Occupational Stress and Obesity in Hospital-based Female Nurses

Purpose. The purpose of this study is to examine associations between occupational stress and obesity in hospital-based, female, registered nurses. Hospital-based nurses are a population of workers exposed to a variety of stressors at work [1]. This study will build upon prior research in US female nurse populations, which based measurement of occupational stress in Karasek's high demand/low control model [2], providing evidence that work schedule factors are associated with overweight and obesity, and that presumably occupational stress reducing factors such as a supportive boss and input at work reduced risk of overweight and obesity [3, 4]. To add to these examinations of occupational stress in female nurses, this proposed study will measure occupational stress with the Effort/Reward Imbalance model, where a lack of fairness in social reciprocity is the fundamental factor influencing psychological stress [5]. This study will provide an estimate of the prevalence of occupational stress in hospital-based female nurses.

If female hospital-based nurses are experiencing high levels of occupational stress it is possible that they may be at increased risk of excessive weight gain. Occupational stress may have an effect on eating behaviors, appetite, and adiposity. Chronic activation of the HPA axis stimulates the release of cortisol which increases food intake, preference for fat and sweet foods, and promotes fat storage, especially as visceral fat [6, 7]. The relationship between occupational stress and adiposity might be mediated by individual eating behaviors, such as emotional eating and restrained eating. Emotional eating is a concept that refers to the consumption of food in response to negative emotions [8]. When exposed to stress, emotional eaters tend to eat more [9]. Restrained eating is the concept of cognitive control of eating behaviors, such as

when dieting [10]. There is some evidence that when exposed to stress, restrained eaters tend to over-consume, although the evidence is mixed, and it may be that conditions inducing excessive cognitive demand may be the overloading factor that leads restrained eaters to overeat [11]. Therefore, this study will measure eating behaviors, food cravings, waist circumference and Body Mass Index (BMI). It will provide an estimate of the prevalence of obesity among hospital-based female nurses.

The study aims to estimate the contribution of occupational stress to obesity and abdominal fat, controlling for the effect of sleep quality, sleep duration, exercise, and work schedule factors in acute care hospital-based registered nurses. If occupational stress is a risk factor for excessive weight gain and abdominal fat deposition among nurses, then future solutions to improve nurse's health need to implement stress reduction strategies at the individual, institutional, and policy levels.

Significance. In the United States (USA), approximately 22.8% of the workforce is obese [12]. This is less than the age-adjusted prevalence of obesity among the adult population, which is 34.9% [13], likely due to the healthy worker effect, where those who are extremely obese are probably not able to be in the workforce. Nonetheless, it is a serious problem that more than one fifth of the nation's workers is affected by the obesity epidemic. Obesity, categorized as a BMI >30kg/m^2, is associated with many comorbidities including, but not limited to, diabetes, cardiovascular disease, and cancer [14]. At work, obesity may affect performance and increase risk for work-related illness or injury [15]. In addition to this considerable disease burden, there is a large financial cost associated with obesity. In the USA, the estimated annual cost of obesity, due to lost productivity and medical expenditure among full-time employees, is $71 billion [16].

Nurses have an important role in promoting health and wellness to reduce obesity and associated risks to health [17]. Yet the prevalence of obesity may be as high as, or higher in this population of workers than the prevalence found in workers overall [18]. Recently, in analysis of self-reported data from the 2003-2009 Behavioral Risk Factor Surveillance Survey in Washington State, researchers reported the prevalence of obesity in 1,210 registered nurses at 22.6%, with the highest rate found among those aged 45 to 64 years, reported to be 25.6% [18]. In 2013, the authors of a cross-sectional survey of 169 nurses from one US hospital reported the percentage of obese nurses to be 31.4% [19]. Thus, although nurses are well-educated in health risk behaviors, it is likely that knowledge of the potential risk factors is necessary, but may not be sufficient to prevent obesity. Therefore, in the nurses' workplace there are probable environmental and social factors that are contributory risk factors for excessive weight gain. Psychological stress is an additional important factor that may be associated with obesity as chronic stress can affect weight by its effects on fat storage [7], and eating behaviors [20].

The nursing occupation has many potential stressors [1], although the current prevalence of occupational stress in US hospital-based nurses is not clearly described in the literature. One relatively recent cross-sectional survey of 194 nurses from 6 hospitals in the Northwestern USA, noted that 27% of nurses agreed their jobs were highly stressful [21]. Additionally, a nationally representative survey of 37,562 working female registered nurses, all participants in the Nurses' Health Study, measured job strain, defined as high demand and low control at work, and found that 28.5% reported working in high strain jobs [22]. Thus, it is important to clearly describe the prevalence

of occupational stress, and to describe the prevalence of obesity among hospital-based female nurses. If vulnerable nurses are experiencing occupational stress, it is possible that it may be a key factor contributing to obesity among this group of workers.

