COUNTY VARIATIONS IN SEATBELT USE: A MULTILEVEL MODELING STUDY

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Background

- Seatbelt Use Saves lives
- NHTSA does a yearly national survey of seatbelt use.
- Survey is designed to identify rates and changes in rates at state level
- This level of analysis may mask significant geographic variability in seatbelt use within state
- We wanted to examine variability in seatbelt use at more local levels
- Wanted to understand variables that might account for variability in local rates of seatbelt use
- Gain a better understanding of how primary seatbelt laws work in influencing seatbelt use

Data Set

- CDC's Behavioral Risk Factor Surveillance System (BRFSS)

- Nationally representative telephone survey done by 50 states, DC, and US territories

- In 2002, a seatbelt question was included in the core module

- The BRFSS survey identifies county data for larger counties within many of the states

- This allowed us to create a data set that has self-reported seatbelt use at county level

Counties

- ◆ Selected counties with at more than 100 data points in 2002
  - ◆ 73 counties
  - ◆ 93,523 Individuals
  - ◆ Representative of 33% of the American population

- ◆ Obtained Census data for each of these counties
  - ◆ Using 165 counties and 18 variables, conducted a factor analysis
  - ◆ Resulted in 5 orthogonal census factors that described differences in counties

Factor Analysis of Census Data for 165 US Counties

	Poverty	Elites	Size	Density	Segregated Crowded
Poverty	0.92				
Unemp	0.87				
PerWhite	-0.85				
PerBlack	0.83			-0.45	
Less25k	0.79	-0.48			
Middle	-0.76				
LessHS	0.71	-0.55			
JustHSGrad		-0.90			
GradDeg		0.83			
Bach	-0.54	0.67			
More100k	-0.47	0.65			
Population			0.94		
PopWhite			0.92		
PopBlack			0.83		
PerOther				0.70	
Density				0.65	
Segregation Index					0.81
Area			0.48		-0.70

Self-reported Seatbelt Use

- Self-reports overestimate observed levels of belt use
- However, reported seatbelt use is strongly correlated with observed use at the state level
- We can use these data to study variability in seatbelt use without being too concerned that the rate estimates may be higher than observed level

Seatbelt Question

How often do you use seatbelts when you drive or ride in a car?

Value	Value Label	Frequency	Percentage
1	Always	189,610	77.27
2	Nearly always	27,729	11.3
3	Sometimes	13,041	5.31
4	Seldom	6,379	2.6
5	Never	7,810	3.18
7	Do not know/Not sure	146	0.06
8	Never drive or ride in a car	572	0.23

Recoded Seatbelt Use

- 0 = Less than Always
- 1 = Always
- When weighted data is used
  - 80.7% in the full survey report always using seatbelts
  - 80.9% in the set of data selected for analysis report always using seatbelts

State Law

- Primary – can be stopped and ticketed for not wearing a seatbelt
- Secondary – can be ticketed for NOT wearing a seatbelt if stopped for some other reason
- Used the laws in effect in 2002

Statistical Analysis

- Used SUDAAN for descriptive statistics
  - Takes into account multi-stage sampling of BRFSS
  - Used case weights to make results representative of target population
- For Multi-level modeling, used HLM program
  - Level 1 models created from BRFSS data
  - Level 2 models created using 2000 Census data factor scores plus state law

Sample Description

	Male	Female	Total
Non-Hispanic White	28747	41720	70467
Non Hispanic Black	2942	5452	8394
Hispanic	2424	3568	5992
Other	3804	4866	8670
Total	37917	55606	93523

