



Ong Zhi Rong Jordan

Joyce Chia

Bomin Kim

School of Computing and Information System

### Introduction

Anticipating rapid growth, the city of Engagement, Ohio USA has done a participatory urban planning exercise to understand the current state of the city and identify opportunities for future growth. About 1000 representative residents in this modest-sized city have agreed to provide data using the city's urban planning app, which records the places they visit, their spending, and their purchases, among other things. From these volunteers, the city has access to the data that can assist with their major community revitalization efforts, the allocation of a very large city renewal grant they have recently received.

### Challenge Selection

#### Challenge 1: Demographics and Relationships

This challenge involves understanding the city's demographics and relationships. Provided data includes participants, social networks, financial journals, and other information about the city. We have focused on the citizens' demographic background, geological neighborhoods, and its business locations of interest. Under the assumption that the surveyed sample is representative of the entire city's population, below are the main focuses of this study:

1. Characterization of the demographics of the town, including geographic distribution, and correlation between different factors.
2. The social networking patterns in the town.
3. Identification of the predominant business base of the town, and describe patterns you observe.

### Methodology

The app uses visual analytics techniques to help viewers to conduct exploratory data analysis, **tidyverse** packages, **ggstatsplot**, **ggHoriPlot**, **sf**, **mapvie**, **tmap** were used.



