What Drives Nurse Turnover?

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Project Introduction

Nurse turnover and shortage has been a challenge in healthcare industry particularly in hospital care. Although researchers have been studied the intension of nurse turnover through Likert scale questions in order to better understand the factors that potentially leads to the issue, the nurse turnover rate still remains high nowadays. Our research aims to not only study the reasons that cause nurse turnover but also the reasons for nursing shortage. Thus, questions such as "what drives nurse turnover and what drives nurse shortage" await to be answered.

Detail

Data

This is a survey data that was conducted by Regis professor and student from nursing and data science department.

- Demographic data
- Basic and current job data (job changes and nurse traveler)

Analysis Methods

- Chi-Square: using statistical measurements to find out relationship among categorical variables and continuous variables.
- EDA: Creating graphs to slice and dice demographic and job data from different perspectives.
- Logistic Regression: Predicting whether a nurse will change jobs in the next six month based on the predictors.

Analysis Process

I. Data Cleaning

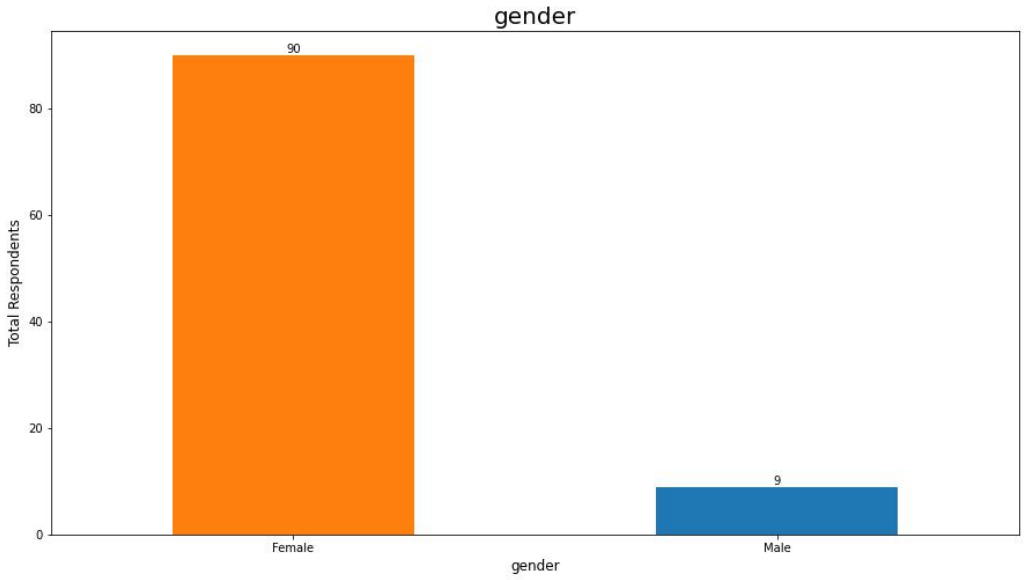
Since this project is the extended study of the last research, data structure is already reformatted to a regular table with column, row, and header. Variables are selected for studying what drives nurse turnover, which only include demographics and job history data. All null answers in plan to change job question as well as the retired respondents were dropped. Nulls in other fields include "is_nurse_traveler", "cur_annual_range", "cur_total_hour_work" were also removed. Finally, observations that have data quality issue were also dropped. Quality issues in open ended questions were fixed where groups were assigned to each observation. After data cleaning, there were 99 total observations remain in the dataset.

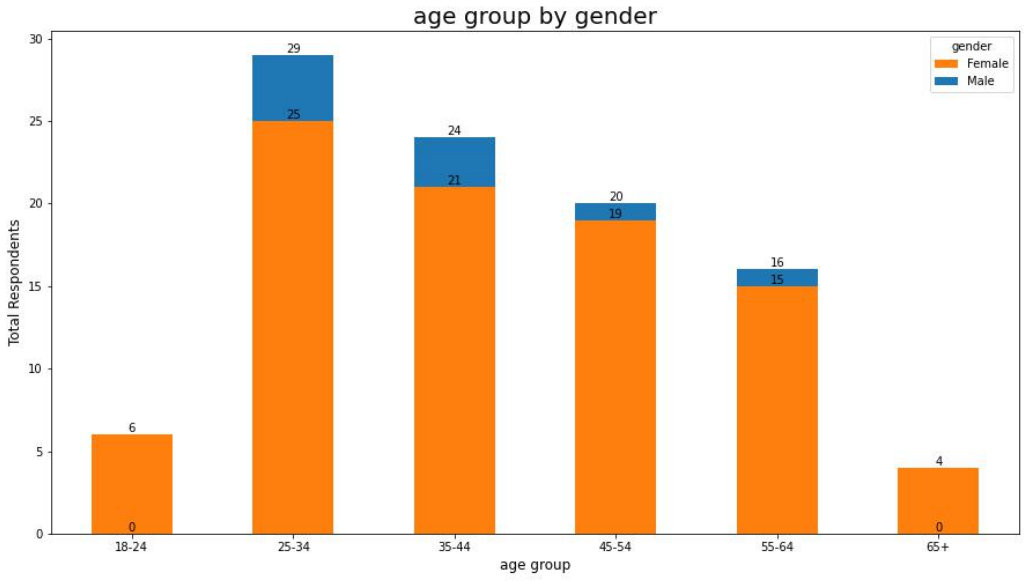
II. EDA

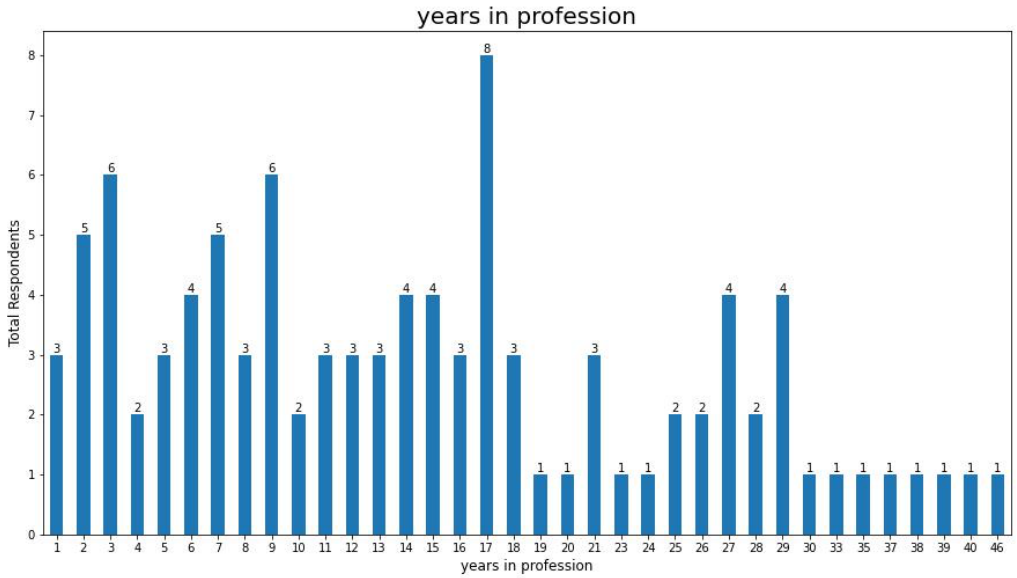
EDA focuses on learning the data, which includes demographic and job changes information. Interesting findings are 1) only around 10% of nurses are planning to change jobs in the next six