Individual Level 1 Predictors
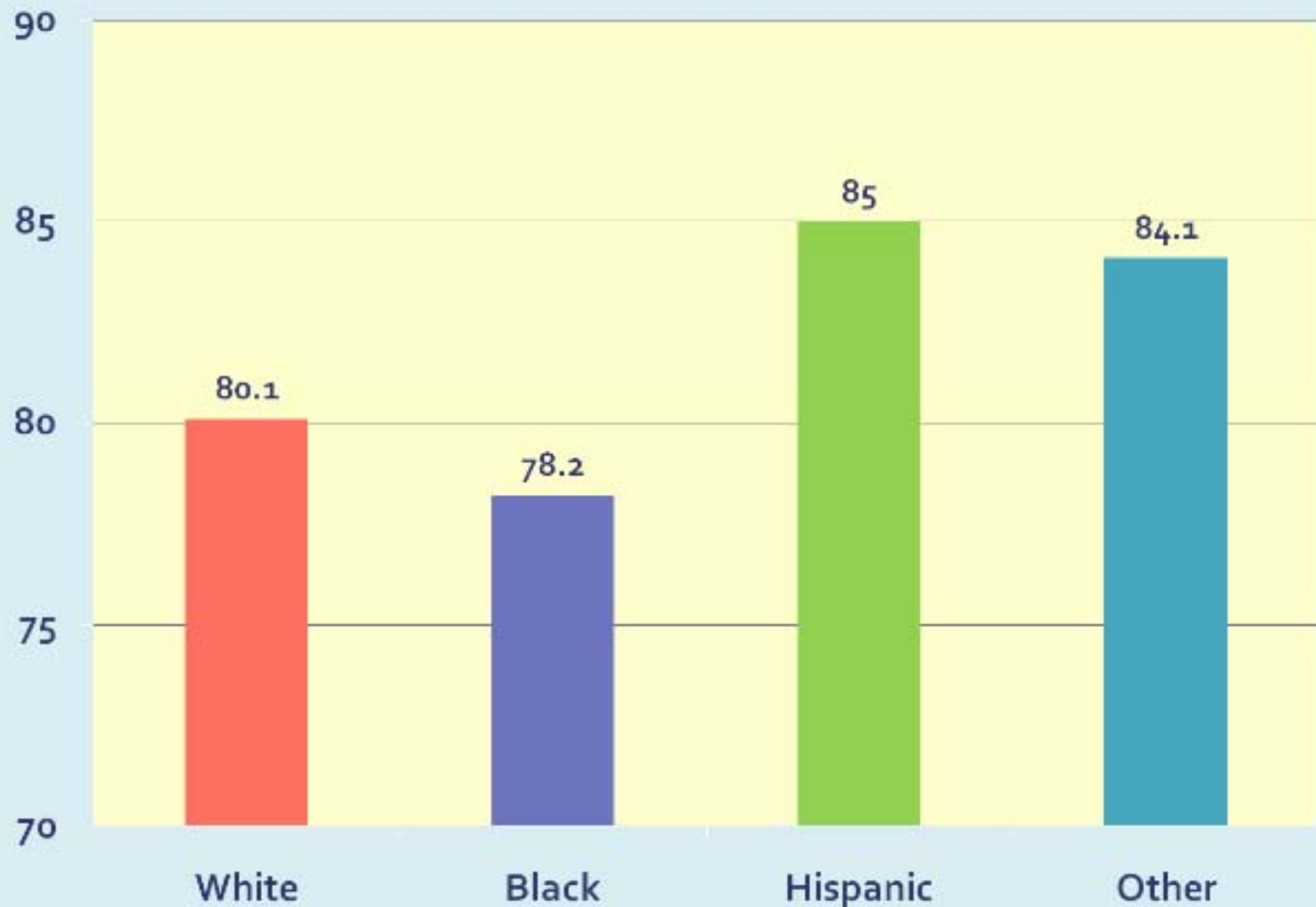
- Sex (male, female)
- Race Ethnicity (White, Black, Hispanic, Other)
