

Title Page

Resilient Emergency Physicians: the personal, chronobiologic and organizational characteristics of burnout-resistance.

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**Introduction:** Previous work suggests that emergency physicians (EPs) are particularly prone to burnout. Lack of support, shiftwork and stress are cited as reasons for burnout. Yet, many EPs have long and rewarding careers. The factors which make EPs resilient have seldom been investigated.

**Study Objective:**

1. To examine the shift-work patterns in modern emergency medicine, and the compensatory strategies used, compared to burnout scores.
2. To examine the strength of various coping mechanisms and resilience strategies used by EPs, and compare these to burnout scores.

**Methods:** This was a validated, 2-part electronic survey offered to 3,000 randomly selected ACEP members, and completed by 237 members. The outcome variable was Maslach Burnout Inventory (MBI) score; the predictors were measure of control over shifts and scores on validated coping scales.

**Results:** Simple summary statistics compared our respondents against the demographics of ACEP as a whole. Our respondents were older than most ACEP members. The 2 surveys were moderately comparable, with respondents to survey 1 slightly younger, more stressed; lower on perceived social impact, lower on professional efficacy, and lower on resilience, although the differences on each measure fell within one standard deviance.

**Conclusions:** Physicians who the lowest MBI scores were most satisfied with their shift schedules, with the control they had over when they worked, were most likely to feel that medicine was a “calling” and had good social support.

## **Methods**

The literature was searched for references about resilience, shiftwork and workplace support. Validated survey instruments addressing these elements were chosen for conciseness and applicability to emergency medicine. Burnout was measured with the Maslach Burnout Inventory (MBI) because it has been used for over 25 years in EM. We focused on factors which the sociology literature suggested would be associated with personal resilience in emergency physicians (EPs).

This study was IRB approved.

**Study design:** The study consisted of two cross-sectional, web-based surveys, sent to 2 non-overlapping cohorts of 1500 randomly chosen ACEP members, for a total of 3000 invitations. Invitations were sent to the same cohort 3 times, at 1 week intervals. That number of invitations was chosen to represent approximately 10% of ACEP's membership, which is generally considered an adequate sample in the sociology literature. The sample was randomly generated by ACEP, which pre-screened the database to exclude residents, medical students, international members and honorary members. Members of these random samples were invited via email by ACEP to link to a survey written in Qualtrics, and anonymously and securely housed at the Weatherhead School of Management at Case Western Reserve University.

### **Participants:**

Participants were those responding to one of the 3 waves of invitations for each of the two surveys. Because of the nature of the study, EPs who are not ACEP members, or who do not use email were not eligible for inclusion.

### **Exclusion criteria:**

1. Not practicing clinical emergency medicine at least half-time (average of 20 hours per week or more)
2. Less than 1 post-residency
3. Primarily practicing outside the United States

### **The Survey Instrument:**

The survey was developed in stages. The Maslach Burnout Inventory (MBI) was chosen as the outcome variable because it is validated, has been extensively used in burnout studies, and in emergency medicine, particularly at the Wellness Booth at the annual ACEP's Scientific Assembly.

Next, a number of previously validated scales measuring aspects of resilience and resistance to work-stress were examined for length and relevance to emergency medicine. After removing questions not relevant to EM, the shortest scales that were both valid and reliable were combined into a single survey. Novel questions relating specifically to shift

work as practiced in EM were created. Initially the survey contained all 3 elements above.

Next, the combined survey was validated. Face validity was assured by the review of several experienced emergency physicians with 10-25 years experience, who were not otherwise involved in the research. Next, content validity was examined by sending the survey to members of the Wellness Section for review and comments. Structural validity was examined by members of the ACEP Research Section who also reviewed and commented on the survey. The major threat identified was potential non-completion because of length.

To address this potential threat, the survey was divided into 2 parts. Each part contained the same outcome variable: the MBI, and the same demographic questions (in order to compare the responding populations). Survey 1 focused on shift work and adaptation to random night shifts. Survey 2 contained the validated scales of factors associated with resilience and mitigation strategies. The results from the surveys will be reported separately.

