Understanding the Complex Dynamics of Cigarette Smoking and Its Impact on Substance Use and Crime:Insights from Longitudinal Data Analysis

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Data Sources

- National Survey on Drug Use and Health (NSDUH)
  - Conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA)
  - Cross-sectional, nationally representative survey
  - Covers U.S. civilian, non-institutionalized population aged 12 years and older
  - Collects comprehensive information on alcohol, tobacco, and illicit drug use prevalence, patterns, and consequences
  - 2014-2021

- Tax Burden on Tobacco (Orzechowski and Walker, 2023)
  - Cigarette consumption in 50 states and D.C.
  - Prices per pack of cigarettes
  - Tobacco control program expenditures
  - Tobacco control program expenditures out of the Master Settlement Agreement (MSA) funds
  - 1955-2023

- American Lung Association
  - Lung Cancer Age-Adjusted Incidence Rates by Site, Race and Sex, 1975-2020

Cigarette Sales Trend

Peak Year and Max Value:

- 1981: "Cigarette Sales" peaked at 29,979.9 million packs.

2023 Value and Percentage Decrease:

- 2023: "Cigarette Sales" decreased to 9,109.3 million packs.
- Percentage decrease from peak year to 2023: approximately 69.62%.

Sales Per Capita Trend

Peak Year and Max Value:

- 1978: "Sales Per Capita" reached its highest level at 133.8 packs per capita.

2023 Value and Percentage Decrease:

- 2023: "Sales Per Capita" decreased to 34.1 packs per capita.
- Percentage decrease from peak year to 2023: approximately 74.51%.

Cigarette Sales and Sales Per Capita Over Years
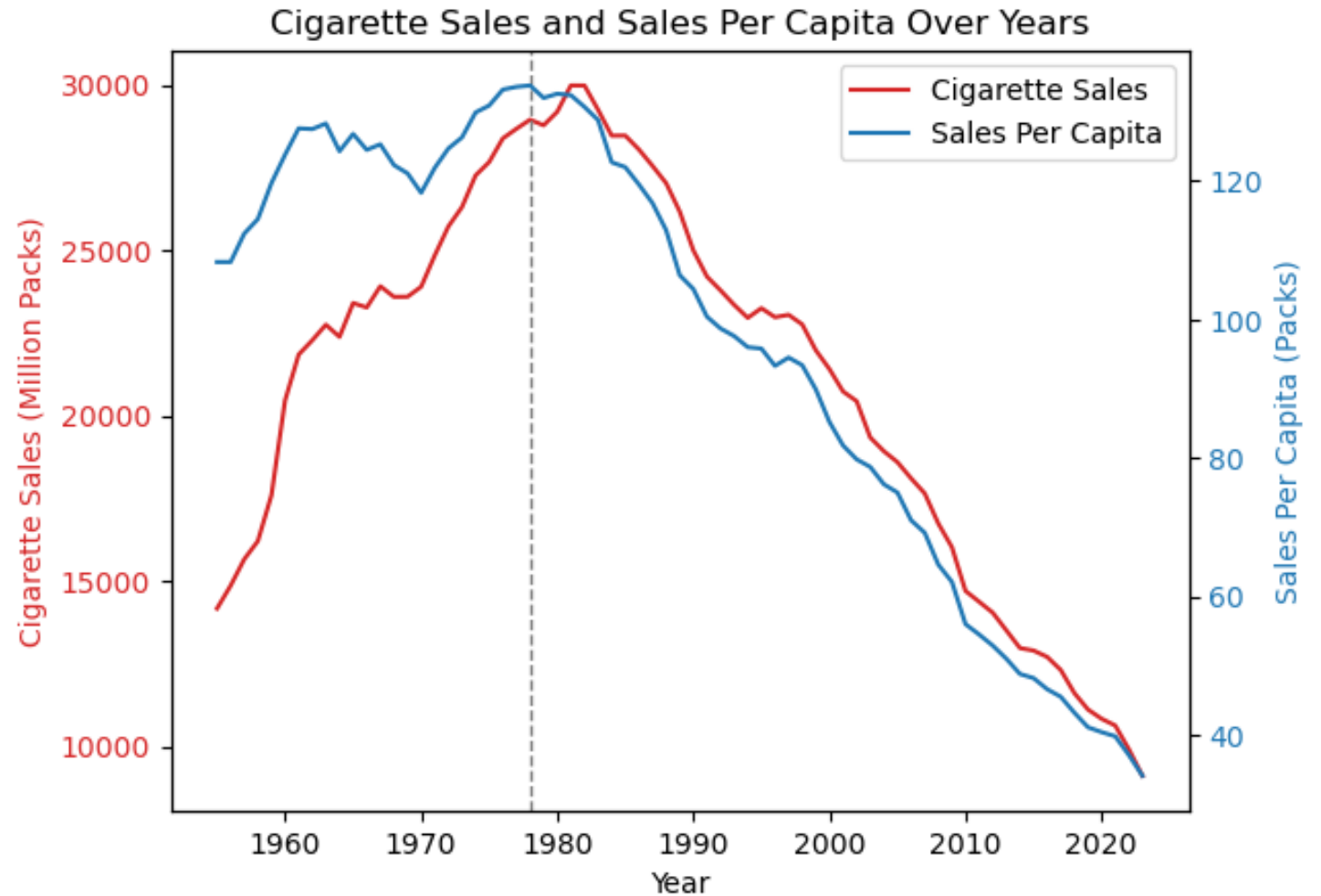
Real Retail Price Comparison

- 1978: Real retail price was $2.15.
- 2023: Real retail price increased to $6.86.
- approximately 218.34%.

Impact on Consumer Behavior

- Significant price escalation likely influenced consumer behavior.
- Estimated decline in cigarette consumption: around 75% from 1978 to 2023.
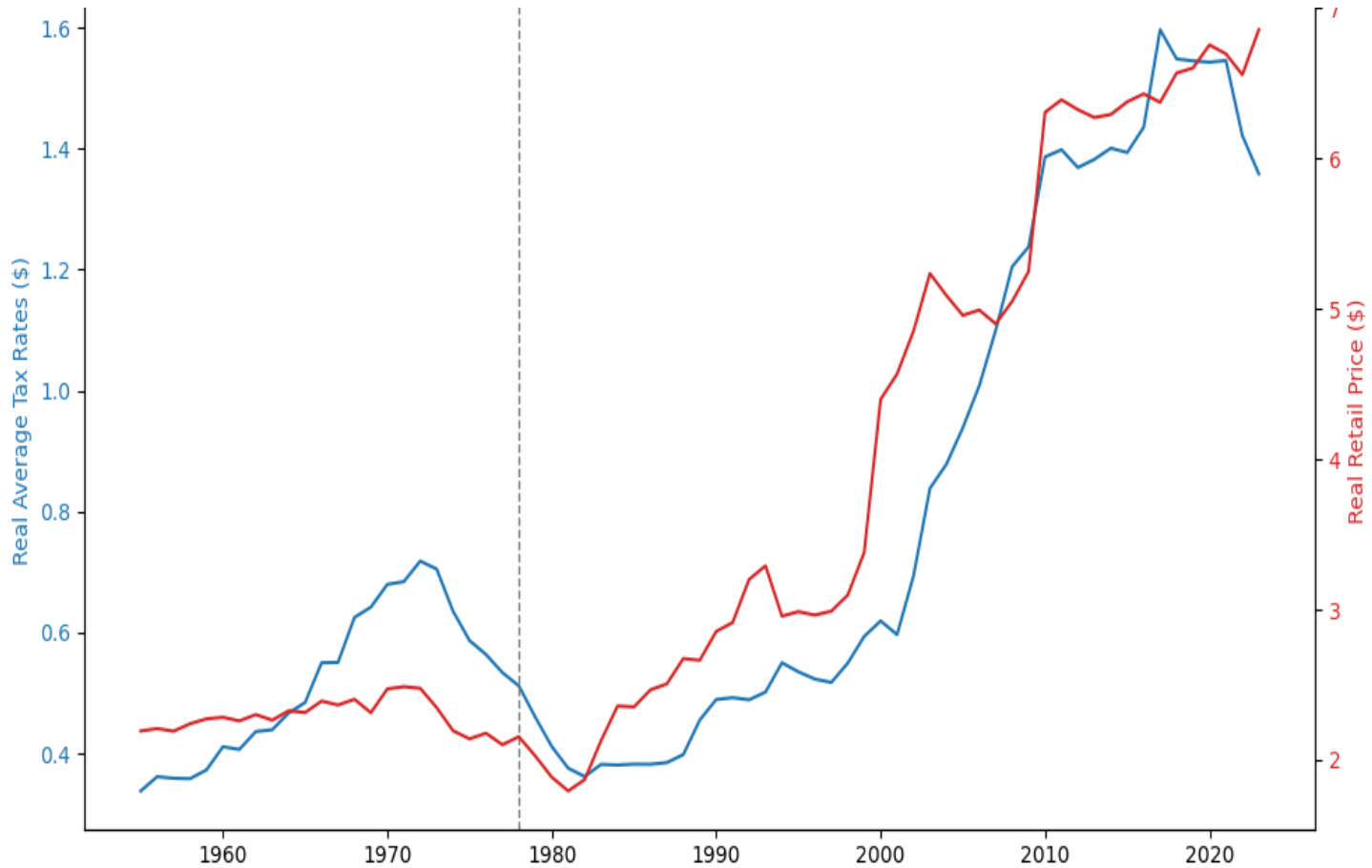
Consumer Response

