# Social Determinants of Emergency Department Utilization in Utah

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# Layout of Presentation

1. Overview
2. Data and Linkage
3. Methodology
4. Data Confidentiality and Disclosure Avoidance
5. Results
6. Conclusions and Next Steps

# Enhancing Health Data (EHealth) Program

- Utilizes existing survey and administrative records data and engages with new stakeholders to acquire health records.

- Goal is to improve the quality and availability of statistical information to better understand and advance population health.

- Potential to reduce respondent burden and data collection costs while increasing the quality of existing data.

- During the COVID-19 pandemic, these kinds of new data and statistics and related research questions may have become even more crucial.

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# Background

In 2019, the U.S. Census Bureau entered into a partnership agreement with the Utah Department of Health (UDOH) with two aims:

- Aim 1: Examine social determinants of emergency department (ED) utilization in Utah in order to reduce preventable visits
- Aim 2: Evaluate the utility of ED encounter data for surveys for which the Census Bureau collects data, by making comparisons to the National Hospital Ambulatory Medical Care Survey (NHAMCS)

This presentation is regarding Aim 1, examining social determinants of emergency department (ED) utilization in Utah.

# Goals

- Understand person and household characteristics associated with preventable ED visits to inform policy, improve health outcomes, and increase cost-effectiveness of emergency care in Utah

- Validate ACS survey content, increase utility of survey data, and create new estimates related to social determinants of ED utilization

- Are individual- and household-level Social Determinants of Health (SDOH) significantly associated with preventable ED visits in Utah?
  - If so, which SDOH?
  - How do our findings compare with existing literature?

# Source Data

- 2013-2017 Emergency Encounters Data from Utah's Department of Health (UDOH ED)
  - Visit-level dataset

- 2013 through 2017 1-Year American Community Survey (ACS) restricted microdata from U.S. Census Bureau (not 5-year ACS product)
  - Person- and household-level dataset
  - Roughly 1-2% of Utah population per year

- We link UDOH ED and ACS using internal person-level linkage keys, Protected Identification Keys (PIKs)

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# Linkage Summary

- UDOH visit file (2013-2017)
  - 3.6 million UDOH visit records, from 1.4 million unique persons, i.e., 2.5 visits per person
  - 3.5 million visits with matched PIK, i.e., 97 percent PIK rate

- ACS Utah person file (2013 through 2017, not 5-year ACS product)
  - 375,000 person records (about 75,000 person records per year)
  - 353,000 persons with matched PIK, i.e., 94 percent PIK rate

- Linked UDOH-ACS file
  - 230,000 matched visits, i.e., 7 percent of the PIK'd UDOH visits
  - 98,000 matched patients, i.e., 7 percent of the PIK'd UDOH patients

- Many of the linked UDOH ED-ACS records borrow data from other years in the 2013-2017 period (e.g., links between 2014 UDOH data and 2016 ACS data)

# Classification of ED Visits

- We use the New York University (NYU) ED Algorithm to classify visits.

  - (Billings et al., 2000a, 2000b, 2000c)

- The NYU ED Algorithm uses International Classification of Diseases (ICD) codes to classify ED visits into nine categories (four main categories and five others).

- To determine if a UDOH visit was preventable, we apply the Algorithm to the UDOH visit's primary diagnosis code, including for the four main categories:

  - **Nonpreventable Emergency Care:** Care Needed – Not Preventable ("true" emergency)
  - **Preventable Emergency Care:** Care Needed – Preventable

    Primary Care Treatable

    Non-Emergent

- For ICD codes associated with multiple Algorithm categories, we assign the visits to the Algorithm's highest probability category, and we randomize for ties of 50%.

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# SDOH Framework

- Theorizes that an individual's health is impacted by conditions of the environments in which one works, lives, and plays (WHO, 2008)

- Consistent with the *Healthy People 2020* framework (CDC, 2010), SDOH characteristics span five domains:
  - Economic Stability
  - Education
  - Social & Community Context
  - Health & Healthcare
  - Neighborhood & Built Environment

- We select ACS measures from each of the 5 SDOH dimensions:
  - 19 specific characteristics

# Social Determinants of Health (SDOH) Variables

| Economic Stability | Education | Social & Community Context | Health & Healthcare | Neighborhood & Built Environment |
|---|---|---|---|---|
| • Employment<br>• Household Income Decile<br>• Household Size<br>• Poverty Status (family)<br>• SNAP Participation | • English Speaking Ability<br>• Educational Attainment | • Age<br>• Internet Access<br>• Marital Status<br>• Nativity<br>• Race<br>• Sex<br>• Veteran Status | • Disability Status<br>• Health Insurance Coverage<br>• Public Coverage | • Vehicle Access<br>• Housing Tenure |

# Methodology

- For each SDOH category and each of the 4 ED visit categories, we compute the following figures:
    - Average number of ED visits per 1,000 people
    - Percentage of ED visits across the 4 ED categories

- Study bivariate relationships between SDOH categories and ED use

- Study results from logistic regressions (stepwise, LASSO) to confirm observed relationships in the presence of control variables

- Study characteristics of Utah ED patients relative to those of the overall Utah population

# Data Confidentiality and Disclosure Avoidance

- Confidential data cannot be disclosed or published in any way that permits identification of a particular individual or an entity.

- Maintaining confidentiality of these data is guaranteed under Title 13 of the U.S. Code Section 9 and the Privacy Act of 1974.