Impact. It is important to examine if occupational stress, which is potentially modifiable, is associated with obesity so that effective solutions can be developed. At the institutional level, the data from this study will provide evidence to inform worksite wellness programs, worksite weight loss programs, as well as hospital policies that will further support nurses' health, reduce occupational stress, and promote positive health behaviors. Beyond potential changes at the organizational level, the results may assist in changing the national and state regulatory environment to support nurses' health. Legislation mandating coverage for meal breaks might help nurses to rest, and eat without interruption to perform patient duties. Additionally, national staff/patient ratio could help to reduce nurses' workload, thereby reducing occupational stress. This study's findings will inform the design of prospective studies, which could also include measurement of the biological mediators, and physiological effects of allostatic load to evaluate the role of occupational stress and obesity among nurses.

Review of the literature. Research in non-nursing worker populations has reported mixed evidence for associations between occupational stress and obesity. A large prospective cohort study in the UK that included 10,308 office workers, followed for 19 years, found that the odds of obesity increased with each additional reported exposure to occupational stress. In an adjusted logistic regression model those with 3 or more consecutive reports of occupational stress (defined as job strain and no social support at work) had 1.70 (95%CI 1.07-2.71) the odds of obesity than those not reporting

occupational stress [23]. A recent meta-analysis of 32 longitudinal studies (at least 1 year duration and with direct measurement of the adiposity variables) published between 1988 and 2009, reported no association in subgroup analysis of the 14 included studies that measured occupational stress (in various manufacturing, factory, and office worker populations) and adiposity [24].

In nursing worker populations, there is some evidence that no influence at work, and high or low levels of busyness at work, and long work hours are associated with weight gain in female nurses [3, 25]. Further, possible stress reducing factors such as having a favorable schedule and supportive boss are reported to be protective against overweight (OR 0.83 95%CI 0.68-0.99) in a cross-sectional survey of 2,103 female nurses, from North Carolina and Illinois [4]. Interestingly, gender may moderate the relationship between stress and eating behaviors as women tend to consume more food in response to stress exposure than men [26]. Epidemiological studies have reported mixed results in regards to whether weight gain in response to stress depends upon gender [27-29]. A 3-year cohort study of 4134 Danish workers used a measure that added concepts about the psychosocial work environment to the model of job strain as high demand low control. These authors reported higher odds of weight gain in women with high role conflicts, compared to women with low role conflicts (OR 1.13 95% CI 1.06 -1.19), but it was not significant for men; although this study included 3982 females and only 152 males [28].

Stress, if psychologically or physically threatening to the individual, brings about physiological, psychological, and behavioral responses [30]. This allostatic response to threat is orchestrated by the brain, moves the individual away from the stressor, and

generates physiology and behaviors that promote adaptation, and restore homeostasis. However, if the threat or perceived threat is ongoing, there is continued activation of the stress response, which can become maladaptive over time, leading to pathology (allostatic load) [31].

The key biochemical mediator of allostatic load relevant to weight gain is cortisol, which affects the biochemistry of appetite control, increases the motivation to eat, and promotes preference for the consumption of high fat/high sugar foods, and affects fat storage [6, 7]. Behavioral mediators in the stress response may include increased emotional eating, failure to maintain restrained eating under stress, and food cravings for high fat/high sweet foods [11, 32]. Chronic activation of the allostatic response to occupational stressors may result in maladaptive physiological and behavioral responses that increase the risk for obesity. Physiological responses include increased levels of cortisol that increase risk for fat accumulation, and changes in the biochemical mediators of appetite control [33]. Behavioral responses include increase in preference for highly palatable (high fat, sweet) foods, food cravings, and increases in amount of food consumed [9, 34].

The proposed study will examine the evidence in a sample of hospital-based female nurses, working at least 32 hours per week, to estimate the prevalence of occupational stress, waist circumference >35inches, BMI >30kg/m^2, and associations between occupational stress and obesity. Evidence in the literature suggests that occupational stress may be a modifiable issue that is likely to be associated with excessive weight gain, and it is important to evaluate its impact among this population of workers.

Methods. Allostasis is the theoretical perspective used to guide the study measurement and analysis.

Study design. This is a cross-sectional survey.

Sample. The target population is hospital-based, female registered nurses working at least 32 hours per week in acute care hospitals in the USA. The accessible population are the members of the Academy of Medical Surgical Nurses (AMSN) a national nurses' organization. As of December 31, 2013, AMSN had 11,147 members.

Inclusion criteria: female registered nurses, working minimum of 32 hours per week in acute care hospitals in the USA (50 states).

Exclusion criteria: as 92% of registered nurses are female, women are more likely than men to eat when stressed, and women are more vulnerable to emotional eating than men, this study will exclude male nurses. Pregnant females and females who have delivered a baby within the previous 6 months; those who are currently on a leave of absence from work for any reason; and those who work outside of the USA (50 states and District of Columbia) will be excluded.

Power analysis. It is necessary to have adequate power to detect the unique contribution of occupational stress in explaining the variance in BMI. Rule of thumb estimates for the value of the population R^2 are: 0.02 for small effect, 0.13 for medium effect, and 0.26 for large effect size [35]. In a multiple linear regression model with 9 predictor variables that explain 13% of the variance in BMI, a sample size of 222 will have 80% power at an alpha of 0.05 to detect an increase in R^2 of 0.03 due to the unique contribution of stress in explaining BMI [36].

