

Original Article



# Association between unpredictable work schedule and work-family conflict in Korea

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**Abbreviations**

CI: confidence interval; IRB: Institutional Review Board; KWCS: Korean Working Conditions Survey; OR: odds ratio; Q1:

## ABSTRACT

**Background:** As unpredictable work schedule (UWS) has increased worldwide, various studies have been conducted on the resulting health effects on workers. However, research on the effect of UWS on workers' well-being in Korea is still insufficient. This study aimed to investigate the relationship between UWS and work-family conflict (WFC) using 6th Korean Working Conditions Survey (KWCS).

**Methods:** Both UWS and WFC were measured using self-reported questionnaires, using data from the 6th KWCS conducted between 2020 and 2021, including 31,859 participants. UWS was measured by questions regarding the frequency of changes in work schedules and limited advanced notice. WFC was measured by questions regarding work to family and family to work conflicts. Logistic regression analysis was conducted to investigate the association between UWS and WFC.

**Results:** The prevalence of UWS was higher among men, those under 40 years old, service and sales workers and blue-collar workers, and those with higher salaries. Workplace size also influenced UWS prevalence, with smaller workplaces (less than 50 employees) showing a higher prevalence. The odds ratio (OR) for WFC was significantly higher in workers with UWS compared to workers without UWS after adjusting for gender, age, marital status, occupation, salary, education, weekly working hours, shift work, company size, and having a child under the age of 18 years, employment status (OR: 3.71; 95% confidence interval: 3.23–4.25).

**Conclusions:** The analysis of nationwide data revealed that UWS interferes with workers' performance of family roles, which can lead to WFC. Our findings suggest that it is crucial to implement policies to address unfair work schedule management, promoting a healthier work-life balance and fostering a conducive environment for family responsibilities.

**Keywords:** Unpredictability; Work-life balance; KWCS; Work family balance

## BACKGROUND

Flexible hiring has been emphasized as a way for employers to stay competitive, allowing them to adjust the number of employees and labor types according to market demand.<sup>1</sup> However, this has led to a rise in precarious work,<sup>2</sup> which refers to work that deviates from the traditional models of standard employment, such as having a single employer, and

question 1; Q2: question 2; Q3: question 3; ROWE: results-only work environments; UWS: unpredictable work schedule; WFC: work-family conflict.

#### Competing interests

The authors declare that they have no competing interests.

#### Author contributions

Conceptualization: Choi SM; Data curation: Park HO; Formal analysis: Choi SM; Funding acquisition: Park HO; Investigation: Choi SM, Park YT; Methodology: Park HO; Software: Park YT; Validation: Park HO; Visualization: Choi SM; Writing - original draft: Choi SM; Writing - review & editing: Choi SM, Park HO, Kim CW.

permanent or year-round employment with an indefinite term.<sup>3</sup> While this flexibility may benefit employers, it creates uncertainty, unpredictability, and risks for workers.<sup>4</sup>

Workers with precarious work schedules, including those in non-standard, temporary, part-time, and on-call positions, and those who work during early mornings, late nights, and weekends, experience irregular and unpredictable work hours.<sup>5</sup> There has been a recent increase in the number of "gig" workers, who also typically have irregular and unpredictable schedules.<sup>6,7</sup> According to the 2015 American Working Conditions Survey, 9.7% of U.S. workers reported working unpredictable and irregular hours. Interestingly, among workers who received one-sided notice of a schedule change, 23% were expected to modify their work schedule within a few days.<sup>8,9</sup> The 2015 European Working Conditions Survey found that 26% of respondents from 28 European countries had experienced similar changes in their work schedules.<sup>6,10</sup> Unpredictable work schedules (UWSs) are not limited to unstable employment; even highly educated workers in standard employment face this issue, as shown in a previous study.<sup>11</sup>

Research interest in understanding the impact of precarious employment on workers has grown, particularly on a characteristic known as UWS.<sup>6</sup> Recent exploratory studies have found negative effects on workers' quality of life. Schneider and Harknett's<sup>12</sup> study of 27,792 workers revealed that unstable work schedules have an overall negative impact, leading to increased mental stress and reduced sleep quality. Korean research based on the 5th Korean Working Conditions Survey (KWCS) reported that UWS is associated with depressive symptoms.<sup>6</sup>

