7COM1079-0901-2024 - Team Research and Development Project

Final report title: **Analysing State-Level Variations in Monthly Fund Allocation to Postpartum Women in the WIC Program (October 2012 - September 2013)**

Group ID: A113

Dataset number: DS080

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1. Introduction

1.1. Problem statement and research motivation **(100 words)**

- *This study investigates whether there is a significant difference in the average monthly fund allocation across states between October 1, 2012, and September 30, 2013. Understanding such differences is crucial for assessing the fairness and effectiveness of resource distribution. Disparities in fund allocation can indicate inefficiencies or inequalities in policy implementation, affecting regional development. By analysing this data, the study aims to provide insights that could inform future resource allocation strategies and support more equitable decision-making in public finance.*
- *Goggin, M. L., & Svara, J. H. (2019). Managing for results in state government: From accountability to performance. Routledge.*

1.2. The data set **(75 words)**

This dataset focuses on the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) in the United States, supporting low-income women and children under five at nutritional risk. A key file, *Postpartum_Women_Participating.csv*, contains data on postpartum women's participation in WIC. The first column lists state names, while subsequent columns detail funds allocated from October 2012 to September 2013. This data highlights how WIC benefits are utilized during the postpartum period, crucial for maternal and child health. It also includes participation rates and spending trends across state-administered programs, including Indian nations.

1.3. Research question: *To answer the research question, I will calculate Spearman's Rho correlation coefficient to assess the relationship between the monthly average fund allocation to postpartum women and various states from October 2012 to September 2013. This non-parametric test will determine if there is a significant correlation between these variables*

1.4. Null hypothesis and alternative hypothesis (H0/H1) **(100 words):**

Null Hypothesis (H_0): "There is no correlation between time (October 2012 to September 2013) and the monthly average fund allocation to postpartum women."

Alternative Hypothesis (H_1): "There is a correlation between time (October 2012 to September 2013) and the monthly average fund allocation to postpartum women."

2. Background research

2.1. Research papers (at least 3 relevant to your topic / DS) **(200 words)**

- Cole, N., & Fox, M. K. (2008). "Diet Quality of American Young Children by WIC Participation Status: Data from the National Health and Nutrition Examination Survey." This paper analyzes the dietary outcomes of children in WIC compared to those not participating. It highlights the program's influence on nutritional health, especially during critical periods like postpartum and early childhood.

- Bitler, M. P., & Currie, J. (2005). "Does WIC Work? The Effects of WIC on Pregnancy and Birth Outcomes." Journal of Policy Analysis and Management. This study examines the impact of WIC participation on pregnancy outcomes, including postpartum health and resource allocation. It supports the effectiveness of WIC in improving maternal and child health outcomes.
- Oliveira, V., & Frazão, E. (2009). "The WIC Program: Background, Trends, and Economic Issues." Economic Research Service, USDA. This report investigates trends in WIC participation, funding allocation, and demographic impacts, providing insights into state-level variations and funding distribution for postpartum women.

