The actual–ideal gap in work–life balance and quality of life among acute care ward nurses

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ABSTRACT

Aims To describe the current situation of the work–life balance gap among acute care ward nurses and assess its association with quality of life (QOL).

Background Nurses who spend more time at work than on their personal lives are reported to have lower QOL. To capture the actual–ideal work–life balance gap among nurses with different backgrounds, time spent on work, family, and private life must be examined.

Methods This cross-sectional study included 228 nurses from 3 Japanese acute care hospitals.

Results Work gap scores and family gap scores for nurses living alone were significantly higher and lower, respectively, than those for nurses living with family. Moreover, the QOL score decreased with increase in the work–life balance gap for nurses.

Conclusions Nurses living alone had greater work burden than nurses living with family. Conversely, living with family may protect nurses' family lives. The work–life balance gap was associated with QOL.

Implications for Nursing Management Addressing the gap between the actual–ideal proportions in work–life balance is important for improving nurses' QOL and work–life

balance. Flexible working options and policy changes may also improve their work–life balance and QOL.

Keywords: Work–life Balance; Quality of Life; Nurses; Occupational Health; Work Environment

INTRODUCTION

Nurses work in harsh working environments; their jobs are demanding and stressful (Al-Homayan, Shamsudin, Subramaniam, & Islam, 2013). Shift work imposes irregular life rhythms on nurses (Shiffer et al., 2018). Nurses have a heavy responsibility for their patients' lives. Such an environment threatens their health, which can manifest as suicide (Davidson, Proudfoot, Lee, Terterian, & Zisook, 2020), burnout (Woo, Ho, Tang, & Tam, 2020), fatigue (Kagamiyama et al., 2019), and musculoskeletal pain (Amiri & Behnezhad, 2020) and contributes to high turnover (Holland, Tham, Sheehan, & Cooper, 2019). Although there are various problems in nurses' working environments, recent research has focused on work–life balance. Work–life balance is defined as "the individual perception that work and non-work activities are compatible and promote growth in accordance with an individual's current life priorities" (Kalliath & Brough, 2008). Poor work–life balance is negatively related to job satisfaction and motivation; private life satisfaction; stress coping ability; annual

leave acquisition rate; and work-related factors, including job title, working unit type, and work-shift type (Kowitlawkul et al., 2019; Makabe, Takagai, Asanuma, Ohtomo, & Kimura, 2015; Tanaka, Maruyama, Ooshima, & Ito, 2011). Moreover, global nursing shortages have become a serious issue (Drennan & Ross, 2019). A previous report estimated a needs-based shortage of approximately 9 million nurses and midwives in 2016 (Scheffler et al., 2016). An increase in a nurse's workload by even one patient increases inpatient mortality (Aiken et al., 2014) and may inflict both physical and mental burdens on nurses.

Nurses' quality of life (QOL) affects patient safety (Arakawa, Kanoya, & Sato, 2011), nurses' health status (Joslin, Davis, Dolan, & Clark, 2014; Oyama & Fukahori, 2015), burnout and high turnover rate (Lee, Dai, & McCreary, 2015), and perceived work ability among nurses (Chiu et al., 2007; Milosevic et al., 2011). Thus, improving nurses' QOL is important for providing high-quality patient care and improving health status and burnout and turnover rates among nurses. Indeed, some previous studies have reported an association between work–life balance and QOL among nurses (Askari et al., 2019; Kowitlawkul et al., 2019; Makabe et al., 2015). Therefore, improving work–life balance among nurses may improve their QOL.

A lower QOL was reported in nurses spending more time on work than on their private lives (Askari et al., 2019; Kowitlawkul et al., 2019; Makabe et al., 2015). However, these studies compared only actual work–life balance and QOL among nurses. Some people enjoy spending more time on work than on their private life, whereas it may be the opposite for others. Therefore, merely evaluating the relationship between the actual time spent on work–life and QOL is insufficient. Individual perceptions regarding the gap between the time actually spent versus the time that should ideally be spent on work–life (i.e., work–life balance gap) should be evaluated to assess the association between the work–life balance gap and QOL. Moreover, nurses living alone and nurses living with family have different dimensions of life, implying they are at different stages of their careers and have different values, expectations, and needs for their lives. Although the nature of differences in work–life balance between nurses living alone and nurses living with family must be clarified, no studies on work–life balance have focused on nurses living alone and with family. Moreover, considering that these nurses live in different dimensions, the categories of work and private life do not fully capture the current work–life balance situation among nurses. Research has defined work–life balance as "the balancing act of an individual between the three-dimensional aspects of life, namely, organizational, societal, and personal life, is termed