- Higher prices discourage consumption according to economic principle.
- Less affordability of cigarettes may lead to downward trend in demand over time.
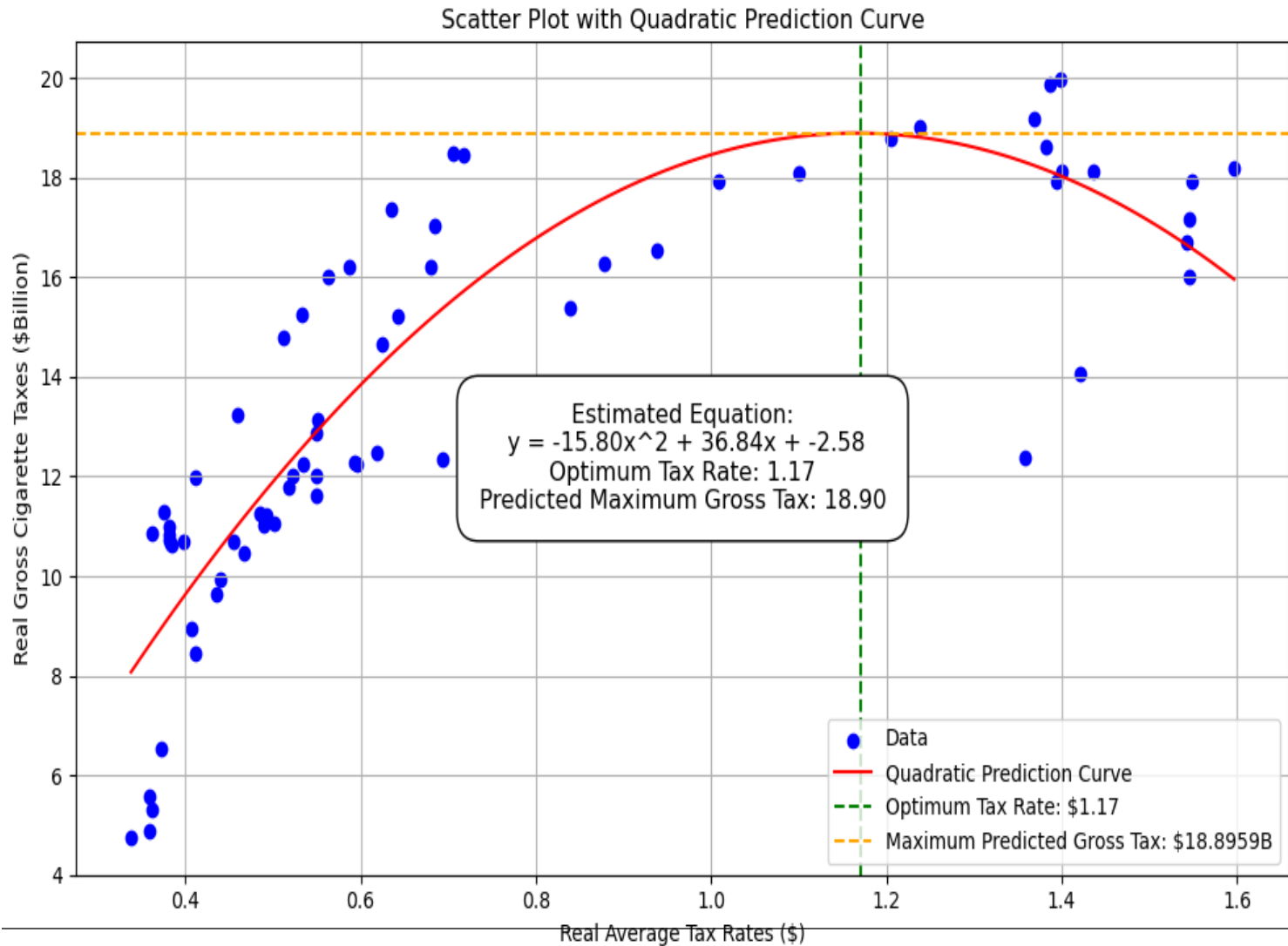
Significance of Comparison

- 1978 marked critical turning point in cigarette consumption.

Trends of Sales Per Capita and Real Retail Price Over Years
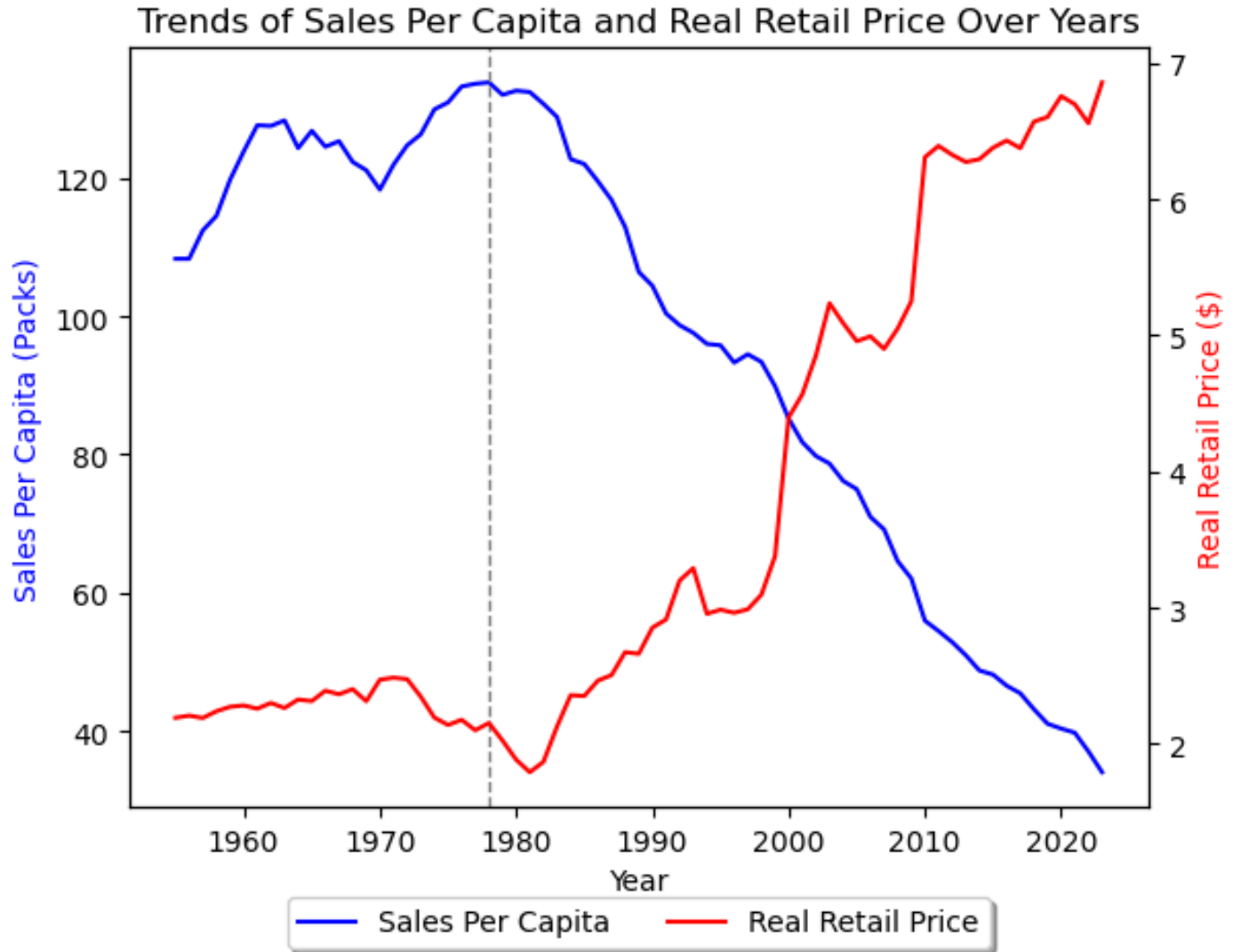
Real Average Tax Rates Trend

- Changes in <mark>real average tax rates</mark> occurred alongside <mark>retail price escalation.</mark>
- 1978: Real average tax rates around $<mark>0.51</mark>.
- 2023: Real average tax rates increased to $<mark>1.36</mark>.
- <mark>275.25</mark>% increase.