Procedure. The AMSN will send an email to every member on their membership list. Participants will complete the survey online. The total time to complete the questionnaires is estimated to be 30 minutes or less. A follow-up email will be sent to AMSN members at one month after first contact. Data collection will close at 8 weeks. The study design does not require follow up, so there is no risk of loss to follow-up in this study. The online data collection will utilize Research Electronic Data Capture (REDCap) to contact participants, and to send the follow-up reminder emails. The data is directly downloadable from REDCap into STATA version 13 for analysis.

Human Participants Components. This research involves minimum risk for participants; the only risk being breach of confidentiality of personal information. REDCap data collection is secure and HIPAA compliant. Confidentiality and security of participants' information will be kept by using a password protected desktop computer on a secure network. Only the primary investigator will have access to the full data, and analysis of the data will use a de-identified data set. To provide compensation for participation, the participants will be asked to provide their email address at the end of the survey to be enrolled in a drawing to win one of eight $100 gift certificates to Amazon.com. The drawing will take place at closure of the data collection period, and winners will be notified and sent the certificates by email.

Outcome variables. Self-reported BMI is the primary outcome variable. BMI will be calculated by the formula, (Weight in Pounds / (Height in inches x Height in inches)) x 703. BMI is widely used as a measure of adiposity. Self-report derived BMI tends to underestimate actual BMI compared to direct measurement in both men and women [37]. BMI is unable to assess fat distribution, and as allostatic load is associated with

increased abdominal fat [38] the participants will be asked to self-report waist circumference (WC) measurement. Self-reported WC is likely to be reliable. In a study of 1298 Dutch workers, the authors reported kappa >0.70 between direct measurement and self-report in male and female participants [39].

Predictor variables. Occupational stress will be measured with the Effort Reward Imbalance Model, based in the concept of social reciprocity, that posits when efforts (job demands, workload, work pressures) are higher than rewards (job security, support from coworkers, and financial rewards) the individual may be vulnerable to experience occupational stress [40]. The 16 item short form of the ERI instrument will be used. The scale asks participants to respond to questions with a 4 point Likert scale (1) strongly agree, (2) disagree, (3) agree, and (4) strongly agree. The effort/reward ratio can be calculated from the subscales, and a value >1 indicates an imbalance with high effort and low reward. The ERI short form was evaluated for reliability and validity in sample of 10,698 German workers, and researchers reported Cronbach's alphas above 0.70, which suggests adequate reliability, and confirmatory factor analysis indicated the instrument's items are representative of the concepts of effort, and reward [5].

Mediating variables. The behavioral response to chronic activation of the stress response includes food cravings for high fat/high sweet foods, increases in emotional eating, and failure of restrained eating with resultant overconsumption of calories.

The Food Craving Inventory (FCI) will be used to measure specific cravings for foods high in fat, carbohydrate, sweets, and fast-food fats over the previous month. A food craving is defined as an intense desire for a particular food. The FCI is a 28 item scale, and the four subscales ask participants to rate the frequency of their food

cravings on a 5-point Likert scale (1) never, (2) rarely, (3) sometimes, (4) often, and (5) always/almost every day. The scale is reliable with acceptable Cronbach's alphas for the subscales reported as high fats = 0.86, carbohydrates = 0.84, sweets 0.86, and fast-food fats 0.76 reported from a study of 379 adults, average age 37.9 years, predominantly female (79.8%), with mean BMI in the overweight range (27.0 kg/m^2), and confirmatory factor analysis established that the items included in the subscales are adequate to measure cravings for the specified four food categories. [41].

Eating behavior traits including emotional eating, and routine and compensatory restrained eating, will be measured with The Weight-related Eating Questionnaire (WREQ). The WREQ is a 16 item scale that asks the participants to rate how well each item describes their eating behavior on a five-point Likert scale: (1) not at all, (2) slightly, (3) more or less, (4) pretty well, and (5) completely. There is evidence to support the scale's reliability. In a sample of 621 young adults Cronbach's alphas ranged from .66 for compensatory restraint to .91 for emotional eating [42]. In comparison to the Dutch Eating Behavior Questionnaire and the Three Factor Eating Questionnaire, both of which are well established scales for measure of emotional, and restrained eating, Pearson's correlations between the similar concepts comparing the instruments were high, all above 0.70 [43]. There is evidence for the predictive validity of this instrument, as in a recent Hawaiian study of body fat and its associations with eating behaviors in a sample of 60 postmenopausal women (50% white and 50% Japanese American), higher routine restraint scores were significantly associated with higher visceral fat (β = 0.42 p = 0.04), but emotional eating scores were not associated with adiposity or visceral fat [44].

Confounding variables. Sleep quality and duration will be measured with the Pittsburg Sleep Quality Index (PSQI). The PSQI is a 19 item, self-report tool to measure sleep quality over the previous month [45]. It includes 7 components: sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disruption, use of sleeping medication and daytime dysfunction. Possible global scores are 0-21, and a global score >5 is suggestive of significant sleep disruption. The PSQI has been widely used in healthy and non-healthy populations, including among nurses, but it is not validated among night shift workers. A recent cross-sectional study of 435 Taiwanese nurses reported an overall Cronbach's alpha of 0.73 [46].

