

Data profile: Korean Work, Sleep, and Health Study (KWSHS)

Seong-Sik Cho¹ , Jeehee Min² , Heejoo Ko³ , Mo-Yeol Kang^{4,*} 

¹Department of Occupational and Environmental Medicine, Dong-A University College of Medicine, Busan, Korea

²Department of Occupational and Environmental Medicine, Hanyang University Hospital, Seoul, Korea

³College of Medicine, The Catholic University of Korea, Seoul, Korea

⁴Department of Occupational and Environmental Medicine, Seoul St. Mary's Hospital, College of Medicine, The Catholic University of Korea, Seoul, Korea

Ann Occup Environ Med. 2025;37:e3

<https://doi.org/10.35371/aoem.2025.37.e3>

eISSN 2052-4374



*Corresponding author:

Mo-Yeol Kang

Department of Occupational and Environmental Medicine, Seoul St. Mary's Hospital, College of Medicine, The Catholic University of Korea, 222 Banpo-daero, Seocho-gu, Seoul 06591, Korea

E-mail: snaptoon@naver.com

ABSTRACT

The Korean Work, Sleep, and Health Study (KWSHS) was launched in 2022 as a longitudinal panel study to examine the interactions between work conditions, sleep health, and labour market performance among the Korean workforce. Baseline data were collected from 5,517 participants aged 19 to 70, encompassing diverse occupations. Follow-up surveys occur biannually, accommodating seasonal variations in sleep and health dynamics. To ensure stability, refreshment samples were integrated in later waves, maintaining a cohort size of 5,783 participants in wave 5. Key data include socio-demographics, employment characteristics, sleep patterns, health outcomes, and workplace performance. Early findings highlight critical associations, such as the adverse effects of occupational physical activity on productivity, the impact of emotional labour on health-related productivity loss, and the significance of sleep disruptions on mental health. The cohort's design enables detailed analyses of longitudinal and cross-sectional trends, offering insights into how changing work environments influence health and productivity. The KWSHS could serve as a vital resource for evidence-based interventions aimed at improving occupational health and productivity in Korea's evolving labour landscape. Data access is available through the study's principal investigator upon request.

Keywords: Occupational health; Sleep disorders; Working conditions; Health-related productivity loss; Work ability

BACKGROUND

Korea's unique labour environment, characterized by long working hours and a high prevalence of unfavourable employment factors, such as precarious employment, poses specific health risks to workers.¹ Globalization and advances in information technology

have expanded unstable employment trends, such as the gig economy.² These trends were further accelerated by the coronavirus disease 2019 pandemic, which increased platform labour and remote work.³ The changes in employment conditions have unpredictable effects on labour markets and health outcomes, necessitating research to inform policy development tailored to the recent Korean context.

Received: January 10, 2025 Revised: January 13, 2025 Accepted: January 15, 2025 Published: February 19, 2025

© 2025 Korean Society of Occupational & Environmental Medicine

© This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<https://creativecommons.org/licenses/by-nc/4.0/>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Sleep health has emerged as a crucial determinant of physical and mental well-being, contributing to diminished productivity and workability.⁴ Despite the importance of these occupational influences, research in this area has been limited, especially among the Korean working population. A nationwide panel of "Korean Work, Sleep, and Health Study" (KWSHS) was established to address the need for comprehensive research on how various working conditions, sleep, and health outcomes interact within the Korean workforce. The key motivation for starting the study was to collect relevant, high-quality, and up-to-date data on this broad spectrum of topics from a Korean labour market perspective. This study aims to provide essential information for evaluating how work conditions impact sleep and health, subsequently influencing labour market performance in the Korean context.

STUDY PARTICIPANTS

The KWSHS is an ongoing nationwide panel study initiated in 2022. Participants were recruited in July 2022 using an online survey platform called EMBRAIN. In brief, panellists were invited to participate in the survey through random sampling, which was stratified by sex and age. The study population for the KWSHS was selected based on specific inclusion and exclusion criteria. Participants had to be aged between 19 and 70

years old, with those outside this range being excluded. Occupation and employment status were key determinants; individuals working in various sectors, such as the self-employed, with or without employees, wage workers, or those involved in digital platform work, were included. However, individuals engaged in agriculture, home-based teaching, freelance, homemaking, students, and the unemployed were excluded from the survey, ensuring a focus on the core workforce relevant to the study purpose. A total of 5,517 participants completed the initial screening process at baseline. Inclusion in the study was contingent upon participants providing complete responses to questions designed to gather the necessary information.