as work–life balance" (Poulose & Sudarsan, 2014). Therefore, work–life balance must comprise "work," "family (home)," and "private life" rather than just "work and family (home)" or "work and private life."

The present study aimed to examine the gap between the time actually spent versus the time that ideally should be spent on work–life among nurses working in the acute care ward with a particular focus on whether they live alone. The secondary purpose was to assess the association between the work–life balance gap and QOL among acute care ward nurses.

METHODS

Design

We used a cross-sectional, descriptive, and comparative design.

Setting and Participants

This study was conducted with a convenience sample of nurses from three acute care hospitals in the Nagasaki Prefecture, Japan. The study participants were nurses working in the acute care ward. Nurse managers and chief nurses were excluded. Nurses working in operation theaters and outpatient departments were also excluded, because they mainly work daytime shifts.

After selecting three hospitals, we requested research cooperation from the representatives of the nursing departments to which the study subjects belonged at each hospital. After receiving research approval, we asked them to inform the participants about the nature of the study both verbally and in writing and to distribute the self-administered questionnaires. We explained that responses to the questionnaires were voluntary and anonymous and that the questionnaires could not be withdrawn after consent. We presented a seven-day response deadline from the questionnaire-distribution date and requested responses by the due date. The collection box was withdrawn eight days after the distribution date. We distributed the questionnaires to 353 Japanese nurses working in the acute care ward from September to October 2019. Returning completed questionnaires was regarded as voluntary agreement to participate in the study.

Measurements

The questionnaires assessed the following information: (i) demographic factors (e.g., gender, age, marital status, presence of children, living with parents, presence of families who need care, and sleeping time per day); (ii) work–life balance: actual and ideal time spent on work, family (home), and private life; (iii) work-related factors (e.g., nursing experience, working shift type, day and night shifts per month, overtime work

per month, annual leaves, and job motivation); (iv) various types of satisfaction (e.g.,

job satisfaction, family satisfaction, private life satisfaction, and work–life balance

satisfaction); and (v) QOL.

Nurses living alone or with family

The burden of family (home) life and support from family vary depending on

whether a nurse is living alone or with family and has time to devote to work and/or

private life. Nurses who live alone, are unmarried, and have no children empirically

appear to have a greater workload than nurses who live with family. Nurses living with

family have the responsibility of caring for their children and family members with

health problems and performing housework. Conversely, some nurses who live with

family can more easily get support from their family than nurses living alone.

Therefore, this study attempted to analyse the participants by categorizing them into

nurses living alone and nurses living with family. Following the responses regarding

marital status, presence of children, living with parents, and/or the presence of families

who require care, the participants were categorized as either nurses living with family

(if at least one of these categories applied) or nurses living alone.

<u>Actual and ideal work–life balance</u>

Actual work–life balance was measured among acute care ward nurses using the item, "Please indicate the proportion of time spent on work (e.g., working hours and overtime work), family (e.g., housework, childcare, and nursing care for the elderly), and private life (e.g., personal time excluding work and family time without sleeping time) in the past month. Answer with numbers as integers that sum up to a total of 10." Thus, the total proportions for actual work, family, and private life summed to 100%, as did their ideal proportions. Although we divided "private life" into "family (home)" and "private life," a similar procedure has been applied by other researchers (Kowitlawkul et al., 2019; Makabe et al., 2015). The work gap between the actual and ideal proportions of work was calculated as the proportion of actual work minus ideal work. If the participants answered "6" as the actual work proportion and "4" as the ideal work proportion, the work gap score became +2. The same calculation was applied to family and private life. The work, family, and private life gap scores ranged from −10 to +10. A positive score indicates greater actual time spent than is ideal, and a negative score indicates lesser actual time spent than is ideal. No gap (i.e., 0) indicates the ideal balance between work, family, and private life. For example, the score can vary from +10 (i.e., respondents spend more time at work than is ideal) to −10 (i.e., respondents are not spending the