Participants will be asked to report type and duration of physical activity. Physical activity is identified as a confounding variable as regular physical activity may help prevent weight gain in women [47], and physical activity may be a protective buffer against psychological stress [48]. Shift-work and long work hours are both stressors and associated with increased risk for obesity, and are therefore potential confounding variables. Shiftwork, work schedule and job information questions are from the National Institute for Occupational Safety and Health (NIOSH) Generic Job Stress Questionnaire section on General Job information.

The demographic questions include: race and ethnicity, age, health rating, current smoking status, time since quitting smoking, and menopausal status.

Statistical Analysis Plan. Descriptive statistics for continuous variables, and frequency counts and percentages for categorical variables will be used to examine the characteristics of those who participated in the study. Prevalence of occupational stress,

and prevalence of obesity (BMI>30 kg/m^2) and waist circumference >35 inches will be described.

To determine occupational stress, the ERI over-commitment subscale score and the effort/reward ratio will be calculated. The subscale of over-commitment will be categorized into tertiles, then dichotomized into high and low levels of over-commitment, with the highest tertile indicative of high over-commitment. To calculate the effort/reward ratio the subscale reward score is multiplied by a correction factor, calculated by dividing the 3 items in the effort subscale by the 7 items in the reward subscale (3/7 = 0.4286). The subscale effort score will be divided by the corrected subscale reward score to calculate the effort/reward ratio as a continuous variable. A ratio >1 is indicative of an imbalance between high effort and low reward.

The demographic characteristics, occupational stress, BMI, waist circumference, sleep quality and duration, exercise and work schedules of study participants will be compared by pre and post-menopausal status, by effort/reward ratio, and by high and low over-commitment scores. Student's t-tests will be used to test for differences between numerical means, and Wilcoxon rank-sum tests for differences in non-parametric data. The categorical variables will be compared with chi-square tests.

Multiple linear regression models will be used to investigate the association between occupational stress and nurses' BMI, and to investigate the association between occupational stress and waist circumference.

Model development. The models will include occupational stress (effort/reward ratio, and over-commitment) as the primary predictor variables. Pearson's correlations between predictor variables will assess for high correlations between the predictor

variables, which may indicate collinearity. The data will be checked for missing variables and outliers. The overall, unadjusted effect of occupational stress on BMI, and the unadjusted effect of occupational stress on waist circumference will be estimated.

The models will next adjust for confounding variables including: sleep quality, sleep duration, exercise, and work schedule factors (based on a priori knowledge). The coefficient of each variable (beta value) represents the unique contribution of each variable controlling for the other variables in the model. All predictors will be included in the model, and backwards selection of predictor variables will eliminate variables that do not change the coefficient for effort/reward ratio by >5%.

Regression model diagnostics will be performed to check for linear relationships between the variables, to assess departures from normality, and to look for constant variance and outliers. Multicollinearity between predictor variables will be assessed with assessment of the variance inflation factor (VIF). VIF >10 indicates collinearity. In which case, solutions may require the centering on the mean of continuous predictor variables, or removal of collinear predictor variables from the model.

Cronbach's alphas will be calculated for psychometric instrument subscales to assess the reliability for measurement of the variables in this study. All analyses will be considered significant at $p < .05$. Data analysis will be done with STATA version 13.

Limitations. The female nurses enrolled in this study may not be representative of all female nurses in the USA. The nurses will be recruited from the AMSN, and the nurses who are members of this organization may not be representative of all medical/surgical nurses. It will not be possible to quantify or explain all the reasons for non-participation, which may include undeliverable emails, junk email filtering, lack of time or interest, and

other reasons. Nurses who self-selected to volunteer for this study may be different in their health behaviors, and perception of occupational stress than others who did not participate. The survey is online, and there may be participants who inadvertently miss data entry when self-completing the form.

Job characteristics and working conditions that contribute to occupational stress may vary by state, and this study does not plan analysis to compare by state, nor does the study stratify the random sample by state. Further, the study it is dependent upon self-reported data, which may be biased. For example, self-report BMI tends to underestimate the directly measured value.

There are limitations in the measurement of adiposity. BMI may not accurately measure body fat as BMI is a ratio between height and weight, and therefore not able to differentiate lean from fat body mass. There is evidence that WC is a valid measure of abdominal fat, and that self-report WC has a good agreement with direct measurement, but there may be error in measurement and self-report of this outcome variable. As this study is self-report, bio-chemical mediators of the stress response are not included. The study is cross-sectional and cannot assess causality.

Depression may be a confounding variable in the relationship between occupational stress and obesity, as depression may dysregulate the physiological stress response, and increase stress reactivity [49]. However, there is evidence for a bi-directional relationship between depression and obesity as depression is a risk factor for obesity, and also obesity is a risk factor for depression [50]. Further research is needed to identify the extent to which depression is a mediator of the relationship between occupational stress and weight gain, or if it is a confounding variable. This proposed

study will not measure or control for the effect of depression on the hypothesized association between occupational stress and obesity.

As the evidence for alcohol's effect on weight status is mixed, with some research suggesting weight gain with alcohol use [51], and other research finding weight loss [52], measurement of alcohol use is not included. Furthermore, from an ethical standpoint, as this study is online, without means of providing referral to treatment for those who report either high alcohol consumption or severe depression, and per request of the AMSN these measures are omitted.

