

Determining the Risk Factors for General Anesthesia Usage for Cesarean Section

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University of Pennsylvania, 2019

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Outline

- Background
- Project Overview
- My Role
 - Methods
 - Results
- My Learning Experience



Cesarean Section (CS)

- Abdominal surgery to deliver a baby
- 32% of deliveries in U.S. are by CS
 - CS is most common non-diagnostic surgical procedure in the country¹
- CS may be required for several reasons
- Due to advancements in surgical technique, women can request to have CS

Anesthesia Type for CS

- Neuraxial anesthesia CS (NACS) → state of consciousness
 - Spinals
 - Epidurals
- General anesthesia CS (GACS) → state of unconsciousness
 - Asleep with a breathing tube and ventilator

Neuraxial vs. General

Neuraxial Anesthesia		General Anesthesia
<ul style="list-style-type: none"> • Lower incidence rate of GA complications² • Lower rate of analgesic transfer to breast milk³ • Less need for opioids⁴ • Being awake for delivery 	P R O S	<ul style="list-style-type: none"> • Administered more quickly²
<ul style="list-style-type: none"> • Hypotension² • Severe postdural headaches² • Longer to administer² • Uncomfortable for patients already in pain 	C O N S	<ul style="list-style-type: none"> • Failed intubation² • Aspiration of stomach contents during intubation² • Intraoperative awareness² • Respiratory problems² • Greater maternal blood loss²

2. Afolabi, Bosede B., and Foluso EA Lesi. "Regional versus general anaesthesia for caesarean section." *The Cochrane Library* (2012).

3. Sumikura, Hiroyuki, Hidetomo Niwa, Masaki Sato, Tatsuo Nakamoto, Takashi Asai, and Satoshi Hagihira. "Rethinking general anesthesia for cesarean section." *Journal of anesthesia* 30, no. 2 (2016): 268-273.

4. Dahl, Jørgen B., Inge S. Jeppesen, Henrik Jørgensen, Jørn Wetterslev, and Steen Møiniche. "Intraoperative and Postoperative Analgesic Efficacy and Adverse Effects of Intrathecal Opioids in Patients Undergoing Cesarean Section with Spinal Anesthesia A Qualitative and Quantitative Systematic Review of Randomized Controlled Trials." *Anesthesiology: The Journal of the American Society of Anesthesiologists* 91, no. 6 (1999): 1919-1919.

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Systematic Review

- Identify factors associated with the use of GACS
- PubMed, MEDLINE, Scopus, Web of Science, and Ovid Embase databases
- 14 studies from 9 countries between 1998-2015
- Emergency CS, maternal demographics, and maternal comorbidities



GACS Indications/Associations

Indications

- Emergent cases
- Neuraxial contraindications
- Failed neuraxial anesthesia
- Maternal request

Associations

- BMI < 40
- Age > 35
- Non-obstetric anesthesiologists
- Perceived lack of time to give epidural
- VAS > 3 during labor
- Black race
- Hispanic ethnicity

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Project Overview

- **Question:** What factors affect clinicians' decisions about obstetric anesthesia care?
- **Goal:** To determine the risk factors of GACS and better understand clinician decision-making to ultimately, mitigate the use of GACS
- Mixed methods study
 - Quantitative: retrospective cohort study
 - Qualitative: surveys and interviews

Significance

- Large, young population of people affected
 - Childbirth is the most common reason for hospital admission in the US⁵
- Disparities in care
 - 6% of CS in U.S. are managed with general anesthesia⁶
 - 9% of CS at HUP are managed with general anesthesia

5. Lange, Elizabeth MS, Suman Rao, and Paloma Toledo. "Racial and ethnic disparities in obstetric anesthesia." In *Seminars in Perinatology*. WB Saunders, 2017.

6. Juang, Jeremy, Rodney A. Gabriel, Richard P. Dutton, Arvind Palanisamy, and Richard D. Urman. "Choice of Anesthesia for Cesarean Delivery: An Analysis of the National Anesthesia Clinical Outcomes Registry." *Anesthesia & Analgesia* 124, no. 6 (2017): 1914-1917.

Specific Aims

1. Build two parallel databases (local and national) to elucidate variability relating to obstetric anesthesia care.
1. Using multivariable regression and the databases created in SA1, identify the patient-, provider-, and system-level risk factors for GACS.
1. Using qualitative methods, develop theory about clinician decision-making in obstetric anesthesia care.



Hypotheses

Patient-level

1. Demographics, obesity/BMI, parity, and intrapartum disorders are associated with GACS.
2. GACS rate is higher for CS during night and weekend shifts.

