

A cross-sectional study of the relation between routines for shift work scheduling and sickness absence at a Norwegian hospital.

Abstract

Background: Shift work is associated with increased health problems. Knowledge about how a “healthy schedule” should look like to prevent negative health issues is essential, but also the workplace routines for planning for a shift work schedule are important. This affects the work-life balance as much as social well-being for the employees.

Aim: The aim of the present paper is to describe the association between organizational units' routines for shift-work scheduling and sickness absence among nurses when controlling for the average level of burnout, average age and proportion of women on each unit.

Participants: The survey was sent out to the leaders of all 210 units at OUS with nurses working shift work schedule. 160 responded. All personal records data used in this study are at unit level; mean percent sickness absence, mean age of nurses, mean percent female staff, - and mean score at the burnout scale from employee survey.

Methods: The study used a cross-sectional survey design. Data was collected Jan- Feb 2020. The survey data was merged with data from - organizational units' including average age of employees in the unit, ratio female nurses, and units' average score on the burnout construct from the employee survey conducted during three weeks in March in 2019.

Results: The factors “Health promotion scheduling”, “Health education/ physical activity” and “operational considerations” had no observed total effect on mean sickness absence. Only individual adjustment in shift work scheduling had a large direct negative effect, and a small positive effect on burnout, entailing a total negative correlation of medium to large size ($b = -.26$) on mean sickness absence at unit level.

Conclusions: There is a relationship between the units' routines for shift work scheduling and mean sickness absence at the unit. In some way the hypothesis assuming that increased individual adjustment would lead to sickness absence is correct. Individual adjustments increases burnout at the unit and burnout increase sickness absence in the long run. However,

when the direct effect and the overall total effect are accounted for, the result is that individual adjustment reduces sickness absence. This might support that you can't only follow the guidelines for a "healthy- schedule", it has to be a balance between that and individual adjustment.

Contribution of the paper

What is already known?

- Numerus of studies conclude that shift work has negative impact on people`s health.
- Shift work can cause burnout, which can lead to sickness absence.

What does this paper adds:

- There is a relationship between the units` routines for shift work scheduling and sickness absence. Levels of individual adjustments have the highest effect towards the units` mean sickness absence.
- Mean higher age at the unit results in less burnout. This probably due to the healthy worker effect.
- There is a relationship between the units` level of burnout and sickness absence.

Keywords

Health promotion, shift work schedule, sickness absence, nurse.

Search performed in Oria, PubMed, Google scholar, Embase.

1. Introduction

Shift work is associated with increased health problems (Garde et al., 2020). The nursing workforce is the most numerous group of healthcare workers (OECD, 2018), and therefore contributes in a large amount to the healthcare system and the hospital resource management (Aiken et al., 2011). It is crucial that nurses maintain health to stay in their profession to the optimal end of their professional carrier. Knowledge about how a “healthy schedule” should look like to prevent negative health issues is essential, but also the workplace routines for planning for a shift work schedule are also important (Flo et al., 2013). This affects the work-life balance as much as social well-being for the employees (Garde et al., 2020).

Sickness absence can be defined as “absence of paid work due to illness”(Pedersen, Mæland, & Bruusgaard, 2019). Research has shown that sickness absence depends directly on the employees` physical health, but also on how different individuals cope with their health issues (Allebeck & Mastekaasa, 2004). Healthcare workers have a higher level of sickness absence than other professions. According to SSB, in the first quarter of 2021 the average sickness absence was 5.9%, while the health care sector had a sickness absence of 8.7% (Statistisk sentralbyrå, 2021).

Shift work is defined as working ours that differs from traditionally working ours daytime, i.e. between 7:00 am and 6:00 pm Monday to Friday (Mikalauskas, 1994). A total of **63.8%** of nurses in Norway work in some form of shift work (SSB, 2019). Shift work has negative effect on nurses` health and in recent years a number of studies have linked negative health issues to shift work, and then especially to night shifts (Flo, Magerøy, Moen, Pallesen, & Bjorvatn, 2011; Lien, Pallesen, Bjorvatn, & Moen, 2014; Reknes et al., 2014; Thun et al., 2017; Øyane et al., 2013). Nevertheless, research also indicates that a well-planned shift work schedule can reduce the risks for developing health issues related to shift work (Hassel, 2018, p. 78; Waage et al., 2021).

