

Long working hours related to elevated psychological distress among United States pregnant workers: findings from the National Health Interview Survey

Megan Guardiano, Tong Xia, Liwei Chen & Jian Li

To cite this article: Megan Guardiano, Tong Xia, Liwei Chen & Jian Li (2025) Long working hours related to elevated psychological distress among United States pregnant workers: findings from the National Health Interview Survey, *Journal of Psychosomatic Obstetrics & Gynecology*, 46:1, 2521780, DOI: [10.1080/0167482X.2025.2521780](https://doi.org/10.1080/0167482X.2025.2521780)

To link to this article: <https://doi.org/10.1080/0167482X.2025.2521780>



© 2025 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



Published online: 24 Jun 2025.



[Submit your article to this journal](#)



Article views: 1628



[View related articles](#)



[View Crossmark data](#)

RESEARCH ARTICLE



Long working hours related to elevated psychological distress among United States pregnant workers: findings from the National Health Interview Survey

Megan Guardiano^a , Tong Xia^{b,c} , Liwei Chen^d  and Jian Li^{a,d,e} 

^aSchool of Nursing, University of California Los Angeles, Los Angeles, CA, USA; ^bChanning Division of Network Medicine, Harvard Medical School and Brigham and Women's Hospital, Boston, MA, USA; ^cDepartment of Nutrition, Harvard T.H. Chan School of Public Health, Boston, MA, USA; ^dDepartment of Epidemiology, Fielding School of Public Health, University of California Los Angeles, Los Angeles, CA, USA; ^eDepartment of Environmental Health Sciences, Fielding School of Public Health, University of California Los Angeles, Los Angeles, CA, USA

ABSTRACT

Long working hours and psychological distress have each been related to adverse maternal health and birth outcomes. Understanding the potential psychological health impacts of long working hours among pregnant workers may support the implementation of maternity work protections in the United States (U.S.). This cross-sectional study among a weighted sample of 3637 pregnant workers from the U.S. population-based National Health Interview Survey (NHIS) 1997–2018 aimed to examine the association of working hours with psychological distress. Multivariable linear regression models analyzed associations between categories of weekly working hours and continuous scores of psychological distress measured by the Kessler 6 (K6) scale, while accounting for demographic, socioeconomic, behavior and health characteristics. In the fully adjusted model, compared to the standard workweek of 35–40 h/week, working ≥ 49 h/week was associated with higher psychological distress [β (SE): 0.59 (0.21); $p = .0058$]. This initial evidence connecting excessive working hours with increased psychological distress among a U.S. sample of pregnant women supports clinical practices in prenatal assessments of occupational risk factors, and the provision of work-related resources and work accommodations. Future research is warranted to investigate potential occupational effects on maternal mental health throughout the course of pregnancy and postpartum using cohort studies.

ARTICLE HISTORY

Received 27 December 2024
Revised 23 May 2025
Accepted 12 June 2025

KEYWORDS

Pregnancy; women's health; psychological wellbeing; mental health; perinatal epidemiology

Introduction

Work, a recognized social determinant of health [1], may affect the well-being of women working while pregnant in the United States (U.S.), as 65.6% of primiparous women worked during pregnancy in 2006–2008 [2], and 59.73% of mothers with children under one year old were employed in 2023 [3]. For pregnant workers, work-related benefits vary internationally, as other countries offer paid maternity leave [4] and have occupational regulations for working time arrangements to prevent overtime work [5]. In contrast, the U.S. does not federally provide paid maternity leave [4], and current U.S. laws primarily focus on work accommodations, such as the Pregnant Workers Fairness Act [6]. From the clinical perspective, the American College

of Obstetricians and Gynecologists advises obstetric healthcare providers to support pregnant patients through work accommodation letters based on medical necessity [7]. Suggested work modifications include “flexible schedules” and break timing, but do not specify working hours length [8]. This omission may be intended to protect employment [8], but may also reflect limited evidence on working hours and pregnant women's health.

The work environment introduces stressors that may particularly affect pregnant worker populations, as both general and work-related stress during the prenatal period have been associated with negative effects on mothers, pregnancies and children. General prenatal stress has been associated with increased

maternal cortisol levels [9], elevated risks of preterm birth, small for gestational age, and low birth weight [10], and mental health and behavioral issues in children [11]. Psychosocial work-related stress during pregnancy has been related to miscarriages, births that were preterm, small for gestational age, and low birth weight, maternal depressive symptoms, and the diagnoses of children with attention deficit hyperactivity disorder [12]. Maternal stress hormones, including cortisol, may impact those of the umbilical cord to influence birth outcomes [10]. Animal model research suggests a biological pathway in which prenatal stress affects hippocampus neuron function in children [13].