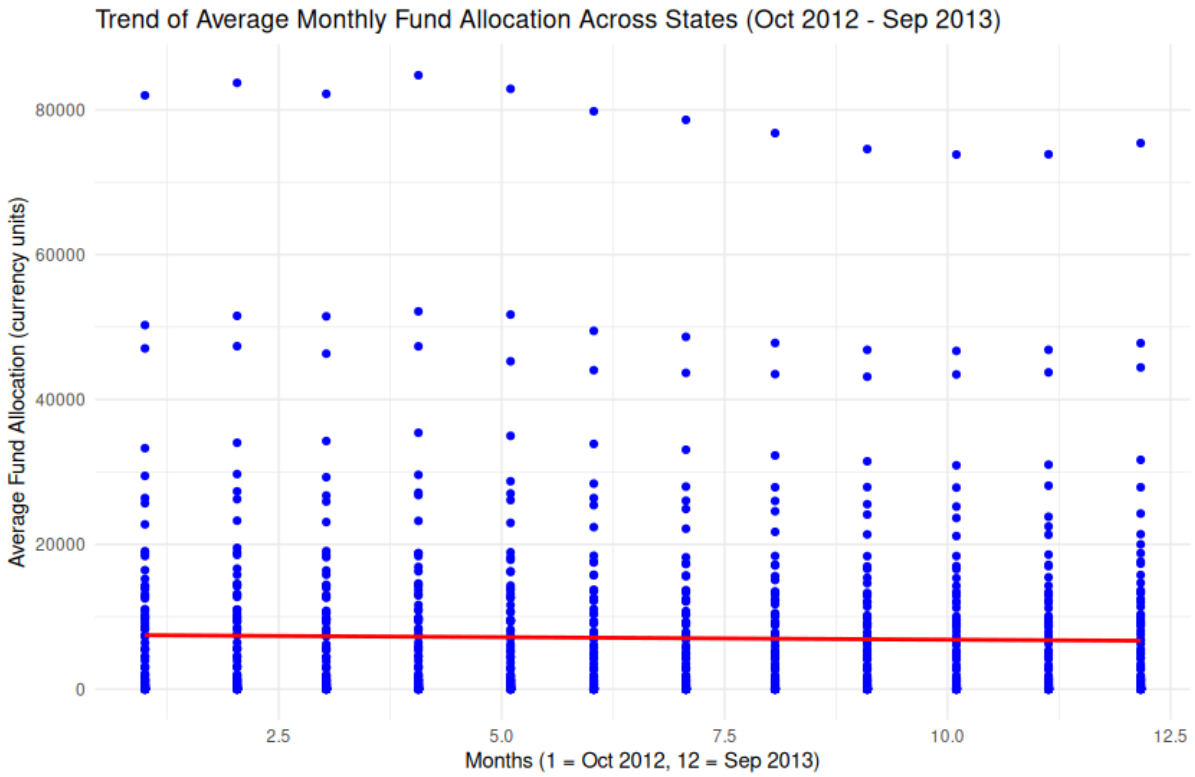
2.2. Why RQ is of interest (research gap and future directions according to the literature) **(100 word**s)

The research question fills a gap in understanding how monthly fund allocations to postpartum women in the WIC program vary across states. While prior studies emphasize WIC's role in improving maternal and child health (Bitler & Currie, 2005) and highlight state-level funding differences (Oliveira & Frazão, 2009), none examine the consistency of monthly trends. Exploring this correlation can shed light on equitable fund distribution and guide policy adjustments for better resource allocation. This research can help ensure postpartum women receive consistent support, contributing to improved outcomes for mothers and children.