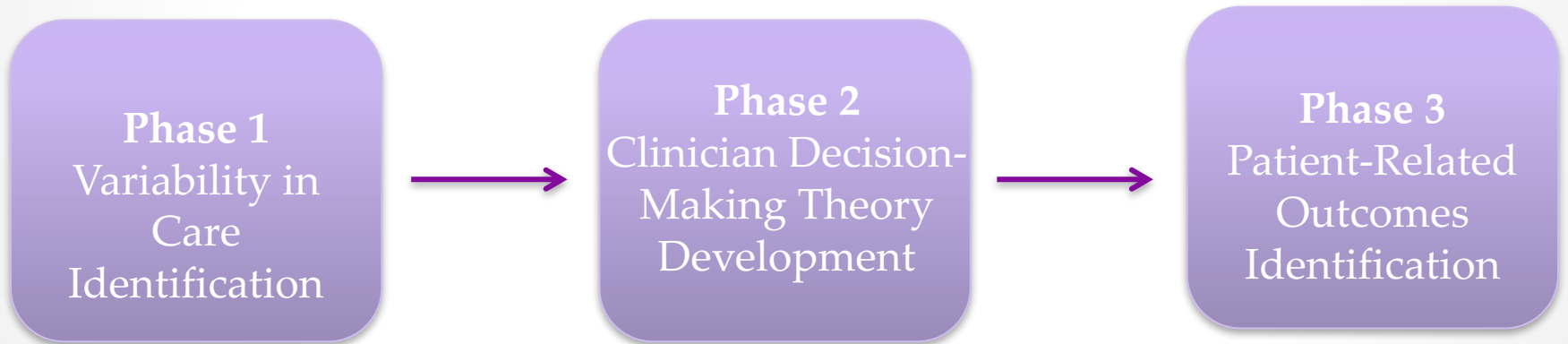
Provider-level

1. Obstetric anesthesiologists perform less GACS compared to non-obstetric anesthesiologists.
2. The rate of GACS is lower for patients admitted to Family Medicine service compared to Obstetrics service.