Extended working hours, which have been related to physical and mental health conditions among general workers [14–16], have also been associated with negative outcomes for birth and maternal health among working pregnant women and mothers. Long working hours may affect birth outcomes through a pathway of increased fatigue and sleepiness, increased stress, and decreased placental growth and function [17]. Research on long working hours and pregnancy and birth outcomes encompass miscarriage [17,18], preterm labor [19] and delivery [18,20,21], and small for gestational age and low birthweight infants [17]. For maternal health outcomes, long working hours have been associated with increased odds of pre-eclampsia among U.S. pregnant nurses [22]. Long working hours have also been linked to negative impacts on maternal mental health and families, as a longitudinal study found that increased working hours were negatively associated with general mental health among single working mothers with children under 16 years of age in the United Kingdom [23].

Maternal mental health is an area of concern, as depression and anxiety symptoms may manifest prenatally or antenatally [24,25], and stress is a postpartum depression risk factor [26]. In a North American study, prenatal and postnatal psychological distress were significantly related [27]. Psychological distress specifically has been connected to maternal outcomes of postpartum depression symptoms within the year after delivery [28,29], as well as child health outcomes of low birthweight, preterm birth, adiposity, wheezing and asthma [30]. A recent study in Japan evaluated the maternal work environment, including long working hours, with psychological distress [31], but no U.S.-based studies have examined long working hours with mental health among pregnant workers.

A U.S. *Healthy People 2030* goal for pregnancy and childbirth aims to enhance women's health across the continuum of antepartum, intrapartum and postpartum, with a specific objective of increasing postpartum

depression screening [32]. Increased awareness of occupational risk factors and mental health during pregnancy may contribute toward these public health targets. This research may provide new evidence on possible psychological health repercussions related to long working hours among pregnant workers, as well as clarify implications for the improvement and implementation of work accommodations during pregnancy. This study aims to examine associations of working hours with psychological distress among U.S. pregnant workers.

Materials and methods

Study design and dataset

This cross-sectional study used National Health Interview Survey (NHIS) data, which is annually conducted by the National Center for Health Statistics on noninstitutionalized U.S. citizens [33,34]. Survey waves from 1997 to 2018 were combined for this study. This research was deemed as exempt from IRB review by the University of California Los Angeles Institutional Review Board (IRB#22-001879).

Study sample

Sample weights were applied. A total of 671,696 people participated in the NHIS 1997–2018. Of these participants, 403,930 were workers that reported having a job in the previous week. There were 3791 workers that reported as currently pregnant. Pregnant workers with complete data on working hours totaled at 3670. After removing 33 participants without complete psychological distress data, the final sample for analysis was 3637 (see Figure 1).

Measures

Working hours, originally collected via self-reported questionnaire as a continuous measure of the previous week's working hours, were then divided into categories: (1) less than 35, (2) 35–40 (reference group), (3) 41–48 and (4) 49 and more hours. While the World Health Organization (WHO) and International Labour Organization (ILO) categorize long working hours into 41–48, 49–54 and 55 and above hours per week [16], this study combined the latter two groups because of small sample size.

Psychological distress was measured by the Kessler 6-item (K6) scale, a validated and reliable instrument (Cronbach's alpha = 0.86), which evaluated frequencies of depressed mood, motor agitation, fatigue, worthless guilt, and anxiety within the last month

