Speeders, Sloths, and Average Janes & Joes

Using Web Survey Response Times to Examine Estimate Quality

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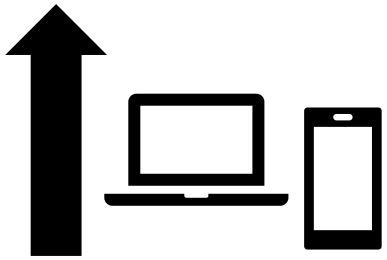
Disclaimer: The views expressed in this presentation are those of the author and do not reflect the views or position of the Department of Justice.

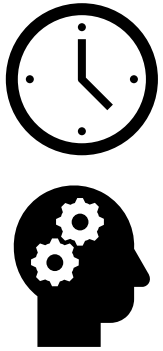
Overview

1. Statement of the Problem
2. Literature on outlier detection and data quality
3. Methodology: data source and analytics
4. Speeders and sloths
5. Research questions:
   - How many speeders and sloths?
   - Who are the speeders and sloths?
   - How does adjusting for outliers impact estimates?
6. Implications

Research Problem

- Self-administered web-based surveys are ubiquitous and growing
- Lack of an interviewer reduces control over interview process
- Reading, processing, and understanding questions takes time
- Timing measures have been used as potential indicators of possible measurement errors in surveys
- Respondents may spend too little or too much time on cognitive exercise
- **How should we treat outliers?**





Speeder → **Error?**

Average Jane & Joe → **Quality response**

Sloth → **Error?**

Literature Review

But why do respondents speed or move slowly?

Shorter response times:

- Indicator of satisficing/lack of motivation
- Reflect simpler mental processes and more stable/mature attitudes
- Reflection of survey design/cognitive task (efficient design, simple burden)

(Simon 1957; Krosnick 1991; Bassili and Fletcher 1991; Krosnick et al. 2002; Bassili, 1996; Tourangeau, Couper and Conrad 2004; Yan and Tourangeau 2008)

Longer response times:

- Reflect disengagement or distraction
- Low cognitive skills/uncertainty
- Attention and careful reflection
- Reflection of survey design/cognitive task (poorly designed, greater burden)

(Heerwegh 2003; Draisma and Dijkstra 2004; Wagner-Menghin, 2002; Bassili 1996; Bassili and Scott, 1996; Bassili and Krosnick, 2000; Yan and Tourangeau, 2008)

Literature Review

<u>Prevalence and Impact</u>:

Greszki et al. (2015)

- Examined speeding through surveys and showed that speeding occurs, but not at high levels.
- Limited impact on substantive estimates.

Greszki, Meyer and Schoen (2014)

- Relative exclusion of speeders, 50%, 40% and 30% faster than median response.
- Marginal distributions do not change considerably when speeders excluded

Research focused on speeders and less on those who take very long times.

Methodology- Data Source and Analytics

Campus Climate Survey Validation Study (CCSVS)

- Self-administered survey on experiences with sexual victimization
- 23,000 student respondents across 9 postsecondary campuses, oversampled females (2:1)
- Confidential, web-based survey, functional on smartphones, tablets, laptops, desktops
- Incentives were used to increase response rates (randomly assigned $10, $25, or $40)

- Instrument design:

  Screener on experiences with various forms of sexual victimization
  - Series of incident-level follow-up

- Response rates across all 9 schools: 54% for females, 40% males

Research Questions

1. How many speeders and sloths?
   - Definitional issues: How do you define a fast/slow survey time?

2. Who are the speeders and sloths?
   - Examine respondent characteristics

3. How does adjusting for outliers impact estimates?
   - How to treat outliers?
   - Bias
   - Precision/sample sizes

How many speeders and sloths?

How to detect speeders and sloths?

Zhang and Conrad (2013)

- Speeding threshold set at 300 millisecond per word, reading speed, times number of word in question.