- This project was approved by UDOH Institutional Review Board (IRB) and executives, by Utah Health Data Committee at an open, public meeting, and by State of Utah executives.

- Formal review and approval was received from the Census Bureau's Disclosure Review Board (DRB) before release of this and any other results or products.

- The released data contain no personally identifiable information, nor any information that can be made personally identifiable when combined with other publicly-available resources.

- The UDOH *Data Suppression and Data Aggregation Guidelines,* as well as additional Census Bureau DRB criteria, have been met.

# Results (1): Main Social Determinants of Preventable Emergency Care Visits

- On average, Utah ED patients from more vulnerable populations tend to have more ED visits (many of which are preventable visits) than do other Utah ED patients.

| Group 1 | vs. | Group 2 |
|---|---|---|
| Individuals in **lower income deciles** → | | → individuals in **higher income deciles** |
| Individuals who were **unemployed** → | | → individuals who were **employed** |
| Individuals with **less educational attainment** → | ...had **more preventable emergency care visits** than... | → individuals with **more educational attainment** |
| Individuals with **one or more disabilities** → | | → individuals with **no disabilities** |
| Individuals who were **divorced/separated/widowed** → | | → individuals who were **married** or **never married** |
| **Women** → | | → **men** |
| Individuals living in **renter-occupied housing** → | | → individuals living in **owner-occupied housing** |
| Individuals **without Internet access** → | | → individuals **with Internet access** |

