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Savvi Financial
Final Project

Group Members:

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MISM 6214 Fall 2024
December 4, 2024

Introduction

Enhance personalized financial planning by tackling rising healthcare costs and unpredictable service usage patterns

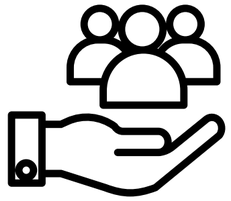
Utilize demographic and historical data to forecast healthcare needs and inform targeted financial solutions, addressing disparities and enhancing preparedness

Examine MEPS dataset (2022), longitudinal data (2018–2021) to identify key predictors, including demographics, socioeconomic, and behavioral factors.

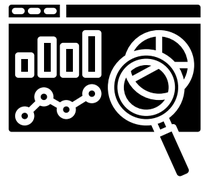
Outcomes-Benefits

Accurate Insights: Predictive models provide precise forecasts of client healthcare needs.

Competitive Leadership: Advanced analytics establish Savvi as an innovator in financial planning.

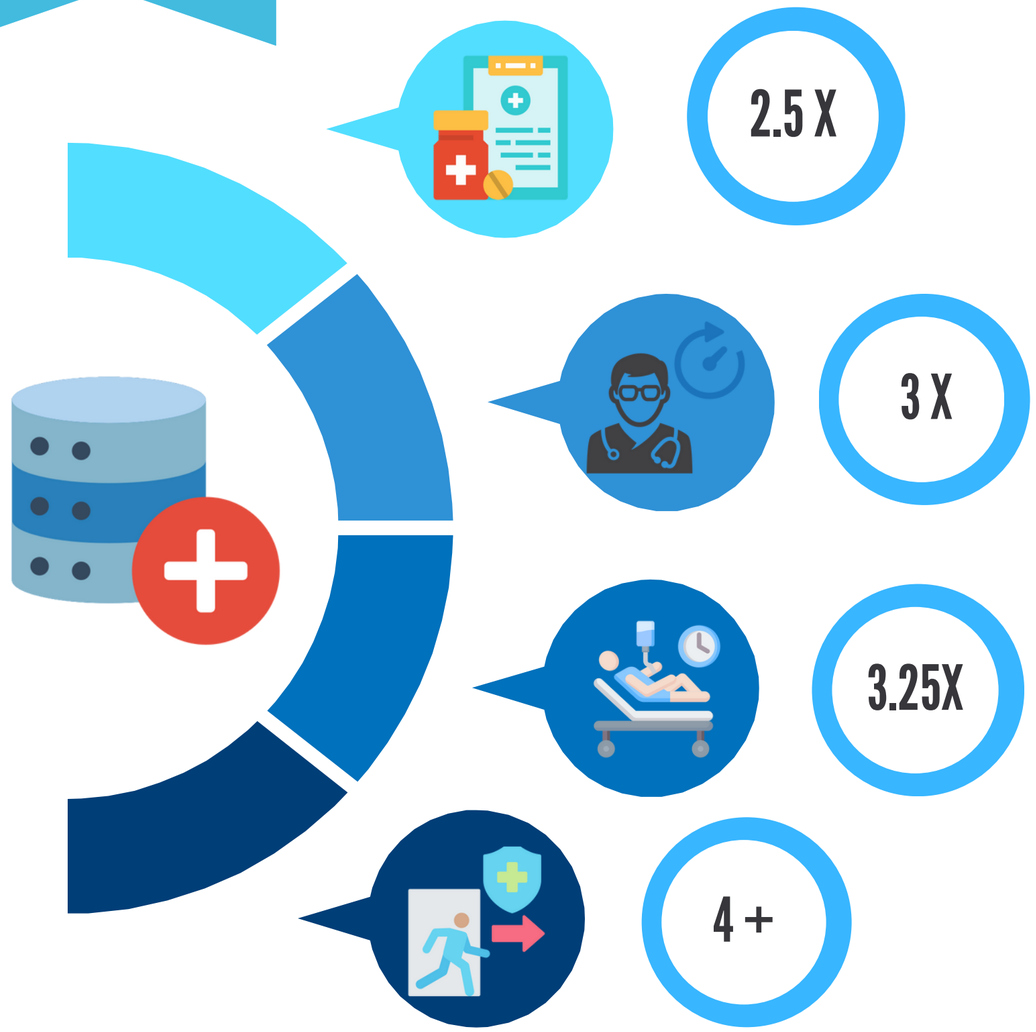


Stronger Client Relationships: Personalized solutions build trust and long-term loyalty.