Table 1 details the socio-demographic characteristics of the survey participants at baseline, which comprised 5,517 participants, with 45.5% female and 54.5% male respondents. The survey captured a broad age range, with the largest cohorts being in the 50–59 (25.3%) and 40–49 (23.7%) age brackets. Regarding occupation, 56% of participants (3,088 individuals) were employed in office-based jobs. The high proportion of office workers was likely to be due to the online nature of the survey, which may have been more accessible to individuals with regular access to computers and digital platforms. Nevertheless, the participant pool included diverse occupations, enabling a well-rounded analysis of the broader workforce.

Table 1. Socio-demographic characteristics of study participants in the Korean Work, Sleep, and Health Study from wave 1 to 5

Group	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5
Sex					
Female	2,512 (45.5)	1,803 (45.1)	2,519 (45.4)	2,189 (43.2)	2,719 (47.0)
Male	3,005 (54.5)	2,197 (54.9)	3,034 (54.6)	2,875 (56.8)	3,064 (53.0)
Age group (years)					
20–29	1,059 (19.2)	464 (11.6)	991 (17.8)	490 (9.7)	1,022 (17.7)
30–39	1,069 (19.4)	873 (21.8)	1,059 (19.1)	1,090 (21.5)	1,107 (19.1)
40–49	1,308 (23.7)	976 (24.4)	1,307 (23.5)	1,221 (24.1)	1,354 (23.4)
50–59	1,395 (25.3)	1,110 (27.8)	1,406 (25.3)	1,421 (28.1)	1,408 (24.3)
>60	686 (12.4)	577 (14.4)	790 (14.2)	842 (16.7)	892 (15.4)
Occupation					
Senior management and professional	641 (11.6)	476 (11.9)	705 (12.7)	661 (13.1)	693 (12.0)
Clerical	3,088 (56.0)	2,300 (57.5)	3,411 (61.4)	3,050 (60.2)	3,524 (60.9)
Sales and service	722 (13.0)	491 (12.3)	651 (11.7)	576 (11.4)	694 (12.0)
Skilled or unskilled manual	1,066 (19.4)	733 (18.2)	786 (14.2)	777 (15.3)	872 (15.1)
Total	5,517 (100)	4,000 (100)	5,553 (100)	5,064 (100)	5,783 (100)

Values are presented as number (%).

The KWSHS has been continued on a repeated-measure basis. Since the first survey in 2022, follow-up surveys have been conducted at six-month intervals, specifically in February and August of 2023 and March and September of 2024. This biannual schedule was intentionally designed to capture seasonal variations, particularly the differential effects of summer and winter on sleep patterns. Given that sleep duration, quality, and disorders may be influenced by seasonal factors such as daylight hours and temperature, this approach allows for a more comprehensive understanding of how environmental changes impact sleep health in the Korean workforce.

Fig. 1 illustrates an overview of the number of participants across five waves of the KWSHS. Although retention from the original cohort declined steadily, reaching 44.0% by wave 3 and 47.1% by wave 5, refreshment samples of 1,451 and 1,734 participants were added at wave 3 and 5, respectively, boosting the total sample size to 5,783 in wave 5. As the follow-up survey has progressed from wave 2 to wave 5, the overall socio-demographic characteristics of the participants have remained relatively stable (Table 1). Despite certain attrition and refreshments, the distribution of key variables such as age, sex, and occupational sectors has been maintained across the waves. This consistency ensures the reliability of longitudinal analyses while minimizing potential biases due to demographic shifts in the participant pool.

ETHICAL CONSIDERATIONS

All participants signed a consent form, and anonymity

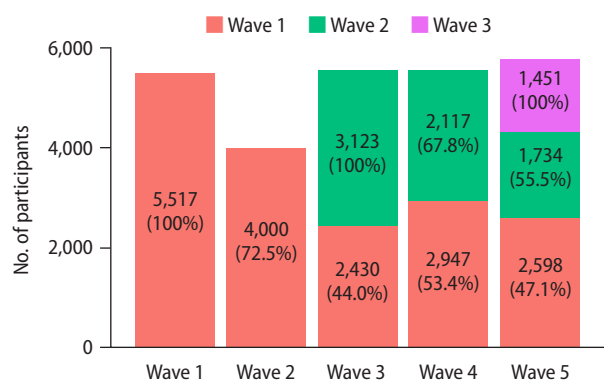


Fig. 1. Number of participants in each wave.

and confidentiality were ensured in accordance with the Ethical Principles for Medical Research Involving Human Subjects, outlined in the Helsinki Declaration. The study protocol was approved by the Institutional Review Board of Dong-A University (IRB No.2-1040709-AB-N-01-202202-HR-017-06).