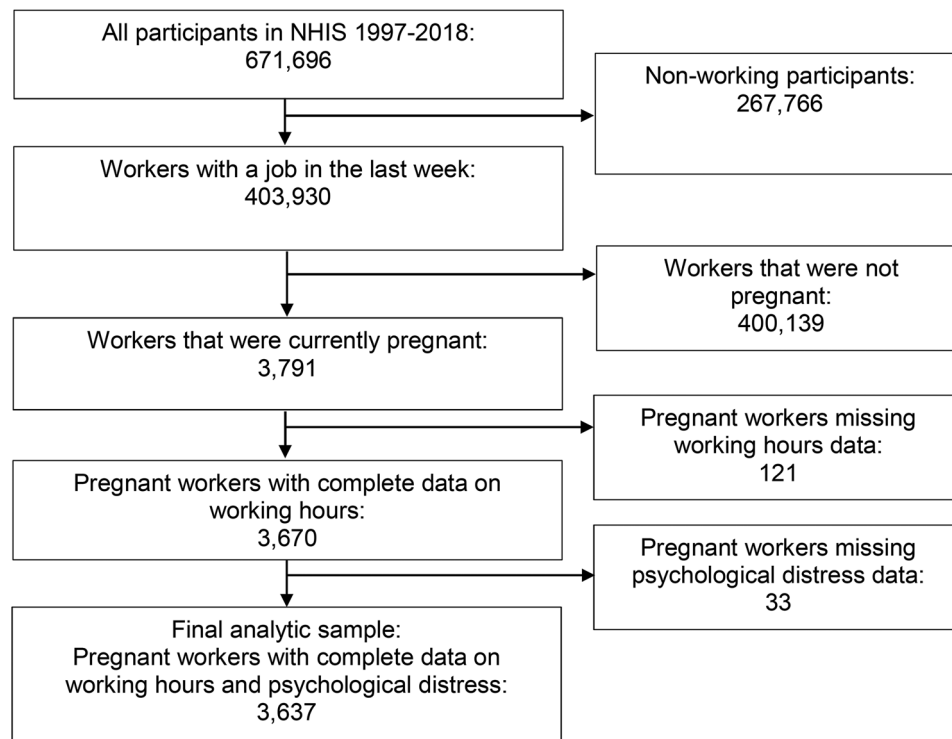


Figure 1. NHIS 1997–2018 sample flowchart. A flowchart depicting the sample selection process starting from the total number of participants in the NHIS 1997–2018 and ending with the final sample for this study's analysis.

[35]. Five frequency responses ranging from “none of the time” to “all of the time” were summed as a continuous score, with higher results corresponding to higher psychological distress with range of 0–24 [35]. Previous studies on psychological distress among pregnant populations have utilized the K6 [29,31,36,37].

Covariates included age, sex, race/ethnicity, marital status, education, annual household income, insurance coverage, smoking, alcohol consumption, physical activity categories, body mass index (BMI) and the variable of metabolic conditions, which encompassed affirmation of provider diagnosis of any of the following health conditions: angina, myocardial infarction, heart conditions, stroke, hypertension or diabetes. Studies similarly investigating working hours with psychological distress have adjusted for many of these demographic, socio-economic, lifestyle and health characteristics, due to their confounding potential [31,36,38].

Statistical analysis

Descriptive analyses provided weighted sample means with standard errors of means, frequencies, percentages, weighted frequencies and standard errors of percent. Supplemental analysis examined the mean K6 scores per working hour category. Associations of working hours with psychological distress were examined through multivariable linear regression modeling, accounting for

sample weights, strata and clusters. Observations with missing covariate data were excluded from the analysis. After the crude Model 1, covariates were systematically adjusted in multiple steps to demonstrate their possible effects on the associations of working hours with psychological distress. Model 2 adjusted for age, sex, race/ethnicity and marital status; Model 3 additionally for education, income and insurance; Model 4 additionally for smoking, alcohol and physical activity; and Model 5 additionally for BMI and metabolic conditions. Analyses were performed using SAS 9.4 (SAS Institute, Cary, NC).

Results

Descriptive results

For sample characteristics in Table 1, all participants were female, with mean age of 29.12 years. The sample majority was non-Hispanic White (61.74%) and married or living with a partner (84.32%). For education, 40.45% were college graduates or above, 31.45% had attended some college or possessed an associate's degree and 28.11% had up to a high school level of education. Most of the sample (63.73%) earned less than \$45,000. Most participants had health insurance (93.75%). Mean BMI was 27.11 kg/m², 70.79% never smoked, 61.94% reported drinking at least one alcoholic drink within the past year, and

Table 1. Sample characteristics, $n = 3637$ (weighted sample, $n = 1,272,215$).