# Results (2): Income Gradient in ED Use
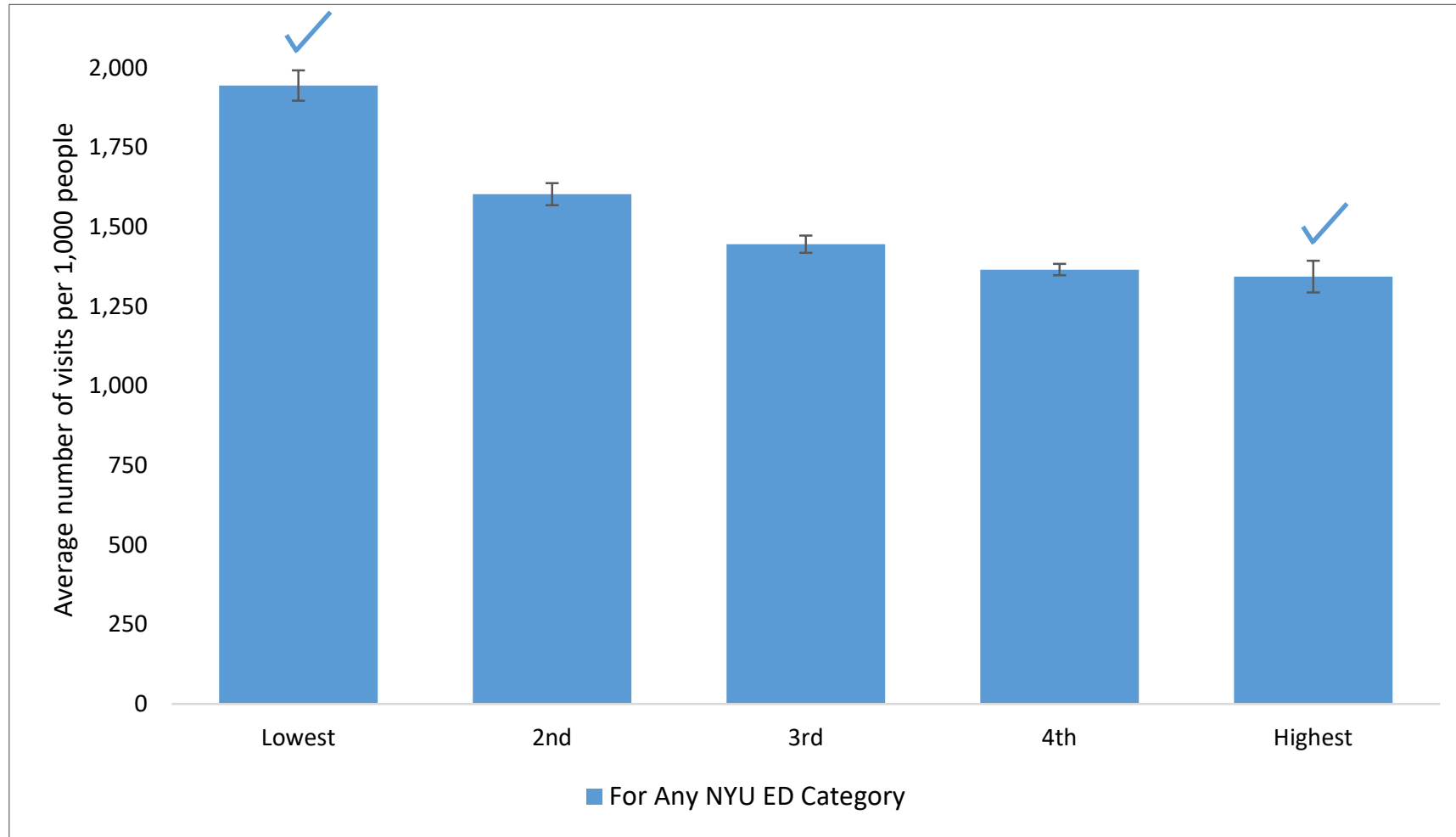
# Results (3): Preventable and Not Preventable ED Use
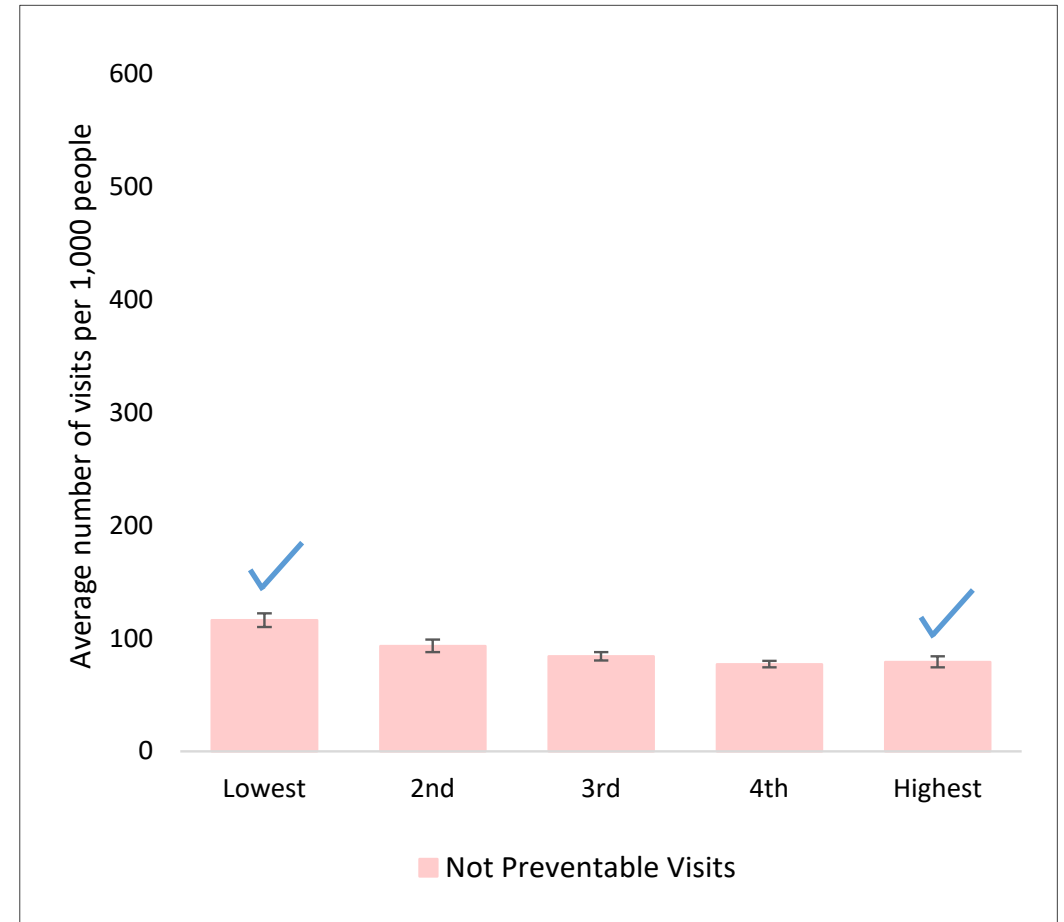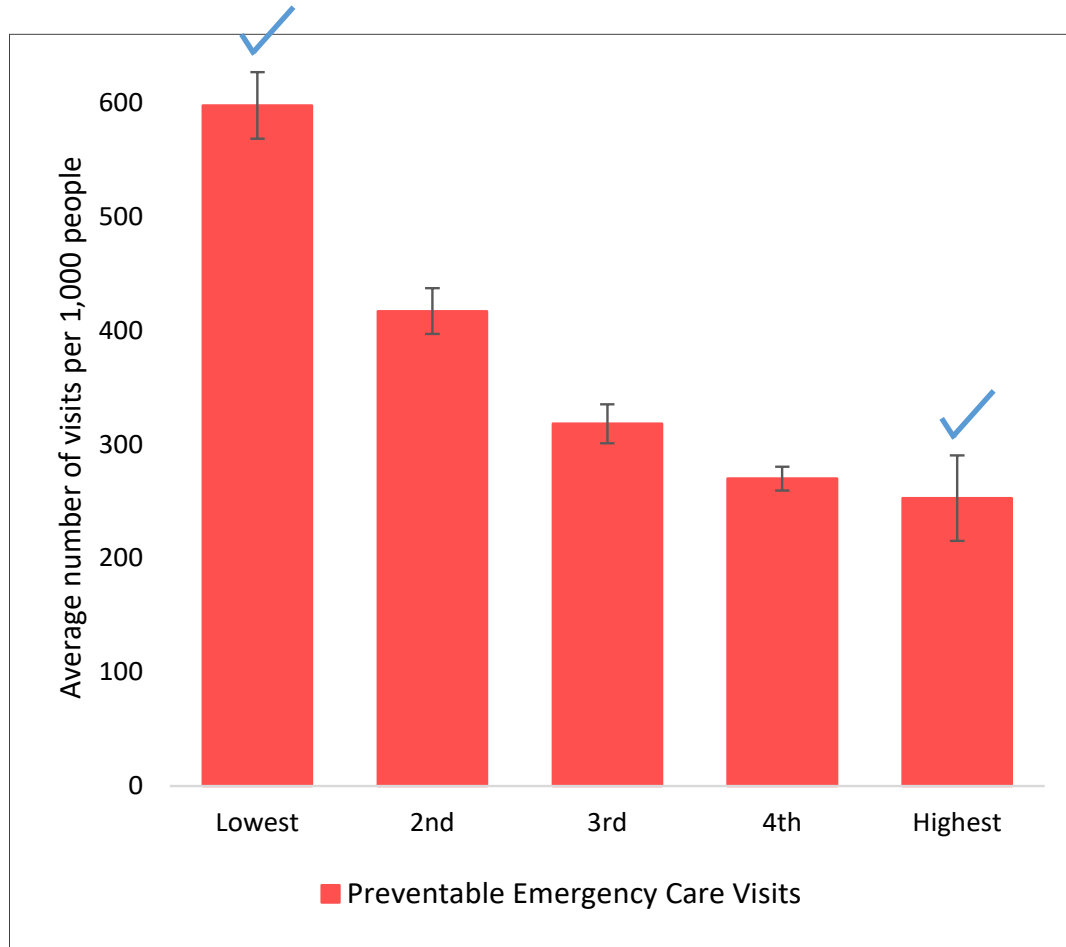
# Results (4):  Preventable and Not Preventable Shares