- Age (18-29, 30-44, 45-64, 65+, unknown)
- Education (dropout, HS, Some College, College Grad, Unknown)
- Income (Unknown, low (<$25k), med ($25-50k), High (>$50k)
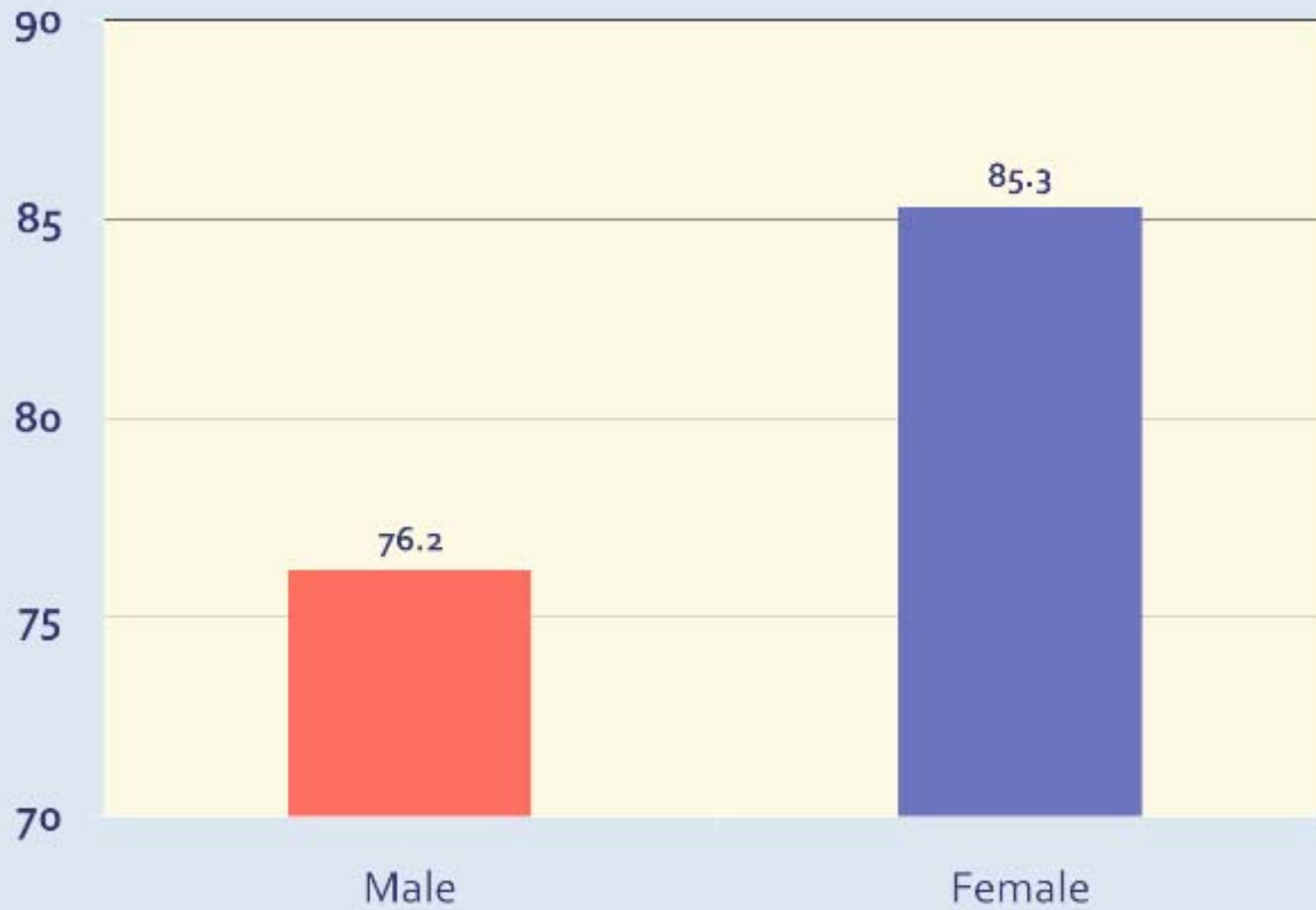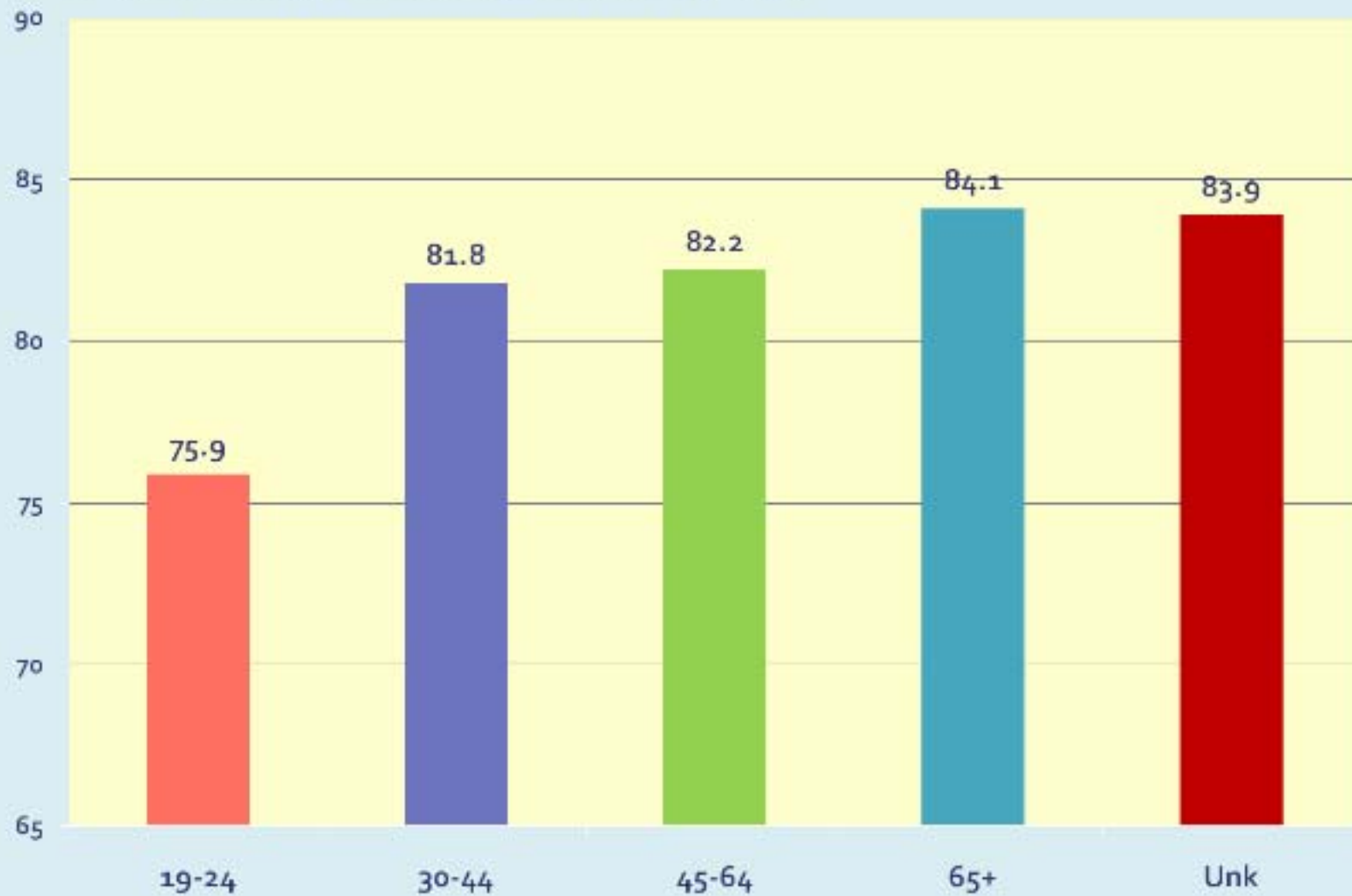
