

Stats 506, F20, Final Project

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Introduction

Different commercial buildings have different operation times. Moreover, their operation times may vary from buildings to buildings due to multiple reasons (Regulations, geographic conditions, etc.). However, there may exist some common patterns for the operating time in one specific division, or in one specific building types (Office, shopping mall, lodging houses. . .). Some buildings will possibly have longer operating hours than others in general.

Hence, in my final project, I decided to carry out analysis to answer this question: **For what portion of the day are different types of commercial buildings typically in use?**

This analysis may be helpful for further energy consumption analysis. For example, buildings in longer operation time may have more energy consumed. This analysis will point out which type of commercial buildings in which are in heavily operation each day.

I will analyze *the mean working hours* for buildings in each division with different building activities. Moreover, considering that the square footage of buildings may have some influence on the final result, besides the per-building analysis, I will also do per-square-footage analysis.

Data & Methods

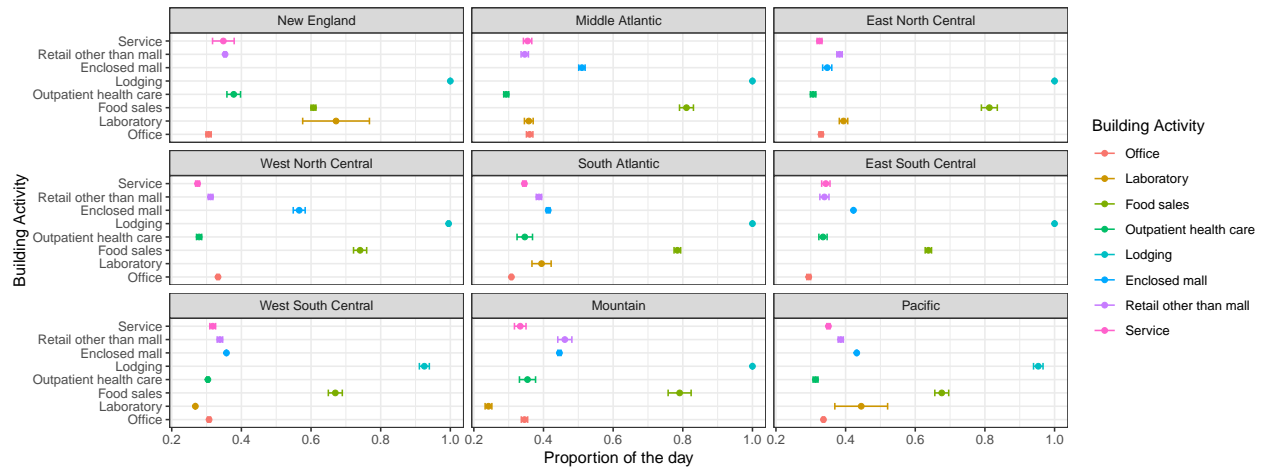
The data set I planned to use is the 2012 US Commercial Building Energy Consumption Survey (CBECS) data. My data analysis steps is:

- i. Clean the data, select variables in interest and assign labels to the categorical variables. I will only use those truly responded observations for my analysis.
- ii. Compute the mean proportions for working hours per day grouped by division and principal building activities with 95% confidence intervals using replicate weights.

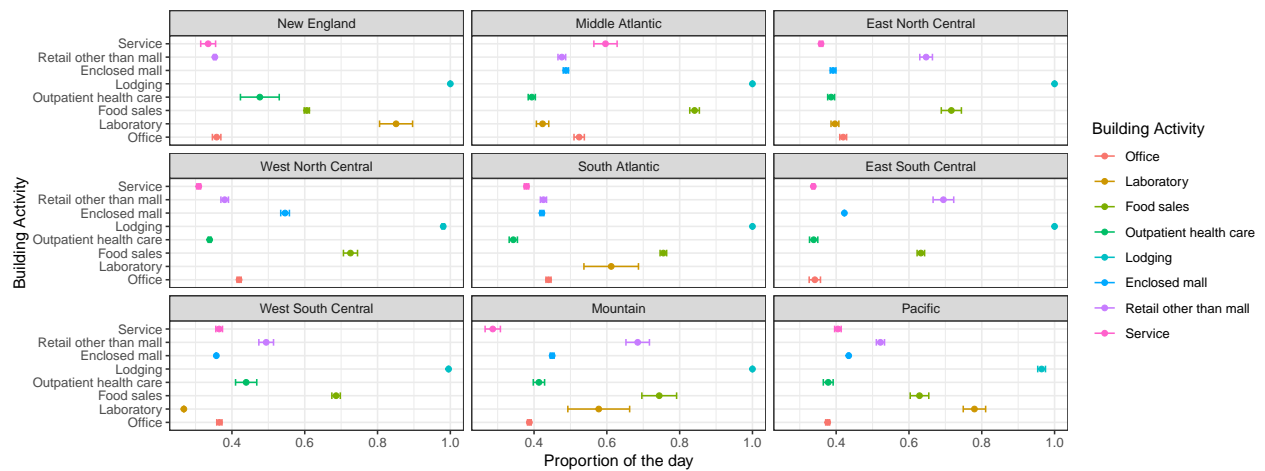
(Special Notes on imputed variables: In this survey, some observations failed to get accurate responses. For these variables, there are additional variables with the same name plus a prefix “Z” as the identifier, determining whether these variables are truly responded, estimated or imputed.)

Results

Per Building Analysis



Per Square-Footage Analysis



Conclusion

It can be seen that lodging buildings has the longest operation hours among all divisions. It operates almost throughout the day. Food selling buildings also have relatively long operating hours. For other buildings, the operation time varies from division to division. Service buildings, health care buildings and offices occupied the smallest proportion of the day in operation.

The per-square-footage analysis gives approximately the same conclusion. However, the proportions of buildings like laboratory and mall-excluded retail buildings have more variations than the per-building analysis.

This analysis only summarized about 2300 observations and they may not be convincing enough. More detailed analysis will help in answering this question more thoroughly.