-by-occupation groups using the baseline sample. Compare with Figure 3, which shows similar results for a simplified set of age groups. The estimates are conditional on controls for precipitation as well as fixed effects for municipality by year and municipality by month. Shaded areas show 95% confidence intervals based on bootstrapped standard errors clustered at the state level.

Figure A9: Heterogeneity in the temperature-mortality relationship by municipality characteristics



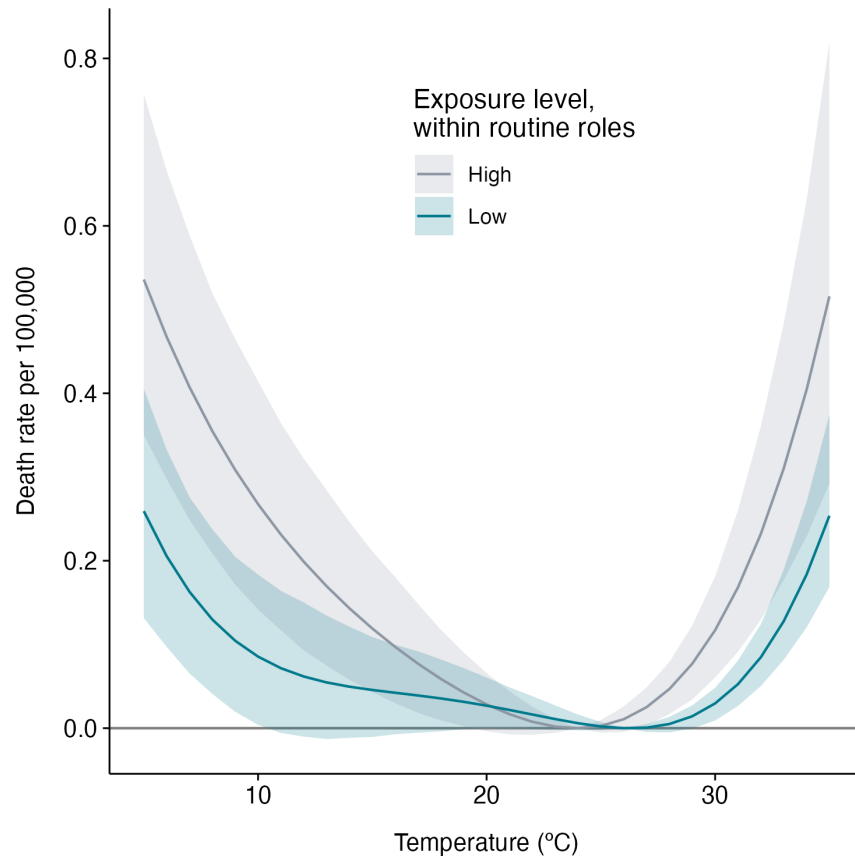
Notes: The figure shows estimates from fitting versions of Equation (1) separately for municipalities that are above- and below-median on the indicated metrics. The estimates are conditional on controls for precipitation as well as fixed effects for municipality by year and municipality by month. Shaded areas show 95% confidence intervals based on bootstrapped standard errors clustered at the state level.

Figure A10: Mortality–temperature exposure–response functions for routine and knowledge workers within the technical/manual occupation group