A recent meta-analysis found that on average those who quit smoking gained 4.7kg at 12 months after cessation [53]. Although quitting smoking is associated with weight gain, the association between occupational stress and tobacco use is not conclusive [54]. Therefore, this variable is not included as a confounding variable in this analysis. In the proposed study analysis, there may be residual confounding from other non-identified factors.

There may be other stressors that may affect obesity in this population from social relationships, financial issues, environmental stressors, or other threats, which are not measured in this study.

Timeline

Action	Date
Study protocol development, recruitment plan, creation of data collection forms, and web page	October 2013 to January 2014
Ethical review	February 2014
Data collection	June to August 2014
Analysis	September to December 2014
Manuscript draft and review	January to April 2015
Submission to publication	May 2015

Appendix 1 Instruments for data collection (online survey)

Screening questions	Choices
Are you a registered nurse?	1, Yes | 0, No
Are you female?	1, Yes | 0, No
Are you pregnant, or did you deliver a baby within the previous 6 months?	1, Yes | 0, No
Are you currently on a leave of absence from work for any reason?	1, Yes | 0, No
Do you work 32 hours or more per week in an acute care hospital?	1, Yes | 0, No
Do you work within the USA (50 states & District of Columbia)?	1, Yes | 0, No
If eligible the following are the survey questions and intruments	
What is today's date?	
What is your highest nursing degree?	1, Associate's degree | 2, Diploma degree | 3, Bachelors degree | 4, Masters degree | 5, Doctoral degree
For how many years have you worked as a nurse?	
Which state do you work in?	a drop down menu to pick USA state
If you work in another state, please give a short description of where you work.	
Please select the type of hospital where you work	1, Community hospital (non-profit) | 2, Community hospital (for-profit) | 3, University medical center | 4, Military or veteran's hospital | 5, County hospital | 99, Other
Please specify the type of hospital	
What is your current job title?	1, Staff nurse | 2, Charge nurse | 3, Nurse manager/supervisor | 4, Clinical nurse specialist | 5, Nurse practitioner | 99, Other
If other, please specify your job title	
Select the most appropriate description of your job situation:	1, Full-time regular employee (32 hours or more per week) | 2, Full-time temporary employee (32 hours or more per week) | 5, Casual (per diem) (32 hours or more per week)
Select the description that comes closest to your present work shift:	1, Rotating eight hour shift (days- evenings -nights) | 2, Rotating eight hour shift (evenings- nights) | 3, Rotating eight hour shift (days - nights) | 4, Rotating twelve hour shift | 5, Permanent twelve hour shift (days) | 6, Permanent twelve hour shift (nights) | 7, Permanent eight hour day shift | 8, Permanent eight hour evening shift | 9, Permanent eight hour night shift

In your current position, how long (years) have you worked the shift you indicated above?	
If you work an 8 hour rotating shift, what rotation pattern do you follow?	1, Day to Evening to Night | 2, Night to Evening to Day | 3, No set pattern
If you work a 12 hour rotating shift, what rotation pattern do you follow?	1, Day to Night | 2, Night to Day | 3, No set pattern
How many times a week do you change shifts?	0, 0 times (I don't change) | 1, 1 time | 2, 2 times | 3, More than 2 times | 4, On call | 5, Standby | 6, Non standard work week | 99, Other
Please describe your shift change pattern	
How many hours are you scheduled to work per week?	
How many hours overtime do you work in your job in an average week?	
How many hours per week do you work on any other (additional) job(s)? Please mark 0 if no other job.	
Are you happy with your work schedule?	0, No | 1, Yes
Effort reward imbalance questionnaire	
I have constant time pressure due to a heavy work load	1, Strongly agree | 2, Agree | 3, Disagree | 4, Strongly disagree
I have many interruptions and disturbances while performing my job	1, Strongly agree | 2, Agree | 3, Disagree | 4, Strongly disagree
Over the past few years, my job has become more and more demanding	1, Strongly agree | 2, Agree | 3, Disagree | 4, Strongly disagree
I receive the respect I deserve from my superior or a respective relevant person	1, Strongly agree | 2, Agree | 3, Disagree | 4, Strongly disagree
My job promotion prospects are poor	1, Strongly agree | 2, Agree | 3, Disagree | 4, Strongly disagree
I have experienced or I expect to experience an undesirable change in my work situation	1, Strongly agree | 2, Agree | 3, Disagree | 4, Strongly disagree