UWS not only affects workers' physical and mental health but also contributes to work-life conflict. Henly and Lambert's study on retail workers demonstrated that UWS can cause work-life conflict.<sup>5</sup> Work-life conflict occurs when the demands and expectations from work roles clash with personal life roles. Work-family conflict (WFC) is a specific type of work-life conflict that arises when work responsibilities hinder family obligations.<sup>13</sup> Given that work and family are crucial aspects of people's lives,<sup>14</sup> the prevalence of dual-income households and longer work hours in modern society has increased, leading to more severe work-life conflicts.<sup>14,15</sup> UWS exacerbates WFC by further impeding the proper distribution of time between work and family.<sup>16</sup> Moreover, UWS contributes to income variability and economic uncertainty, which also intensifies WFC.<sup>12</sup> WFC greatly affects work-life balance, and work-life balance problems caused by WFC eventually interfere with worker's physical and mental health and work performance.<sup>17,19</sup>

The crude marriage rate in Korea has been consistently declining from 6.5 persons in 2011 to 3.8 persons in 2021, and the birth rate is now the lowest in the world at 0.84 births per person.<sup>20,21</sup> To address these challenges, society must collectively work to alleviate the burden on individuals in fulfilling their family roles.

Despite UWS's negative consequences in unstable working conditions, research specifically examining its effects on workers' health and well-being in Korea is limited. This study's objective is to investigate the impact of UWS on WFC using data from the KWCS, which represents the working population in Korea.

## METHODS

### Study participants

This study utilized data from the 6th KWCS, which was conducted between 2020 and 2021. The KWCS is a nationwide survey regularly conducted by the Korea Occupational Safety and Health Agency. It employs the same set of questions as the European Working Conditions Survey and aims to gather information on employment and working conditions that impact the health and safety of workers. We selected a sample of 50,000 households from different regions of the country, following a stratified sampling approach based on data from the National Population and Housing census. To ensure the representativeness of the findings, we applied sample weights provided by the KWCS to all our analyses. Data collection for the KWCS was conducted through home-visit interviews using tablet computers, self-reported paper questionnaires, and online questionnaires.

From the total survey population of 50,538 individuals, we focused our analysis on employed workers aged 19 years and above, excluding self-employed individuals, business owners, and unpaid family workers. Respondents with missing data for unpredictable work time or covariates were also excluded from the study, resulting in a final sample of 31,859 participants.

### Main variables

Participants who provided responses of "every day," "several times per week," or "several times per month" to question 1 (Q1), which asked how often their company or organization had suddenly asked them to return to work promptly in the past year, or responses of "the same day," "the day before," or "a few days before" to question 2 (Q2), which inquired about the timing of notification for changes in work time for those with regularly changing schedules, were classified as experiencing UWS. On the other hand, participants who responded with "rarely" or "never" to Q1, and with "several weeks before" or "my work time does not change regularly" to Q2 were classified as non-UWS. Respondents only answered Q2 if they had selected either "The company/organization decides, and I cannot change it" or "I can choose from several work times decided by the company/organization" in response to question 3 (Q3), which asked about how their work time was determined. Participants who chose "I can decide my work time, as long as I adhere to a few restrictions" or "I can freely decide my own work time" for Q3 were also classified as non-UWS. Participants who did not answer Q2 were also classified as experiencing UWS if they responded with "every day," "several times per week," or "several times per month" to Q1.

In the KWCS, WFC was assessed using responses to the following questions: "In the last year (or, if you have been at your current place of work for less than one year, since you started working), how often do you experience the following situations?—(A) I am too tired after work to do my household chores. (B) Because of work, I am unable to allocate as much time as I would like to my family. (C) I find it difficult to concentrate on work because of household chores. (D) Because of household chores, I am unable to allocate as much time as I should to work." Participants rated their responses to each question (A-D) on a 5-point Likert scale ("always," "most of the time," "sometimes," "not often," and "never") which were then scored from 4 to 0 accordingly. In this study, we classified participants into "low WFC" and "high WFC" categories using the summary index developed by Borgmann et al.<sup>22,23</sup> The scores for all items were summed, resulting in a range of 0–16, with scores above 8 classified as "low WFC" and scores below 7 classified as "high WFC."

