

Analysis of Contractor Staffing Trends in US Nursing Homes for Clipboard Health

Introduction:

Clipboard Health provides staffing solutions to long-term care facilities in the U.S., specializing in placing contractors (temporary workers) in nursing homes. This report analyzes staffing dynamics using data from the Centers for Medicare & Medicaid Services (CMS), focusing on contractor utilization. The goal is to identify staffing trends, contractor dependency, and provide actionable recommendations for Clipboard Health's sales team to optimize sales strategies and market expansion.

Data Overview:

This analysis utilizes two primary datasets from CMS:

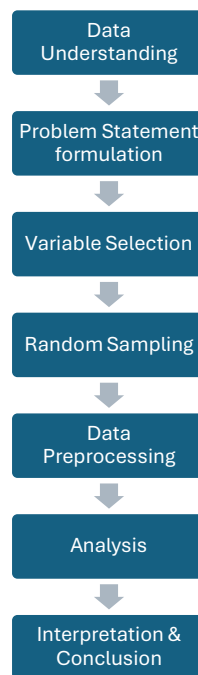
1. **Payroll-Based Journal (PBJ) Daily Nurse Staffing Data (Q1 2024):** This dataset contains 1,048,575 rows and 26 variables, providing detailed daily staffing information for nursing homes, including staff type (employee/contractor), role (RN, LPN, CNA, etc.), hours worked, and shift times.
2. **Provider Info Dataset (August 2024):** This dataset includes 14,512 rows and 18 variables, offering details about individual nursing homes, such as size (number of beds), location (state/region), ownership type (for-profit, non-profit, government), and overall ratings.

Combining these datasets enables a comprehensive analysis of contractor utilization across different nursing home characteristics.

Tools Used:

- Python (with libraries like Pandas and NumPy): For data analysis, manipulation, and visualization.
- MS Excel: For initial data exploration and pivot table analysis.

Approach



Methodology:

- 1) **Data Understanding and Preprocessing:** The initial steps involved understanding the variables in both datasets and performing necessary data cleaning. This included removing null rows in the Provider Info dataset (313 rows) and imputing missing values for Overall Rating and Staffing Rating using the mode. Two new variables, `Total_Employee_Hours` and `Total_Ctr_Hours`, were calculated for the PBJ dataset to facilitate contractor utilization analysis.
- 2) **Sampling Strategy:** Due to the large size of the PBJ dataset, a random sample of 50,000 rows (approximately 4.77%) was extracted for initial analysis. This significantly reduced processing time without compromising the representativeness of the data, as validated later.
- 3) **Variable Selection**

PBJ Daily Nurse Staffing Dataset (Q1 2024)

1. **PROVNUM:** Unique identifier for each nursing home. This will help you match data across datasets.
2. **Staff Type:** Distinguishes between full-time employees and contractors. Since Clipboard Health provides contractor staff, this is crucial for the analysis.
3. **Work Date:** This can help to analyze seasonal or time-based trends (e.g., are contractors used more frequently at certain times of the year?).

4. **Hours Worked:** Gives insight into how much reliance there is on different types of staff.
5. **Staff Role:** Break down staff by role (e.g., RN, LPN) to see where contractors are most heavily used.
6. **Shift Time:** Knowing whether contractors are primarily used for night shifts or weekends can guide the sales team to emphasize the flexibility of Clipboard Health's contractor workforce.

NH ProviderInfo Dataset (August 2024)

1. **CMS Certification Number (CCN):** The identifier that allows you to join this dataset with the PBJ staffing data.
2. **State/Region/Location:** This will help to identify geographic trends (e.g., which states or regions rely most heavily on contractors).
3. **Facility Size (Number of Beds):** Larger facilities may have a greater need for flexible staffing solutions, so this will help target facilities that might require more contractors.
4. **Ownership Type:** For-profit vs. non-profit facilities might have different staffing needs. For example, for-profit facilities may be more likely to use contractors to optimize costs.
5. **Overall Ratings:** to consider how well or poorly managed facilities impact staffing needs