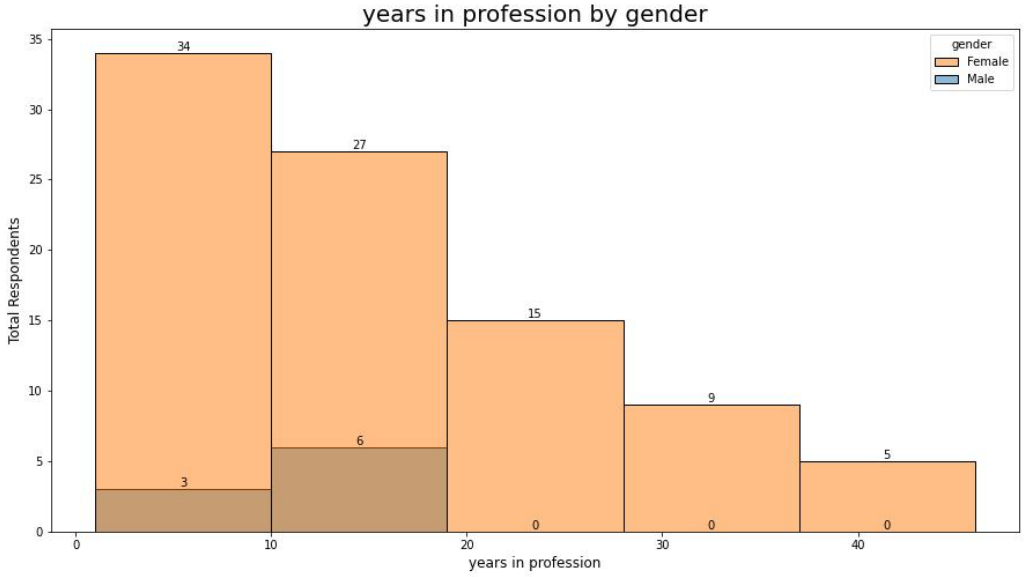
months, whereas approximately 65% nurses said no and 25% of them answered “maybe”. 2) for those who work in acute care hospitals and said yes to change jobs, 57% of them are from critical unit. 3) for the seven nurse travelers (7/99), three answered maybe, two for no and two for yes, which is 43%, 29%, and 29% respectively. 4) 80% of nurses who said yes (8/10) to change job have less than 10 years’ experience, which accounts for 22% of population in this group (<10 years in profession). 5) in the group of less than 20 years and greater than 10 years in profession, almost half of population answered maybe in job change question. Moreover, more than 60% of respondents who have 28-36 years’ experience also considered to change their jobs with the answer of maybe. 6) 10/44 respondents (23%) who work between 20-40 hours are part time nurses and 41/81 full time nurses works an average of 41-50 hours a week.

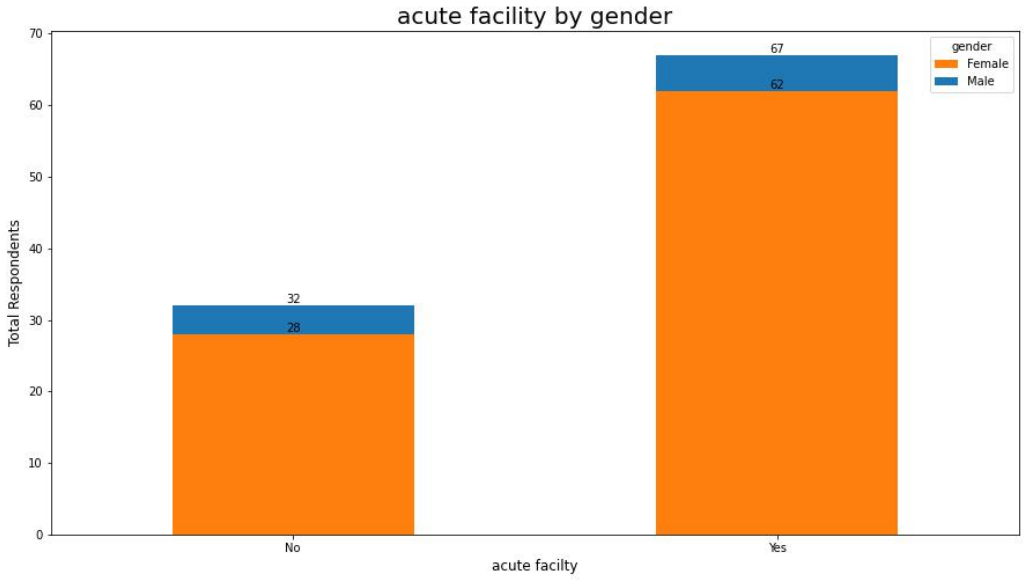
As for the two continuous variables – years in profession and total job changed, there’s no correlation between them. It looks like the two variables are right skewed in distribution.