Scatter Plot with Quadratic Prediction Curve

Estimated Equation:
y = -15.80x^2 + 36.84x + -2.58
Optimum Tax Rate: 1.17
Predicted Maximum Gross Tax: 18.90

Data
Quadratic Prediction Curve
Optimum Tax Rate: $1.17
Maximum Predicted Gross Tax: $18.8959B

Optimal Tax Rate and Maximum Predicted Gross Tax
- Optimum tax rate: $1.17 (in 2020 current value)
- Maximum predicted gross tax: $18.9 billion

Comparison with 2023 Data
- Real tax rate in 2023: $1.36
- Real gross tax revenue in 2023: $12.38 billion

Differences and Potential Implications
- Difference between optimal and real tax rate in 2023: $0.19
- Difference between maximum predicted and real gross tax in 2023: $6.52 billion

Practical Implications
- Reducing tax rate to $1.17 could potentially increase tax revenue by $6.5 billion.
- Based on Laffer Curve model, optimal tax rate maximizes revenue by balancing tax rates and consumption.

Implications for Policy
- Laffer curve provides insights into effects of tax policy changes on revenue..

Pre-2008 Trend

- Positive correlation between tax rates and tax revenue.
- Increase in tax rates led to increase in gross tax revenue from cigarette sales.

Post-2008 Shift

- Vertical line at 2008 marks shift in correlation.
- Horizontal line at $1.166 indicates pivotal tax rate threshold.
- Higher tax rates beyond threshold led to reduction in gross tax revenue.

Implications

- Increase in tax rates above $1.166 may have negatively impacted cigarette sales.
- Resulted in decline in tax revenue despite higher tax rates.

Yearly Trends of Real Average Tax Rates and Real Gross Cigarette Taxes
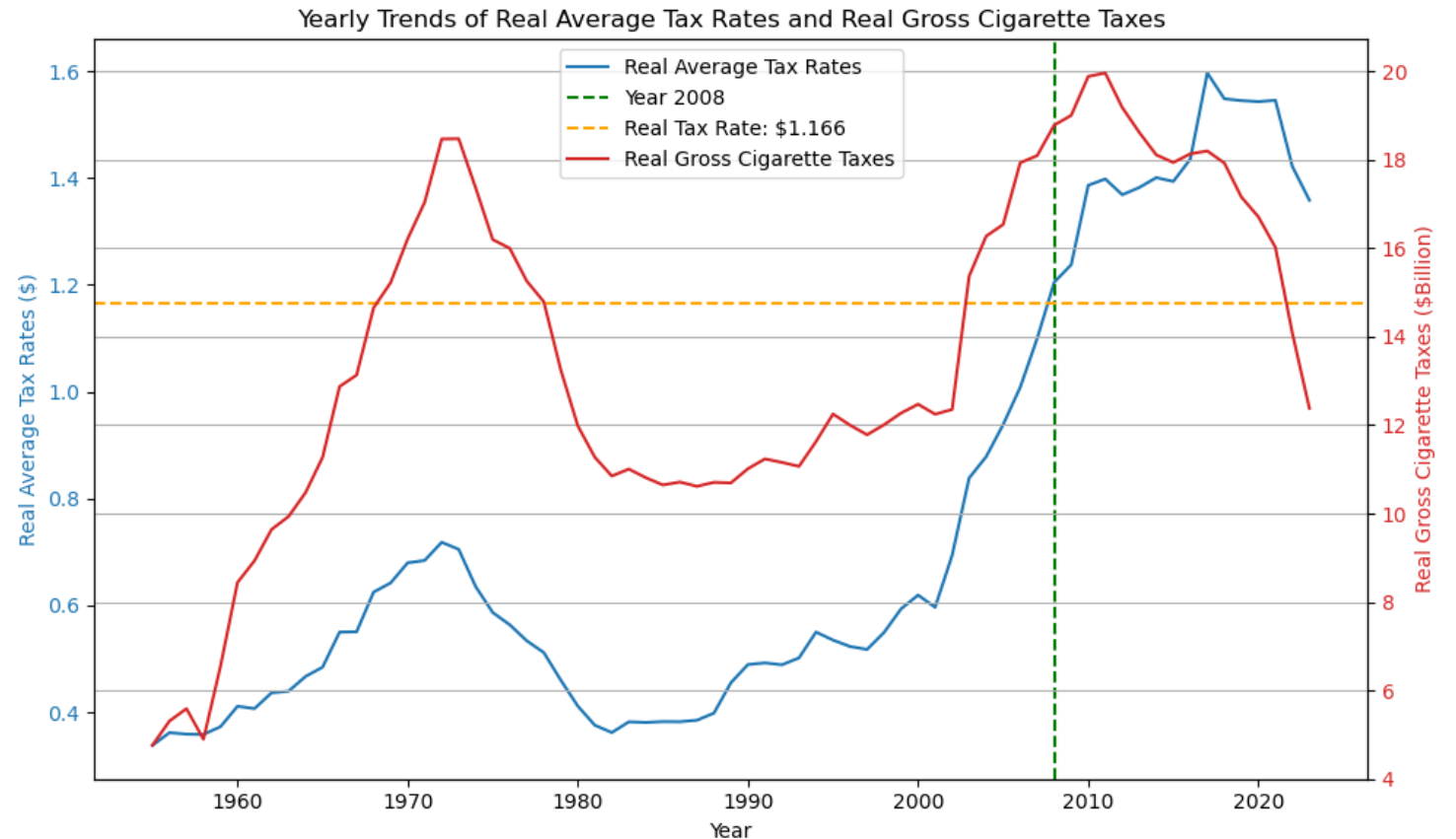
Master Settlement Agreement (MSA)

- Significant legal resolution reached in 1998 between major tobacco companies and attorneys general of 46 U.S. states, D.C., and five territories.
- Aimed to settle lawsuits for healthcare costs associated with smoking-related illnesses.
- Tobacco companies committed to making annual payments to states indefinitely, constituting the Master Settlement Fund.

Utilization of Funds

- Funds designated for smoking prevention programs, healthcare initiatives, and public health endeavors.
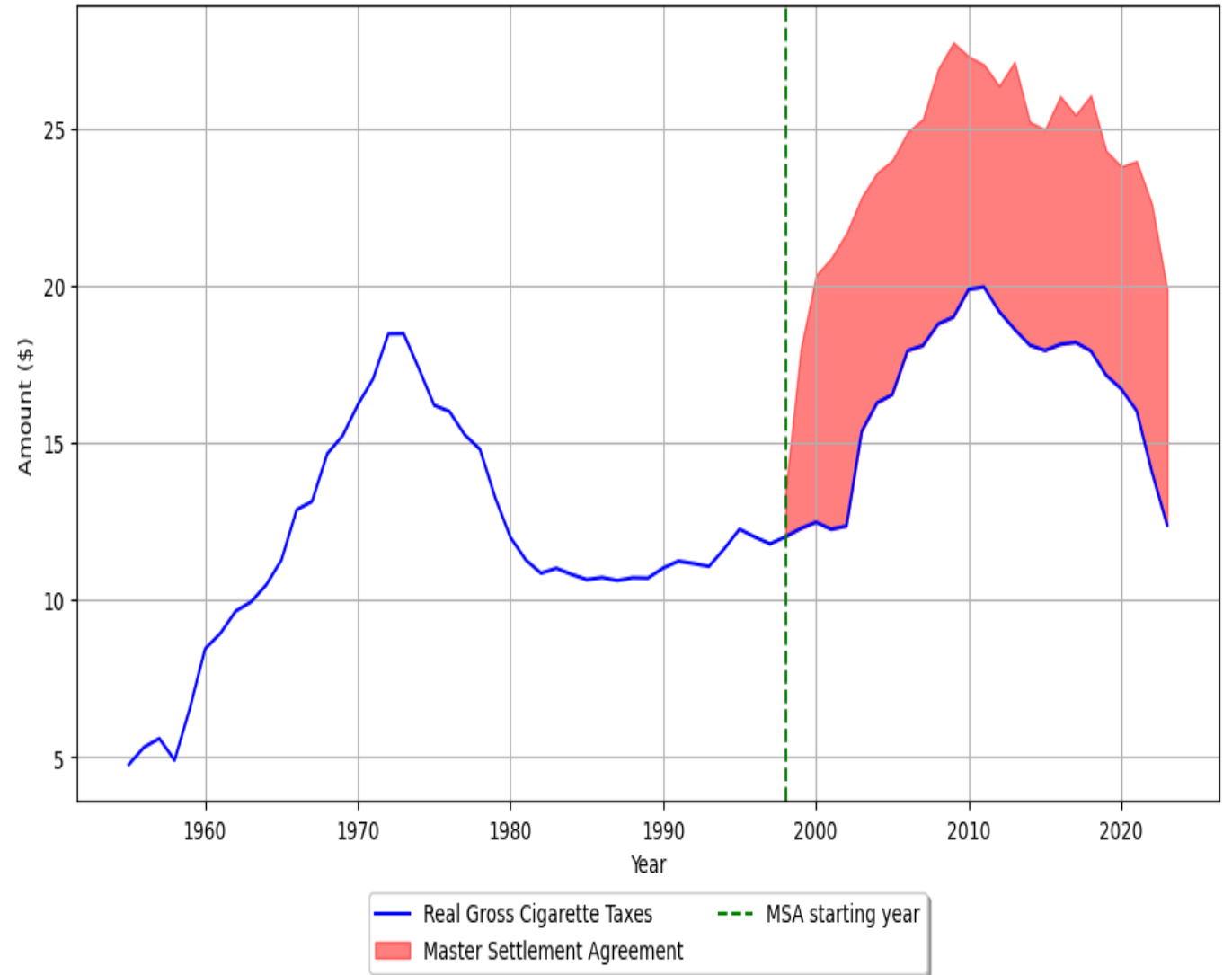- Emerged as critical revenue source for many states.