A systematic review by Merkus et al. (2012) found strong support for a relationship between fixed evening shifts and long term sick-leave for female healthcare workers. Regarding rotating shifts and night shifts- the findings were inconclusive (Merkus et al., 2012). A positive correlation exists between working three- shift rotation and sickness absence among Norwegian women (Lien et al., 2014).

There is a well-documented relationship between weeks with many working hours (≤ 50 h. a week) and higher risk for heart conditions (Virtanen et al., 2012). Several studies also support higher risk of miscarriage and early labor when working >50 h. a week (Bonde, Jørgensen, Bonzini, & Palmer, 2013). Some studies found increased risk for developing diabetes for persons with low economic status (Kivimäki et al., 2015). Reduced total amount of sleep occur more often when working many hours a week (Litwiller, Snyder, Taylor, & Steele, 2017). Quick returns, which means working evening and then daytime the next day often result in few hours of rest between the shifts, reduces sleep length, more disturbed sleep and increased feeling of burnout and sleepiness (Vedaa et al., 2016).

Both fixed - and rotating night shifts- are linked to several negative health outcomes (Bernstrøm & Ellingsen, 2018; Lie, Gulliksen, Bast-Pettersen, Skogstad, et al., 2014). There is well documented that there is a relationship between nightshifts and heart conditions, cancer, as well as depression (Angerer, Schmook, Elfantel, & Li, 2017); Lie, Gulliksen, Bast-Pettersen, Marit, et al. (2014); (Wang et al., 2015). Forward rotating shifts (i.e. day – evening- night) is more beneficial for the employees' quality of sleep than backward rotating shifts (Vedaa et al., 2016).

1.1 Health promotion related to shift work scheduling

To organize shift work in an optimal way, it is necessary to have knowledge about the possible health consequences of different kind of shift schedules (Bernstrøm, Ellingsen, Alves, & Ingelsrud, 2019). OUS have started to focus on so-called “healthy scheduling”. In this paper that means planning for a schedule that will affect the employees' health negatively as little as possible, based on existing research on the field (Bernstrøm et al., 2019; Garde et al., 2020; Kleiven, 2018).

This study take into account the following variables from the survey; “healthy scheduling”, “organizational health measures”, “planning for shifts requirements” and “the possibility for individual adjustments” when looking at the relationship between the units` routine for shift work scheduling and sickness absence.

1.1.1 Healthy scheduling

As more research started to focus on the relationship between shift work and health in the healthcare sector, guidelines regarding how to plan a healthy schedule were made for nurses. A healthy scheduling- means and schedule that is planned so the impact on your health will be as little as possible. Norges sykepleierforbund (NSF) the largest union of nurses in Norway has composed guidelines based on existing research in the field (Kleiven, 2018):

- As few different types of shifts as possible during the week.
- Numbers of shifts should not exceed your job percentage.
- Forward rotating shifts.
- As few nightshifts as possible in a row, never more than three, preferably no more than two.
- Always 24 hours off after nightshift.
- The length of the shifts should not be more than eight hours, especially at nightshifts.
- The shift handovers in the morning should not be before 07 am.
- As many weekends off as possible.

1.1.2 Organizational health measures

When working nights, the employee has the right to get a healthcare follow-up by a physician from the Occupational Health service at the hospital (Arbeidstilsynet, 2005). There is also recommended that the employees get the opportunity to implement a routine for a physical active break during the shift to maintain awakening and prevent muscle- and skeletal disorders related to work. Lie and colleges (2014) concluded that there were few studies on the field that looked at muscle- and skeletal disorders related to shift work, but found some higher risk for subjective pain when working shifts and nights (Lie, Gulliksen, Bast-Pettersen, Skogstad, et al., 2014). The theory is that allowing nurses to take breaks to do easy training/physical exercise will reduce muscle- and skeletal problems.

1.1.3 Planning for shift requirements

The national regulations set restrictions like that there is sufficient rest between shifts, regulations for numbers of days off before and after night shifts, when working weekends and numbers of nights in a row are some of the key requirements. Additionally there are several local agreements between the hospital and the employee unions that deviate from the national regulations, e.g. exception from hours of rest, length of shifts and total amount of working hours.

1.1.4 Possibility for individual shift work rotation

WHO defines empowerment as a process of enabling people to gain greater control over decisions and actions affecting their health (WHO, 1986). There is a distinction between individual and community empowerment. Individual empowerment refers primarily to the individuals' ability to make decisions and have control over their life (Smith, Tang, & Nutbeam, 2006). The term conducts the individuals' ability to have real influence in cases that affect their life in any way, that your opinions are taken into account before decision making is being done (Green, Tones, Cross, & Woodall, 2008, p. 30). However, this requires that the employees understands what is good for them (Green et al., 2008, pp. 92-95).