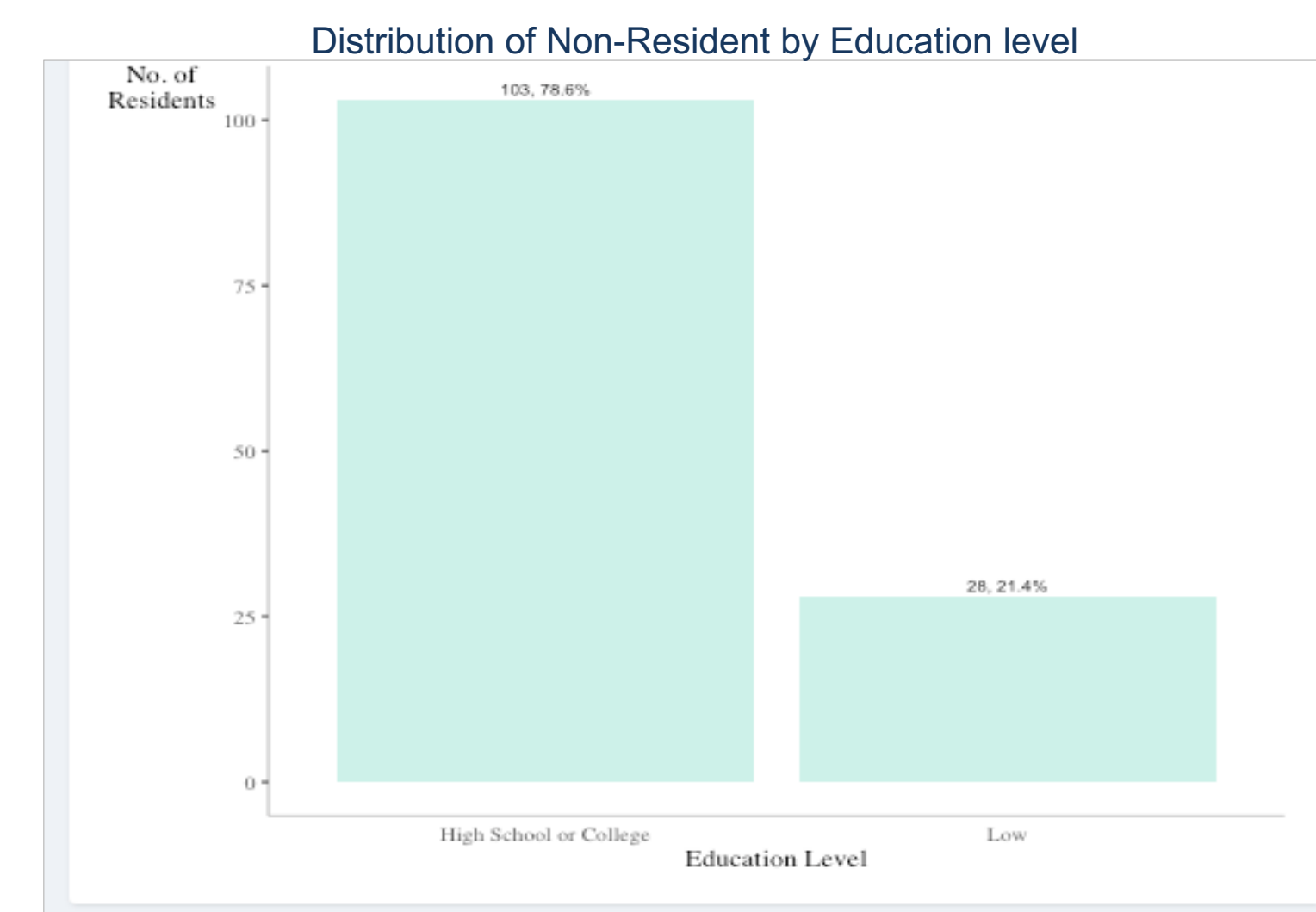
### Results and Insights

#### 1. Demographics

##### 1.1 Residency and Education level

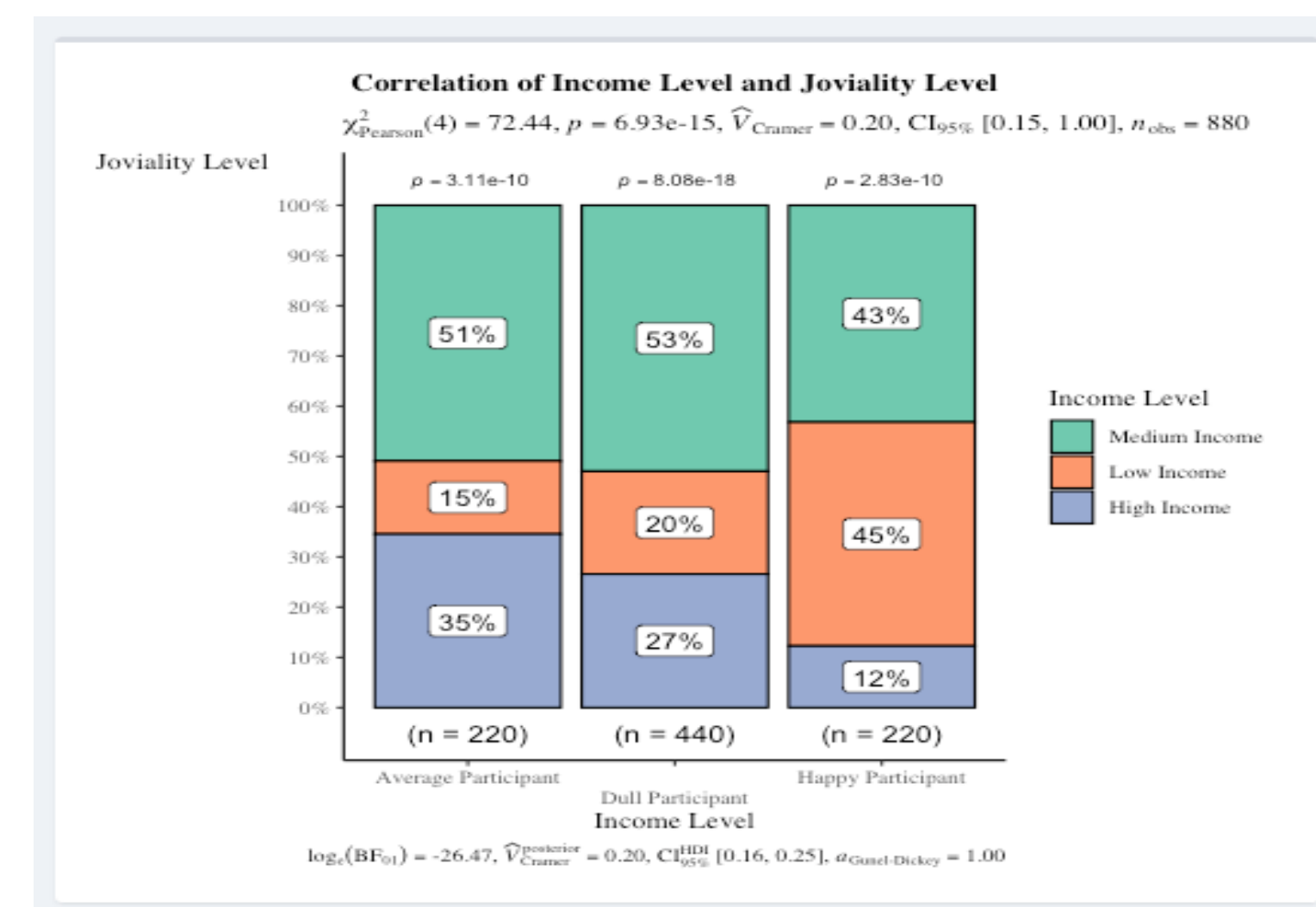
From Participant's data, Check in-Journal, and Building data set we have identified some of the participants have no residence compared to others.

