

# Predictive Modeling of Emergency Department (ED) Super-Utilizers in Texas

Fall Quality Forum  
November 5, 2015

Chris Delcher, PhD  
External Quality Review Organization  
Institute for Child Health Policy  
University of Florida

# Overview

- Identifying ED Super-Utilizers
- How many?
- Who are they and what are their health conditions?
- How much do they spend?
- How much are the top 10 spending?
- Can we predict Super-Utilizers?
- Future Directions: Person, Place, and Time

# Background



- “beneficiaries with complex, unaddressed health issues and a history of **frequent** encounters with health care providers”<sup>1</sup>
- In Medicaid overall, approximately 5% of beneficiaries drive more than 50% of total spending<sup>2</sup> **10:1**
- Typically, but not always, excessive ED visits are used to identify Super-Utilizers

<sup>1</sup> Mann, C. Targeting Medicaid Super-Utilizers to Decrease Costs and Improve Quality. (2013). <http://www.medicaid.gov/federal-policy-guidance/downloads/cib-07-24-2013.pdf>

<sup>2</sup> Kaiser Commission on Medicaid and the Uninsured, Kaiser Family Foundation. 5 Key Questions About Medicaid and Its Role In State/Federal Budgets & Health Reform. May 2012. <https://kaiserfamilyfoundation.files.wordpress.com/2013/01/8139-02.pdf>

# Background

By John Billings and Maria C. Raven

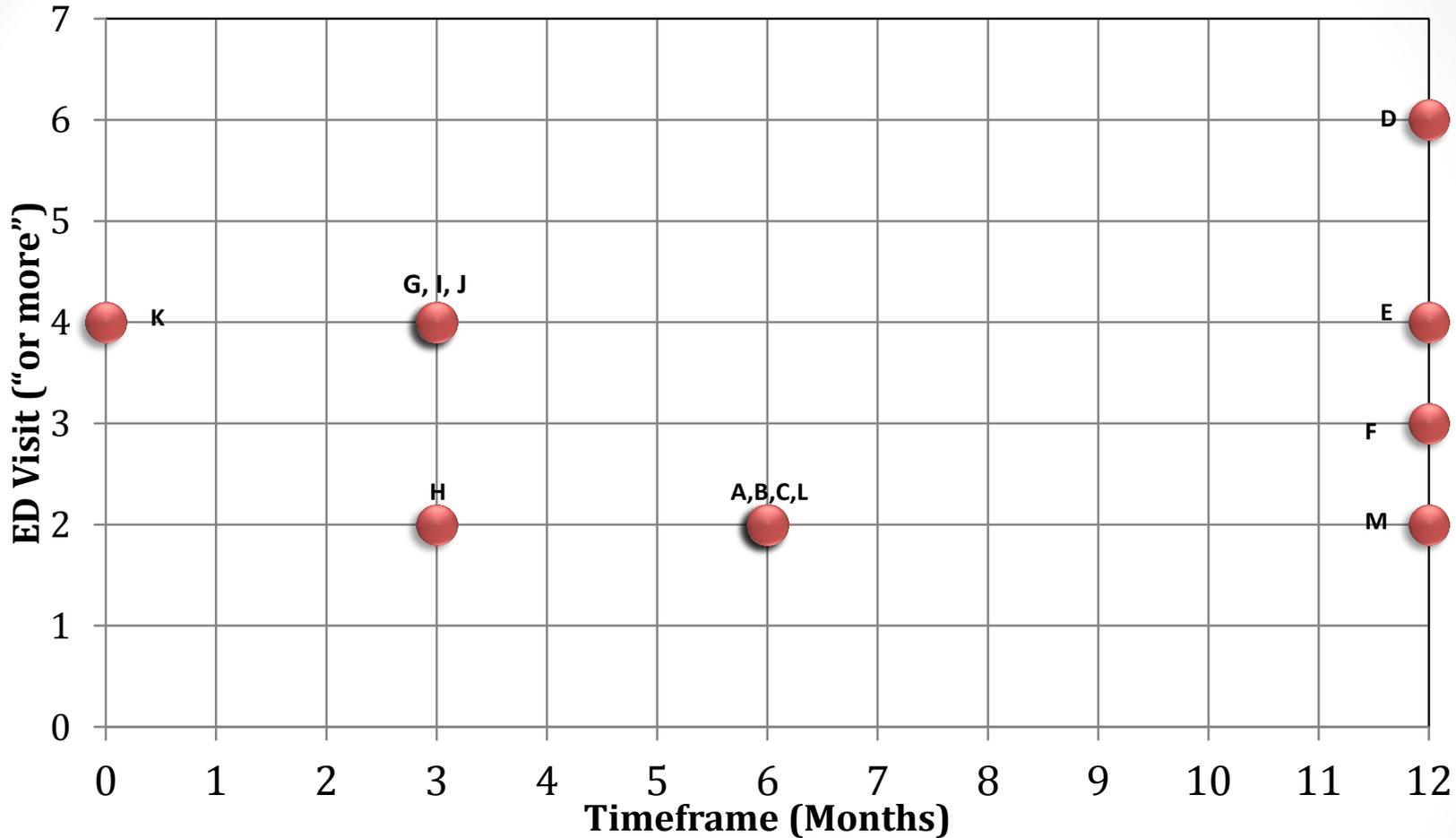
## Dispelling An Urban Legend: Frequent Emergency Department Users Have Substantial Burden Of Disease

**ABSTRACT** Urban legend has often characterized frequent emergency department (ED) patients as mentally ill substance users who are a costly drain on the health care system and who contribute to ED overcrowding because of unnecessary visits for conditions that could be treated more efficiently elsewhere. This study of Medicaid ED users in New York City shows that behavioral health conditions are responsible for a small share of ED visits by frequent users, and that ED use accounts for a small portion of these patients' total Medicaid costs. Frequent ED users have a substantial burden of disease, and they have high rates of primary and specialty care use. They also have linkages to outpatient care that are comparable to those of other ED patients. It is possible to use predictive modeling to identify who will become a repeat ED user and thus to help target interventions. However, policy makers should view reducing frequent ED use as only one element of more-comprehensive intervention strategies for frequent health system users.

