

Quantium Case Study Report: Task 1

Data Preparation and Customer Analytics

May 29, 2025

Executive Summary

This report provides comprehensive insights into customer purchasing behaviour within the chip category. By analyzing customer transactions and demographics, significant purchasing patterns emerged across distinct customer segments, highlighting variations in purchasing behaviour by life stage and customer type. These insights, backed by robust statistical analysis, form the foundation of strategic recommendations for optimizing product offerings, pricing, and marketing strategies to maximise sales and customer satisfaction.

Data Preparation and Methodology

The analysis commenced by integrating two primary datasets: transaction records (`QVI_transaction_data.xlsx`) and customer demographic data (`QVI_purchase_behaviour.csv`). These datasets were carefully merged based on unique loyalty card identifiers to establish a unified view of customer purchasing behaviour. Subsequent data cleaning involved removing irrelevant products, such as salsa, and filtering out anomalous transaction quantities indicative of non-retail purchases. Feature engineering included extracting product pack sizes, standardising brand names, and calculating unit prices and price-per-gram metrics. These enhanced metrics enabled more accurate segmentation and insightful analysis.

Customer Segment Analysis

Detailed segmentation revealed clear distinctions in total spending and purchasing frequency across various customer types. The primary contributors to chip category sales were Budget Older Families, Mainstream Young Singles/Couples, and Mainstream Retirees, collectively representing the highest volumes and total sales figures. These findings suggest targeted opportunities to leverage these segments to drive future growth and maintain market leadership.

Pack Size Preferences

The analysis highlighted significant differences in pack size preferences. Family-oriented customer segments exhibited a strong preference for larger chip pack sizes, reflecting a value-oriented purchasing mindset. Conversely, segments consisting primarily of singles and couples displayed a notable inclination towards smaller, convenient, snack-sized packs. Statistical validation using a chi-squared test confirmed a significant relationship between customer segments and their preferred pack sizes ($X^2 = 49.87$, $p < 0.001$). This information is crucial for tailoring product offerings and optimising inventory to meet consumer demands effectively.

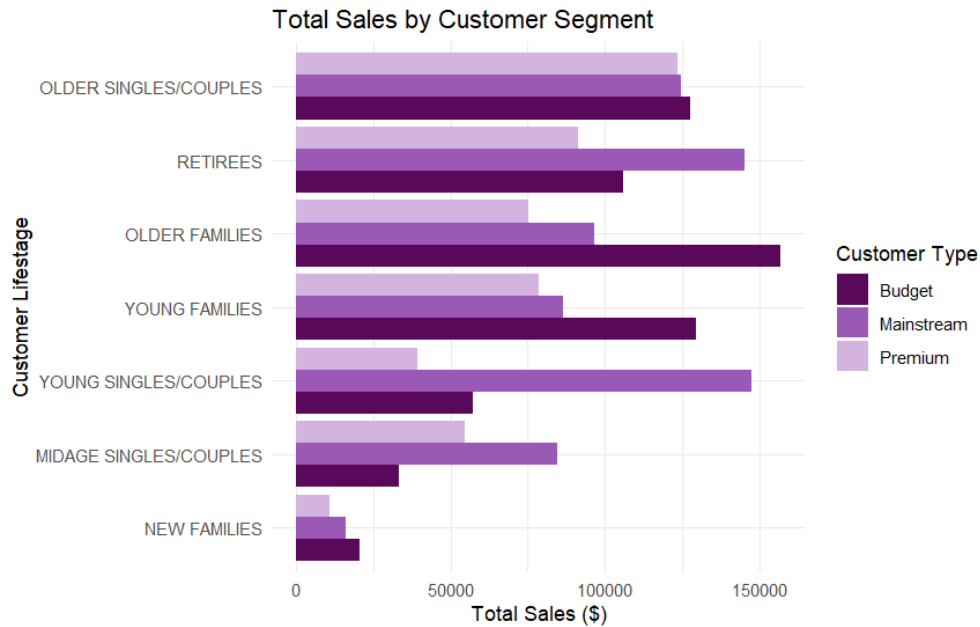


Figure 1: Total chip sales segmented by customer type, highlighting that Budget Older Families, Mainstream Young Singles/Couples, and Mainstream Retirees are the highest revenue contributors.