	<i>n</i>	%	Weighted frequency	Standard error of percent
Sex				
Female	3637	100.00	1,272,215	0.00
Race/ethnicity				
Non-Hispanic White	1934	61.74	785,420	0.99
Hispanic or Latino	1042	22.17	282,024	0.79
Non-Hispanic Black	444	10.42	132,529	0.61
Non-Hispanic Asian	142	3.72	47,355	0.38
Other, including AIAN/multiracial	75	1.96	24,887	0.28
Marital status				
Married/living with partner	2810	84.32	1,072,032	0.66
Widowed/divorced/separated	218	3.53	44,860	0.31
Never married	603	12.15	154,513	0.60
Missing	6			
Education				
High school/less	1120	28.11	356,534	0.91
Some college/associate's degree	1172	31.45	398,932	0.94
College graduate/above	1333	40.45	513,056	1.01
Missing	12			
Annual household income (USD)				
1–19,999	1187	30.90	393,119	0.96
20,000–44,999	1205	32.83	417,728	0.96
≥45,000	608	18.27	232,419	0.82
Refused/do not know/not ascertained/missing	637	18.00	228,948	0.73
Insurance				
No	270	6.25	79,239	0.49
Yes	3529	93.75	1,187,629	0.49
Missing	8			
Smoking				
Never	2558	70.79	897,386	0.97
Former	761	21.52	272,870	0.85
Current	308	7.69	97,505	0.54
Missing	10			
Alcohol consumption				
Never	825	20.99	264,935	0.84
Former	616	17.07	215,453	0.78
Current (≥1 drinks within past year)	2168	61.94	781,664	0.97
Missing	28			
Physical activity				
Meets neither aerobic/strengthening activities guidelines	2127	59.73	729,206	1.01
Meets strengthening activities guideline only	96	2.83	34,577	0.34
Meets aerobic activities guideline only	865	25.28	308,589	0.83
Meets both aerobic and strengthening activities guidelines	389	12.16	148,434	0.70
Missing	160			
Metabolic conditions				
Yes	417	10.61	134,957	0.61
No	3219	89.39	1,137,217	0.61
Missing	1			
Weekly working hour categories				
<35	1160	31.20	396,961	0.97
35–40	1944	54.43	692,411	1.01
41–48	236	6.41	81,567	0.47
≥49	297	7.96	101,276	0.52

	Mean	Standard error of mean	Minimum	Maximum
Age, years	29.12	0.09	18	49
BMI, kg/m ²	27.11	0.11	15.63	58.48
Weekly working hours	35.39	0.19	1	95
Psychological distress, K6 score	2.28	0.05	0	24

AIAN: American Indian and Alaska Native; BMI: body mass index; USD: U.S. dollar; K6: Kessler Psychological Distress Scale, 6-item.

Weighted frequencies, standard error of percent applied where applicable. Values rounded to hundredths. BMI mean omits $n = 140$ that did not provide BMI data (BMI unknown).

59.73% did not meet either aerobic or strengthening physical activity guidelines. Lastly, 89.39% denied preexisting metabolic conditions. The mean weekly working hours was 35.39, with over half (54.43%) of the sample working 35–40 weekly hours, and 7.96% working 49 weekly hours and more. The mean

psychological distress score was 2.28. [Supplemental Table 1](#) contains the average psychological distress data for each working hour category. The working hour category of 35–40 h per week had the most participants ($n = 1944$) and a mean psychological distress score of 2.06 ($SD = 0.07$).

Table 2. Associations of working hours with continuous psychological distress in NHIS 1997–2018.

Weekly working hours	Model 1				Model 2				Model 3				Model 4				Model 5			
	Est.	SE	t	p	Est.	SE	t	p	Est.	SE	t	p	Est.	SE	t	p	Est.	SE	t	p
<35	0.45	0.15	3.04	.0024	0.36	0.14	2.50	.0126	0.23	0.15	1.49	.1372	0.22	0.16	1.36	.1737	0.23	0.16	1.42	.1566
35–40	Ref.				Ref.				Ref.				Ref.				Ref.			
41–48	0.07	0.20	0.33	.7398	0.08	0.20	0.43	.6670	0.08	0.20	0.41	.6820	0.04	0.21	0.21	.8347	0.06	0.20	0.32	.7484
≥49	0.63	0.27	2.32	.0210	0.66	0.28	2.34	.0195	0.71	0.27	2.60	.0097	0.63	0.21	2.06	.0032	0.59	0.21	2.77	.0058

Linear regression. est.: estimated regression coefficients; SE: standard errors; t: t values; p: p values.

Model 1: crude. Model 2: adjusted for age, sex, race/ethnicity and marital status. Model 3: additionally adjusted for education, income and insurance.

Model 4: additionally adjusted for smoking, alcohol and physical activity. Model 5: additionally adjusted for BMI and metabolic conditions.