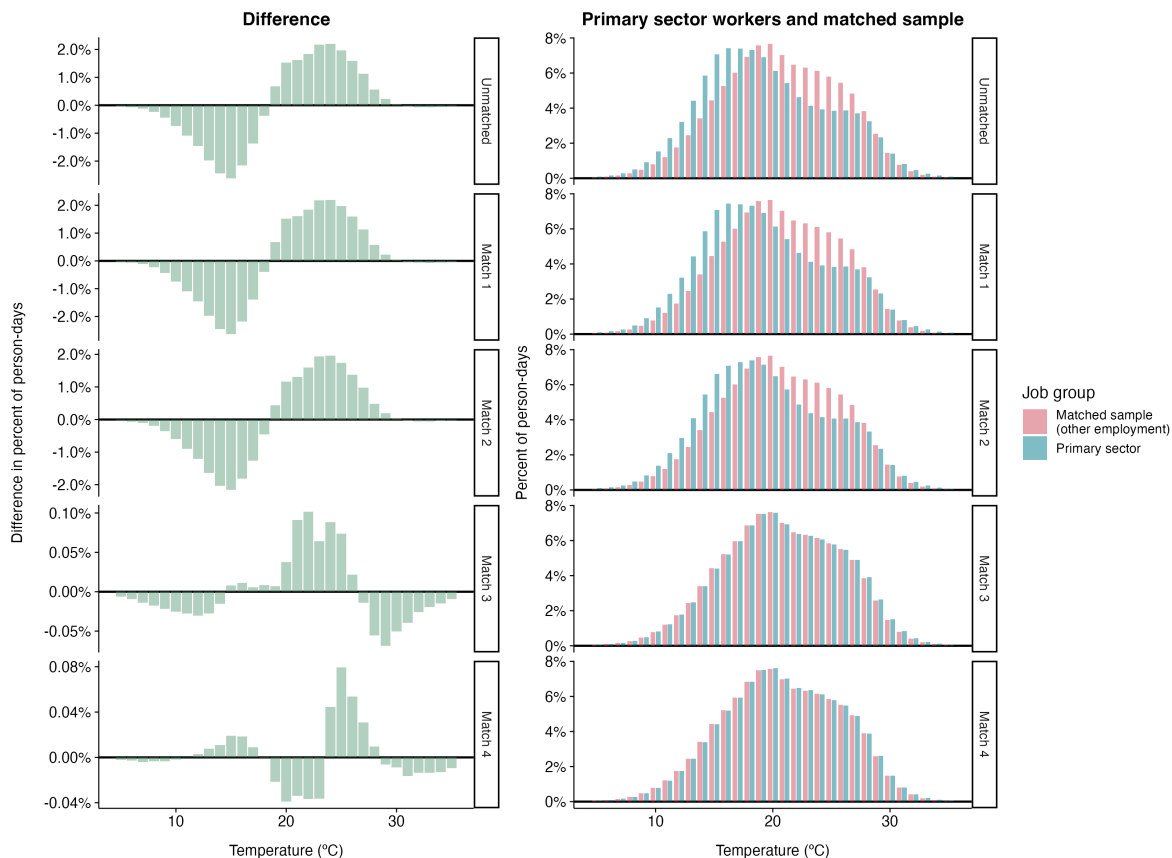
Notes: The figure shows estimates from fitting versions of Equation (1) separately for workers classified as routine (“low-skill”) and knowledge (“high-skill”) workers within the technical/manual occupation group. The estimates are conditional on controls for precipitation as well as fixed effects for municipality by year and municipality by month. Shaded areas show 95% confidence intervals based on bootstrapped standard errors clustered at the state level.

Figure A11: Mortality–temperature exposure–response functions for high- and low-exposure routine workers within the technical/manual occupation group



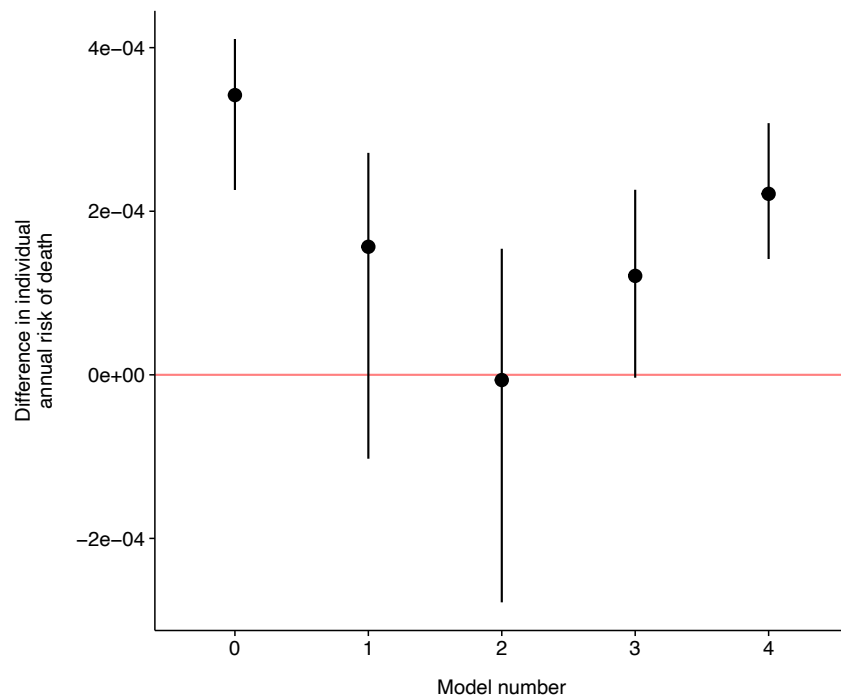
Notes: The figure shows estimates from fitting versions of Equation (1) separately for routine workers in the technical/manual occupation group that we classify as having as either high or low exposure to ambient environmental conditions. The estimates are conditional on controls for precipitation as well as fixed effects for municipality by year and municipality by month. Shaded areas show 95% confidence intervals based on bootstrapped standard errors clustered at the state level.