- One analytic approach is to look at a spectrum of utilization
  - Billings and Raven (2013)
- Critical to understand this population in Texas

# Identifying Super-Utilizers: Health Plan Approaches

# Health Plan Definitions



e.g., 4 of 13 (shown) identify Super-Utilizers as having 2 or more ED visits in a 6 month period

# Identifying Super-Utilizers: Billings and Raven's (2013) Approach

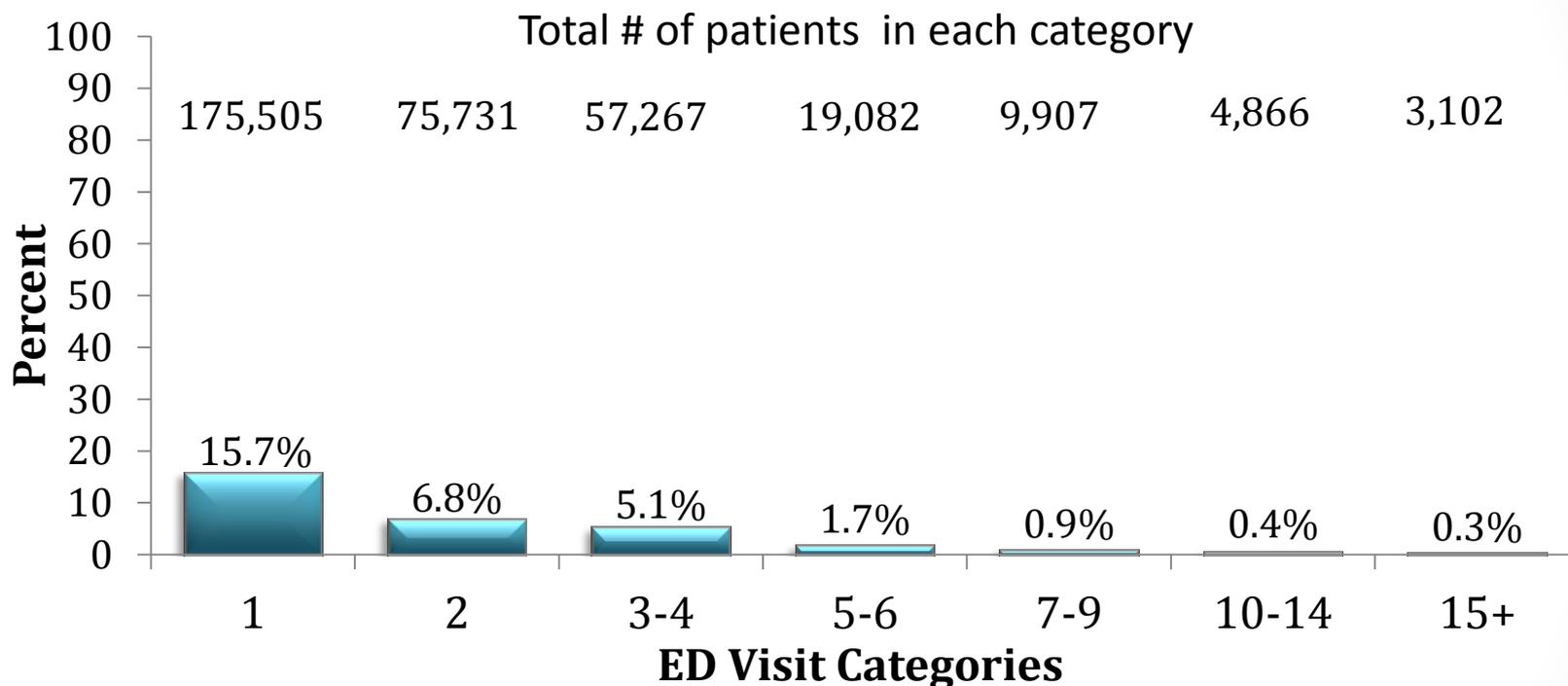
# Characteristics of Super-Utilizers in Texas Medicaid

- Data source(s): Calendar year (CY) 2014 Texas Medicaid claims and encounter data
- Adult Texas Medicaid super-utilizers, enrollees are limited to age 18-62
- This analysis excludes dual-eligible enrollees
- Super-utilizers examined according to the frequency of emergency department (ED) utilization
- ED visits categorized from Billings and Maven (2013)

How many?

A: 36,957

# Distribution of ED Patients, CY 2014



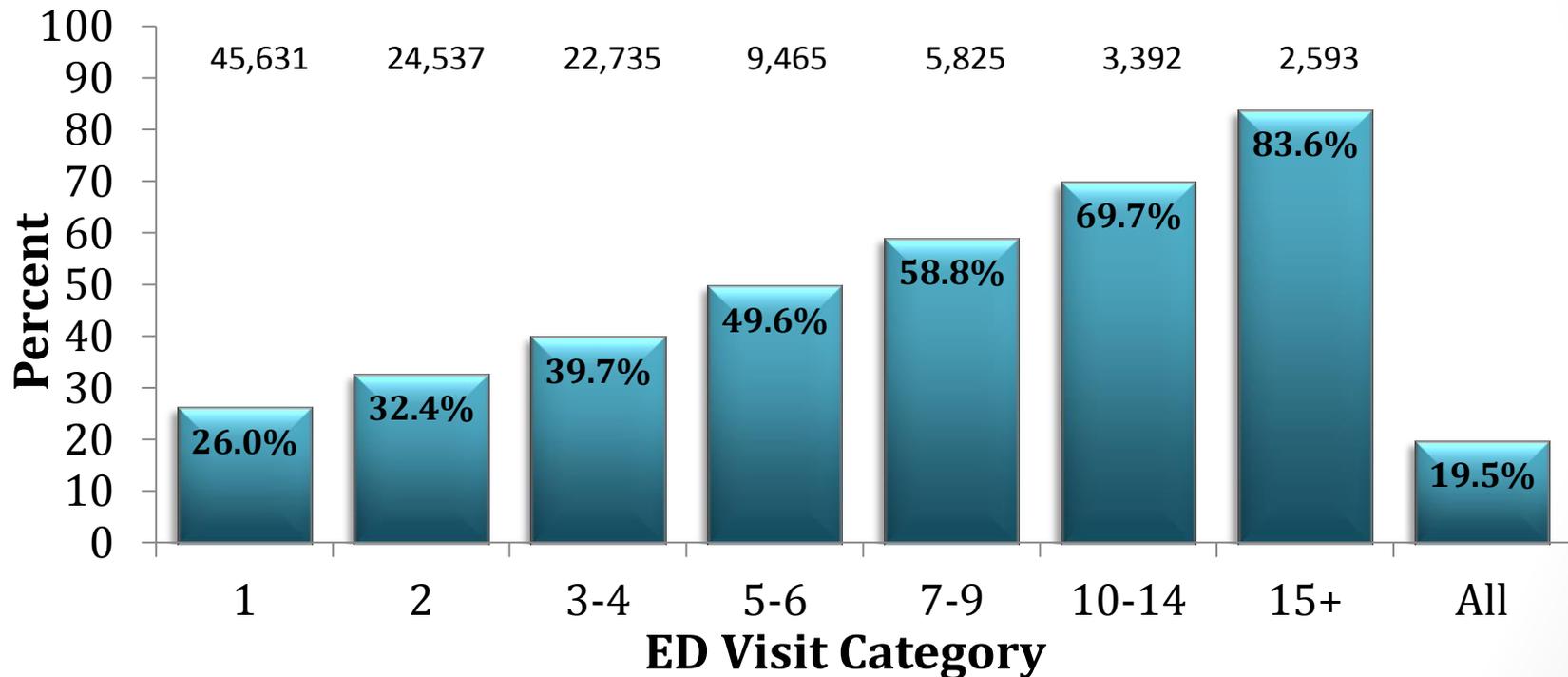
e.g., patients with 5+ visits represent 3.3% (n=36,957) of all TX Medicaid

Who are they and what are their health conditions?