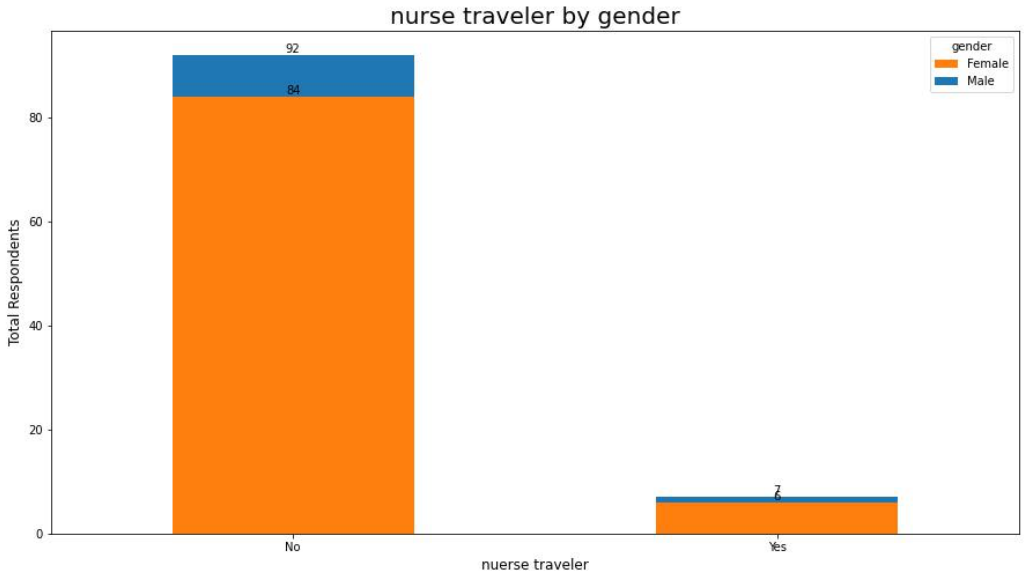

gender
90
9
Total Respondents
0
20
40
60
80
Female
Male
gender

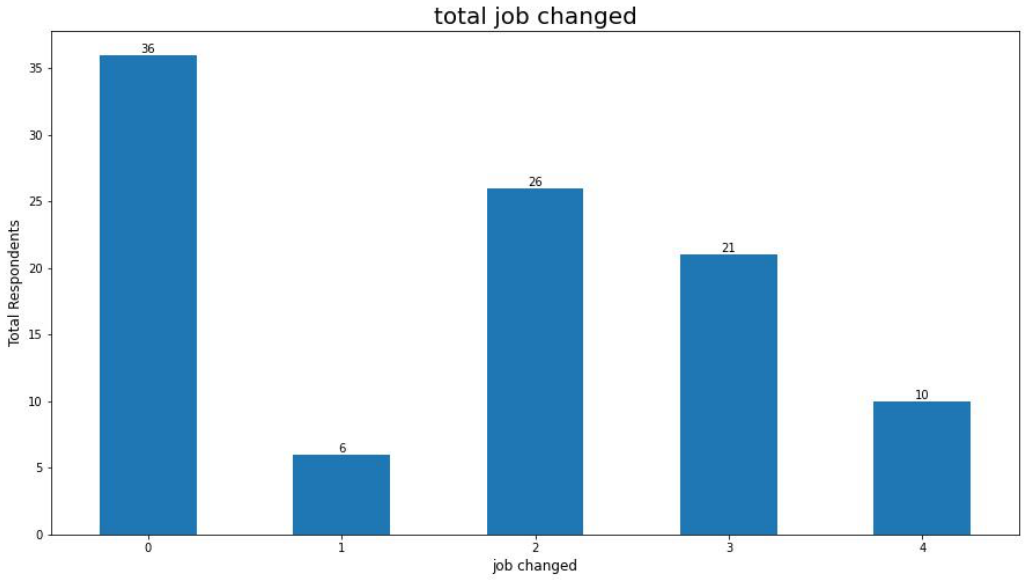

age group by gender
gender
Female
Male
29
25
24
21
20
19
16
15
6
0
4
0
Total Respondents
0
5
10
15
20
25
30
18-24
25-34
35-44
45-54
55-64
65+
age group

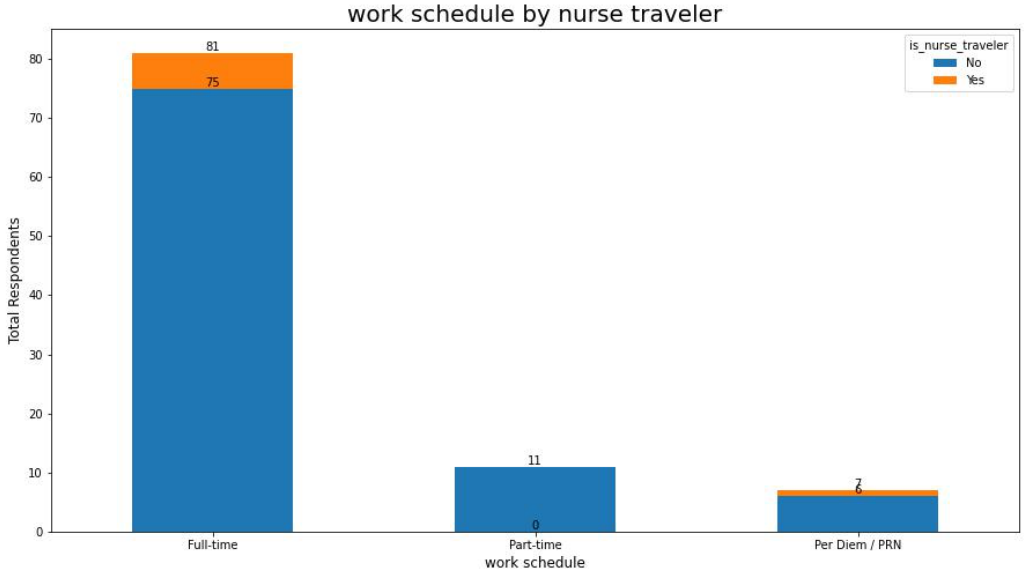

years in profession
Total Respondents
years in profession
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 23 24 25 26 27 28 29 30 33 35 37 38 39 40 46
3 5 6 2 3 4 5 3 6 2 3 3 3 4 4 3 8 3 1 1 3 1 1 2 2 4 2 4 1 1 1 1 1 1 1 1

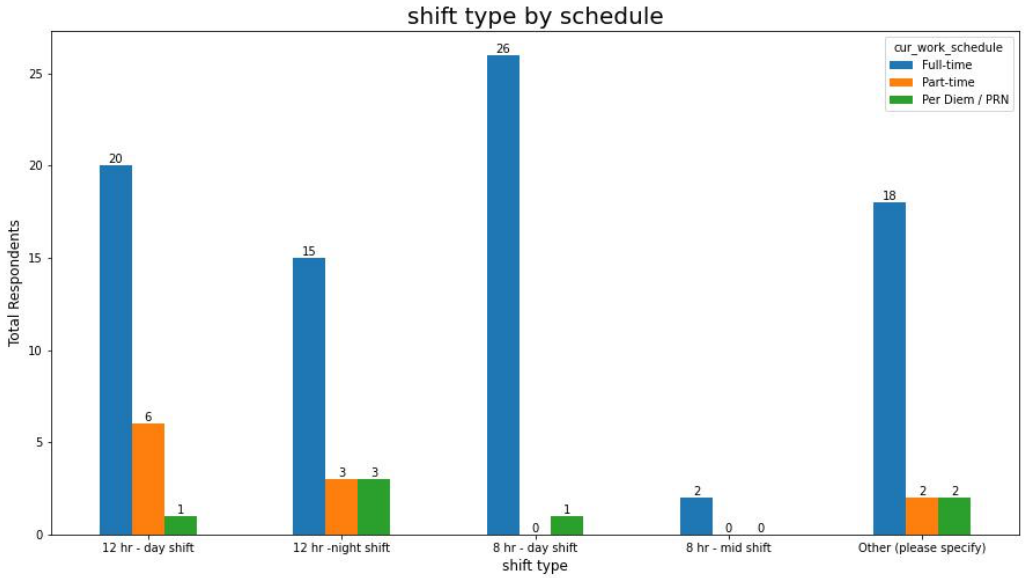

years in profession by gender
Total Respondents
years in profession
gender
Female
Male
34
27
15
9
5
3
6
0
0
0