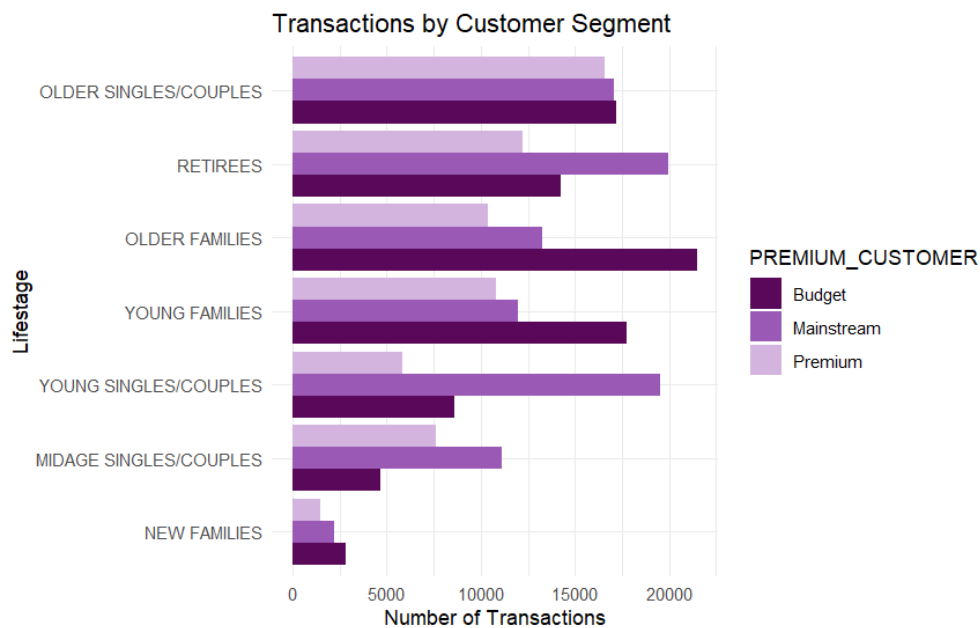


Figure 2: Number of transactions segmented by customer type, demonstrating that high revenue segments also drive high purchase frequency.

Pricing Behaviour Insights

Analysis of unit pricing behaviour revealed that Mainstream customers paid significantly more per pack on average (\$4.07) compared to Premium customers (\$3.67), an unexpected finding given the typical expectation of Premium segments demonstrating a willingness to pay higher prices. This insight was validated through

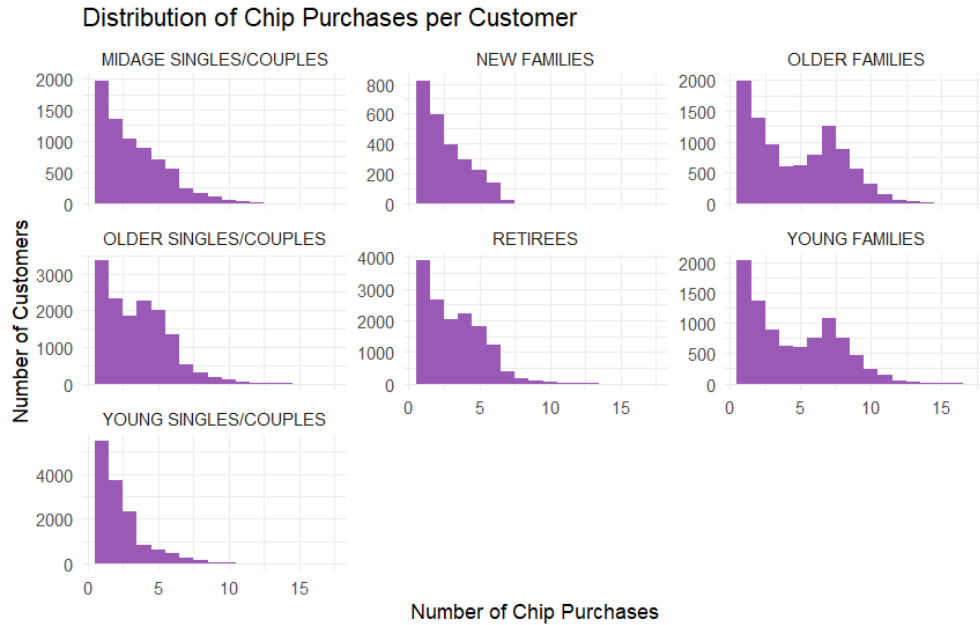


Figure 3: Frequency distribution of repeat chip purchasers across different customer segments, providing insight into customer loyalty and purchase consistency.