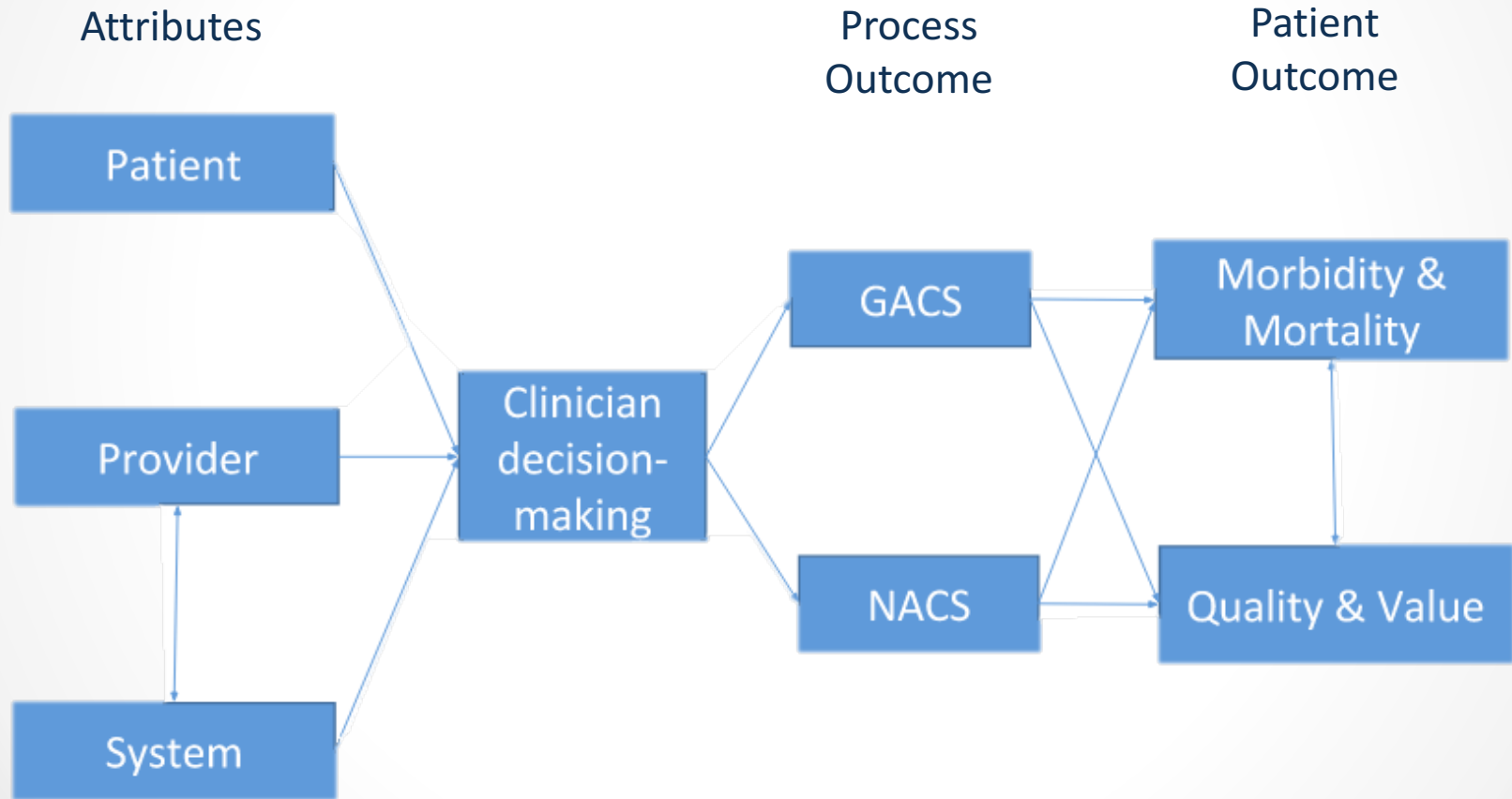
System-level

1. The greater the distance between labor room and operating room, the lower GACS rate is.

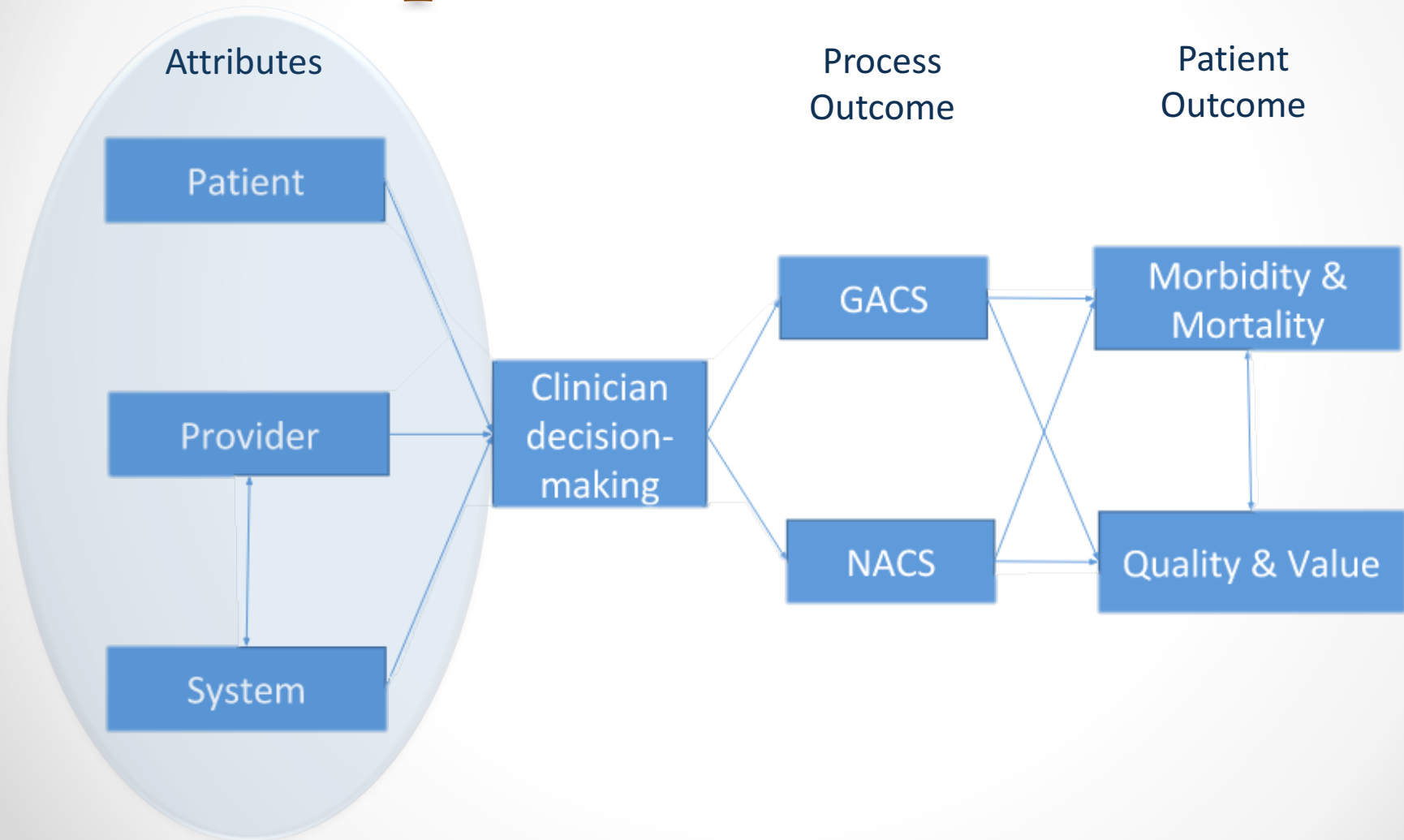
Study Design



Conceptual Model



Conceptual Model



Penn Obstetric Database

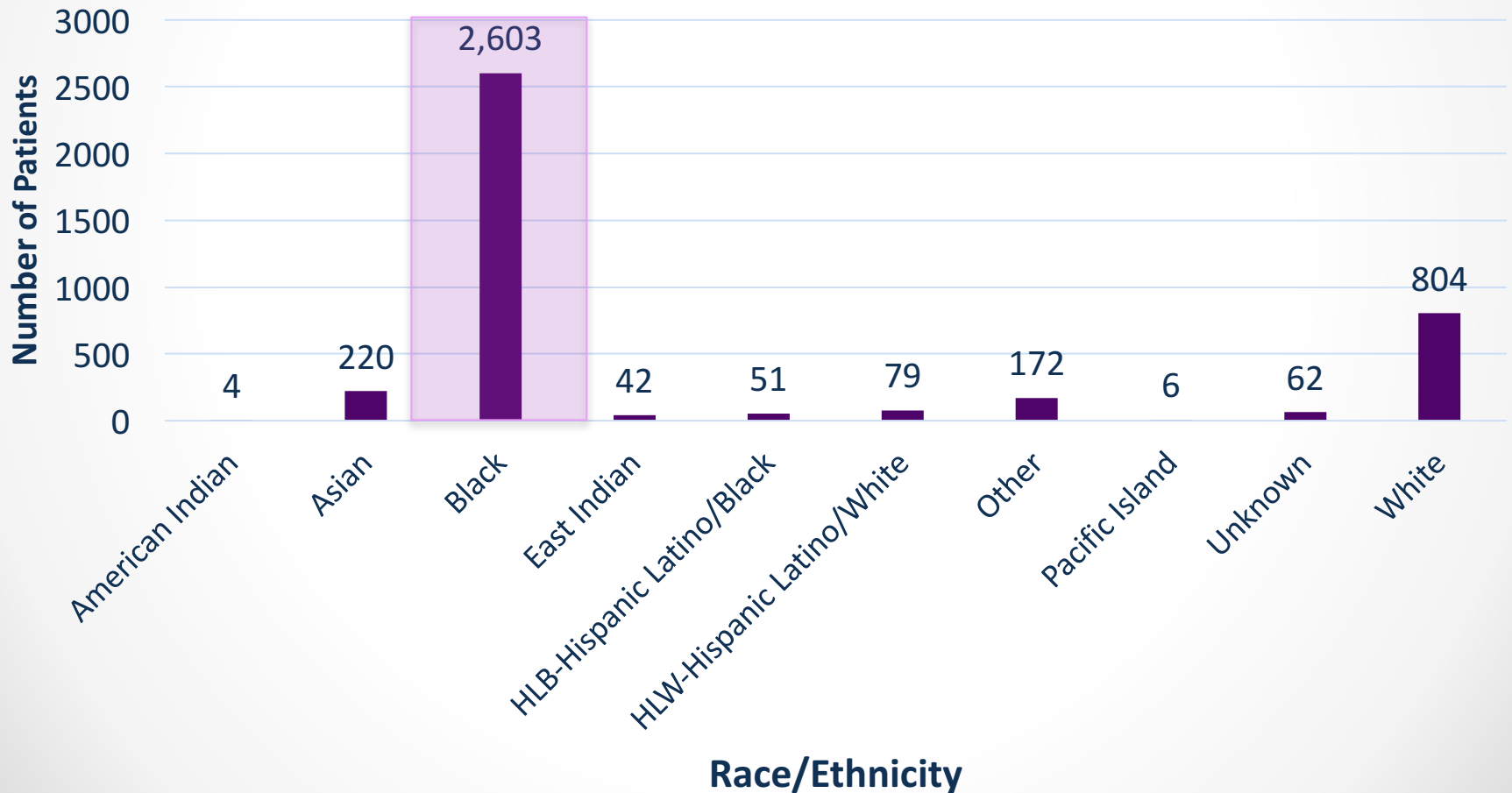
- 3 Data Sources
 1. Centricity Perinatal & Epic Perinatal
 2. Inpatient medical records
 3. Anesthesia Preoperative Forms
- Includes CS in the HUP L&D unit from July 2013 to June 2017
- 4,034 CS
- > 40 variables

Variables of Interest in POD

Patient-level characteristics	Provider-level characteristics	System-level characteristics
<ul style="list-style-type: none">• Age• Race/ethnicity• ZIP code• Marital status• Smoking status• Prenatal care service• Parity• Intrapartum disorders	<ul style="list-style-type: none">• Day, month, and time of delivery• Obstetric anes vs. non-obstetric anes• Gender of anes• MFM ob vs. non-MFM ob	<ul style="list-style-type: none">• On-call (night and weekend) assignment of physicians