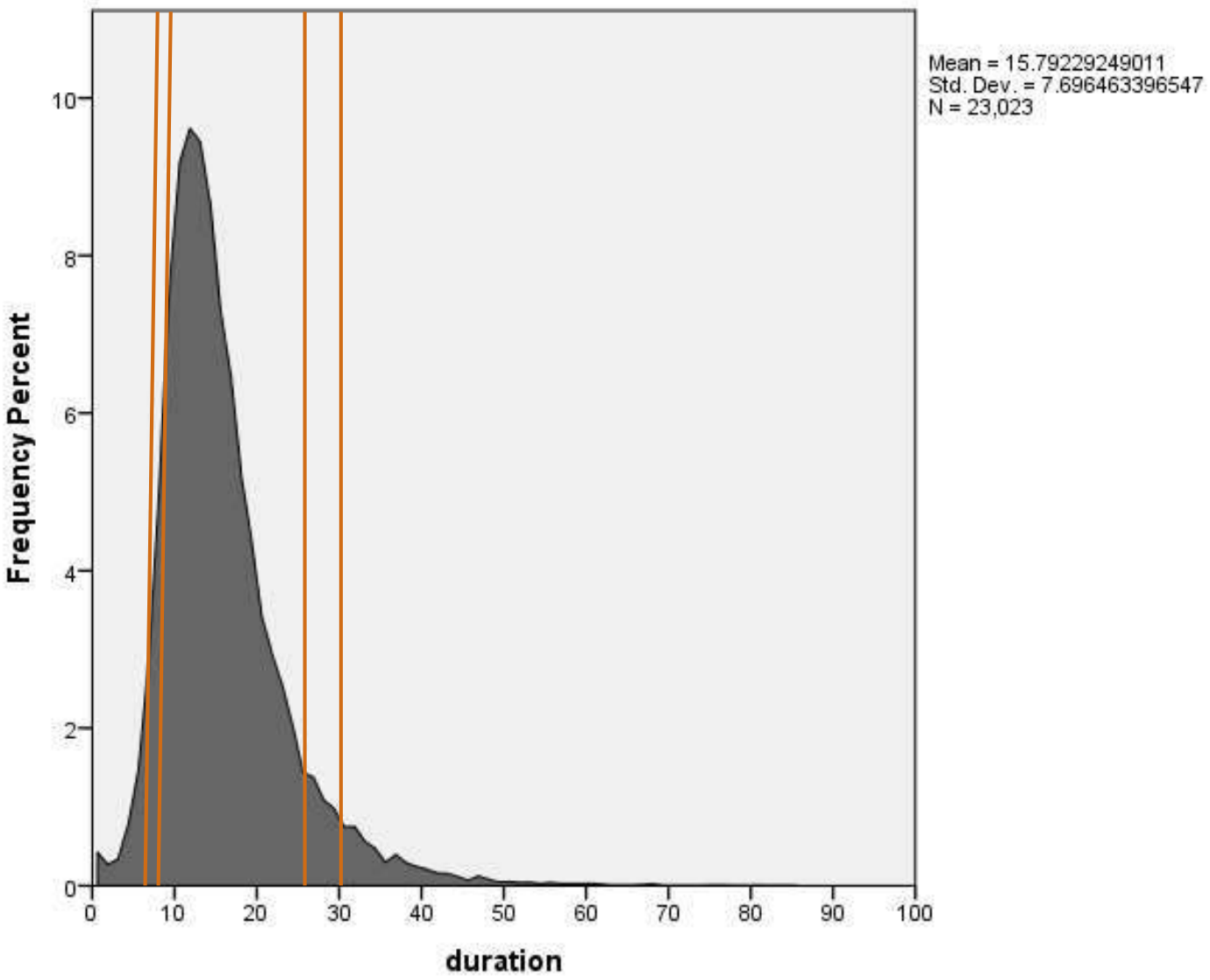
Zmuk (2017)

- Examined speeders and slowers in business survey using graphical and quantitative techniques to detect outliers.
- Very few speeders (hard to detect), more slowers.
- Techniques not appropriate or effective.

Current project:

- Complex task that involves recalling sensitive experiences – no guidance from literature
- Used percentile thresholds: 5, 10, 90, and 95

How many speeders and sloths?