Moreover, data have also shown patterns in check-in records of those who don't have residence data. We have labeled them as 'Non-Resident', assuming they come to the City of Engagement for working purposes for who those have regular check-in patterns in other venues such as restaurants and pubs. We have carefully examined the data and figured out that the distribution of non-residents have High School or College and Low Educational levels compared to the resident in the City of Engagement.



##### 1.2 Joviality and Income level

We have grouped the income levels into three tiers (33%/66%/100%), labeled as Low Income, Medium Income, and High Income. If plotted against joviality, which ranges from 0-1 in participants' survey, we have found the significance in the regression model, a small enough p-value at  $6.93 \times 10^{-13}$ , indicating people's joviality is highly affected by income level, in this case, the lower the income, the happier the population.



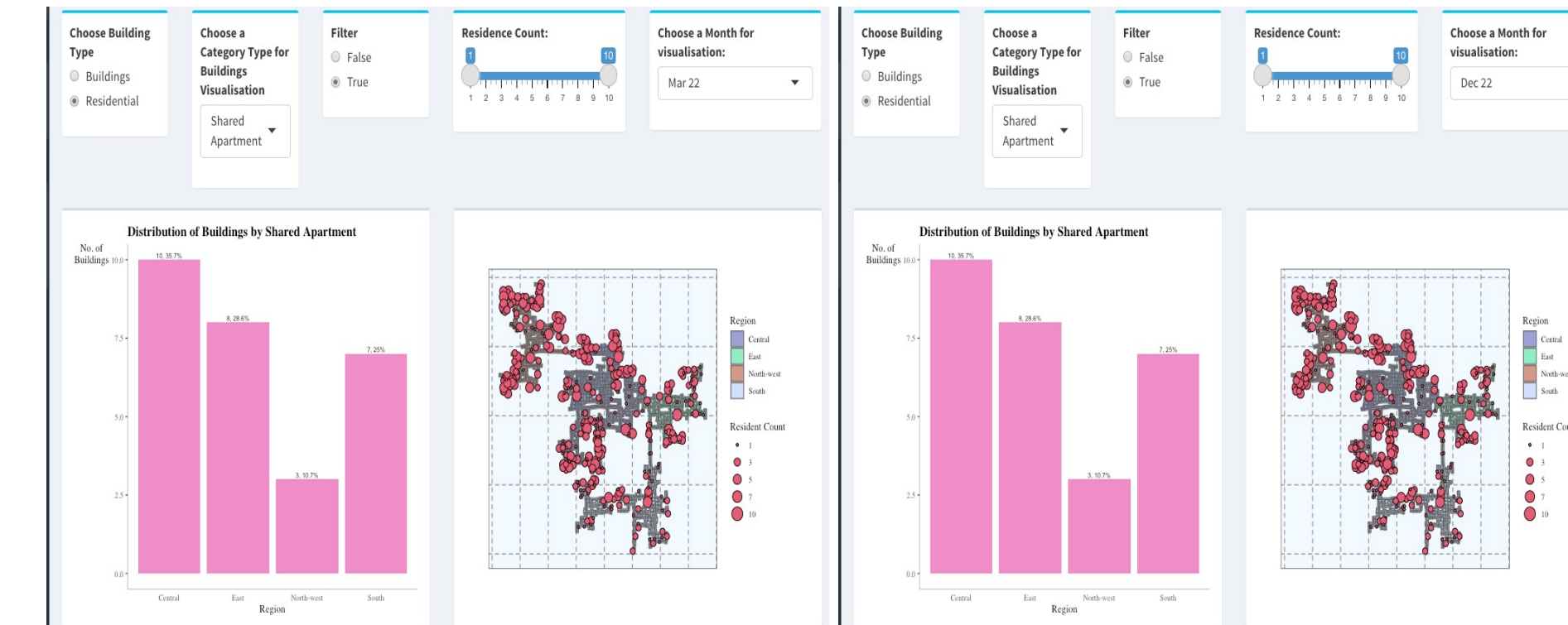
##### 1.3 Shared apartments

By comparing the number of apartment visits in check-in journal with buildings' max occupancy, we can distinguish the apartments with exceeding amount of visits, likely a result of having short-term visitors. We have found out the percentage of shared apartments is at 1.3%.



#### 1.4 People reside in the same place

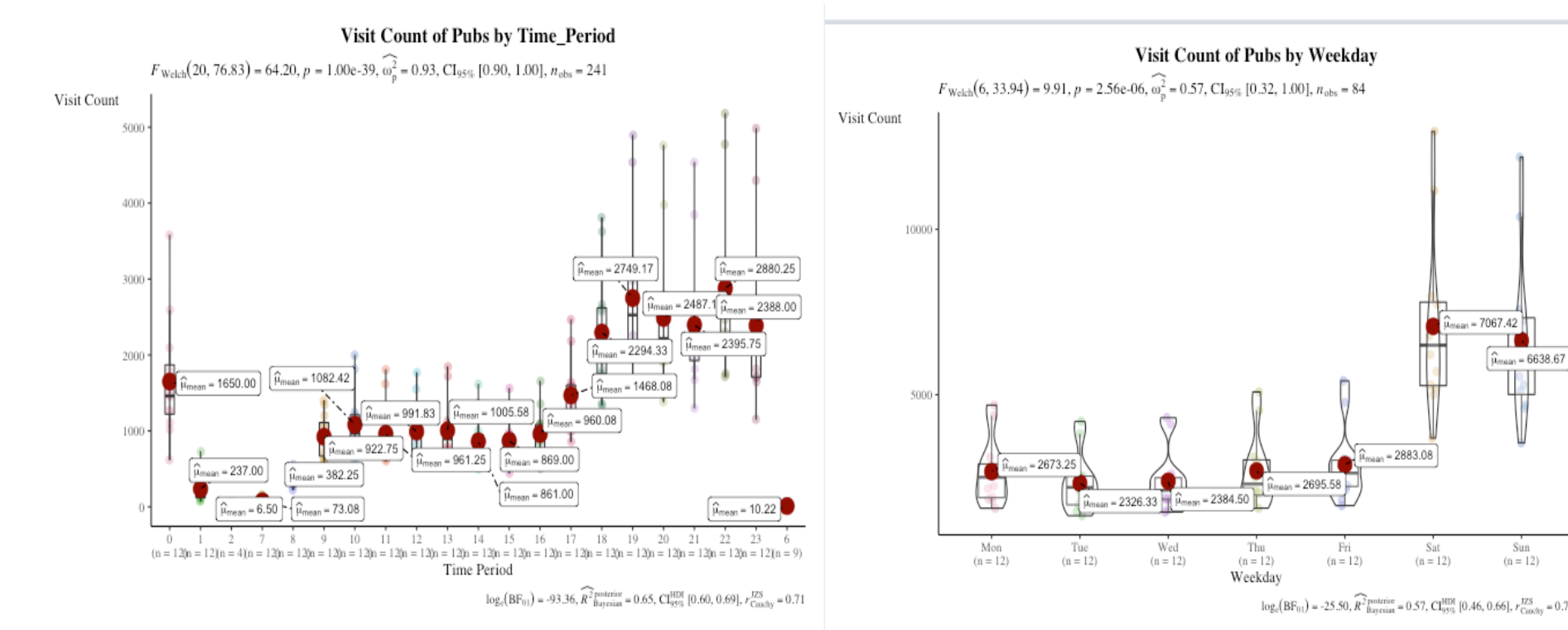
Between Mar-22 and Dec-22, residency patterns have barely changed, 99.4% of people stayed at the same place.