For many years shift work scheduling in the healthcare sector has been about urging the employees to design and plan their own schedule. Experience indicates that in some cases the employees plan a schedule that might have negative impact on their health, especially in the long run (Garde et al., 2020). One can handle it for a while, but after a couple of years one might notice that the health is reduced in some way (Garde et al., 2020).

Empowerment has been linked to important nursing outcomes such as job satisfaction, commitment, prevention of burnout, and nurses perceptions of respect and fairness (Spence Laschinger, Wong, & Greco, 2006). Studies show that job- satisfaction among nurses is linked to their experience of empowerment (Matthews, Spence Laschinger, & Johnstone, 2006). Lack of organizational empowerment may therefore lead to lower job- satisfaction. A study from 2019 looked at the relationship between job- satisfaction and quality of sleep among nurses working shifts. They concluded that employees with high levels of job- satisfaction experienced higher quality of sleep (Chang & Chang, 2019). Quality of sleep is one of the main reasons for poorer health among shift- workers (Øyane et al., 2013).

1.2 Factors affecting sickness absence

1.2.1 Gender and age

Women in general have a higher level of sickness absence compared to men. According to the SSB, the first quarter of 2021 women had 7.6 % average sickness absence compared to men at an average of 4.4 % (Statistisk sentralbyrå, 2021). It is an association between fixed evening work and sickness absence among female healthcare workers (Merkus et al., 2012).

Sickness absence increases with age, and older employees have higher levels of sickness absence than their younger colleagues` (Houkes & Bernstrøm, 2020). A study that looked at shift work and sickness absence at a Norwegian hospital, found that older employees that worked shifts, and especially three - shift rotations had higher risk for sickness absence (Houkes & Bernstrøm, 2020). A review from 2011 looked at the difference in individual tolerance to shift work, including age. They found that in most studies younger people coped with shift work better than the elderly. In some studies older employees tolerated shift work better, but these studies concluded that there was a possibility for selection effect in these studies (Saksvik, Bjorvatn, Hetland, Sandal, & Pallesen, 2011).

1.2.2 Burnout

Shift work is a stressor associated with reduced health and has a negative impact on mental and physical fatigue (Øyane et al., 2013). Burnout, defined as a work- related stress syndrome when one is experiencing symptoms of exhaustion towards work, is an important factor when studying elements that affect sickness absence (Peterson et al., 2011). Burnout can be caused by lack of balance between job-demands and job- resources with high levels of demands and fewer resources (Arnold B. Bakker, Demerouti, & Euwema, 2005; Arnold B. Bakker, Demerouti, & Verbeke, 2004; Arnold B. Bakker & Evangelia Demerouti, 2007). According to Bakker et al. (2014) burnout is a syndrome that encompasses exhaustion and cynicism as its core dimensions (A. B. Bakker, Demerouti, & Sanz-Vergel, 2014). Research has shown that burnout leads to poor physical health and thereby increased sickness absence (A. B. Bakker et al., 2014). Those suffering from burnout have a higher probability of developing illness (Van Doornen et al., 2009). There are many studies that have looked at what cause burnout, but not that many have studied burnout with the purpose of study if it leads to sickness absence (Toppinen-Tanner, Ojajärvi, Väänäänen, Kalimo, & Jäppinen, 2005).

Hypotheses

The aim of the present paper is therefore to describe the association between organizational units` routines for shift- work scheduling and sickness absence among nurses when controlling for the average level of burnout, average age and proportion of women on each unit. To these ends the following hypotheses are tested:

H1. Operational considerations when planning the shift work schedule, is negatively correlated to the units` average sickness absence.

H2. Offering health education regarding sleep and circadian factors and/or elements of physical activity during shifts is negatively correlated to the units` average sickness absence.

H3. High levels of individual adjustments when planning the shift work schedule, is positively correlated to the units` average sickness absence.

H4. Following the guidelines for «healthy scheduling», is negatively correlated to the units` average sickness absence.