### Covariates

The covariates included age, gender, marital status, occupational group, monthly salary, educational status, work time, shift pattern, size of workplace, and the presence or absence of children under 18 years old, employment status. Age was grouped into five categories: less than 30 years old, 30–39 years old, 40–49 years old, 50–59 years old, and over 60 years old. Marital status was divided into two groups: married/cohabiting and unmarried/other. Occupational group was classified into four categories: professional and manager (including professional related workers), office worker, service and sales, and blue-collar worker (including trained agriculture and fisheries workers, technicians and related technical workers, equipment and machine operators, and simple laborers). Monthly salary was categorized into four groups: less than 2 million KRW, 2 million-2,999,999 KRW, 3 million-3,999,999 KRW, and 4,000,000 KRW or higher. Educational status was divided into three groups: below high school graduation, high school graduation, and college graduation. Work time was categorized into three groups: 40 or fewer hours per week, 41–52 hours per week, and more than 52 hours per week. The size of the workplace was classified into three categories: less than 50 people, 50-299 people, and 300 or more people. The presence or absence of children under 18 years old was categorized into four groups: none, 1 child, 2 children, and 3 or more children.

### Statistical analysis

Due to the nature of the KWCS data utilized in this study, sample weights were applied to account for representativeness in all analyses conducted. Chi-square tests were employed to examine differences in general characteristics between the "low WFC" and "high WFC" groups. To investigate the association between UWS and WFC, logistic regression analysis was conducted, controlling for potential confounding variables. In order to compare the effects of WFC according to gender, men and women were stratified and analyzed, and subgroup analysis was added. The significance level was set at  $p < 0.05$ , with a confidence level of 95%. IBM SPSS Statistics for Windows version 25.0 (IBM Corp., Armonk, NY, USA) was utilized for all statistical analyses.

### Ethics statement

This study was approved by the Institutional Review Board (IRB) of Samsung Changwon Hospital (IRB No. SCMC2023-06-007).

## RESULTS

**Table 1** provides information on the prevalence of UWS based on different general and occupational characteristics. Of 31,859 participants, 1,372 (4.3%) and 30,487 (95.7%) were classified in the UWS and non-UWS groups, respectively. The prevalence of UWS was higher among men than women (4.9% vs. 3.6%,  $p < 0.001$ ). Younger participants, particularly those aged 30–39 years old, had a higher prevalence of UWS (5.1%,  $p < 0.001$ ). Service and sales workers (4.9%) and blue-collar workers (4.7%) had a higher prevalence of UWS ( $p < 0.001$ ). Interestingly, participants with higher salaries had a higher prevalence of UWS ( $p = 0.020$ ), and UWS was most prevalent among high school graduates (4.7%,  $p = 0.002$ ). Regarding weekly working time, the prevalence of UWS was highest for those working more than 52 hours per week ( $p = 0.043$ ), and shift workers had a higher prevalence of UWS compared to non-shift workers (7.3% vs. 4.0%,  $p < 0.001$ ). Workplace size also influenced UWS prevalence, with smaller workplaces (less than 50 employees) showing a higher prevalence (4.6%,  $p < 0.001$ ).