Trends in Revenue

- Initial rise followed by declining trend after around 2009, indicating decrease in tobacco-related revenue despite presence of MSA fund.

Scale of Revenue

- MSA Fund collected from $1.4B to $9.3B, with average of $7.4B.

Real Gross Cigarette Taxes and Master Settlement Agreement Over Years

Significant Decline: The success of public health initiatives targeting smoking cessation.

Impact on Black/White Males: Peak lung cancer cases in 1984, followed by a substantial decline, highlighting the effectiveness of tobacco control measures.

Lung Cancer Cases by Year and Gender/Ethnicity
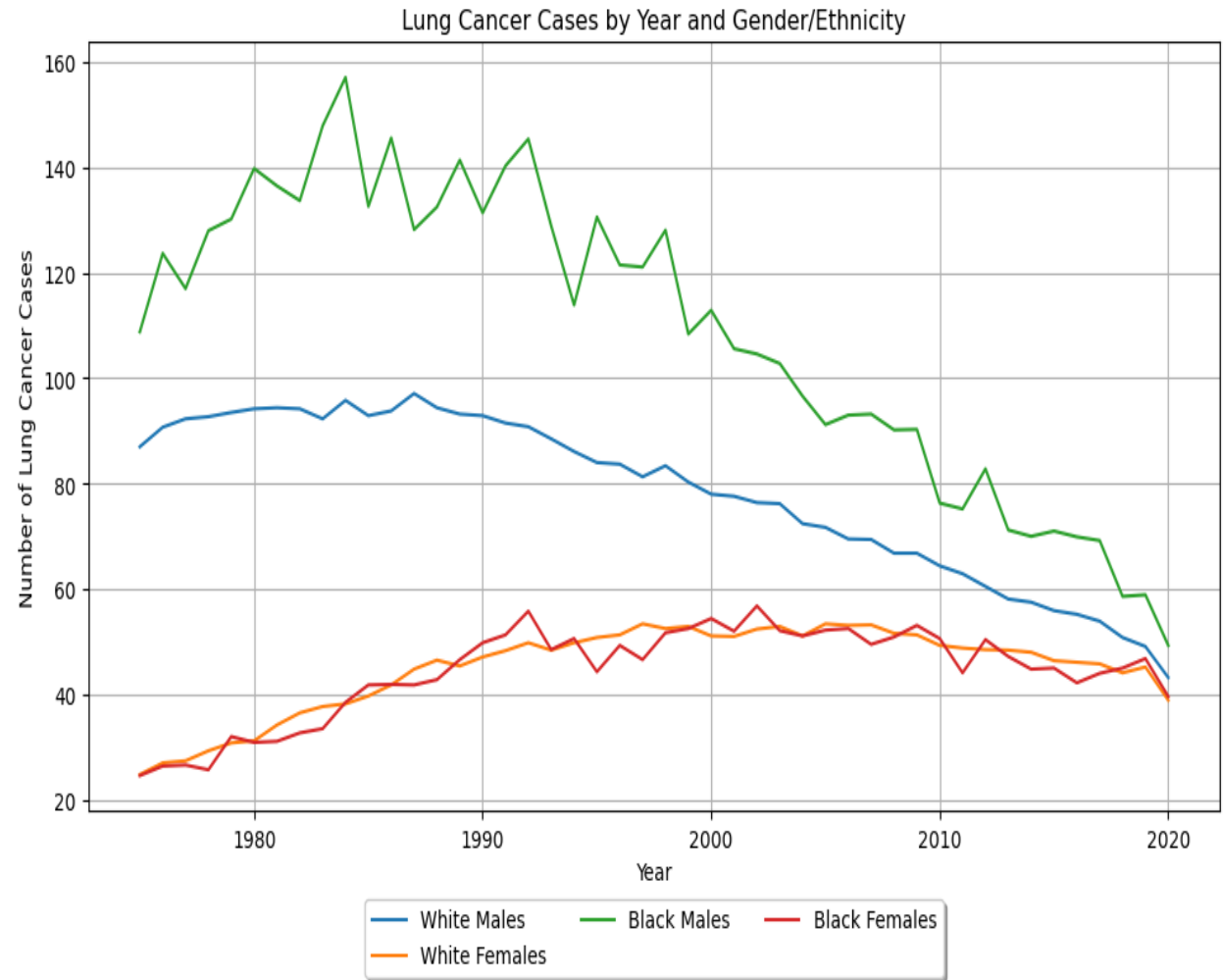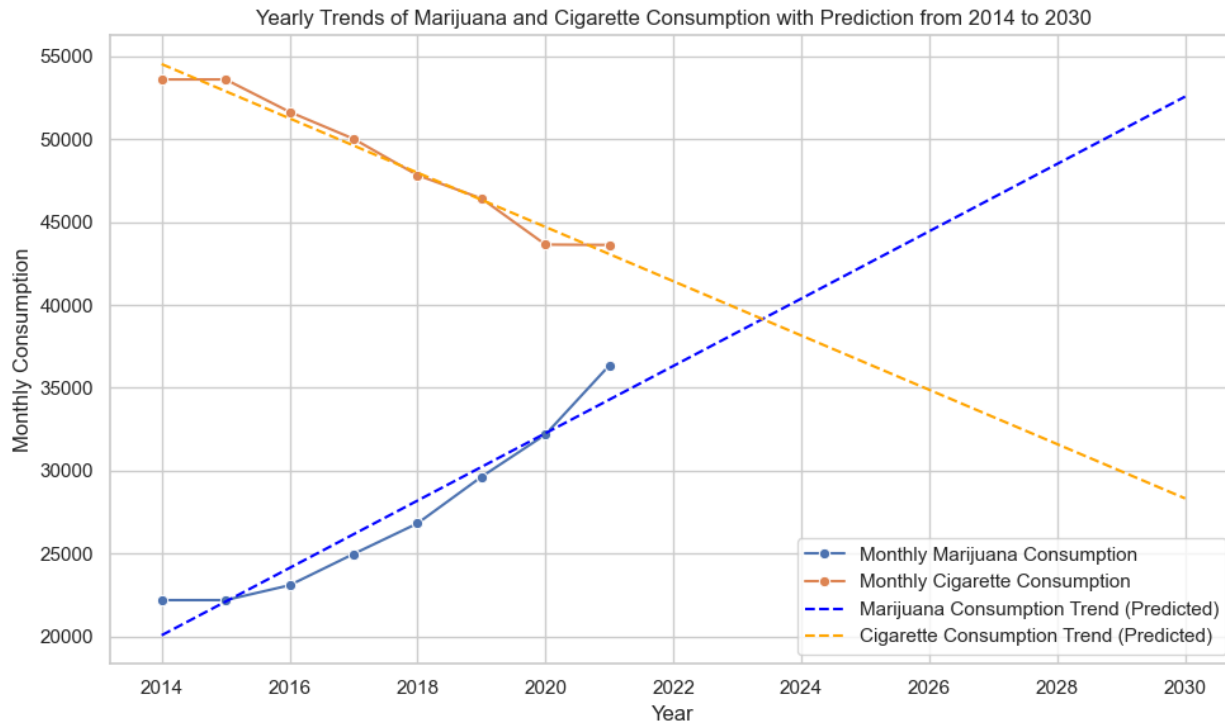
- Key Points:
  - Cigarette smoking: Downward trajectory due to the increasing prices and heightened awareness of health risks
  - Marijuana smoking: Upward trend, indicating changing attitudes and lower perceived risk
  - Shift in smoking preferences: Transition from cigarettes to marijuana observed
- Statistics:
  - 44 million monthly cigarette smokers
  - 36 million monthly marijuana smokers (as of 2021)
- Forecasting:
  - Simple linear regression projects marijuana smoking to exceed cigarettes by 2024.