MEASUREMENTS

The KWSHS questionnaire was designed to capture socio-demographic variables, job characteristics, sleep behaviours, health outcomes, and their broader impact on labour market performance and workability. Table 2 provides the domains assessed using the main questionnaire.

The survey garners extensive socio-demographic data from participants, including age, gender, marital status, education level, household size, and income. Work-related variables are a core component of the survey, reflecting the diverse nature of the Korean workforce. Participants report on their job type, including whether they are self-employed; business owners, with or without employees; wage workers in public or private sectors; or engaged in digital platform work. The survey distinguishes between full-time and part-time workers, as well as those with employment contracts through employment agencies. Further job characteristics include the nature of the work environment, whether participants are engaged in shift work (particularly night or rotating shifts); weekly working hours; working hour flexibility; physical work environment and chemical exposure; workplace ergonomic exposure; occupational stress and psychosocial safety climate; emotional labour and workplace violence; workplace safety climate and practice; and also the presence of labour unions or workplace safety committees; and so on.

The survey explores multiple aspects of sleep, including sleep timing, duration, quality of sleep, and sleep disorders. Participants are asked to report their average nightly sleep duration, the time they go to bed and wake up, and whether they experience difficulty falling or staying asleep. The survey enquires about early morning awakenings, non-restorative sleep, and daytime sleepiness, which can signal more significant sleep issues. In addition to general sleep quality, the survey investigates

Table 2. Korean Work, Sleep, and Health Study questionnaire topics and examples

Questionnaire modules/areas	Examples
Socio-demographics	Age, sex, marital status, education, household size and income, place of residence
Employment status	Job type (self-employed, wage worker, digital platform worker), work schedule (full-time, part-time)
Work and job characteristics	Shift work, weekly working hours, working hour flexibility (wave 5 only), job stress, emotional labour, workplace violence, physical and chemical exposure at the workplace, ergonomic exposures and physical demand at work, safety climate, psychosocial safety climate (wave 4 and 5 only), presence of workplace labour unions or workplace safety committees
Sleep patterns	Sleep duration, sleep quality, insomnia, daytime sleepiness, chronotype (morningness/eveningness)
Sleep disorders	Chronic insomnia, obstructive sleep apnoea, restless legs syndrome, use of medications or treatments for sleep disorders
Health status	Self-rated health, presence, and diagnosis date of chronic diseases, depressive symptoms, Workplace injuries and accident
Health behaviour	Smoking, alcohol consumption, beverages contain caffeine, dietary habits, physical activity
Health care utilization	Unmet medical needs, medication use
Work performance	Health-related productivity loss (including absenteeism and presenteeism), workability, work engagement, turn-over intention

the prevalence of specific sleep disorders such as chronic insomnia, obstructive sleep apnoea, and other related conditions like restless legs syndrome. These disorders are often linked to occupational factors, particularly shift work, where irregular work hours can disrupt the body's circadian rhythms, leading to poor sleep quality and subsequent health issues. The survey tracks the use of medications or treatments for sleep disorders, providing insights into how individuals manage sleep-related health concerns.

Subjective evaluations of health and well-being primarily measure health outcomes in the KWSHS, self-report-based diagnoses by medical doctors for various diseases, medication use, and a focus on how occupational factors impact physical and mental well-being. Self-reported health statuses are obtained, including data on possible chronic diseases such as cardiovascular conditions, diabetes, hypertension, and respiratory illnesses, as well as their diagnosis date. Additionally, participants are asked to rate their perceived stress levels, both in general and in work-specific contexts, and whether they have experienced symptoms of depression or anxiety, which are often exacerbated by poor sleep and challenging work conditions. The survey extends to occupational safety by investigating workplace injuries, accidents, and near-misses, especially in relation to sleep deprivation and fatigue.

In addition to health outcomes, the KWSHS examines the labour economic consequences of health problems, particularly in terms of workability, turnover intention,

and health-related productivity loss (HRPL). The survey includes questions related to absenteeism (time missed from work due to illness or fatigue) and presenteeism (being physically present at work but functioning at a reduced capacity due to health issues). These measures are key to assessing individuals' and employers' direct and indirect costs of sleep disorders.