My job security is poor	1, Strongly agree | 2, Agree | 3, Disagree | 4, Strongly disagree
Considering all my efforts and achievements, I receive the respect and prestige I deserve at work	1, Strongly agree | 2, Agree | 3, Disagree | 4, Strongly disagree
Considering all my efforts and achievements, my job promotion prospects are adequate	1, Strongly agree | 2, Agree | 3, Disagree | 4, Strongly disagree
Considering all my efforts and achievements, my salary/income is adequate	1, Strongly agree | 2, Agree | 3, Disagree | 4, Strongly disagree
I get easily overwhelmed by time pressures at work	1, Strongly agree | 2, Agree | 3, Disagree | 4, Strongly disagree
As soon as I get up in the morning I start thinking about work problems	1, Strongly agree | 2, Agree | 3, Disagree | 4, Strongly disagree
When I get home, I can easily relax and 'switch off' work	1, Strongly agree | 2, Agree | 3, Disagree | 4, Strongly disagree
People close to me say I sacrifice too much for my job	1, Strongly agree | 2, Agree | 3, Disagree | 4, Strongly disagree
Work rarely lets me go, it is still on my mind when I go to bed	1, Strongly agree | 2, Agree | 3, Disagree | 4, Strongly disagree
If I postpone something that I was supposed to do today I'll have trouble sleeping at night	1, Strongly agree | 2, Agree | 3, Disagree | 4, Strongly disagree
Additional health questions	
Would you say your health is	0, very good | 1, good | 2, fair | 3, bad | 4, very bad
Have your natural menstrual periods ceased permanently?	0, No. I am pre-menopausal | 1, Yes. I am post-menopausal | 2, Not sure (peri-menopausal)
Do you currently smoke cigarettes?	0, Not at all | 1, Every day | 2, Some days
If you have quit smoking, how long has it been since you last smoked a cigarette, even one or two puffs?	1, Within the past month (less than 1 month ago) | 2, Within the past year | 3, More than a year ago | 4, Never smoked regularly
During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?	0, No | 1, Yes
How many times per week did you take part in this activity during the past month?	

And when you took part in this activity, for how many minutes did you usually keep at it?	
Weight related eating questionnaire	
I purposefully hold back at meals in order not to gain weight.	1, Not at all | 2, Slightly | 3, More or Less | 4, Pretty Well | 5, Completely
I tend to eat more when I am anxious, worried, or tense.	1, Not at all | 2, Slightly | 3, More or Less | 4, Pretty Well | 5, Completely
I count calories as a conscious means of controlling my weight.	1, Not at all | 2, Slightly | 3, More or Less | 4, Pretty Well | 5, Completely
When I feel lonely I console myself by eating.	1, Not at all | 2, Slightly | 3, More or Less | 4, Pretty Well | 5, Completely
I tend to eat more food than usual when I have more available places that serve or sell food.	1, Not at all | 2, Slightly | 3, More or Less | 4, Pretty Well | 5, Completely
I tend to eat when I am disappointed or feel let down.	1, Not at all | 2, Slightly | 3, More or Less | 4, Pretty Well | 5, Completely
I often refuse foods or drinks offered because I am concerned about my weight.	1, Not at all | 2, Slightly | 3, More or Less | 4, Pretty Well | 5, Completely
If I see others eating, I have a strong desire to eat too.	1, Not at all | 2, Slightly | 3, More or Less | 4, Pretty Well | 5, Completely
Some foods taste so good I eat more even when I am no longer hungry.	1, Not at all | 2, Slightly | 3, More or Less | 4, Pretty Well | 5, Completely
When I have eaten too much during the day, I will often eat less than usual the following day.	1, Not at all | 2, Slightly | 3, More or Less | 4, Pretty Well | 5, Completely
I often eat so quickly I don't notice I'm full until I've eaten too much.	1, Not at all | 2, Slightly | 3, More or Less | 4, Pretty Well | 5, Completely
If I eat more than usual during a meal, I try to make up for it at another meal.	1, Not at all | 2, Slightly | 3, More or Less | 4, Pretty Well | 5, Completely
When I'm offered delicious food, it's hard to resist eating it even if I've just eaten.	1, Not at all | 2, Slightly | 3, More or Less | 4, Pretty Well | 5, Completely
I eat more when I'm having relationship problems.	1, Not at all | 2, Slightly | 3, More or Less | 4, Pretty Well | 5, Completely
When I'm under a lot of stress, I eat more than I usually do.	1, Not at all | 2, Slightly | 3, More or Less | 4, Pretty Well | 5, Completely
When I know I'll be eating a big meal during the day, I try to make up for it by eating less before or after that meal.	1, Not at all | 2, Slightly | 3, More or Less | 4, Pretty Well | 5, Completely

Other questions regarding eating behaviors	
When I am feeling happy, I eat less than I usually do	1, Not at all | 2, Slightly | 3, More or less | 4, Pretty well | 5, Completely
Are you currently on a diet to lose weight?	
Does your work schedule allow you to eat regularly?	1, Always | 2, Most of the time | 3, Sometimes | 4, Rarely | 5, Never
Is healthy food available to you while you are at work?	1, Always | 2, Most of the time | 3, Sometimes | 4, Rarely | 5, Never
Do you eat more or less when you are at work, compared to when you have a day off work?	1, I eat the same | 2, I eat less at work | 3, I eat more at work
Do you take a 30 minute meal break during your workday?	1, Always | 2, Most of the time | 3, Sometimes | 4, Rarely | 5, Never
Do you take two 30 minute breaks during your work shift?	1, Always | 2, Most of the time | 3, Sometimes | 4, Rarely | 5, Never
Typically, do you choose when you get to take your meal break?	1, Always | 2, Most of the time | 3, Sometimes | 4, Rarely | 5, Never
How often are you able to sit down for a meal during your shift?	1, Always | 2, Most of the time | 3, Sometimes | 4, Rarely | 5, Never
Are you relieved of patient care responsibilities during your meals?	1, Always | 2, Most of the time | 3, Sometimes | 4, Rarely | 5, Never
How often are your meal breaks interrupted because you must return to patient care responsibilities?	1, Always | 2, Most of the time | 3, Sometimes | 4, Rarely | 5, Never
What is your waist circumference (inches)?	
Please enter your height in feet and inches in the next two drop-down boxes.	
How much do you weigh in pounds (without shoes)?	
Do you think you are	1, very underweight | 2, somewhat underweight | 3, normal weight | 4, somewhat overweight | 5, very overweight
How old were you on your last birthday (years)?	
Food Craving Inventory (copyrighted instrument)	Asks about food cravings for carbohydrates fat, sweet, fast food fats over the previous month.
Pittsburgh sleep quality index	

