### Conclusions Report on Customer Behavior and Expenditure Analysis

This report summarizes the main findings from our study on customer behavior, spending habits, and response data. We looked at different factors like education level, marital status, and income category, and how these affect buying choices. By understanding these factors, businesses can adjust their marketing strategies to improve customer engagement and increase sales.

**Education Level:**

* Majority of customers are graduates.
* Few customers have only basic schooling.

**Marital Status:**

* Most customers are married.
* A significant number are living together (around 50%).
* Minimal number of customers live alone, indicating a preference for companionship.

A negative correlation is observed between purchases and the presence of kids in the home, suggesting that households with children may spend less on certain products.

### Recency(time between two purchases) Data Insights for Business

* **Average Re-engagement (Mean: 49.5):**On average, customers come back after about 49.5 units of time (like days or weeks). This gives a general idea of how long to wait between customer interactions.
* **High Variance (816.75):**There is a wide range in how quickly customers re-engage:
  + **What It Means:** Some customers come back quickly, while others take much longer. This makes it hard to predict when a customer will return, so businesses should use different strategies for different customers.
* **Low Chances of Quick Re-engagement:**
  + Only **5.05%** of customers return within 5 units of time, and **1.01%** within 15 units.
  + **What to Do:** Since most customers take longer to come back, businesses should keep in touch with customers over time through things like reminders and targeted marketing to encourage them to return.

### Response data analysis

From a business standpoint, the "Response" variable is crucial as it indicates whether a customer made a purchase during a marketing campaign. Understanding response rates helps businesses assess the effectiveness of their marketing strategies and identify areas for improvement.

1. **Probability of Success (p):**
   * **0.1289 (12.89%)**: This is the probability that a customer will respond positively.
2. **Number of Trials (n):**
   * **1,877**: This is the total number of interactions or attempts made to receive a response.
3. **Mean (Expected Value):**
   * **242.0**: This indicates that, based on the probability of success, we expect around 242 positive responses out of 1,877 trials.
4. **Variance:**
   * **210.80**: This reflects the variability in the number of responses. A higher variance suggests that the actual number of responses can vary widely from the expected mean.
5. **Probability of Getting 1 Success (P(X=1)):**
   * **8.40e-111**: This extremely low probability indicates that it is very unlikely to receive exactly one positive response in 1,877 trials.
6. **Probability of Getting 0 Successes (P(X=0)):**
   * **3.02e-113**: Similarly, this shows that the probability of receiving no positive responses at all is also extremely low, suggesting that at least one positive response is expected.

### Insights

* **Low Success Rate:**While the probability of success is around **12.89%**, the very low probabilities for getting exactly one or zero successes indicate that the actual response behavior is much more predictable and tends toward receiving multiple responses rather than just one or none.
* **Expectation of Responses:**The mean expected value of **242** positive responses out of **1,877** trials is useful for setting realistic targets and expectations for response rates in future campaigns or interactions.
* **High Variability:**The variance of **210.80** indicates that while the average is around 242, the actual number of responses could vary widely. This variability may be influenced by factors like customer segmentation, timing of outreach, and the nature of the offer.

### Recommendations

* **Refine Engagement Strategies:**Given the low response probability, consider analyzing and refining your engagement strategies to improve the overall response rate. This may include targeted messaging, personalized offers, or follow-up communications.
* **Monitor Trends:**Keep monitoring response rates over time to identify trends or factors that may influence customer behavior, adjusting your strategies accordingly.

The **95% confidence interval** for the number of successes (positive responses) is calculated as follows:

### Confidence Interval

* **Lower Bound:** 213.54
* **Upper Bound:** 270.46

### Interpretation

This interval means that you can be **95% confident** that the actual number of positive responses in your sample of 1,877 trials will fall between **213 and 270**.

### Insights

* **Understanding Variability:**The confidence interval reflects the uncertainty in your estimate of the number of responses. A wider interval indicates more variability in your data, while a narrower interval suggests more precision.
* **Setting Expectations:**This range can help set realistic expectations for stakeholders regarding response rates. For instance, planning for at least **213 responses** while recognizing that you could see up to **270**.