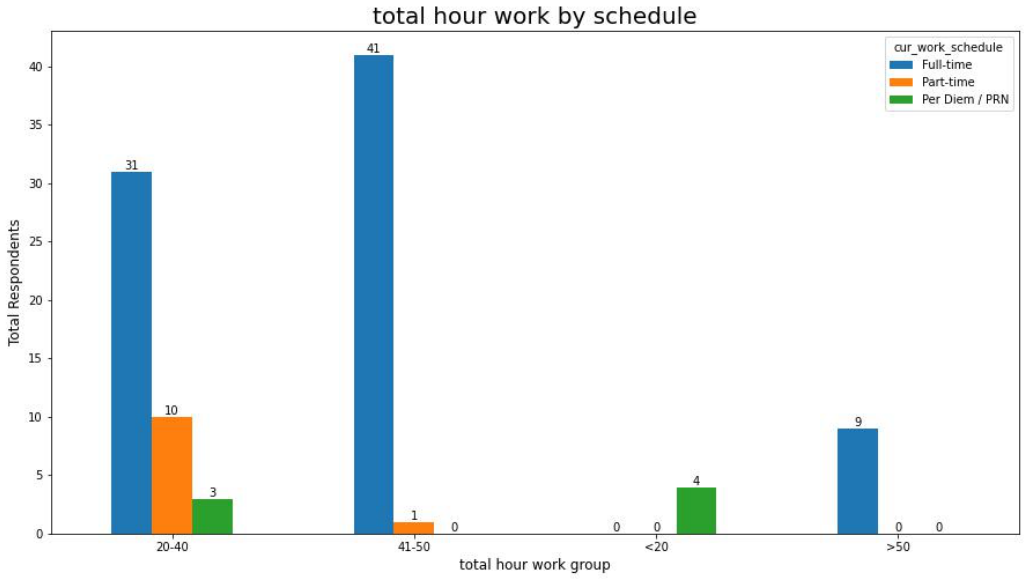

acute facility by gender
gender
Female
Male
Total Respondents
acute facilty
No
Yes
32
28
67
62

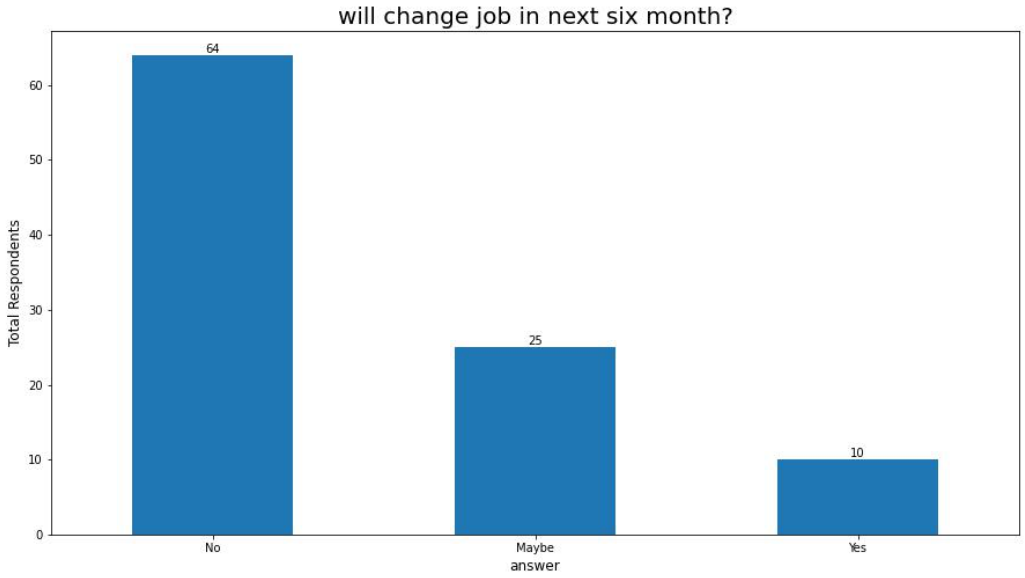

nurse traveler by gender
gender
Female
Male
Total Respondents
nuerse traveler
No
Yes
92
84
7
6

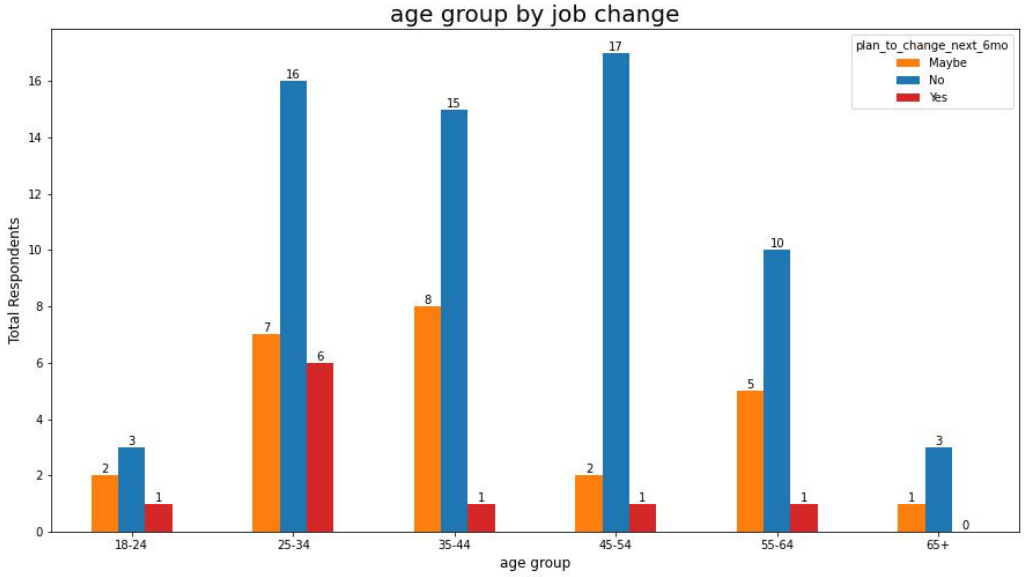

total job changed
Total Respondents
job changed
36
6
26
21
10
0
1
2
3
4
0
5
10
15
20
25
30
35

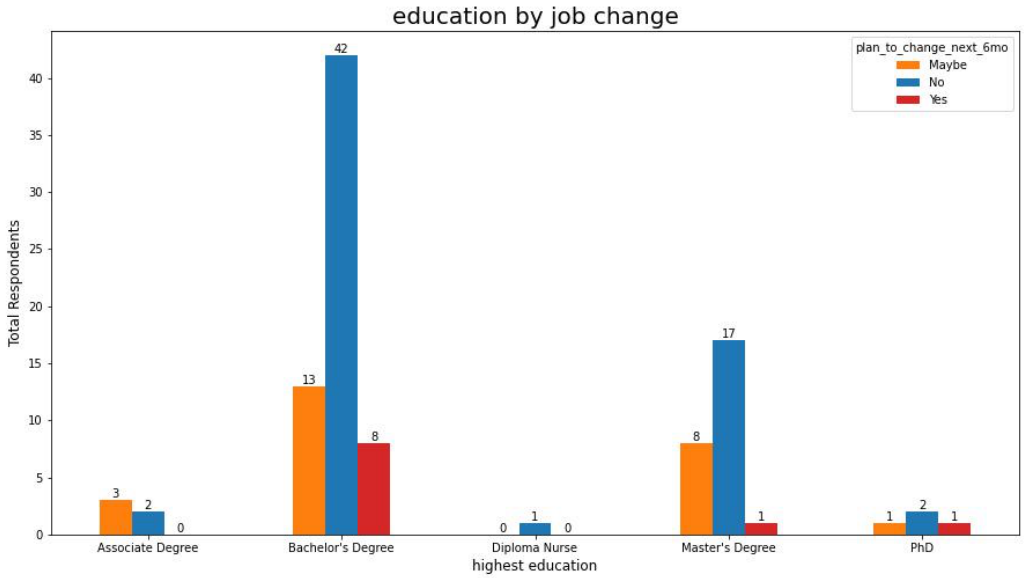

work schedule by nurse traveler
Total Respondents
work schedule
is_nurse_traveler
No
Yes
81
75
11
0
7
6
Full-time
Part-time
Per Diem / PRN
0
10
20
30
40
50
60
70
80