Figure A12: Exposure distributions for primary sector workers and matched non-primary sector workers and their difference



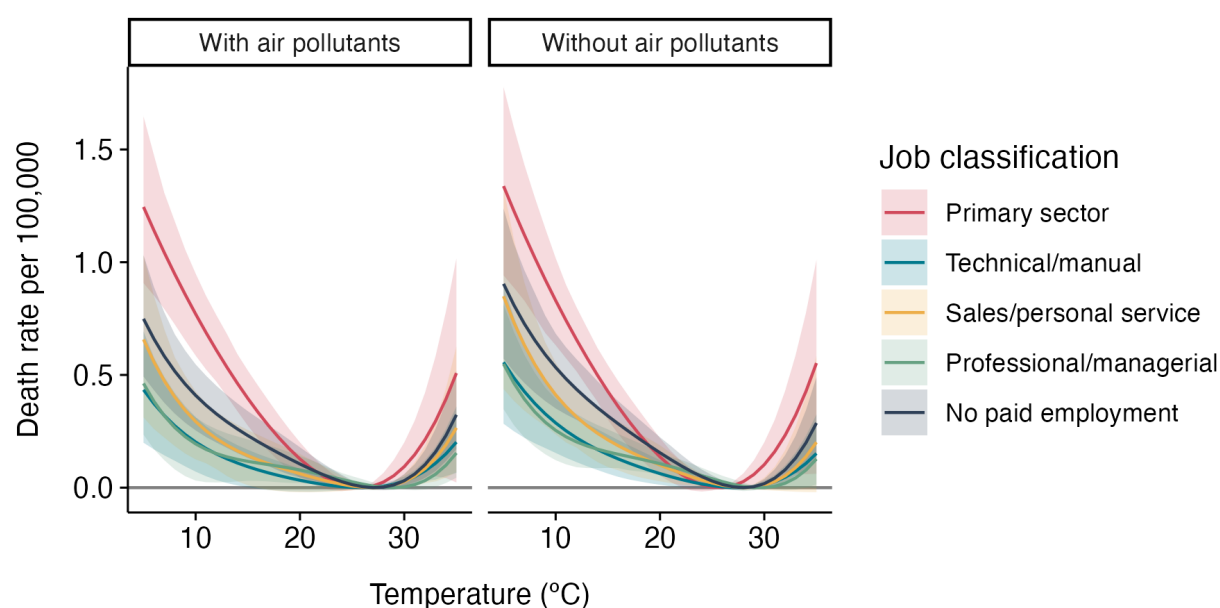
Notes: The figure shows the percent of person-days spend in each one-degree Celsius temperature bin across primary sector workers and their matched counterparts (right panels) as well as the difference between these distributions by bin (left panels). The top panel shows the exposure distributions for the unmatched sample. The next four panels show exposure distributions for matched primary sector workers and for comparison groups constructed with coarsened exact matching. Match 1 shows exposures when matching primary sector workers to other workers on age. Match 2 adds sex, education, and marital status. Match 3 adds municipality-level controls related to income. Match 4 adds additional municipality-level controls related to other sociodemographic characteristics and climate.

Figure A13: Average difference in annual risk of temperature-related death, primary sector vs. matched counterparts by coarsened exact matching specification



