



Adult Protective Services Technical Assistance Resource Center

enhancing
effectiveness of
APS programs

Using AI to Predict Adult Maltreatment

November 18th, 2020

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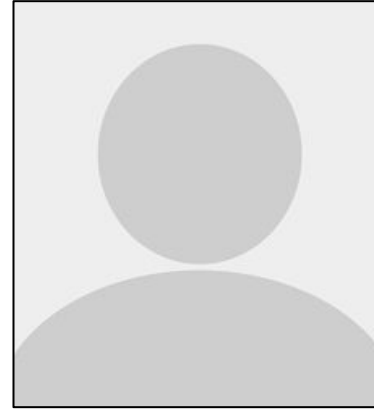


Our Speakers



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Disclaimer

The National Adult Maltreatment Reporting System (NAMRS) and the Adult Protective Services Technical Assistance Resource Center (APS TARC) are a project of the U.S. Administration for Community Living, Administration on Aging, Department of Health and Human Services, administered by the WRMA, Inc.

Contractor's findings, conclusions, and points of view do not necessarily represent U.S. Administration for Community Living, Administration on Aging, Department of Health and Human Services official policy.

About the APS TARC

The mission of the APS TARC is to enhance the effectiveness of state APS programs by:

- Supporting federal, state, and local partners' use of data and analytics,
- Applying research and evaluation to practice, and
- Encouraging the use of innovative practices and strategies.

Agenda

- ACL's Vision
- Define predictive analytics and describe use cases
- Discuss possible applications for APS
- Describe research on risk and protective factors
- Explain processes to identify and assess data sources
- Predictive Modeling
- Findings
- Implications

ACL's Vision for Elder Justice

A comprehensive, multidisciplinary system
that effectively supports
older adults and adults with disabilities
so they can exercise their right
to live where they choose,
with the people they choose, and
fully participate in their communities
without threat of
abuse, neglect, or financial exploitation.



ACL Projects to Enhance APS Programs

- APS Technical Assistance Resource Center (APS TARC)
- National Adult Maltreatment Reporting System (NAMRS)
- Grants to Enhance State APS Systems
- National Voluntary Consensus Guidelines for APS Systems
- Adult Maltreatment Screening and Assessment Tools Inventory
- Measuring and Improving APS Performance:
 - APS Process Outcomes Study
 - APS Client Outcomes Study
 - Predictive Analytics [this workshop]

Predicting Risk of Adult Maltreatment

- Background and Purpose
 - The Administration of Community Living (ACL) and Centers for Medicare and Medicaid Services (CMS) are interested in leveraging predictive analytic technologies and approaches to assist in the **prevention of abuse, neglect, and exploitation (ANE)** of older individuals and people with disabilities.
 - The purpose of this study is to assess opportunities for using predictive analytics to identify individuals who are at increased risk for abuse, neglect, and exploitation.

Poll

- To what degree have you considered using data driven approaches to make decisions? (For example, using data driven approaches to inform resource allocation, planning..)
 - Never considered
 - Somewhat considered
 - Considered but have not implemented
 - We already use data driven approaches
- What is your role in the field of adult maltreatment?
 - APS worker
 - APS supervisor
 - APS administrator
 - Health care professional
 - Justice professional (such as law enforcement, prosecutor)
 - Researcher
 - Other

Definition of Terms

- **Predictive Analytics:** the branch of advanced analytics used to make predictions about unknown future events. Predictive analytics uses many techniques from data mining, statistics, modeling, machine learning, and artificial intelligence to analyze current data to make predictions about the future.
- **Artificial Intelligence:** the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience.
- **Machine Learning (ML):** discipline concerned with the implementation of computer software that can learn autonomously.

Examples of Predictive Analytics In Practice

Predictive Analytics in Child Welfare

- Common use cases:
 - to assist with decision making,
 - to reduce risk of reoccurrence,
 - to predict severe harm,
 - to identify locations with increased risk.
- Transparency in algorithm design is paramount to ensuring a sense of trust between the child welfare agency and the members of the public that they are serving.