Data Preprocessing

1. Removed 313 null rows in Provider Info Dataset
2. Imputed null values for Overall rating and staffing rating using mode
3. Created two new variables: Total_Employee_Hours and Total_ctr_Hours for Daily staffing data.

```
In [30]: print(provider_info.isnull().sum())
```

CMS Certification Number (CCN)	0
Provider Name	0
City/Town	0
State	0
County/Parish	0
Ownership Type	0
Number of Certified Beds	0
Provider Type	0
Overall Rating	141
Staffing Rating	201
Reported Nurse Aide Staffing Hours per Resident per Day	313
Reported LPN Staffing Hours per Resident per Day	313
Reported RN Staffing Hours per Resident per Day	313
Reported Licensed Staffing Hours per Resident per Day	313
Reported Total Nurse Staffing Hours per Resident per Day	313
Total number of nurse staff hours per resident per day on the weekend	313
Registered Nurse hours per resident per day on the weekend	313
Reported Physical Therapist Staffing Hours per Resident Per Day	313

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```
In [31]: print(pbj_daily_staffing.isnull().sum())
```

PROVNUM	0
WorkDate	0
Hrs_RNDON	0
Hrs_RNDON_emp	0
Hrs_RNDON_ctr	0
Hrs_RNadmin	0
Hrs_RNadmin_emp	0
Hrs_RNadmin_ctr	0
Hrs_RN	0
Hrs_RN_emp	0
Hrs_RN_ctr	0
Hrs_LPNadmin	0
Hrs_LPNadmin_emp	0
Hrs_LPNadmin_ctr	0
Hrs_LPN	0
Hrs_LPN_emp	0
Hrs_LPN_ctr	0
Hrs_CNA	0
Hrs_CNA_emp	0
Hrs_CNA_ctr	0
Hrs_NAtrn	0