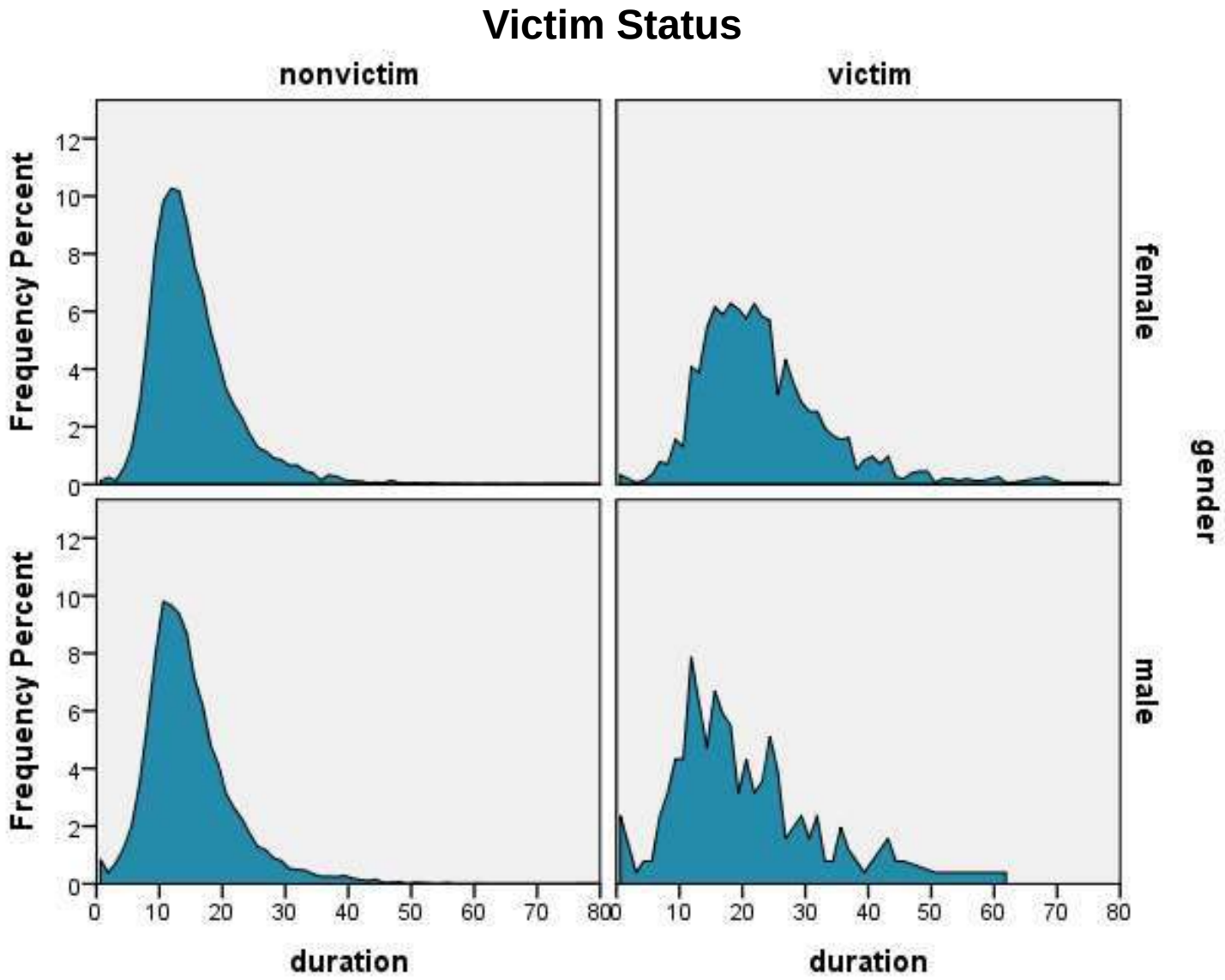
Expectation: ~15 minutes

Average:	15.8 minutes
Median:	14.2
SD:	7.7
Range:	1 – 86

23,023 respondents

Percentiles	Time	Number of respondents
5th	7.1	1,158
10th	8.5	2,302
90th	25.0	2,305
95th	30.2	1,154

How many speeders and sloths?



By design, victims will take longer…

	Ave	5th	95th
Female	16.2	7.6	30.9
Victim	23.2	11.0	42.2
Nonvictim	15.4	7.5	28.6
Male	15.1	6.1	29.1
Victim	19.7	6.8	41.5
Nonvictim	14.9	6.1	28.4

Who are the speeders and sloths?

Group 10/90					
average_Jane_Joe					
speeder			**Coef.**	**P>|z|**	**RRR**
	Victim		-1.49	0.000	0.226
	Gender		-0.07	0.156	0.934
	LGBT		-0.01	0.874	0.986
	Age		-0.19	0.000	0.829
	Black		-0.03	0.771	0.971
	Hispanic		-0.22	0.014	0.803
	Asian		0.93	0.000	2.542
	race_other		0.26	0.015	1.291
	Incentive $10		0.11	0.103	1.120
	Incentive $40		-0.09	0.213	0.916
	_cons		1.59	0.000	4.911
sloth					
	Victim		1.700	0.000	5.472
	Gender		0.192	0.000	1.211
	LGBT		0.150	0.057	1.162
	Age		0.101	0.000	1.107
	Black		0.573	0.000	1.773
	Hispanic		0.412	0.000	1.510
	Asian		0.073	0.334	1.076
	race_other		0.180	0.077	1.197
	Incentive $10		-0.024	0.735	0.976
	Incentive $40		0.380	0.000	1.462
	_cons		-4.634	0.000	0.010

