A building with a roof and a porch

Description automatically generated with medium confidence

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| **Emergency Shelter Daily Occupancy In AB** |
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**Summary/Abstract**

This report investigates the trends of daily occupancy in emergency shelters across Alberta, AB, due to the increasing demand for temporary housing solutions and an urgent need for informed resource allocation. Using data obtained from [specify data source, such as Alberta's municipal shelter records or other datasets], the study uses exploratory data analysis to identify patterns in shelter usage, seasonal fluctuations, and demographic insights.

Key findings indicated that the trends of occupancy were affected by factors such as seasonal changes in weather, socio-economic trends, and changes in policy, with peak usage recorded during these specific trends. Another important highlight is the unequal access to shelter across regions. These thus call for targeted interventions such as increasing the capacity of shelter during peak demand and reducing regional inequities.

Although the study gives actionable recommendations-for example, reallocation based on demand and predictive modeling of occupancy-it is limited because some data are incomplete, missing demographic details. Future work includes integrating additional data sources, developing predictive models to support proactive resource planning.

This research helps to bring out the dynamics of emergency shelter occupancy in Alberta and informs policymakers and service providers on how to make shelters available and efficient.

**Introduction (Motivation and Objectives should be included in this)**

**Motivation**

1. Demand for Emergency Shelters

* Alberta has seen an increasing number of people and families resort to emergency shelters because of combined economic challenges like unemployment or inflation, added to which there is an increasing housing affordability crisis.
* This demand is further exacerbated by unplanned events, such as economic downturns or natural disasters, which force vulnerable populations into homelessness and further stress shelter resources.

2. Seasonal Weather Conditions

* Alberta's extreme winters, with sub-zero temperatures and heavy snowfall, make emergency shelters a critical lifeline for the homeless population.
* These seasonal demands put many shelters at or beyond their capacity, thus requiring careful planning and resource management to ensure safety and accessibility.

3. Efficient Resource Allocation

* Emergency shelters operate with limited budgets and resources, so it is essential to allocate these efficiently based on actual usage data.
* Identifying peak periods and underutilized locations ensures that resources are distributed to maximize their impact.

4. Homelessness Being an Issue to Be Prioritized at a Social Level

* It is a multifarious issue that involves not only the individuals themselves but also the community in general, as it bears implications of economic, health, and safety concerns.
* Analyzing occupancy trends provides a perspective on where to place supportive mechanisms within the system to help remedy the problem long-term.

**Objectives**

1. Analyze Daily Occupancy Trends: Understanding daily variability in shelter occupancy will indicate days where more need occurs than others, for example: weekends, holidays, extreme weather days. The analysis forms the basis of being proactive in ensuring that shelter operations do not result in a crisis when the capacity is used.

2. Seasonality and Pattern Identification: Seasonal analysis shows periodic changes in shelter usage according to the year, either during winter months or even during economic slumps. These insights are crucial for informing the need to adjust shelter capacities or staffing levels in response to fluctuating needs.

3. Provide Actionable Insights for Resource Optimization: Translating data analysis into practical recommendations allows shelters and policymakers to improve operational efficiency and service delivery. For instance, the implementation of flexible capacity strategies or prioritization of funding in high-demand areas can pay dividends.

4. Support Long-Term Policy and Planning Efforts: Findings are supposed to inform policymakers on how to develop strategies that reduce homelessness, improve shelter systems, and address root causes of shelter dependence. This will eventually contribute to long-term sustainability when integrated into urban planning or housing policies.

**Methodology (Data sources and how analysis is conducted and any research you have done so far)**

* Data Collection and Preprocessing: The dataset should be cleaned, transformed, and preprocessed to ensure its quality and consistency.
* Exploratory Data Analysis: The trends, patterns, and correlations in the data are explored through visualization.
* Statistical Analysis: Hypothesis testing and correlation analysis to prove key trends.
* Predictive Modeling: Create models for predicting future demand to plan shelter and resources.
* Best Practices and Recommendations: Provide actionable insights on how to improve shelter operations and inform policy decisions.

**Data Sources:**

* The data was collected from sources including but not limited to the Alberta government records, municipal shelter data, public datasets. This dataset ranges by yearly From January 2020 to September 2024 (e.g., monthly/ yearly data). Preprocessing steps undertaken included cleaning missing values and normalization of data.

**Analysis Conducted:**

* Performed EDA to understand the occupancy patterns. Seasonal variations, peak usage periods, and regional differences were analyzed. Visualizations included line graphs, heatmaps, and bar charts to identify trends.

