

# Assessing Racial Bias in Pulse Oximetry Using Graded Skin Tone Scale

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## Background

- Pulse oximetry is ubiquitously used in medicine to assess oxygenation status
- Multiple recent studies report a bias in pulse oximetry measurement between white patients and other racial/ethnic groups
- Race/ethnicity is likely not an accurate predictor of skin color
- The purpose of this study is to examine the accuracy of pulse oximetry with different skin colors using a standardized scale

## Methods

- 1 IRB approval obtained
- 2 ABG SaO<sub>2</sub> collected from pulmonary blood gas lab
- 3 Patients screened for PaO<sub>2</sub> > 125 and age < 18
- 4 SaO<sub>2</sub> time paired 5-minute average SpO<sub>2</sub>, Massey-Martin skin tone rating (MMSTS)
- 5 SaO<sub>2</sub> – SpO<sub>2</sub> compared between MMSTS groups using Kruskal-Wallis statistical test and Spearman Correlation

# Masimo pulse oximeter monitors appear to be accurate in different skin tones



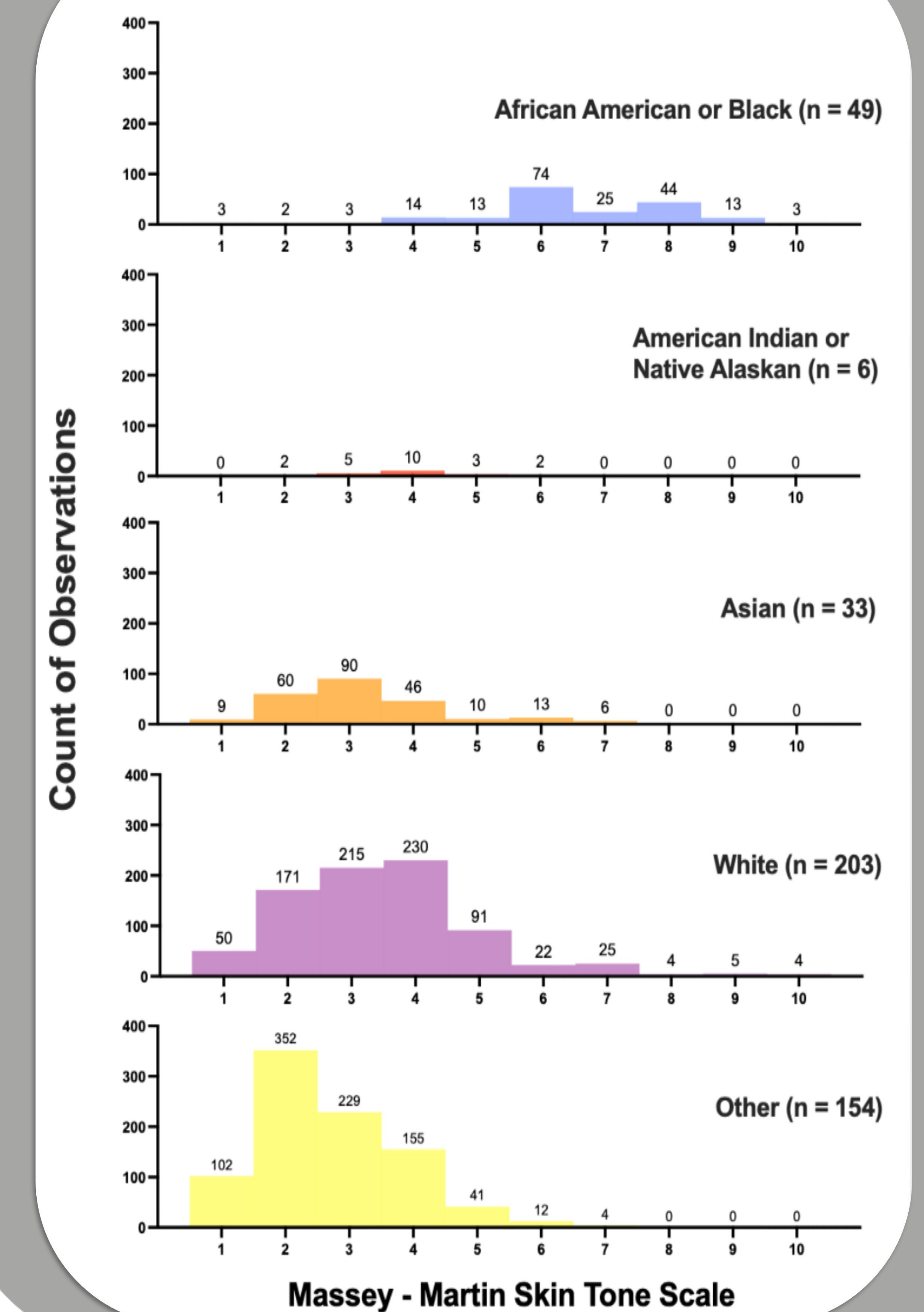
Download the Abstract

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## Discussion

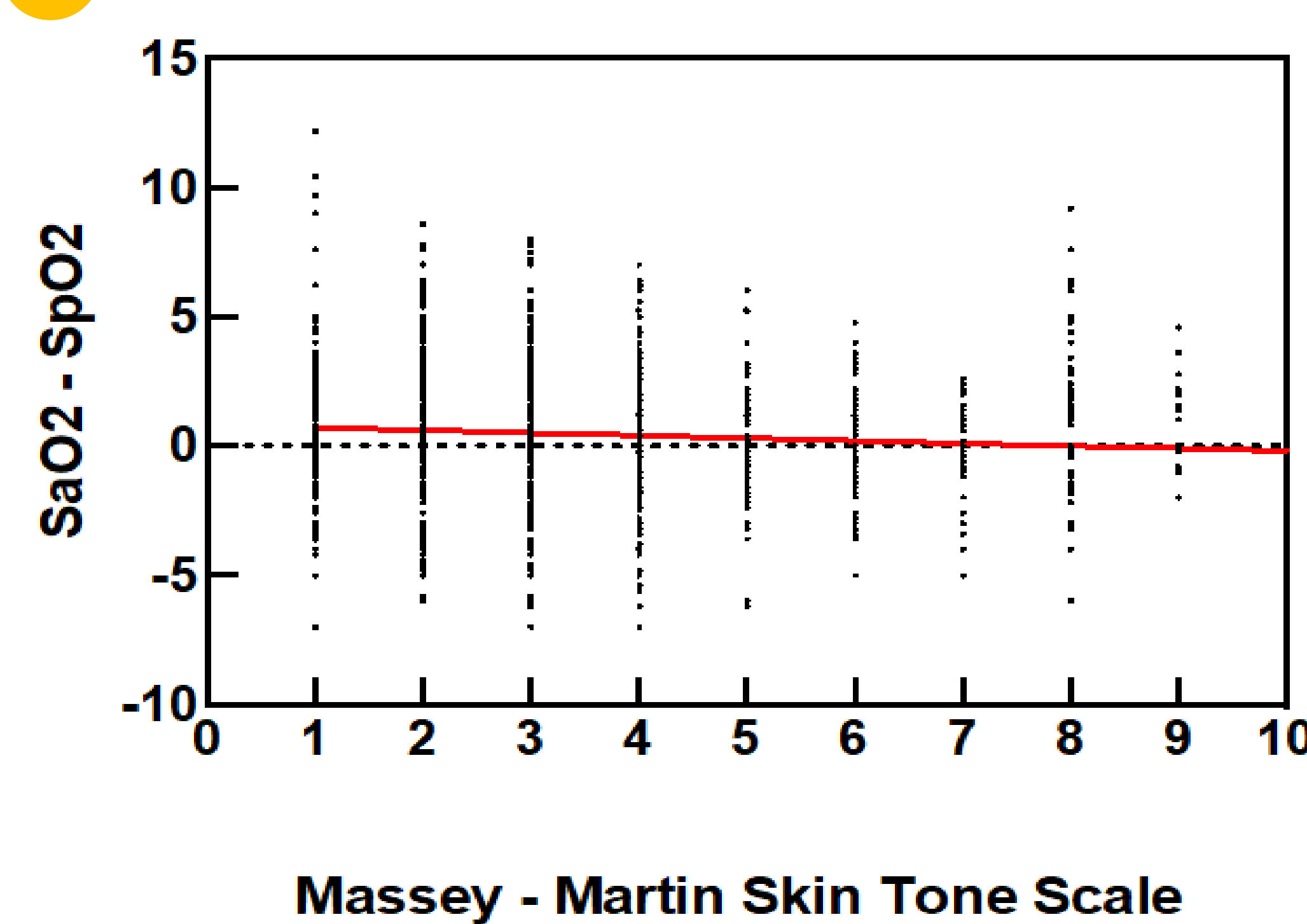
Race and ethnicity correlate poorly with skin color. Despite a statistical significance difference in SaO<sub>2</sub> – SpO<sub>2</sub> across all MMSTS, it is unclear if there is a clinical significance to these findings as there is no trend between SaO<sub>2</sub> – SpO<sub>2</sub> and MMSTS.