*Survey Administration:* Respondents who clicked on the link in the invitation email were directed to a server located in Case Western Reserve University's Weatherhead School of Management. The survey was written on the Qualtrics online survey platform, which assured both anonymity to respondents, and prevented duplication of response.

When the surveys were complete, ACEP sent out emailed requests to the randomly chosen cohort of members with a cover letter developed by the researchers and approved by both the local IRB and ACEP. That cover letter invited the respondent to click on an embedded link and respond to the survey. Reminders were sent out at weekly intervals. The surveys were not simultaneous. Each survey was available for a month.

*Data handling:* Data was exported to SPSS. Subsequently, Stata 12 software was used to analyze the data. First, simple summary statistics and univariate analysis were performed. This raw data is presented in tabular form in the supplement. Then, correlations of interest to answer the research questions were performed. These results and associated interpretation are below.

Data were gathered using two forms of measurement. Data on observable constructs, such as demographic, individual, hospital, ED and shift work characteristics, were gathered using direct single-item questions. Data on latent constructs, such as resilience and burnout, were gathered using validated summated scales consisting of multiple items, each using a Likert-type response format. All the latter were analyzed using exploratory factor analysis to ensure proper factor structure and reliability to ensure internal consistency. Citations and Cronbach's alphas for each scale are given in the appendix.

## **Analysis of Results**

### **Hypotheses**

Those physicians who have greater control over their work will be more resistant to burnout

Physicians who score low on burnout will report the use of more coping mechanisms than those who score high.

### **Question 1: Combinability. Are the populations of the 2 surveys comparable?**

For reasons of length, this survey was split into two sections. Each section contained the same outcome variable and demographics in order to determine if the two populations were comparable. The number of ACEP members invited was equal, random, and non-overlapping. Populations were compared by number responded, number who completed the survey; and by demographics of racial distribution, board status, hospital status, length of employment at current hospital, and commute times. The two populations were similar in age and race distribution; however, there was a statistically significant difference in age: on average, respondents to survey 1 were younger. Consequently, they graduated from medical school more recently, have spent less time working in their current ED and the longest time they have worked in one ED was significantly shorter, on average. In addition, survey 1 respondents feel that they have less control over the total number of hours they work, perceive more stress in their lives, and have lower perceived social impact, professional efficacy, and resilience. Although the populations were slightly different, the differences between the two populations tend to strengthen our hypothesis that more stressed emergency physicians are those who feel their work has less social significance and are those who are less resilient. These findings also suggest that there is a relationship with age and continuation within the EM specialty: the older physicians have greater perceived social impact, professional efficacy and resilience. We do not know if this is a generational difference, a result of greater experience, or because the less resilient tend to leave the field.

### **Question 2: Generalizability. How does the population of respondents compare to ACEP members?**

ACEP kindly sent some raw statistics about members. The data was cleaned by excluding those members who reported having graduated from medical school before 1973 (some as early as 1900—the default setting for those who declined to give ACEP their year of graduation -- ) and those whose year of graduation was 2010 or later to make this population more similar to our respondents (i.e. still actively practicing EM). The younger sample would not have been in practice for at least a year. Overall, the proportion of women in our sample is significantly higher than the proportion of female members of ACEP. In addition, our respondents graduated from medical school more recently. This significant difference could be explained by lesser computer use by older EPs who may not have received the invitation email or opted out of completing an online survey.

### **Question 3: What are the characteristics of the combined population?**

#### Demographics

The vast majority (89%) of respondents was white. 8% were Asian or Southeast Asian; the remaining categories accounted for 1% or less each. Men accounted for 65%; women 35%. There was a difference in the age distribution between the two surveys. In each group, the most common decade for graduation from medical school was 1970s, followed by 1960s, but in Survey 1 the split was 82% '70s and 13% '60s while Survey 2 had 50 and 38% respectively. Overall, the difference is statistically significant; at  $p < 0.001$ . Survey 1 respondents were younger. Combined, there were 66% '70s graduates and 24% '60s graduates. Younger physicians were surprisingly under-represented. We have no explanation for this finding. More respondents to survey 2 worked part-time rather than full time (Survey 1-- 68% v Survey 2 -- 78% full time; 72% for the combined sample worked full time versus 25% working part time and 3% "other".)