## Unpredictable schedules: impact on work-family conflict

**Table 1.** Prevalence of UWS by characteristics of participants

Variables	Total (n = 31,859)	UWS (n = 1,372)	Non-UWS (n = 30,487)	p-value <sup>a</sup>
Gender				< 0.001
Men	18,078 (56.7)	882 (4.9)	17,196 (95.1)	
Women	13,781 (43.3)	490 (3.6)	13,291 (96.4)	
Age (years)				< 0.001
< 30	5,267 (16.5)	249 (4.7)	5,018 (95.3)	
30–39	7,152 (22.4)	363 (5.1)	6,789 (94.9)	
40–49	7,919 (24.9)	331 (4.2)	7,588 (95.8)	
50–59	7,058 (22.2)	285 (4.0)	6,773 (96.0)	
≥ 60	4,463 (14.0)	145 (3.2)	4,318 (96.8)	
Marital status				0.124
Single/other	2,770 (8.7)	135 (4.9)	2,635 (95.1)	
Married/together	29,089 (91.3)	1,237 (4.3)	27,851 (95.7)	
Occupation				< 0.001
Professional and manager	8,027 (25.2)	335 (4.2)	7,692 (95.8)	
Office worker	7,089 (22.3)	241 (3.4)	6,848 (96.6)	
Service and sales	5,496 (17.3)	269 (4.9)	5,227 (95.1)	
Blue-collar worker	11,247 (35.3)	527 (4.7)	10,720 (95.3)	
Salary (10,000 KRW)				0.020
< 200	8,891 (27.9)	366 (4.1)	8,525 (95.9)	
200–299	10,283 (32.3)	406 (4.0)	9,877 (96.0)	
300–399	6,978 (21.9)	337 (4.8)	6,642 (95.2)	
≥ 400	5,707 (17.9)	263 (4.6)	5,444 (95.4)	
Education				0.002
< High school	2,713 (8.5)	87 (3.2)	2,626 (96.8)	
High school	10,355 (32.5)	490 (4.7)	9,864 (95.3)	
≥ College	18,791 (59.0)	795 (4.2)	17,996 (95.8)	
Weekly working hours				0.043
≤ 40	6,139 (19.3)	308 (5.0)	5,830 (95.0)	
41–52	22,929 (72.0)	862 (3.8)	22,066 (96.2)	
> 52	2,791 (8.8)	202 (7.2)	2,590 (92.8)	
Shift work				< 0.001
Yes	3,199 (10.0)	233 (7.3)	2,967 (92.7)	
No	28,660 (90.0)	1,140 (4.0)	27,520 (96.0)	
Company size				0.003
1–49	20,314 (63.8)	927 (4.6)	19,387 (95.4)	
50–499	6,053 (19.0)	216 (3.6)	5,837 (96.4)	
≥ 500	5,492 (17.2)	229 (4.2)	5,263 (95.8)	
Having a child under the age of 18 years				0.052
No	19,863 (62.3)	831 (4.2)	19,032 (95.8)	
1	5,120 (16.1)	251 (4.9)	4,870 (95.1)	
2	5,760 (18.1)	234 (4.1)	5,526 (95.9)	
≥ 3	1,115 (3.5)	57 (5.1)	1,058 (94.9)	
Regular employee				< 0.001
Yes	25,569 (80.3)	1,007 (3.9)	24,562 (96.1)	
No	6,290 (19.7)	366 (5.8)	5,924 (94.2)	
WFC				< 0.001
Low-WFC	29,401 (92.3)	1,071 (3.6)	28,330 (96.4)	
High-WFC	2,458 (7.7)	301 (12.3)	2,157 (87.7)	

Values are presented as number (%).

UWS: unpredictable work schedule; WFC: work-family conflict.

<sup>a</sup>Compared using chi-square test.

**Table 2** presents the prevalence of WFC based on general and occupational characteristics. Of the 31,859 participants, 2,458 (7.7%) experienced high WFC and, women had a higher prevalence of high WFC compared to men (7.3% vs. 8.3%,  $p = 0.001$ ). Participants aged 30–39 years old had the highest prevalence of high WFC (9.0%), followed by those aged 40–49 years old (8.2%,  $p < 0.001$ ). Professionals and managers (8.3%) and office workers (8.4%) had a higher prevalence of high WFC ( $p = 0.001$ ). Regarding salary, the groups earning 2–3 million