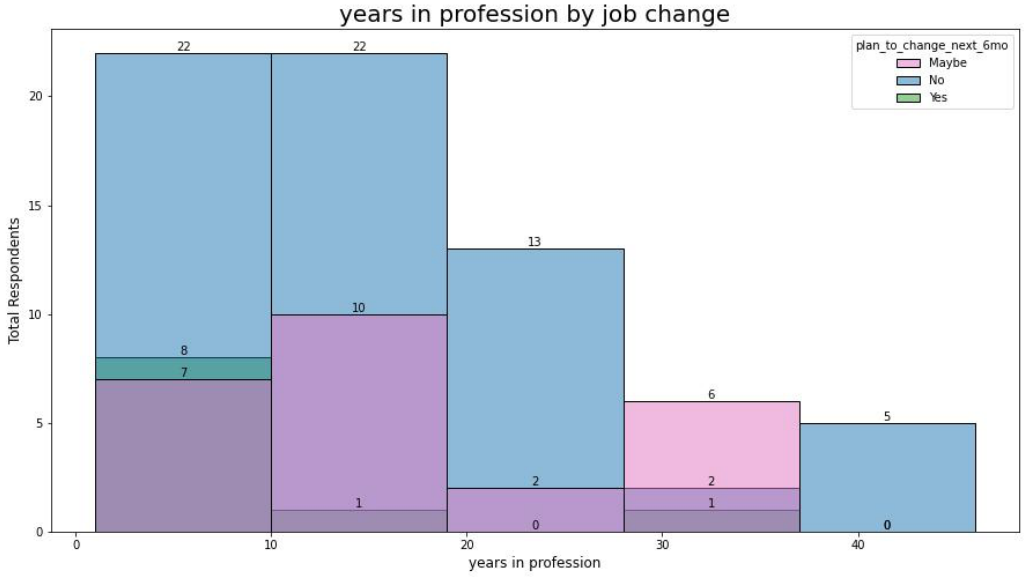

shift type by schedule
cur_work_schedule
Full-time
Part-time
Per Diem / PRN
Total Respondents
shift type
12 hr - day shift
12 hr -night shift
8 hr - day shift
8 hr - mid shift
Other (please specify)
20
6
1
15
3
3
26
0
1
2
0
0
18
2
2

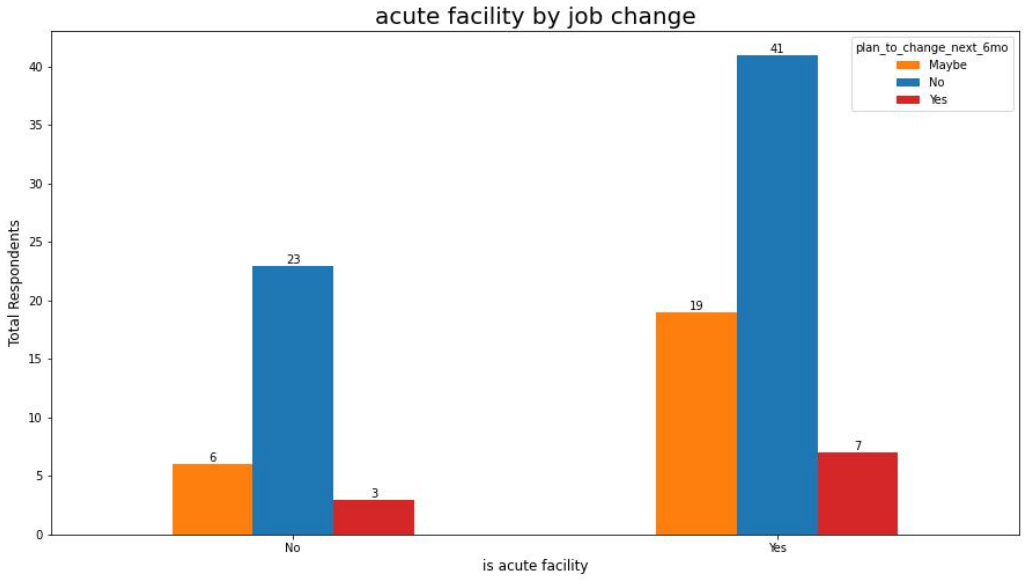

total hour work by schedule
cur_work_schedule
Full-time
Part-time
Per Diem / PRN
Total Respondents
total hour work group
20-40
41-50
<20
>50
31
10
3
41
1
0
0
0
4
9
0
0

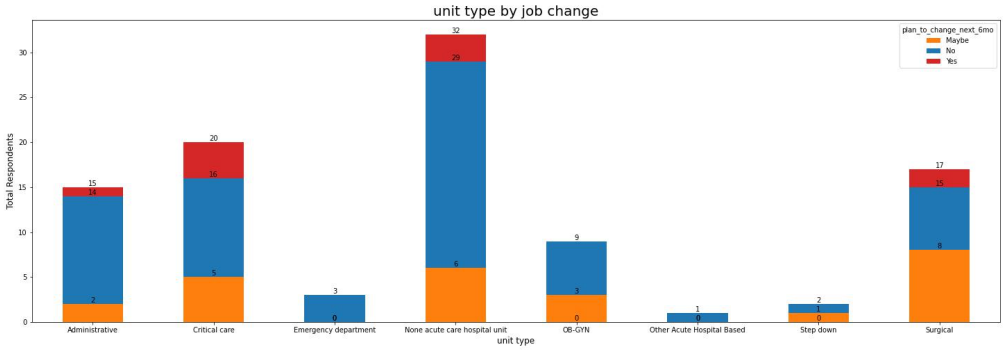

will change job in next six month?
Total Respondents
answer
No
Maybe
Yes
64
25
10
0
10
20
30
40
50
60