1. Thinking about your days off or if you work days, During the past month, what time have you usually gone to bed at night?	
2. During the past month, how long (in minutes) has it usually taken you to fall asleep each night?	
3. During the past month, what time have you usually gotten up in the morning?	
4. During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spent in bed.)	
5a) Cannot get to sleep within 30 minutes	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week
5b) Wake up in the middle of the night or early morning	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week
5c) Have to get up to use the bathroom	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week
5d) Cannot breathe comfortably	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week
5e) Cough or snore loudly	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week
5f) Feel too cold	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week
5g) Feel too hot	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week
5h) Had bad dreams	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week
5i) Have pain	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week
5j) Other reason(s), please describe	
If you answered yes to other reason, how often during the past month have you had trouble sleeping because of this?	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week
6. During the past month, how would you rate your sleep quality overall?	0, Very good | 1, Fairly good | 2, Fairly bad | 3, Very bad

7. During the past month, how often have you taken medicine to help you sleep (prescribed or "over the counter")?	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week
8. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week
9. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?	0, No problem at all | 1, Only a very slight problem | 2, Somewhat of a problem | 3, A very big problem
Now thinking about when you were working during the past month, please answer the sleep questions again. This time, please answer the questions thinking about your sleep when you were working nights or evenings during the past month only Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.	
1. During the past month, what time have you usually gone to bed at night?	
2. During the past month, how long (in minutes) has it usually taken you to fall asleep each night?	
3. During the past month, what time have you usually gotten up in the morning?	
4. During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spent in bed.)	

For each of the remaining questions, check the one best response. Please answer all questions. 5. During the past month, how often have you had trouble sleeping because you . . .	
5a) Cannot get to sleep within 30 minutes	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week
5b) Wake up in the middle of the night or early morning	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week
5c) Have to get up to use the bathroom	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week
5d) Cannot breathe comfortably	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week
5e) Cough or snore loudly	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week
5f) Feel too cold	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week
5g) Feel too hot	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week
5h) Had bad dreams	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week
5i) Have pain	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week
5j) Other reason(s), please describe	
If you answered yes to other reason, how often during the past month have you had trouble sleeping because of this?	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week
6. During the past month, how would you rate your sleep quality overall?	0, Very good | 1, Fairly good | 2, Fairly bad | 3, Very bad
7. During the past month, how often have you taken medicine to help you sleep (prescribed or "over the counter")?	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week
8. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week

9. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?	0, No problem at all | 1, Only a very slight problem | 2, Somewhat of a problem | 3, A very big problem
During the past month how often have you used alcohol to help you to get to sleep?	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week
During the past month how often have you used caffeine to help you to stay awake at work?	0, Not during the past month | 1, Less than once a week | 2, Once or twice a week | 3, Three or more times a week
Is there anything else you'd like to tell me about your work and health?	
What is your ethnicity?	1, Hispanic or Latino | 0, Not Hispanic or Latino
What is your race?	1, Black or African American | 2, American Indian or Alaska Native | 3, Asian | 4, Native Hawaiian or Other Pacific Islander | 5, White
Thank you for completing this survey.	
You have the option to provide your email to be entered into a drawing for one of eight $100 amazon gift certificates. Entering your email is optional. You will be notified by email if your email is drawn randomly from all those who participated at completion of the survey. Thank you!	

Appendix 2. Subject's consent form

UNIVERSITY OF CALIFORNIA, SAN FRANCISCO

CONSENT TO BE IN RESEARCH

Study Title: Nurses' Work and Health Survey

This is a research study, and you do not have to take part. This study is an online survey being conducted by Julia Buss under the direction of OiSaeng Hong, RN, PhD, FAAN, Director of the Occupational and Environmental Health Nursing Specialty, in the Department of Community Health Systems at University of California, San Francisco. If you have any questions, you may ask the researcher, Julia Buss at 510-384-7939.

You are being asked to take part in this study because you are a registered nurse. You are eligible to participate if you are a registered nurse, female, working at least 32 hours per week in an acute care hospital in the USA (50 states and District of Columbia). You are not eligible to participate if you are male, pregnant or delivered a baby within the previous 6 months, or currently on a leave of absence from work.

