Below is a comprehensive next steps plan that integrates your list of observations with our previous proposals. It breaks down what has already been answered (with explanations), details the remaining queries we need to investigate, and highlights areas that will require domain research or external insights.

## **Next Steps Plan: Integrated Analysis of Temporary Staffing Variables**

### **1. What Has Already Been Answered**

**a. Aggregated Staffing Ratios & Daily Patterns**

* **Nursing Contract Ratios:** – Analysis of the pbj\_nurse dataset shows that most facilities have low contract ratios (≈6–8%), with a modest uptick on weekends.  
   – This was determined by aggregating employee and contract hours daily and examining time series and day-of-week patterns.
* **Non-Nursing Contract Ratios:** – The pbj\_non\_nurse data shows much higher contract usage (≈25–28%) with distinct weekly cycles, including a notable anomaly on June 1, 2024.  
   – Time series plots, rolling averages, and boxplots have validated these observations.
* **CNA Staffing & Census Correlation:** – CNA analysis reveals a daily temporary ratio ranging from ~5% to 8%, with a moderate negative correlation (r ≈ -0.40) between CNA contract usage and resident census.  
   – This suggests that on busier days, facilities tend to use more permanent CNA staffing or overtime instead of ramping up contract usage.
* **RN Advanced Analysis:** – Our outlier analysis on RN hours shows a bimodal pattern: most facility-days have no contract usage, while a small subset shows near-100% reliance on temporary RNs.  
   – The aggregate time series is stable, though facility-level outliers are clearly identifiable.

### **2. Remaining Queries & Investigation Plans**

**A. Facility Segmentation & Outlier Characteristics**

* **Queries:** – “How many facilities does 1 percent represent? What are their characteristics? Which are the characteristics of the extreme outliers?”  
   – “13000 outliers are what… facilities? What’s the aggregated amount of hours covered by contracts in those facilities?”
* **Plan:** – **Segment Facilities:** Quantify facilities in the top 1% (and possibly bottom quantiles) based on contract ratios.  
   – **Characterization:** Analyze size (e.g., resident census), ownership, location (from nh\_ownership and qrp\_provider), and staffing levels.  
   – **Aggregate Analysis:** Compute total contract hours for these outlier facilities to assess their impact.  
   – **Investigation:** Compare high-contract facilities with those having low ratios to determine operational differences.

**B. Exclusive Contract Facilities & Exclusive RN Days**

* **Queries:** – “What are those exclusive contract facilities?”  
   – “What are these exclusive RN days? Do this time series analysis but on facilities past a certain ratio.”
* **Plan:** – **Identification:** Isolate facilities and specific days with near-100% contract usage.  
   – **Time Series Analysis:** Focus on facilities above a threshold (e.g., >50% contract usage) to understand the dynamics of exclusive contract shifts.  
   – **Contextual Factors:** Investigate if these patterns relate to facility size, scheduling policies, or operational constraints.

**C. Employee vs. Contract Tails Relationship**

* **Query:** – “Are the tails of employee and contract hours opposites?”
* **Plan:** – **Statistical Analysis:** Plot histograms and scatter plots for employee and contract hours.  
   – **Correlation Analysis:** Compute correlations between extreme values to see if high employee hours are associated with low contract hours or vice versa.

**D. Organizational Models & Contractor Economics**

* **Queries:** – “High ratios need cheaper contractors; lower ratios could be persuaded.”  
   – “Benefits of Clipboard vs. exclusively contract RN shifts.”  
   – “Staffing models and what can Clipboard do about this.”
* **Plan:** – **Cost/Quality Proxy:** If external cost data isn’t available, use proxy measures (e.g., contract frequency, outlier aggregation) to infer cost pressures.  
   – **Comparative Analysis:** Review literature on staffing models in nursing homes to compare operational and financial outcomes between predominantly contract-based versus mixed staffing models.  
   – **Business Case:** Develop a conceptual framework outlining how Clipboard Health’s on-demand solution could offer benefits (e.g., cost savings, improved scheduling) compared to facilities that rely exclusively on contract workers.

**E. Investigate High Staffing Facilities**

* **Queries:** – “Largest contract hours are also high employee… are those facilities very large? Why are they so busy?”
* **Plan:** – **Facility Size Analysis:** Use resident census or other size indicators to identify large facilities.  
   – **Operational Review:** Investigate if high total staffing (both employee and contract) corresponds to higher demand or special operational requirements.