**Tools/Techniques:**

* Python libraries such as pandas, matplotlib, seaborn for data analysis and visualization. Statistical techniques or clustering methods, if applicable.

**Data Analysis (present your main findings derived from the data. Add your visualizations here)**

**Main Findings:**

* Daily and seasonal occupancy trends: for example, higher occupancy during the winter months because of unfavorable weather conditions.
* Regional disparities: e.g., while certain areas are chronically over-capacity, others may be underutilized.
* Demographic patterns: e.g., A large proportion of the residents are of [demographic group].

**Visualizations:**

**Insights:**

* Growing Demand for Shelter Services: The number of individuals seeking shelter in Alberta has increased significantly over the years, nearing or exceeding the capacity of existing shelters. This indicates a growing housing or homelessness crisis in the region.
* Unequal Distribution of Resources: Edmonton and Calgary dominate in shelter availability, while smaller cities like Grande Prairie appear underserved, potentially leaving rural or less urban populations at risk.
* Seasonal Impact on Occupancy: Shelter demand peaks in winter months, highlighting the vulnerability of homeless populations during colder seasons and the system's seasonal strain.
* Dependence on Key Shelters: Certain shelters, like Riverfront Community Shelter, bear a disproportionately high share of the demand, suggesting potential over-reliance on a few key facilities.

**Recommendations:**

* Expand Shelter Infrastructure: Increase overall shelter capacity in both urban and underserved rural areas to meet rising demand and reduce the risk of overcrowding.
* Enhance Seasonal Readiness: Prepare for predictable winter surges by adding temporary shelters or resources, especially in colder months, to ensure safety and accessibility.
* Decentralize and Balance Utilization: Strategically distribute resources to relieve overburdened shelters and encourage the use of underutilized facilities through outreach, better accessibility, or incentives.
* Focus on Long-Term Solutions: Strengthen programs aimed at transitioning individuals from shelters to permanent housing to address the root causes of homelessness and reduce dependency on shelter systems.

**Interpretations and Limitations (Discuss your findings and talk about limitations here)**

**Interpretations**

* Seasonal Spikes: Winter months show a much higher level of occupancy, presumably due to sub-zero temperatures. Some holidays, such as Christmas, may have increased demand due to looking for shelter.
* Interpretation: Resource strategies need to be adaptive to the peak periods in demand, such as capacity expansion or shelter hours extension.
* Regional Disparities: Urban centers, particularly large cities like Calgary or Edmonton, are disproportionately burdened by shelter demand, while shelters in rural areas are largely underutilized.
* Interpretation: Resource reallocation can balance the load, enhancing efficiency across regions.
* Demographic Trends: Trends may indicate that a greater proportion of shelter users are from vulnerable groups, such as seniors or people from marginalized communities.
* Interpretation: Specialized services, such as mental health or family-oriented shelters, could meet these needs.

**Limitations**

* Incomplete Data: Missing demographic information restricts comprehensive analysis of certain population segments.
* Inability to Integrate External Data: The absence of economic indicators, weather data, or public health statistics lowers the predictive power of the models.
* Predictive Model Constraints: Current models may not capture complex non-linear patterns due to limited data scope or outdated techniques.

**Recommendations and Future work (Add some actionable recommendations and talk about your next steps and what remains to be completed)**

**Recommendations**

* Invest in Real-Time Data Systems: Develop systems to integrate real-time data streams from external sources like weather forecasts or public health alerts. Implement live dashboards for timely insights and decision-making.
* Explore Advanced Machine Learning Techniques: Move beyond traditional models and explore deep learning to improve predictive accuracy, especially for complex and non-linear patterns in shelter demand.
* Increase Data Diversity: Integrate external data sources such as economic indicators, social trends, and detailed demographic information to enhance prediction models and provide a comprehensive view of shelter demand.

**Future Work**

* + More Data Sources: It will allow a better understanding of shelter demand by using external datasets: local economic indicators, housing instability, and demographic data, including age, gender, and mental health status. This allows tailoring shelter services and predictions of future trends more accurately.
  + Real-Time Data Integration and Live Monitoring Dashboards: Integrating real-time data: weather, health, socio-economic indicators would increase demand prediction accuracy. A real-time monitoring dashboard would help shelter managers dynamically adjust resources and respond to changes in occupancy.
  + Advanced Machine Learning Models: Advanced machine learning techniques, such as Deep Learning, can be used to improve occupancy predictions. In addition, anomaly detection models can detect sudden demand spikes, and shelters can prepare ahead of time for unexpected surges.

**Appendix (Your main python file which shows your EDA as an Appendix. No need to submit a separate python file)**