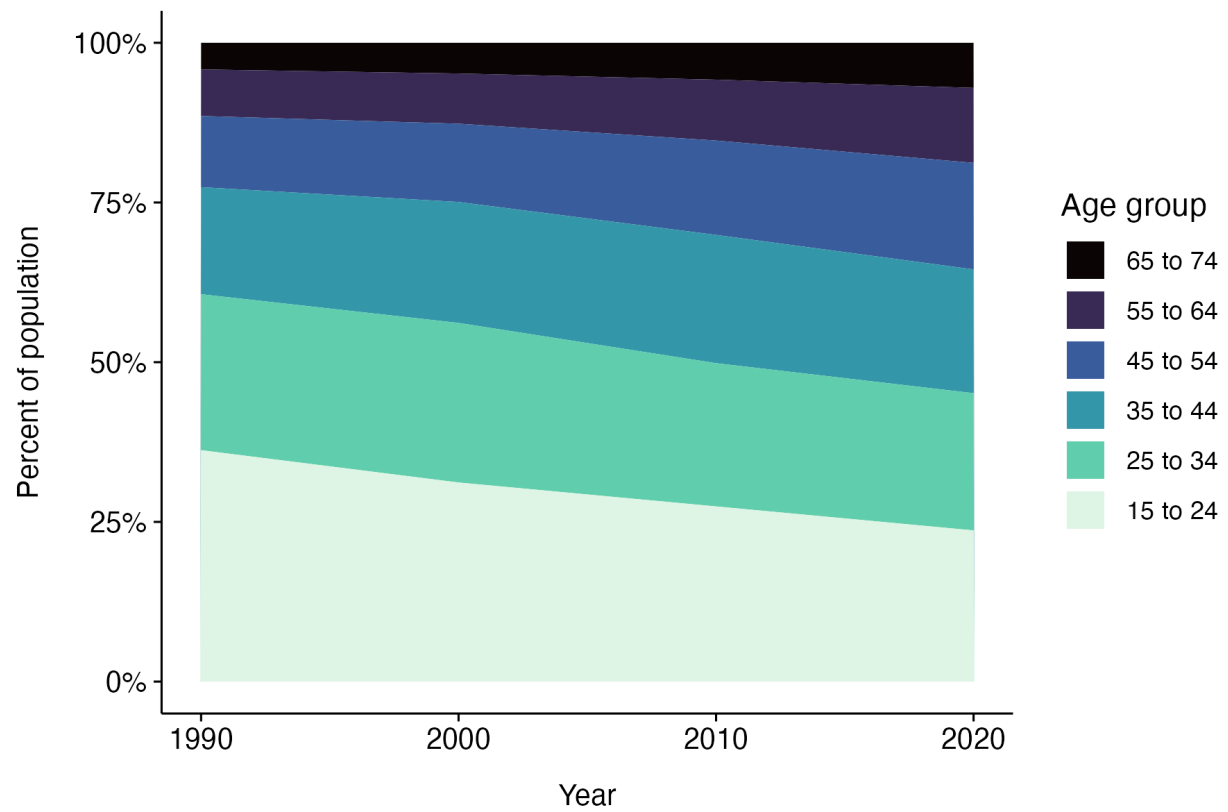
Notes: The figure shows the average difference in the annual risk of temperature-related death per person between primary sector workers and their matched counterparts, a value net of differences in exposure-response functions and the implied distribution of exposures. Model number 0 shows the difference for the unmatched sample (only primary sector workers to all other workers). The next four panels show differences in the annual risk of temperature-related death between matched primary sector workers and comparison groups of non-primary sector workers constructed with coarsened exact matching. Match 1 shows exposures when matching primary sector workers to other workers on age. Match 2 adds sex, education, and marital status. Match 3 adds municipality-level controls related to income. Match 4 adds additional municipality-level controls related to other sociodemographic characteristics and climate.

Figure A14: Mortality–temperature relationship by job classification, model estimated with and without nine air pollutants (data spanning 2003–2023)



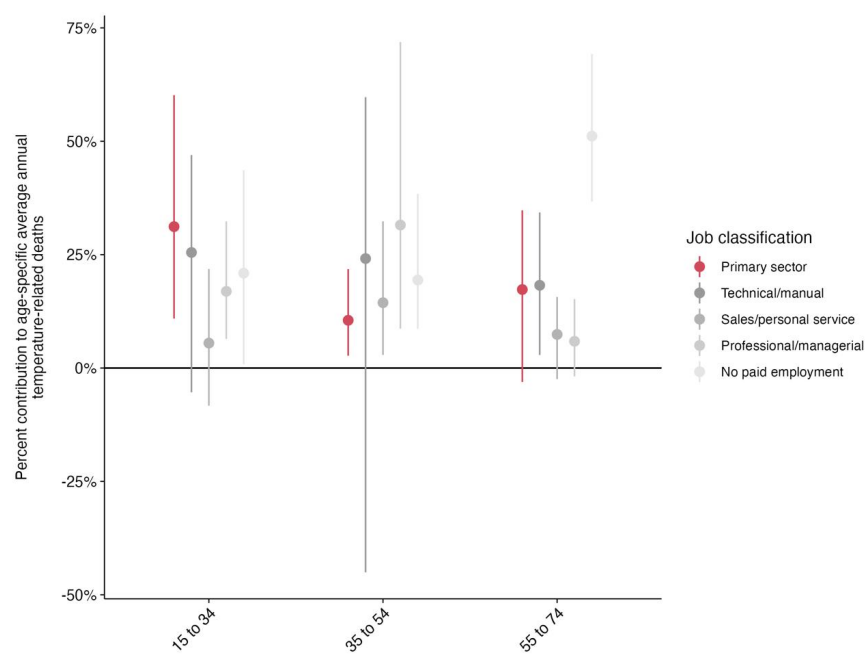
Notes: The figure shows estimates from fitting versions of Equation (1) separately for each of the given occupation groups using the sample from 2003 (when air pollution data is available) to 2023. For both panels, the estimates are conditional on controls for precipitation as well as fixed effects for municipality by year and municipality by month. The right panel further conditions on flexible functions for 9 air pollutants. Shaded areas show 95% confidence intervals based on bootstrapped standard errors clustered at the state level.