### 2. Social interaction

#### 2.1 When to visit the pub

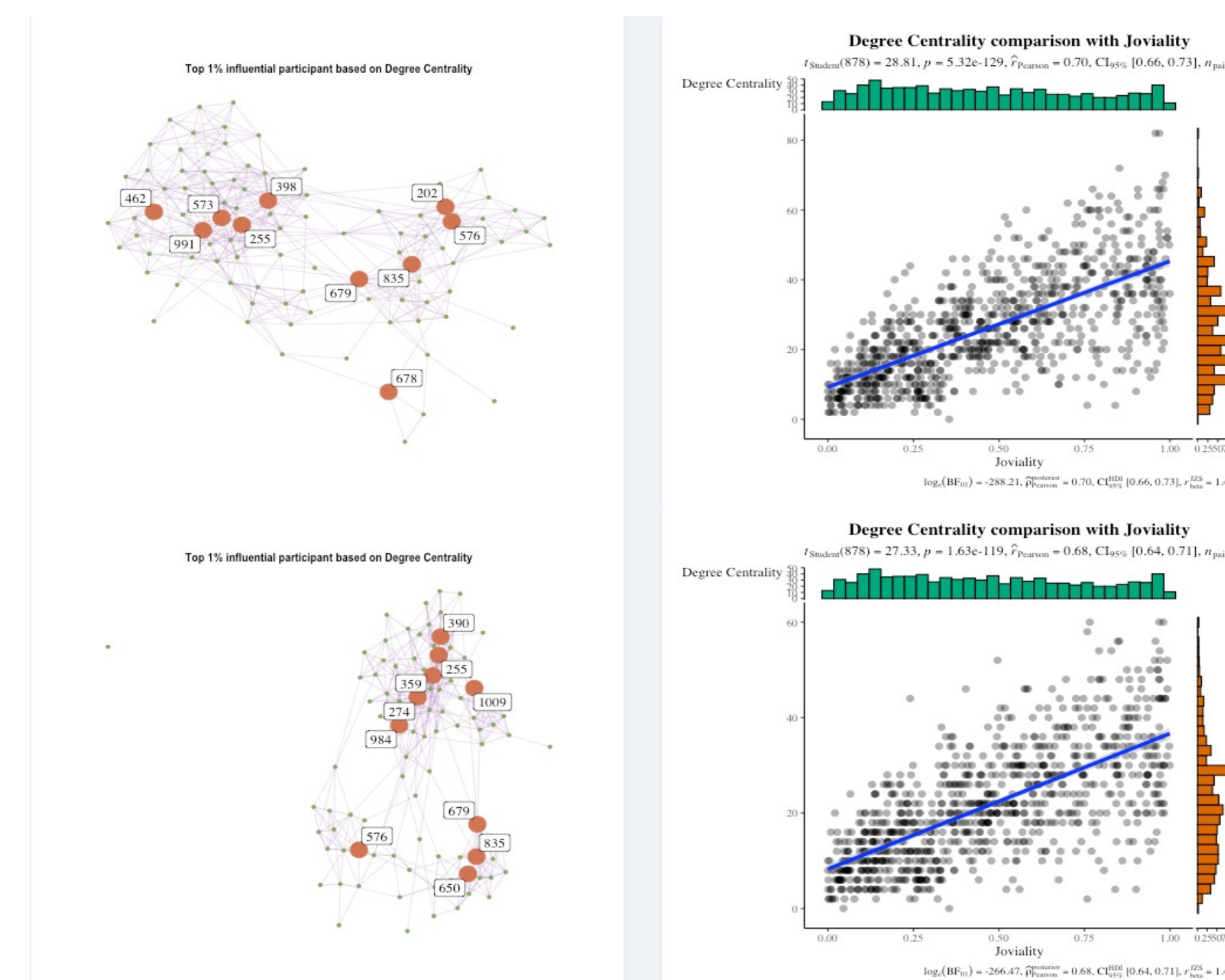
Social interactions are more active in the evening of weekdays, and morning on weekends.