KEY FINDINGS TO DATE

Several results of KWSHS have been published in scientific publications since 2022. Cross-sectional analyses (initial baseline study) have shown critical associations between occupational factors, sleep health, and labour market performance among Korean workers. One finding includes evidence of the "physical activity paradox", where occupational physical activity (OPA) negatively affects workability and health-related productivity, contrasting with the positive health outcomes linked to leisure-time physical activity (LTPA).⁵ Specifically, high levels of LTPA correlate with decreased workability and increased HRPL among older workers with high OPA, highlighting the need for tailored interventions to manage physical demands in the workplace.

Another finding of this study has demonstrated the detrimental effects of emotional labour and workplace violence on productivity.⁶ Emotional labour, often required in customer service roles, was shown to contribute to HRPL, especially when combined with exposure to workplace violence. The analysis revealed that higher

levels of emotional labour and frequent experiences of workplace violence were linked with increased absenteeism and presenteeism, emphasizing the need for protective measures to safeguard workers in high-stress roles.

This study explored the association between chronotype and mental health outcomes.⁷ Workers with an evening chronotype exhibit a higher risk of depressive symptoms compared to those with morningness or intermediate chronotypes. This relationship is mediated by sleep quality, pre-sleep cognitive arousal, and social jetlag, suggesting that poor sleep quality and misalignment between a biological and a social clock play a substantial role in mental health. These results emphasize the importance of promoting flexible schedules among workers, particularly those predisposed to later chronotypes.

In addition, the KWSHS investigated workplace safety climate and its relationship with occupational injuries.⁸ The findings indicate that an unfavourable safety climate, characterized by insufficient management support for safety, lack of adherence to safety practices, and poor coworker collaboration, is associated with higher rates of occupational injuries. This suggests that enhancing the safety climate through organizational commitment to safety practices may significantly reduce workplace accidents, benefiting employees and employers.

These findings reflect complex interactions between work conditions, sleep, and health. They provide practical insights for policymakers and organizations aiming to improve occupational health, demonstrating that interventions targeting specific risk factors, such as physical demands, sleep disruptions, emotional labour, and workplace violence, may enhance worker well-being and productivity across diverse industries. In the future, repeated cross-sectional and longitudinal analyses may be used to investigate a broad range of research questions, including examining how changes in work characteristics, such as the transition to shift work, may affect sleep patterns and health outcomes over time. By tracking the same participants across several waves, the KWSHS provides a comprehensive dataset that supports robust analyses of causal relationships between work, sleep, and health. The study's findings are expected to

contribute to developing workplace interventions, policies to improve worker health and productivity, and broader public health initiatives related to sleep disorders in the working population.

STRENGTHS AND WEAKNESSES

The KWSHS has several notable strengths and limitations that impact its utility and applicability in occupational and public health research. A key strength of the KWSHS is its longitudinal panel design, which enables researchers to track individual changes over time. The study allows a focused analysis of within-person changes in occupational conditions, sleep patterns, and health outcomes by controlling for unobserved, time-invariant characteristics.⁹ The repeated cross-sectional data allows for examining the shifts within the general workforce, providing insights into population-level changes without relying solely on the initial cohort, thereby enhancing the generalizability of findings. Another key strength is the comprehensive scope of KWSHS in capturing physical and mental health measures. The study provides a holistic view of the health and well-being of workers by including data on sleep quality, chronic diseases, experiences of occupational injuries, and mental health symptoms. The breadth of health variables enables detailed analyses, such as the interaction between sleep disorders and mental health or the effects of chronic health conditions on HRPL. Additionally, the KWSHS predominantly uses internationally validated survey tools, allowing for better cross-national comparisons. This approach enhances the capacity of the survey to contribute to global occupational health research, as results from the KWSHS can be reliably compared with data from other populations.

Despite its strengths, the KWSHS has several limitations. First, its reliance on self-reported data poses a risk of information bias, as participants may underreport or misinterpret questions related to sensitive topics, such as mental health issues, job stress, or sleep quality. Self-reported sleep data, in particular, may lack objective measures of sleep, such as polysomnography and actigraphy, which provide a more accurate picture of sleep patterns. However, the survey employs standardized, internationally validated tools, which are widely

recognized for their reliability and validity in epidemiological research. For example, the instruments used to measure sleep quality and job stress are commonly utilized in large-scale studies, ensuring consistency and comparability. This mitigates concerns about subjectivity, as the tools provide structured and validated frameworks for data collection.