### Summary of Complaints Analysis

1. **Mean (Expected Value) of Complaints:**
   * **Value:** **0.009375** (or **0.9375%**)
   * **Interpretation:** On average, about **0.9375%** of interactions result in complaints, indicating a well-functioning system in terms of customer satisfaction.
2. **Variance:**
   * **Value:** **0.009287**
   * **Interpretation:** The low variance suggests that complaints do not vary significantly, with most data points clustering around the mean. This reinforces that complaints are infrequent.
3. **Probability of Complaint (P(X=1)):**
   * **Value:** **0.009375** (or **0.9375%**)
   * **Interpretation:** There is a **0.9375%** chance of receiving a complaint, highlighting that complaints are rare occurrences, which is favorable for performance quality.
4. **Probability of No Complaint (P(X=0)):**
   * **Value:** **0.990625** (or **99.0625%**)
   * **Interpretation:** There is a **99.0625%** chance of not receiving a complaint, indicating that most interactions result in high customer satisfaction.

### Key Insights on Expenditure by Education Level

1. **Overall Expenditure:**
   * **Graduation:** Highest total spending, especially on wine, meat, and gold products.
   * **PhD:** Second highest expenditure, notably on wine and meat, indicating a preference for quality.
   * **Master:** Considerable spending, particularly on meat and gold.
   * **2n Cycle and Basic Education:** Lowest overall expenditure, suggesting limited purchasing power or different preferences.
2. **Product Category Insights:**
   * **Wines:** Graduates lead with spending of **219,300**, while Basic Education spends only **156**.
   * **Meat Products:** Graduation again tops with **140,064**, with Basic and 2n Cycle spending much less.
   * **Fish Products:** Overall low spending; Graduation highest at **33,847**.
   * **Fruits and Sweet Products:** Moderate expenditure led by graduates; sweet products see varied spending.
   * **Gold Products:** Graduates spend the most (**30,368**), indicating investment in luxury items.
3. **Comparative Analysis:**
   * Graduates consistently spend more across all categories, particularly in wine and meat.
   * PhD holders also show high spending patterns but at lower levels than graduates.
   * Basic and 2n Cycle individuals exhibit minimal spending, possibly due to economic constraints.
4. **Consumer Behavior Implications:**
   * **Targeted Marketing:** Focus on graduates and PhDs with premium offerings in wine and meat.
   * **Product Development:** Create budget-friendly options for Basic and 2n Cycle consumers.
   * **Educational Segmentation:** Tailor marketing campaigns to align with preferences based on educational attainment

### Key Insights on Expenditure by Marital Status

1. **Overall Expenditure:**
   * **Married:** Highest total expenditure across all categories, especially in wine, meat, and gold products, indicating stable financial resources.
   * **Single:** Significant spending, particularly on wine and meat, suggesting a preference for quality items.
   * **Together:** Similar spending patterns as singles, indicating shared purchasing decisions.
   * **Divorced:** High expenditures on meat and wine, reflecting a focus on quality post-divorce.
   * **Widow:** Much lower spending, possibly due to changes in income or consumption patterns after loss.
   * **Alone and YOLO:** Very low expenditures, indicating limited financial resources or differing priorities.
2. **Product Category Insights:**
   * **Wines:**
     + Married individuals lead with **184,213**, while singles spend **111,083**.
     + Alone individuals show minimal spending (**20**).
   * **Meat Products:**
     + Married lead with **98,855**, followed by divorced individuals at **23,825**.
     + YOLO spends only **100**.
   * **Fish Products:**
     + Married group spend the most (**22,370**), while YOLO shows minimal engagement (**8**).
   * **Fruits and Sweet Products:**
     + Significant spending by married individuals (**16,071** and **17,272** respectively), with Together showing similar patterns.
   * **Gold Products:**
     + Highest spending by married individuals (**20,667**), with divorced at **5,179**.
3. **Comparative Analysis:**
   * Married individuals dominate spending across categories, indicating a strong preference for quality.
   * Single and Together groups show high spending, particularly in wines and meats, reflecting a desire for quality experiences.
   * Widow and Alone individuals exhibit lower spending, possibly due to reduced purchasing power.
4. **Consumer Behavior Implications:**
   * **Targeted Marketing:** Focus on married individuals for premium products, with tailored offerings for singles and couples.
   * **Product Diversification:** Create products that cater to varied preferences based on marital status.
   * **Budget-Friendly Options:** Introduce budget-friendly products for Widow, Alone, and YOLO groups.