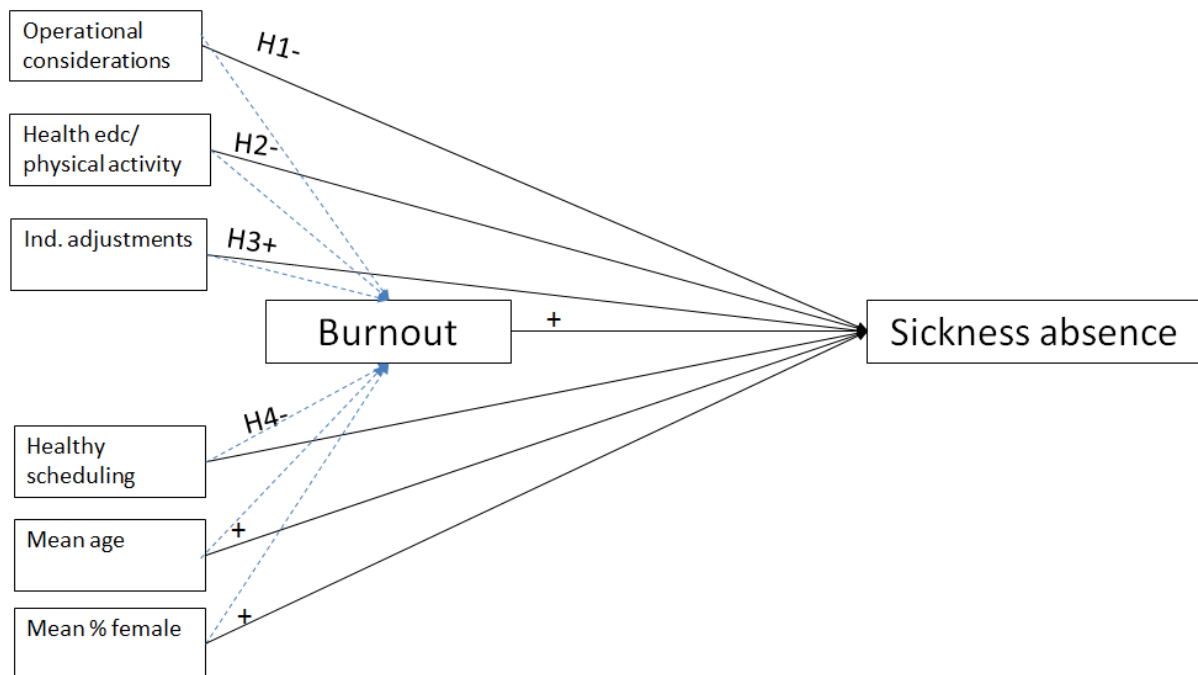


Figure 1: Path analytic model indicating the research hypotheses including burnout as a control variable and the direction of the covariates based on existing research.

2. Methods

2.1. Design

The study used a cross-sectional survey design. Data was collected January to February 2020. The survey data was merged with data from – the organizational units` including average age of employees in the unit, ratio of female nurses, and the units` average score on the burnout construct from the employee survey conducted during three weeks in March in 2019.

2.2. Participants

The survey was sent out to the leaders of all 210 units at OUS with nurses working shift work schedule. All personal records data used in this study are at unit level; mean percent sickness absence, mean age of nurses, mean percent female staff, - and mean score at the burnout scale from the employee survey.

2.3. Measures

2.3.1. Survey

The survey was sent as a Quest back questionnaire attached in an email with information about the ongoing study. The survey was open for three weeks; weekly reminders were sent to those who had not answered.

The survey consisted of two parts. Part 1 contained eight categorical answers, yes/no, part 2 five constructs with two to five questions each. Part 2 was answered using five-point likert scale denoting the extent that leaders agreed/disagreed with individual statements. The answers had a five- point range scale. All answers had to be filled out before moving along in the survey, so there were no problems with missing data from the survey.

2.3.2. Sickness absence and demographics at unit level

This study used average percentage of sickness absence for each unit in the time period January – to December 2019. As demographic data average age of employees at the unit and percentage of female employees at each unit in December 2019 were used.

2.3.3. Burnout measures from employee survey

Indicators of the burnout construct were taken from the 2019 OUS employee survey “ForBedring”. The three questions were: “My work is straining me emotionally”, “I feel exhausted because of my work” and “I feel discouraged at work and often think about quitting”. The average score of the employees` answers was used as an indicator of the average level of burnout in each organizational unit.

2.4. Ethics

The handling of person identifying data was approved by the Norwegian center for data research, project number 168481, as well as by the data protection officer at OUS and at USN. All participants filled out an informed consent form in accordance with Norwegian regulations for social science research.

2.5. Analyses

IBM Statistical Program for the Social Sciences - SPSS version 25 was used for all statistical analyses.