Another limitation is the potential for sample attrition, which is common in longitudinal studies. Although the KWSHS employs refreshment samples to counter this issue, significant participant dropout over time may still affect the representativeness and reliability of longitudinal findings. Additionally, the KWSHS may face limitations in capturing the full diversity of the Korean workforce, especially due to its online survey format. This format may include limited participation from workers with insufficient digital access and digital literacy, such as those in manual work, with lower incomes, and based in rural areas, possibly skewing the data toward white-collar workers with easier access to digital platforms.¹⁰ This limitation may reduce the applicability of the survey to all occupational sectors and introduce challenges in generalizing findings to the broader working population. While achieving perfect representativeness is challenging, especially in a rapidly evolving labour market, the study's primary aim is to examine relationships between key variables and track trends over time rather than estimate prevalence rates. Estimating the prevalence for the entire working population from these data could be achieved through a weighted approach. Additionally, the longitudinal nature of the study enables researchers to analyze temporal trends and within-person changes. This capability compensates for any limitations in initial representativeness by emphasizing causal inference and trend analysis.

DATA ACCESSIBILITY

The possibility of collaboration in any potential analysis and publication is considered on an ongoing and case-by-case basis. The KWSHS data are available upon reasonable request, provided that researchers meet specific criteria. Those interested in accessing the dataset for academic or research purposes can contact the principal investigator (Prof. Seong-Sik Cho: sscho@dau.ac.kr),

who will guide the approval process. Approved requests may grant researchers access to KWSHS data. Researchers planning to use this data should note that KWSHS data files are extensive and require careful data management, as well as a solid understanding of how the data are organized and stored. For further details on data access procedures and conditions, researchers should contact the study team or consult associated research publications to ensure alignment with the data-sharing guidelines of the study.

NOTES

Abbreviations

HRPL: health-related productivity loss; KWSHS: Korean Work, Sleep, and Health Study; LTPA: leisure-time physical activity; OPA: occupational physical activity.

Funding

This work was supported by the National Research Foundation of Korea (NRF-2021R1C1C1007796, NRF-2022R1F1A1066498).

Competing interests

Mo-Yeol Kang, contributing editor of the *Annals of Occupational and Environmental Medicine*, was not involved in the editorial evaluation or decision to publish this article. All remaining authors have declared no conflicts of interest.

Author contributions

Conceptualization: Cho SS, Kang MY. Data curation: Cho SS, Kang MY. Formal analysis: Ko H. Funding acquisition: Cho SS, Kang MY. Methodology: Cho SS, Min J, Kang MY. Writing - original draft: Kang MY. Writing - review & editing: Cho SS, Min J, Kang MY.

REFERENCES

1. Kim W, Park EC, Lee TH, Kim TH. Effect of working hours and precarious employment on depressive symptoms in South Korean employees: a longitudinal study. *Occup Environ Med* 2016;73(12):816–22.
2. Ly B. Employment in the gig economy. *ONResearch* 2020; 15:29–37.

3. Davila Moran RC. Influence of remote work on the work stress of workers in the context of the COVID-19 pandemic: a systematic review. *Sustainability* 2023;15:12489.
4. Ishibashi Y, Shimura A. Association between work productivity and sleep health: A cross-sectional study in Japan. *Sleep Health* 2020;6(3):270–6.
5. Ko H, Kim D, Cho SS, Kang MY. The physical activity paradox in relation to work ability and health-related productivity loss in Korea. *Epidemiol Health* 2023;45:e2023096.
6. Ko H, Kim D, Cho SS, Lee DW, Choi J, Kim M, et al. The association of emotional labor and workplace violence with health-related productivity loss. *J Occup Health* 2024; 66(1):uia057.
7. Kim SY, Kim HJ, Cho SS, Park MY, Kang MY. Mediation analysis of chronotype, sleep-related factors, and depressive symptoms among workers: a cross-sectional study. *Ann Occup Environ Med* 2023;35:e47.
8. Min J, Jang TW, Lee HE, Kang MY, Cho SS. Association between the safety climate and occupational injury in the Korean working population: a cross-sectional study. *Epidemiol Health* 2024;46:e2024082.
9. Gunasekara FI, Richardson K, Carter K, Blakely T. Fixed effects analysis of repeated measures data. *Int J Epidemiol* 2014;43(1):264–9.
10. Intaratat K. Digital literacy and digital skills scenario of ASEAN marginal workers under and post COVID-19 pandemic. *Open J Bus Manag* 2022;10:118–133.