### Key Insights on Expenditure by Income Category

1. **Overall Expenditure:**
   * **Medium-High Income Group:** Highest spending across all categories, particularly in MntWines (**870.91**) and MeatProducts (**617.97**), indicating a strong preference for premium products.
   * **Medium Income Group:** Substantial spending on MntWines (**557.98**) and MeatProducts (**343.72**), highlighting a solid market for quality goods.
   * **Medium-Low Income Group:** Moderate expenditures, especially on MeatProducts (**49.90**) andFishProducts (**14.34**), reflecting a balance between quality and affordability.
   * **Low Income Group:** Lowest overall spending, particularly on wine (**13.00**) and fish products (**7.74**), indicating budget constraints.
   * **High Income Group:** Despite high income, this group shows minimal spending across categories, suggesting a preference for luxury items or non-consumables.
2. **Product Category Insights:**
   * **Wines:**
     + Medium -High income group leads with **870.91**, followed by Medium at **557.98**. Low income shows negligible spending.
   * **Meat Products:**
     + Medium-High leads with **617.97**, Medium spends **343.72**, while Low spends the least (**16.13**).
   * **Fish Products:**
     + Medium income spends the most (**72.64**), Medium-High spends **99.54**, and Low has minimal spending (**7.74**).
   * **Fruits:**
     + Medium leads with **51.60**, Medium-High spends **62.26**, and Low spends only **5.78**.
   * **Sweet Products:**
     + Medium -High group spends the most (**85.54**), Medium spends **54.53**, and Low spends relatively low (**5.77**).
   * **Gold Products:**
     + Medium income spends **46.69**, Medium-High spends **50.20**, while Low and High show much less engagement (**14.51** and **4.80**).
3. **Comparative Analysis:**
   * Higher income groups (Medium-High) significantly invest in premium goods, while lower income groups (Low) exhibit minimal expenditures.
   * Medium and Medium-Low categories show balanced spending habits, indicating opportunities for brands to market affordable yet quality options.
   * The High income group's low spending may suggest prioritization of investments or luxury items outside typical consumption categories.

## Cluster Analysis

### Cluster 0

* **Demographics:**
  + **Age:** Approximately 53 years
  + **Income:** $36,170.22
  + **Education:** Graduation
  + **Marital Status:** Married
* **Expenditure Patterns:**
  + **MntWines:** $61.58
  + **MeatProducts:** $26.70
  + **FishProducts:** $7.34
  + **Fruits:** $5.22
  + **Sweet Products:** $5.33
  + **MntGoldProds:** $14.60

### Cluster 1

* **Demographics:**
  + **Age:** Approximately 55 years
  + **Income:** $76,605.14
  + **Education:** Graduation
  + **Marital Status:** Married
* **Expenditure Patterns:**
  + **MntWines:** $547.35
  + **MeatProducts:** $469.84
  + **FishProducts:** $112.62
  + **Fruits:** $82.92
  + **Sweet Products:** $85.18
  + **MntGoldProds:** $57.58

### Cluster 2

* **Demographics:**
  + **Age:** Approximately 58 years
  + **Income:** $65,455.17
  + **Education:** Graduation
  + **Marital Status:** Married
* **Expenditure Patterns:**
  + **MntWines:** $543.83
  + **MeatProducts:** $210.21
  + **FishProducts:** $38.85
  + **Fruits:** $23.65
  + **Sweet Products:** $27.13
  + **MntGoldProds:** $46.74

## Insights

1. **Income Disparities**:
   * Cluster 1 has the highest income and expenditure levels, indicating a strong purchasing power.
   * Cluster 0 shows the lowest income and spending, highlighting budget constraints.
2. **Spending Behavior**:
   * **Wines and Meat Products**:
     + Cluster 1 leads significantly in expenditure on wines and meat products, reflecting a preference for premium quality.
     + Cluster 2 also spends considerably on wines but at a lower rate than Cluster 1, suggesting potential for marketing strategies aimed at this demographic.
   * **Low Expenditure Categories**:
     + Clusters 0 and 2 show minimal spending in fish, fruits, and sweets, which might suggest that these products are less prioritized or deemed non-essential by these consumers.
3. **Potential Growth Areas**:
   * **Fruits and Fish Products**:
     + The lower spending in these categories presents an opportunity for businesses to promote affordable, healthy options tailored for Clusters 0 and 2, potentially improving market share in these segments.
4. **Luxury Goods**:
   * Cluster 1 and Cluster 2's relatively higher spending on gold products indicates an interest in luxury items, providing avenues for luxury brands to target these clusters with tailored marketing strategies.
   * Explore healthier options for low expenditure categories.

