

The Significant Impact COVID-19 Had on an Automotive Salespersons Monthly Average Income

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MTH-1210 Statistics & Probability

April 4th, 2025, 1st Half of Project

May 8th, 2025, 2nd Half of Project



Introduction

This project explores how the COVID-19 pandemic affected the monthly average income of automotive salespeople, specifically focusing on income trends during and after the pandemic. The idea for this study stemmed from my own experience working in automotive sales, where I witnessed significant changes in earnings tied to market fluctuations caused by the pandemic. During COVID-19, limited vehicle supply and high consumer demand created a unique environment that boosted a salesperson's average income. By analyzing monthly income data from 2021 (during COVID) and 2024 (post-COVID), this project aims to statistically examine and prove that change. My hypothesis is that an automotive salesperson's monthly average income was significantly higher during the COVID-19 pandemic due to supply and demand issues than it was in the post-COVID market.

Data Collection Methodology

To conduct this study, I personally visited Castle Rock Autoplex, the dealership where I previously worked as an automotive salesperson. March 2025, I finalized the collection of self-reported income data from twenty-one current salespeople who were selling vehicles for the entire year in both 2021 and 2024. Because these individuals experienced both market conditions firsthand, their data provides a direct comparison of income during and after the COVID-19 pandemic.

- Sample Size – 21 paired observations (same individuals in both years to hold accountability towards experience per individual).
- Variable Measured - Monthly gross income (in U.S. dollars).
- Data Conversion – Reported annual income divided by twelve to calculate monthly averages.
- Sampling Method – Convenience sampling from a single dealership where I had a direct professional connection in both types of vehicles available and experience.
- Representativeness – While the sample is limited to only one location, it includes a full sales team with stable employment across both years in an automotive sales position. The use of paired data (same individuals in both years) minimizes individual performance differences, allowing for more accurate comparison of external market effects.

Exploratory Data Analysis and Descriptive Statistics

Statistics

<u>Variable</u>	<u>Mean</u>	<u>StDev</u>	<u>Minimum</u>	<u>Q1</u>	<u>Median</u>	<u>Q3</u>	<u>Maximum</u>
2021 Monthly	11623.9	3827.52	4025.25	8666.67	11750	13541.7	21666.7
2024 Monthly	8006.67	2125.43	3907.67	6401.29	7416.67	9830.48	11666.7

2021 Monthly Income

The mean monthly income for 2021 was approximately \$11,624. This reflects the average earnings of automotive salespeople during the peak of the COVID-19 pandemic, when limited vehicle supply and increased consumer demand allowed significantly higher commission opportunities. The high standard deviation of \$3,827.52 indicates that there was considerable variation in income among salespeople. This could be attributed to differences in an individual's performance or varying commission structures based on high priced vehicle sales.

2024 Monthly Income

In 2024, the Monthly Average Income dropped to about \$8,007. This decline aligns with the post-COVID stabilization of the automotive market, where inventory levels increased, and competition intensified. The lower standard deviation of \$2,125.43 suggests that incomes were more tightly clustered around the average, reflecting a narrower distribution. This could mean more uniform earnings across the sales team, due to reduced profit margins or changes in sales strategies.