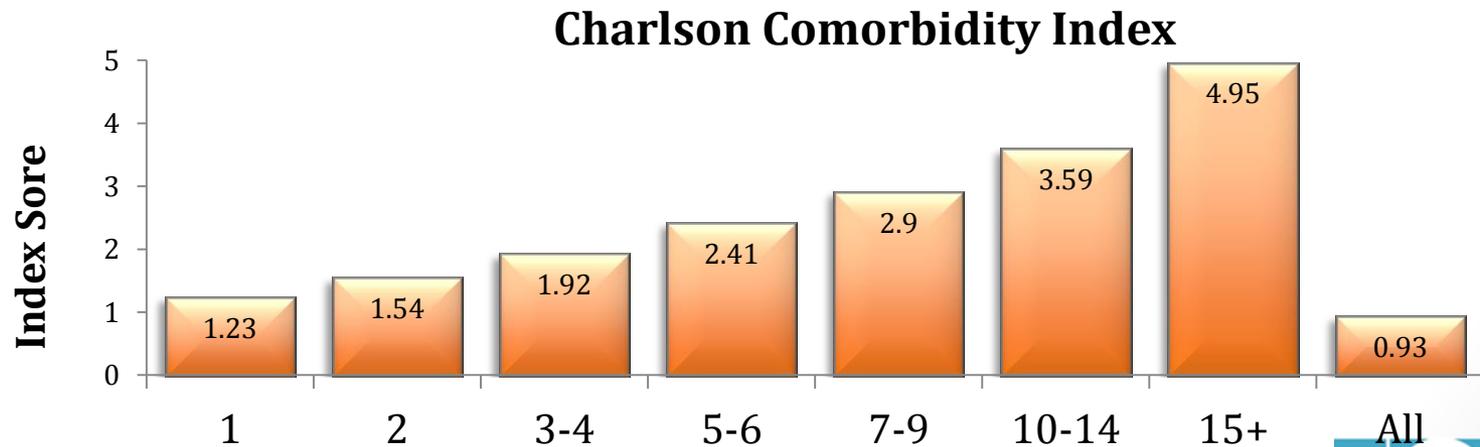
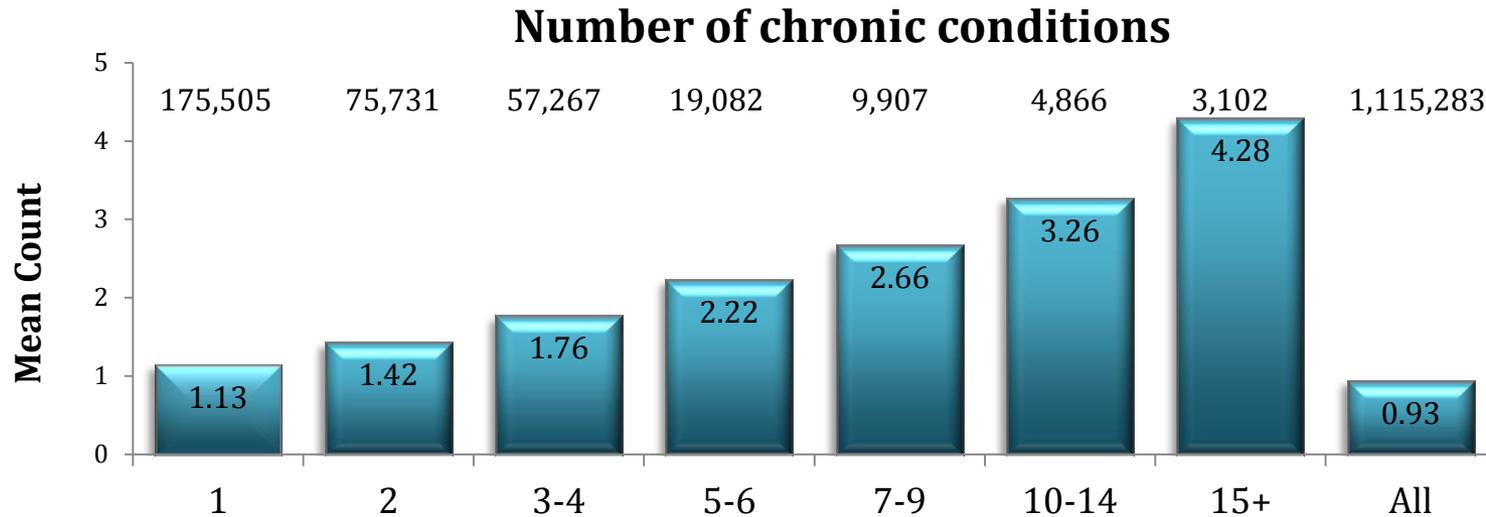
# Age, Race/Ethnicity, Sex (extreme-utilizers, CY 2014)

	ED Visit Category	
	<b>15+</b> n=2,235	<b>All</b> n=1,115,283
<b>Average Age</b>	39.0	31.6
<b>Sex (% Female)</b>	67.0	78.4
Race/Ethnicity (%)		
<b>White</b>	32.5	24.8
<b>Black</b>	23.5	20.1
<b>Hispanic</b>	25.8	43.5
<b>Unknown/Other</b>	18.2	11.6