Main results

Associations of working hours with psychological distress are displayed in Table 2. Across all models, compared to a 35–40-h workweek, weekly working hours of 49 and above were significantly associated with increased psychological distress. In the fully adjusted model, which adjusted for demographic, socioeconomic, behavior and health covariates, the mean psychological distress score for 49 and above weekly working hours was 0.61 units higher than that of the 35–40-h workweek (SE = 0.21; $p = .0046$). Initially, less than 35 weekly working hours was associated with increased psychological distress in the crude Model 1 and in Model 2, which adjusted for age, sex, race/ethnicity and marital status, but was no longer significant after subsequent model adjustments for education, annual household income, insurance, smoking, alcohol, physical activity, BMI and metabolic conditions.

Discussion

In this weighted, nationally representative cross-sectional study of U.S. pregnant workers, compared to the 35–40-h workweek, working hours exceeding 48 weekly hours were associated with greater psychological distress scores after adjustments for demographic, socioeconomic, behavior and health characteristics.

The current study aligns with recent findings in Asian worker populations and may also reflect unique challenges among pregnant workers. Compared to a 35 or 36-to-40-h workweek, 49 and above weekly working hours among young and midlife general workers in Korea, and 51 and above weekly working hours among pregnant workers in Japan, were both associated with increased odds of psychological distress [31,38]. During pregnancy, physiological changes may contribute to mental health conditions through neural pathways [39], and may generate perceived control loss and increased responsibility [40]. At work, additional conflict may arise from the “ideal worker image,” which prioritizes the worker role over other obligations, experienced by medical trainees working

long hours while pregnant who expressed guilt, personal weakness and job demands pressure [41]. Additionally, pregnant workers have disclosed working longer hours to obtain other work accommodations, and also identified policy and systemic issues regarding working hour inflexibility and occupational health referral delays [42].

Although working less than 35 weekly hours was initially associated with higher psychological distress in Models 1 and 2, significance was attenuated after adjusting for education, income and insurance in Model 3, implying a confounding effect of these socioeconomic indicators. Previous NHIS 1997–2016 results among pregnant and postpartum women identified higher education as protective against psychological distress [36]. Research among general workers has similarly associated shorter working hours with increased psychological distress, speculating on job insecurity influences [38]. Occupational concerns among pregnant women have included negative career impacts and job loss [43].

These study findings, together with previous evidence of the independent associations of long working hours and psychological distress with negative maternal health, birth and child outcomes, advocate for future legislation and guidelines on maternity work protections. In the U.S., the lack of maternity protections in the workplace and maternity leave have been related to the issues of discrimination, job and financial insecurity, job loss, and negative health and pregnancy impacts among pregnant and postpartum working women [8]. Based on data from other countries, the implementation of maternity workplace protection legislation is complex, involving multi-level contexts, and encountering challenges such as the lack of communication of employers to pregnant employees on worker rights, and inconsistencies in the application of maximum daily working hours [44]. This study's findings of long working hours and increased psychological distress, along with continued research evidence, may improve aspects of legislation implementation by increasing knowledge of occupational risks among employees, employers and healthcare

professionals on individual and workplace levels, and scientifically on the macrosocial level [44].

Practice applications may include tiered workplace accommodations with temporary working hour adjustments, alternative work and paid leave [42]. In one U.S. study, pregnant women with severe psychological distress were less likely to obtain mental health treatment [37], necessitating mental health interventions involving prenatal healthcare access, education and screening [36]. Obstetric clinicians are positioned to evaluate, educate and advocate for pregnant patients, especially for work-related concerns [8]. However, prenatal assessments of occupational social risk factors may not extensively evaluate working conditions [45]. These practice discrepancies may indicate organizational and system-level problems, as clinicians affirm awareness and concern for these risks, yet report issues including limitations of system solutions [45], staffing, time and patient caseload [46]. Future solutions addressing pregnant patients' working hours and mental health must jointly account for occupational facilitators and barriers of healthcare practices.

Study limitations urge deliberation regarding study interpretations. Cross-sectional findings may not infer causation between working hours and psychological distress. The NHIS focuses on a broad U.S. population [33,34] instead of a pregnancy cohort, and thus does not measure gravidity, parity and gestational age. Consequently, variables such as alcohol consumption and metabolic conditions cannot specifically account for timing of the current pregnancy. Additionally, data on other, varied pregnancy outcomes were not regularly assessed in every NHIS survey wave, and were limited to a few, older survey waves in the 1980s [47].