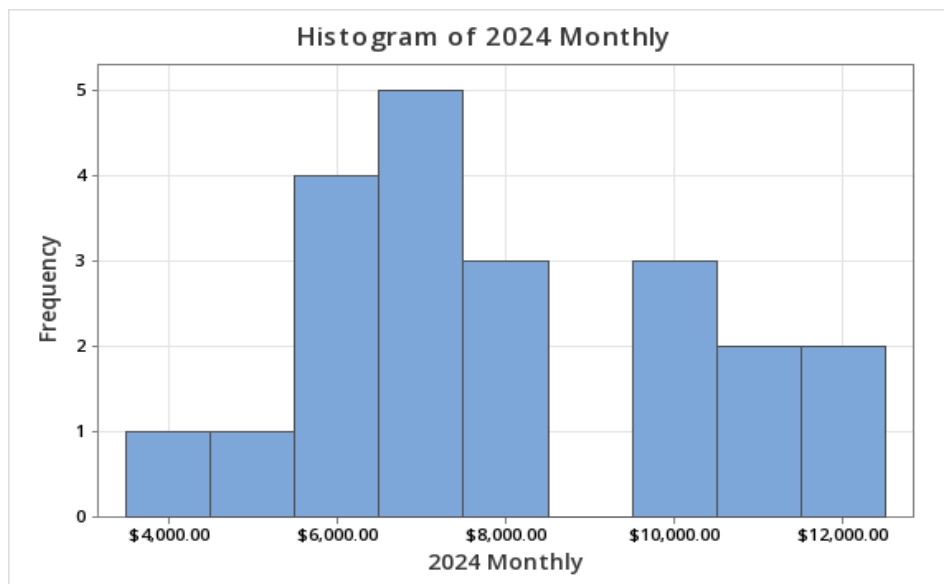
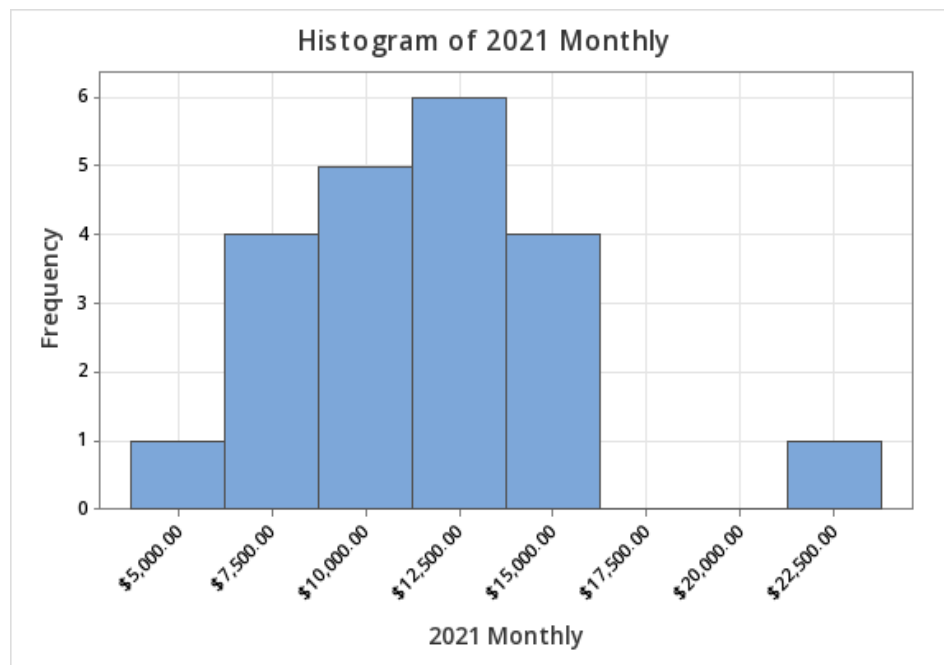
Interpretation

The higher mean and greater variability in 2021 strongly support the idea that pandemic-related market conditions had led to both increased income opportunities and wider income gaps among salespeople. In contrast, 2024 saw more moderate and consistent earnings, reflecting a more normalized industry environment. These statistical values reinforce the hypothesis that COVID-19 did significantly affect the automotive sales income levels.