#### Workplace characteristics

More than half of respondents worked in large hospitals, of 201 beds or more. These hospitals were mostly private, not for profit. Many respondents taught, either at an academic center (32%) or elsewhere (46%); only 22% replied that their hospital was a non-teaching hospital. Just over 40% were either employees or part of a contracted group; only 16% considered themselves independent contractors. 65% had worked at several hospitals (2-5) in their careers; only 5% had worked at 11 or more hospitals. Respondents tended to stay in one place. The longest most respondents (62%) had spent in any one location was 5-10 years with 31% in their current location more than 1 year but less than 5 and 45% 5-10 years. Respondents live close to work. The vast majority commuted less than 1 hour, with almost 70% commuting 30 minutes or less.

#### **Work Characteristics**

Most respondents (63%) spent most of their professional time in an ED, but 13% spent less than 50% of their professional time in an ED. The mean number of clinical shifts per month was 12-13 (SD 3.3). Mean clinical hours was about 120, but the SD was very wide (35) and ranged from 0-270 claimed worked hours per month. Respondents saw between 16-25 patients per shift. The most common shift length was 8-10 hours, followed by 10-12. Less than 10% worked less than 8 hours; about the same number worked 24 hour shifts. 8 hour shifts were about half as common as "more than 8 but less than 12". In addition to scheduled shift times, many physicians stay over to complete charts and other paper work. Less than a third (31%) reported that they spent less than 30 minutes. Forty percent stayed between 30-59 minutes, 70% less than an hour. A full 25% reported that they stayed more than an hour but less than 2 hours. Traditionally, this time is not compensated.

## **Shift work Characteristics**

### Control over shift

Respondents did not feel they had much control over the number of shifts they worked, (3.7 on a 1-6 scale), and only slightly more 3.6 (1-6) over when they worked. There was a difference between Survey 1 and Survey 2, with Survey 2 respondents feeling like they had more control over the number of hours worked, significant at  $p= 0.028$ . Just over a quarter (28%) reported that there was EM back-up if they felt overwhelmed.

### Shift work pattern

The vast majority (72%) of respondents reported that their shift pattern was random; the next most common patterns were “flip flop” or “repeating pattern” at 8% and 7% respectively. Of those who had a pattern, more had advancing than retreating patterns. (7% versus 1%).

Most respondents were only somewhat satisfied with their shift patterns (6 on a 1-10 scale) and had little control over their number of hours (3.5 on a 1-6 Forced Likert Scale).

### Night shifts

Almost all respondents (93%) worked at least 1 night shift in the last 12 months. Most preferred to work 2 nights in a row, with the next most popular options being three or 1.

Most had moderate trouble working nights (3.6 on a 1-6 Likert scale). Many reported systematic hindrances to completing their work at night. The most commonly cited was lack of consultants, followed by fewer ‘non-person resources’, non-availability of the PMD or of a colleague to discuss the case with.

### Well-being on night shifts

The respondents reported moderate difficulty with night shifts, mean 3.6, SD 1.45 (1-6 Forced Likert scale). Most felt fairly well when they started a night shift (3.9) but not as well (2.9) when they finished. The first sleep after a night shift was not very restorative. After sleeping then waking again, well-being averaged 2.8, only “moderately well.”

Slightly less than half (42%) reported “hitting the wall” during their last night shift, and 47% reported that they experienced a period of time, more than 5 minutes long, that they were worried that they were not functionally optimally. In spite of that, the difficulty was less in remembering drug doses (16%) or missing the significance of a finding (15%) than in making a differential diagnosis (25%). Most were only somewhat sleepy when they started the shift (2.4 on 1-6 scale) and fairly alert (4.7) but much sleepier (4.5 on a 1-6 scale) and only moderately alert (3.3) when they finished the shift.

### Use of aids for adaptation to shift work

There are two primary physiologic difficulties with shift work: sleeping during the biological day-alert period and being awake and functional during the night-sleep time.