ideal amount of time at work). Zero indicates that the actual and ideal times spent at work are

the same. Then, the work–life balance gap score was calculated by the summation of the

absolute values of these gap scores (ranging from 0 to 20), with higher scores indicating

a greater gap (see Appendix, Figure S1). We also calculated the percentage of nurses

who reported equivalent actual to ideal proportions of work, family, private life, and

work–life balance (i.e., fit-rate of work, family, private life, and work–life balance,

respectively).

Satisfaction score

The various types of satisfactions (job satisfaction, family satisfaction, private

life satisfaction, and work–life balance satisfaction) were measured on a four-point

Likert scale (1 = very unsatisfied, 2 = mostly unsatisfied, 3 = mostly satisfied, 4 = very

satisfied) as performed previously (Makabe et al., 2015; Hancke et al., 2014). A higher

score indicates higher satisfaction.

Quality of life

We used the Japanese version of the World Health Organization Quality of Life

scale (WHOQOL-BREF) (Tazaki & Nakene, 2007) to measure QOL among nurses.

This instrument is derived from the WHOQOL-100 (Power & Kuyken, 1998). The

WHOQOL-BREF questionnaire contains two items for overall QOL. The other 24

items are divided into 4 domains: physical health (7 items), psychological health (6

items), social relationship (3 items), and environmental domain (8 items). Each item

was rated on a five-point Likert scale ranging from 1 to 5 points, and a median was

calculated for each domain. The total QOL score was calculated based on the averages

of the 26 items. A higher total QOL score indicates a better QOL. Here, the Cronbach's

alpha of the total QOL score was 0.92, and the Cronbach's alpha for each subscale was

as follows: overall (0.71), physical (0.76), psychological (0.80), social relationship

(0.61), and environmental (0.79).

Statistical analysis

We entered data from the collected questionnaires into Microsoft Excel

(Microsoft Office 2019, Microsoft Corporation, Redmond, WA). Data were then

analysed using Stata MP (Version 15.1: Stata Corp, College Station, TX). The chi-

square test was used to analyse the categorical variables. Two-sample Wilcoxon rank-

sum test and Spearman's rank-order correlation test were used to analyse the

quantitative variables. All tests were two-tailed; the significance level was set at 5%.

RESULTS

Of the 353 Japanese nurses working in the acute care ward to whom we administered questionnaires, 294 (83.2%) completed the questionnaire survey. We discarded 42 questionnaires with missing data and 13 with unrealistic answers, resulting in a total of 228 for the final analysis (effective response rate = 64.5%).

Participant characteristics

Table 1 shows the participants' characteristics and differences between nurses living alone and nurses living with family. Nurses' median age was significantly different, with nurses living alone being approximately five years younger than nurses living with family (z = −3.493, p < .001). Nursing experiences were significantly different, with nurses living alone having approximately four years less experience than nurses living with family (z = −3.144, p = .002). The number of day shifts per month differed significantly between groups.

Satisfaction scores

Table 2 compares various satisfaction scores between nurses living alone and nurses living with family. A significant difference was found between the groups only for family satisfaction (z = −2.808, p = .005). Detailed results are shown in Table 2.

Quality of life

Table 3 compares QOL between nurses living alone and nurses living with family. There were no significant differences in any of the Japanese-version WHOQOL-BREF subscales or total QOL scores. Detailed results are shown in Table 3.

Fit-rate of work, family, private, and work–life balance between actual and ideal proportions

Table 4 shows the rates for nurses living alone and nurses living with family who reported equivalent actual and ideal proportions of work, family, private life, and work–life balance. Although the work fit-rate among nurses living alone was lower than that among nurses living with family, there was no relationship between the two groups ($\chi^2(1) = .938$, $p = .333$). The family fit-rate was significantly related to whether the nurses lived alone or with family ($\chi^2(1) = 6.317$, $p = .012$).

