# Factors Related to Caffeine Consumption for Nurses at Medical City Healthcare

Mackenzie Berryman, Department of Mathematics and Statistics

Assisted By: Jennifer Janovsky. Advisor: Gregory K. Miller

## Two Hypotheses

Determine the relationship between increased caffeine consumption and poor sleep quality/quantity when controlling for energy drink consumption, shift worked, age, stress, and work satisfaction.

Evaluate the relationship between energy drink consumption with respect to sleep quality/quantity and self-reported patient care mistakes or near-misses.

## Abstract

The market for caffeine is rising across the globe, as people are over-exerting themselves and lacking proper rest. In this study, we aim to determine if caffeine intake among nurses at Medical City Healthcare affects factors related to their work and sleep.

A survey was administered to nurses at Medical City Healthcare regarding caffeine intake, sleep, stress, and other occupational factors. The responses were then analyzed using multiple linear regression and contingency tables. Concerning Hypothesis 1, the results show that energy drink consumption is the most significant predictor of daily caffeine intake. The analysis of Hypothesis 2 makes evident that large energy drink consumption and multiple near miss events are significantly related in the extreme cases.

Our results suggest that sleep quality/quantity, energy drink consumption, and age are the most significant variables for prediction of caffeine intake. Further, we conclude that a nurse who intakes large amounts of caffeine daily has a notably greater chance for multiple patient care near-miss occurrences compared to a nurse with no daily caffeine consumption.

## Introduction

The stimulant caffeine is heavily used in the nursing industry, due to long shifts and daunting workloads. For this reason, our research concerns the effects caffeine has on the nurses at Medical City Healthcare.

Using statistical modeling we will gain a better understanding of the role caffeine plays in a nurses daily occupational stress.

**Figure 1.** JMP Analysis Output Logistic Regression

### Effect Likelihood Ratio Tests

| Source | Nparm | DF | L-R ChiSquare | Prob>ChiSq |
|---|---|---|---|---|
| EnergyDrinkDailyOz | 1 | 1 | 35.562608 | <.0001* |
| PSQI | 1 | 1 | 2.18111743 | 0.1397 |
| Shift | 3 | 3 | 0.90174831 | 0.8250 |
| Age | 1 | 1 | 1.2271881 | 0.2680 |
| StressScore(Low=Stressed) | 1 | 1 | 2.56135751 | 0.1095 |
| JobSatisfaction | 1 | 1 | 4.96371088 | 0.0259* |

**Figure 2.** JMP Analysis Output Multiple Linear Regression

### Parameter Estimates

| Term | Estimate | Std Error | t Ratio | Prob>|t| |
|---|---|---|---|---|
| Intercept | 11.840725 | 0.627856 | 18.86 | <.0001* |
| EnergyDrinkDailyOz | 0.3579832 | 0.020816 | 17.20 | <.0001* |
| Age | 0.0608948 | 0.012651 | 4.81 | <.0001* |
| PSQI | 0.1084205 | 0.042367 | 2.56 | 0.0106* |

## Methodology

Hypothesis 1: A considerable number of respondents reported not intaking caffeine daily. As a result, our modeling for Hypothesis 1 was in two stages. The first of which models the factors that determine whether someone consumes caffeine daily. The second of which demonstrates the significance of nurse's work-related factors, conditional on taking in caffeine daily, through a multiple linear regression model.

Hypothesis 2: We used logistic regression to determine the factors that effect regular energy drink consumption. In addition, statistical cross-classification and conditional probabilities were used to produce interpretable results.

## Results

Figure 1 displays the results from the first stage of addressing Hypothesis 1. For the predictors energy drink consumption and job satisfaction, the analysis reports significant p-values, which are less than .05, associated with the chi-square tests. For the second stage of addressing Hypothesis 1, Figure 2 displays the multiple linear regression model which shows a significant p-value of less than .05 for each predictor.