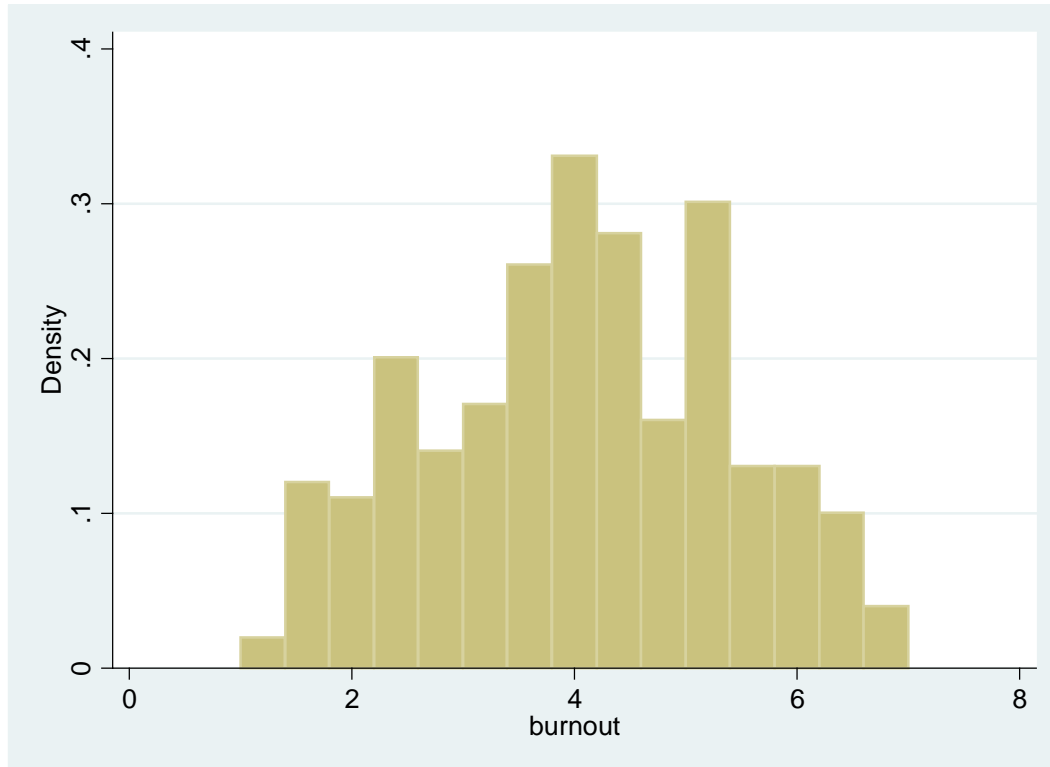
Many adaptations have been recommended to it easier to sleep during the day. Our respondents seemed to find reducing exposure to light most important. 70% light-proofed their rooms and 25% used eye shades. (Categories are not mutually exclusive.) Sound isolation seemed less important to our respondents. Only 36% used white noise and 21% used earplugs. Only 16% reported using “did none of the above.” (See discussion)

Among the interventions recommended to keep awake and alert during a night shifts are bright light, exercise, caffeine, and Provigil or other medications. Almost all respondents reported using caffeine ‘almost always’; the next most common intervention was ‘bright light’, followed by ‘nothing at all’, followed by ‘exercise’. (See discussion)

### Outcome variables

“Burnout”, measured by the Maslach Burnout Inventory (MBI), was the primary outcome variable. The MBI is composed of 3 sub-scales, “exhaustion”, “cynicism” and “professional efficacy.” The 2 populations were comparable on 2 dimensions (sub-scores) of the MBI: exhaustion and cynicism. The respondents of Survey 2 reported higher professional efficacy scores (mean= 5.60) compared to Survey 1 respondents (mean=5.28); this was significant at  $p < 0.006$ . However, following the latest convention in burnout research, aggregate burnout scores were calculated using only the exhaustion and cynicism sub-scales. The 2 populations were comparable on this aggregate score.





The above graph shows the distribution of burnout scores, measured on a 1 – 7 Likert scale. The mean burnout score was 4.1; the median was 4.2 and the standard deviation was 1.3.