Figure A15: Distribution of Mexican residents by age



Notes: The figure shows the percentage of the population that falls into 10-year age groups between 1990 and 2020 based on census data.

Figure A16: Annual temperature-related deaths within age and occupation groups



Notes: The estimates were generated by fitting versions of Equation (1) for each subgroup, calculating implied total annual mortality across Mexico for each sample year, averaging across years, then calculating the share of temperature-related deaths for each occupation among all temperature-related deaths within a given age group. Values within each age group sum to 100%. Line ranges indicate bootstrapped 95% confidence intervals of econometric model uncertainty.

D Coarsened exact matching

We attempt to address potential confounding through a coarsened exact matching exercise. In this exercise, we define “*treated*” individuals as those employed in the primary sector, matching them on observable dimensions with those employed in other sectors. We then re-estimate our Equation 1 for these two subgroups and visualize and calculate the differences.

We match primary sector workers ages 15 to 74 with all other workers within each Census, ensuring that we match on variables available in both the Census microdata and the mortality records. We assume that the resulting weights—which differ by decennial Census—apply to proximate mortality observations. In other words, we assume that weights resolved for 1990 Census matches apply to mortality observations from 1990 to 1995, that those resolved for the 2000 Census apply to mortality observations from 1996 to 2005, and so on. To interpolate the population between Censuses, we apply matched weights to nearby Censuses (e.g., we apply Census 2000 weights to Census 1990, 2000, and 2010). Then we linearly interpolate the population of the matched sample, keeping only the population values for matched mortality records. By aggregating mortality and Census population data similarly, we can construct a complete panel of monthly mortality rates for primary sector workers along with a matched sample of all other workers that corresponds with primary sector workers over time.

We apply four progressively more restrictive matching specifications to control for possible confounders. In our first specification (1), we match only on age group. Our second specification matches on (1) and adds sex, education, and marital status. Specification (3) combines (2) with municipality-level average income, rural population share (as of 2020), the share using wood or coal as fuel, and the NASA gridded deprivation index ([Center For International Earth Science Information Network-CIESIN-Columbia University, 2022](#)). Specification (4) combines (3) with municipality-level average household size, the share of individuals speaking an indigenous language, and Köppen climate classification.

The differences in Figure 7 reflect results from a bootstrap at the state level of Equation 1 applied to treatment and matched samples.

E Sensitivity analysis on occupational classifications

In the primary analysis, we classify occupations in two main ways. This classification process maps different occupational classifications that change over the sample period (see Section 3) into a consistent set of occupational categories. Here, we test the sensitivity of the classifications used in the main text by categorizing death records into three groups: non-workers, manual workers, and non-manual workers. This simplified classification scheme contrasts with the five sectors used in the main body and groups workers from different parts of those five sectors, provided their occupational category indicates they perform manual work. This distinction is important in the Mexican context due to the large number of small-scale manual manufacturing workers.

Figure A17 shows the effect of exposure to a single day at the indicated wet-bulb temperature on mortality risk for these different occupational groups. For instance, the exposure-response function for manual workers implies that when a manual worker experiences one day with an average wet-bulb temperature of 28°C, their risk of mortality increases by 20% compared to experiencing one day with an average wet-bulb temperature of 13°C. The bottom part of the figure, below each exposure-response function, contains a histogram that shows the distribution of wet-bulb temperatures experienced by people in Mexico over the sample period (gray bars) and the distribution of wet-bulb temperatures that they are expected to encounter at the end of the century (red bars). This visualization conveys how frequently people encounter wet-bulb temperatures at different levels. For instance, 8% of the days experienced by people in Mexico over the sample period had a wet-bulb temperature of 13°C, while temperatures rarely exceeded 26°C. Taken together, this figure conveys both how deadly a marginal day at a certain wet-bulb temperature is for each occupational group (exposure response functions in the top part of the figure), as well as how often they are expected to occur in the future (histograms in the bottom part of the figure). As the figure shows, non-workers face the highest mortality risk from cold, while manual workers face the highest mortality risk from heat.