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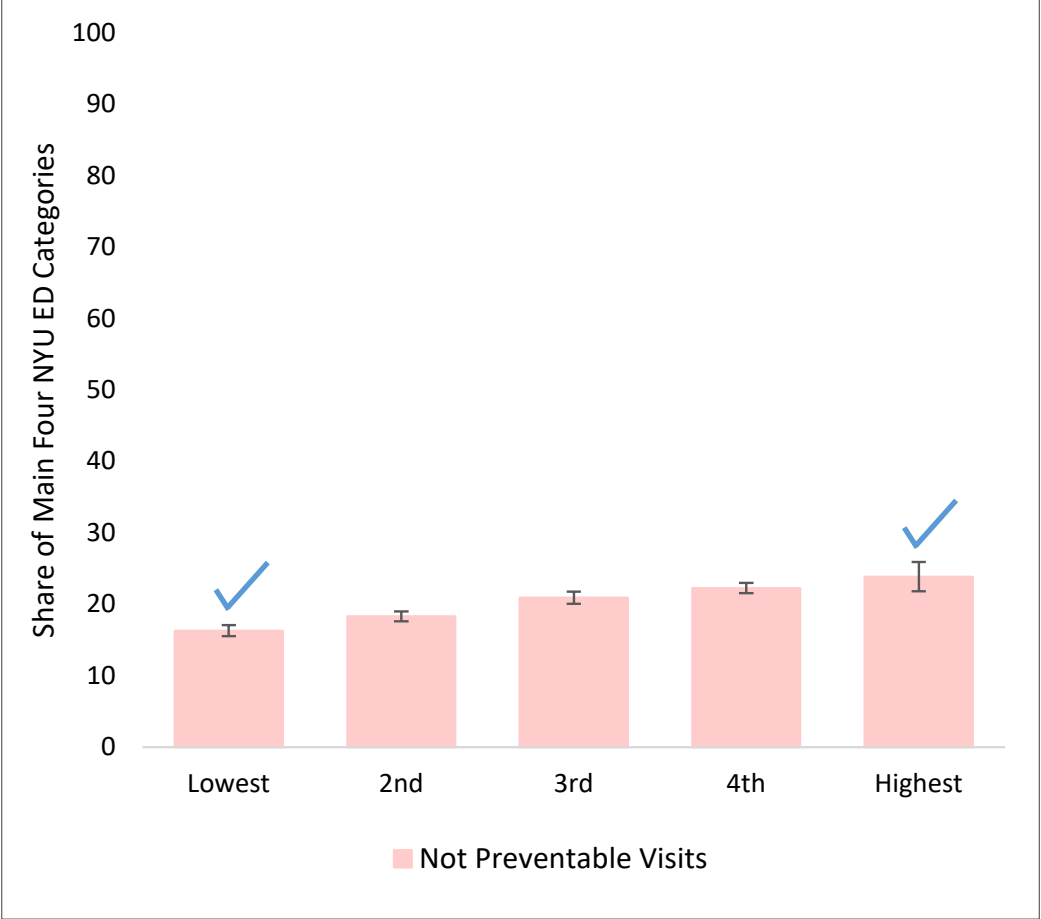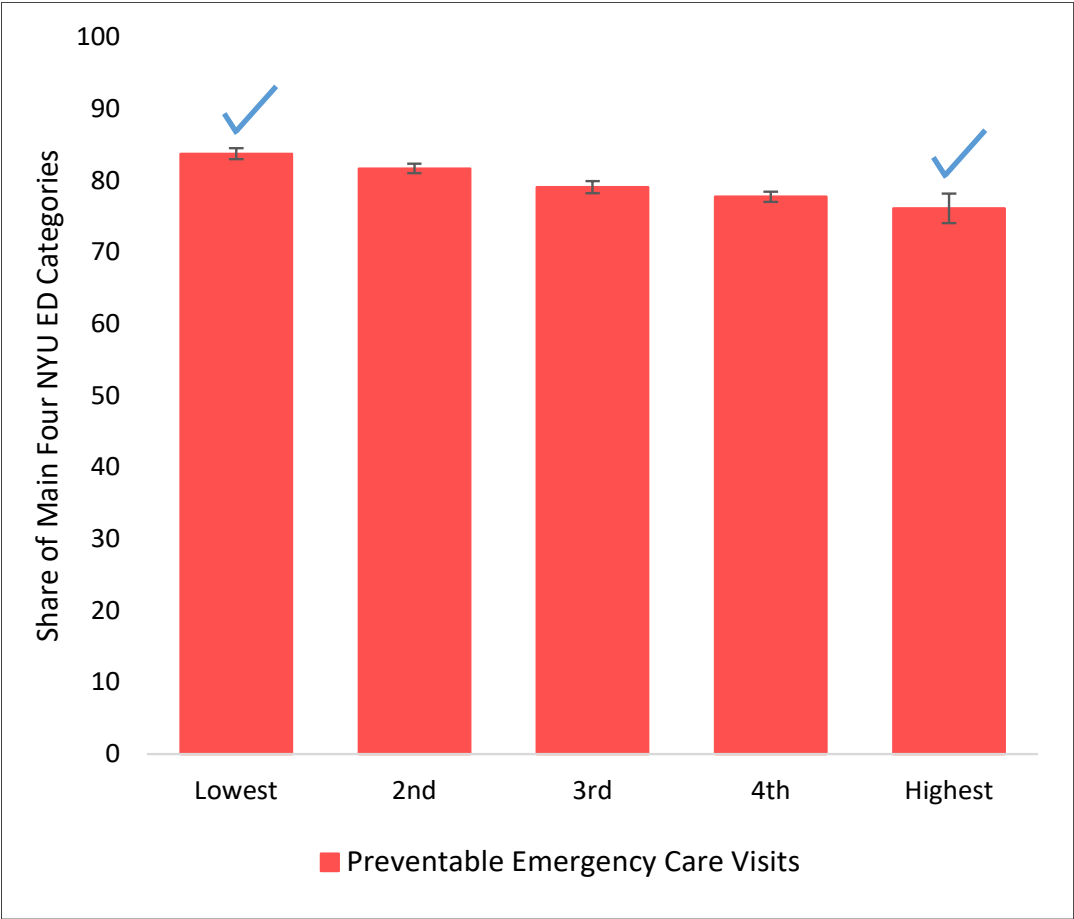
# Results (5): Comparisons Among Populations