Multinomial Logistics Regression

1. Speeders vs Average Janes & Joes
2. Sloths vs Average Janes & Joes

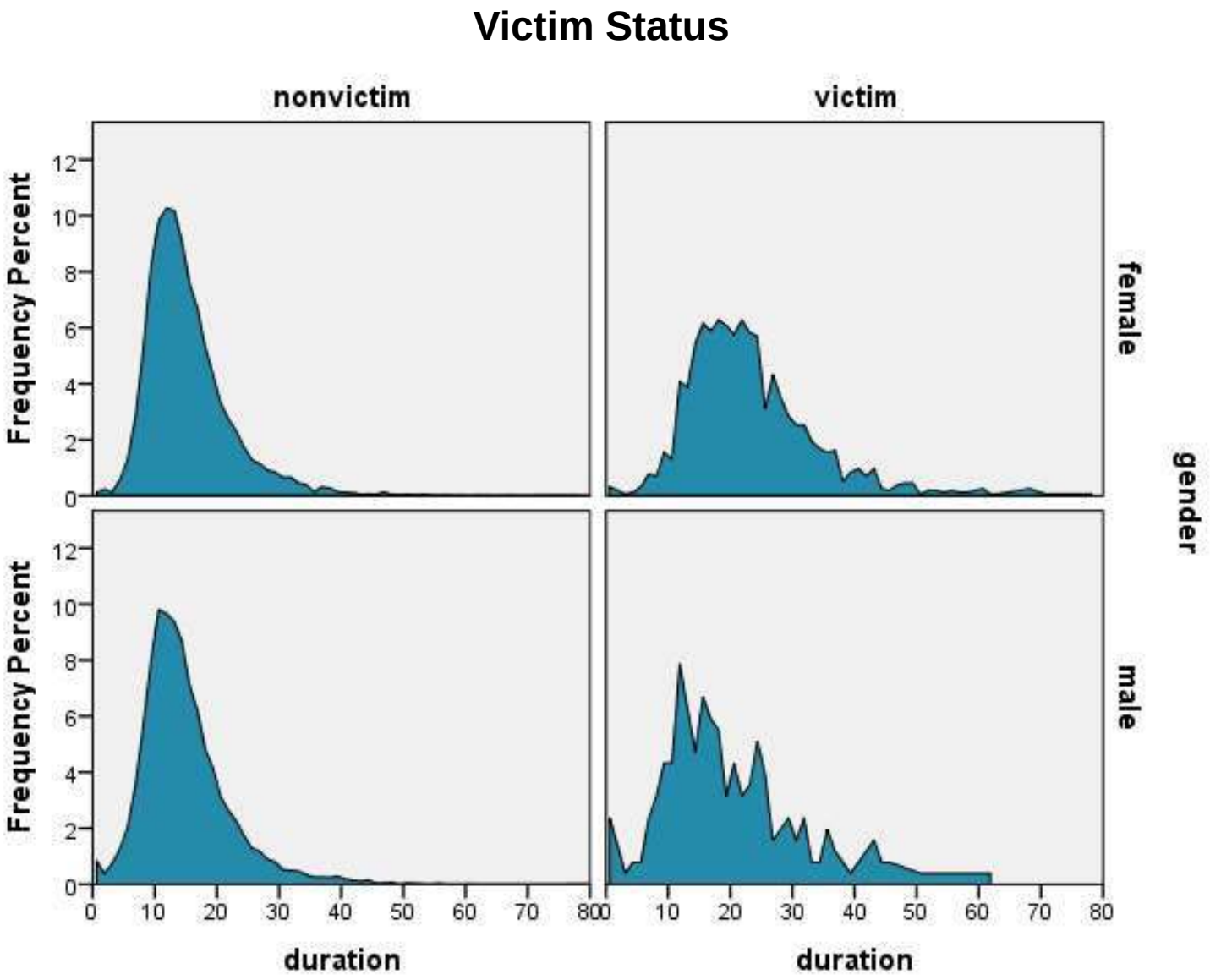
Speeders

- Nonvictims
- Older students
- Asians compared to Whites

Sloths

- Victims
- Females
- Younger students
- Blacks compared to Whites
- Hispanics compared to Whites
- $40 incentive compared to $25 incentive

Outlier Treatment: Case Trimming/Deletion



Speeders: 5th and 10th percentiles

Sloths: 90th and 95th percentiles

<u>Attend to survey design</u>

- Oversampled females who are at higher risk of victimization
- Victims get more questions

<u>Timing case selection</u>

Naïve: adjust by sex

Informed: adjust by sex & victim status

Outlier Treatment: Case Trimming/Deletion

Speeders: 5th and 10th percentiles
Sloths: 90th and 95th percentiles

Naïve: adjust by sex
Informed: adjust by sex & victim status

Comparison group: Estimate with all survey completers, no cases eliminated

Eliminate speeders

Treatments 1 and 2:	5th and 10th, naive
Treatments 3 and 4:	5th and 10th, informed