### Skin Color Distribution by Race



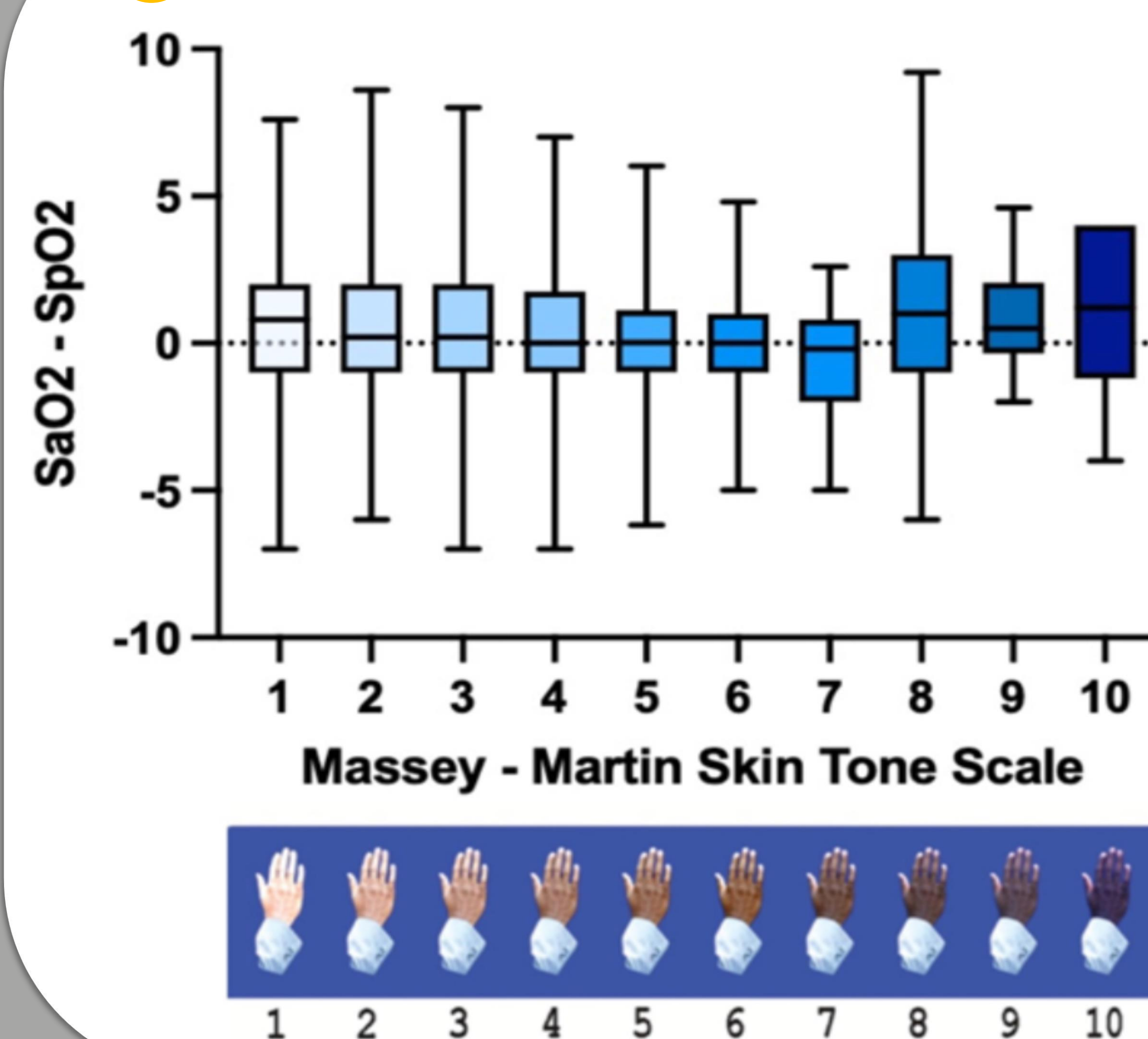
## Results

### 1 SaO<sub>2</sub> - SpO<sub>2</sub> vs. MMSTS



MMSTS	1	2	3	4	5	6	7	8	9	10	Overall
Number of Observations	164	587	542	455	158	123	60	48	18	7	2162

### 2 SaO<sub>2</sub> - SpO<sub>2</sub> vs. MMSTS



### Statistical Significance

1  
 $r = -0.07967$   
 $p = 0.0002$

2  
 $H = 29.77$   
 $p = .00005$

MMSTS Groups  
 1 & 5  $p = 0.035$   
 1 & 7  $p = 0.039$

## Limitations

- Low amount of high Massey score patients in the UC Davis hospital population
- Study conclusions only limited to Masimo monitor and algorithms
- Next step: Extend study to capture higher Massey score and lower saturation pulse ox data observations

## References

1. Sjoding et al, *N Engl J Med.* 2020;383(25):2477-2478.
2. Fawzy, et al., *JAMA Internal Medicine* 2022;182(7):730-738
3. Massey, Douglas S., and Jennifer A. Martin. 2003. The NIS Skin Color Scale.