POD Race Breakdown

HUP Labor and Delivery Patient Population

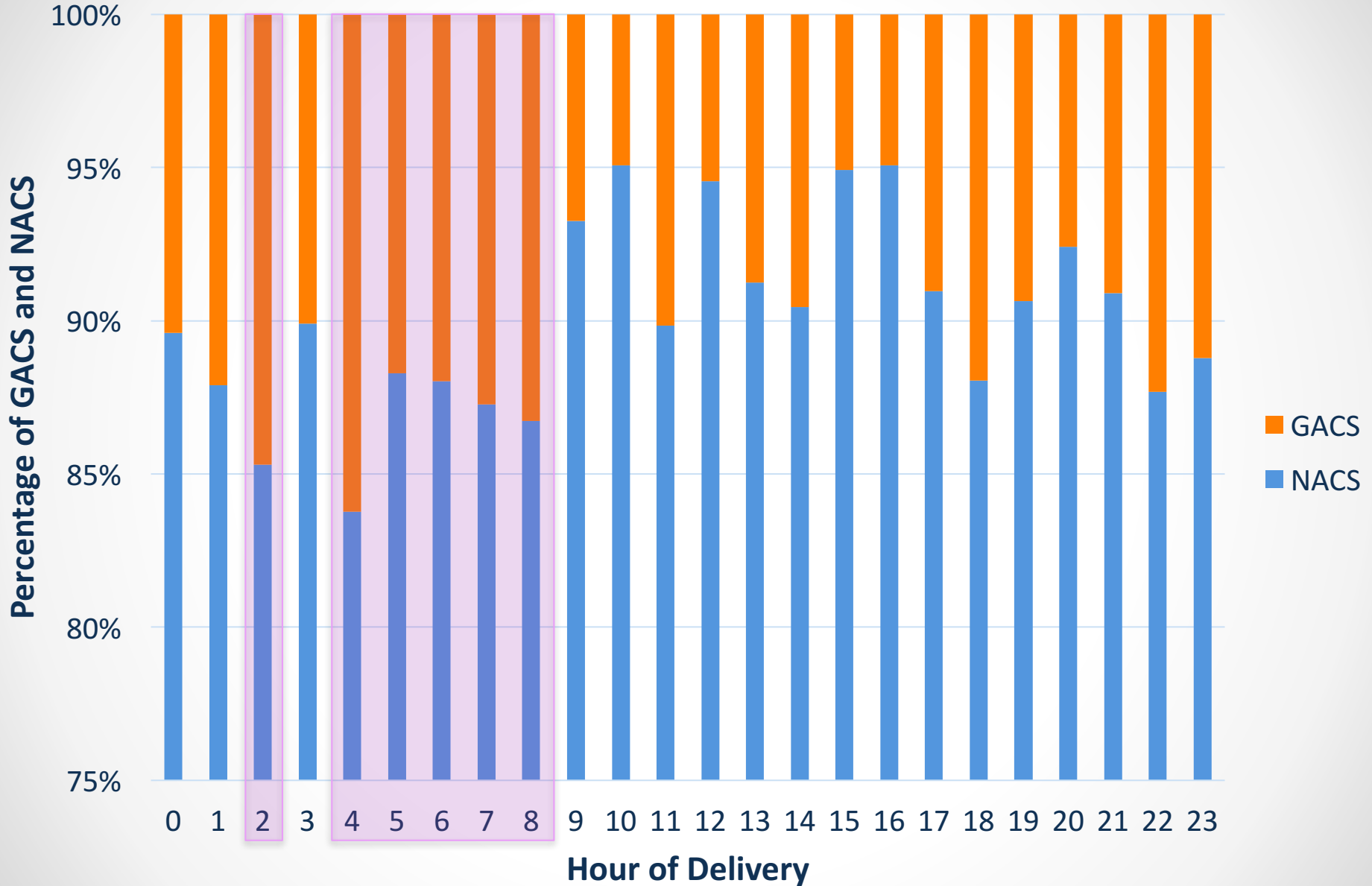


Race/Ethnicity for Anesthesia Type



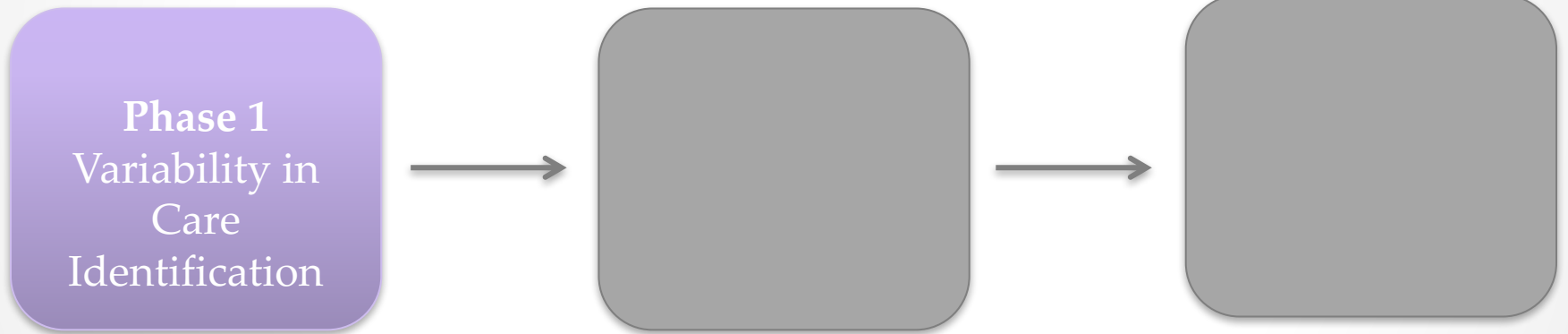
Pr = 0.001

Hour of Delivery by Anesthesia Type



Pr = 0.006

My Role



My Role: Specific Aims

1. Use the Penn Obstetric Database (POD) and multivariable regression analysis to identify patient-level risk factors for GACS.
1. Learn about the challenges in defining variables to understand the effects of risk factors.

My Variable of Interest in POD

Patient-level characteristics	Provider-level characteristics	System-level characteristics
<ul style="list-style-type: none">• Age• Race/ethnicity• ZIP code• Marital status• Smoking status• Prenatal care service• Parity• Intrapartum disorders		

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ZIP Code Variable

- Proxy for household income
- **Hypothesis:** Lower household incomes are associated with GACS.