% Who Always Wear Seatbelts by Ethnicity P < 0.0001
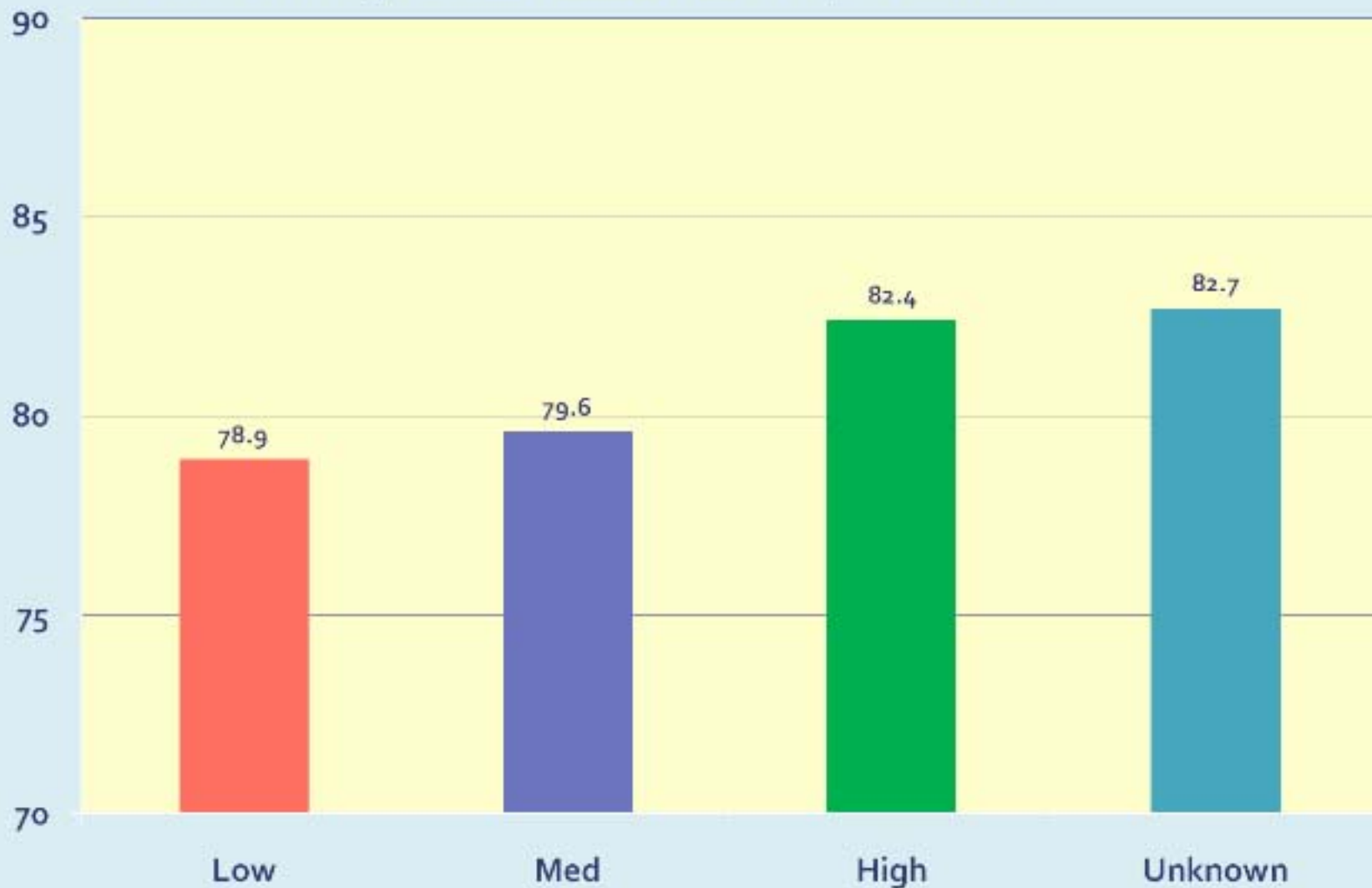
% Who Always Wear Seatbelts by Income   P < 0.0001