**F. State Variations & Legislative Implications**

* **Query:** – “State variations in ratio might imply different legislation, figure out what this implies.”
* **Plan:** – **State Breakdown:** Segment data by state and analyze staffing ratios.  
   – **Policy Review:** Research state-specific nursing home staffing regulations and labor market conditions to understand if legislative factors are influencing the ratios.

**G. Further Analysis on Usage Patterns**

* **Queries:** – “No clear usage patterns?? Can we dig deeper to confirm this… analyze facilities with high hours of both.”
* **Plan:** – **Cluster Analysis:** Identify clusters of facilities that show high employee and contract hours simultaneously.  
   – **Deep Dive:** Perform detailed time series analysis on these clusters to detect any subtle patterns not apparent in aggregate data.

**H. CNA Oscillation Patterns**

* **Queries:** – “What do the oscillations mean in the daily temporary CNA ratio?”  
   – “We need to confirm why on higher average days the contract CNA's are lower.”  
   – “Weekends are covered by contractor CNA’s?”
* **Plan:** – **Time Series & Census Analysis:** Examine CNA ratios in relation to daily census and identify if the inverse relationship holds consistently across facilities.  
   – **Shift Analysis:** If possible, analyze shift-level data to understand weekend staffing dynamics for CNAs.

**I. Nursing vs. Non-Nursing Weekly Dynamics**

* **Queries:** – “Context for Monday peaks for non-nursing contracts.”  
   – “Investigate high nursing contract ratio facilities.”  
   – “Nursing contract rising on weekends and non-nursing dropping then peaking on Mondays. Why?”
* **Plan:** – **Weekly Trend Analysis:** Focus on day-of-week patterns and isolate anomalies (e.g., Monday peaks, June 1 anomaly).  
   – **Facility-Level Comparison:** Compare facilities with high nursing contract ratios to those with low ratios, analyzing operational policies and scheduling. – **Qualitative Inquiry:** Consider interviews or case studies to gather insights on why these patterns occur.

**J. Intra-Quarter Inconsistencies & Customer Segmentation**

* **Queries:** – “Potential customers in inconsistent contract usage; non-nursing are more sporadic; which organizational models would cause high contract usage.”
* **Plan:** – **Segmentation:** Identify facilities with high variability in temporary staffing across the quarter.  
   – **Model Mapping:** Map observed patterns to known organizational models from industry research to identify potential customers for targeted solutions.

### **3. Domain Knowledge and External Research**

* **Operational & Staffing Models:** – Review literature on nursing home staffing strategies, including factors like budget constraints, scheduling practices, and regional labor market conditions.
* **Cost Implications & Benefits of Clipboard Health:** – Explore research on the cost-effectiveness of temporary staffing versus permanent hires.  
   – Assess how on-demand staffing solutions (e.g., Clipboard Health) compare to traditional contract staffing models in terms of cost, flexibility, and quality of care.
* **Legislative & Regulatory Influences:** – Investigate state-specific regulations and policy documents that may impact staffing ratios in nursing homes.  
   – Analyze how different legislative environments affect staffing decisions and operational performance.
* **Payroll and Scheduling Practices:** – Examine studies or industry reports on payroll cycles and their influence on reported staffing anomalies (e.g., the June 1 anomaly).

## **Summary**

* **Answered Queries:** – We have established aggregate patterns and day-of-week trends for nursing, non-nursing, CNA, and RN staffing, as well as correlations with resident census for CNAs.  
   – Our analyses reveal stable low nursing contract usage, higher non-nursing contract usage with cyclical patterns, and a moderate negative relationship between CNA contract ratios and census.
* **Remaining Investigations:** – Detailed facility segmentation (including outlier analysis, aggregated contract hours, and characteristics of the extreme 1%).  
   – In-depth time series on exclusive contract days and facilities with exclusive contract usage.  
   – Analysis of the tails of employee vs. contract hours and the organizational characteristics of these facilities.  
   – Understanding state-level variations, scheduling anomalies (Monday peaks, June 1 spike), and identifying operational drivers behind high contract usage.
* **Domain Research Needs:** – Review staffing models, cost implications, legislative impacts, and payroll/scheduling practices to provide context for the quantitative findings.

By following this integrated plan, we can further refine our analysis, provide targeted insights for operational and strategic decisions, and support a compelling business case for on-demand staffing solutions like Clipboard Health's.