Predictive Analytics in Healthcare

- Common use cases:
 - reduce readmission,
 - rare disease identification,
 - to improve resource allocation,
 - to predict medically underserved areas.
- While there are some post implementation issues to consider, the successful use of predictive analytics integrates multiple sources of data to improve quality of care and reduction of healthcare costs.

Predictive Analytics in Criminology

- “Predictive Policing”
- Common use cases:
 - to tie perpetrators to multiple crimes they’ve committed,
 - to predict likely victims,
 - to improve resource allocation,
 - to assign police to high-crime areas when crime is likely to happen.
- Challenges:
 - More policing leads to more recorded crime
 - Accused of racial bias & racial profiling, especially when applied to individuals instead of locations

Predictive Analytics in Adult Maltreatment

- No study has employed a machine learning approach to predict adult maltreatment.
- No study has employed a geospatial approach to predict adult maltreatment.
- However, recently...
 - Tony Rosen and colleagues (2019): Can artificial intelligence help identify elder abuse and neglect?
 - Jason Burnett and colleagues (2020): Socioecological indicators of senior financial exploitation: an application of data science to 8,800 substantiated mistreatment cases.

Possible Applications for APS

- How do you think APS could use predictive analytics?

Possible Applications for APS

- Our thoughts:
 - State- or county-level service planning
 - Targeted funding & hiring
 - Generate new questions about what leads to ANE
 - Guides new factors for preventive services to target
 - Suggests what groups of people might benefit most from prevention

Technical Expert Panel (TEP)

- The role of the TEP is to provide guidance and validation to the project.
- Participants included:
 - Federal Stakeholders
 - Federal Data Experts
 - State and local APS program administrators
 - Academics
 - Data scientists
 - Non-profit organizations

Research Question

What community (county) level characteristics predict adult maltreatment, neglect, and exploitation (ANE), and lead to Adult Protective Service system engagement and involvement?

Risk Factors

- 50+ different risk factors
- Inconsistency in the literature regarding terms
 - “abuse”, “maltreatment”, “mistreatment”
- Studies either focused on “maltreatment” in general (e.g. unspecified) or specific types of maltreatment
- There is some overlap and clear distinctions with regards to risk factors for different types of maltreatment
- There are several domains of risk

Most Frequently Cited Risk Factors

- Individual
 - **Low income**
 - **Social isolation**
 - Depression
 - Poor health
 - Need assistance with Activities of Daily Living (ADLs)
 - Marital status (separated or divorced)
 - Female
- Community context
 - Abuse Culture
 - Rural geography
- Caregiver
 - Caregiver Stress
 - Caregiver substance abuse
 - Caregiver mental illness (unspecified)
 - Depression
 - Anxiety
- Perpetrator
 - Dependency
 - Mental illness (unspecified)
 - Substance abuse

Protective Factors

- 15 potential protective factors
- There are no proven, 100% effective protective factors identified in the literature.
- Not necessarily characteristics associated with the individual or community, but societal interventions.
- Most frequently cited protective factors:
 - Social Support
 - Caregiver Interventions
 - Education about available services

Data



Data Sets

- Identified data sources including information on abuse, neglect, and exploitation as well as sources with risk factor information
- Developed a data set inventory
- Prioritizing data based on the following criteria:
 - County level data
 - Publicly available data
 - Population wide or surveillance
 - Data collected during a time period comparable to the time period of NAMRS

NAMRS

- **Key Data Source:** NAMRS (National Adult Maltreatment Reporting System)
- APS data from each state – some with more complete entries than others
- Restricted to states that submit *case component* data (33 states in FFY 2019)
 - Data on each report that is screened in and investigated by the agency
 - Information is specific to the investigation, including the clients, maltreatment, and perpetrators associated with the specific investigation.

Additional Data Sources

- American Community Survey (ACS)
- Area Health Resource Files (AHRF)
- County Health Rankings (CHR)
- Consumer Complaint Databases (CCD)
- IRS 990
- USDA Food Environment Atlas (USDA)

Development of the Algorithm

What do we want to predict or estimate?