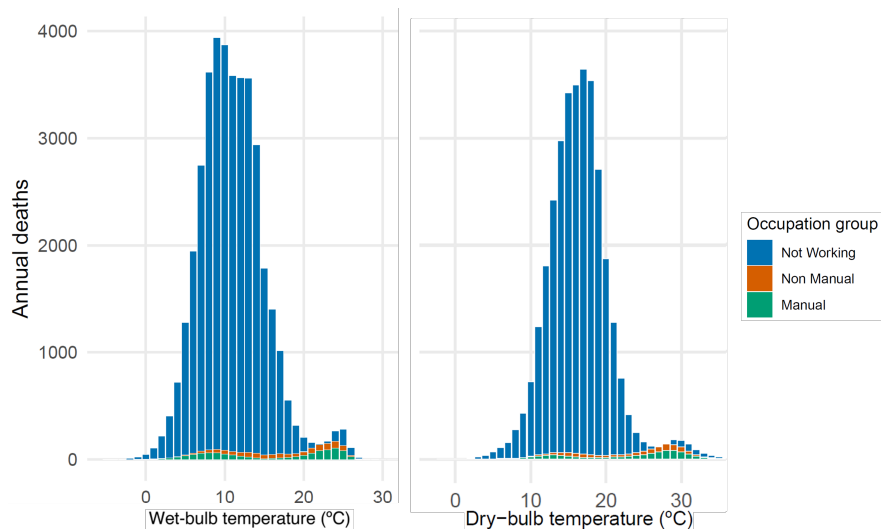
Figure A18 is the same as Figure A17 except that it uses dry bulb temperature as the main treatment variable. The figure shows that the occupation-specific results remain robust, whether we use wet-bulb or dry-bulb temperature as the metric of exposure (also see further results below). We also find that the exposure-response function over wet-bulb temperature is estimated more precisely than the exposure-response function over dry-bulb temperature.

As the exposure-response functions in figures A17 and A18 show, the hottest temperatures—such as a 30°C wet-bulb temperature and a 40°C dry-bulb temperature—have the most

damaging effects on heat-related deaths. However, the temperature-distribution histograms at the bottom of those figures reveal that heat waves reaching these temperatures occur very rarely. This raises the question: what is the overall temperature-related mortality burden associated with exposure to temperatures throughout the entire year, from the coldest days to the hottest days?

We address this question in figure A19. The overall temperature-related mortality burden results from both (1) the damage caused by exposure to a certain temperature (i.e., figures A17 and A18 top panels) and (2) how often people experience those temperatures (i.e., figures A17 and A18 bottom panels). Figure A19 combines these two factors to show the temperature-related mortality burden associated with exposure to each degree of temperature. The left hump of this figure represents cold-related deaths. The right hump of this figure represents heat-related deaths. The peak of the right hump—which represents a temperature exposure that causes a most heat-related deaths in the sample period—occurs at 25°C wet-bulb temperature and 29°C dry-bulb temperature. The peak of the left hump of the figure—which indicates a temperature exposure that causes a most cold-related deaths in the sample period—occurs at 9°C wet-bulb temperature and 17°C dry-bulb temperature.

Figure A19: Historical temperature-related deaths in Mexico



The panels show average annual temperature-related deaths resulting from exposure to days with the average temperatures shown on the x -axis during the historical period across occupation in Mexico. The left panel shows deaths resulting from exposure to wet-bulb temperature. The right panel shows deaths resulting from exposure to dry-bulb temperature.

Consistent with past literature on temperature-related mortality in Mexico (Cohen and Dechezleprêtre, 2022; Jáuregui-Díaz et al., 2020), we find that cold historically associates

with many more deaths than heat across the entire population. However, this finding masks substantial heterogeneity on the differential impacts of heat and cold on different demographic groups within the population. We break out premature deaths from both cold and heat in table A8 below.