Work, family, private and work–life balance gap

Figure 1 shows the gaps between the actual and ideal proportions of work, family, private life, and work–life balance in nurses living alone and nurses living with family. Assuming 6–8 hours of sleep, the characteristics of nurses who showed work gap outliers of $\geq +4$ were nurses who wanted to work only 3–5 hours. The characteristics of nurses who showed family gap outliers of $\geq +2$ were nurses living with family whose actual time spent with their families was as high as 8–14 hours.

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Conversely, the characteristics of nurses who showed family gap outliers of ≤ −3 were

nurses living with family who spent less time with their families (0–3 hours). The work

gap scores for nurses living alone (*Mdn* = 2, *IQR* [1, 2]) were significantly different

from those for nurses living with family (*Mdn* = 1, *IQR* [1, 2], z = 2.076, p = .038). The

family gap scores for nurses living alone (*Mdn* = −1, *IQR* [−1, 0]) were significantly

different from those for nurses living with family (*Mdn* = 0, *IQR* [−1, 0], z = −2.946, p

= .003). No significant difference was observed for the private life gap between nurses

living alone (*Mdn* = −1, *IQR* [−2, 0]) and nurses living with family (*Mdn* = −1, *IQR* [−1,

−1], z = .443, p = .658). Additionally, no significant difference was observed for the

work–life balance gap between nurses living alone (*Mdn* = 4, *IQR* [2, 4]) and nurses

living with family (*Mdn* = 4, *IQR* [2, 4], z = 1.706, p = .088).

<u>Work–life balance gap and quality of life</u>

The relationship between work–life balance gap scores and the Japanese-version

WHOQOL-BREF subscales and total QOL scores was tested using Spearman's rank-order

correlation test. The QOL scores decreased as the work–life balance gap score increased. The

results of the Spearman rank-order correlation coefficient were as follows: overall (r_s = −0.26, p

< .001), physical (r_s = −0.20, p = .002), psychological (r_s = −0.24, p < .001), social relationship

($r_\text{s} = -0.16$, $p = .014$), environmental ($r_\text{s} = -0.28$, $p < .001$), and total QOL score ($r_\text{s} = -0.27$, $p < .001$).

DISCUSSION

This study investigated the current situation of work–life balance and assessed the association between the work–life balance gap and QOL among acute care ward nurses, particularly focusing on whether the nurses were living alone. Our results demonstrated substantial differences in the work–life balance characteristics between nurses living alone and nurses living with family.

Results showed that the family fit-rate was significantly different, with nurses living with family having a higher percentage of no gap than nurses living alone. Meanwhile, the private life fit-rate was lower among nurses living with family than among nurses living alone; however, the difference was not significant. As a whole, the percentage of nurses living with family who reported equivalent actual and ideal proportions of work–life balance (i.e., work, family, and private life) was as low as 1.8%. A previous study showed that the work–life balance fit-rates between the actual and ideal work–life balance were 36% in the 50/50 (work/life) and lower group, 5% in the 60/40 group, 1% in the 70/30 group, and 1% in the 80/20 and higher group (Makabe

et al., 2015). This study did not report the fit-rate of the entire study population;

however, using reproducible data from the paper, the fit-rate of the entire study

population was calculated as approximately 13.6%, and the work–life balance fit-rate in

this study was 3.9%. This difference may have occurred because of categorizing work–

life balance into three; consequently, the number of combinations was more in three

categories than in two categories. Therefore, the two-category method may overestimate

the harmonization of work–life balance. The fit-rate among acute care nurses increased

to 8.3% using the two-category method with the data in the current study. We

confirmed that most nurses perceived the presence of a gap regarding work, family,

private life, and work–life balance. These nurses are prone to health problems and may

resign from work because of a poor work–life balance.