## Unpredictable schedules: impact on work-family conflict

**Table 2.** Prevalence of WFC by characteristics of participants

Variables	Total (n = 31,859)	High-WFC (n = 2,458)	Low-WFC (n = 29,401)	p-value <sup>a</sup>
Gender				0.001
Men	18,078 (56.7)	1,313 (7.3)	16,765 (92.7)	
Women	13,781 (43.3)	1,145 (8.3)	12,636 (91.7)	
Age (years)				< 0.001
< 30	5,267 (16.5)	362 (6.9)	4,904 (93.1)	
30–39	7,152 (22.4)	645 (9.0)	6,507 (91.0)	
40–49	7,919 (24.9)	650 (8.2)	7,269 (91.8)	
50–59	7,058 (22.2)	556 (7.9)	6,502 (92.1)	
≥ 60	4,463 (14.0)	246 (5.5)	4,217 (94.5)	
Marital status				0.541
Single/other	2,770 (8.7)	222 (8.0)	2,548 (92.0)	
Married/together	29,089 (91.3)	2,237 (7.7)	26,852 (92.3)	
Occupation				0.001
Professional and manager	8,027 (25.2)	667 (8.3)	7,360 (91.7)	
Office worker	7,089 (22.3)	593 (8.4)	6,497 (91.6)	
Service and sales	5,496 (17.3)	405 (7.4)	5,091 (92.6)	
Blue-collar worker	11,247 (35.3)	793 (7.1)	10,453 (92.9)	
Salary (10,000 KRW)				< 0.001
< 200	8,891 (27.9)	468 (5.3)	8,424 (94.7)	
200–299	10,283 (32.3)	944 (9.2)	9,339 (90.8)	
300–399	6,978 (21.9)	649 (9.3)	6,329 (90.7)	
≥ 400	5,707 (17.9)	397 (7.0)	5,309 (93.0)	
Education				< 0.001
< High school	2,713 (8.5)	129 (4.8)	2,584 (95.2)	
High school	10,355 (32.5)	802 (7.7)	9,553 (92.3)	
≥ College	18,791 (59.0)	1,528 (8.1)	17,263 (91.9)	
Weekly working hours				< 0.001
≤ 40	6,139 (19.3)	267 (4.3)	5,872 (95.7)	
41–52	22,929 (72.0)	1,848 (8.1)	21,081 (91.9)	
> 52	2,791 (8.8)	344 (12.3)	2,448 (87.7)	
Shift work				0.004
Yes	3,199 (10.0)	288 (9.0)	2,911 (91.0)	
No	28,660 (90.0)	2,171 (7.6)	26,489 (92.4)	
Company size				0.097
1–49	20,314 (63.8)	1,594 (7.8)	18,720 (92.2)	
50–499	6,053 (19.0)	427 (7.1)	5,626 (92.9)	
≥ 500	5,492 (17.2)	437 (8.0)	5,055 (92.0)	
Having a child under the age of 18 years				< 0.001
No	19,863 (62.3)	1,420 (7.1)	18,444 (92.9)	
1	5,120 (16.1)	434 (8.5)	4,687 (91.5)	
2	5,760 (18.1)	518 (9.0)	5,242 (91.0)	
≥ 3	1,115 (3.5)	88 (7.9)	1,027 (92.1)	
Regular employee				< 0.001
Yes	25,569 (80.3)	2,088 (8.2)	23,481 (91.8)	
No	6,290 (19.7)	371 (5.9)	5,919 (94.1)	

Values are presented as number (%).

WFC: work-family conflict.

<sup>a</sup>Compared using chi-square test.

KRW (9.2%) and 3–4 million KRW (9.3%) had a higher prevalence of WFC ( $p < 0.001$ ). Higher educational levels ( $p < 0.001$ ) and longer working hours ( $p < 0.001$ ) were also linked to a higher prevalence of WFC. Shift workers had a higher prevalence of elevated WFC (9.0% vs. 7.6%,  $p = 0.004$ ). Participants with children under 18 years old exhibited a higher prevalence of elevated WFC than those without ( $p < 0.001$ ). The ratio of high WFC was higher in regular employees (8.2%,  $p < 0.001$ ).

**Table 3** displays the results of multiple logistic regression analysis examining the relationship between UWS and WFC. The stratified analysis revealed that UWS and WFC were significantly associated in both men and women. In men, this association was stronger (odds ratio [OR]: 4.17; 95% confidence interval [CI]: 3.51–4.95) than in women (OR: 3.11; 95% CI: 2.46–3.93). Men in their 50s and women in their 30s showed a higher OR (OR: 1.26; 95% CI: 1.02–1.57 and OR: 1.24; 95% CI: 1.00–1.54, respectively). Among women, high school graduates (OR: 1.41; 95% CI: 1.01–1.97) showed a significantly stronger association than those with a lower educational status. Regarding salary, men in the 2–4 million KRW group showed higher ORs than those in the less than 2 million KRW group. Among women, all groups earning more than 2 million KRW showed high ORs. Among men and women, the association with WFC also increased as the weekly working hours increased. Among men, the number of children was not associated with WFC. However, among women, those with 1 and 2 children showed higher ORs than those without children.