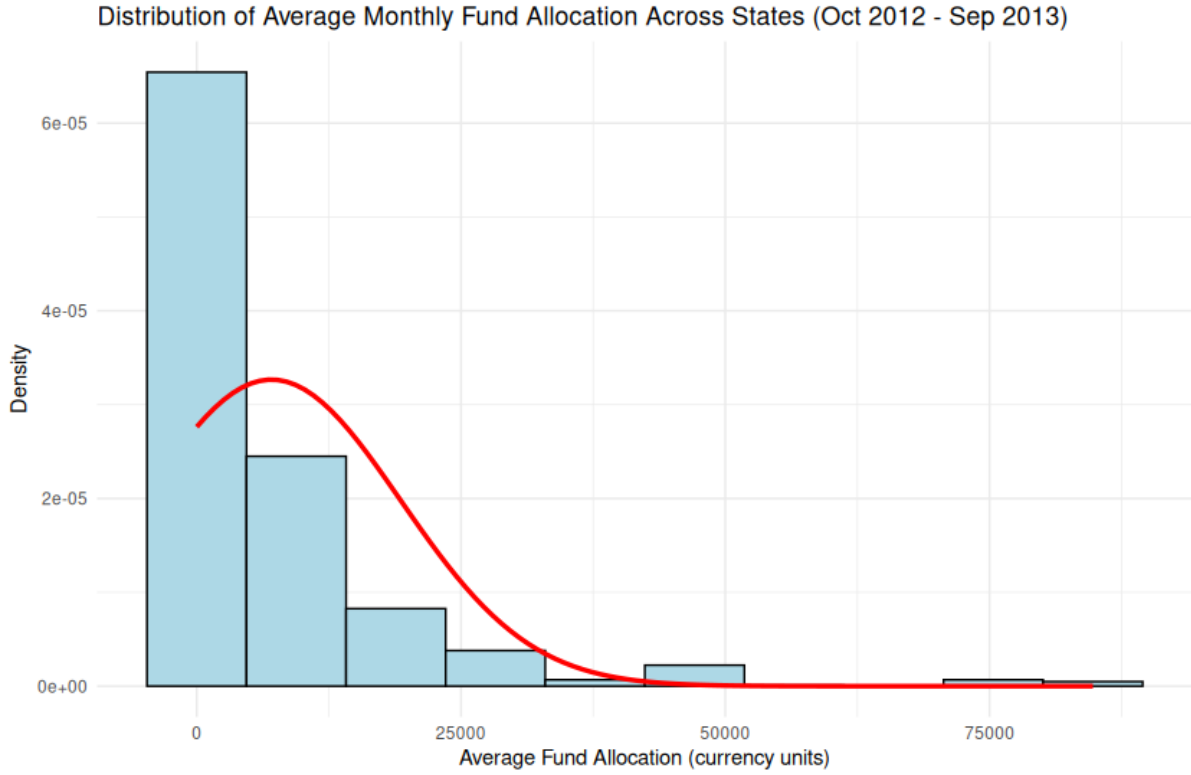
3. Visualisation

3.1. Appropriate plot for the RQ:

This scatterplot visualizes average monthly fund allocation across states over 12 months. Most states cluster around lower allocations, with some outliers receiving higher funds. The red line represents the mean allocation, showing minimal temporal variation.



3.2. Additional information relating to understanding the data:



This histogram shows the distribution of average monthly fund allocation across states. It is heavily right-skewed, with most states receiving lower allocations, while a few receive significantly higher amounts. The overlaid red curve represents a fitted density estimation.

3.3. Useful information for the data understanding (**50 words)**

- The distribution of average monthly fund allocations is highly right-skewed, indicating that most states receive lower allocations, while a few receive substantially higher funds.
- There is notable inequality in fund distribution across states.
- Temporal trends show consistent monthly allocations over the year, with no significant changes observed.
- Outliers represent states with exceptionally high fund allocations.

4. Analysis

4.1. Statistical test used to test the hypotheses and output (**75 words)**

The normal curve overlay does not follow the shape of the underlying data, so for our analysis, we use the non-parametric test for correlation that does not assume normality: **Spearman's Rho**.

4.2. The null hypothesis is rejected /not rejected based on the p-value (**100 words)**

Test-Statistic value = 220069524

p-value = 0.6437

The value of p-value (0.6437) is greater than 0.05, the result is not

The p-value is greater than 0.05, **we fail to reject the null hypothesis**.

The result Suggest that there is no monotonic relationship between the Month variable (which represents time) and the Average Fund Allocation.

5. Evaluation – group's experience at 7COM1079

5.1. What went well **(75 words):**

Group members were supportive throughout the project. We schedule meetings on (Microsoft teams and Google Meet) twice a week to discuss our progress. Everyone gives 100% for the task assigned to them. Everyone helps each other in setting up also. It was wonderful experience to work with each other.

5.2. Points for improvement **(75 words):**

There is no such point to improve.

5.3. Group's time management (**50 words):**

We scheduled meetings twice a week at a common time when everyone is available. Everyone was supportive and understood each other's situation.

5.4. Project's overall judgement (**50 words):**

The project effectively identifies disparities in WIC fund allocations for postpartum women and highlights the program's temporal consistency. While limited by the absence of demographic context, it provides valuable insights into allocation trends and underscores the need for equitable distribution. This work lays a foundation for further policy-oriented research.