3. Results

A total of 72% (N=160) of the leaders responded to the survey. 30 units had to be removed prior to analyses, because sickness absence was not registered at the level of the individual unit. N=130 was used as basis for the analyses.

3.1. Principal component analyses

To enable the components to correlate, a principal component analyses with oblique rotation was performed. A factor loading above .63 is considered to be very good (Tabachnick & Fidell, 2007). The loading of the factors are shown in table 2. The following variables were concluded from the principal component analyses, “Operational considerations”, “Health education/physical activity”, “Individual adjustments” and “Healthy scheduling”.

Table 1

The results of the principal component analyses. Factors scores lower than .30 has been removed from the table.

Survey questions	Oper. Consid	H. Edu/phy act	Ind. Adj.	HPS
Suitability	.790			
Competence	.739			
Care burden at the unit	.718			
Healthcare follow up for employees working rotating shifts		.868		
Healthcare follow up for employees working 50 % night shifts		.854		
Elements of physical activity during shifts		.584		
Schedule planned entirely by the employee			.852	
Ind. adjustments for each employee	.307		.787	
Not more than 2 nights in a row			.488	.435
Maintaining percent of employment				.695
Fewest possible evening/day shifts				.681
Avoid frequent rotation				.636

Notes: Abbrev.: SA=Sickness absenteeism, Oper.Consid=Operational Considerations, H. Edu/Phy act = Health education or Physical Activity, Ind. Adj. = Individual Adjustment, HPS=Health promoting Scheduling

After the final component structure was established, regression factors scores were saved and later used in multiple regression analyses as part of the path analyses.

Naming of effect sizes as «small», «medium» and «large» follows Cohen’s (1992) convention (Cohen, 1992).

3.2. Correlation Matrix and Cronbach’s alpha

The correlation between the variables is shown in table 1. Most notable, is the medium size negative correlation, between individual adjustment and average unit sickness absence in percent ($r=-.267$) indicating that higher levels of individual adjustment at the unit was related to lower sickness absence. Interestingly there was a medium size negative correlation ($r=-.368$) between mean age at units and the burnout level, indicating that there might be a “healthy worker effect” (Shah, 2009) present in the dataset.

High levels of individual adjustments are positively correlated to burnout. And burnout positively correlated to sickness absence at the unit.

The variable “mean age” correlates negatively to burnout and “mean percentage females at the unit” correlates positively.

Table 2.

Correlation matrix with Cronbach’s alpha for all study variables.

	(n)	M	SD	1	2	3	4	5	6	7
1 Mean % SA	130	8.94	3.31							
2 Oper. Consid	130	3.88	0.81	-.038	(.63)					
3 H edu phy act	130	1.78	0.97	-.037	.076	(.66)				
4 Ind. Adj	130	3.23	0.92	-.267**	.215*	.095*	(.60)			
5 HPS	130	3.65	0.68	-.050	.249	.134	.225*	(.55)		
6 Mean % females	130	79.25	24.54	.003	.054	-.037	.182*	.074		
7 Mean age	130	39.37	6.08	.063	-.205*	.205*	-.083	-.190*	.075	
8 Burnout	126	31.7	9.2	.032	.182*	-.180*	.177*	.071	.026	-.368**

Notes: Pearson’s correlations between the variables and Cronbach’s alpha (α) for each scale (marked in brackets) are shown in the table. Number of units (n). Mean (M), Standard deviation (SD), Abbrev.: SA=Sickness absenteeism, Oper.Consid=Operational Considerations, H. Edu/Phy act = Health education or Physical Activity, Ind. Adj. = Individual Adjustment, HPS=Health promoting Scheduling, * $p<.05$, ** $p<.01$

3.3. Sickness absence at the unit and routines for shift- work scheduling

As illustrated in figure 2, a path analyses was calculated with “Operational considerations”, “Health education/physical activity”, “Individual adjustments” and “Healthy scheduling”. Average score at the units’ result in “burnout” from the employee survey was used as a moderating variable and the units` average sickness absence as the outcome variable.