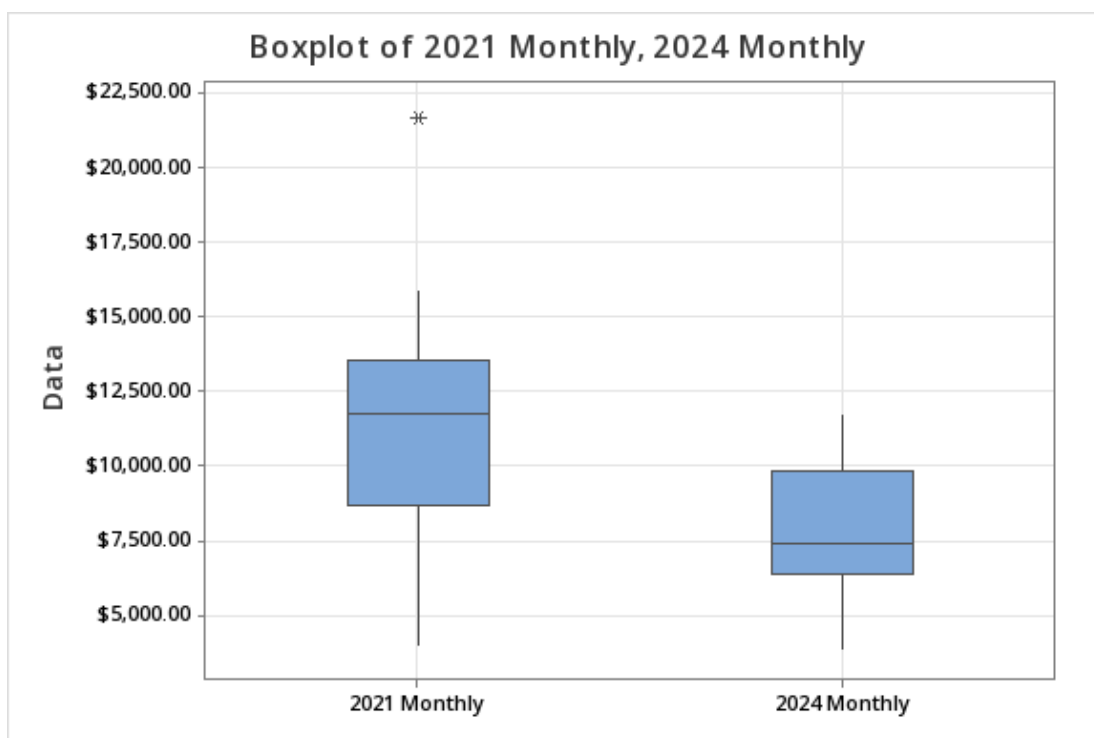
Five Number Summary

The five number summaries for both years show a clear decline in monthly earnings from 2021 to 2024. In 2021, monthly incomes ranged from a min of \$4,025.25 to a max of \$21,666.70, with a median income of \$11,750. The first quartile (Q1) was \$8,666.67, and the

third quartile (Q3) was \$13,541.70, indicating that 50% of the salespeople earned between those two values. This wide interquartile range reflects a higher level of variability in income during the COVID-19 pandemic, likely-driven by the high commissions due to the inflated vehicle prices and limited supply. In contrast, 2024 showed a more compressed income distribution, with a min of \$3,907.67, a max of \$11,666.70, and a median of \$7,416.67. The quartiles (Q1= \$6,401.29, Q3= \$9,830.48) suggest that most salespeople earned more similar amounts, reflecting a return to more normalized market conditions post-pandemic. The median monthly income dropped by approximately 36.9% from 2021 to 2024, highlighting the significant financial impact of the market shift. Overall, the summary shows that not only were earnings higher in 2021, but they are also more spread out, while 2024 earnings were much lower.



The histograms for both 2021 and 2024 monthly incomes illustrate distinct differences in distribution and spread between the two years. The 2021 histogram shows a wide spread of incomes, with majority of values falling between approximately \$8,000 and \$14,000 made per month. There is a clear outlier above \$21,000, which represents a salesperson with exceptionally high earnings during the COVID-19 pandemic. This high-end value skews the distribution slightly to the right, though the bulk of the data is concentrated in the middle range. In contrast, the 2024 histogram is more compact, with monthly incomes more consistently clustered between \$6,000 and \$10,000. The absence of any extreme values in 2024 results in a distribution that appears slightly right skewed, but much more uniform compared to 2021. These patterns reflect a shift from the volatile, opportunity-driven earnings environment of 2021 to a more predictable market in 2024, reinforcing the analyses.