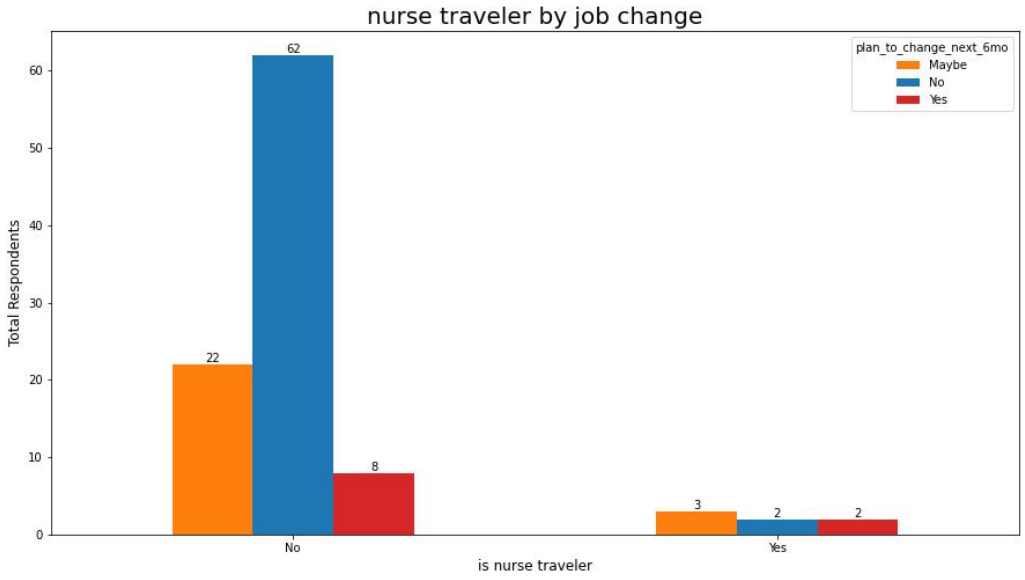

age group by job change
Total Respondents
age group
plan_to_change_next_6mo
Maybe
No
Yes
18-24
25-34
35-44
45-54
55-64
65+
2
3
1
7
16
6
8
15
1
2
17
1
5
10
1
1
3
0
0
2
4
6
8
10
12
14
16

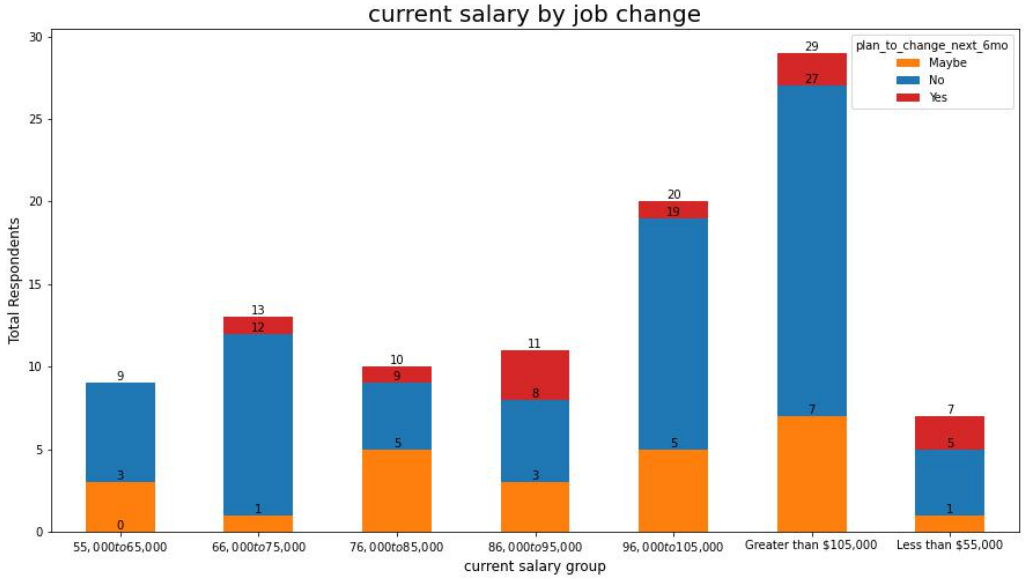

education by job change
plan_to_change_next_6mo
Maybe
No
Yes
Total Respondents
highest education
Associate Degree
Bachelor's Degree
Diploma Nurse
Master's Degree
PhD
3
2
0
13
42
8
0
1
0
8
17
1
1
2
1

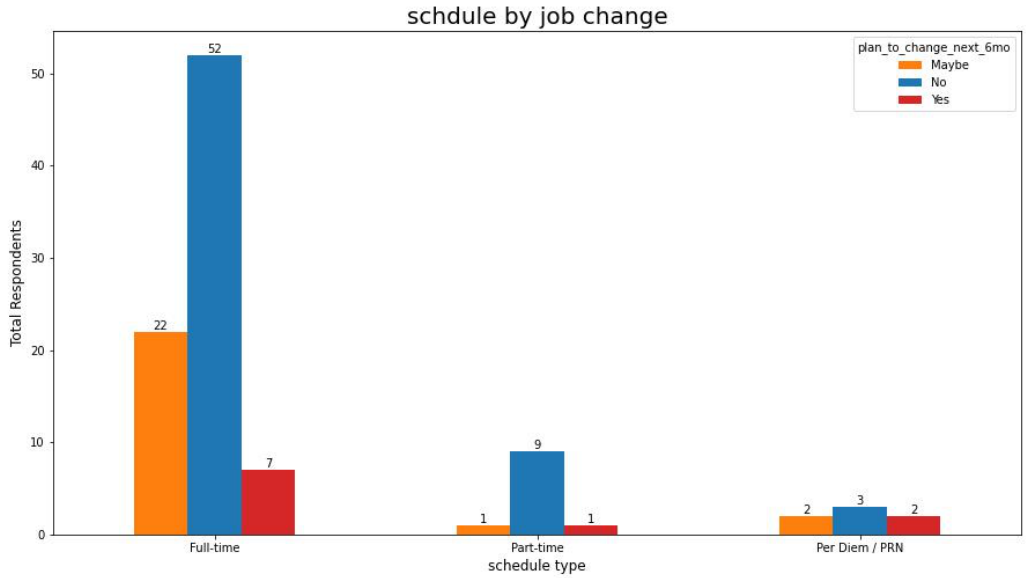

years in profession by job change
plan_to_change_next_6mo
Maybe
No
Yes
Total Respondents
years in profession
22
22
13
6
5
8
7
10
1
2
0
2
1
0

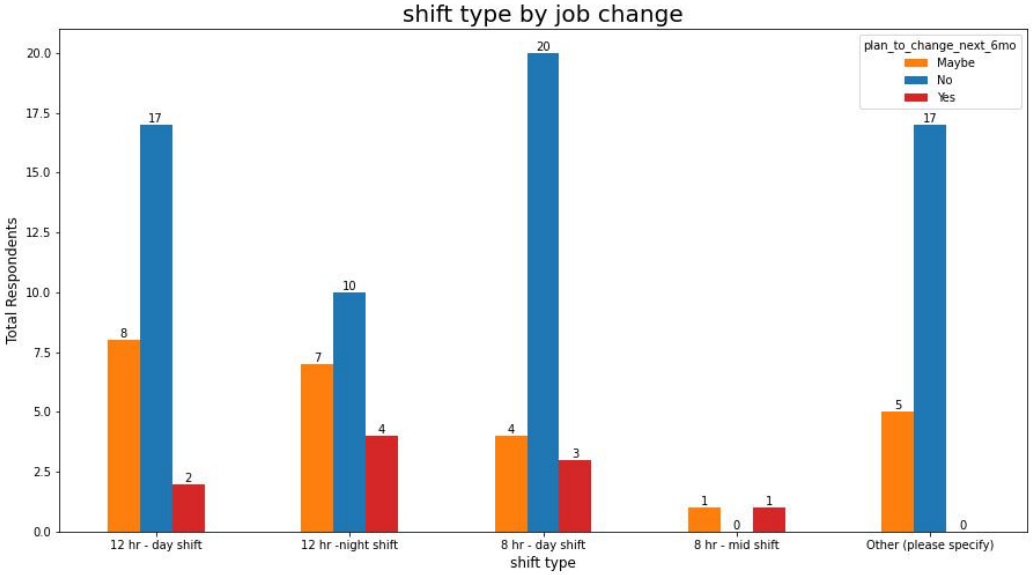

acute facility by job change
plan_to_change_next_6mo
Maybe
No
Yes
Total Respondents
is acute facility
No
Yes
6
23
3
19
41
7