Yearly Trends of Marijuana and Cigarette Consumption with Prediction from 2014 to 2030

Legend:
- Monthly Marijuana Consumption
- Monthly Cigarette Consumption
- Marijuana Consumption Trend (Predicted)
- Cigarette Consumption Trend (Predicted)

## Substitution Trend between Marijuana and Cigarette Smoking

Shifting preference observed from cigarette to marijuana smoking

Transparent trend evident across states and over years

Flatter slopes indicate gradual but discernible shift

Factors include evolving attitudes, perceived health risks, and regulatory changes

Insights crucial for public health policies and interventions

Time Trend between Marijuana and Cigarette smoking
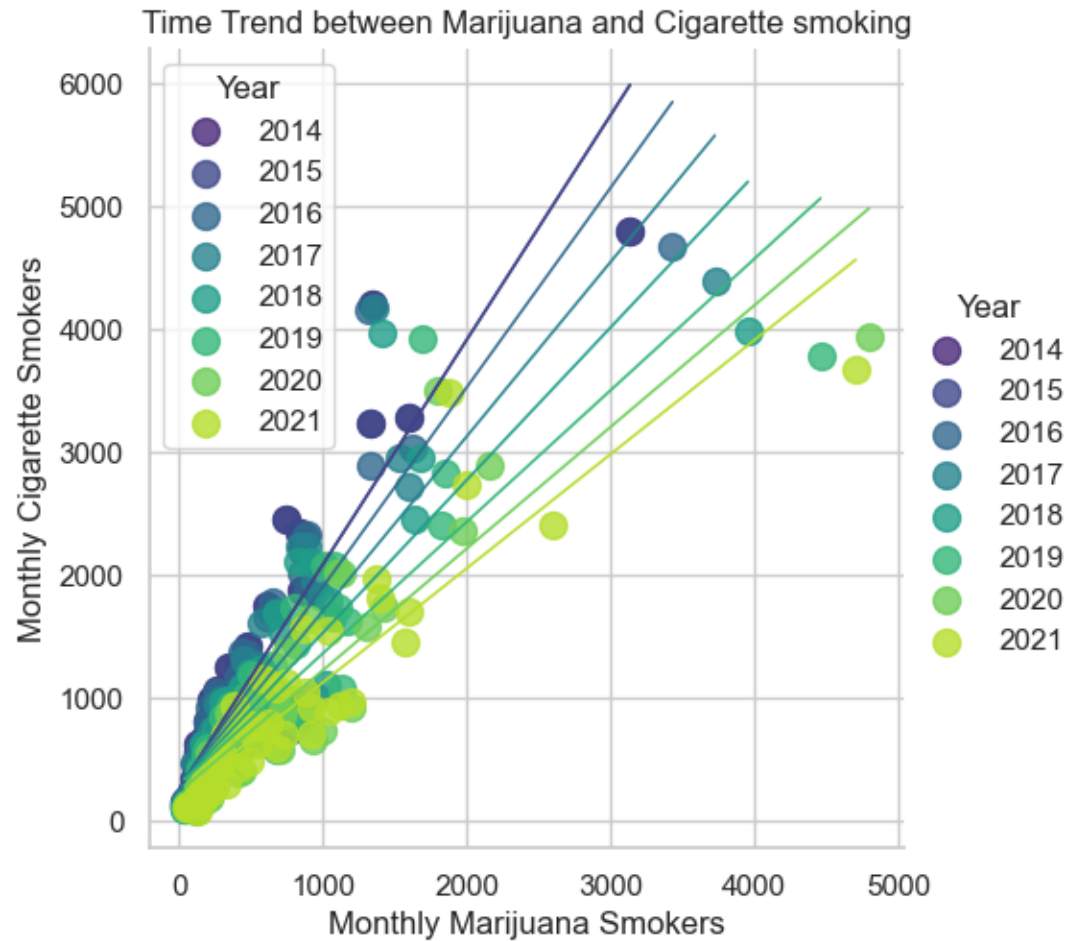
- Changing ==Perceptions of Substance Risks== (2021 Data)

- Heroin: 230 million perceive as ==riskiest==

- ==Cigarettes: 194 million== express concern

- Cocaine: 184 million perceive as risky

- Alcohol: 123 million express concern

- ==Marijuana: 60 million== perceive as risky, ==with decreasing trend==

Substance Risk Perceptions in the USA
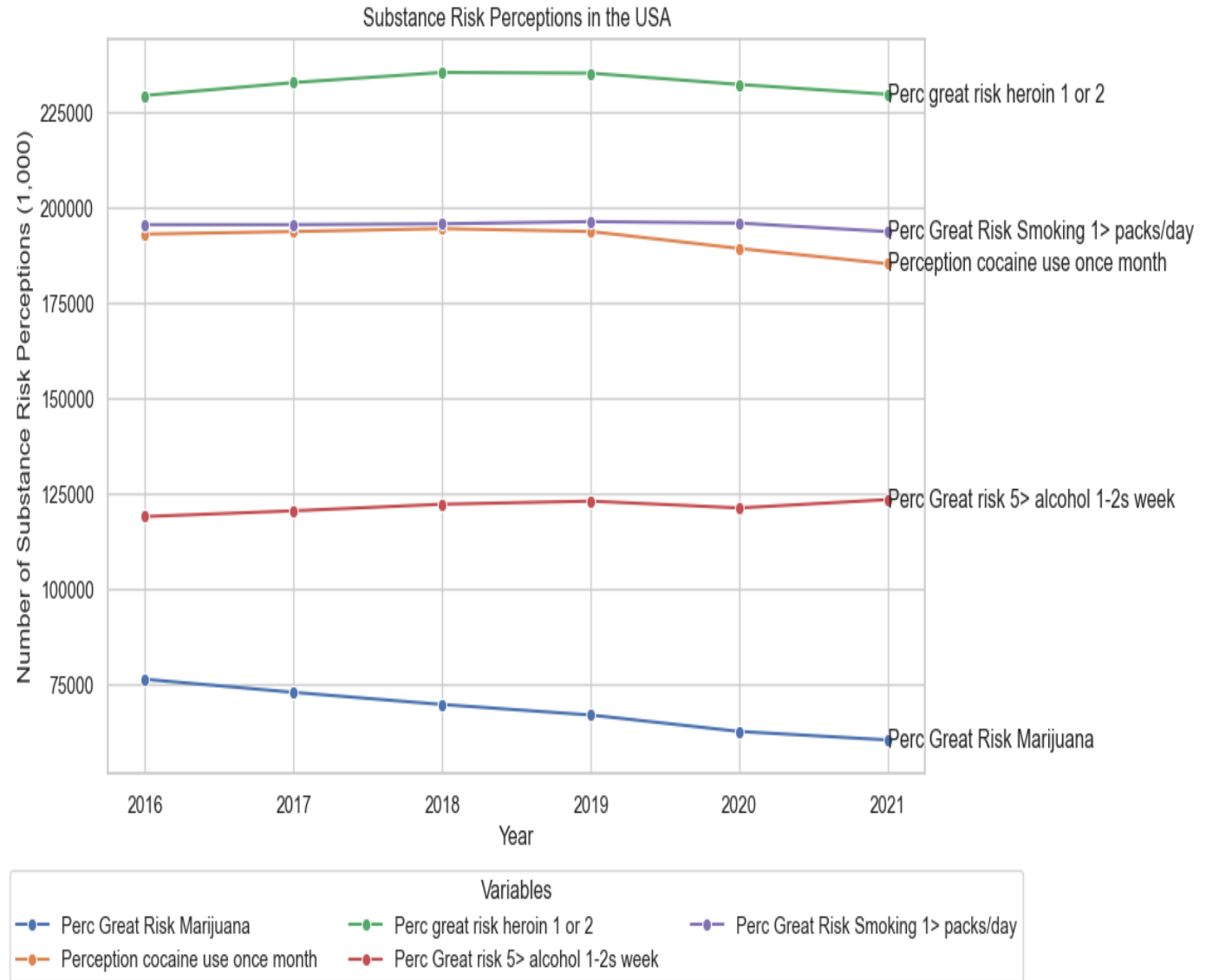
## Marijuana Risk Perception vs. Consumption Trends