# Multiple Chronic Conditions (2 or more)

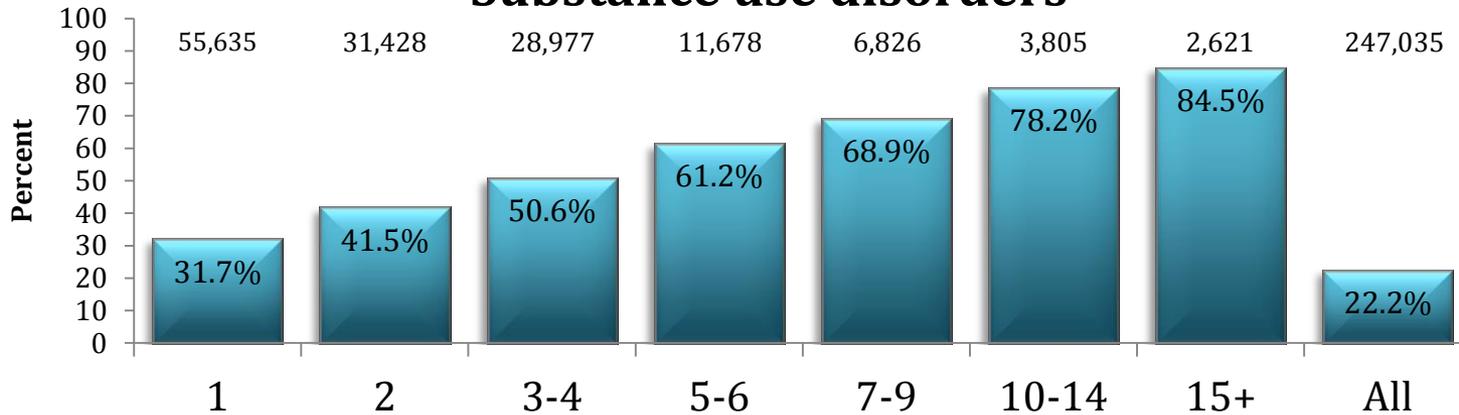


# Burden of Chronic Conditions

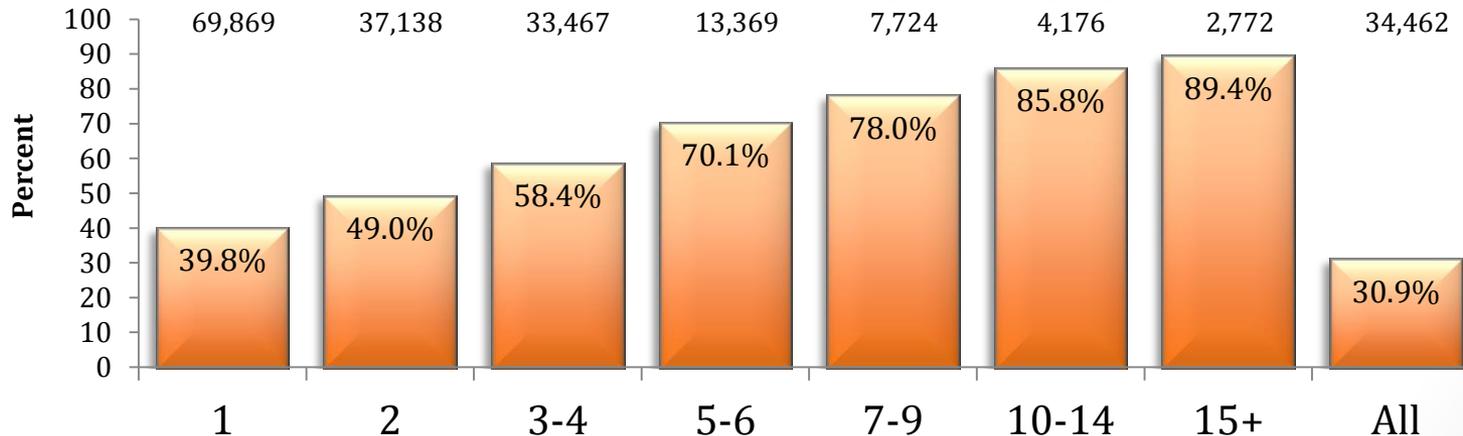


# Substance Use Disorders and Mental Health Conditions

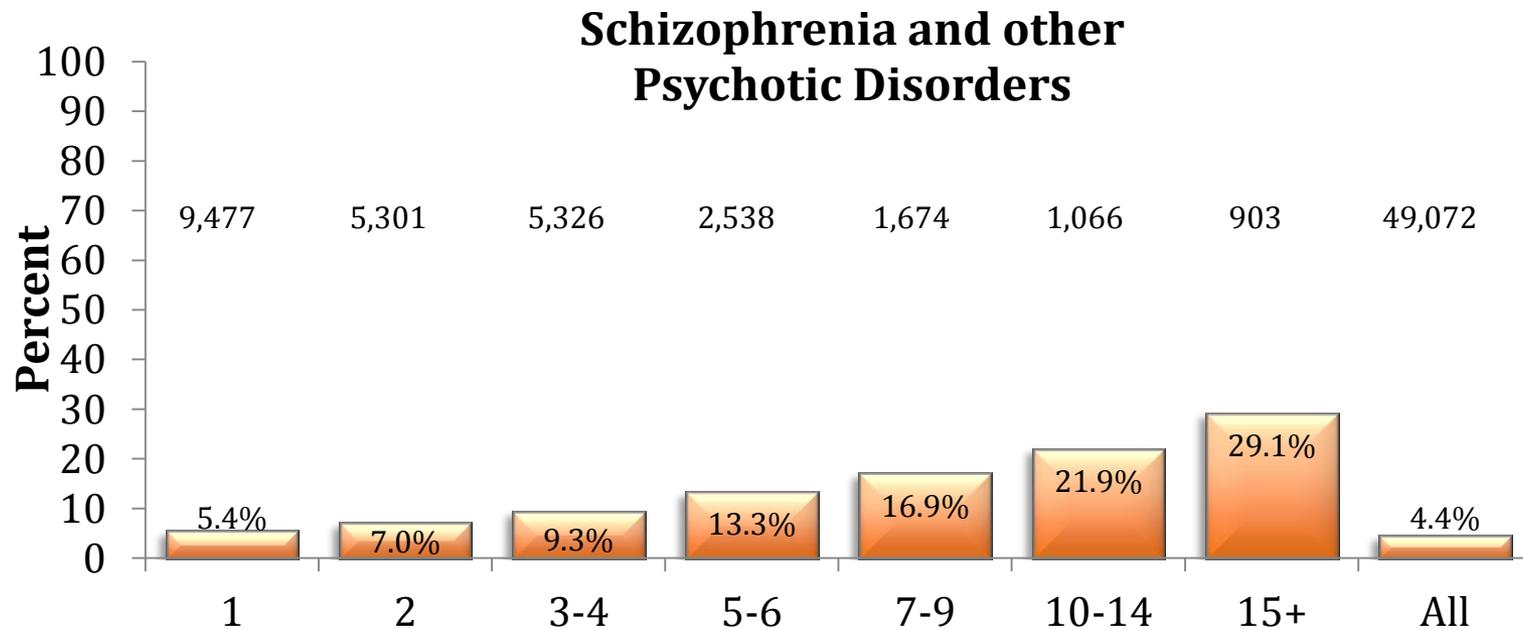
## Substance use disorders



## Mental Health Conditions



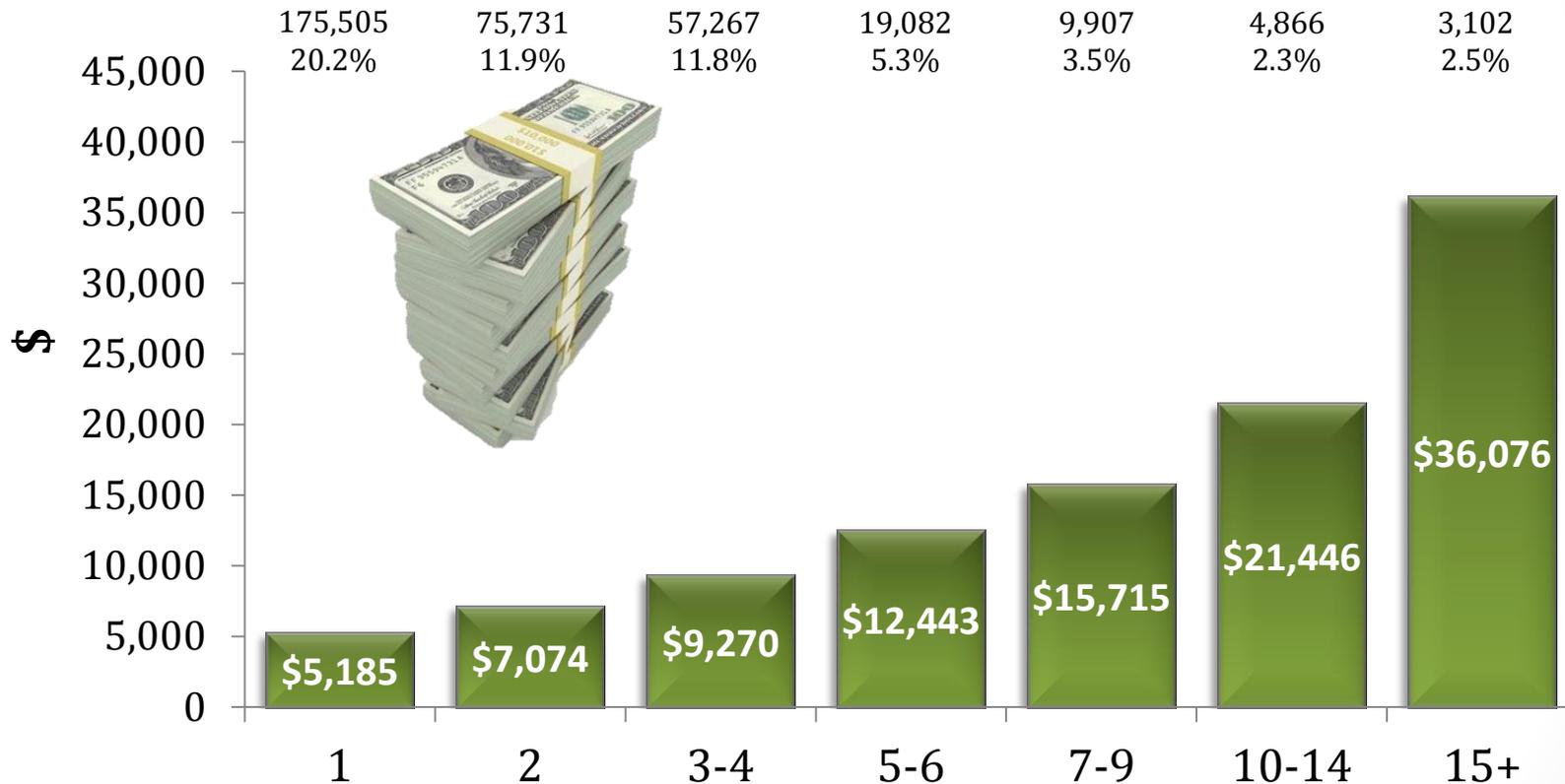