Market Growth: Identifying underserved groups opens new revenue opportunities.

Insights



Prescription Usage

On Average , Widowed Individuals used prescription drugs 2.5 times more than average individuals

Emergency Room Visits

Low income groups utilized emergency services 3 times more than High income individuals.

Inpatient Discharges

Higher discharges for low-income groups vs. high-income groups, indicating preventative care disparities.

Outpatient Visits

People Aged 65+ had 4 more Outpatient visits than the average person

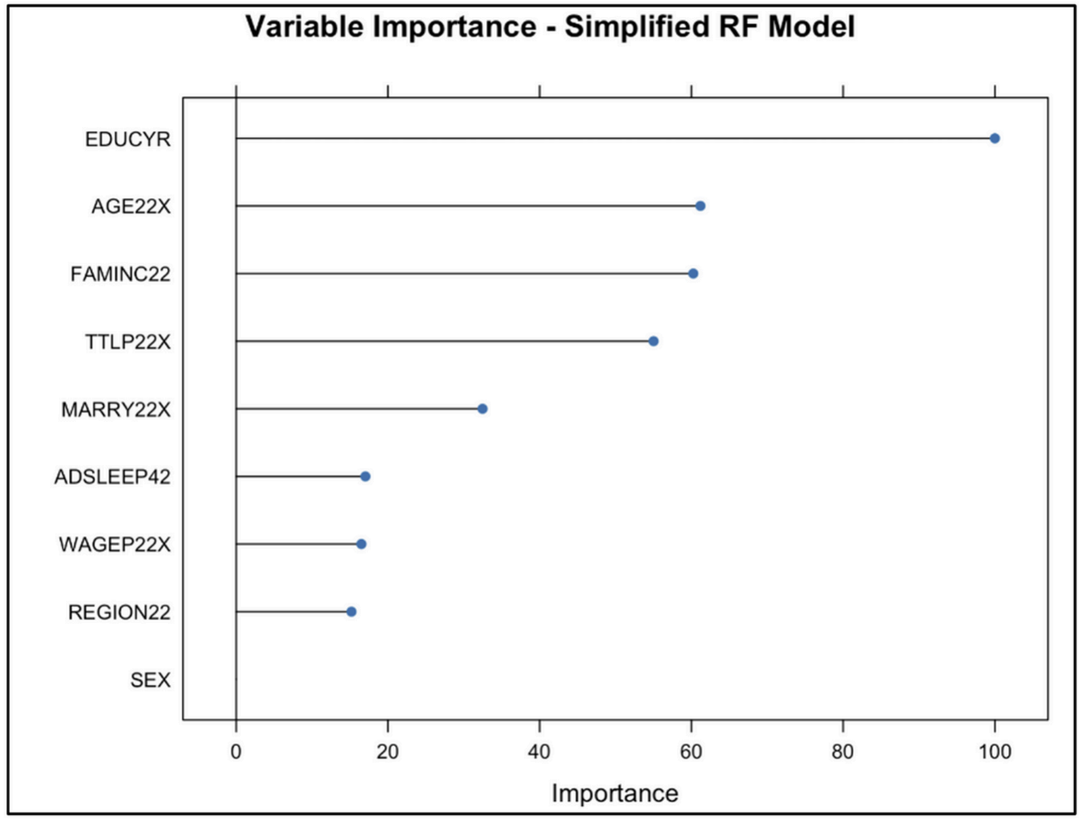
Insights

Socioeconomic Disparities:

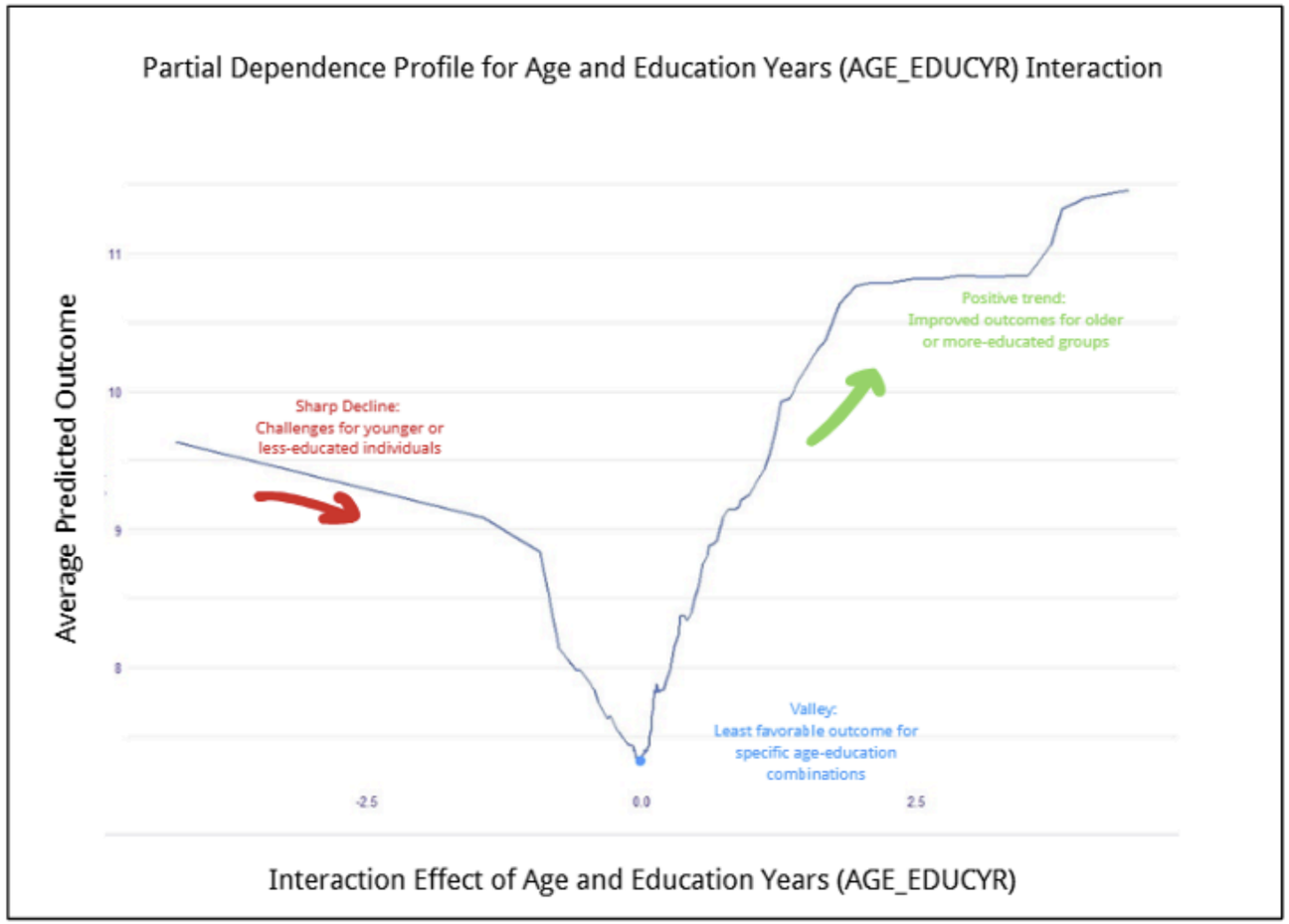
- Income and education significantly influenced healthcare utilization.

Age-Driven Healthcare Engagement:

- Older adults (65+) have the highest service utilization.