To ensure internal validity, we also asked the respondents if they felt stressed. On a Likert scale from 1-6, the mean was 3.6, suggesting a medium high level of current stress. The mean for the last month was 4.2, suggesting a high chronic level of stress.

Perceived stress was a significantly higher in survey 1 (mean=3.40) than in survey 2 (mean=3.15). . All three measures of stress were positively correlated with burnout at  $p < 0.0001$ . This provides convergent validity for our chosen measure for burnout. In addition, burnout was positively correlated with the intention to leave one’s current job (turnover), at  $p < 0.0001$ . This confirms that burnout affects EP’s desire to leave their current ED, and possibly to leave the specialty.

### Analysis

Burnout Scores were divided into quartiles from lowest to highest. The highest scores represent the most “burned out” while the lowest represent the most resilient physicians. In addition to conducting correlation analysis, we compared the most and least ‘burnt out’ on several variables.

No association was found between burnout and any of the demographic variables (sex, race/ethnic identification, decade of birth). Similarly, there were no significant

relationships between burnout and physician (demographic) characteristics, such as graduation year, type of certification, type of practice, employment type, or years in practice. There was no association between burnout and the total number of hospitals worked, the greatest length spent at a hospital or the time spent at the current ED even when these variables were standardized against number of years since medical school graduation.

### Burnout and hospital characteristics

We found that EPs who work for public, non-federal government hospitals (i.e. state, county or municipal) reported significantly lower burnout scores than others, while EPs working for private, for-profit reported significantly higher scores. EPs working at academic medical centers also reported significantly lower scores than others. There was no association between burnout and the setting of the hospital (i.e., rural, urban etc.). This finding begs for an explanation.

### Work environment (climate) & social support

As expected from the sociology literature, all variables in this category had strong relationships with burnout. Psychological safety –which signifies that one feels safe voicing one’s views at work– and administrative autonomy –which includes participation in planning– were both negatively significantly related to burnout ( $p < 0.001$ ). Likewise, feeling supported by one’s supervisor or director, by the hospital administration, and by coworkers had similar negative and significant correlations with burnout. Feeling that the ED is truly committed to serving the needs of patients (as opposed to financial goals) was also negatively significantly correlated with burnout. Similarly, there was a marginally significant negative correlation between burnout and the perception that the ED is focused on providing high quality service. On the other hand, the experience of hostile interactions with patients was positively significantly correlated with burnout. **In other words, the least burned out physicians were those who felt supported by their supervisors, co-workers and by administration. These were physicians who participated in planning for the department. They felt that they and their hospitals answered a significant social need by providing excellent service, and did not experience many hostile interactions with patients. Administrators who focus on these qualities may reap a happier, more stable and productive workforce.**

### Burnout and shift patterns

There was a significant difference in reported shift pattern satisfaction between the most and least burned out respondents. Those with the lowest burnout scores reported being more satisfied with their shift pattern (mean= 6.8) than those with the highest score (mean= 4.9). The two variables were significantly and negatively correlated ( $r = -0.29$ ,  $p < 0.0001$ ). A similar relationship was found between perceived control when one works and burnout. The two variables were significantly negatively correlated ( $r = -0.17$ ,  $p < 0.006$ ). However, the correlation between perceived control over how many hours one works and burnout was only marginally significant ( $p < 0.08$ ). Again, in other words,

disgruntlement is less a function of how many hours a physician works than the pattern of shifts worked. (comment in discussion)

We found a large negative, and statistically significant relationship between workload and burnout. However, there was only a marginally significant correlation between burnout and the average number of clinical shifts worked per month. The same was true of the number of clinical hours worked per month. The relationship with the average number of patients seen per shift was non-significant. Comparison between the highest and lower burnout scores similarly yielded no significant differences.

Respondents who had worked a night shift in the last 12 months were not more burnt out than those that hadn't. However, those who found night shifts more difficult, did experience more stress, or greater burnout. The correlation between the two variables was positive.

Finally, respondents who reported working a shift that lasted more than 12 hours also reported greater burnout.

#### Burnout and home

Support from family and friends had no relationship to burnout, surprisingly. However, work-home conflict, the feeling that one sphere interferes with the other, was positively significantly correlated with burnout.