We showed that the work gap scores among nurses living alone were

significantly different from those among nurses living with family. This finding

suggests that nurses living alone have a greater burden of work than nurses living with

family. Nurses living alone can use family and private time to balance their work–life

balance gap, because they do not have an equally important role in their family life

except for doing housework. Conversely, the median value of the family gap score

among nurses living with family was zero; they fulfilled family life as they desired. The

gap score was −1 regarding private life, which indicates that nurses spent less time on actual private time than they desired; thus, we speculated that nurses living with family balanced the work gap by sacrificing their private life to secure their family life, because nurses living with family played a relatively important role in their family. In addition, organizational support for flexible working options for nurses living with family and their exemption from night shifts can affect the relatively low work gap, thus protecting their family life. However, nurses living alone did not generally select flexible working options, as shown in Table 1. Flexible working options, such as working part-time, sharing jobs, and making available a range of contracting options, must be implemented for nurses living alone as well (Foster, 2019). A previous study showed that work-schedule flexibility was positively related to emotional exhaustion (Dhaini et al., 2018).

The results showed that there was no significant difference in the work–life balance gap between nurses living alone and nurses living with family. However, these nurses adjusted their work–life balance in different ways. Although there were no differences in the work–life balance gap and QOL between nurses living alone and nurses living with family, the nurses' QOL score tended to decrease as the work–life balance gap score increased. Interventions and policy changes that promote diverse

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ways of working may improve work–life balance and QOL among nurses. These changes may help reverse the current global nursing shortage.

Limitations

This study faced several limitations that should be highlighted. First, although we tried to use new methods to capture the work–life balance gap, it may be difficult to determine the exact actual and ideal work–life balance proportions, because most acute care ward nurses work in shifts. Consequently, we may be unable to grasp the precise situation of actual and ideal work–life balance. Additionally, the new methods used to capture the work–life balance gap have not yet been assessed for reliability and validity. Moreover, some nurses rated their ideal work/family/private life balance as 2/2/6. However, this may not be a realistic or sustainable possibility even if they only hope to work for a few hours. Thus, this measurement may require some restrictions within economical limits, and the actual time spent on work, family, and private life may more accurately be captured by actually recording it. Second, we measured work–life balance using new methods. We conducted this questionnaire survey with small samples. Therefore, we were unable to perform a multivariate analysis to adjust for confounding factors to identify the determinants of the work–life balance gap score and individual gap scores. Moreover, we did not include employee engagement, peer support, and job

outcomes as potential factors influencing the work–life balance gap and QOL in this study. In the future, a large-scale survey must be conducted to better understand the relationship between the work–life balance gap and QOL among nurses.

While interpreting the results of this study on work–life balance, considering the current working environments for nurses in Japan is necessary. According to a survey conducted by the Japanese Nursing Association in 2014 (Japanese Nursing Association, 2014), the majority of Japanese hospitals require nurses to work two rotating shifts. Furthermore, working for shorter hours and part-time work is unusual in Japan. In 45% of 1,674 hospitals, 1 or more nurses had reduced working hours. The average number of nurses that worked for shorter hours was 4.2 of 163.9 per hospital. Research has reported that for nurses with children in Japan, the percentage of "reduction and exemption from the night shift and watch duty" was 33.9%," "leave for sick child" was 18.7%, "flexible work hours" was 15.3%, and "extended childcare leave" was 16.1% (Fujimoto, Kotani, & Suzuki, 2008).

In our study, the Cronbach's alpha for social relationships was relatively low, which is probably because only three variables were included in social relationships. Some researchers have indicated that an alpha ranging from 0.5 to 0.7 shows moderate reliability (Hinton, McMurray & Brownlow, 2014), whereas others have reported that

reliability coefficients less than 0.60 are considered low and indicate limited instrument reliability or consistency in measurement with high random error (Gray & Grove, 2020). In accordance with these studies, we believe that the Cronbach's alpha for social relationships in our study was acceptable.

CONCLUSIONS

We investigated the current situation of work–life balance and assessed the association between the work–life balance gap and QOL among acute care ward nurses using a cross-sectional self-administered questionnaire survey. Results showed that the family fit-rate was significantly different between the two groups, with nurses living with family having a higher percentage of no gap than nurses living alone. Furthermore, the work gap was significantly different, with nurses living alone having a higher work gap score than nurses living with family. However, the family gap was lower for nurses living alone than for nurses living with family. Although there were no differences when we compared the work–life balance gap and QOL between nurses living alone and nurses living with family, nurses' QOL scores tended to decrease as the work–life balance gap score increased.