Hrs_NAtrn_emp	0
Hrs_NAtrn_ctr	0
Hrs_MedAide	0
Hrs_MedAide_emp	0
Hrs_MedAide_ctr	0
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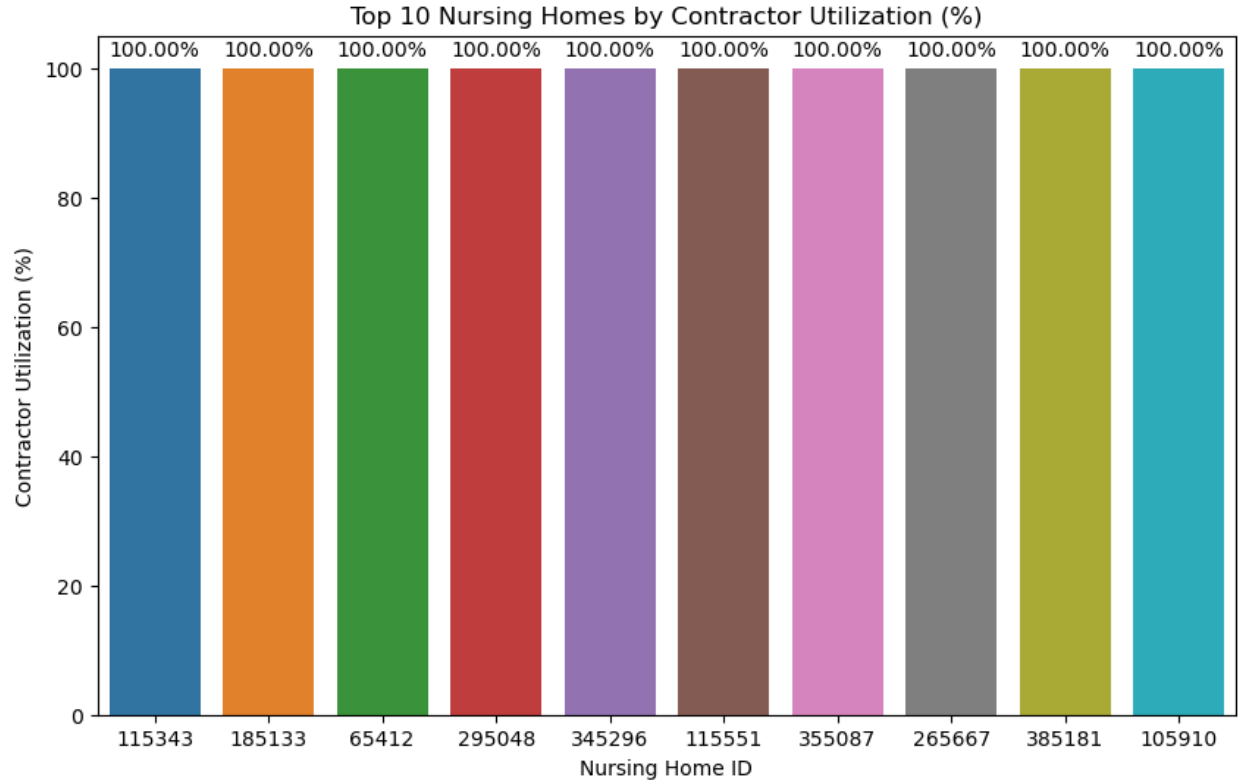
Business Questions, Analysis and Recommendations

1. Prevalence of Contractor Utilization Across Nursing Homes

Objective: To calculate and understand the proportion of contractor hours worked in nursing homes, allowing Clipboard Health, to identify homes heavily dependent on contractors.

Explanation: For this we calculate Total Contractors and total Employee hours. Thereafter find contractor utilization percentage, then filter Top 10 facilities with higher contractor dependency.

Analysis:



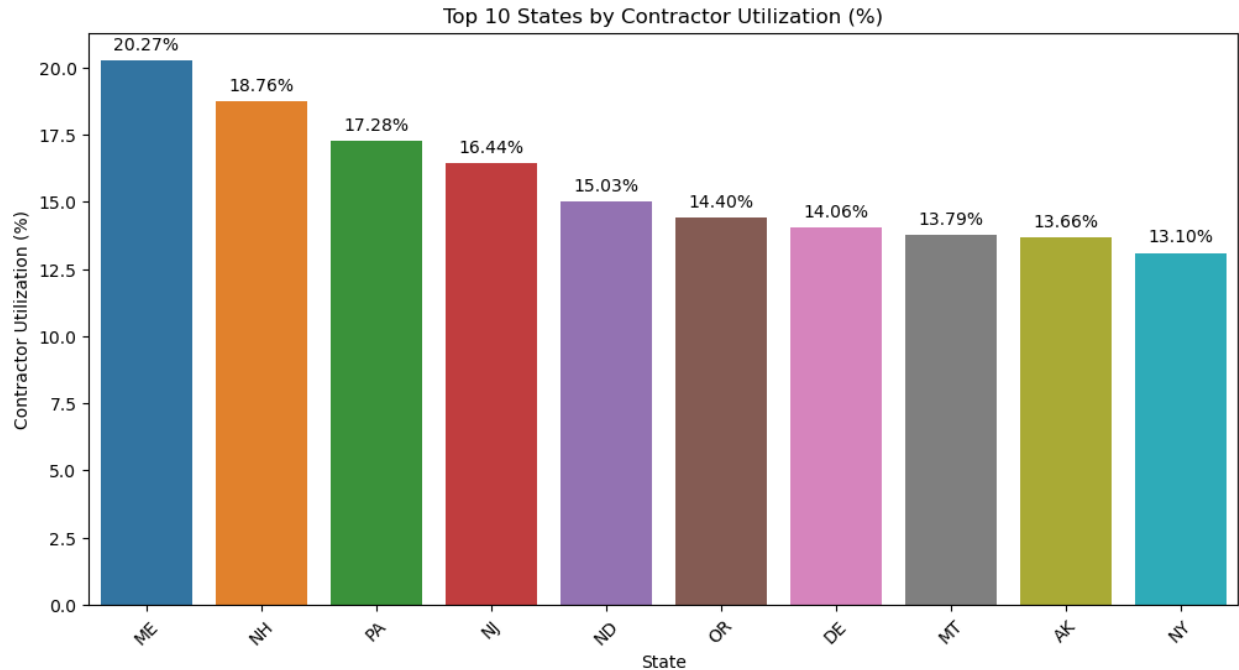
Interpretation: These facilities are heavily reliant on contractors, making them ideal candidates for expanded services from Clipboard Health.

Recommendation: Clipboard Health should focus its efforts on these high-contractor utilization homes.

2. Geographic Focus on High Contractor Demand Regions

Objective: To identify which states or geographic areas rely the most on contractors and focus sales efforts on these regions.

Explanation: Here, we merged staffing data with Provider Info dataset to get state or region of each nursing home. This calculates the contractor utilization percentage for each state, like how we did it for individual nursing homes.