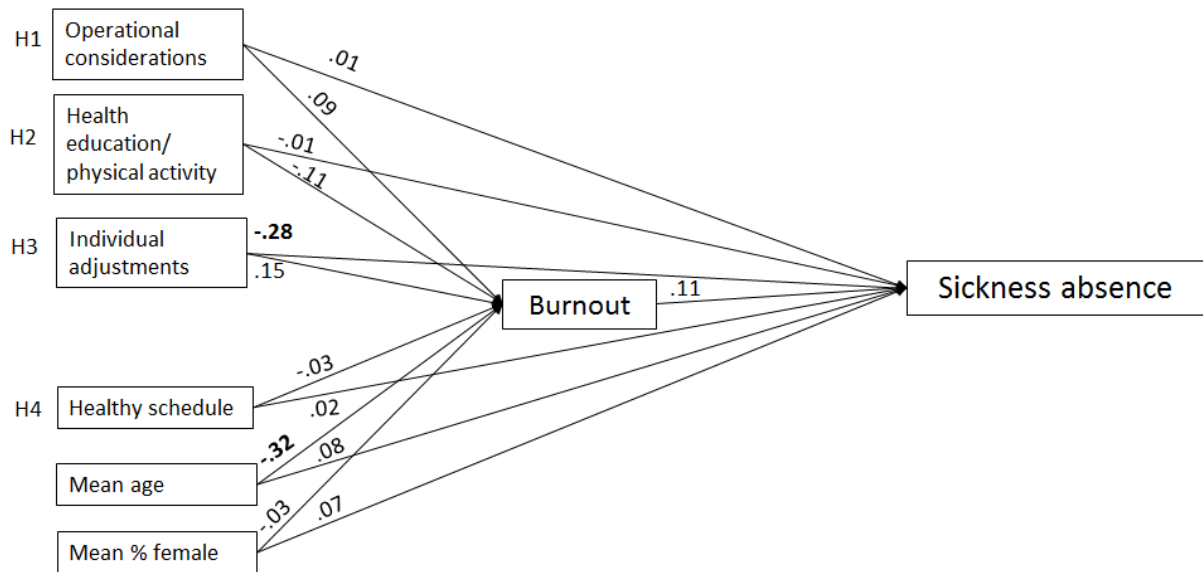


Figure 2: Path analyses – model that shows the directions of the results of the hypothesis.

Table 3

Indirect- and total effect towards sickness absence at unit level.

Ind. variable	Coefficients (95% CI)			
	Direct effects from scheduling and demographics on Burnout	Direct effects from scheduling and demographics on SA	Direct effects of burnout on SA	Total effect
Oper. Consid	.09 (-0.08, 0.27)	.01 (-0.19, 0.21)	.01	.01
H edu phy act	-.11 (-0.29, 0.06)	-.01 (-0.19, 0.18)	-.01	-.02
Ind. Adj	.15 (-0.02, 0.33)	-.28 (-0.47, -0.10)	.02	-.26
HPS	-.03 (-0.20, 0.15)	.02 (-0.16, 0.21)	-.00	.02
Mean age	-.32 (-0.49, -0.14)	.08 (-0.12, 0.28)	-.04	.04
Mean % females	-.03 (-0.19, 0.13)	.07 (-0.12, 0.26)	-.00	.07
Burnout	-	.11 (-0.09, 0.30)	-	.11

Notes: Abbrev.: SA=Sickness absenteeism, Oper.Consid=Operational Considerations, H. Edu/Phy act = Health education or Physical Activity, Ind. Adj. = Individual Adjustment, HPS=Health promoting Scheduling.

3.4. The total - and indirect effect towards sickness absence

As illustrated in table 3, the multiple regression analyse indicate there is a medium size negative regression coefficient ($\beta = -.28$, 95% CI [-0.47, -0.10]) between “individual adjustment” and “sickness absence” present in the dataset. On the other hand, there is a small to medium size positive regression coefficient ($\beta = .15$, 95% CI [-0.02, 0.33]) between “individual adjustments” and “burnout”. However, the total effect when “burnout” is controlled for is ($\beta = -.26$), assuming “individual adjustment” affect “average sickness absence at the unit” with an total effect between medium and large (Cohen, 1992). This result

indicates that the hypothesis assuming that high levels of individual adjustments at the unit (H3) would correlate positively with sickness absence was wrong.

Following the guidelines for “healthy scheduling” does not affect average sickness absence at the unit negatively as the hypothesis predicted (H4). The regression coefficient between “healthy scheduling” and sickness absence is a small positive regression coefficient. But it might affect the units’ average result in “burnout” with a small negative regression coefficient ending up with a small positive total effect ($\beta=.02$) between “healthy scheduling” and “average sickness absence” indicating that hypothesis 4 is not what was expected in this study.