My Role: Methods

- 1000 patient chart review
 - Epic data June 2016 – February 2017
 - REDCap format conversion with Data Import Tool on Excel
- Merging databases
 - Centricity database and Epic database
 - Overlap July 2013 to June 2017
- Classify zip codes by median household income
 - Via Esri
- Data analysis
 - Via STATA 14.2

Esri

- GIS mapping software
- Updated annually
- Data sources
 - American Community Survey (1-year and 5-year estimates)
 - Bureau of Economic Analysis' Local Personal Income series
 - Current Population Survey
 - Bureau of Labor Statistics' Consumer Price Index

ZIP Lookup

What Your ZIP Code Says About You.

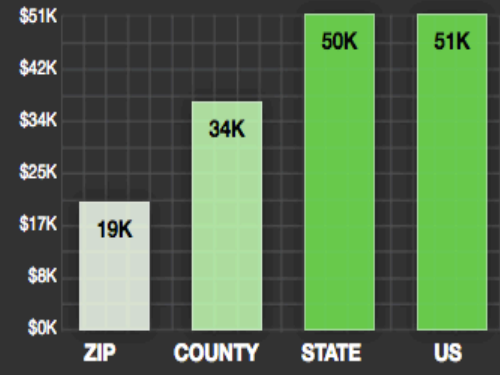


- Tapestry
- Income**
- Age
- Population Density

For ZIP Code

Median Household Income

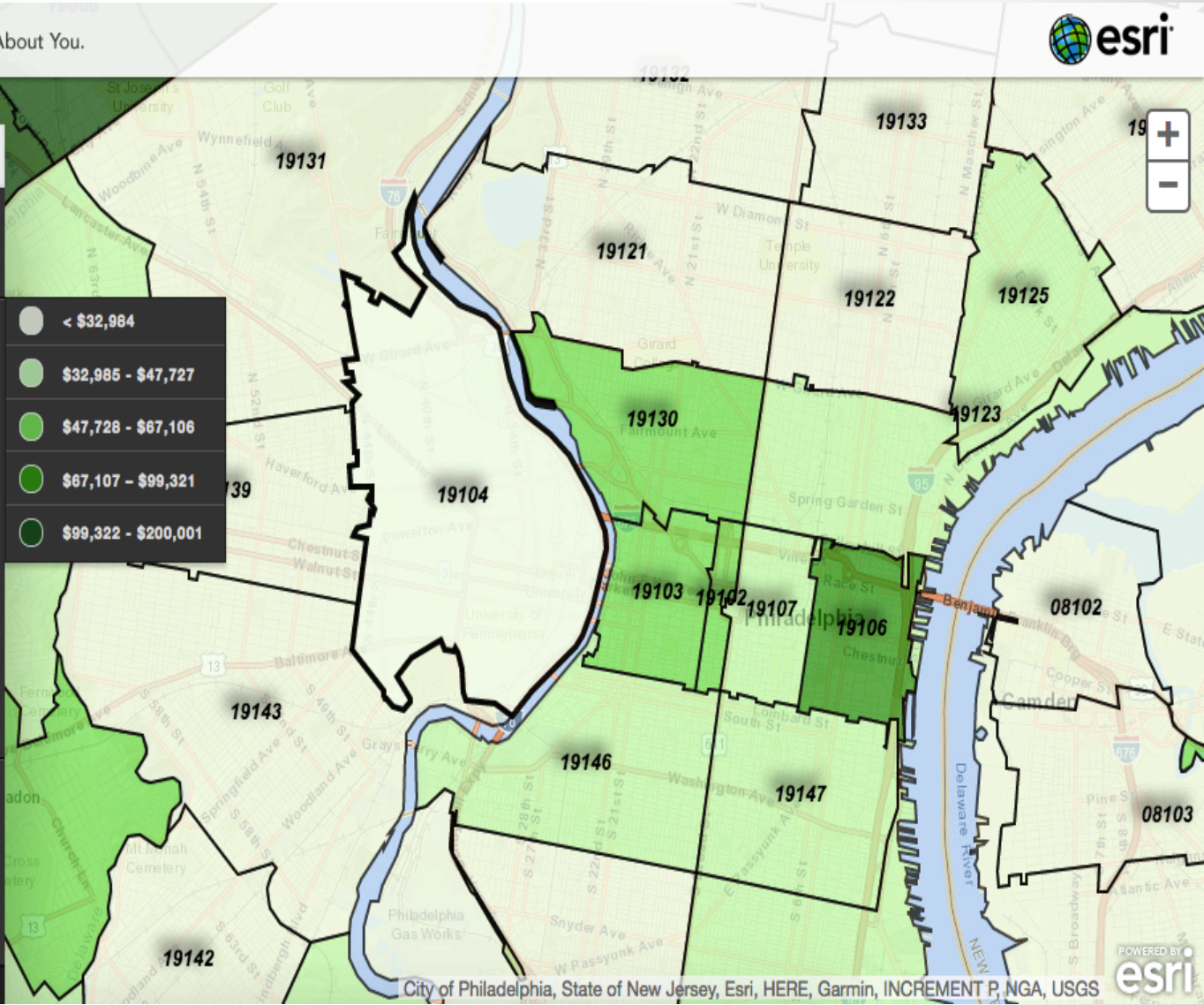
Legend



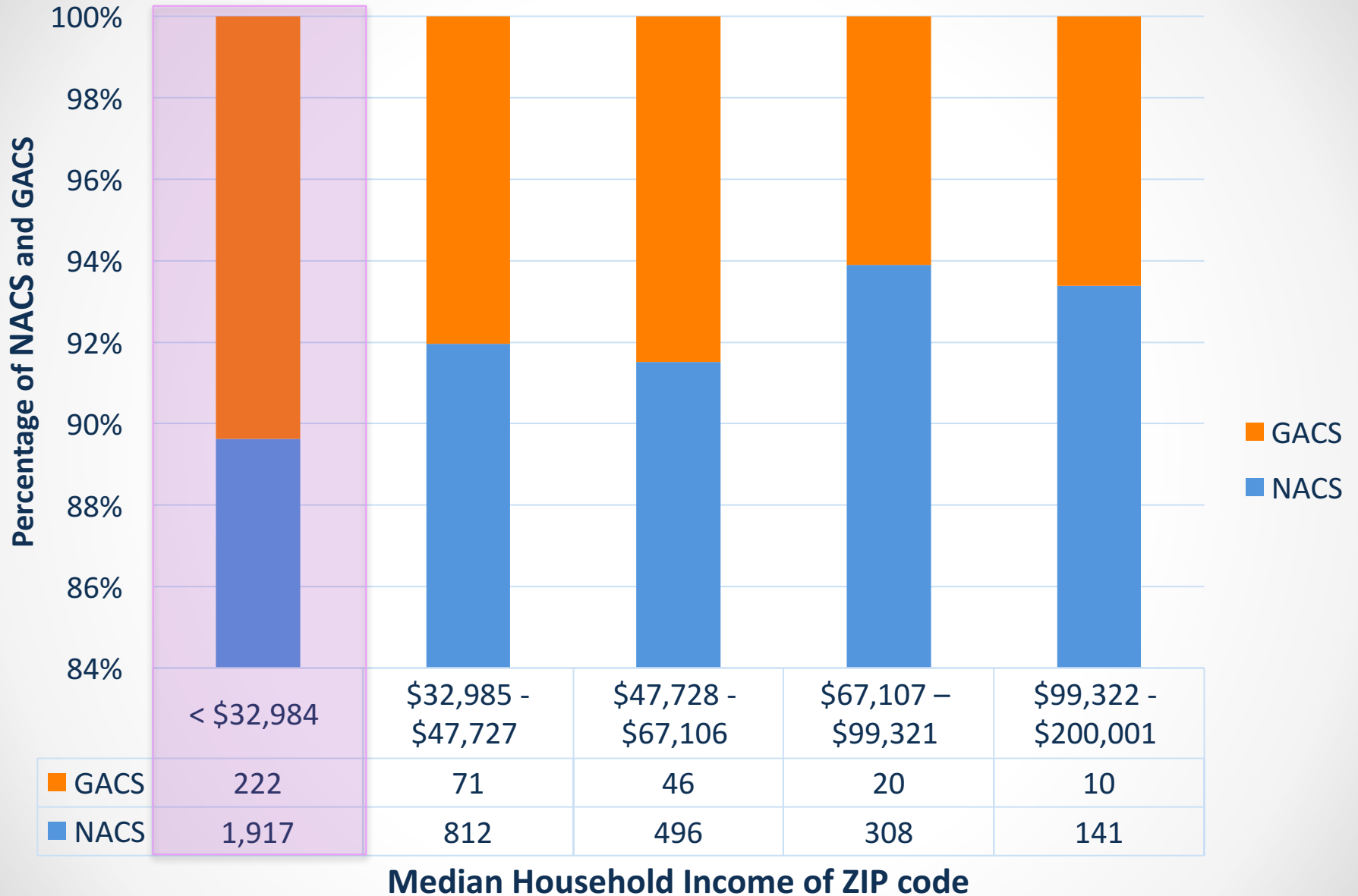
- < \$32,984
- \$32,985 - \$47,727
- \$47,728 - \$67,106
- \$67,107 - \$99,321
- \$99,322 - \$200,001

Want to know more? Esri provides comprehensive demographic, lifestyle, business, and consumer data for areas large and small—from the US down to block groups.