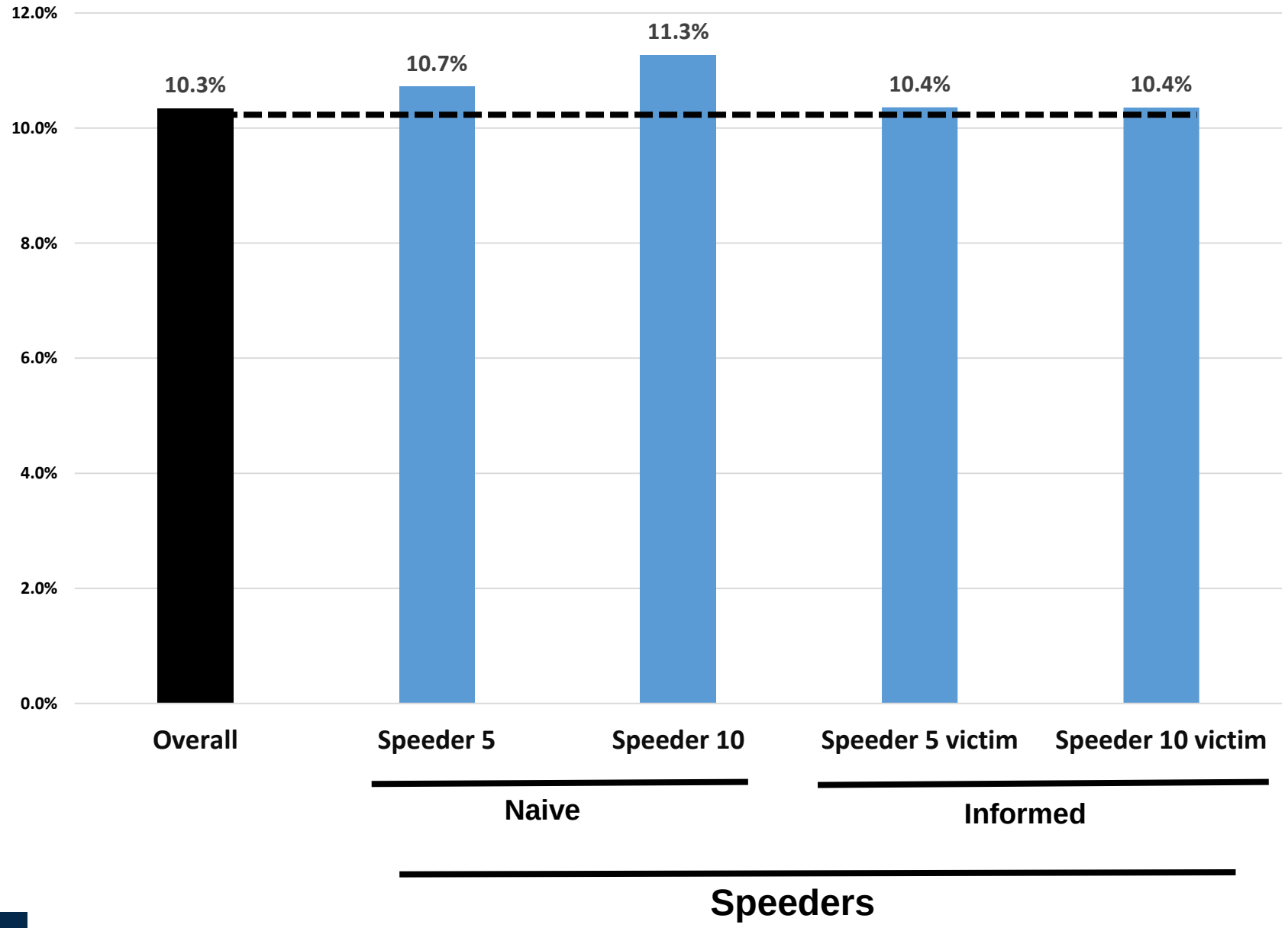
Eliminate sloths

Treatments 5 and 6:	90th and 95th, naive
Treatments 7 and 8:	90th and 95th, informed

Eliminate speeders and sloths

Treatments 9 and 10:	5/95 and 10/90, naive
Treatments 11 and 12:	5/95 and 10/90, informed

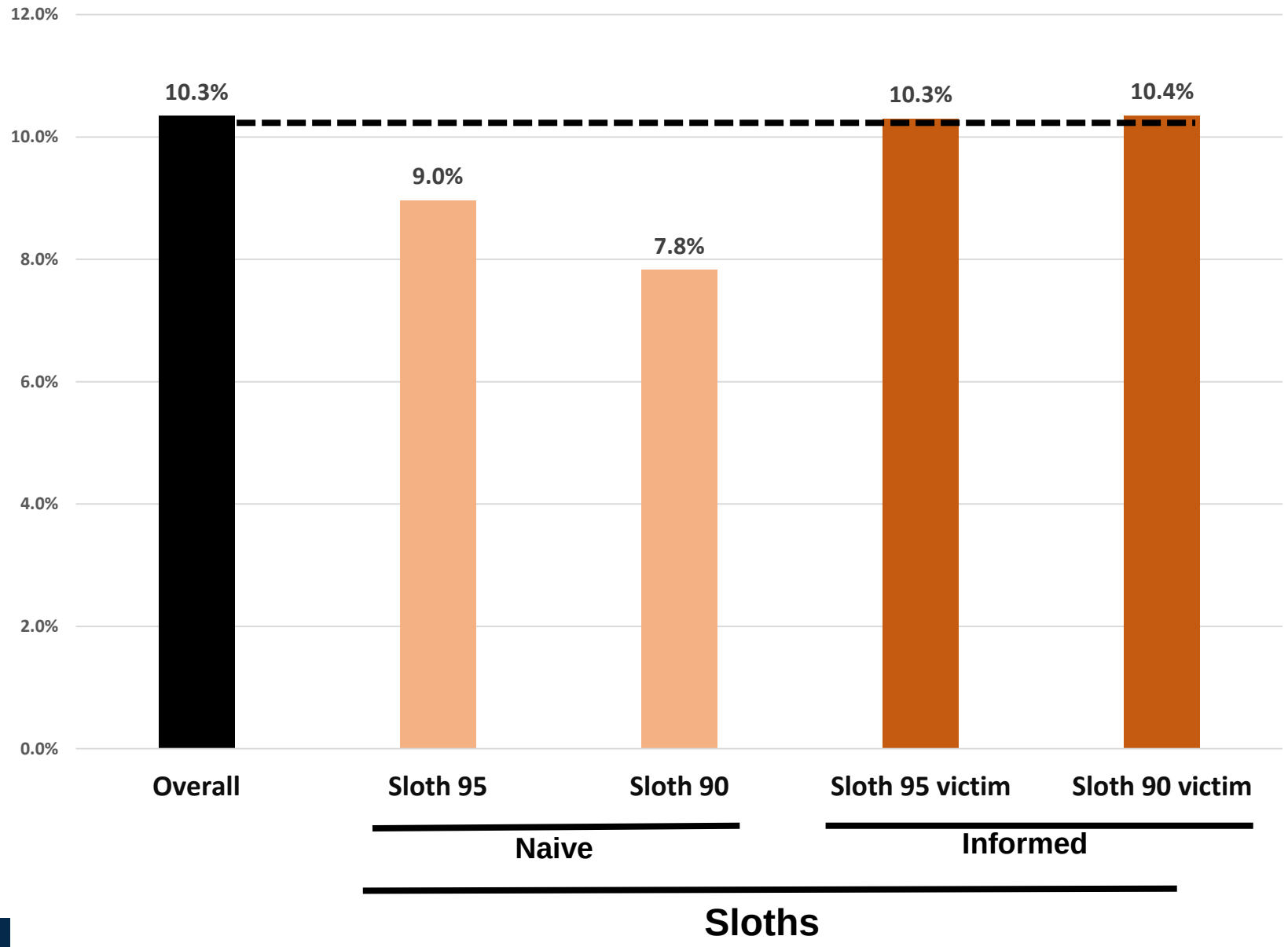
Prevalence of Sexual Assault for Females by Outlier Treatment