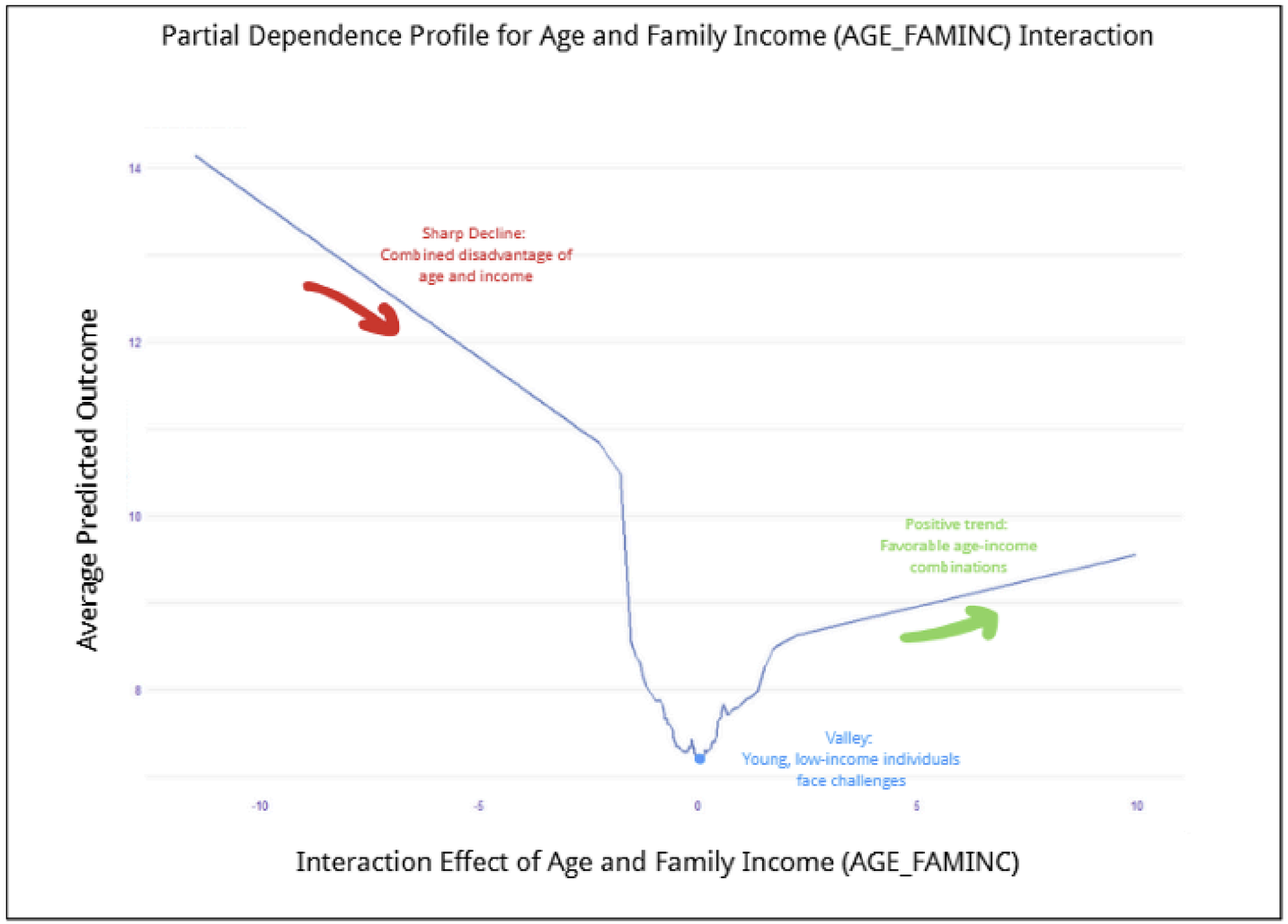


Insights



- This pdp helps reveal the combined influence of age and education on the outcome.
- Disadvantages for younger, less-educated individuals and improvements for older, educated groups.

Insights

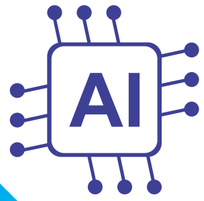


- This pdp helps reveal the combined influence of age and family income on the outcome.
- Young, low-income groups face steep challenges, while outcomes improve with age and income.