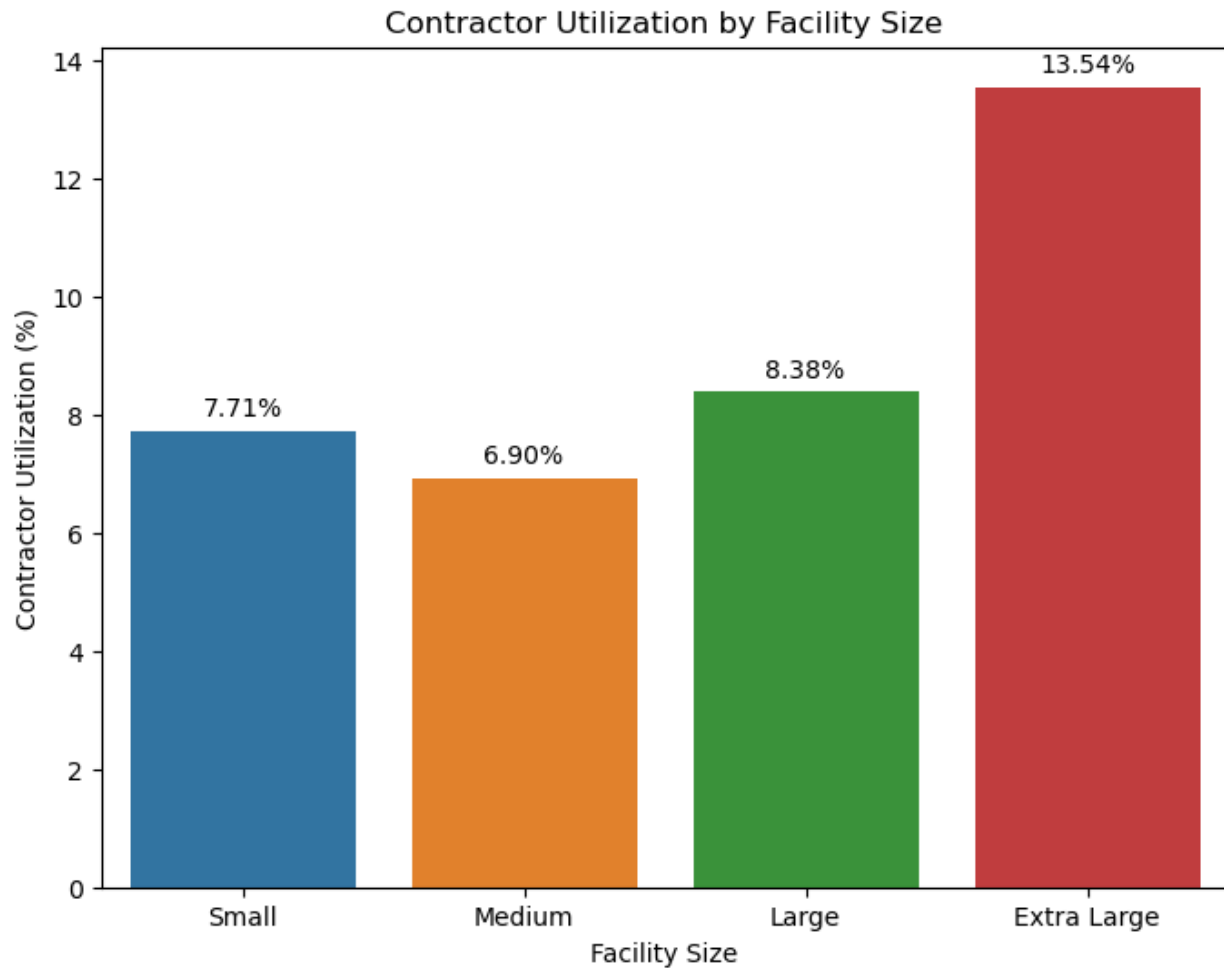
Interpretation: States with the highest contractor utilization percentages are those where contractors are in high demand.

Recommendation: Focus on states with higher contractor utilization, such as Maine, New Hampshire, Pennsylvania, North Dakota, New Jersey, Oregon, Montana, South Dakota, New York and Delaware. These regions show a greater reliance on contractors, indicating a larger market for staffing services.

3. Target Larger Facilities with More Beds

Analysis: To identify larger nursing homes (with more beds) that rely on contractors, as they may have higher staffing needs.

Explanation: Here, we create categories for the size of nursing homes based on the number of beds. For example, a "Small" facility has up to 50 beds, while an "Extra Large" facility has more than 200 beds. Then, the grouping of facility Size, and total hours worked (both Contractor & Employee) was performed. Then calculated contractor utilization (%) as did earlier.



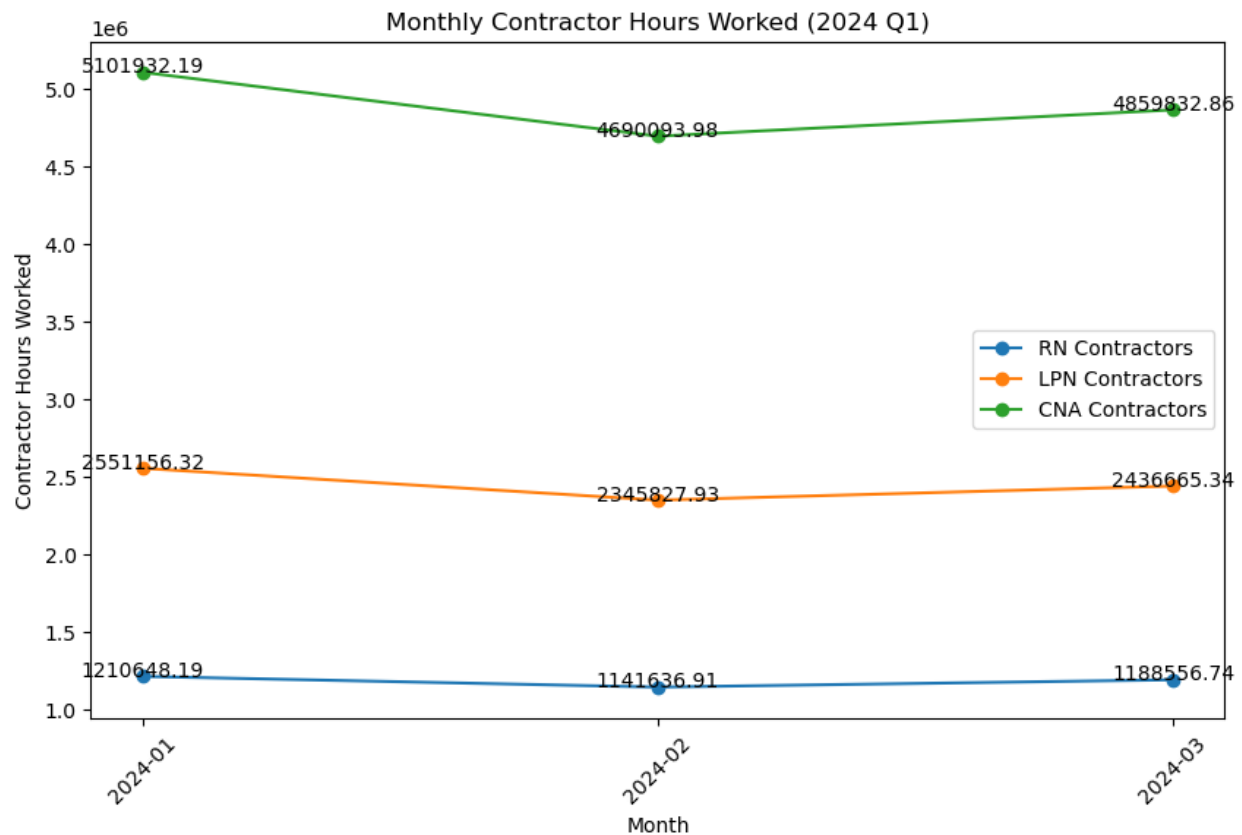
Interpretation: Facilities with more than 100 beds are more dependent on contractors, likely due to their increased demand for flexible staffing. These larger facilities face more significant fluctuations in patient needs, making contractors an essential resource to manage staffing gaps. By focusing on these larger institutions, Clipboard Health can secure long-term partnerships and offer comprehensive staffing solutions.