==Declining perception of health risks== associated with marijuana smoking

Corresponding increase in marijuana consumption over time and across states

Increasing slopes toward marijuana consumption indicate ==shifting societal attitudes==

Despite diminishing perceived health risks, marijuana use continues to rise

Time Trend between Marijuana Risk Perception and Marijuana smoking
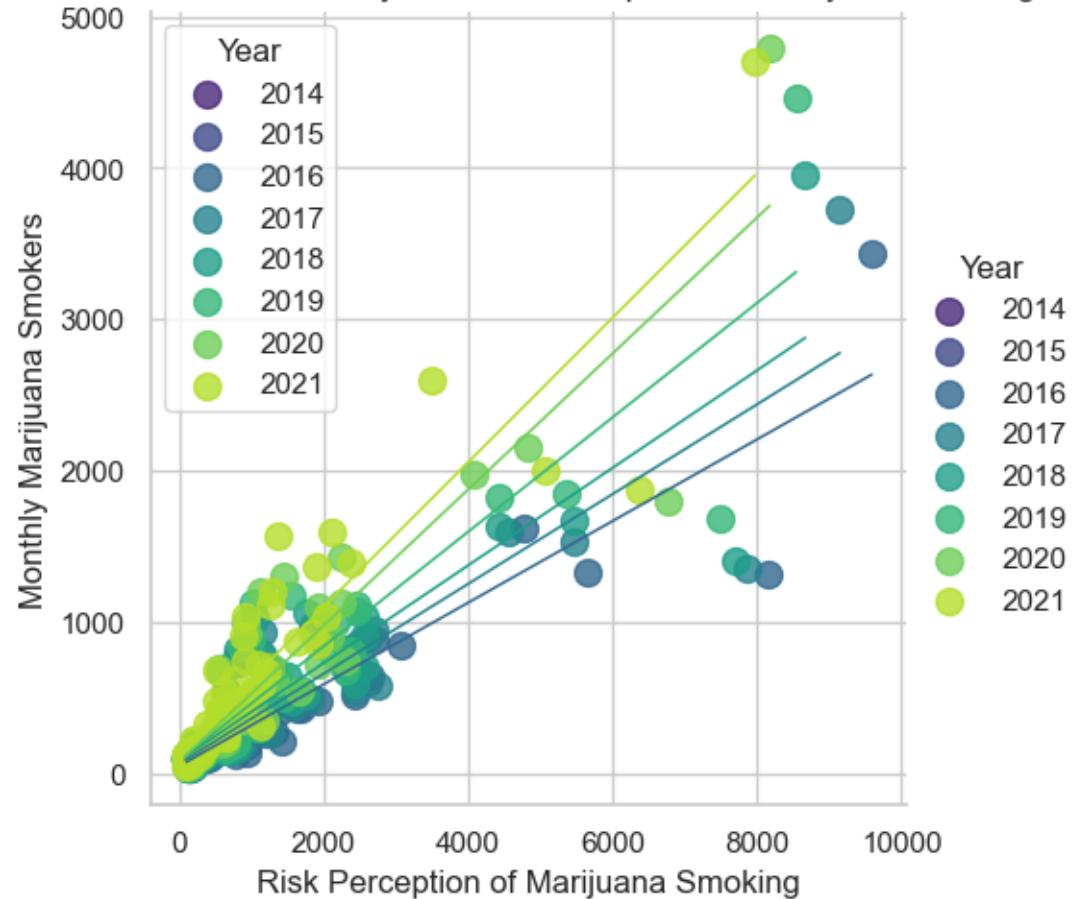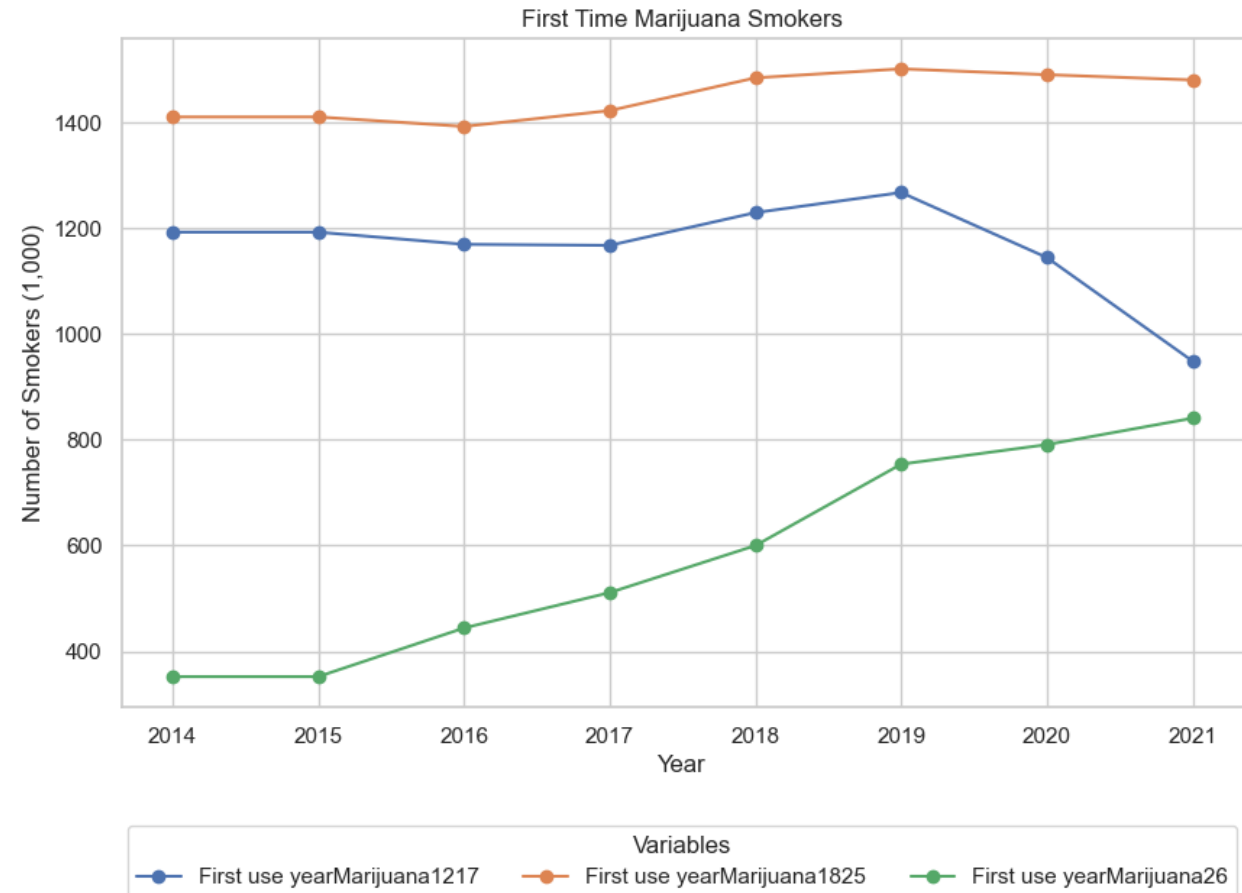
Insights into First-Time Marijuana Smoking

Young Adults (18-25): High initiation rates reflect exploration and experimentation.

Teenagers (12-17): Decline during COVID-19, possibly due to increased parental supervision.

Adults (>26): Fastest growth rates suggest shifting attitudes among older demographics.