**Table 3.** The ORs and 95% CIs of UWS on WFC<sup>a</sup>

Variable	Total		Men		Women	
	OR	95% CI	OR	95% CI	OR	95% CI
<b>UWS</b>						
Non-UWS	1.00		1.00		1.00	
UWS	3.71	3.23–4.25	4.15	3.50–4.94	3.10	2.45–3.91
<b>Age (years)</b>						
< 30	1.00		1.00		1.00	
30–39	1.17	1.01–1.36	1.07	0.86–1.32	1.24	1.00–1.54
40–49	1.11	0.94–1.30	1.09	0.86–1.37	1.04	0.83–1.32
50–59	1.22	1.05–1.42	1.26	1.02–1.57	1.08	0.87–1.33
≥ 60	1.04	0.86–1.27	1.04	0.80–1.35	1.05	0.77–1.43
<b>Marital status</b>						
Single/other	1.00		1.00		1.00	
Married/together	0.86	0.74–1.01	0.89	0.73–1.10	0.80	0.63–1.00
<b>Occupation</b>						
Professional and manager	1.00		1.00		1.00	
Office worker	0.98	0.87–1.10	1.07	0.90–1.27	0.91	0.77–1.07
Service and sales	0.91	0.79–1.05	1.09	0.87–1.36	0.83	0.68–1.02
Blue-collar worker	0.82	0.72–0.94	0.96	0.80–1.15	0.96	0.76–1.21
<b>Salary (10,000 KRW)</b>						
< 200	1.00		1.00		1.00	
200–299	1.33	1.16–1.52	1.63	1.28–2.08	1.31	1.11–1.56
300–399	1.25	1.07–1.45	1.53	1.18–1.98	1.61	1.30–2.01
≥ 400	0.88	0.74–1.04	1.11	0.84–1.46	1.42	1.07–1.89
<b>Education</b>						
< High school	1.00		1.00		1.00	
High school	1.16	0.93–1.44	1.05	0.77–1.41	1.41	1.01–1.97
≥ College	1.10	0.87–1.40	1.11	0.80–1.54	1.16	0.80–1.68
<b>Weekly working hours</b>						
≤ 40	1.00		1.00		1.00	
41–52	1.64	1.40–1.94	1.46	1.11–1.91	1.81	1.47–2.22
> 52	2.53	2.08–3.07	2.48	1.85–3.31	2.50	1.86–3.37
<b>Shift work</b>						
Yes	1.00		1.00		1.00	
No	1.12	0.97–1.28	1.07	0.90–1.28	1.22	0.98–1.51
<b>Having a child under the age of 18 years</b>						
No	1.00		1.00		1.00	
1	1.10	0.97–1.25	1.01	0.85–1.21	1.23	1.01–1.49
2	1.24	1.09–1.42	1.15	0.96–1.37	1.44	1.17–1.76
≥ 3	1.07	0.84–1.36	1.03	0.76–1.41	1.29	0.81–1.77
<b>Regular employee</b>						
Yes	1.00		1.00		1.00	
No	1.02	0.89–1.17	1.08	0.89–1.32	0.97	0.79–1.18

OR: odds ratio; CI: confidence interval; UWS: unpredictable work schedule; WFC: work family conflict.

<sup>a</sup>Adjusted for age, marital status occupation, salary, education, weekly working hours, shift work, having a child under the age of 18 years, regular employee.