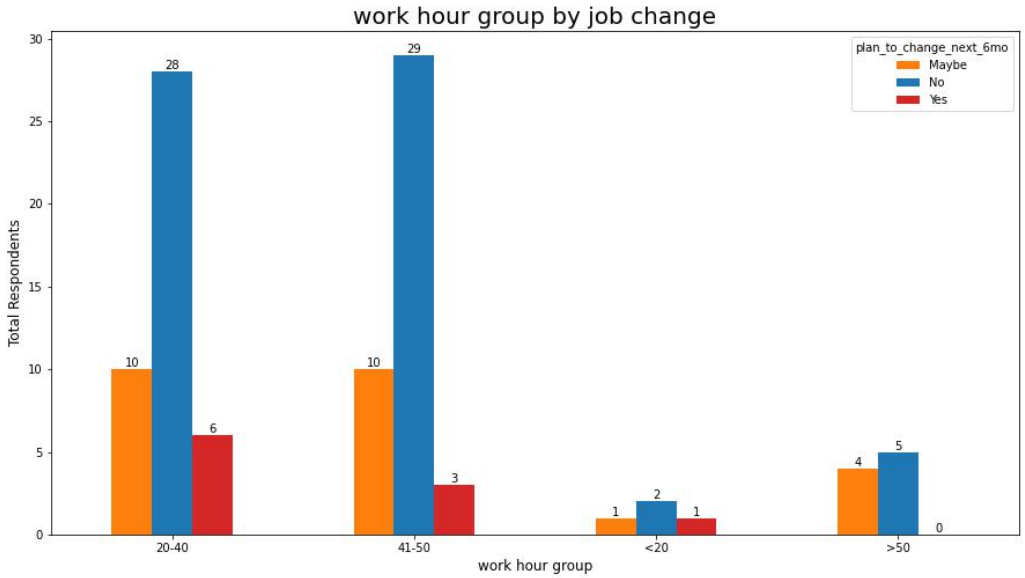

unit type by job change
plan_to_change_next_6mo
Maybe
No
Yes
Total Respondents
unit type
Administrative
Critical care
Emergency department
None acute care hospital unit
OB-GYN
Other Acute Hospital Based
Step down
Surgical

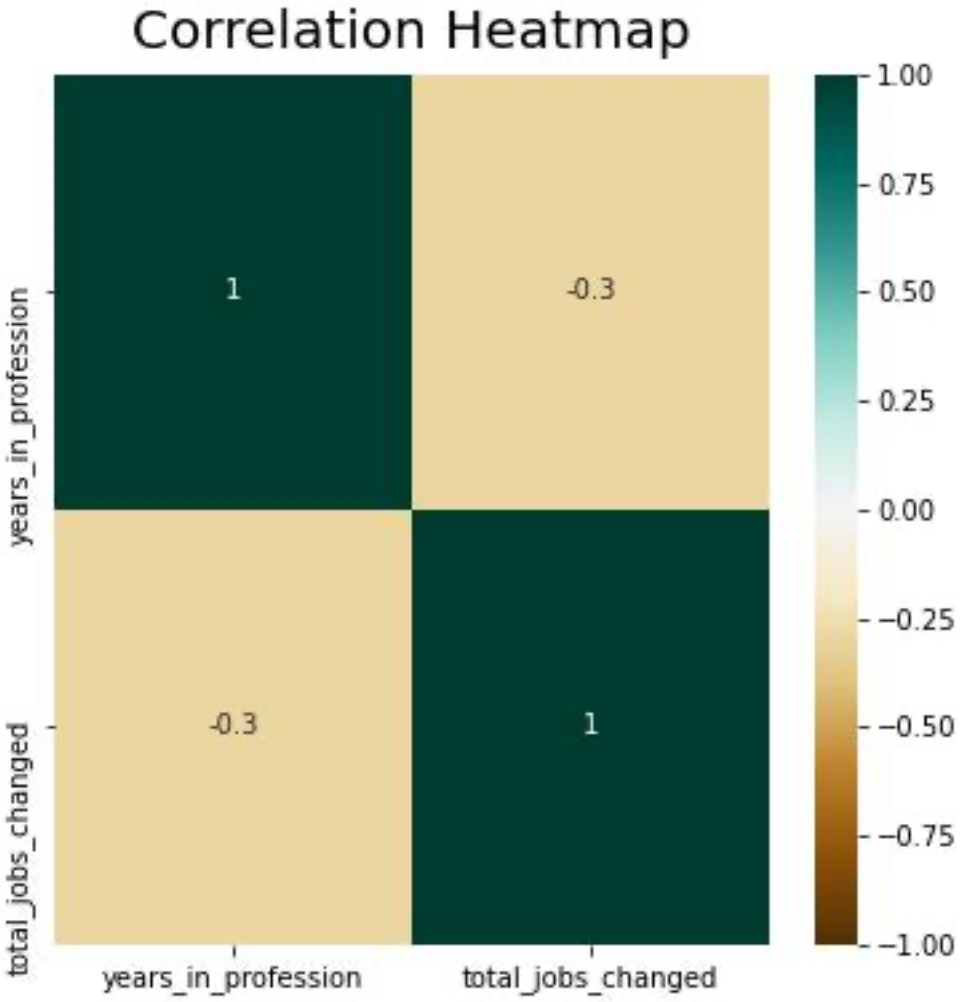

nurse traveler by job change
plan_to_change_next_6mo
Maybe
No
Yes
Total Respondents
is nurse traveler
No
Yes
22
62
8
3
2
2