#### 2.2 Top 1% Influential People

Joviality has a positive correlation with the amount of interactions.

The top 1% influential people, nodes with the most axis, is a function of joviality, regions, and pub visits. They tend to have a vast web of nodes during the weekdays (professional), while on weekends the interaction scale is smaller (intimate).



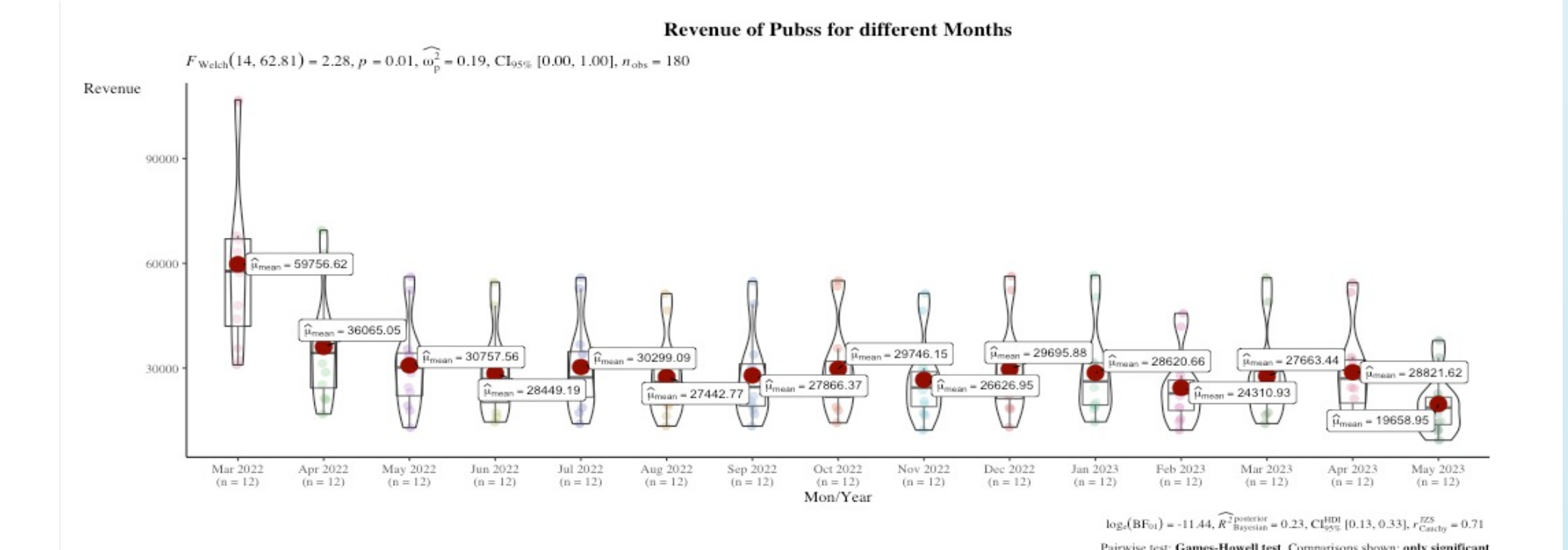
### 3. Predominant business

#### 3.1 Pub is popular

Between pubs and restaurants, pubs' total revenue is a lot higher (higher by almost 4 holds).