As shown in table 3, the variable “operational considerations” does not affect “average sickness absence” or the mediating variable “burnout” notably, ending up with a very small total effect between operational considerations and sickness absence of ($\beta=.01$) indicating the hypothesis (H1) was incorrect.

“Offering health education/physical activity” has a small to medium size negative regression coefficient ($\beta=-.11$, 95% CI [-0.29, 0.06]) towards “burnout”, and a small negative size directly effect towards the units’ average sickness absence ($\beta=-.02$). This indicates that the hypothesis assuming that health education/physical activity would affect average sickness absence negatively (H2) is supported with a small size negative total effect ($\beta=-.02$).

“Mean age” at the unit has a large size negative regression coefficient towards “burnout” ($\beta=-.32$, 95% CI [-0.49, -0.14]). However, the total effect between “mean age” and “average sickness absence” is positive with a small effect ($\beta=.04$). This agrees with existing observations that sickness absence increase with age (Bernstrøm et al., 2019).

Regarding sickness absence and gender, this study show results as already observed in existing literature and statistics, women have higher sickness absence than men (Løset et al., 2018; Statistisk sentralbyrå, 2019).

4. Discussion

The present study looks at the relation between routines for shift work scheduling and sickness absence at unit level. Opposite of what was expected it was found that increases in individual adjustment were associated with reduction in average sickness absence at the unit. However individual adjustments had a medium size positive path coefficient with burnout.

Following the recommendations for a “healthy schedule” had no observed relationship with average sickness absence at the unit. Units` which had routines for offering health education/ physical activity had a medium size negative path coefficient towards burnout.

Health education/physical activity

A review from 2014 show some support for behavioral interventions as increased physical activity, education about sleep routines and circadian factors could improve the shift workers sleep quality (Sarah, Manisha, Paul, & Carolyn, 2014). Also a review from 2016 that looked at non- pharmaceutical interventions as nutrition, lightning therapy, lifestyle changes and behavioral changes concluded that napping and exposure to bright light can have a positive effect on insomnia among shift workers. A few studies also provide good evidence for the efficacy of cognitive-behavioral techniques (Richter, Acker, Adam, & Niklewski, 2016). The present study has a small negative correlation ($\beta=-.11$) between “health education/physical activity” and “burnout”. In the long run burnout can cause sickness absence; this result indicates that it might be advantageous to implement routines of offering health education/physical activity to prevent burnout and in the long run sickness absence at the unit.

Individual adjustment

This study supports earlier studies that highlights the importance for the employee to have real influence in how their schedule ends up looking (Richter et al., 2016). Having the possibility to adjust their schedule is why many nurses, and others, cope with shiftwork. An older review from 2008 found three studies that looked at “self- scheduling”. Health outcomes and work- home balance were improved in all studies (Bambra, Whitehead, Sowden, Akers, & Petticrew, 2008). This might support what this study also indicate- you can not only follow the guidelines for a “healthy- schedule”, it has to be a balance between that and individual adjustment.

Nevertheless, the employees have to know the possibly negative consequences of planning for an unfavorable schedule. This might make the employee reconsider some of their choices regarding schedule planning. On the other hand, this study concludes that the average level of burnout at the unit is higher when there are high levels of individual adjustments. However this study does not say anything about what kind of individual adjustments that exist at the unit. Is there a lot of employees that is exempt from some kind of duties, who causes harder schedule for others, or is it the fact that the employee do unfavorable choices when they are

planning their schedule and this cause burnout? For further research that would be interesting to look into.

Healthy scheduling

The recommendations for healthy schedule is based on existing research on the field regarding the several negative health outcomes when working shifts, and then especially nights (Garde et al., 2020; Garde et al., 2019). At the hospital the present study took place, the levels of following the recommendations for “healthy schedule” vary in between the units. The hypothesis that assumed units` following the recommendations for “healthy schedule” (H4) have less average sickness absence than those units who do not, turned out not to be the case. A possible explanation could be that scheduling based on these recommendations has only been done for a couple of years, and this is a cross sectional study, it does not tell us anything about how a “healthy schedule” affect the employees average sickness absence in the long run. It is necessary to do the same study later to see if the result would be affected different.

However there is a systematic review that has looked at “quick returns” (short rest between shifts) and health related outcomes (Vedaa et al., 2016). The review concluded that “quick returns” gives few hours of rest between the shifts, reduces sleep length, gives more disturbed sleep and increase the feeling of burnout and sleepiness (Vedaa et al., 2016). Avoiding “quick returns” was one of the questions from the survey regarding “healthy scheduling”. Perhaps it was too soon to see any total effect between “healthy scheduling” and the units` average sickness absence at this point. But it is worth mentioning that there is a small negative path coefficient between “healthy scheduling” and “burnout” present in this study ($\beta=-.03$). And burnout in the long run can cause sickness absence (Toppinen-Tanner et al., 2005).