Deleting speeders

Naïve: slight increase
Informed: no difference

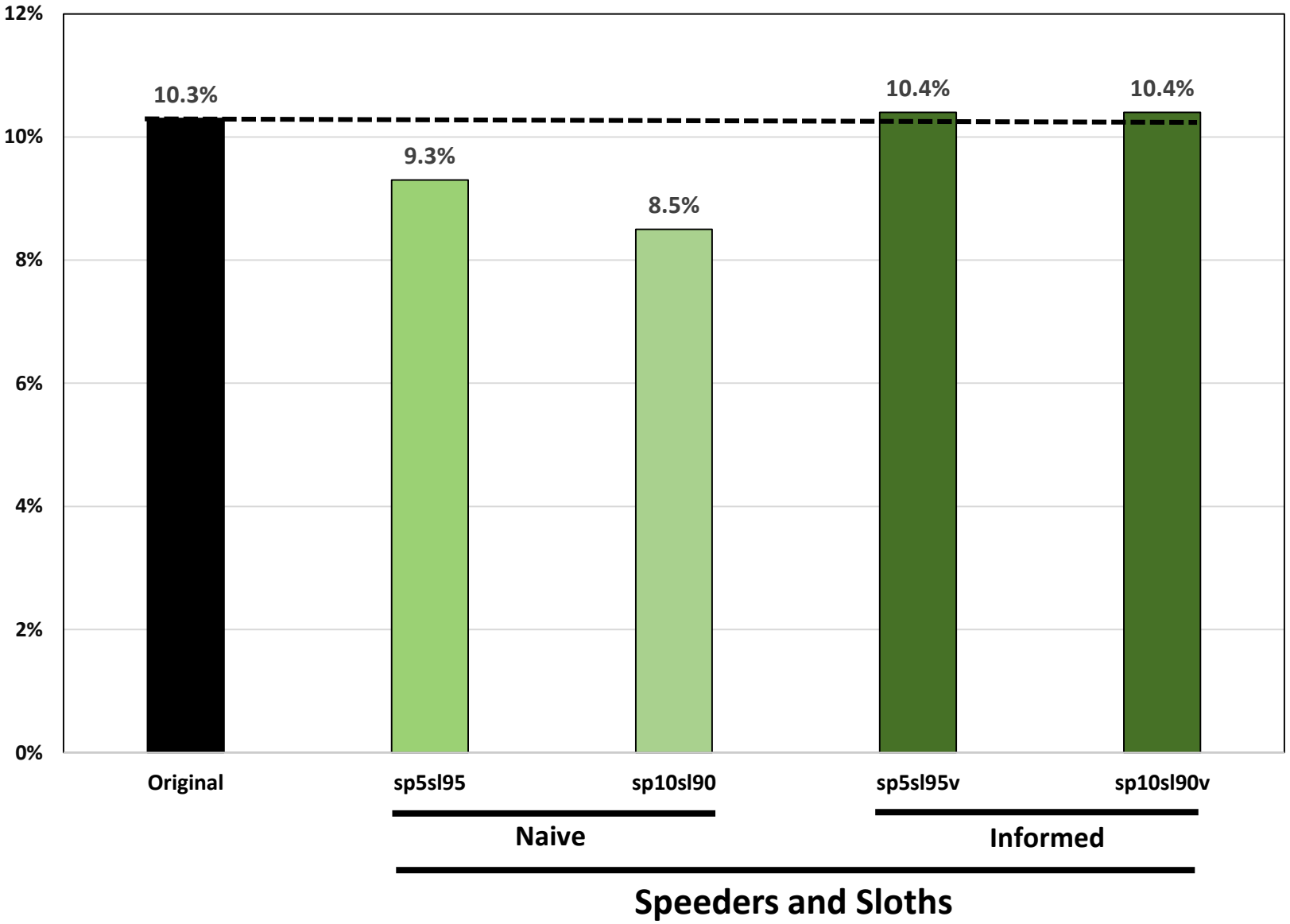
Prevalence of Sexual Assault for Females by Outlier Treatment