First Time Marijuana Smokers

Heatmap Analysis of ==Cigarette Smoking==

Correlation Among Cigarette Smoking, Mental Illness, and Suicide

==Adults (>26): Highest correlation== with depression and suicide

==Teenagers (12-17): Lowest correlation== with mental health issues


Correlation Heatmap
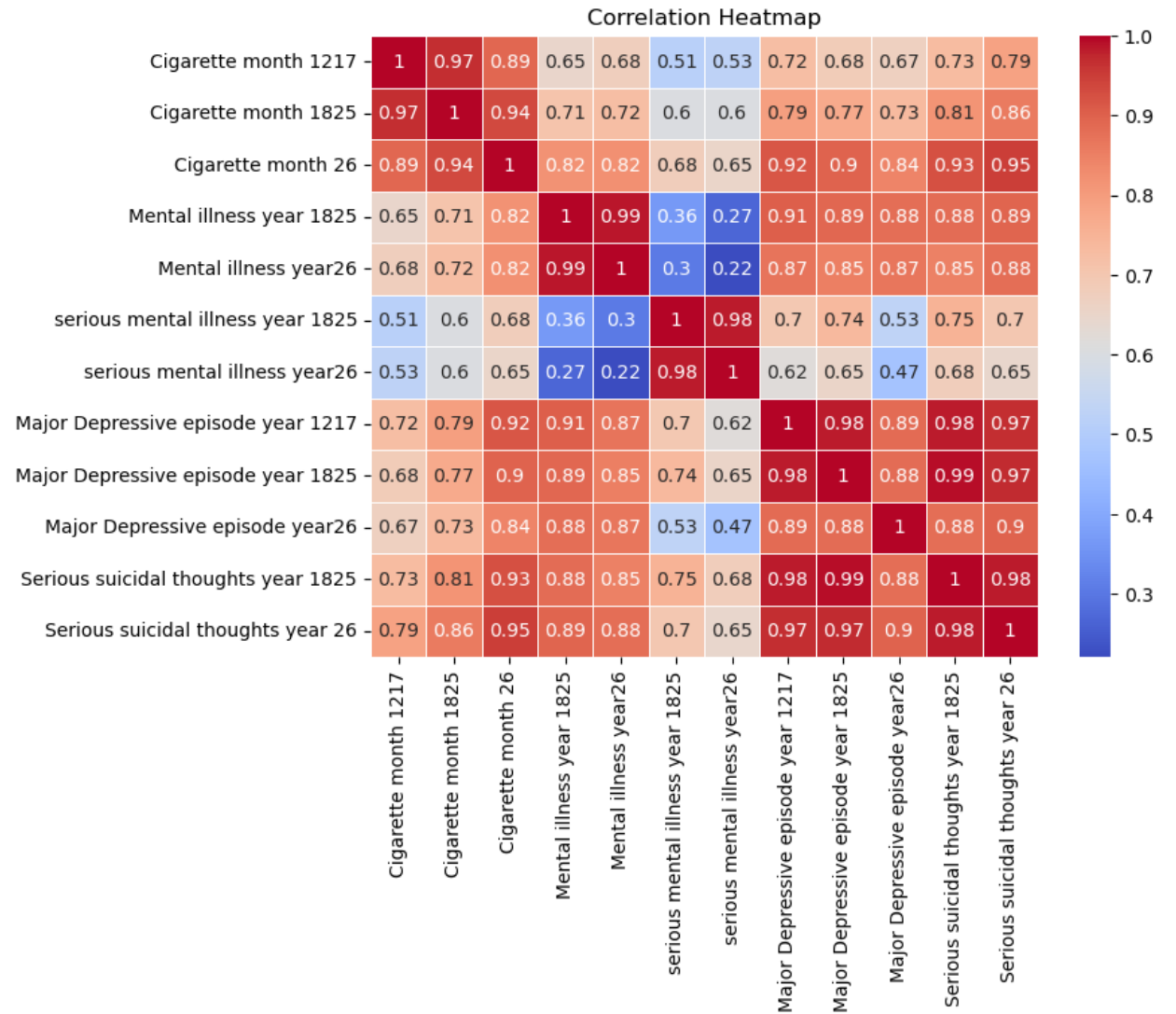
Marijuana Smoking and Mental Illness

Higher correlation with mental illness, depression, and suicide compared to cigarette smoking

Strongest correlation observed in young adults and teenagers

Lowest correlation found in adults

Significant correlation between depression and suicide among young adults and teenagers

Correlation Heatmap of Selected Variables
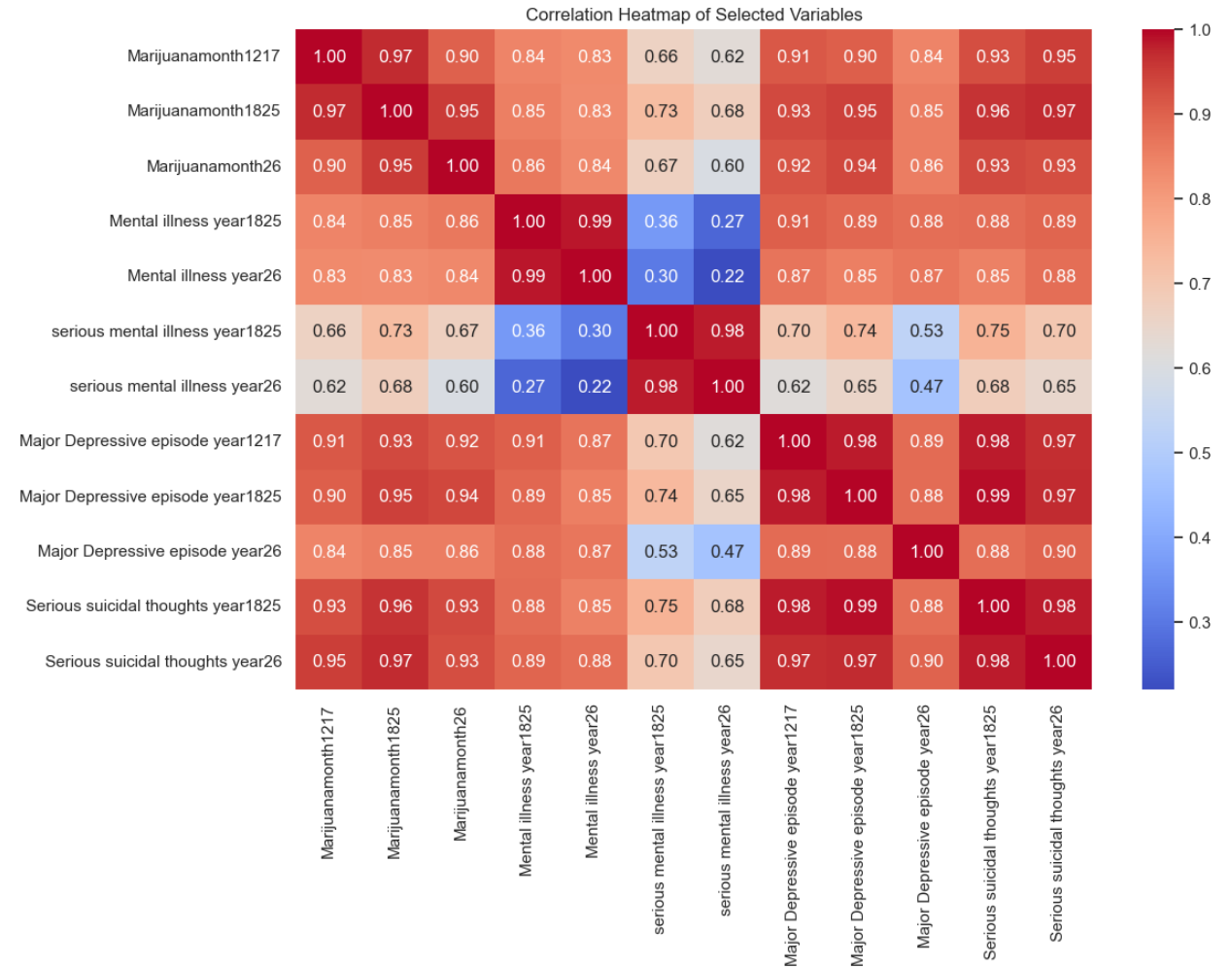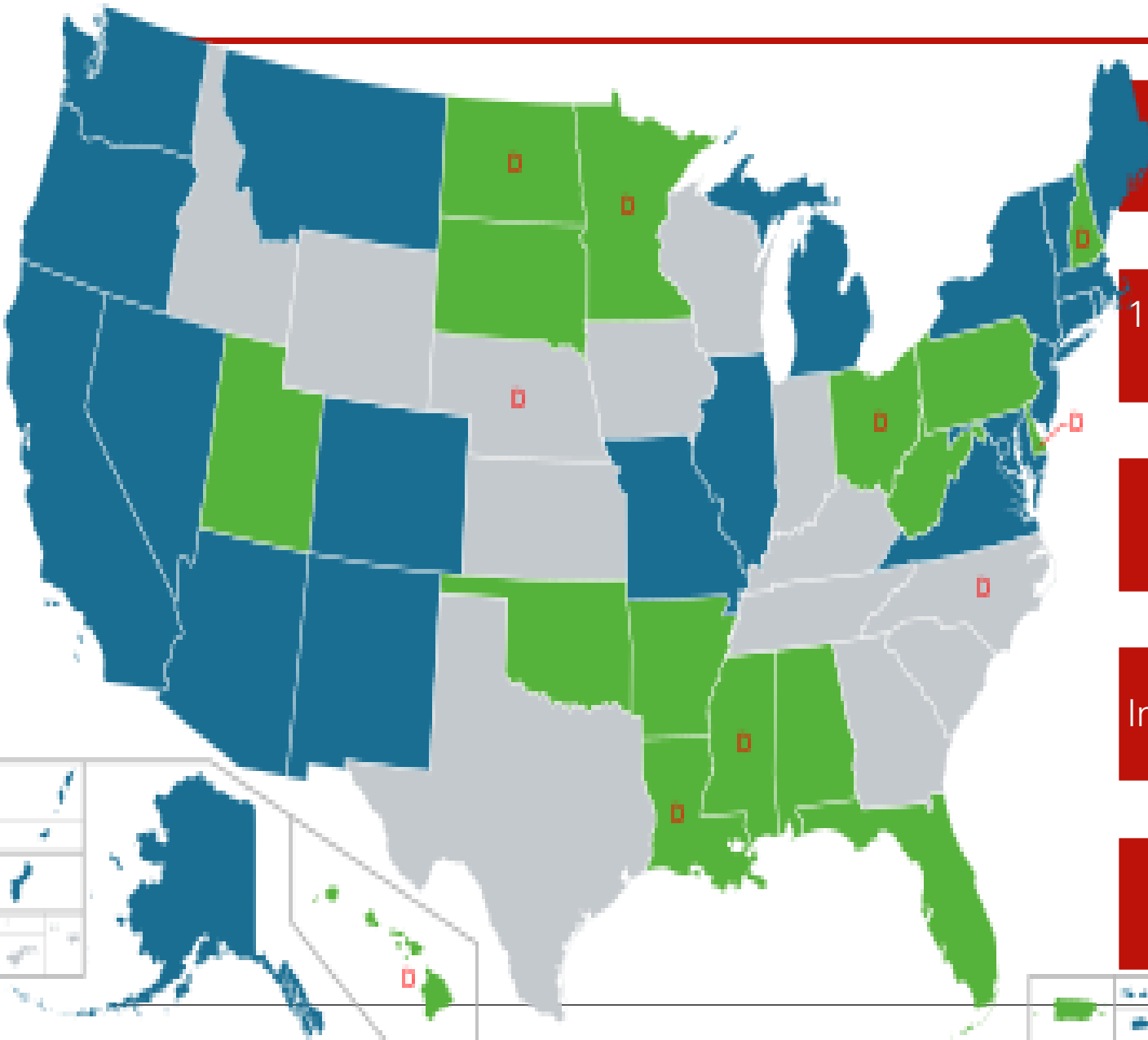
Evolution of Marijuana Legalization in the USA