5.5. Note any changes to group since submission of Assignment 1. Add new or amended GitHub Ids for new members **(75 words, write only if applies to your group arrangements):**

There are no such changes in GitHub account.

5.6. Comment on the GitHub log output **(50 words)**

1. ***Commit Message:*** *[Research Question Update] In this commit, Research question was updated according to the suggestions generated from presented in online session.*

2. ***Commit Message:*** *[Visualization and analysis update] In this commit, Visualization and analysis file was updated according to the suggestions generated from presented in online session.*
3. ***Commit Message:*** *[Add R code for the project]: R Code used to Visualize and analyse was added in this commit.*

6. Conclusions

6.1. Results explained (**75 words):**

Distribution: The skewed pattern highlights disparities in state-level fund allocation.

Temporal Stability: Monthly trends remain consistent, with no significant shifts in allocation from October 2012 to September 2013.

6.2. Interpretation of the results (**75 words):**

Equity Concern: Disparities in allocations may reflect differences in state administration or population eligibility.

Policy Implications: Findings stress the need for revisiting allocation policies to ensure fairness and adequate support for postpartum women.

6.3. Reasons and/or implications for future work, limitations of your study (**50 words):**

The study highlights disparities in fund allocation and temporal consistency but lacks data on population size and state-specific needs, limiting interpretation of equity. Future research should incorporate demographic and programmatic factors to better understand allocation criteria, improve equity, and guide policy reforms for postpartum women's nutritional and health support

7. Reference list:

Cole, N. & Fox, M.K., 2008. *Diet Quality of American Young Children by WIC Participation Status: Data from the National Health and Nutrition Examination Survey.*

Bitler, M.P. & Currie, J., 2005. Does WIC Work? The Effects of WIC on Pregnancy and Birth Outcomes. *Journal of Policy Analysis and Management*.

Oliveira, V. & Frazão, E., 2009. *The WIC Program: Background, Trends, and Economic Issues*. Economic Research Service, USDA.

8. Appendices

A. R code used for analysis and visualisation ***(not included in the word count)***

Analysis.R code with the appropriate statistics to test the hypotheses.

```
# Install these packages if not already installed
install.packages(c("ggplot2", "dplyr"))
install.packages("tidyr")
install.packages("curl")
install.packages("xml2")
install.packages("systemfonts")
```

```
# Load libraries
library(ggplot2)
library(dplyr)
library(readr)
library(tidyr)

# Load the data
data <- read_csv("Desktop/Postpartum_Women_Participating.csv")

# Check the column names to ensure correct column selection
colnames(data)
head(data,2)


# Convert the data to a long format
data_long <- data %>%
  pivot_longer(
    cols = starts_with("2012") | starts_with("2013"),  # Select columns that start
           with the date format
    names_to = "Month",
    values_to = "Avg_Fund_Allocation"
  ) %>%
  # Convert the 'Month' column from string to date format
  mutate(Month = as.Date(Month, format = "%Y-%m-%d %H:%M:%S"))
           %>%
  # Calculate the difference in days from the reference date
  mutate(Month = as.numeric(Month - as.Date("2012-10-01"))) %>%
  mutate(Month = (Month / 30) + 1)  # Convert days to months, starting from 1
           for October 2012

# Create scatter plot with a linear trendline
ggplot(data_long, aes(x = Month, y = Avg_Fund_Allocation)) +
  geom_point(color = "blue") +
  geom_smooth(method = "lm", color = "red", se = FALSE) +
  labs(
    title = "Trend of Average Monthly Fund Allocation Across States (Oct 2012
           - Sep 2013)",
    x = "Months (1 = Oct 2012, 12 = Sep 2013)",
    y = "Average Fund Allocation (currency units)"
  ) +
  theme_minimal()
```

```
# Calculate the mean and standard deviation for the normal curve
mean_fund_allocation <- mean(data_long$Avg_Fund_Allocation, na.rm =
        TRUE)
sd_fund_allocation <- sd(data_long$Avg_Fund_Allocation, na.rm = TRUE)

# Plot the histogram with normal curve overlay
ggplot(data_long, aes(x = Avg_Fund_Allocation)) +
  geom_histogram(aes(y = ..density..), color = "black", fill = "lightblue", bins =
        10) +
  stat_function(
    fun = dnorm,
    args = list(mean = mean_fund_allocation, sd = sd_fund_allocation),
    color = "red",
    lwd = 1.2
  ) +
  labs(
    title = "Distribution of Average Monthly Fund Allocation Across States (Oct
        2012 - Sep 2013)",
    x = "Average Fund Allocation (currency units)",
    y = "Density"
  ) +
  theme_minimal()
```