Sickness absence and burnout

Research concludes that sickness benefit in Norway is frequently certified for reasons other than sickness, for example work- home conflict (Markussen, Røed, Røgeberg, & Gaure, 2011). Using “average sickness absence at the unit” as the outcome variable can be a strength for this study because shift- work schedule directly impacts the employees` everyday life. However, it can also be a limitation because average sickness absence does not say anything about the individual reason for sickness absence.

There are studies that have looked at the relationship between burnout and sickness absence (Toppinen-Tanner et al., 2005). Toppinen-Tanner found in their study a correlation between burnout and sickness absence at ($\beta=.15$). The present study can support that result, although with a smaller size ($\beta=.11$). A possible explanation for the smaller size is that the present study use unit level sickness absence and not on individual level.

Mean age and gender

Mean higher age and sickness absence is positively correlated in this study. Also a higher amount of women at the unit is positively correlated with sickness absence. These results agree with existing research- women have higher sickness absence than men, and older employees have more sickness absence (Houkes & Bernstrøm, 2020; Løset et al., 2018).

On the other hand, mean higher age at the unit is negatively correlated to burnout. This could be explained by the “Healthy worker effect” or “Self- selection effect”. The Healthy worker effect is a selection effect found when employees that cannot handle the working conditions end up quitting their job (Knutsson & Akerstedt, 1993; Shah, 2009). The end result is that nurses who cannot cope with shift work have found work elsewhere- leading to a nurse work force that can handle this type of work. Interestingly a study that looked at shift work and sickness absence at a Norwegian hospital found that a relationship between shift rotation and increased sickness absence was generally stronger for older employees (Houkes & Bernstrøm, 2020). One explanation for could be that the study included all employees working shifts, not only nurses as present study. However, also in this study the total effect between older employees and sickness absence when burnout is accounted for is that units with average higher age is more likely to have higher sickness absence, but the ”Healthy- worker effect” contributes to reducing the overall effect of age.

5. Limitations

This study has limitations. Firstly, the study only had access to data from the employee survey ForBedring from 2019. The causal effect on how the variables affect the moderating variable burnout has limitations. However, the correlation between sickness absence and burnout in this study is similar to the correlation between sickness absence and burnout found in a study from 2005 that shown a regression coefficient of .15 (Toppinen-Tanner et al., 2005).

Second, the study only has data at unit level. This prevents the study to conclude at individual level. An individual level might have given the study more accurate answers regarding the outcome variable sickness absence and the moderating variable “burnout”. Additionally it was unit level leaders who received the survey. Nevertheless, control variables as percentage females at the unit and mean age helps giving the study necessary information about the unit to improve the accuracy of the study.

Third, the study is cross sectional; all measurements are obtained at a single point in time (Sedgwick, 2014). The advantages with cross sectional designs are that they give an accurate description of the condition at one point in time and give us the possibility to look at correlations between different variables. The inability of cross-sectional studies to support causal inferences is well known; hence our study can be used to present a hypothesis for further research.

However, cross sectional studies have its` limitations. This study was unable to determine causality. Follow-up research is necessary. Future researches with more information at individual level, and prospective and experimental design may help to strengthen the evidences. Nevertheless, what the results in this study indicate is of importance for further HR recommendations and organizational considerations concerning shift scheduling.

6. Conclusions

The factors “Healthy scheduling”, “Health education/ physical activity” and “Operational considerations” had no observed total effect on mean sickness absence. Only “Individual adjustment” in shift work scheduling had a large direct negative effect, and a small positive effect on burnout, entailing a total negative correlation of medium to large size ($b = -.26$) on mean sickness absence at unit level. In other words, there is a relationship between the units’ routines for shift work scheduling and mean sickness absence at the unit. In some way the hypothesis assuming that increased “Individual adjustment” would lead to sickness absence is correct. “Individual adjustments” increases burnout at the unit and burnout increase sickness absence in the long run. However, when the direct effect and the overall total effect are accounted for, the result is that “individual adjustment” reduces sickness absence. This might support that you can’t only follow the guidelines for a “Healthy- schedule”, it has to be a balance between that and individual adjustment.

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