## Strategic Recommendations

1. **Targeted Marketing**:
   * **Cluster 1**: Develop premium product offerings and luxury marketing campaigns that emphasize quality and exclusivity, particularly in the wine and meat sectors.
   * **Cluster 2**: Focus on quality products with promotional strategies that appeal to their values, possibly highlighting health benefits or sustainability.
2. **Affordable Options**:
   * For **Cluster 0**: Introduce budget-friendly product lines in meat, fish, and fruit categories to cater to their limited spending power while emphasizing value for money.
3. **Product Development**:
   * Explore introducing new product lines that cater to the preferences of Clusters 0 and 2, particularly in the health and wellness sectors (e.g., ready-to-eat meals, organic options).
4. **Consumer Engagement**:
   * Increase engagement through targeted campaigns that resonate with the lifestyle and values of each cluster, utilizing social media and community outreach to build brand loyalty.
5. **Data-Driven Decisions**:
   * Continue to analyze spending trends and demographic shifts to adapt strategies and product offerings in response to changing consumer behavior.

### Recommendations to Improve the Business

1. **Targeted Marketing Campaigns:**
   * **Focus on Premium Products:**
     + Develop marketing strategies aimed at Cluster 1 (high-income, married customers) to promote premium products, particularly wines and meats.
     + Leverage their high spending propensity in these categories through personalized offers, loyalty programs, or exclusive events.
2. **Develop Tailored Products for Different Segments:**
   * **Affordable Options for Budget-Conscious Customers:**
     + Introduce budget-friendly product lines for Cluster 0, targeting individuals with lower income and expenditures. Focus on essential items like meat, fish, and fruits.
   * **Healthier Options:**
     + Explore healthier alternatives in categories where spending is low, especially among graduates and lower-income groups. This could include organic or low-calorie options to cater to health-conscious consumers.
3. **Enhance Customer Engagement and Retention:**
   * **Re-engagement Strategies:**
     + Implement campaigns to encourage quicker re-engagement among customers, given the high variance in re-engagement times. Consider time-sensitive offers or reminders to shop.
   * **Personalized Follow-ups:**
     + Use data insights to tailor follow-up communications based on past purchases, preferences, and demographic information to encourage repeat purchases.
4. **Increased Focus on Customer Satisfaction:**
   * **Monitor and Address Complaints:**
     + Although complaint rates are low, establish a proactive customer service strategy to address any potential issues quickly. Implement a feedback loop to continuously improve product offerings and customer service.
5. **Utilize Demographic Insights for Product Positioning:**
   * **Cater to Marital Status Insights:**
     + Create marketing materials that appeal to married customers, highlighting family-oriented products or bulk purchase deals, while also developing targeted promotions for singles to encourage them to buy premium products.
6. **Promotional Offers Based on Education Level:**
   * **Differentiate Promotions:**
     + Create differentiated promotions that align with the educational background of customers, as graduates show higher spending. Consider loyalty programs that reward repeat purchases in specific categories like wine and meat.
7. **Income-Based Promotions:**
   * **Tiered Discounts:**
     + Introduce tiered discounts or bundles for medium-high income customers while ensuring low-income groups have access to affordable alternatives to encourage sales across all income brackets.
8. **Cluster-Specific Campaigns:**
   * **Develop Campaigns Targeting Each Cluster:**
     + Create specific marketing campaigns tailored to each cluster's spending behavior, age, and income. This segmentation can enhance relevancy and drive higher engagement rates.
9. **Data-Driven Decision Making:**
   * **Ongoing Analysis:**
     + Implement an ongoing analysis of customer data to identify trends and adapt marketing strategies and product offerings accordingly. Regularly assess the effectiveness of targeted campaigns to optimize performance.
10. **Explore Partnerships:**
    * **Collaborate with Local Producers:**
      + Consider partnerships with local producers to enhance product offerings, especially for meat and organic products, which can appeal to health-conscious consumers while supporting the local economy.

By implementing these recommendations, the business can better meet customer needs, enhance satisfaction, and ultimately improve sales and profitability.