- On average, Utah ED patients (especially those with a preventable visit) tend to overlap more with vulnerable groups than does the overall Utah population.

| *Utah ED patients, on average, have a…* | → higher **poverty rate** → | *…than does the overall Utah population* |
|---|---|---|
| | → higher **unemployment** rate → | |
| | → lower **educational attainment** → | |
| | → higher rate of **disability** → | |
| | → lower rate of being **married** → | |
| | → higher percent **female** → | |
| | → higher share that **receives SNAP benefits** → | |
| | → higher share that **lacks a vehicle** → | |

# Results (6):  By Year, By Age Category

- Examination by linkage year
  - For example, 2013 UDOH visits linked only with 2013 ACS, 2014 with 2014, and so forth
  - Results are very similar vs. all years, though with sample size reduced and MOEs raised

- Examination by age category
  - Three age categories:  Under 19, ages 19-64, ages 65+
  - Results for ages 19-64 are very similar vs. all ages, though sample size is reduced
  - Results for Under 19 and for ages 65+ show some differences relative to all ages

- Examination under logistic regression models
  - Control for all 19 SDOH at once, with county effects, seasonality and day-of-week factors
  - All of these SDOH covariates are highly statistically significant
  - The original bivariate relationships between SDOH and ED visits hold up well

# Conclusion

- Creation and use of unique and valuable dataset

  - ED encounter data are linked to SDOH at the individual level rather than at the aggregate geographic level

- Utah Department of Health

  - Learn which SDOH are most important for ED visit frequency

  - Can inform new strategies and methods for reducing preventable emergency care

  - Potentially realize ED cost savings and provider reduction of burden

- Census Bureau

  - Create new estimates related to SDOH in ED setting, contributing to its mission

  - Expand research opportunities related to SDOH and healthcare utilization and outcomes

  - Can help validate ACS content and seed ideas for related survey content

# Next Steps

- Development and release of an *interactive data dashboard*
- Further extension of results and related publication(s)
- Continued communication and partnership
- EHealth Program
  - Seeks to fulfill additional health data needs
  - Seeks new partnerships and collaborations with mutual benefit *(please contact us!)*
  - Website coming soon
    - https://www.census.gov/programs-surveys/ehealth.html