#### Burnout and job resources

The 3 measured job resources –opportunities for development at work, job security and feeling properly rewarded– had negative and highly significant correlations with burnout ( $p < 0.001$ ). In other words, physicians were more pleased when they had professional development opportunities, job security, and felt rewarded. These also are characteristics which are under the control of a chair or administration.

#### Burnout and psychological variables

All psychological variables we measured were negatively significantly correlated with burnout. Resilience, perceived meaningfulness of one's work, perceived social impact of one's work, optimism and mindfulness all were negatively correlated at  $p < 0.0001$ . This is very encouraging, as all these factors can be altered through educational interventions.

#### Burnout and coping

We measured the association between burnout and a number of coping strategies which might be employed by EPs. The strategies we measured included both beneficial and potentially harmful strategies. Among the coping strategies was 'cognitive coping'; making a conscious, mindful effort to cope appropriately.

The following approaches to coping had a negative significant correlation with burnout (they were beneficial):

- Active coping (trying to change the situation)
- Seeking emotional support from others
- Seeking instrumental support (help) from others
- Refocus on planning (cognitive)
- Positive reappraisal (seeing the situation as an opportunity to grow) (cognitive)

The following approaches to coping had a positive significant correlation with burnout (they were harmful):

- Self-distraction (finding ways to take one's mind off the situation)
- Substance abuse (alcohol, drugs or medication)
- Behavioral disengagement (giving up trying to cope)
- Self-blame
- Social withdrawal (avoiding others)
- Acceptance (cognitive)
- Focus on rumination (dwelling upon one's feelings) (cognitive)
- Catastrophizing (thinking about how bad it is) (cognitive)
- Blaming others (cognitive)

Finally, through regression analysis, we determined that the following variables had the strongest positive or negative relationships with burnout: working at an academic medical center, psychological safety in the workplace, perceived meaningfulness of work, optimism, seeking emotional support from others, job security and active coping were all strategies associated with less burnout; high workload, acceptance (cognitive coping) and substance abuse were associated with greater burnout. . While regression has the advantage of yielding results that control for the effect of other variables in the analysis, in this case the power of the analysis is low because the sample size is modest. Thus these results should be treated only as suggestive.

Looking at the patterns of the results, we note that four groups of variables have strong relationships with burnout: work environment and social support, psychological variables, coping approaches, and job resources. It is encouraging that these are all variables that are modifiable. Psychological variables and coping approaches are individual level variables and can be altered through interventions. Work environment and social support are group-level characteristics and can be changed through collective effort. Job resources can be changed by the administration.

We conclude that physician resilience to burnout can be developed thus increasing the sustainability of the EM as a career choice.

### Limitations

Membership bias: Only members of ACEP were sampled. They may not represent all EPs.

Selection bias: There is no way to prevent selection bias using a completely voluntary model. Those who are particularly interested in the topic or the method – either because they are members of the Wellness Section or the Research Section – are more likely to complete the survey. On the other hand, those who are high on burnout may feel too exhausted or withdrawn from their work to respond. The presence of non-response bias can be detected by comparing sample characteristics to known characteristics of the overall population of ACEP members. Still, the possibility that our samples are not entirely representative of the intended population -- ACEP members who are actively practicing EM at least half-time, are practicing primarily in the US, and have at least 1 year of post-residency experience -- cannot be entirely dismissed.

Issues of engoneity: In a cross-sectional observation study, the exact causal relationship between variables cannot be known or tested. That is, one cannot definitely determine to what degree X affects Y, Y affects X, or the causal relationship between them is reciprocal. For this reason we have chosen to discuss relationships between variables as associations rather than causal links. Longitudinal (panel) data would allow us to avoid this problem in future studies. We did not conduct a longitudinal study, but ABEM might wish to add some of these measures to a future study.

Method bias: Self-report may introduce biases such as social desirability bias. Issues of common method variance were minimized in 2 ways. First, item order was randomized within almost all scales to minimize item order effects. Second, during the validation of the scale a marker variable technique was used to test for the presence of common method variance. None was detected.