Development Considerations

- Quality of data used to produce predictions
- Transparency of personnel who design the algorithm and who are responsible for using it
- Implicit or systemic bias in the data will be reflected in the predictions of the model

Implementation Considerations

- Accuracy of the results
- Training of staff who oversee using the predictive analytics algorithms
- Accounting for implicit or systemic bias in the data that may be reflected in the predictions of the model

Partners & Approach

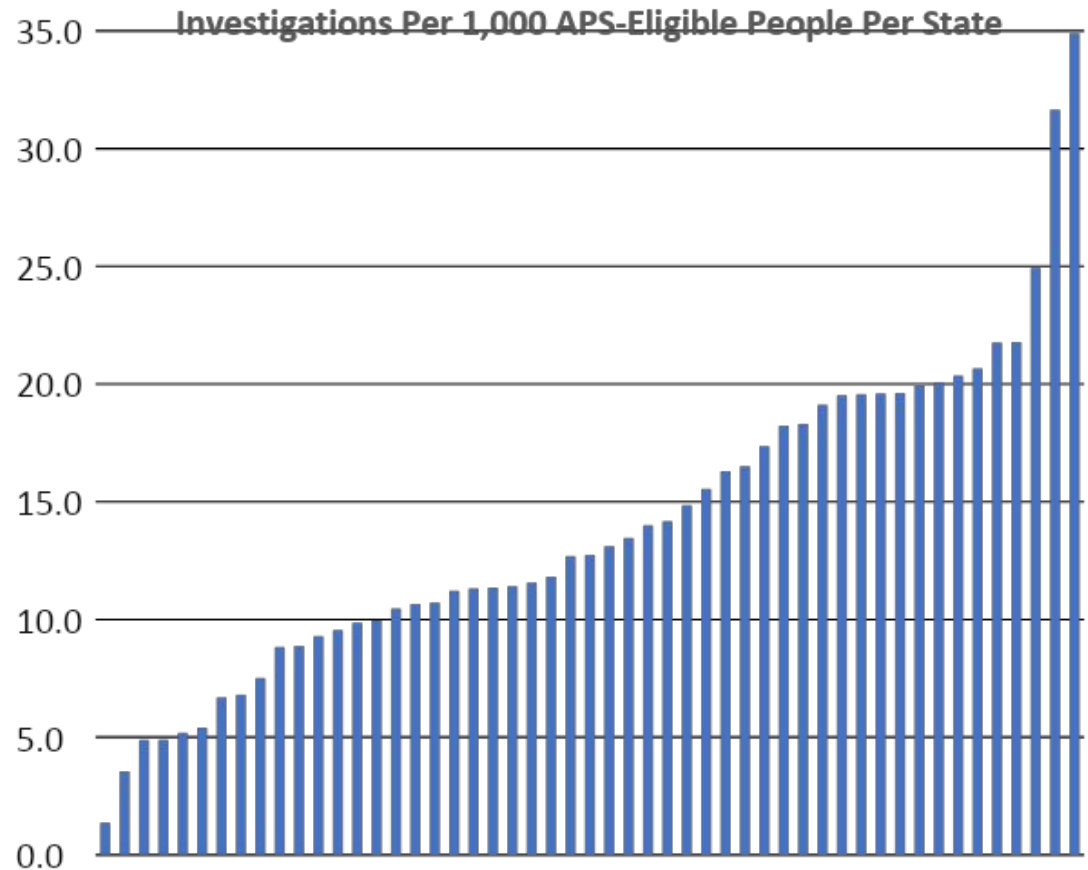
- BCT Partners
 - History of integrating social science with data science
 - Prioritize social justice and equity in their models
- Not just a black box
 - Common approach: maximize accuracy but can't tell you why
 - BCT's approach: target high accuracy, but explain the variables and factors that are most important
- Other firms as peer reviewers:
 - Microsoft

What Level Do We Look At?