- [More about Demographics](#)
- [Contact Us](#)

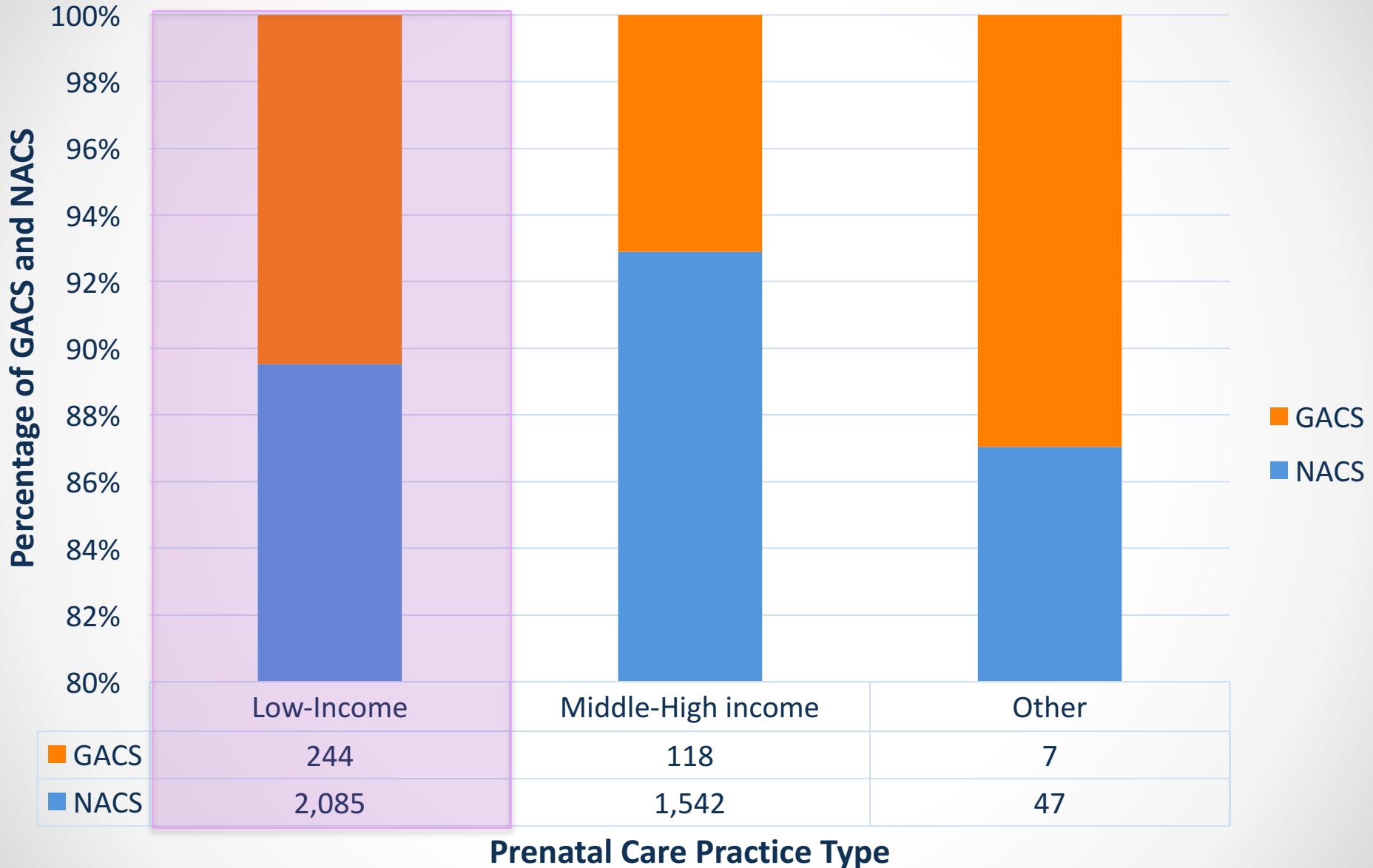


Median Household Income for Anesthesia Type



Pr = 0.035

Prenatal Care Practice for Anesthesia Type



Pr = 0.001

Patient-related Variable Associated with GACS	Odds Ratio	95% Confidence Interval	p-value
Univariable Regression			
Black race	1.74	1.36-2.22	0.00
Smoking status	1.42	1.12-1.81	0.00
Single marital status	1.76	1.38-2.24	0.00
Low-income Z.I.P. code	1.38	1.11-1.72	0.00
Low-income prenatal care practice	1.48	1.34-2.51	0.00
Multivariable Regression			
Black race	1.38	1.05-1.88	0.03
Smoking status	1.38	1.09-1.76	0.00
Single marital status	1.31	0.99-1.74	0.54
Low-income Z.I.P. code	1.05	0.82-1.33	0.70
Low-income prenatal care practice	1.15	0.89-1.48	0.25

**Controlled for age, ASA status, HTNsive disorders, neurologic disorders, hematologic disorders, on-call deliveries, high-risk obstetrics specialty, obstetric anesthesia specialty, gestational age at delivery, obesity, diabetes, thyroid disease, depression.*

Limitations

- ZIP code may not be the best surrogate for household income
 - Ex: 19104 → median household income of ~\$19,000 may be falsely low
 - More impoverished areas further west, wealthier areas closer to Penn
 - Substantial amount of patients from that ZIP code
 - Proxy for distance from hospital instead
- Secondary data

My Learning Experience

- A well-organized and well-cleaned database makes the difference during data analysis
- Being thorough
- STATA basics
- Developing a research question
- L&D shadowing experience



Acknowledgements

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Safa Browne



Questions?