# Schizophrenia and other Psychotic Disorders



How much do they spend?

\$36,076

# Mean ED Expenditures per Patient <sup>1,2</sup>



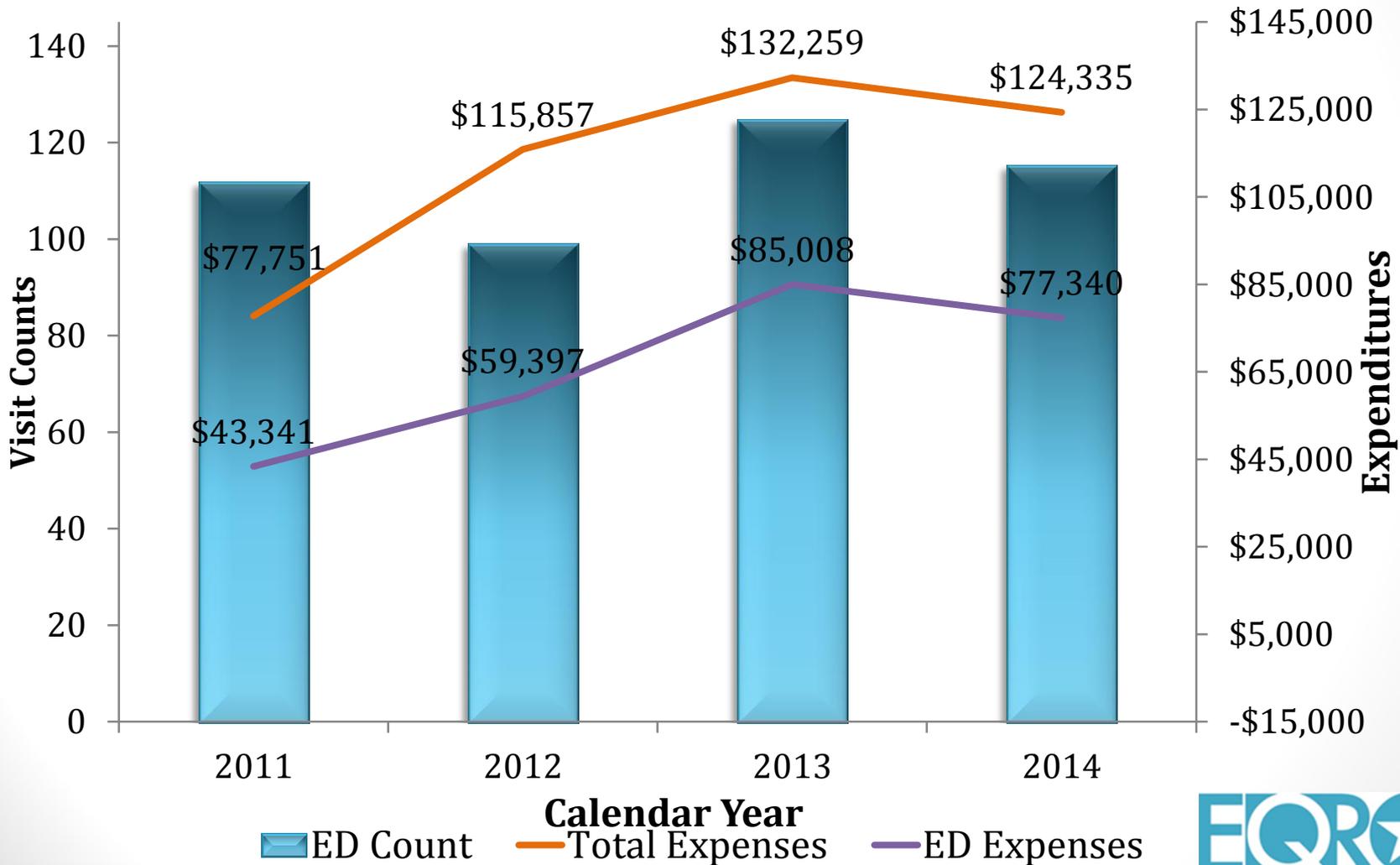
1. Includes professional, institutional, and dental expenditures. Excludes pharmacy expenditures.