This is the first study on the association between working hours and mental health among U.S. pregnant women, based on available evidence. Other merits include its statistical power as a 21-year compilation from a U.S. population-based study, utilizing a weighted sample. The validated K6 psychological distress instrument had high reliability and internal consistency. Incremental covariate adjustments across multiple models controlled for confounding, demonstrating a sustained association between long working hours and increased psychological distress. Future longitudinal research among pregnant worker populations is needed to consider pregnancy stages, other specific occupational characteristics and other perinatal and infant outcomes among women throughout pregnancy and postpartum, as in previous research, working hours with physical workload and night shift-work have been significantly related to preterm labor

and birth during different trimesters [19,48]. This study's initial evidence of long working hours and increased psychological distress among U.S. pregnant workers may support future research and practices that address working conditions and mental health in this population.

Acknowledgements

The authors thank the National Center for Health Statistics (NCHS) for providing open access to the National Health Interview Survey (NHIS) datasets.

Consent form

All NHIS participants provided consent.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

M.G. was partially supported by the National Institute for Occupational Safety and Health (NIOSH) Occupational and Environmental Health Nursing Program of the Southern California Education and Research Center (SCERC), Grant Agreement Number T42 OH008412, from the Centers for Disease Control and Prevention (CDC). M.G. was also supported by the Graduate Research Mentorship Program from the University of California Los Angeles (UCLA), Division of Graduate Education. L.C. and J.L. were partially supported by the Occupational Epidemiology Training Program of the SCERC (Grant Agreement No. T42 OH008412) from the CDC.

ORCID

Megan Guardiano  <http://orcid.org/0000-0002-2592-9890>
Tong Xia  <http://orcid.org/0000-0001-7136-8361>
Liwei Chen  <http://orcid.org/0000-0002-8458-5661>
Jian Li  <http://orcid.org/0000-0003-2614-4291>

Data availability statement

The NHIS 1997 to 2018 data that support the findings of this study are openly available in the CDC website at <https://www.cdc.gov/nchs/nhis/index.htm>. The analytic SAS codes for this current study are available from the corresponding author on reasonable request.

References

- [1] Frank J, Mustard C, Smith P, et al. Work as a social determinant of health in high-income countries: past, present, and future. *Lancet*. 2023;402(10410):1357–1367. doi:10.1016/S0140-6736(23)00871-1