% Who Always Wear Seatbelts by Education   P < 0.0001

Category	Value
Dropout	77.6
HS	77.1
Some College	80.5
College Grad	85.4
Unknown	87.4
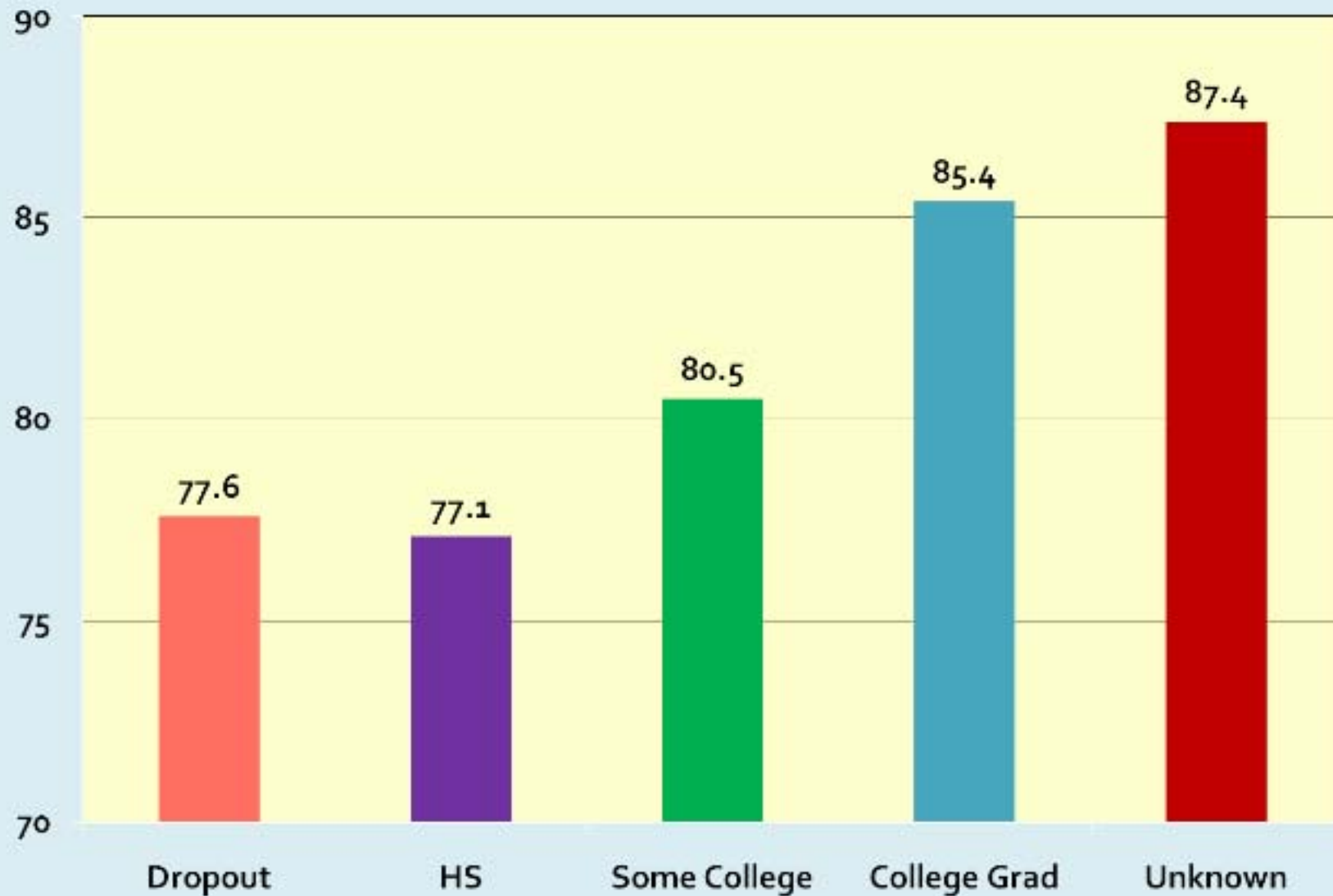
% Who Always Wear Seatbelt by State Law   P < 0.0001
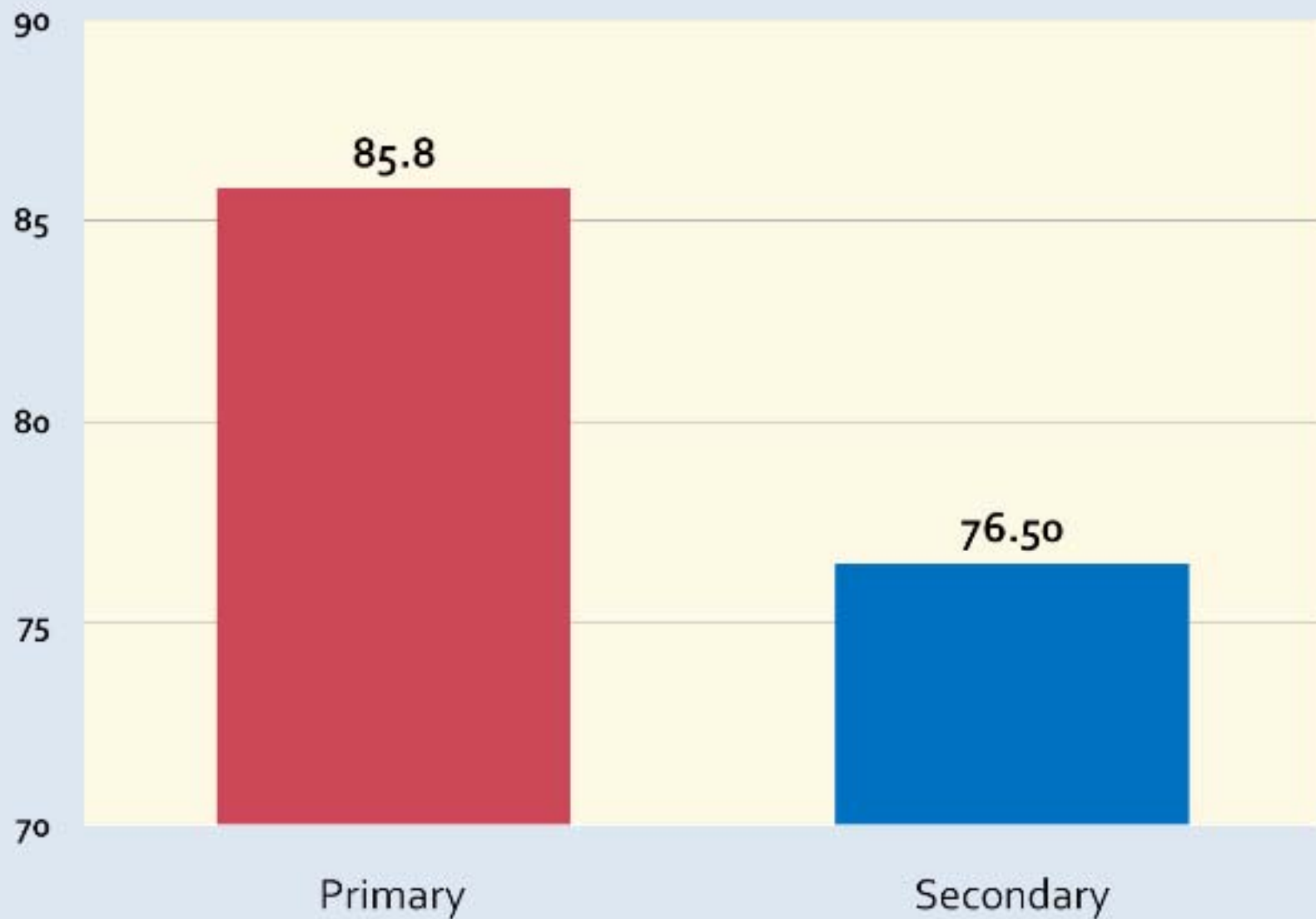
Place Differences