2. Percentages represent the percent of total medical expenditure in each subcategory

# Top 10 Adult Super-Utilizers, 2011-2014

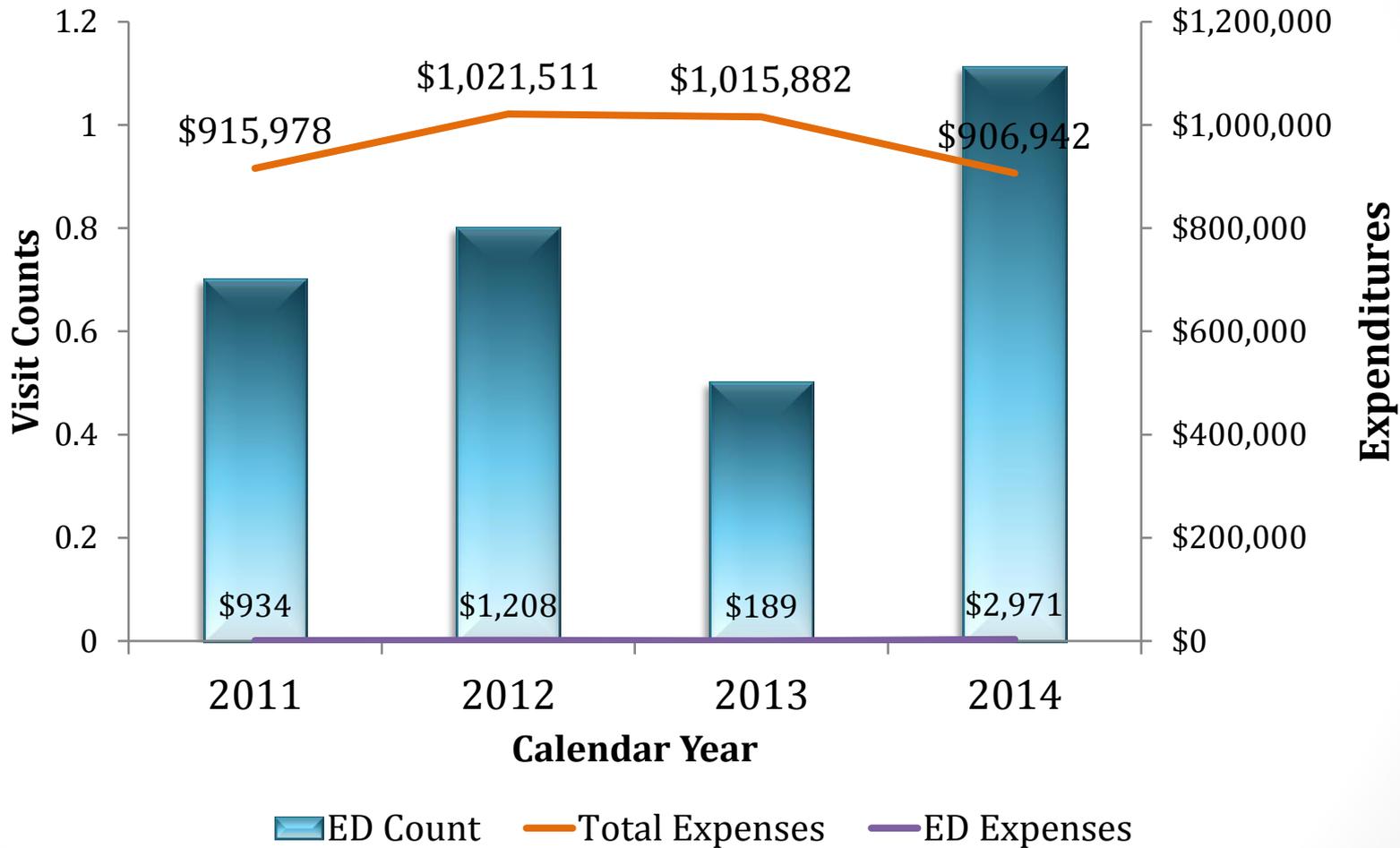
# Top 10 ED Super-Utilizers

(measures are averages)



# Top 10 Expenditure Super-Utilizers

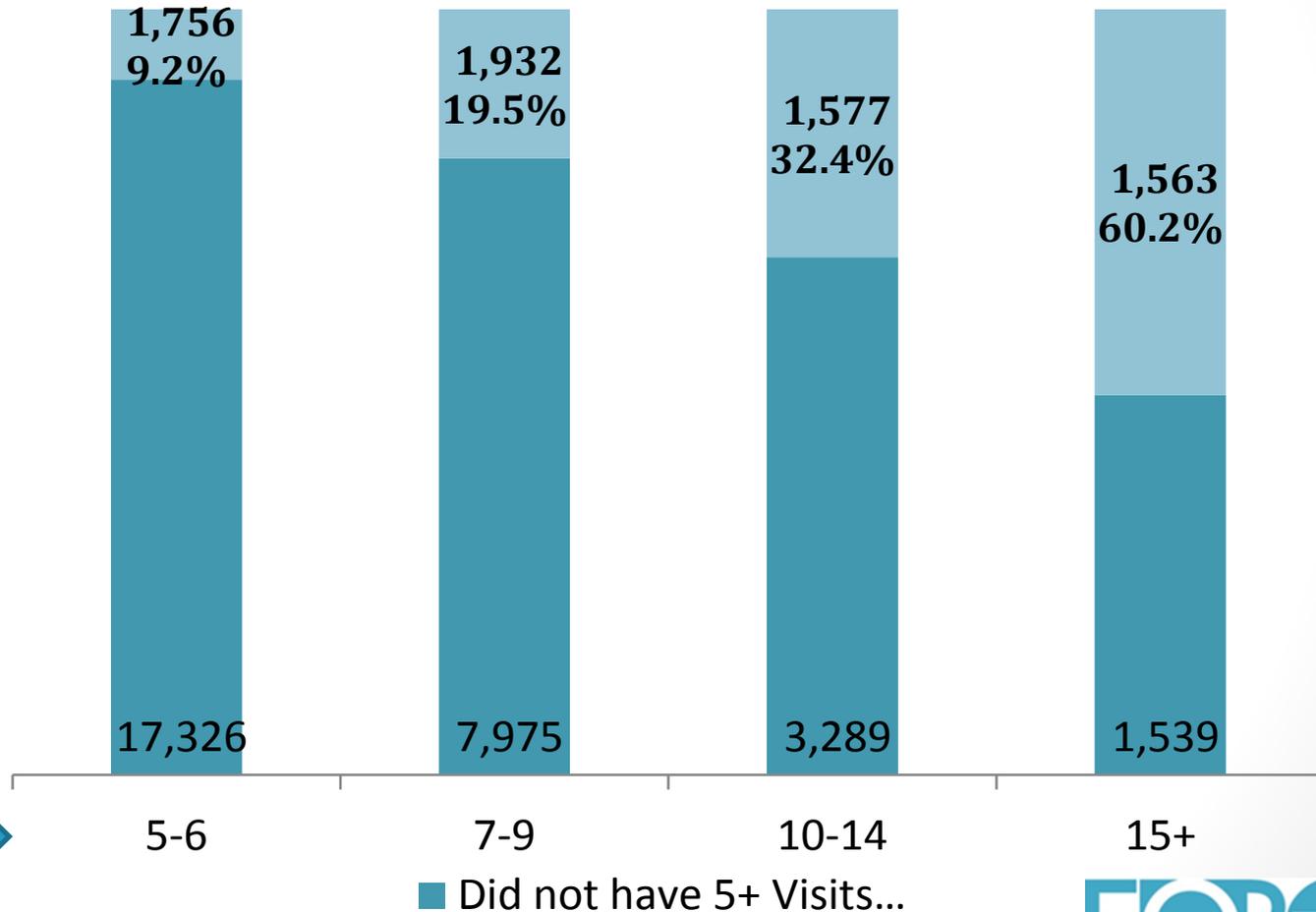
(measures are averages)