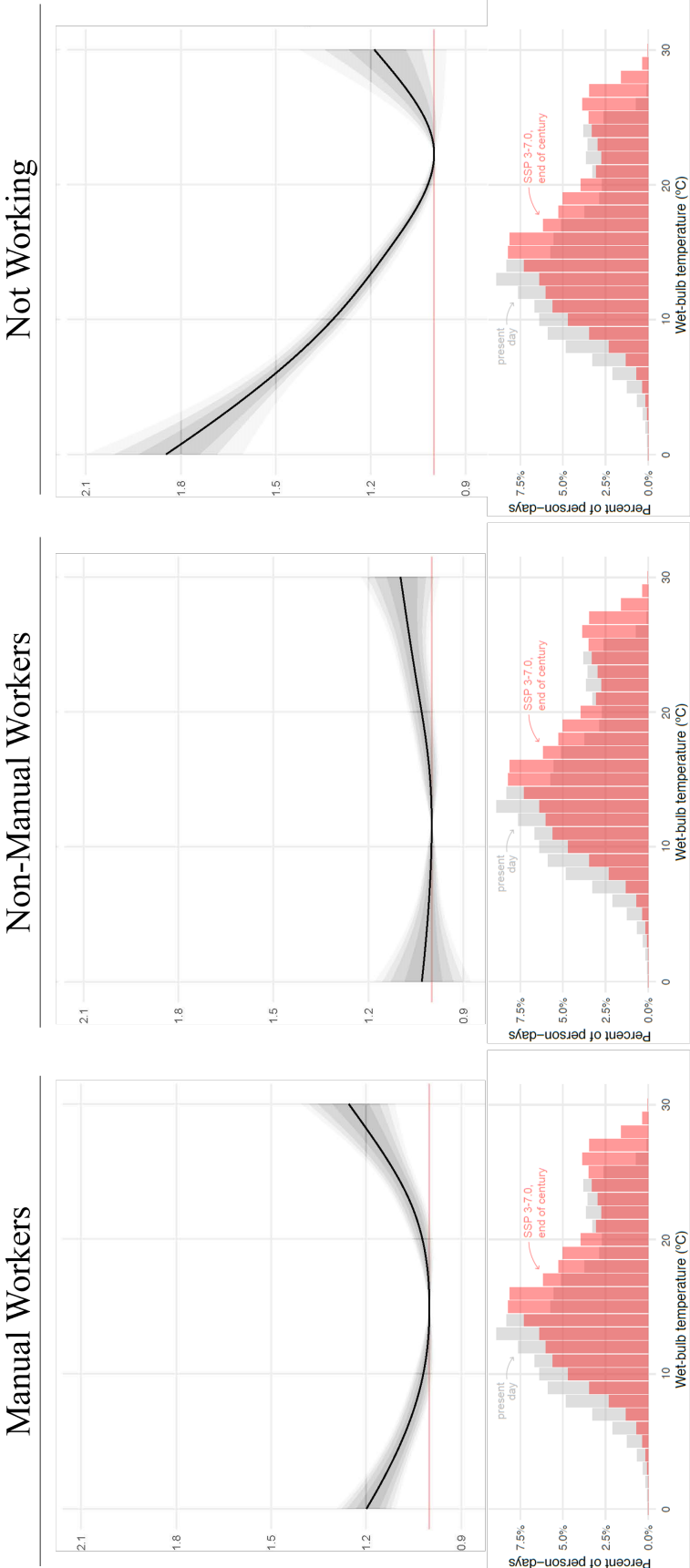
Table A8: Annual Historical Cold-Related and Heat-Related Deaths in Mexico by Manual vs Non-Manual Occupation

	Cold-Related Deaths		Heat Related Deaths	
	Wet-Bulb Temperature	Dry-Bulb Temperature	Wet-Bulb Temperature	Dry-Bulb Temperature
Manual Workers	477 (1%)	341 (1%)	684 (47%)	766 (55%)
[2.5th-97.5th Percentile]	[193, 760]	[-13, 695]	[122, 1,256]	[153, 1,380]
Non-Manual Workers	267 (1%)	240 (1%)	408 (28%)	301 (22%)
[2.5th-97.5th Percentile]	[-403, 937]	[-79, 560]	[-11, 827]	[87, 515]
Not Working	36,849 (98%)	30,926 (98%)	359 (25%)	318 (23%)
[2.5th-97.5th Percentile]	[29,994, 43,703]	[22,291, 39,561]	[-342, 1,060]	[-474, 1,110]

Table shows the average number of yearly cold and heat-related deaths broken down by occupation, using both wet-bulb and dry-bulb temperature as the metric of temperature exposure. The parentheses indicate the percentage of the total heat or cold deaths that are occurring in that occupational category. E.g., for heat-related deaths using wet-bulb temperature as the metric of temperature exposure, 47% of heat-related deaths are occurring among manual workers, 28% are occurring among non-manual workers, and 25% are occurring among non-workers.