- [2] Laughlin L. Maternity leave and employment patterns of first-time mothers: 1961–2008. Washington (DC): U.S. Census Bureau; 2011. (Current population report; P.70–128).
- [3] U.S. Bureau of Labor Statistics. Employment characteristics of families – 2023. Washington (DC): U.S. Department of Labor; 2024. (Economic news release; USDL-24-0743).
- [4] Organisation for Economic Co-operation and Development. Key characteristics of parental leave systems. Paris (FR): OECD; 2024. (OECD family database; PF2.1).
- [5] Addati L, Cassirer N, Gilchrist K. Maternity and paternity at work: law and practice across the world. Geneva (CH): International Labour Organization; 2014.
- [6] Equal Employment Opportunity Commission. Implementation of the Pregnant Workers Fairness Act. Fed Regist. 2024;89:29096–29220.
- [7] ACOG Committee on Obstetric Practice. Employment considerations during pregnancy. Obstet Gynecol. 2018; 131(4):e115–e123.
- [8] Franco J, Morris L, Lee J, et al. The health care provider's role in securing work accommodations for pregnant and postpartum patients. J Midwifery Womens Health. 2020;65(4):474–486. doi:10.1111/jmwh.13131
- [9] Palomo-Gómez R, Rüger-Navarrete A, Antúnez-Calvente I, et al. Prenatal stress as a risk factor for maternal–foetal morbidity: a longitudinal study. Healthcare. 2024; 12(3):312. doi:10.3390/healthcare12030312
- [10] Ding X, Liang M, Wu Y, et al. The impact of prenatal stressful life events on adverse birth outcomes: a systematic review and meta-analysis. J Affect Disord. 2021;287:406–416. doi:10.1016/j.jad.2021.03.083
- [11] Van den Bergh BRH, van den Heuvel MI, Lahti M, et al. Prenatal developmental origins of behavior and mental health: the influence of maternal stress in pregnancy. Neurosci Biobehav Rev. 2020;117:26–64. doi:10.1016/j.neubiorev.2017.07.003
- [12] Corchero-Falcón MDR, Gómez-Salgado J, García-Iglesias JJ, et al. Risk factors for working pregnant women and potential adverse consequences of exposure: a systematic review. Int J Public Health. 2023;68:1605655. doi:10.3389/ijph.2023.1605655
- [13] Cai Q, Zhang B, Huang S, et al. The effects of prenatal stress on expression of CaMK-II and L-Ca2+ channel in offspring hippocampus. Acta Biochim Biophys Sin. 2011;43(8):601–606. doi:10.1093/abbs/gmr057
- [14] Li J, Pega F, Ujita Y, 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. doi:10.1016/j.envint.2020.105739
- [15] Niedhammer I, Bertrais S, Witt K. Psychosocial work exposures and health outcomes: a meta-review of 72 literature reviews with meta-analysis. Scand J Work Environ Health. 2021;47(7):489–508. doi:10.5271/sjweh.3968
- [16] Pega F, Náfrádi B, Momen NC, 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;154:106595. doi:10.1016/j.envint.2021.106595
- [17] Cai C, Vandermeer B, Khurana R, et al. The impact of occupational shift work and working hours during pregnancy on health outcomes: a systematic review and meta-analysis. Am J Obstet Gynecol. 2019; 221(6):563–576. doi:10.1016/j.ajog.2019.06.051
- [18] Marsters CM, Stafli L, Bugden S, et al. Pregnancy, obstetrical and neonatal outcomes in women exposed to physician-related occupational hazards: a scoping review. BMJ Open. 2023;13(2):e064483. doi:10.1136/bmjopen-2022-064483
- [19] Suzumori N, Ebara T, Matsuki T, et al. Effects of long working hours and shift work during pregnancy on obstetric and perinatal outcomes: a large prospective cohort study-Japan Environment and Children's Study. Birth. 2020;47(1):67–79. doi:10.1111/birt.12463
- [20] Adane HA, Iles R, Boyle JA, et al. Maternal occupational risk factors and preterm birth: a systematic review and meta-analysis. Public Health Rev. 2023;44:1606085. doi:10.3389/phrs.2023.1606085
- [21] Stylianou-Riga P, Kouis P, Kinni P, et al. Maternal socioeconomic factors and the risk of premature birth and low birth weight in Cyprus: a case-control study. Reprod Health. 2018;15(1):157. doi:10.1186/s12978-018-0603-7
- [22] Agarwal I, Wang S, Stuart J, et al. First-trimester occupational exposures and hypertensive disorders of pregnancy among US nurses. Occup Med. 2023;73(7):419–426. doi:10.1093/occmed/kqad089
- [23] Simpson J, Wildman J, Bamba C, et al. Do longer job hours matter for maternal mental health? A longitudinal analysis of single versus partnered mothers. Health Econ. 2024;33(12):2742–2756. doi:10.1002/hec.4895
- [24] Wisner KL, Sit DKY, McShea MC, et al. Onset timing, thoughts of self-harm, and diagnoses in postpartum women with screen-positive depression findings. JAMA Psychiatry. 2013;70(5):490–498. doi:10.1001/jamapsychiatry.2013.87
- [25] Howard LM, Khalifeh H. Perinatal mental health: a review of progress and challenges. World Psychiatry. 2020;19(3):313–327. doi:10.1002/wps.20769
- [26] Chauhan A, Potdar J. Maternal mental health during pregnancy: a critical review. Cureus. 2022;14(10):e30656. doi:10.7759/cureus.30656
- [27] Obrochta CA, Chambers C, Bandoli G. Psychological distress in pregnancy and postpartum. Women Birth. 2020;33(6):583–591. doi:10.1016/j.wombi.2020.01.009
- [28] Abdollahi F, Sazlina SG, Zain AM, et al. Postpartum depression and psycho-socio-demographic predictors. Asia Pac Psychiatry. 2014;6(4):425–434. doi:10.1111/appy.12152
- [29] Kikuchi S, Murakami K, Obara T, et al. One-year trajectories of postpartum depressive symptoms and associated psychosocial factors: findings from the Tohoku Medical Megabank Project Birth and Three-Generation Cohort Study. J Affect Disord. 2021;295:632–638. doi:10.1016/j.jad.2021.08.118
- [30] Vehmeijer FOL, Guxens M, Duijts L, et al. Maternal psychological distress during pregnancy and childhood health outcomes: a narrative review. J Dev Orig Health Dis. 2019;10(3):274–285. doi:10.1017/S2040174418000557
- [31] Kobayashi S, Saijo Y, Itoh M, et al. Effects of the maternal work environment on psychological distress during pregnancy: a cross-sectional research—The Japan Environment and Children's Study. J Occup Environ Med. 2025;67(2):89–99. doi:10.1097/JOM.0000000000003276

