

# Regression Analysis

## Regression Analysis in Practice

**Nicoleta Serban, Ph.D.**

*Professor*

Stewart School of Industrial and Systems Engineering

Emergency Department  
Healthcare Costs



## About This Lesson



# Emergency Department Healthcare Costs

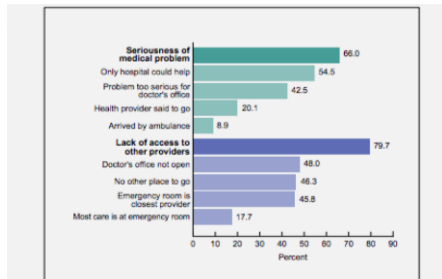


Figure 1. Percentage who had selected reasons for last emergency room visit, among adults aged 18–64 whose last visit in past 12 months did not result in hospital admission: United States, January–June 2011

## Research Question 1

What factors impact the healthcare cost due to emergency department encounters?

## Research Question 2

Is access to primary care providers associated with healthcare costs due to emergency department encounters?



# Emergency Department Healthcare Costs

## Study Population

Adults enrolled in Medicaid in 2011 in four southeast states

- Alabama, Arkansas, Louisiana, and North Carolina
- Medicaid is a low-income health insurance program

## Data Source

Medicaid Analytic eXtract (MAX) claims files available from the Centers of Medicare and Medicaid Services (CMS)

- Additional data sources: U.S. Bureau Census, Health Analytics Group at GT, Robert Wood Johnson Foundation, among others.
- Disclaimer: This analysis of healthcare cost for the Medicaid population using the MAX claims data is in compliance with the study protocol approved by the Georgia Tech Internal Review Board (IRB) and by CMS. Do NOT use the data provided for this analysis for purposes other than the study in this lesson.



# Response Variable

- *EDcost*
  - Primary variable of interest
  - Emergency Department cost aggregated at the census tract level
  - Depends on number of enrollees (members) and lengths of their enrollments
- *PMPM*
  - Per Member Per Month
  - Total number of enrollment months aggregated by census tract
  - Used to scale *EDcost* for comparison across census tracts
    - Each census tract has different numbers of enrollees, and each enrollee can have a different length of enrollment
    - Scaling *EDcost* by *PMPM* allows a comparison of cost per enrollee month



# Predicting Variables

- **Location**
  - *State* and *GEOID* give state and census tract identification
- **Utilization**
  - Data must be scaled by *PMPM*
    - *ED* (number of emergency department claims)
    - *HO* (number of hospitalization claims)
    - *PO* (number of physician office claims)
- **Population characteristics**
  - Percentages of Medicaid-enrolled adults of various populations
    - *BlackPop*, *WhitePop*, *OtherPop* (race/ethnicity)
    - *HealthyPop*, *ChronicPop*, *ComplexPop* (health conditions)
- **Socioeconomic and Health Environment Factors**
  - 13 variables quantifying other possibly health-related factors
    - Includes unemployment, median income, urbanicity of the census tract, access to primary care, health rankings, and others



# Controlling Variables

## Selection Bias

- Adults with chronic or complex health problems tend to need emergency services more than the healthy population
- Controlling factors
  - *ChronicPop* (percentage of population with chronic conditions)
  - *ComplexPop* (percentage with complex health problems)

## Confounding Variable

- The number of ED claims correlates with both response and predicting variables
  - It is a measure of the utilization of the emergency department
    - Utilization directly leads to ED healthcare costs
    - It is therefore a confounding variable
    - Do not include this confounding variable in the model

# Summary