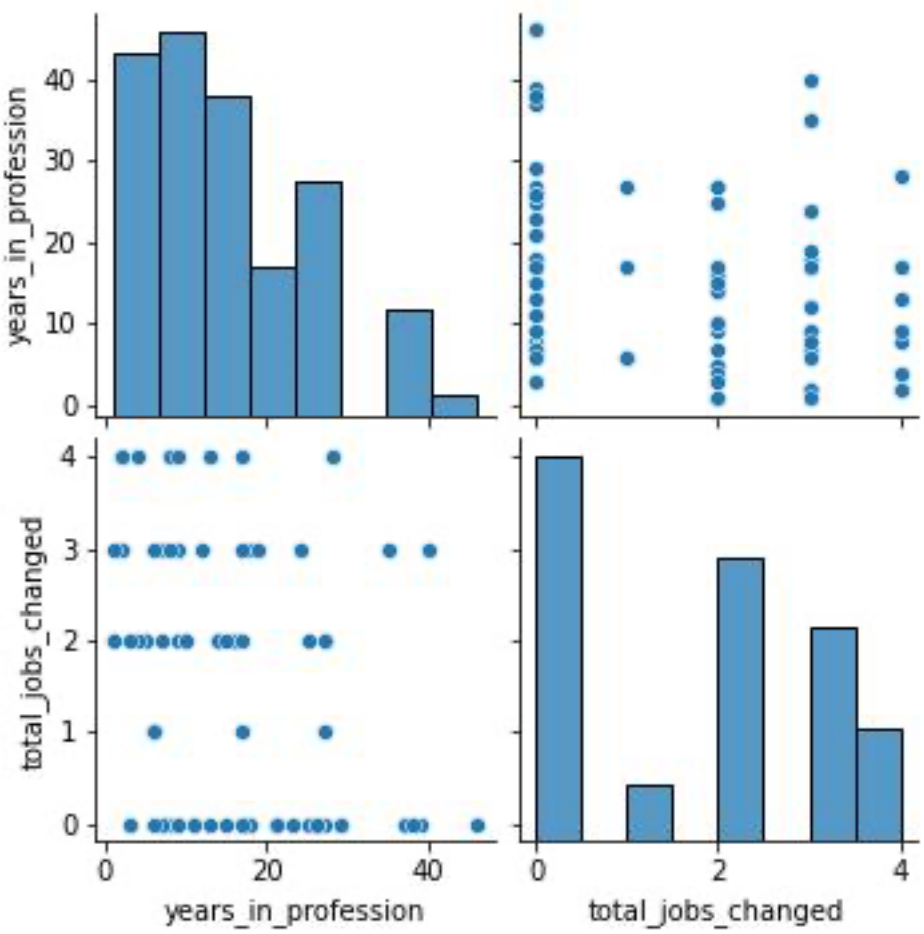

current salary by job change
plan_to_change_next_6mo
Maybe
No
Yes
Total Respondents
current salary group
55,000to65,000
66,000to75,000
76,000to85,000
86,000to95,000
96,000to105,000
Greater than $105,000
Less than $55,000
9
3
0
13
12
1
10
9
5
11
8
3
20
19
5
29
27
7
7
5
1


schdule by job change
plan_to_change_next_6mo
Maybe
No
Yes
Total Respondents
schedule type
Full-time
Part-time
Per Diem / PRN
22
52
7
1
9
1
2
3
2


shift type by job change
plan_to_change_next_6mo
Maybe
No
Yes
Total Respondents
shift type
12 hr - day shift
12 hr -night shift
8 hr - day shift
8 hr - mid shift
Other (please specify)
8
17
2
7
10
4
4
20
3
1
0
1
5
17
0


work hour group by job change
plan_to_change_next_6mo
Maybe
No
Yes
Total Respondents
work hour group
20-40
41-50
<20
>50
10
28
6
10
29
3
1
2
1
4
5
0


Correlation Heatmap
1
-0.3
-0.3
1
years_in_profession
total_jobs_changed
years_in_profession
total_jobs_changed
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00



III. Chi-Square

In this section, each categorical variable is paired with the rest categorical variables to test for independence.

H0: two variables are independent meaning no relationship.

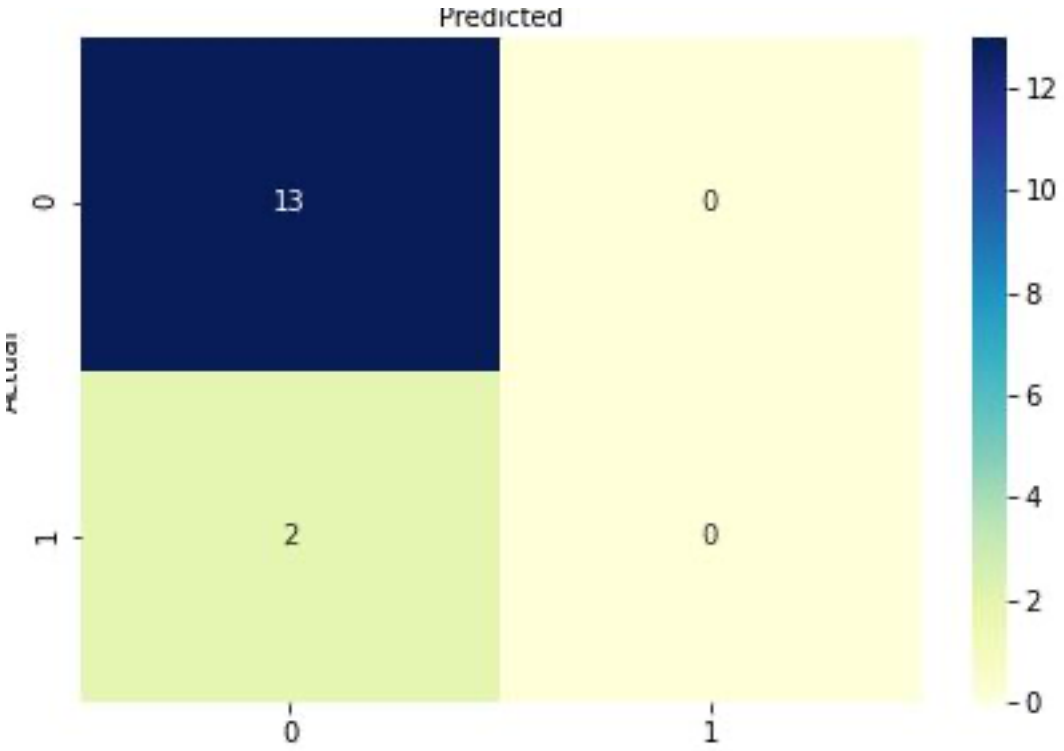
H1: two variables are dependent meaning there's a relationship.

The results below are significant due to the fact of p<alpha (0.05). It explains change jobs is related to licensed state type, length of current license level, or current shift type.

('plan_to_change_next_6mo', 'cur_licensed_state_type', 0.014844509365393704)
('plan_to_change_next_6mo', 'len_of_cur_license_level', 0.03264350167884819)
('plan_to_change_next_6mo', 'cur_shift_type', 0.01794285288127181)

IV. Predictive

There were only 77 observations in the predictive model where 15 are test dataset and 62 are training dataset. The result shows 13/15 no answers were predicted correctly as no and 2/15 no answers were predicted as yes. There was zero yes in the testing data.



Summary

Logistic regression was not successful due to the imbalanced output data and small sample size. In this case, the model failed to predict the answer of job change in the next six months. Therefore, a conclusion of what drives nurse turnover cannot be made based on the current results. However, this model can still be used when sample size grows. Moreover, decision tree can be built to predict three outcomes: yes, no, or maybe if the study scope changes. Although the predictive model did not work, some interesting finding via EDA can still explains some of the situations.