IMPLICATIONS FOR NURSING MANAGEMENT

These findings imply that nurses living alone have a greater burden of work than nurses living with family. Conversely, nurses living with family protected their family life by sacrificing parts of their private lives and/or their careers. Flexible working options, such as working part-time, sharing jobs, and making available a range of contracting options, must be implemented for both nurses living alone and nurses living with family. Interventions and policy changes that promote diverse ways of working may improve work–life balance and QOL among nurses.

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<u>FIGURE LEGEND</u>

Figure 1 Work, family, private life, and work–life balance gap among nurses living alone and nurses living with family.

The text above each boxplot indicates the gap between the actual and ideal proportions of time spent on work, family, private life, and work–life balance. The work, family, and private life gap scores ranged from −10 to +10. A positive score indicates greater actual time spent than what is considered ideal, and a negative score indicates lesser actual time spent than what is considered ideal. No gap (i.e., 0) indicates that the ideal balance between work, family, and private life has been achieved. The work–life balance gap score was calculated by summing the absolute values of these gap scores, ranging from 0 to 20, with higher scores indicating a greater gap. A comparison of each gap score between nurses living alone and nurses living with family was performed by the Two-sample Wilcoxon rank-sum test, and p-values are presented above the boxplots. * indicates $p < .05$.

Work–Life Balance Gap and QOL

TABLES

Table 1. *Participant characteristics*

Variable	Total		Nurses living alone		Nurses living with family		*p* value
	(*N* = 228)		(*n* = 57)		(*n* = 171)		
Demographic characteristics							
Gender (female), *n* (%)†	216	(94.7)	52	(91.2)	164	(95.9)	.171
Age (years), *median* (IQR)‡	31	(26–40)	27	(24–32)	32	(27–42)	<.001 **
Marital status (unmarried), *n* (%)	140	(61.4)	57	(100)	83	(48.5)	-
Presence of children (no children), *n* (%)	156	(68.4)	57	(100)	99	(57.9)	-
Living with parents, *n* (%)	66	(29.0)	0	(0)	66	(38.6)	-
Work-related characteristics							
Nursing experience (years), *median* (IQR)‡	7	(3–16)	5	(3–9)	9	(4–17)	.002 *
Type of work shift (Full-time worker), *n* (%)	218	(95.6)	57	(100)	161	(94.1)	
Number of day shifts per month, *median* (IQR)‡	10	(8–12)	10	(7.5–11)	10	(8–13)	.038 *
Number of night shifts per month, *median* (IQR)‡	4	(3.5–5)	4	(4–5)	4	(3–5)	.105
Overtime work per month, hours, *median* (IQR)‡	10	(5–13)	10	(5–12.5)	10	(5–13)	.655

Work–Life Balance Gap and QOL

Variable	Total		Nurses living alone		Nurses living with family		p value
	(N = 228)		(n = 57)		(n = 171)		
Number of annual leaves per year, *median* (IQR)‡	5	(5–8)	5	(5–7.5)	5	(5–10)	.095
Sleeping time per day, hours, *median* (IQR)‡	6	(5–6)	6	(5.5–6)	6	(5–6)	.187
Job motivation, *median* (IQR)‡	2	(2–3)	2	(2–3)	2	(2–3)	.518
Hospital, *n* (%)†							
A hospital	73	(32.0)	17	(29.8)	56	(32.8)	.584
B hospital	87	(38.2)	25	(43.9)	62	(36.3)	
C hospital	68	(29.8)	15	(26.3)	53	(31.0)	

Note: IQR denotes interquartile range. Job motivation was rated on a four-point Likert scale ranging from 1–4 points, with higher scores indicating a higher motivation. †*p*-values are for comparisons between nurses living alone and nurses living with family, as assessed by chi-square test. ‡*p*-values are for comparisons between nurses living alone and nurses living with family, as assessed by two-sample Wilcoxon rank-sum test. *$p < .05$; **$p < .001$.