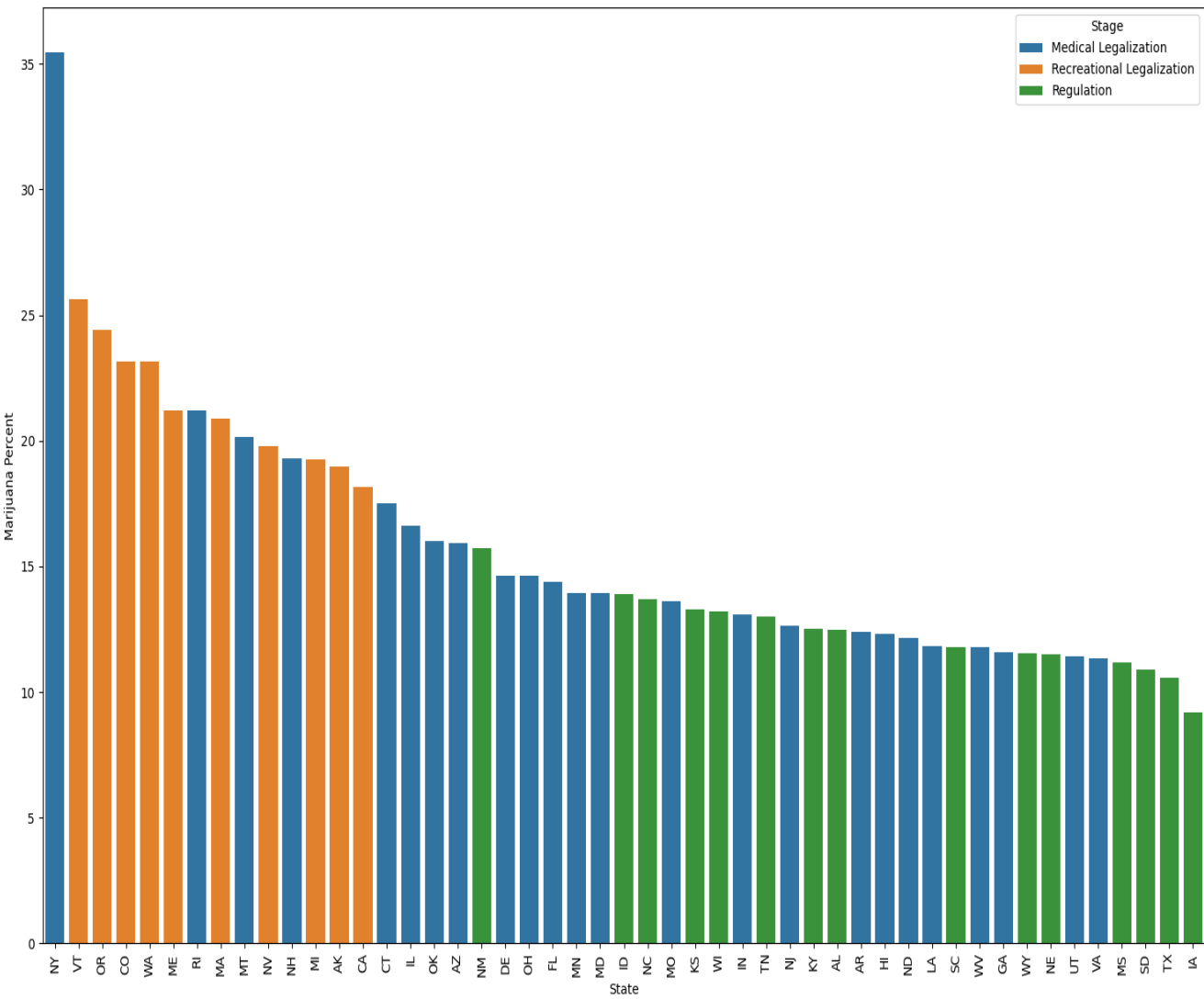1996: California Legalizes Medical Marijuana

Current Status:

21 States + Washington D.C.: Legalized for Adult Recreational Use

37 States + Washington D.C.: Legalized for Medical Use

Global Legal Sales: Increased to $32 Billion in 2022

Continued Growth Expected

Recreational Legalization States: VT, OR, CO, WA, ME, MA, NV, MI, AK, and CA show consistently high consumption rates.

Medical Legalization States: NY stands out with notably high consumption, deviating from other states under medical legalization.

States such as RI, MT, NH, and CT closely align with recreational legalization figures within the medical legalization category.

VA, UT, GA, and WV more closely mirror consumption percentages of regulated states.

Among regulated states, NM, ID, and NC show higher consumption rates around 15%, while IA, TX, SD, and MS reflect lower rates around 10%.

Minimal Difference: Interestingly, there's not much difference in consumption rates between medical and regulated states, despite the legalization type.

Key Findings:

1. **Cigarette Consumption Trends:** Historical analysis reveals a significant decline in cigarette sales and sales per capita, influenced by factors such as real retail price escalation and taxation policies.

2. **Impact of Taxation Policies:** Utilizing the Laffer Curve model, we identified potential revenue optimization opportunities through adjustments in cigarette tax rates.

3. **Master Settlement Agreement (MSA):** Despite initial success, both real gross cigarette taxes and the MSA fund have shown a declining trend post-2009, raising questions about the efficacy of fund utilization.

4. **Cancer Incidence and Mortality:** Insights from cancer rate trends underscore advancements in detection and treatment, while highlighting persistent challenges in combating the disease.

5. **Shift in Substance Preferences:** A shift in smoking preferences from cigarettes to marijuana is observed, with implications for public health interventions and regulatory frameworks.

6. **Association with Mental Health:** Correlation analysis reveals varying degrees of association between substance use, particularly cigarette and marijuana smoking, and mental health issues across different age groups.

Thank you.

Q&A