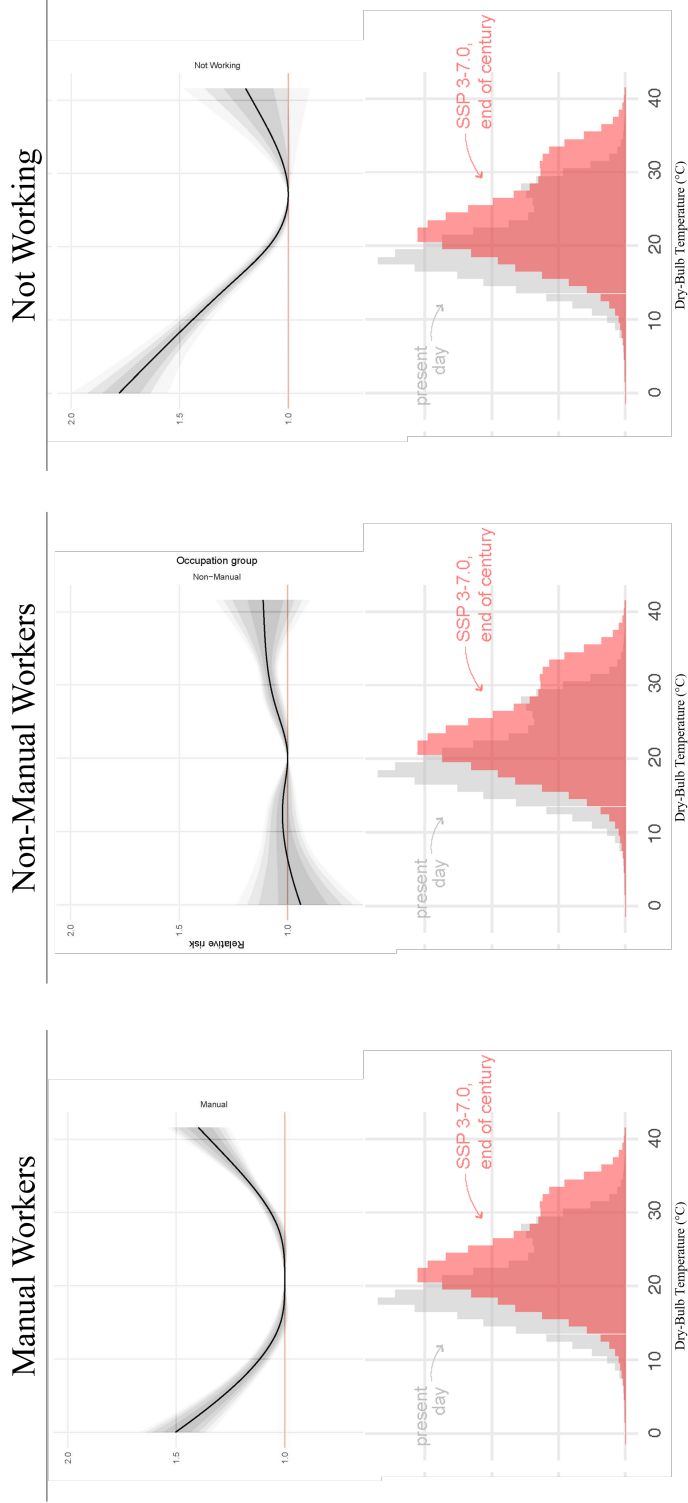
For both wet-bulb temperature and dry-bulb temperature, cold-related mortality overwhelmingly and disproportionately affects non-workers; 98% of cold-related deaths occur among non-workers, who make up 85% of overall deaths in the population. Heat-related mortality, however, tells a different story. Heat-related deaths especially and disproportionately affect manual workers: 47% of deaths occur among manual workers, who comprise just 9% of deaths in the overall population. While only 25% of deaths are among non-workers. When using dry-bulb temperature as the exposure metric, manual workers account for 55% of heat-related deaths while non-workers account for just 23% of heat-related deaths. Non-manual workers also face disproportionate impacts from heat-related mortality, although not to the extent of manual workers. Non-manual workers comprise 28% of heat-related deaths when using wet-bulb temperature as the measure of exposure and 22% of heat-related deaths when using dry-bulb temperature, despite making up just 6% of the deaths in the overall population.

Figure A17: Relationships between mortality risk and exposure to wet-bulb temperature by occupation in Mexico



The top panels show the change in relative mortality risk (y -axis) caused by exposure to one day of the indicated average daily wet-bulb temperatures (x -axis) by occupation divided into manual, non manual, and not working. The bottom panels show the distribution of daily average wet-bulb temperatures in Mexico throughout the sample period as well as the ensemble mean of projected temperature distribution at the end of the century (2083–2099) under the SSP 3-7.0 emission scenario. Note that the bottom histograms represent the distribution of temperatures across the whole Mexican population, so each of the three histograms are exactly the same. Shaded bands around the functions in the top panels indicate 95, 90, 80, and 50% confidence intervals.

Figure A18: Relationships between mortality risk and exposure to dry-bulb temperature by occupation in Mexico



The top panels show the change in relative mortality risk (y -axis) caused by exposure to one day of the indicated average daily dry-bulb temperatures (x -axis) by occupation divided into manual, non manual, and not working. The bottom panels show the distribution of daily average dry-bulb temperatures in Mexico throughout the sample period as well as the ensemble mean of projected temperature distribution at the end of the century (2083–2099) under the SSP 3-7.0 emission scenario. Shaded bands around the functions in the top panels indicate 95, 90, 80, and 50% confidence intervals.