In this study, the researchers are doing a survey to learn more about hospital working nurses' job stress, work schedules, sleep quality, and if they are associated with higher body mass index. Funding from a National Institute for Occupational Safety and Health (NIOSH), Targeted Research Training (TRT) grant from Center for Occupational and Environmental Health at the University of California is paying for this research. About 222 people will participate in this study.

What will happen if I take part in this study?

If you agree to be in this study, you will complete a survey online at a computer with access to the internet. The survey asks about your job situation, work schedule, type of hospital where you work, questions to assess job stress, sleep quality, eating behaviors,

and your meal breaks at work, and asks you for your height, weight, waist circumference, exercise habits, and smoking status. It will take you about 30 minutes to complete the survey.

Are there any risks to me or my privacy?

Some of the survey questions may make you feel uncomfortable or raise unpleasant memories. You are free to skip any question.

We will do our best to protect the information we collect from you. Information which identifies you will be kept secure. The survey itself will not include details which directly identify you, such as your name or address. Please do not put this information on your survey. The completed surveys will be kept secure and separate from information which identifies you. Only a small number of researchers will have direct access to completed surveys. If this study is published or presented at scientific meetings, names and other information that might identify you will not be used.

Are there benefits?

There is no benefit to you. The survey results will be used for research.

Can I say "No"?

Yes, you do not have to complete a survey. If you choose not to be in this study you will not lose any of your regular benefits, and you can still receive medical care from UCSF. Your choice will not impact your employment.

Are there any payments or costs?

There are no costs to you for participating in this study.

You may choose to enter your email at completion of the study to be entered into a drawing to receive a $100 Amazon gift certificate. It is your choice if you would like to enter your email address in order to be included in this drawing. There are eight $100

gift certificates, and emails will be randomly drawn at completion of the data collection. If you receive a certificate you will be notified by email. All emails will be separated from the study data, and will be destroyed after the drawing is completed.

Who can answer my questions about the study?

You can talk with the study researcher about any questions, concerns, or complaints you have about this study. Contact the study researcher Julia Buss at 510-384-7939. If you wish to ask questions about the study or your rights as a research participant to someone other than the researchers or if you wish to voice any problems or concerns you may have about the study, please call the Office of the Committee on Human Research at 415-476-1814.

PARTICIPATION IN RESEARCH IS VOLUNTARY.

You may print copies of this consent form to keep.

Appendix 3.

Human Research Protection Program
Committee on Human Research
Notice of Exempt Certification
Principal Investigator Co-Principal Investigator
Oi Saeng Hong Julia C Buss
Study Title: Occupational Stress and Obesity in Hospital-Based Female Nurses
IRB #: 14-13073
Reference #: 082086
Committee of Record: Laurel Heights Panel
Type of Submission: Submission Response for Initial Review Submission Packet
Certification Date: 04/16/2014
IRB Comments:
This research qualifies as exempt under the following category:
(2) Research using educational tests, survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, insurability, or reputation.
1. Please clarify in your consent documents that the funding for this study is from a NIOSH Targeted Research Training award and not from NIOSH *and* a Targeted Research Training award. This change on an exempt consent document does not require CHR review or approval.
Modifications: For exempt research only, researchers can make *minor* changes to the study without notifying CHR. However, significant changes must be submitted to the CHR. The CHR website includes examples of minor vs. significant changes. All changes must follow UCSF guidance, and some changes are not allowed in the consent materials.
Study Closeout Report: This study does not have an expiration date. However, you are required to submit a study closeout report at the completion of the project.
Approved Documents: To obtain a list of documents that were approved with this submission, follow these steps in iRIS: Go to My Studies and open the study – Click on Submissions History – Go to Completed Submissions – Locate this submission and click on the Details button to view a list of submitted documents and their outcomes. For a list of all currently approved documents, follow these steps: Go to My Studies and open the study – Click on Informed Consent to obtain a list of approved consent documents and Other Study Documents for a list of other approved documents.
San Francisco Veterans Affairs Medical Center (SFVAMC): If the SFVAMC is engaged in this research, you must secure approval of the VA Research & Development Committee in addition to CHR approval and follow all applicable VA and other federal requirements. The CHR website has more information.

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Appendix 5. Budget

NAME	ROLE ON PROJECT	Cal. Mnths	Acad. Mnths	Summer Mnths	INST.BASE SALARY	SALARY REQUESTED	FRINGE BENEFITS	TOTAL
Julia Buss	PI							
SUBTOTALS →								

SUPPLIES *(Itemize by category)*	
Poster printing, office supplies, and paper costs	175
TRAVEL	
Present findings at professional conference	1500
OTHER EXPENSES *(Itemize by category)*	
Random drawing of 8 x $100 for those who completed the online questionnaire	800
Study consultation (statistical analysis) $175 per hour x 3	525

CONSORTIUM/CONTRACTUAL COSTS	DIRECT COSTS	
SUBTOTAL DIRECT COSTS FOR INITIAL BUDGET PERIOD *(Item 7a, Face Page)*		**$** 3000
CONSORTIUM/CONTRACTUAL COSTS	FACILITIES AND ADMINISTRATIVE COSTS	
TOTAL DIRECT COSTS FOR INITIAL BUDGET PERIOD		**$** 3000