**Table 4.** The ORs and 95% CIs of UWS on WFC in subgroups by gender

Variables	Men <sup>a</sup>		Women <sup>a</sup>	
	OR	95% CI	OR	95% CI
<b>Age (years)</b>				
< 30	2.97	1.75–5.04	6.50	4.06–10.39
30–39	5.12	3.73–7.02	2.65	1.62–4.32
40–49	4.89	3.35–6.76	2.52	1.49–4.26
50–59	2.95	1.98–4.41	2.85	1.65–4.91
≥ 60	3.46	1.84–6.52	2.16	0.93–5.02
<b>Education</b>				
< High school	2.56	0.91–7.20	2.51	0.88–7.16
High school	3.50	2.56–4.77	2.41	1.61–3.60
≥ College	4.65	3.75–5.76	3.65	2.69–4.94
<b>Salary (10,000 KRW)</b>				
< 200	3.51	1.94–6.33	3.46	2.32–5.16
200–299	4.65	3.40–6.63	2.21	1.48–3.28
300–399	4.29	3.17–5.81	6.15	3.66–10.33
≥ 400	4.21	2.97–5.98	1.25	0.40–3.85
<b>Occupation</b>				
Professional and manager	7.14	5.09–10.02	4.43	2.90–6.51
Office worker	3.00	1.90–4.71	3.37	2.06–5.50
Service and sales	2.79	1.69–4.61	4.18	2.65–6.58
Blue-collar worker	4.13	3.17–5.37	1.09	0.54–2.20
<b>Weekly working hours</b>				
≤ 40	3.03	1.51–6.04	2.70	1.60–4.54
41–52	4.19	3.27–5.37	3.49	2.67–4.55
> 52	3.27	2.09–5.12	3.00	1.56–5.77
<b>Shift work</b>				
No	3.40	2.91–5.42	2.61	1.39–4.87
Yes	4.43	3.67–5.34	3.17	2.46–4.09
<b>Having a child under the age of 18 years<sup>b</sup></b>				
No	4.12	3.26–5.19	3.84	2.87–5.14
1	3.45	2.27–5.52	2.25	1.26–4.04
2	4.58	3.14–6.70	3.45	1.91–6.24
≥ 3	11.47	4.57–28.78	0.00	0.00

OR: odds ratio; CI: confidence interval; UWS: unpredictable work schedule; WFC: work-family conflict.

<sup>a</sup>Adjusted for age, occupation, salary, education, weekly working hours, shift work, having a child under the age of 18 years; <sup>b</sup>In women, there were no participants with UWS who had three or more children.

**Table 4** shows the results of multiple logistic regression analysis between selected subgroups, and UWS and WFC showed a significant association across almost all subgroups. Men in their 30s (OR: 5.12; 95% CI: 3.73–7.02) and women under 30 showed the strongest association (OR: 6.50; 95% CI: 4.06–10.39). Men in the professional and manager category showed a stronger association (OR: 7.14; 95% CI: 5.09–10.02). Women who earned 3–4 million KRW showed a stronger association (OR: 6.15; 95% CI: 3.66–10.33). Men showed a high OR when they had three or more children (OR: 11.57; 95% CI: 4.57–28.78), and none of the women with three or more children had experienced UWS.

## DISCUSSION

The results indicate that workers working with UWS had a higher risk of WFC than those with predictable schedules. This association remained significant even after controlling for factors that could act as confounding variables, such as socioeconomic status, marital status and child status, and work characteristics. This suggests that, even after considering external factors, the unpredictability of UWS has a large impact on WFC. A stratified subgroup analysis of men and women found an association between UWS and WFC in almost all



subgroups, indicating that workers with UWS, regardless of gender or other factors, are more likely to experience WFC.

Research has examined the relationship between workers' work schedules and WFC. Anderson et al.<sup>24</sup> reported that workers' control over their working hours had a positive effect on reducing WFC and increasing job satisfaction. Moen et al.<sup>25</sup> found that results-only work environments (ROWE) improves workers' health behavior and quality of life. ROWE are one type of human resources system that prioritizes outcomes and allows workers to choose when and where they work, without temporal or spatial restrictions. Kelly et al.'s<sup>26</sup> longitudinal study on white-collar workers in the US found that those participating in ROWE experienced lower levels of WFC and improved work-family balance. These studies highlighted that the key mechanism behind these changes was workers' greater control over their schedules. These findings support the results of our study, as a worker with UWS would be expected to experience higher WFC due to the lack of control over their work schedule.

In this study, the prevalence of high WFC was higher in women, but when stratified by gender, the OR of WFC due to UWS was higher in men. This was contrary to our prediction, suggesting that, in general, women experience WFC to a greater extent than men, but the risk of exposure to WFC due to UWS is higher in men. In modern society, not only more women work, but also a larger number of men actively participate in housework and childcare at home.<sup>27</sup> In fact, since the 1960s, the amount of time spent doing housework has decreased among women but more than doubled among men, suggesting that the responsibility and burden experienced by men regarding housework have increased more than in the past.<sup>28</sup> The results of this study indicate that men may be more sensitive to the impact of conflicts with their roles owing to UWS.