- Individuals?
 - *Yes, but not yet*
- Geographic areas?
 - State?
 - *Not granular enough; not enough states for meaningful models*
 - County?
 - *Feasible and interesting*
 - Census tract?
 - *Not available in NAMRS*

What Metric Do We Predict?

- Rate of APS engagement (“Per Capita ANE”)
 - Varies considerably between jurisdictions
 - Challenging to predict actual rate
 - May vary considerably based on local policies, procedures, & practices
- More straightforward to predict change over time
 - “Growth Rate in ANE”
 - Average annual growth from 2016 to 2018



Source: NAMRS Agency Component and US Census

Approach to Estimating Growth

Rate in 2016

Rate in 2018?

Rate in 2018?

Explained by:

- NAMRS
- Community Datasets

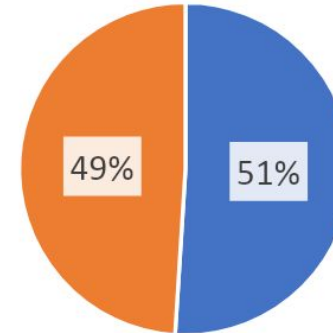
Findings

Model Findings

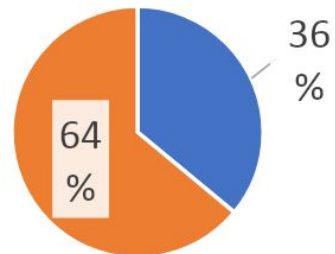
1. All Types of ANE



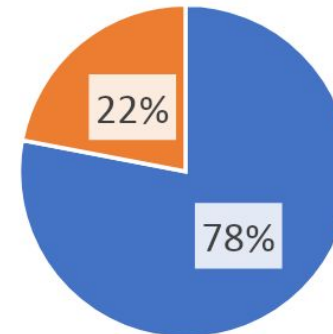