The 2021 boxplot shows a higher median and a wider interquartile range, indicating greater variability in income during the COVID-19 pandemic. Notably, the 2021 data include a distinct outlier above \$21,000 per month, which reflects an unusually high earner during that year, predictably the result of inflated commissions due to inventory shortages and increased demand. In contrast, the 2024 boxplot is tighter and more symmetrical, with a lower median and more consistent income distribution across the sales team. The absence of outliers in 2024 further illustrates the normalization of the market, where earnings have returned to a more predictable range. These boxplots visually confirm that 2021 incomes were both higher and more variable, while 2024 incomes were lower and more realistic, supporting the hypothesis that the unique market conditions during COVID-19 had a significant and temporary impact on automotive salespersons income.

Conclusions from Exploratory Data Analysis and Descriptive Statistics

My exploratory data analysis supports my hypotheses that an automotive salesperson earned significantly more on average during the COVID-19 pandemic than they did post-COVID. The 2021 data showed a higher mean monthly income of approximately \$11,623.90, compared to \$8,006.67 in 2024 with a decrease of about 31.1%. The standard deviation was also higher in 2021, indicating greater variability in income, which aligns with the commission-driven spikes caused by market instability. The five-number summary and histograms further confirmed these differences, with 2021 data displaying a wider spread and the presence of a clear outlier above \$21,000 per month. In contrast, the 2024 data showed a more compact and consistent income distribution with no extreme income values. The side-by-side boxplots made these contrasts visually clear. 2021 had a higher median and broader range, while 2024's earnings were lower and more stable. Overall, the data provides convincing evidence in support of my hypothesis, clearly illustrating how the economic conditions during COVID-19 temporarily inflated income opportunities for automotive salespeople.

Supporting Data to View That Was Collected for This Project

Name ▾	2021 Annual ▾	2021 Monthly ▾	2024 Annual ▾	2024 Monthly ▾
Bart -	\$ 120,000.00	\$ 10,000.00	\$ 140,000.00	\$ 11,666.67
Andrew -	\$ 48,303.00	\$ 4,025.25	\$ 77,844.00	\$ 6,487.00
Juan -	\$ 91,000.00	\$ 7,583.33	\$ 82,000.00	\$ 6,833.33
Rick -	\$ 165,000.00	\$ 13,750.00	\$ 85,000.00	\$ 7,083.33
Austin -	\$ 107,000.00	\$ 8,916.67	\$ 101,285.00	\$ 8,440.42
TJ -	\$ 260,000.00	\$ 21,666.67	\$ 120,000.00	\$ 10,000.00
Paul -	\$ 141,000.00	\$ 11,750.00	\$ 75,000.00	\$ 6,250.00
Matt -	\$ 158,000.00	\$ 13,166.67	\$ 126,000.00	\$ 10,500.00
Cesar -	\$ 159,000.00	\$ 13,250.00	\$ 138,000.00	\$ 11,500.00
Eric -	\$ 188,000.00	\$ 15,666.67	\$ 87,500.00	\$ 7,291.67
Trent -	\$ 101,000.00	\$ 8,416.67	\$ 114,000.00	\$ 9,500.00
Mike -	\$ 110,000.00	\$ 9,166.67	\$ 65,000.00	\$ 5,416.67
Jay -	\$ 97,000.00	\$ 8,083.33	\$ 67,000.00	\$ 5,583.33
Mark -	\$ 160,000.00	\$ 13,333.33	\$ 101,000.00	\$ 8,416.67
Ray -	\$ 121,000.00	\$ 10,083.33	\$ 89,000.00	\$ 7,416.67
Steven -	\$ 148,000.00	\$ 12,333.33	\$ 75,787.00	\$ 6,315.58
Robert -	\$ 187,000.00	\$ 15,583.33	\$ 92,000.00	\$ 7,666.67
John -	\$ 128,840.00	\$ 10,736.67	\$ 88,441.00	\$ 7,370.08
Arturo -	\$ 190,000.00	\$ 15,833.33	\$ 130,000.00	\$ 10,833.33
Moe -	\$ 97,360.00	\$ 8,113.33	\$ 46,892.00	\$ 3,907.67
Rider -	\$ 151,714.27	\$ 12,642.86	\$ 115,931.43	\$ 9,660.95

Inferential Statistic:

To further support the findings of this project, inferential statistical analysis was performed. Since the data for 2021 and 2024 were collected from the same individuals, a paired t-test was the appropriate method to test the hypothesis. The goal was to determine whether there was a statistically significant difference in average monthly income for automotive salespeople during the COVID-19 period (2021) versus the post- COVID period (2024).