# Can we predict Super-Utilizers?

# Persistence of Super-Utilizer Status

% of patients having 5+ visits in subsequent 2 years



Utilization in  
CY 2012 →

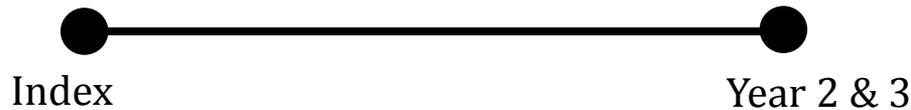
# Predicting Super-Utilizers

- Conceptual Framework: Andersen Behavioral Model of Healthcare Services Use
  - Utilization dependent on three factors: Predisposing Factors, Enabling Factors, Need

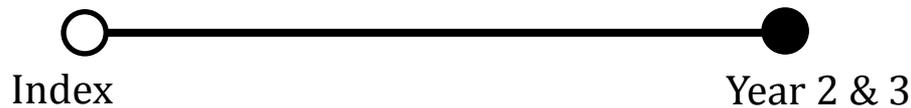
Predisposing Factors	Enabling Factors	Need
<ol style="list-style-type: none"><li>1. Race/ethnicity</li><li>2. Age</li><li>3. Sex</li></ol>	<ol style="list-style-type: none"><li>1. Access to Managed Care Programs</li></ol>	<ol style="list-style-type: none"><li>1. Disability Status</li><li>2. History of chronic conditions</li><li>3. History of Mental Illness</li><li>4. Charlson comorbidity index</li><li>5. Prior use</li></ol>