It is important to note that Hypothesis 2 relies on self-reported patient near-misses and adverse events for predictor variables. This led to an overwhelming number of 0 responses. For example, the predictor for patient care near-misses came back 0 approximately 80% of the time and the predictor for patient care adverse events came back 0 about 97.5% of the time. To accommodate, we evaluated the extremes of the data. The results from the contingency table analysis are in Figure 3. Note the column percentages 10.6% and 6%.
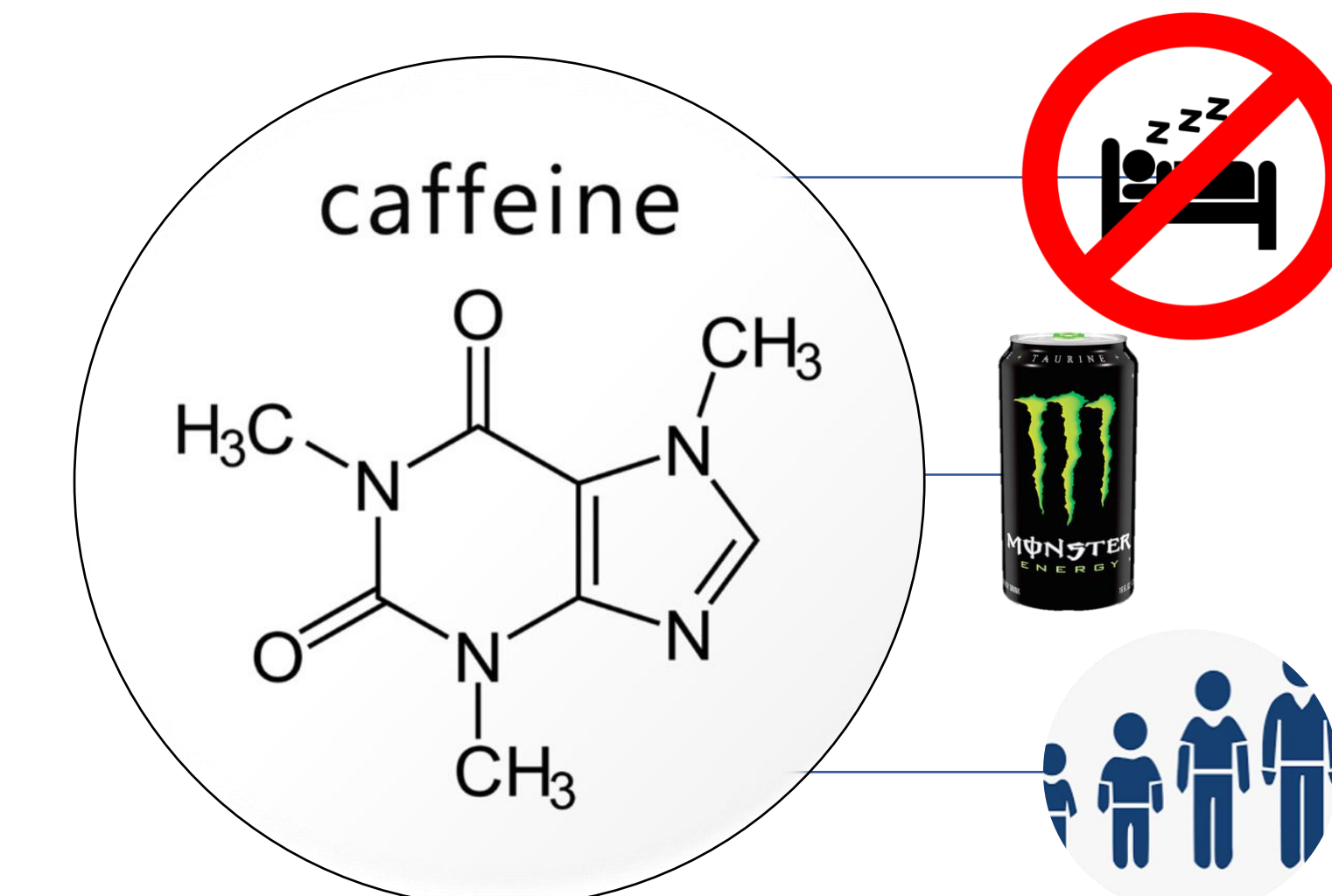
**Figure 3.** Contingency Table Results



### Contingency Table

| Count Total % Col % Row % | Energy High Energy | None | Total |
|---|---|---|---|
| >= 2 Miss | 5 | 80 | 85 |
| | 0.36 | 5.77 | 6.13 |
| | 10.64 | 5.97 | |
| | 5.88 | 94.12 | |
| No Miss | 42 | 1259 | 1301 |
| | 3.03 | 90.84 | 93.87 |
| | 89.36 | 94.03 | |
| | 3.23 | 96.77 | |
| Total | 47 | 1339 | 1386 |
| | 3.39 | 96.61 | |

## Discussion

The significant chi-square values for Job Satisfaction and Energy Consumption tell us that high job satisfaction suggests a lower likelihood of being a caffeine consumer and high energy drink consumption suggests a higher likelihood of being a caffeine consumer. This gives us predictive power allowing us to siphon off the caffeine consumers for further analysis.

Further testing on the caffeine consumers allowed us to conclude energy drink consumption, sleep quality/quantity, and age were all significant variables in predicting total daily caffeine. That is, given that a person consumes caffeine daily, their energy drink consumption, sleep, and age are all significant factors of how much caffeine they intake daily.

Figure 3 can be interpreted as follows:
- Given a nurse does not consume energy drinks, the probability they report 2 or more near-misses per month is 6%.
- Given a nurse consumes energy drinks in quantity 24 oz or more daily, the probability they report 2 or more near-misses per month is 10.6%. Notice, the second percentage is near double the first.

## Conclusions

After evaluating different relationships involving caffeine intake among nurses at Medical City Healthcare, we found that sleep quality/quantity, age, and energy drink consumption are significant predictors of total daily caffeine intake. In addition, we demonstrated that high energy drink consumption suggests an increased chance for patient care errors.

Future research could focus on additional ways of recording patient near-misses and adverse events in the workplace, specifically techniques that do not rely on nurses self-reporting.

## Contact

Mackenzie Berryman
Stephen F. Austin University SURE
2614 N. University Dr. Nacogdoches Tx, 75065
berrymanml@jacks.sfasu.edu

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