Estimation for Paired Difference

Mean	StDev	SE Mean	95% Lower Bound for $\mu_{\text{difference}}$
3617	3468	757	2312
$\mu_{\text{difference}}$: population mean of (2021 Monthly - 2024 Monthly)			

Confidence Interval:

The mean difference in monthly income between 2021 and 2024 was \$3,617, with a standard deviation of \$3,468. Using a 95% confidence level, the lower bound for the population mean difference is \$2,312. Since this value is greater than zero, the confidence interval suggests with high certainty that average monthly income was higher during the COVID-19 period (2021) than after (2024).

Descriptive Statistics

Sample	N	Mean	StDev	SE Mean	95% CI for μ
2021 Monthly	21	11624	3828	835	(9882, 13366)
2024 Monthly	21	8007	2125	464	(7039, 8974)

μ : population mean of 2021 Monthly, 2024 Monthly

Using a 95% confidence level, the confidence interval for the mean monthly income in 2021 is approximately (\$9,882, \$13,366). For 2024, the confidence interval is approximately (\$7,039, \$8,974). These intervals do not overlap, which strongly suggests that the true average monthly income was much higher in 2021 compared to 2024. The confidence intervals help quantify the uncertainty in our sample means and support the notion that the pandemic period led to significantly higher earnings.

Hypothesis Test:

Test

Null hypothesis $H_0: \mu_{\text{difference}} = 0$

Alternative hypothesis $H_1: \mu_{\text{difference}} > 0$

T-Value

4.78

P-Value

0.000

- **Null Hypothesis:** There is no difference in average monthly income between 2021 and 2024 (mean difference = 0).
- **Alternative Hypothesis:** The average monthly income in 2021 was significantly higher than in 2024 (mean difference > 0).
- **Test Statistic (t-value) Formula:**
$$t = \frac{3617}{3468\sqrt{21}} = \frac{3617}{757} \approx 4.78$$
- **P-value:** 0.000

This analysis uses a paired t-test, since the samples are matched by the same individuals over two separate years. Because the p-value is less than the significance ($\alpha = 0.05$), we reject the null hypothesis. This provides strong statistical evidence that automotive salespeople earned significantly more per month during 2021 (the COVID-19 period) than they did in 2024 (post-COVID).

Overall Conclusion:

This project set out to determine whether the average monthly income of automotive salespeople was significantly higher during the COVID-19 pandemic (2021) compared to the post-pandemic period (2024). Using real-world data collected from 21 salespeople at a single dealership, we conducted both exploratory data analyses and inferential statistical analyses.

The exploratory data analysis revealed a clear decline in average monthly income from 2021 to 2024. In 2021, the mean monthly income was approximately \$11,624, while in 2024 it dropped to around \$8,007- a decrease of nearly 31.1%. The five-number summaries and boxplots confirmed this trend and showed a reduction in both the range and variability of income, suggesting a more compressed earning distribution post-COVID. The 2021 data showed one

high-end outlier, further indicating elevated earnings during the pandemic for at least one individual.

The paired t-test confirmed the statistical significance of this income drop. With a t-value of 4.78 and a p-value of 0.000, we rejected the null hypothesis and concluded that the average monthly income in 2021 was significantly higher than in 2024. The 95% confidence interval for the mean difference supported this conclusion, with a lower bound of \$2,312, meaning that, on average, salespeople made at least, a minimum of \$2,312 more per month during the pandemic.

In summary, the results clearly support the hypothesis: automotive salespeople earned significantly more monthly income during COVID-19, likely due to high demand and limited vehicle supply, which allowed for highly increased commission potential. As inventory levels stabilized post-pandemic and consumer demand normalized, monthly income dropped accordingly to more realistic figures. These findings not only validate the economic impact of COVID-19 on the sales commission structures but may also serve as insight for future analysis in other commission-based industries impacted by external events.