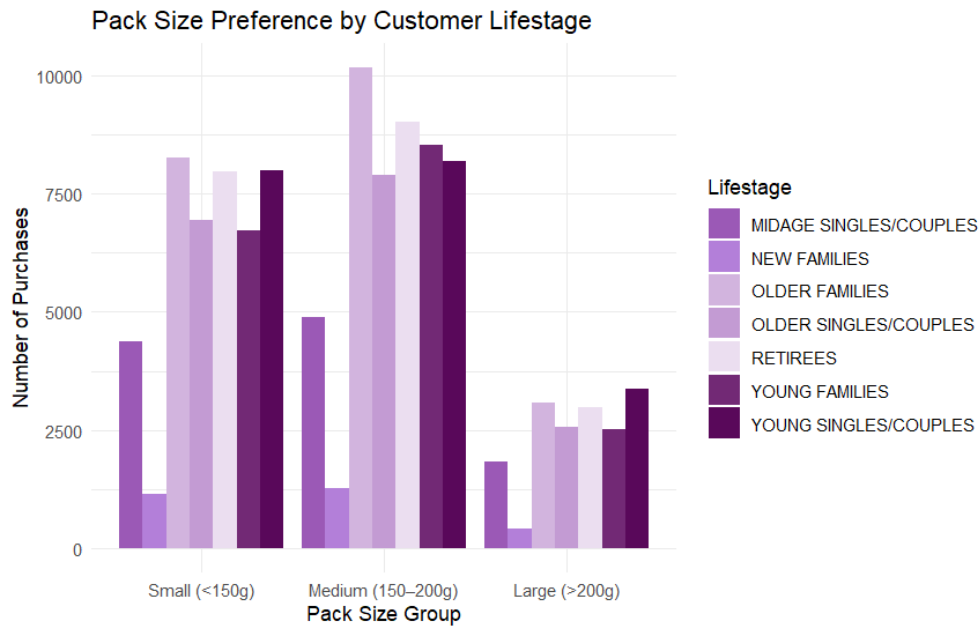


Figure 4: Distribution of average chip pack sizes preferred by different customer segments, illustrating that families prefer larger packs, while singles and couples opt for smaller, convenient packs.

a highly significant t-test ($t = 24.8$, $p < 0.001$), indicating real differences in purchasing strategies between these customer types.

Further ANOVA testing across life-stage segments reinforced these findings, demonstrating considerable variability in average unit prices paid among different life stages ($F = 156.1$, $p < 0.001$). Post-hoc comparisons revealed that Young Singles/Couples consistently paid the highest unit prices, likely driven by

preferences for premium brands or single-serve convenience packs. Conversely, Family segments consistently opted for lower-priced, value-oriented products.

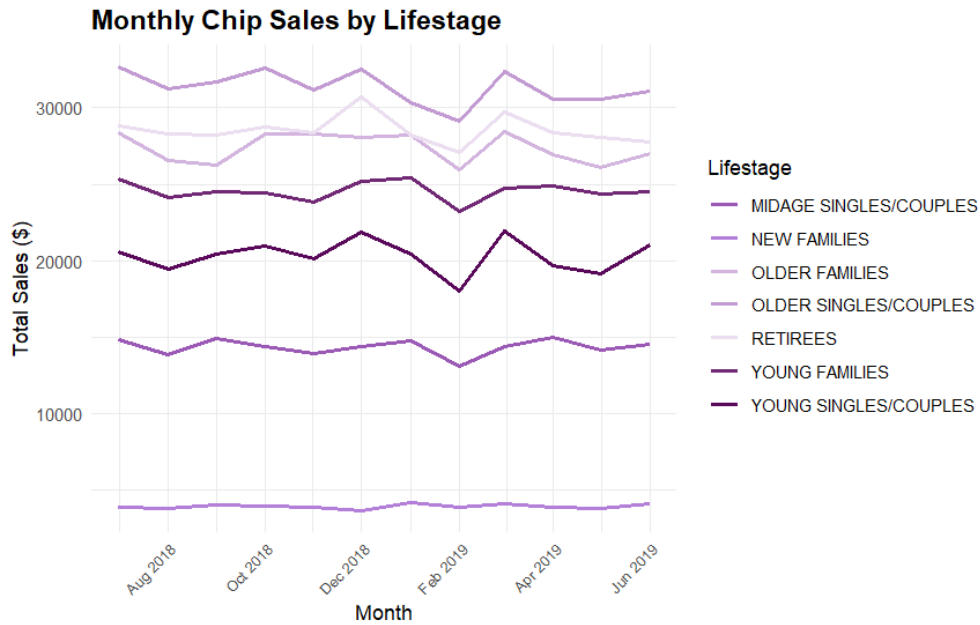


Figure 5: Monthly sales trends indicating seasonality in chip purchases, crucial for timing promotional strategies and managing inventory.