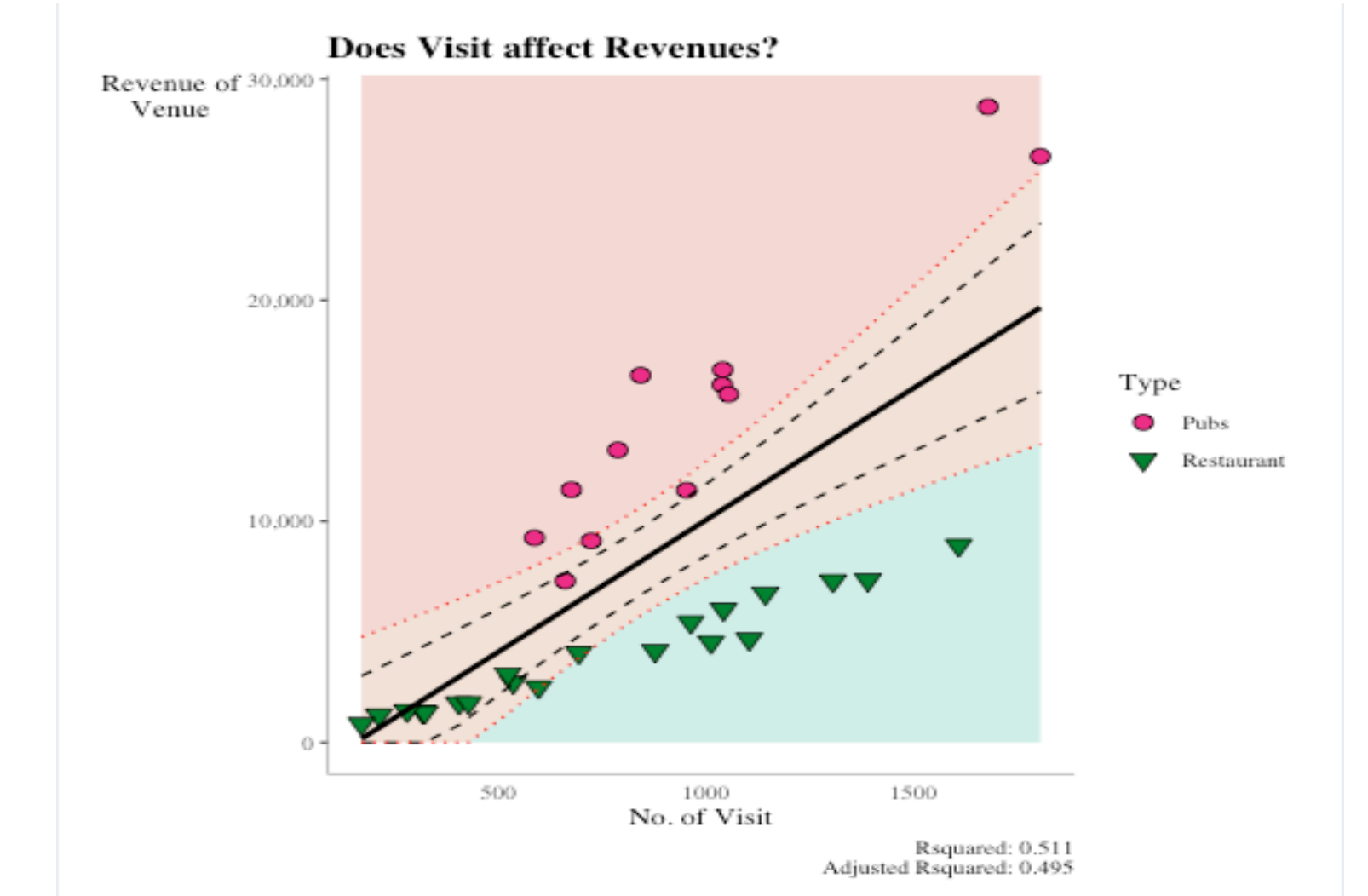
#### 3.2 Monthly drinking pattern

In the surveyed months, pubs' revenue fluctuated considerably, Mar-22 particularly had a high amount of revenue.



#### 3.3 You pay as you drink

Pubs create more revenue than restaurants despite their visits being lower. An adjusted R square of 0.495 reveals a not-so-strong fit between revenue and pub/restaurant visits.



### Conclusions

There are other more intricate detailed findings between different factors in this study, such as higher education tends to lead to higher joviality, bigger the expense tends to lead to lower joviality and more. All these can be found in our shiny app.

### Data used

<https://vast-challenge.github.io/2022/>

Attributes	Journals
Participants.csv	CheckinJournal.csv
Buildings.csv	FinancialJournal.csv
Apartments.csv	SocialNetwork.csv
Pubs.csv	TravelJournal.csv
Restaurants.csv	