Table 2. *Satisfaction scores*

Variable	Total		Nurses living alone		Nurses living with family		p value
	(N = 228)		(n = 57)		(n = 171)		
Satisfaction scores							
Job satisfaction, *median* (IQR)	2	(2–3)	2	(2–3)	2	(2–3)	.719
Family satisfaction, *median* (IQR)	3	(2–3)	3	(2–3)	3	(2–3)	.005 *

Work–Life Balance Gap and QOL

Variable	Total		Nurses living alone		Nurses living with family		p value
Private life satisfaction, *median* (IQR)	2	(2–3)	2	(2–3)	2	(2–3)	.725
Work–life balance satisfaction, *median* (IQR)	2	(2–3)	2	(2–3)	2	(2–3)	.391

Note: IQR denotes interquartile range. Satisfaction scores were rated on a four-point Likert scale ranging from 1–4 points, with higher scores indicating better satisfaction. *P*-values are for comparisons between nurses living alone and nurses living with family, as assessed by two-sample Wilcoxon rank-sum test. *p < .05.

Table 3. *Comparison of quality of life between nurses living alone and nurses living with family*

Variable	Total		Nurses living alone		Nurses living with family		p value
	(*N* = 228)		(*n* = 57)		(*n* = 171)		
Quality of life							
Overall, *median* (IQR)	3.0	(2.3–3.0)	3.0	(2.0–3.0)	3.0	(2.5–3.0)	.835
Physical, *median* (IQR)	3.1	(2.7–3.4)	3.1	(2.7–3.6)	3.1	(2.7–3.4)	.281
Psychological, *median* (IQR)	2.8	(2.5–3.2)	2.8	(2.7–3.3)	3.0	(2.5–3.2)	.822
Social, *median* (IQR)	3.3	(3.0–3.7)	3.3	(3.0–3.7)	3.3	(3.0–3.7)	.522
Environment, *median* (IQR)	3.0	(2.6–3.3)	3.1	(2.8–3.4)	2.9	(2.6–3.3)	.148
Total QOL score, *median* (IQR)	3.0	(2.7–3.3)	3.0	(2.8–3.4)	3.0	(2.7–3.2)	.338

Work–Life Balance Gap and QOL

Note: IQR denotes interquartile range; QOL, quality of life. QOL scores were rated on a five-point Likert scale ranging from

1–5, with higher points indicating improved QOL. *P*-values are for comparisons between nurses living alone and nurses living

with family, as assessed by two-sample Wilcoxon rank-sum test. *p < .05.

Table 4. *Rate of nurses who reported equivalent actual to ideal proportions of work, family, private, and work–life balance*

| Variable	Total		Nurses living alone		Nurses living with family		p value
	(N = 228)		(n = 57)		(n = 171)		
Work fit-rate, n (%)	19	(8.3)	3	(5.3)	16	(9.4)	.333
Family fit-rate, n (%)	88	(38.6)	14	(24.6)	74	(43.3)	.012 *
Private life fit-rate, n (%)	47	(20.6)	15	(26.3)	32	(18.7)	.219
Work–life balance fit-rate, n (%)	9	(3.9)	1	(4.7)	8	(1.8)	.326

Note: Fit-rate indicates the rate of nurses who reported equivalent actual to ideal proportions of work, family, private life, and work–

life balance. *P*-values are for comparisons between nurses living alone and nurses living with family, as assessed by chi-square test. *p

< .05.