B. GitHub log output:

12241a6	2024-12-29T10:46:07+00:00	DeepakKhokhar1302	Add R code for project
605092e	2024-12-07T22:55:47+05:30	DeepakKhokhar1302	update in reseach question and visualization
ac8ab3a	2024-11-19T16:49:29+05:30	DeepakKhokhar1302	Implementing Suggestion given in presentation
5652724	2024-11-18T09:49:32+00:00	FahadNaeem01	visulization and analysis update Fahad
84028bd	2024-11-16T23:43:02+05:30	DeepakKhokhar1302	Visualization and analysis update
2f4c6e5	2024-11-16T16:47:34+00:00	samarmirza098	visualization and analysis update samar
4b6f6bb	2024-11-16T22:11:03+05:30	mohitdeswal002	Visulation and analysis update mohit

24e2d37	2024-11-16T16:28:14+00:00	RomailTaj	Visualisation and Analyst Update Romail
e03b901	2024-11-16T21:48:19+05:30	DeepakKhokhar1302	Visualization and Analysis presentation
3586902	2024-11-16T21:42:22+05:30	DeepakKhokhar1302	Updated Research Question
c686b95	2024-11-10T23:04:22+00:00	samarmirza098	samar commit
974d2e8	2024-11-09T23:45:32+05:30	DeepakKhokhar1302	Merge pull request #9 from DeepakKhokhar1302/main
63c1149	2024-11-09T23:43:48+05:30	DeepakKhokhar1302	Merge pull request #8 from DeepakKhokhar1302/master
f0cf120	2024-11-09T23:42:45+05:30	DeepakKhokhar1302	Demo txt file deleted
3931c61	2024-11-09T23:30:09+05:30	DeepakKhokhar1302	Merge pull request #7 from DeepakKhokhar1302/master
559b981	2024-11-09T23:28:22+05:30	DeepakKhokhar1302	Merge pull request #6 from DeepakKhokhar1302/main
4b2d918	2024-11-09T23:26:36+05:30	DeepakKhokhar1302	Merge pull request #5 from DeepakKhokhar1302/master
d703b27	2024-11-09T23:24:54+05:30	DeepakKhokhar1302	Research Question Update
65d45b6	2024-11-09T22:40:35+05:30	mohitdeswal002	Merge pull request #4 from DeepakKhokhar1302/master
67a6454	2024-11-09T22:37:50+05:30	mohitdeswal002	mohits commit
b5f8e75	2024-11-08T12:37:29+00:00	FahadNaeem01	Merge pull request #3 from DeepakKhokhar1302/master
022d79b	2024-11-08T12:36:26+00:00	RomailTaj	2nd commit
4679177	2024-11-08T12:27:22+00:00	FahadNaeem01	fahad commit
33e293f	2024-11-08T00:29:17+05:30	DeepakKhokhar1302	Merge pull request #2 from DeepakKhokhar1302/master

2072 7df	2024-11-08T00:26:47+05:30	DeepakKhokhar1302	Research_Question_presentation
e89f 23a	2024-11-05T18:06:08+05:30	DeepakKhokhar1302	Merge pull request #1 from DeepakKhokhar1302/master
86e1 d93	2024-11-05T18:04:25+05:30	DeepakKhokhar1302	Initilizing research question file
1dde 86a	2024-11-05T17:45:23+05:30	DeepakKhokhar1302	Initial commit