### **Discussion and Conclusions:**

To our knowledge, this is the first nation-wide study to describe the shift patterns in EM, and the first to correlate shift patterns to burnout scores. Although the sample size for this survey was small, the degree of burnout was similar (moderate to high) similar to other studies of burnout in emergency physicians. <sup>i , ii , iii</sup> We hypothesized that physicians who have greater control over their work would be less burned out. This seems to be true.

Several findings should be highlighted. First, this is, to the best of our knowledge, the first study demonstrating what most of us believed: the majority of EPs work randomly-changing shift schedules. EM is the only profession which seems to readily accept this model. Shift-work researchers in general condemn this model. <sup>iv , v , vi , vii , viii , ix , x</sup>

Anecdotally, schedulers tell us that although they would like to schedule their physicians with greater attention to circadian principles, physicians end up with randomly changing shifts because of ‘day off requests’ and shift swaps. So the schedulers pay more attention to coverage needs than circadian principles. This may be an historical legacy: younger persons tolerate shift work better than older persons (reference); emergency medicine is a young field previously populated primarily by younger physicians who are only now

reaching senior years. In response, some groups grant ‘senior status’ with no night shifts unless requested to physicians over a certain age (age 50 in CEP, private communication 10/17/2013, CEP recruiter). We did not investigate the preferred patterns.

There is data suggesting that 8-hour shifts are optimal, yet in emergency medicine, 8-hour shifts are the exception rather than the norm; most EPs work 10 or 12 hour shifts. In addition to scheduled work time, EPs spend on the average of almost an hour of additional time completing paperwork. Shift length may be an historical legacy, or may be a result of preferring to work longer but fewer total shifts. Our research did not investigate shift length preference. Again, in other words, disgruntlement is less a function of how many hours a physician works than the pattern of shifts worked. (Comment in discussion)

Shift work is physiologically stressful for most people. The literature is replete with suggestions on how to more easily sleep during the day or stay awake at night.<sup>xi</sup>,<sup>xii</sup>,<sup>xiii</sup>,<sup>xiv</sup>. Most EPs report use one or more of these. The most commonly used strategy was to avoid light during the sleeping period. Sound isolation seemed less important to our respondents.