Work–Life Balance Gap and QOL

Figure 1 Work, family, private and work–life balance gap between nurses living alone and nurses living with family
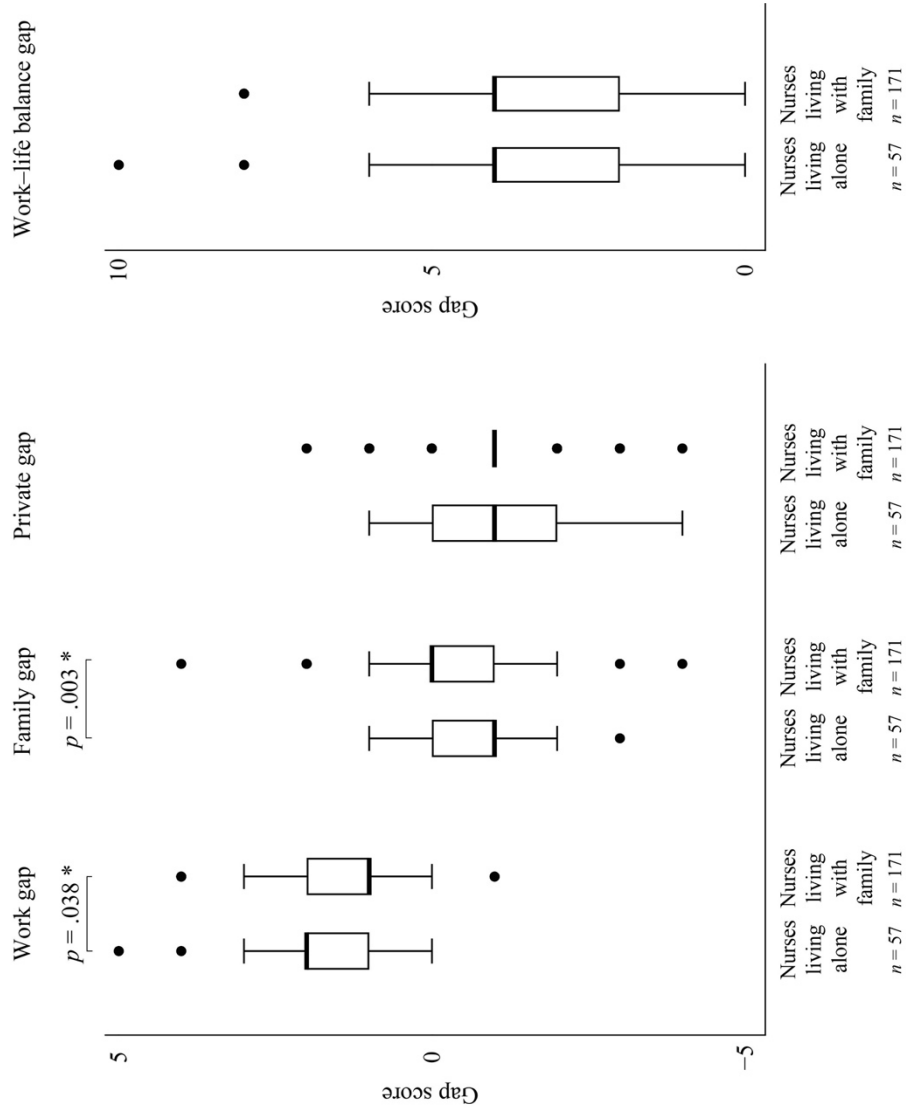
Work–Life Balance Gap and QOL

Figure S1 Procedures to calculate work gap, family gap, private gap and work–life balance gap

A. actual work–life balance

Please indicate the proportion of actually time spent on work, family (home) and private life in the past month.
Answer with numbers as integers that sum to a total of 10. the total proportions for actual work, family, and private life summed to 100%

a1. Time spent on work (e.g., working hours, overtime work, time for self-study as needed to perform the work)
a2. Time spent on family/home (e.g., housework, childcare, nursing care for elderly)
a3. Time spent on private life (e.g., personal time excluding work and family time without sleeping)

I. ideal work–life balance

Please indicate the proportion of ideally time spent on work, family (home) and private life in the past month.
Answer with numbers as integers that sum to a total of 10. the total proportions for ideal work, family, and private life summed to 100%

i1. Time spent on work (e.g., working hours, overtime work, time for self-study as needed to perform the work)
i2. Time spent on family/home (e.g., housework, childcare, nursing care for elderly)
i3. Time spent on private life (e.g., personal time excluding work and family time without sleeping)

e.g.) Procedures to calculate work gap, family gap, private gap and work–life balance gap

	actual work–life balance		ideal work–life balance					
Work	a1 (6)	−	i1 (4)	=	Work gap	g1 (+2)	
Family	a2 (3)	−	i2 (3)	=	Family gap	g2 (0)	
Private Life	a3 (1)	−	i3 (3)	=	Private gap	g3 (−2)	

Summing the absolute values of each gap scores

$$| +2 | + | 0 | + | -2 | = \text{Work–life balance gap} (+4)$$
$$\text{g1} \quad\quad \text{g2} \quad\quad \text{g3}$$