# Dashboard Display – *with Fake Data*
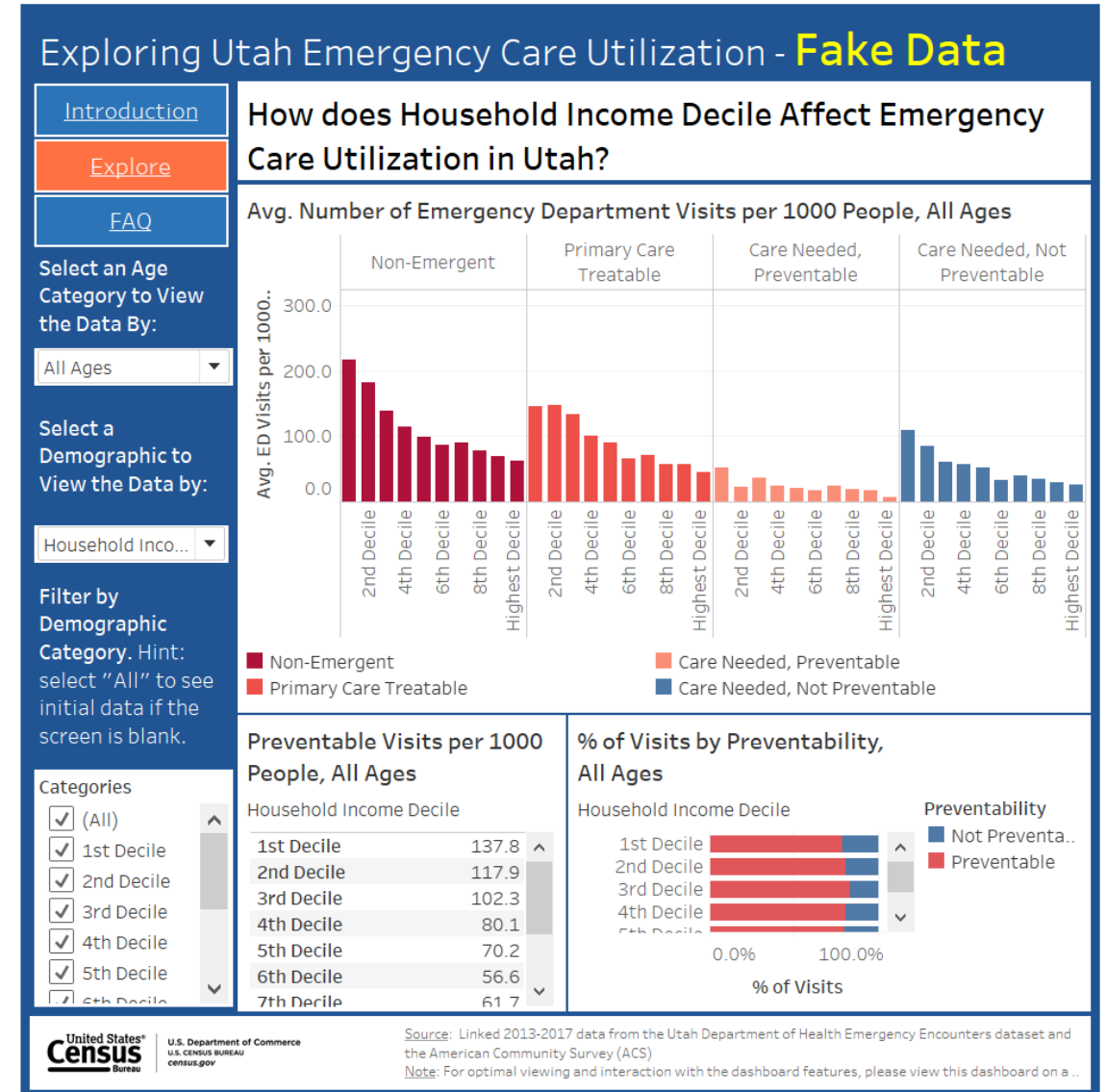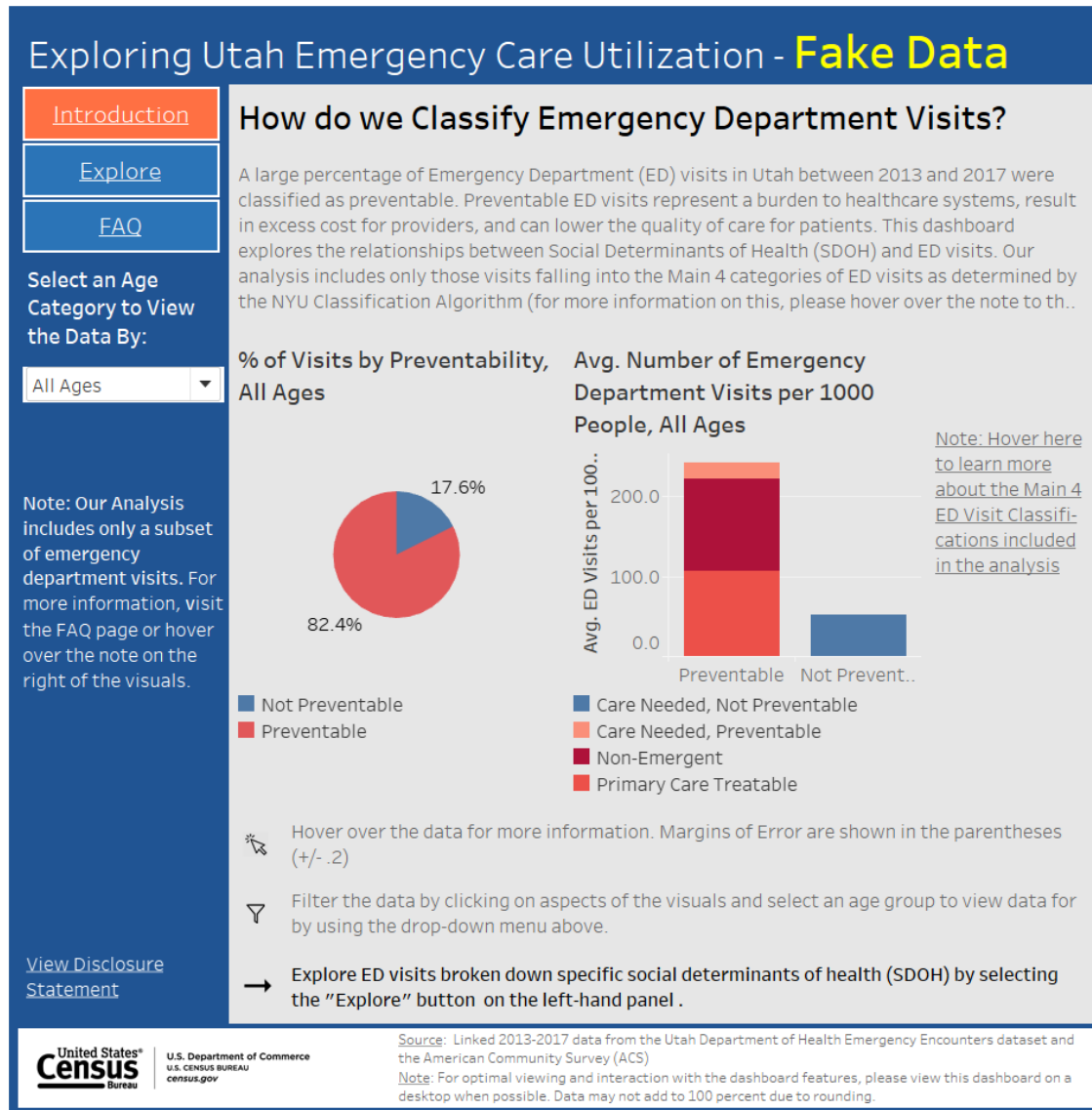