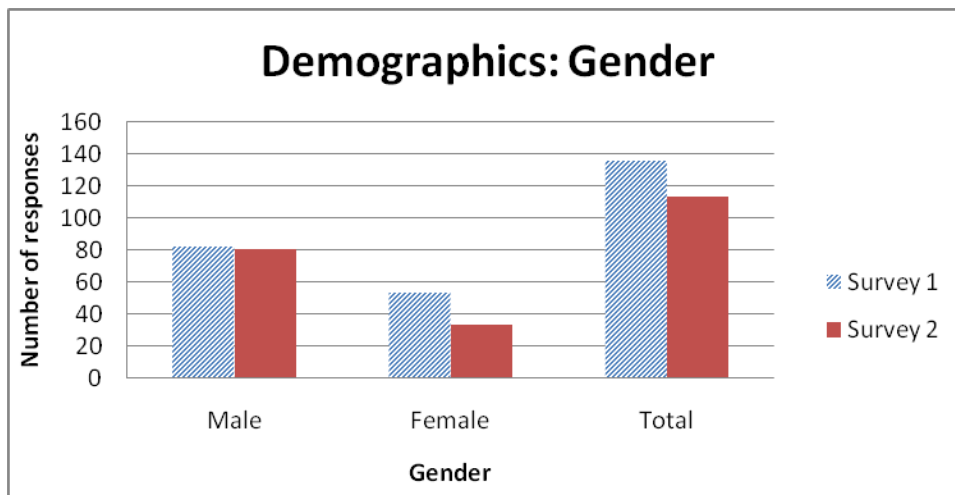
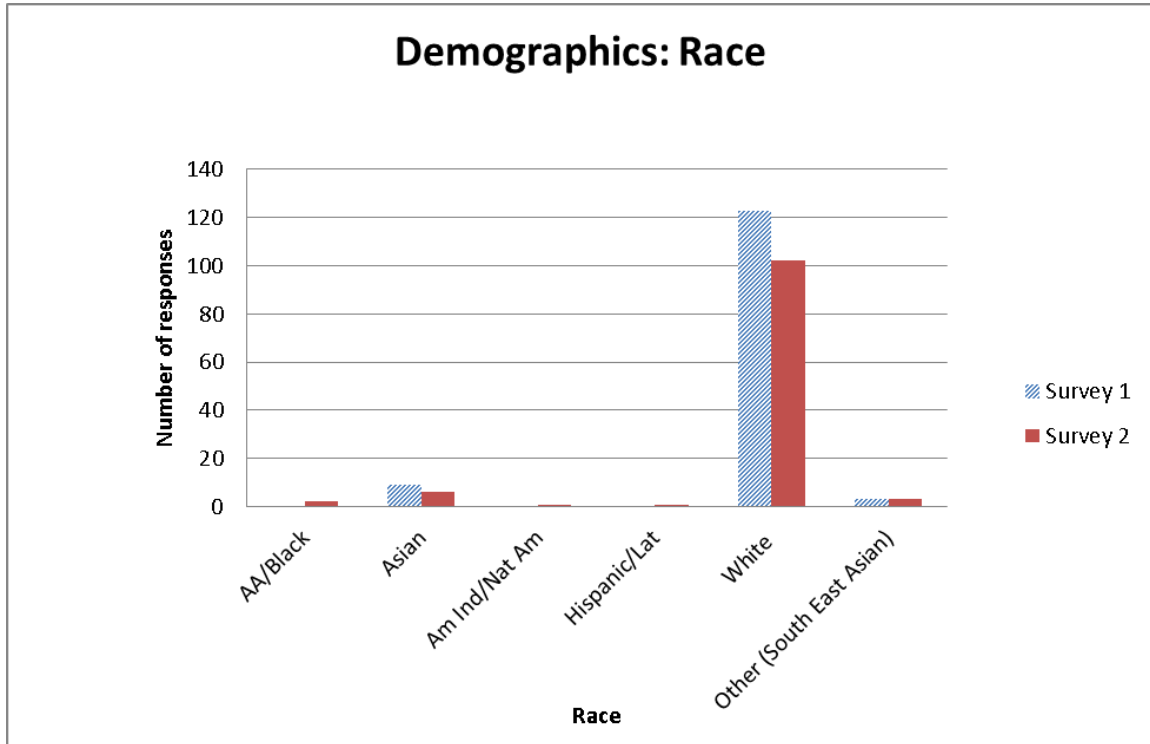
Light avoidance during sleep coupled with bright light during waking hours has more than mere psychological importance.<sup>xv</sup> Melatonin is released by the pituitary in response to darkness. Inadequate melatonin (inadequate dark periods) has been cited by some authors as a risk for breast cancer, and for prostate cancer, although the associations have been argued.<sup>xvi</sup>,<sup>xvii</sup>,<sup>xviii</sup>

Among the interventions recommended to keep awake and alert during night shifts are bright light, exercise, caffeine, and Provigil or other medications. Almost all our respondents reported caffeine use. The health effects of caffeine remain controversial; in moderate doses, caffeine seems not to be a significant risk factor for heart disease or early death.<sup>xix</sup>,<sup>xx</sup>

The next most common wakefulness intervention was bright light, followed by nothing at all, then followed by exercise. Light at the level of 7000 lumens is important to alertness, and blue spectrum light seems to add additional benefit.<sup>xxi</sup>,<sup>xxii</sup>,<sup>xxiii</sup> Napping either just before a night shift (ref) or during the night shift has been advocated. This is an adaptation that seems well favored by our respondents. A few respondents claim to routinely use none of these common strategies. Our research did not investigate why they did not.

The ACEP Wellness Book<sup>xxiv</sup> does not address specific sleep/wake shift work strategies. A future revision of the Wellness Book might include a chapter on “strategies for sleeping during non-preferred times” and a discussion of maintaining alert wakefulness.

## Graphs



## **Section Effort**

Several members of the Section have volunteered to act as co-principle investigators and others will provide experienced advice and direction.

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