In addition to UWS, the variables that had a significant impact on WFC in this study were age, salary, weekly working hours, and the number of children. When gender was stratified, the OR of men in the 50s group and women in the 30s group increased, but overall, WFC remained stable across different age groups. However, the subgroup analysis results showed that UWS had a much higher impact on WFC in women in their 20s and men in their 30s than in other age groups, indicating that the age groups in which UWS has the greatest impact on WFC in men and women are different. In Korea, men tend to start engaging in social life later than women, owing to military service. Additionally, as of 2020, the average age of first marriage in Korea is 33.2 for men and 30.8 for women. These are presumed to be some of the reasons for the differences found regarding WFC between men and women.<sup>29</sup>

When examining income, we observed that groups with a monthly salary in the range of 2 to 4 million KRW faced a higher risk of WFC compared to the group with a salary below 2 million KRW. While higher income can enhance financial well-being, it often comes with increased pressure and responsibilities at work, which in turn heightens the risk of WFC. Workers may feel compelled to invest more time, energy, and attention into their work to meet the expectations associated with higher income levels.<sup>30</sup> By contrast, the group with a salary over 4 million KRW did not show a statistically significant difference from the group earning less than 2 million KRW per month. This could be attributed to the inclusion of many single-income families in the higher salary group, where one spouse does not have to work.<sup>31</sup> Compared to dual-income families, workers in single-income families may feel less burdened to participate in family roles, as their spouse has more time available to dedicate to household responsibilities.<sup>32</sup> This explanation helps shed light on our findings.

The literature has consistently shown a close relationship between long working hours and WFC.<sup>33-35</sup> Adkins and Premeaux<sup>33</sup> found that longer work hours were associated with increased WFC, as allocating more time to work exacerbated the impact on other life roles. Alam et al.,<sup>34</sup> focusing on female white-collar workers, revealed that longer work durations led to emotional fatigue, which subsequently resulted in higher levels of WFC. Similarly, a study on manufacturing workers in Korea involving 5,432 participants reported that longer working hours contributed to increased WFC, particularly for those working in the evenings and on weekends.<sup>35</sup> In this study, the OR of WFC tended to increase as the weekly working hours increased; this was the case for both men and women. Individuals in the long weekly work hour groups frequently reported experiencing overtime work, and unexpected additional work or overtime can be considered a form of UWS.<sup>36</sup> It is important to note that unannounced extra work induces significantly more fatigue and stress compared to planned overtime, consequently increasing the risk of WFC.<sup>37</sup> These findings align with our study results, further supporting the notion that work hours and WFC are closely related.

In this study, the number of children had no significant effect on WFC in men. However, in women, the OR of WFC increased further in the case of one or two children compared to the group without children under the age of 18. Nonetheless, contrary to our expectations, there was no statistically significant difference when there were three or more children. We believe that these results can be explained by the following reasons: if the number of children exceeds a certain level, available human resources other than the workers themselves and their spouses may be utilized or workers may choose less demanding jobs. In fact, in the subgroup analysis, of all the women with UWS, none had three or more children.

This study has several limitations that should be acknowledged. First, the cross-sectional nature of the study limits establishing causal relationships between variables. Further longitudinal research is necessary to explore the temporal dynamics and causality of the observed associations. Second, the data collection for the 6th KWCS took place predominantly during the coronavirus disease 2019 pandemic. However, our study was unable to capture the significant changes brought about by the pandemic, which had a profound impact on various aspects of individuals' lives, including work, family dynamics, and social interactions. Future studies should investigate the influence of the pandemic on work-life conflict.<sup>38</sup> Third, while the WFC experienced by parents is closely tied to the age and educational stage of their children, our study did not examine the specific ages of children in detail.<sup>39</sup> We conducted further assessment by categorizing participants according to the number of children under the age of 5 years, but there was no significant difference with the results of classifying the number of children under the age of 18 years. In modern society, work-life balance is a more meaningful concept than WFC, as the number of individuals who do not form a family has increased; however, this study did not examine this aspect. Therefore, further research on work-life balance would be prudent. Despite these limitations, we believe that our study holds value as the first Korean research endeavor to examine the impact of UWS on WFC and its implications for workers' quality of life.

## CONCLUSIONS

In this analysis of extensive national data, we discovered a strong association between UWS and WFC. This association was continuously observed even after controlling for other factors such as age, education, monthly salary, marital status and child status, and job-related

characteristics in both men and women. Policy measures should be prepared for UWS to prevent negative effects on workers, promote a healthier work-life balance and foster a conducive environment for family responsibilities.

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