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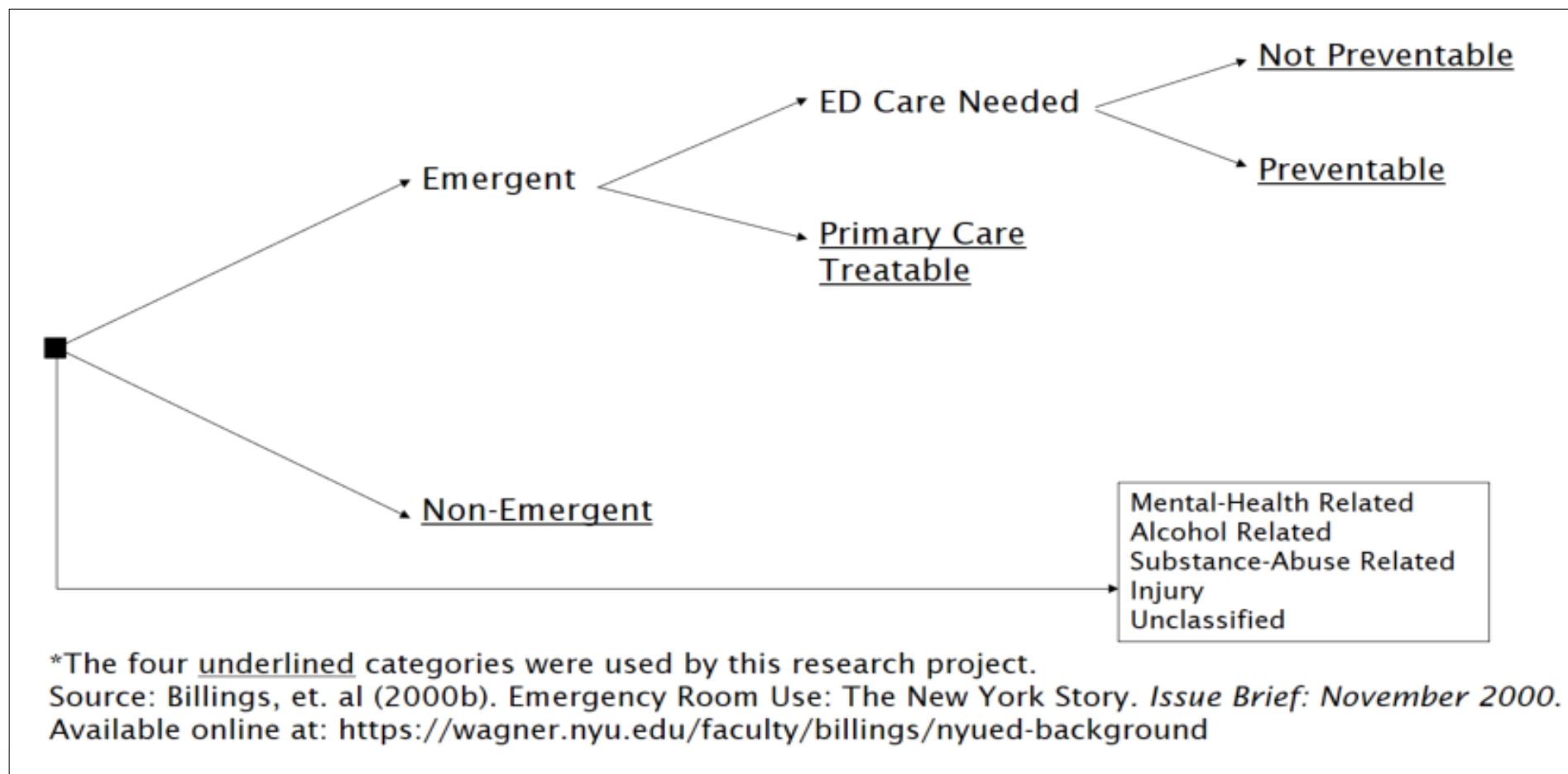
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# Acronyms Used