Recommendation: Larger facilities, especially those with more than 100 beds, should be prioritized as they have higher staffing needs and are more likely to require contractors to meet demand.

4. Seasonal Demand for Contractors

Analysis: Analyze contractor hours worked overtime to detect seasonal trends and prepare for periods of high demand.

Explanation: Firstly, we converted the WorkDate column to a datetime format so that we can group the data by months or quarters to detect seasonal trends. Then, we group the data by months (dt.to_period('M')) and sum the contractor hours for RNs, LPNs, and CNAs.



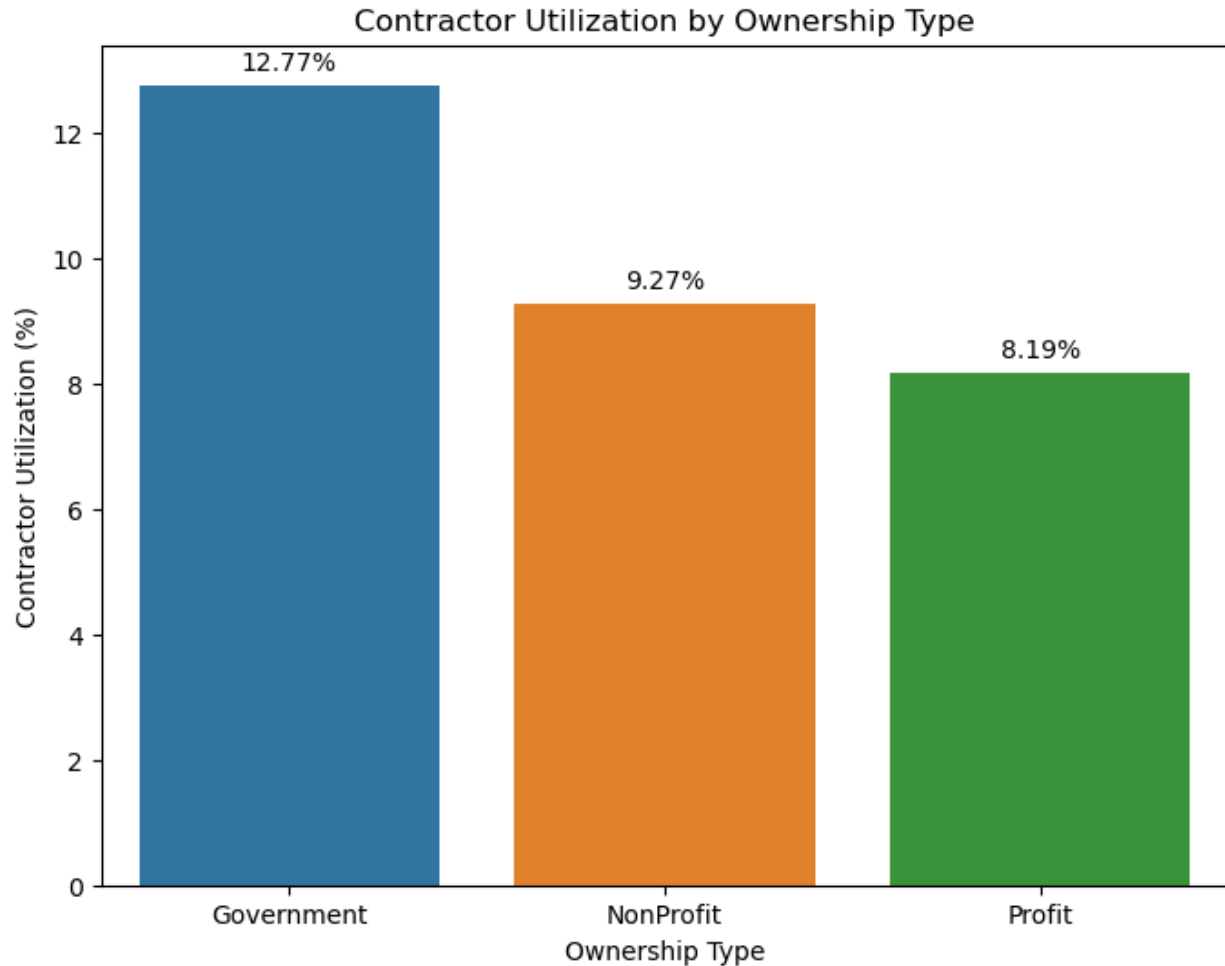
Interpretation: Periods with higher contractor hours indicate times when the demand for temporary staff was higher. This could be due to seasonal factors such as flu outbreaks or holiday staffing shortages.

Recommendation: Clipboard Health should prepare for these spikes in demand by onboarding more contractors during these periods.

5. Prioritize For-Profit Facilities

Analysis: Identify whether for-profit facilities rely more on contractors compared to non-profit facilities and focus on targeting these facilities.