Value Proposition and Pack Size Economics

A deeper analysis of pack size economics further elucidated customer purchasing behaviour. Pearson correlation analyses showed a moderate positive correlation ($r = 0.507$, $p < 0.001$) between pack size and unit price, intuitively indicating that larger packs are priced higher per unit. However, critically, a strong negative correlation ($r = -0.515$, $p < 0.001$) emerged between pack size and price per gram. This result confirmed that larger packs offer superior value, reinforcing why budget-conscious families predominantly prefer larger pack sizes. Such insights provide essential guidance for pricing strategy and promotional activities.

Strategic Recommendations

Based on the comprehensive analytical insights, several strategic recommendations are proposed to optimize market positioning and profitability in the chip category.

Firstly, leverage the purchasing behaviour of Young Singles/Couples, who consistently demonstrate a willingness to pay premium prices for convenience and snack-sized packs. Target this segment with premium-priced, single-serve product lines and upscale packaging to enhance perceived value and drive incremental revenue.

Secondly, capitalize on family segments' preference for value-driven purchases by promoting larger, cost-effective pack options. Marketing strategies should emphasize bulk buying, value packs, and family-sized offerings to resonate effectively with these consumers.

Lastly, optimize brand alignment and product assortment tailored explicitly to customer life stages. For example, popular family-oriented brands such as Smiths and Doritos should dominate shelf space targeting families, while premium and convenience brands like Pringles and Red Rock Deli should be positioned strategically to attract singles and couples.

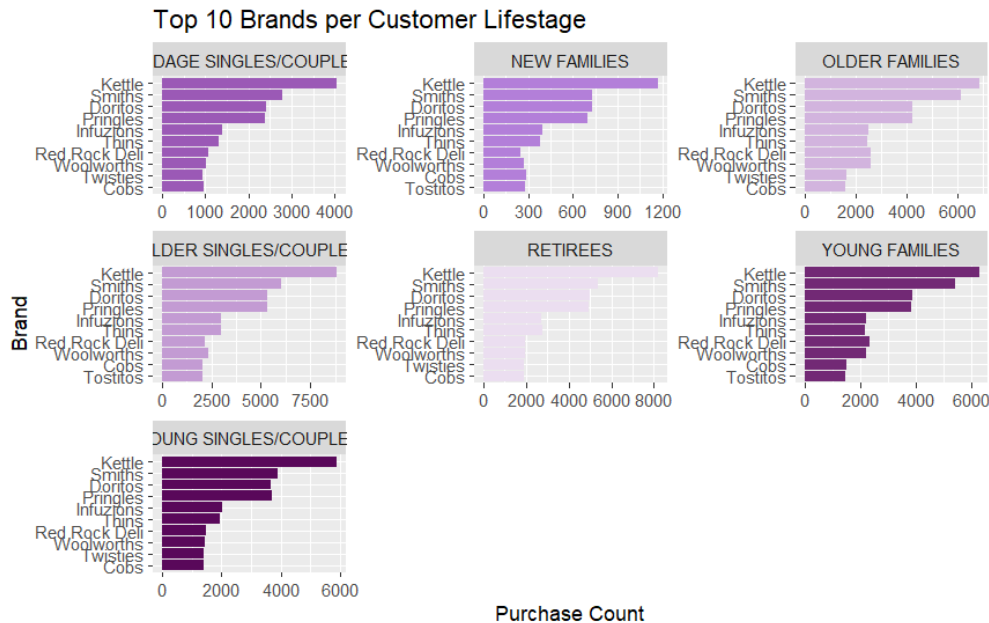


Figure 6: Top chip brands preferred by customer lifestage segments, essential for targeted brand promotion and shelf-space optimisation.

Conclusion

The insights gained from thorough data analysis clearly demonstrate distinctive purchasing patterns among customer segments within the chip category. Implementing targeted marketing, strategic pricing, and appropriately tailored product offerings based on these insights will allow Quantum to effectively meet diverse consumer needs, maximise revenue, and enhance overall category performance in the coming period.