2. Self-neglect, only



3. Young w/disability

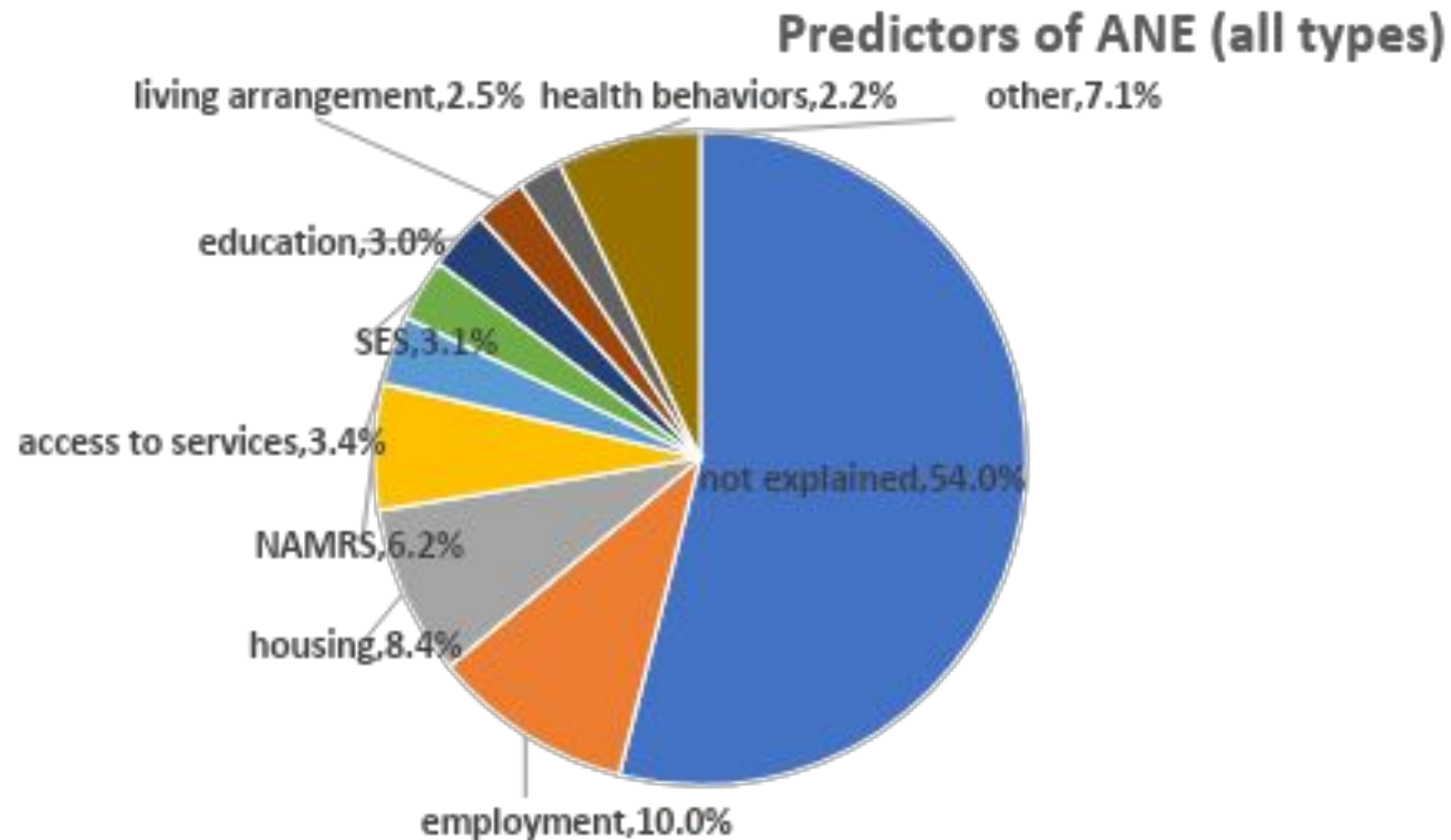


4. Older adults

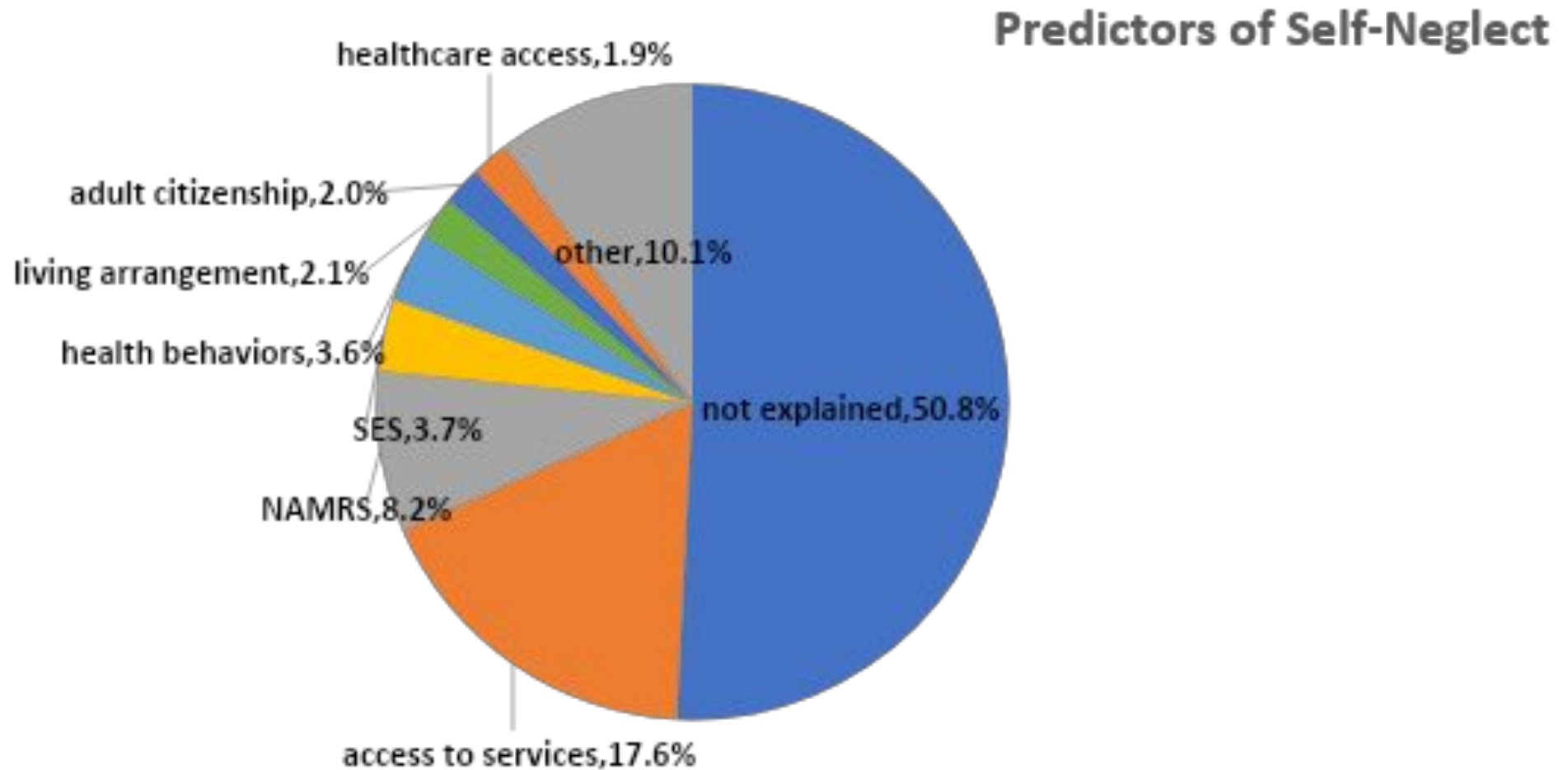


ained

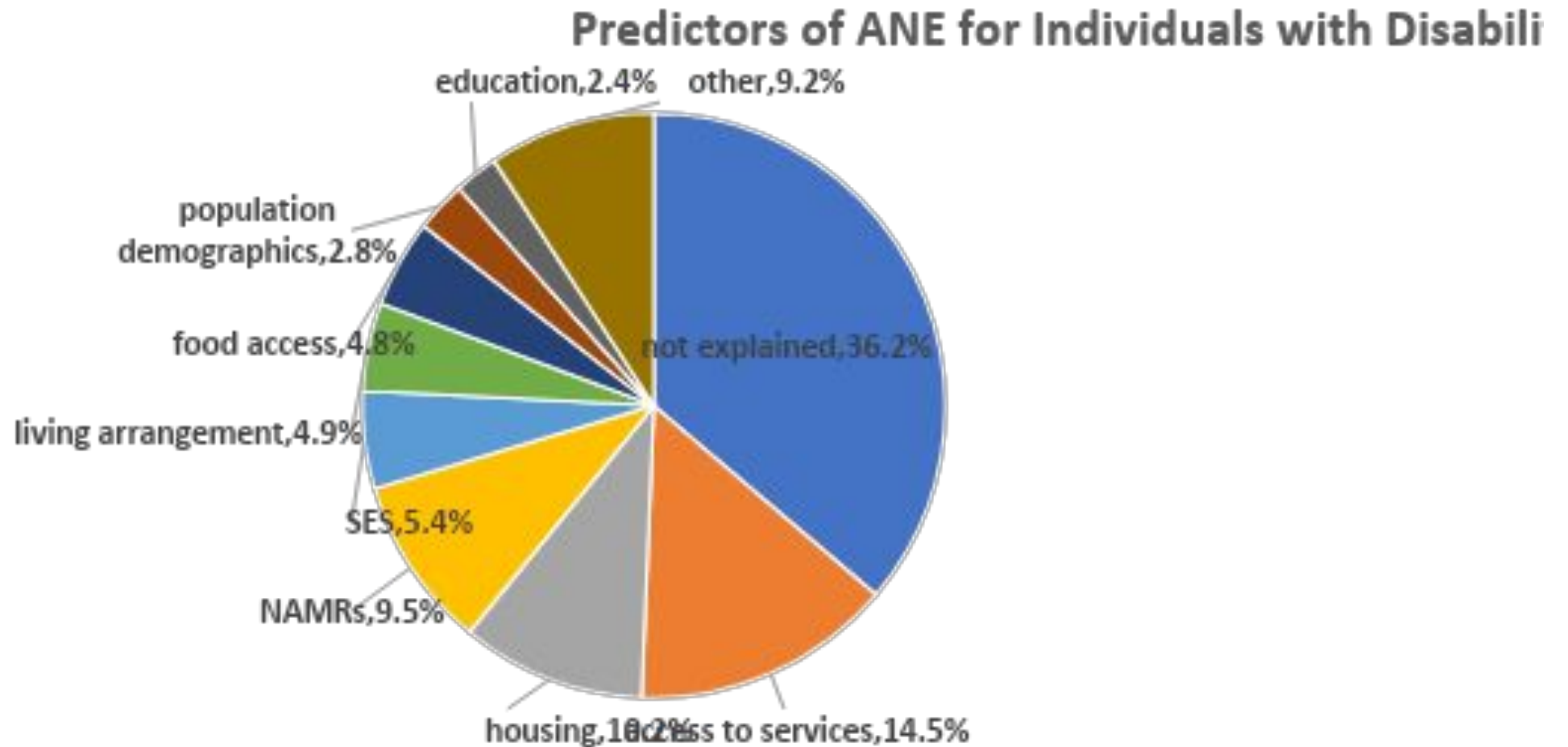
Model Target: Any type of ANE



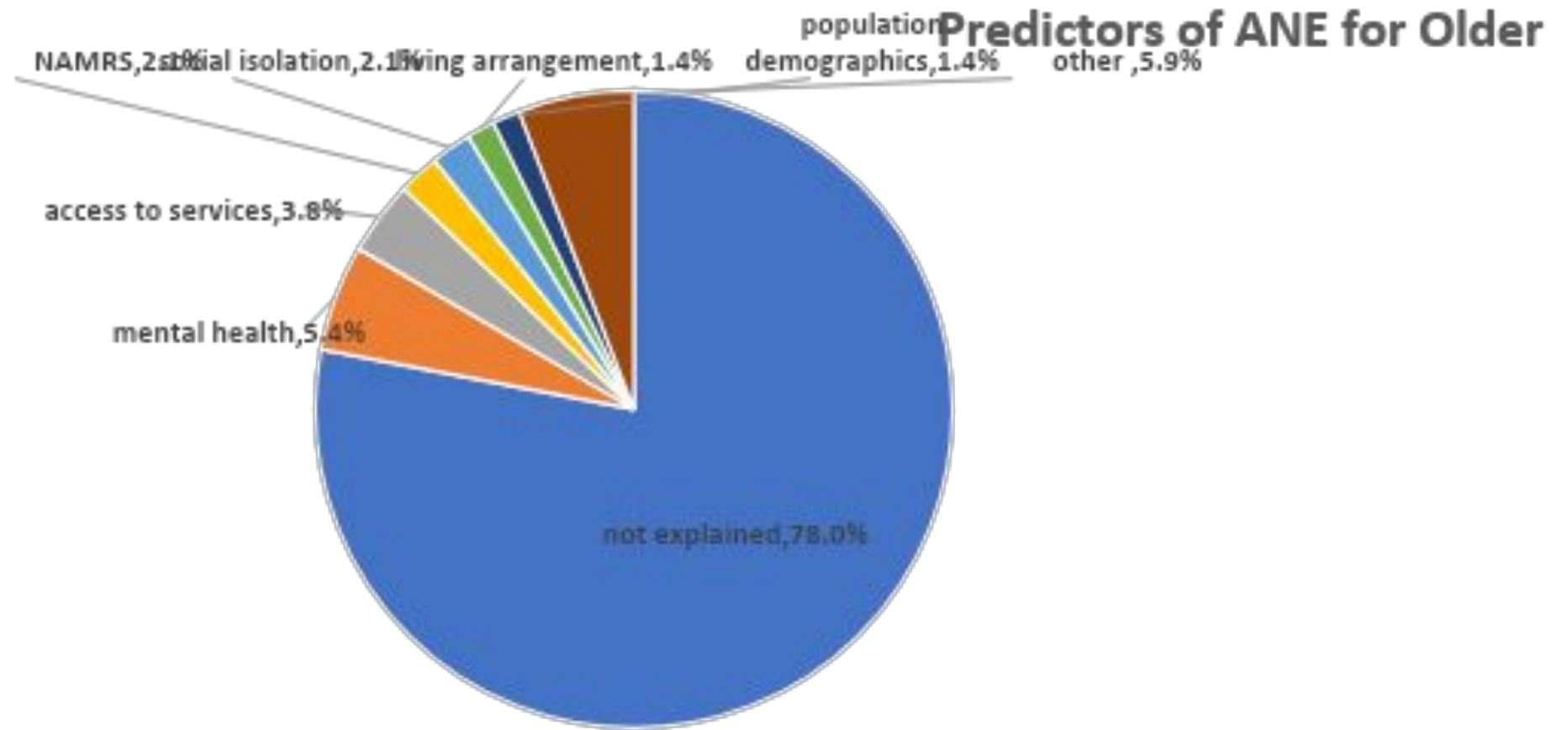
Model Target: Self-Neglect Only



Model Target: Adults with Disabilities



Model Target: Older Adults (only)



Key Findings

- These analyses aimed to elucidate what community factors predict ANE – specifically the annual rate of growth in ANE.
 - As expected, the features (or independent variables) “weigh” in differently depending on the target:
 - ❖ All types of ANE ← Employment, housing and health
 - ❖ Self-neglect ← Accessible community services
 - ❖ Adult w/disability ← Housing and income
 - ❖ Older Adults ← Mental health and social isolation

**How well do the predictors
for the various models