Explanation: Here, we combine ownership type data into the staffing data, to group contractor and employee hours with ownership type. Then calculated contractor utilization (%), as earlier.



Interpretation: Government-owned nursing homes utilize contractors the most, with a contractor utilization rate of 12.77%. Nonprofit nursing homes have a lower contractor utilization rate of 9.27%. Profit-based nursing homes use contractors the least, with a utilization rate of 8.19%.

Recommendation: Target Government-Owned Nursing Homes, based on the data, government-owned nursing homes have the highest contractor utilization rates (12.77%). This suggests that they rely more heavily on contractors compared to nonprofit and profit-based nursing homes.

Validation of Analysis

The validation of the analysis was conducted by comparing key metrics, such as mean, median, and standard deviation, between the random sample of 50,000 rows and the full dataset containing over 1 million rows. The results show a near-perfect match between the sample and the full dataset.

Summary Statistics of Contractor Utilization

Sample	Population
<ul style="list-style-type: none">• Mean: 7.97• Median:1.19• Standard Deviation:12.84	<ul style="list-style-type: none">• Mean: 7.97• Median:1.19• Standard Deviation:12.84

Conclusion: These identical metrics indicate that the sample was highly representative of the full dataset. Therefore, the conclusions and insights derived from the sample are reliable and can be confidently generalized to the entire dataset. This validation ensures that the sampling approach maintained the integrity of the analysis without compromising its accuracy.

Final Recommendations to Clipboard Health Sales Team:

1. **Target Government-Owned Nursing Homes:** Since government-owned facilities show the highest contractor utilization (12.77%), they represent a key market for Clipboard Health's staffing solutions. The sales team should focus on these homes for long-term partnerships.
2. **Prioritize States with High Contractor Demand:** States such as Maine, New Hampshire, Pennsylvania, North Dakota, New Jersey, Oregon, Montana, South Dakota, New York and Delaware, which exhibit high contractor utilization, should be prioritized for market expansion. The validated data confirms that contractor usage in these regions is stable and significant.
3. **Focus on Large Facilities:** Large nursing homes with over 100 beds remain heavily reliant on contractors. The sales team can offer tailored staffing solutions for these homes, emphasizing flexibility and cost-efficiency.
4. **Prepare for Seasonal Trends:** The validated data confirms higher contractor utilization in Q1 and Q4, likely due to seasonal fluctuations. Clipboard Health should proactively increase contractor onboarding during these periods.