- [32] Office of Disease Prevention and Health Promotion. Pregnancy and childbirth; 2025. Available from: <https://odphp.health.gov/healthypeople/objectives-and-data/browse-objectives/pregnancy-and-childbirth>
- [33] Botman SL, Moore TF, Moriarity CL, et al. Design and estimation for the National Health Interview Survey, 1995–2004. *Vital Health Stat 2*. 2000;2(130):1–41.
- [34] Moriarity C, Parsons VL, Jonas K, et al. Sample design and estimation structures for the National Health Interview Survey, 2016–2025. *Vital Health Stat 2*. 2022;2(191):1–30. doi:10.15620/cdc:115394
- [35] Kessler RC, Andrews G, Colpe LJ, et al. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychol Med*. 2002;32(6):959–976. doi:10.1017/s0033291702006074
- [36] Pugo MF, Banta JE, Grohar A, et al. Risk factors for serious psychological distress among pregnant women and mothers with children less than one year of age: an evaluation of National Health Interview Survey data (1997–2016). *P R Health Sci J*. 2023;42(1):57–62.
- [37] Glasheen C, Colpe L, Hoffman V, et al. Prevalence of serious psychological distress and mental health treatment in a national sample of pregnant and postpartum women. *Matern Child Health J*. 2015;19(1):204–216. doi:10.1007/s10995-014-1511-2
- [38] Baek SU, Yoon JH. Effect of long working hours on psychological distress among young workers in different types of occupation. *Prev Med*. 2024;179:107829. doi:10.1016/j.ypmed.2023.107829
- [39] Barba-Müller E, Craddock S, Carmona S, et al. Brain plasticity in pregnancy and the postpartum period: links to maternal caregiving and mental health. *Arch Womens Ment Health*. 2019;22(2):289–299. doi:10.1007/s00737-018-0889-z
- [40] Neiterman E, Fox B. Controlling the unruly maternal body: losing and gaining control over the body during pregnancy and the postpartum period. *Soc Sci Med*. 2017;174:142–148. doi:10.1016/j.socscimed.2016.12.029
- [41] Drumm CM, Martin PC, Schulz EV, et al. "I thought everyone was going to hate me for being pregnant": the enduring influence of the ideal worker image in GME. *Teach Learn Med*. 2024;1–11. doi:10.1080/10401334.2024.2386986
- [42] Al-Hadithy N, Nicholas R, Knight K, et al. Policy and pregnancy: the impact on working families in the NHS. *Future Healthc J*. 2021;8(3):e655–e659. doi:10.7861/fhj.2020-0259
- [43] Yilmaz M, Değirmenci F, Yilmaz DV. A psychosocial examination of feelings and thoughts about pregnancy: a qualitative study. *Midwifery*. 2021;103:103106. doi:10.1016/j.midw.2021.103106
- [44] Probst I, Zellweger A, Politis Mercier MP, et al. Implementation, mechanisms and effects of maternity protection legislation: a realist narrative review of the literature. *Int Arch Occup Environ Health*. 2018;91(8):901–922. doi:10.1007/s00420-018-1339-y
- [45] Goodman JM, Colon M, Cottrell EK, et al. Work as a social risk factor in pregnancy: a systematic review of screening practices related to working conditions and family leave among pregnant adults. *Birth*. 2023;50(1):32–43. doi:10.1111/birt.12695
- [46] Brown J, Ahmed N, Biel M, et al. Considerations in implementation of social risk factor screening and referral in maternal and infant care in Washington, DC: a qualitative study. *PLOS One*. 2023;18(4):e0283815. doi:10.1371/journal.pone.0283815
- [47] University of Minnesota – Minnesota Population Center. Child's birth variables – person: IPUMS Health Surveys: National Health Interview Survey; 2025. Available from: https://nhis.ipums.org/nhis-action/variables/group/health_childbirth
- [48] Vrijkotte T, Brand T, Bonsel G. First trimester employment, working conditions and preterm birth: a prospective population-based cohort study. *Occup Environ Med*. 2021;78(9):654–660. doi:10.1136/oemed-2020-107072