align with what you do in
practice?**

Practitioner Implications

◆ Develop more precise, targeted prevention and intervention strategies

- For example, ACS and IRS data are available at the Census Tract, so it is possible to create current/up-to-date maps of hotspot communities. Additional datasets can help do the same thing at the County level. These insights could be used for more precise local capacity building, partnering with community-based organizations, targeted resource allocation, etc.

◆ Implement real-time monitoring and evaluation

- For example, use NAMRS data to longitudinally track efforts in specific communities, as well as view longitudinal changes in ANE rates

Researcher Implications

◆ Conduct rapid studies

- For example, using the prepared analytics workflow of APS and community datasets, this project was able to conduct a study of the factors that explain self-neglect in a few days.
- The use of a big data platform and machine learning algorithms allows for much more complex analyses, including multi-variate counterfactual studies.

◆ Add additional historical and real-time datasets

- For example, researchers could add COVID-19 data from the CDC and other datasets to study the contributing impact of the Coronavirus on ANE.

◆ Conduct community-level studies of adult maltreatment

Policy Implications

◆ Develop targeted policies that focus on the communities that need it most

- For example, identify which specific communities in a state need stronger policies to prevent housing crises for disabled adults, and focus limited policy making resources on engaging a more precise/targeted group of stakeholders.

◆ Make cost-effective funding decisions

- For example, more precisely identify the communities that need more prevention and/or intervention support, first. Then use the data to identify the local agencies and community-based organizations that are best positioned and capable of addressing needs and/or building community assets. By knowing where to go first there are better assurances that funding constraints won't dilute the potential for impact; funding the communities that need it the most maximizes the likelihood for improvement.

Next Steps

- Report on county-level findings
 - Work with states/counties who want to implement this type of approach
- Additional county-level analytics
 - Alignment of APS clients' characteristics & overall community characteristics
- Individual-level predictive analytics
- Incorporate new data sources:
 - Medicare, Medicaid, etc.
 - Police/crime data – Uniform Crime Reporting (UCR)

Questions?



Contact Us

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