Deleting sloths

Naïve: decrease
Informed: no difference

Impact on Estimate: Prevalence of Sexual Assault for Females



Deleting Speeders and Sloths

Naïve: slight decrease

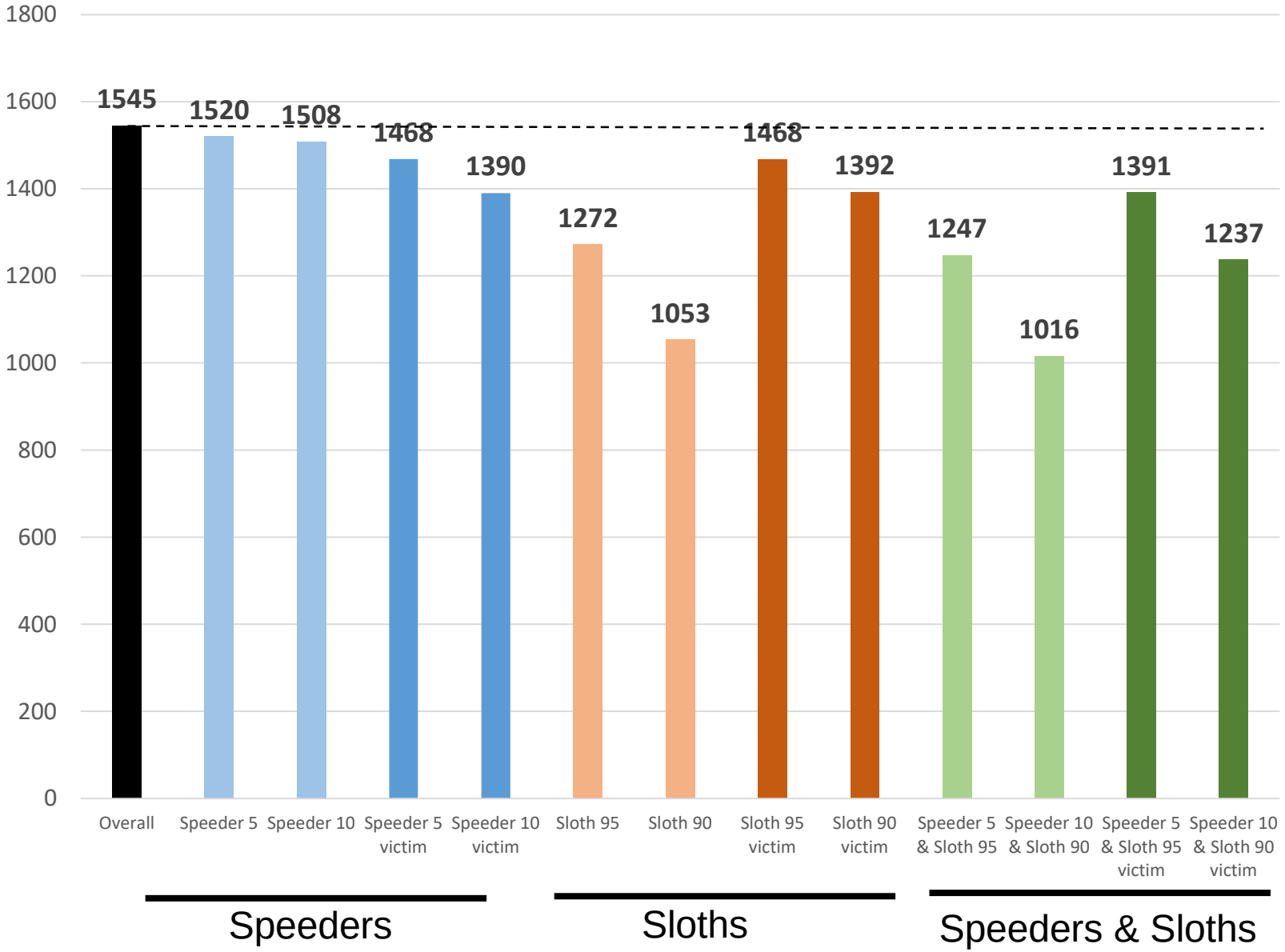
Informed: no statistical or substantive difference