10 Highest

County	Rate
Los Angeles, CA	93.1
Honolulu, HI	91.9
Cobb, GA	91.3
Anne Arundel, MD	90.7
Orange, NC	90.7
Fulton, GA	90.4
Baltimore City, MD	89.9
Orange, FL	89.7
Baltimore, MD	89.3
King, WA	89.3

10 Lowest

County	Rate
Philadelphia, PA	63.3
Milwaukee, WI	64.9
Essex, MA	69.6
Delaware, PA	70.3
Allegheny, PA	70.9
Worcester, MA	71.5
Pulaski, AR	72.0
Darlington, SC	72.0
Suffolk, MA	72.1
Sedgwick, KS	73.0

Multi-Level Models

- Start with people nested within places (Counties)
- Level 1 - Measure characteristics, behaviors, and health outcomes of Individuals (BRFSS survey)
- Level 2 - Independently find ways to measure characteristics of the places (US census)
- After controlling for level 1 variables, can you use level 2 variables to better understand outcomes
  - Intercept models look at how prevalence of seatbelt use differs by county
  - Slope models look at how the importance of a predictor differs by county

Level One Model of Seatbelt Use

Predictor	Coefficient	t-test	Df	p-value	Odds Ratio
Female vs Male	0.67	26.85	53449	0.0000	1.945
Black vs White	-0.08	-1.56	53449	0.1180	0.920
Hispanic vs White	0.32	3.86	53449	0.0000	1.372
Other vs White	0.06	1.16	53449	0.2470	1.063
Inc Unk vs High	0.04	0.74	53449	0.4580	1.040
Inc Low vs High	-0.14	-3.55	53449	0.0010	0.868
Inc Med vs High	-0.11	-3.52	53449	0.0010	0.895
Age 18_29 vs 65+	-0.57	-12.23	53449	0.0000	0.563
Age 30_44 vs 65+	-0.30	-9.04	53449	0.0000	0.743
Age 45_64 vs 65+	-0.25	-7.10	53449	0.0000	0.782
Dropout vs HS	-0.15	-4.19	53449	0.0000	0.860
SOME COL vs HS	0.17	6.80	53449	0.0000	1.189
Grad vs HS	0.53	12.61	53449	0.0000	1.694
Ed Unk vs HS	0.35	1.56	53449	0.1200	1.423

Risk – Med income, ages < 65, dropout
Protective – Female, Hispanic , College

Level 2 Model of Intercepts

Predictor	Coefficient	t-test	Df	p-value	Odds Ratio
Secondary Law	-0.55	-7.66	66	0.0000	0.578
Wealth-Poverty	-0.15	-3.41	66	0.0010	0.857
Population	0.03	1.10	66	0.2780	1.034
Elites	0.01	0.18	66	0.8570	1.005
Density	0.11	3.07	66	0.0040	1.116
Segregated	-0.11	-3.46	66	0.0010	0.898

Seatbelt rates
1. goes down with secondary law
2. Goes down as poverty increases
3. Increases with urban density
4. Decreases with racial segregation

Level 2 Model of Slope for Male

Predictor	Coefficient	t-test	p-value	P-value2	Odd Ratio
Secondary Law	-0.06	-1.07	66	0.289	0.941
Wealth-Poverty	-0.04	-1.46	66	0.148	0.957
Population	-0.04	-2.70	66	0.009	0.961
Elites	-0.07	-3.10	66	0.003	0.934
Density	0.02	0.91	66	0.369	1.021
Segregated	-0.03	-2.01	66	0.048	0.969

Importance of Gender for Seatbelt Rates
1. Is not associated with seatbelt Law
2. Is less important as population increases
3. Is less important as the number of Elites increases
4. Is less important as segregation increases

Level 2 Model of Slope for African American

Predictor	Coefficient	t-test	p-value	P-value2	Odd Ratio
Secondary Law	-0.22	-2.66	66	0.0100	0.615
Wealth-Poverty	0.00	-0.09	66	0.9320	0.869
Population	0.02	0.84	66	0.4030	1.045
Elites	0.07	1.54	66	0.1290	1.024
Density	-0.05	-1.40	66	0.1650	1.117
Segregated	-0.04	-0.65	66	0.5160	0.911

Importance of African American for Seatbelt Rates decreases under a primary seatbelt law

Findings

- Self-reported rates of seatbelt use vary considerably from county to county
- Can model individual level risk factors including age, income, education, ethnicity, and gender
- After controlling for individual differences, seatbelt rates in a county increase with primary law, increased wealth, and greater urban density
- Gender is less important in larger, urban areas with many people who are high in education and wealth
- Primary seatbelt law has a clear impact on overall rates in an area, but does not erase the sex difference
- Primary seatbelt laws decrease the importance of black-white differences in seatbelt use

Implications

- State laws are important and we need to encourage the rest of the states to pass primary laws
- State-wide campaigns may be less effective than strategies that are targeted to a specific area
- Interventions may need to be tailored to characteristics of the place to be optimally effective
- Need to pay attention to place differences rather than aggregate them when conducting passenger restraint research

Limitations

- May be mislead by self-reported seatbelt use, especially if reporting accuracy varies by place
- Need to confirm these findings with observational data
- Census data captures limited information about place difference
- Need to develop better sources of level 2 data
- Because only larger counties included, may underestimate the importance of urban-rural differences