# Modeling Persistence

1. Predicting 5+ ED visits in Year 2013 and 2014 [including Super-Utilizers in 2012]



2. Predicting 5+ ED visits in Years 2013 and 2014 [excluding Super-Utilizers in 2012]

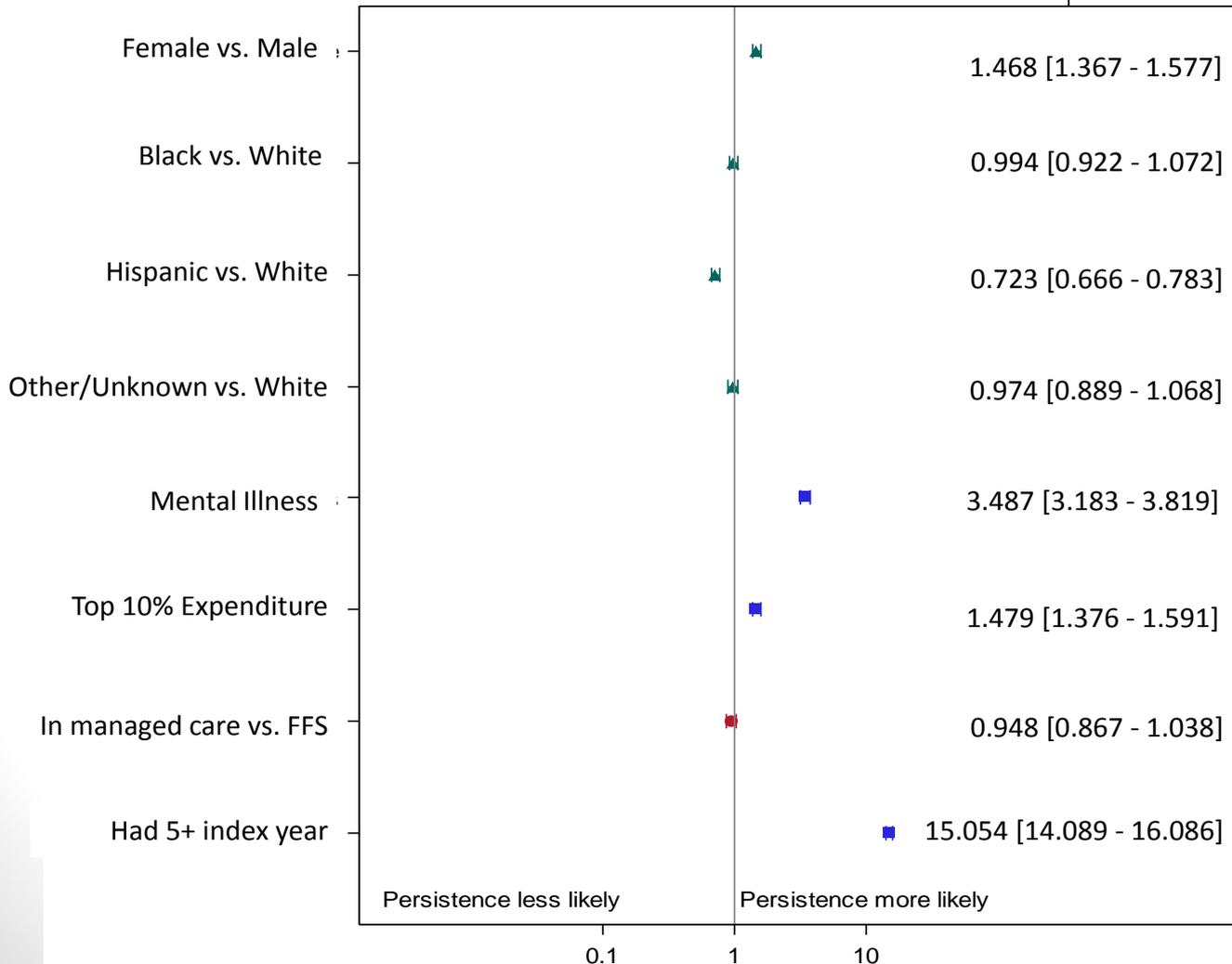


● Super-utilizer ○ Not a super-utilizer

# Predicting Super-Utilizers

## Model 1: Persistent 5+ Visits

Adjusted Odds Ratios and 95% Confidence Intervals



### Contextual Domains:

- Need
- Enabling
- ▲ Predisposing

### Adjusted by:

1. Age\*\*\*
2. Charlson Comorbidity Index\*\*
3. Disability indicator\*\*\*
4. Inpatient stays\*\*

\*\*\* = p<0.005, \*\* = p<0.05

# Preliminary Conclusions

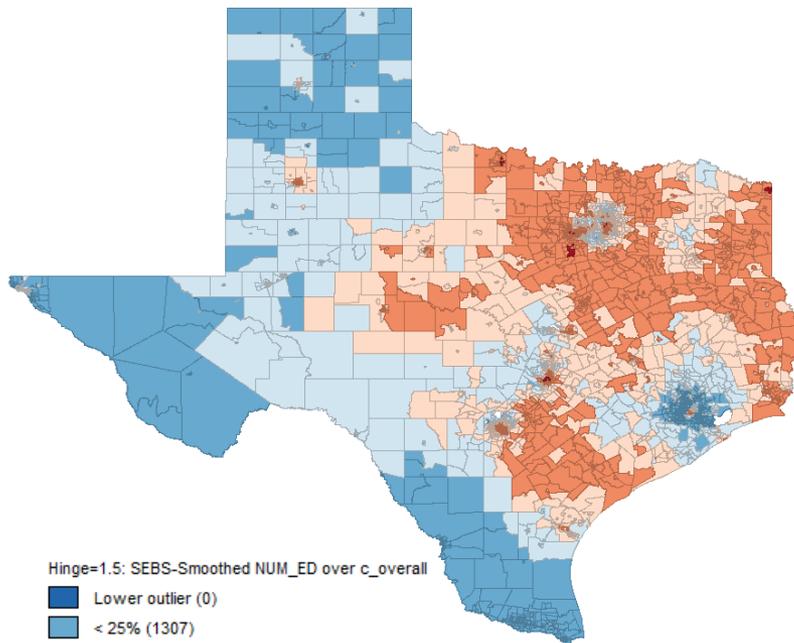
- All models provided high discrimination (c-statistics > 0.75) even when prior Super-utilization excluded.  
***Prediction capability is promising!***
- Important demographic differences emerged.
- Prior utilization a powerful predictor but models are still effective when examining patients that are not yet Super-Utilizers

# Future Directions

# Geographic Hotspots\* for Super-Utilizers

\*ED Visit Rate by US Census Tract

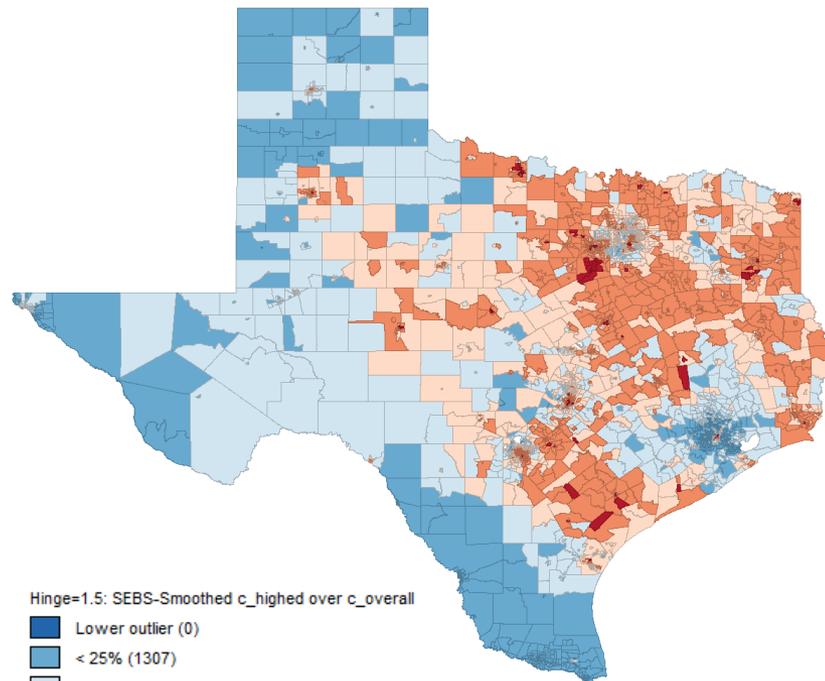
## All Texas Medicaid



Hinge=1.5: SEBS-Smoothed NUM\_ED over c\_overall

- Lower outlier (0)
- < 25% (1307)
- 25% - 50% (1307)
- 50% - 75% (1308)
- > 75% (1272)
- Upper outlier (35)

## Super-Utilizers



Hinge=1.5: SEBS-Smoothed c\_highed over c\_overall

- Lower outlier (0)
- < 25% (1307)
- 25% - 50% (1307)
- 50% - 75% (1308)
- > 75% (1192)
- Upper outlier (115)

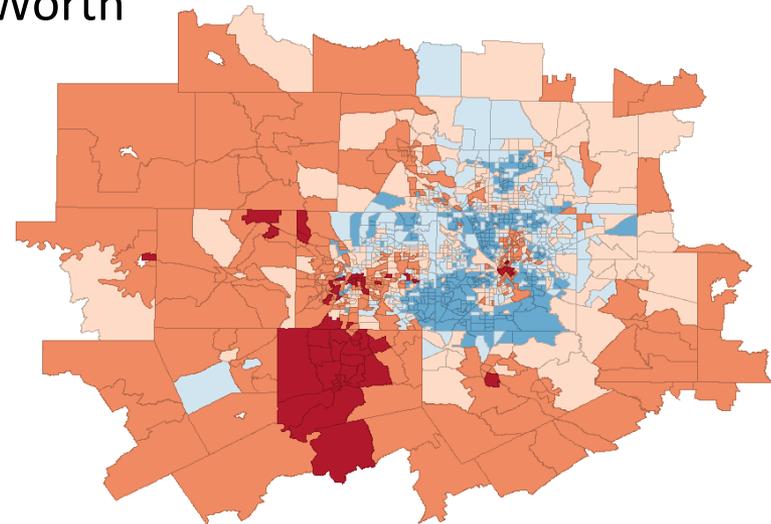
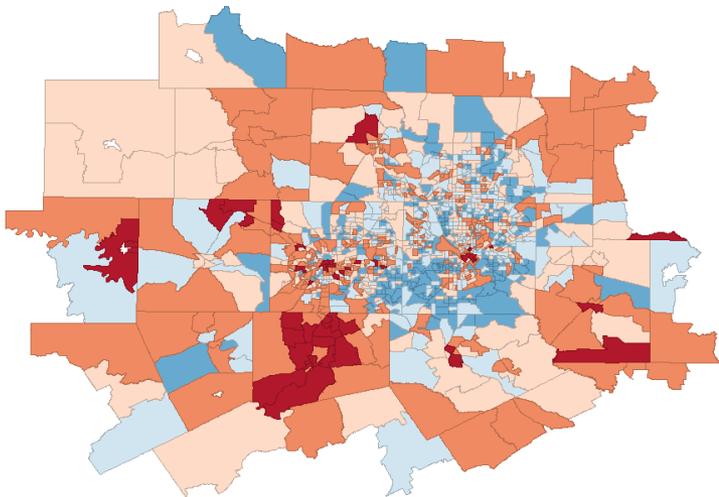
# Geographic Hotspots\* for Super-Utilizers

\* ED Visit Rate by US Census Tract

## All Texas Medicaid

## Super-Utilizers

### Dallas Fort Worth



Hinge=1.5: EBS-Smoothed  $c_{highed}$  over  $c_{overall}$

- Lower outlier (0)
- < 25% (334)
- 25% - 50% (335)
- 50% - 75% (335)
- > 75% (280)
- Upper outlier (54)

Hinge=1.5: SEBS-Smoothed  $c_{highed}$  over  $c_{overall}$

- Lower outlier (0)
- < 25% (334)
- 25% - 50% (335)
- 50% - 75% (335)
- > 75% (279)
- Upper outlier (55)

# Questions?

## **Contact Information:**

Chris Delcher, PhD  
Institute for Child Health Policy  
University of Florida  
cdelcher@ufl.edu | (352) 294-5976