- ACS – American Community Survey

- ED – Emergency Department

- ICD – International Classification of Diseases

- MOE – Margin of error

- NYU – New York University

- SNAP – Supplemental Nutrition Assistance Program

- SDOH – Social Determinants of Health

- UDOH – Utah Department of Health

# References

- Billings, J., Parikh, N., & Mijanovish, T. (2000a). *Emergency Department Use in New York City: A Substitute for Primary Care?* Available online at https://wagner.nyu.edu/files/admissions/Billings%20-%20Emergency%20Department%20Use%20in%20NYC%20-%20A%20Substitute%20for%20Primary%20Care.pdf

- Billings, J., Parikh, N., & Mijanovish, T. (2000b). *Emergency Room Use: The New York Story.* Available online at https://wagner.nyu.edu/files/admissions/Billings%20-%20Emergency%20Room%20Use%20-%20The%20New%20York%20Story.pdf

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- Centers for Disease Control (CDC). (2010). Healthy People 2020. Available online at https://www.cdc.gov/nchs/healthy_people/hp2020.htm

- World Health Organization (WHO), Commission on Social Determinants of Health (2008). *Closing the Gap in a Generation: Health equity through action on the social determinants of health.* Available online at https://www.who.int/publications/i/item/WHO-IER-CSDH-08.1

# *Additional Slides*

# NYU ED Algorithm Categories



Emergent
- ED Care Needed
  - Not Preventable
  - Preventable
- Primary Care Treatable

Non-Emergent

Mental-Health Related
Alcohol Related
Substance-Abuse Related
Injury
Unclassified

*The four underlined categories were used by this research project.
Source: Billings, et. al (2000b). Emergency Room Use: The New York Story. *Issue Brief: November 2000.*
Available online at: https://wagner.nyu.edu/faculty/billings/nyued-background

# Summary of Raw UDOH File

*Table 1-1. Descriptive Statistics of PIKed UDOH Sample, 2013-2017*

| Year | Number of ED visits | Number of unique persons | Average Visits per person |
|---|---|---|---|
| 2013 | 683,500 | 410,600 | 1.7 |
| 2014 | 710,400 | 424,800 | 1.7 |
| 2015 | 737,500 | 442,400 | 1.7 |
| 2016 | 756,400 | 457,000 | 1.7 |
| 2017 | 736,100 | 453,000 | 1.6 |
| Total | 3,624,000 | 1,430,000 | 2.5 |

Source: Utah Department of Health (UDOH) (2018), Utah Healthcare Facility Limited Use Data Sets, Emergency Department Encounter Data, 2013-2017 (2018).

# Top Primary Diagnoses in Raw UDOH File

*Table 1-2. Top 5 Primary Diagnoses by ED Visit Type, 2013-2017*

| Type of Visit | Primary Diagnosis (with *Primary Diagnosis Code*) | |
| --- | --- | --- |
| | ICD-9 | ICD-10 |
| Preventable Emergency Care* | • Abdominal pain, other specified site (*9:78909*)<br>• Headache (*9:7840*)<br>• Acute upper respiratory infections of unspecified site (*9:4659*)<br>• Abdominal pain, unspecified site (*9:78900*)<br>• Other chest pain (*9:78659*) | • Unspecified abdominal pain (*10:R109*)<br>• Other chest pain (*10:R0789*)<br>• Headache (*10:R51*)<br>• Acute upper respiratory infection, unspecified (*10:J069*)<br>• Low back pain (*10:M545*) |
| Not Preventable | • Chest pain, unspecified (*9:78650*)<br>• Calculus of ureter (*9:5291*)<br>• Syncope and collapse (*9:7802*)<br>• Croup (*9:4644*)<br>• Calculus of kidney (*9:5920*) | • Chest pain, unspecified (*10:R079*)<br>• Syncope and collapse (*10:R55*)<br>• Acute obstructive laryngitis [croup] (*10:J050*)<br>• Calculus of kidney (*10:N200*)<br>• Calculus of ureter (*10:N201*) |

*Preventable Emergency Care visits are Non-emergent, Primary Care Treatable, or Preventable visits.

Source: Utah Department of Health (UDOH) (2018), Utah Healthcare Facility Limited Use Data Sets, Emergency Department Encounter Data, 2013-2017 (2018).

# Data Confidentiality

- Confidential data can only be used for statistical purposes as described.

- Project approved by UDOH Institutional Review Board (IRB) and executives, by Utah Health Data Committee at open, public meeting, and by State of Utah executives.

- Only minimum required data shared to complete aims of data agreement, and only minimum number of Census analysts were authorized access to confidential data.

- The record linkage identifiers used at the Census Bureau do not contain any health information or direct identifiers.

- Confidential data cannot be disclosed or published in any way that permits identification of a particular individual or an entity.

- Maintaining confidentiality of these data is guaranteed under Title 13 of the U.S. Code Section 9 and the Privacy Act of 1974.

# Disclosure Avoidance

- Formal review by the Census Bureau's Disclosure Review Board (DRB) before release of any results or products.

- Any sensitive and/or confidential data are fully protected from disclosure.

- The released data contain no personally identifiable information.
  - Moreover, the released data contain no information that can be made personally identifiable when combined with other publicly-available resources.

- UDOH's *Data Suppression and Data Aggregation Guidelines* have been met.
  - 1) a minimum reported cell size of 11; 2) base population of 100; 3) relative standard error (RSE) <=50%; and 4) risk ratio of disclosure and potential need for data suppression must be considered for each dataset.

- Additional Census Bureau DRB criteria have been met.