But…
take a hit in sample sizes – 10-20% decline

4-12% increase in RSE

Loss of power resulting in less precision overall and for subgroup analyses

Unweighted sample sizes for female sexual assault by outlier treatment



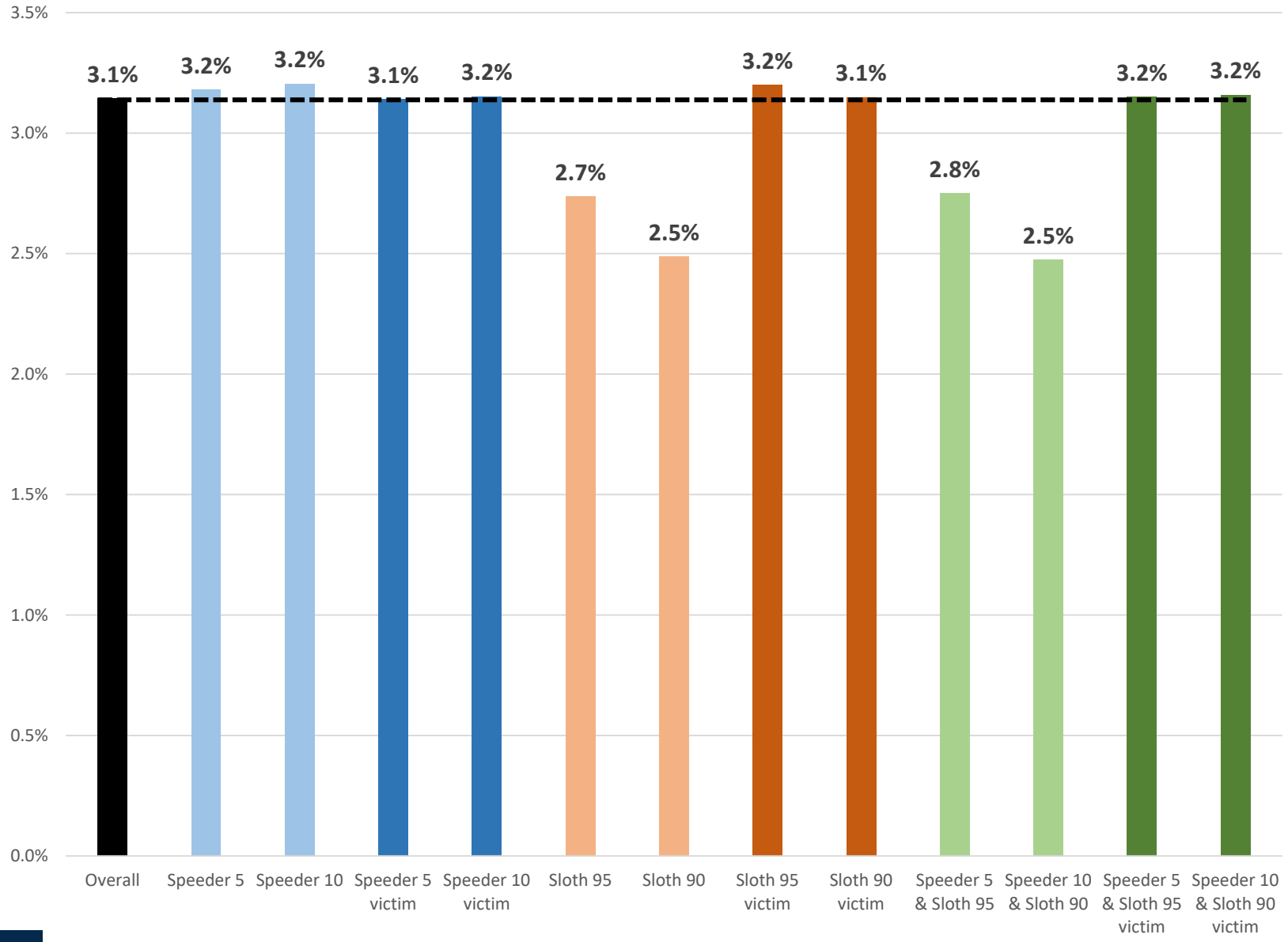
Deleting speeders, sloths, or both

Speeders only
Naïve: slight decline in cases
Informed: slight decline in cases

Sloths only
Naïve: large decrease in cases
Informed: large decrease in cases

Speeders and sloths
Naïve: decrease
Informed: no difference

Percent male sexual assault by outlier treatment



Findings very similar for males..

Informed selection results in no statistical or substantive differences, but loss of power

Implications

Summary

- Not very many clear outliers detected. Most respondent times seem “reasonable.”
- Some small demographic differences associated with survey timing.
- Speeders and sloths had limited impact on overall estimates once survey design taken into account (i.e., victims received additional questions and took longer to complete survey)
- Eliminating outliers does not affect estimates, but does reduce sample size and power
- **Consider conducting this impact exercise routinely to assess outlier treatment plans**

Implications

Limitations

- No good guidance on how to detect and handle outlier response times
- Timing data may not be a good proxy for data quality
- Timing data not broken down by specific sections or subgroups
- Addressed most data problems by first eliminating breakoffs and incomplete surveys

Future work

- Sensitive topics: differential timing by topic salience?
- Examine demographic differences in timing data