Recommendations

Develop targeted financial products for seniors and low-income families

Promote wellness programs to reduce dependency on costly hearthcare services



Use AI-powered tools for personalized solutions

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Actions
Data Preparation

Data Cleaning

Handling Missing Data

Reserved Code Handling

Imputation (MICE)

Scaling & Standardization

Standardization for Continuous Variables.

One hot encoding for Categorical Variables.

Z-Scaling

SMOTE for handling Class Imbalances

Survey Weighted Analysis

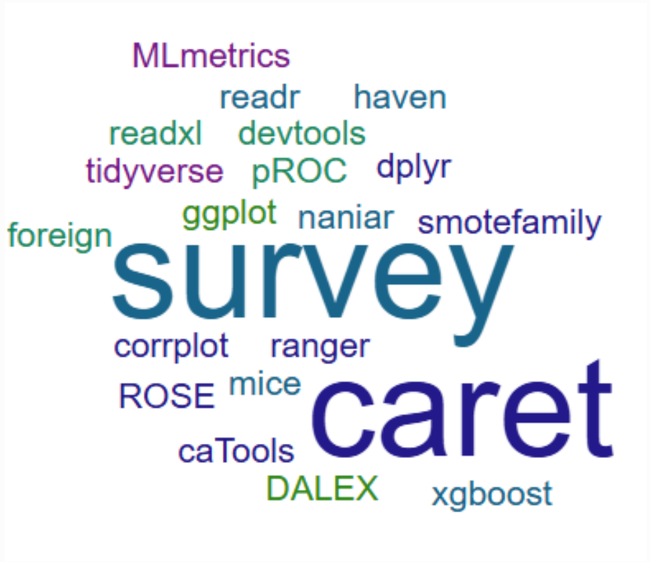
Feature Engineering

Bucketing of key demographic variables
(Age Groups, Income levels)

Adding Interaction Variables
(AGE * EDUCATION)
(AGE * FAMILY INCOME)

Actions

Modeling Process



Data Prep

SMOTE

Exploratory Data Analysis

Survey Weighted Summary Statistics

Correlation

Feature Engineering

Variable Importance

Modeling

Survey weighted Random Forest

Model Evaluation

R Squared

F1 Scores

ROC and AUC

Future Actions

Target Identification

Utilize income, ethnicity, and regional data to pinpoint vulnerable demographics

Pilot Initiatives

Test interventions in high-need regions with elevated ER usage, measure impact, and refine strategies for nationwide scaling

Community Engagement

Deliver culturally relevant and impactful program rollouts tailored to community needs

Digital Rollout

Invest in scalable tools that merge health and financial insights for hyper-personalized user experiences

Evaluate and Adjust

Continuously assess programs using customer feedback and analytics, refining offerings to optimize effectiveness and ROI

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Key Challenges & Takeaways

01. Data Preparation

- Challenge: Large complex data, class imbalances.
- Solution: Imputation, SMOTE for balancing.

02. Model Development

- Challenge: Overfitting, feature complexity.
- Solution: Random Forest, feature selection, cross-validation.

03. Insights & Predictors

- Key Predictors: Income, age, education.
- Behavioral factors reduced costly services.

04.Business Implications

- Targeted solutions for underserved groups.
- Focused financial products for low-income households.

05. Future Improvements

- Enhance model generalizability.
- Address unmeasured external factors.

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Reflections on Technical and Analytical Lessons

Technical Reflections

Data Challenges

Handling imbalanced and incomplete data using SMOTE and imputation

Feature Engineering Value

Interaction variables and scaling improved predictive utility.

Model Selection Challenges

Balancing Random Forest accuracy with interpretability.

Computational Optimization

Efficient coding handled scale and redundancy challenges.

Survey Weighting

Applying survey weights improved generalizability.

Analytical Reflections

Key Role of Predictors

Socioeconomic factors (income, education) are key drivers.

Behavioral Metrics

Metrics like mental health reduce reliance on costly services.

Generalizability Challenges

Real-world disparities highlight the need for further validation.

Patterns in Disparities

Systemic healthcare inequities were uncovered through analysis.

Impact of Feature Engineering

Advanced features added depth and value to the models.

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