

RACIAL BIAS WITHIN PULSE OXIMETRY SATURATION MEASUREMENT

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Background

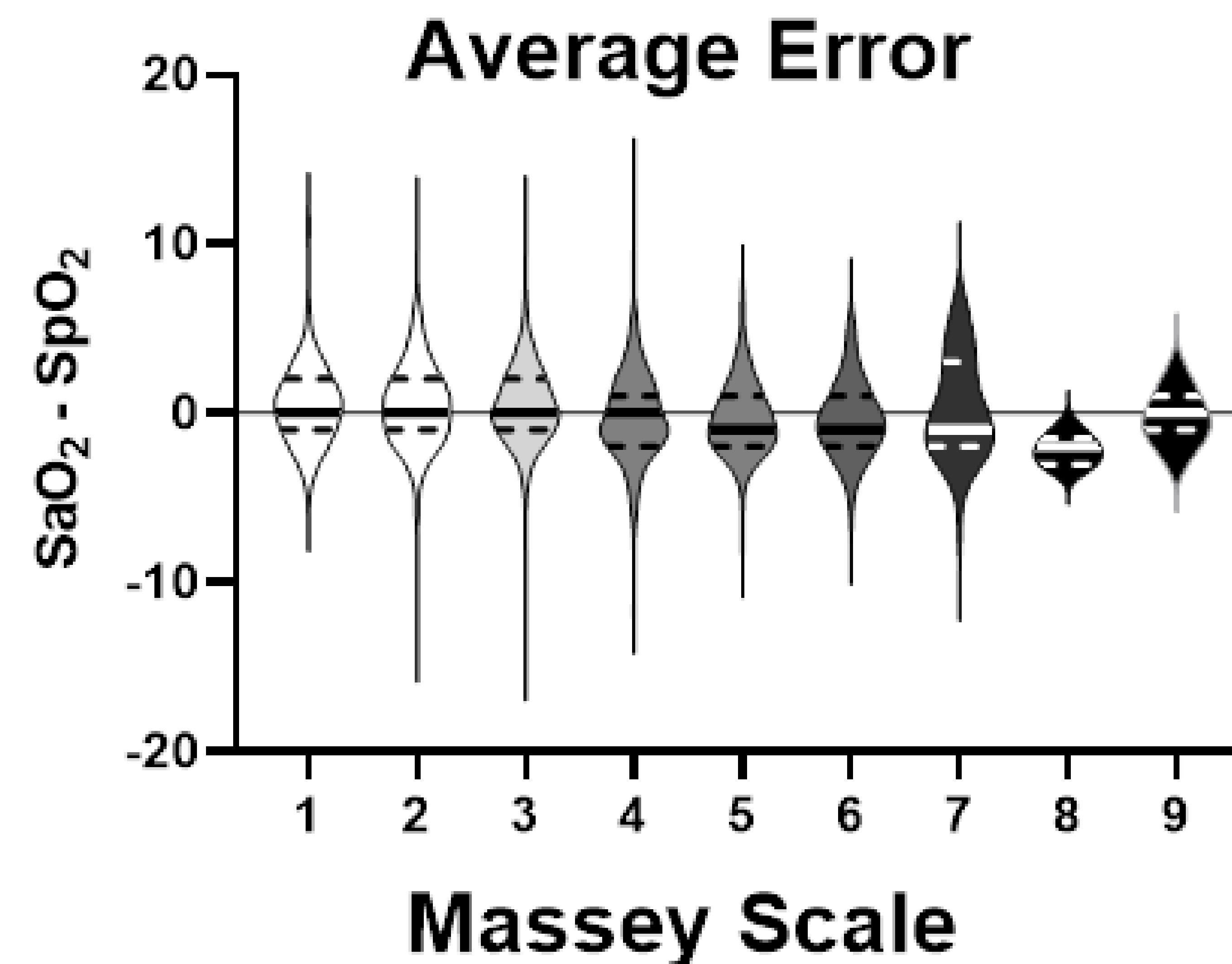
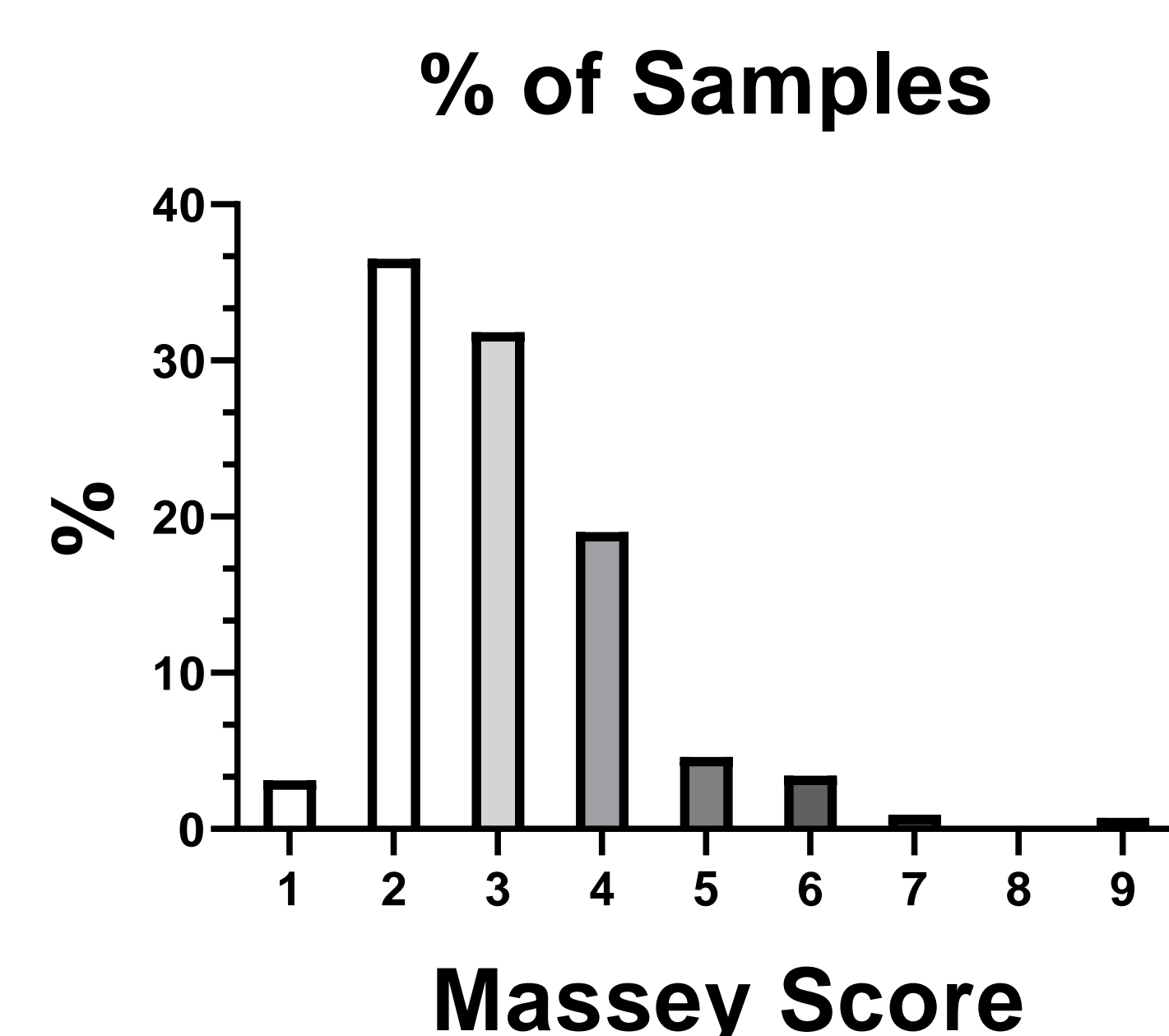
- Pulse oximetry is a ubiquitous measurement in health care used to assess oxygen perfusion status and guide oxygen therapy.
- There is ongoing discussion as to whether pulse oximetry measurements are accurate in patients with darker skin colors. A recent study showed higher rates of occult hypoxemia in Black patients compared to White patients, based on self-reported race¹.
- This report triggered an FDA Safety Communication emphasizing the interpretation and limitations of pulse oximetry particularly in monitoring of patients with COVID-19 infections
- Race is not binary. There is a wide range of graded skin colors².
- We investigated this issue by evaluating correlations between skin color and occult hypoxemia using a retrospective review and a more discriminating assessment of skin color.

Methods

- Obtained Human Subjects Research Committee approval.
- EMR and Case Report Form review conducted to collect demographic information, including reported race and ethnicity as well as skin color (NIS Massey and Martin Skin Color Scale), arterial blood gas PaO₂, SaO₂ and the corresponding SpO₂ values.
- PaO₂ values less than 125 mm Hg were identified and corresponding SaO₂ and SpO₂ values were compared.

Results

- Data were available from 742 patients, of which 579 had ABG PaO₂ <125 mmHg.
- The number of patients at each Massey rating varied widely.



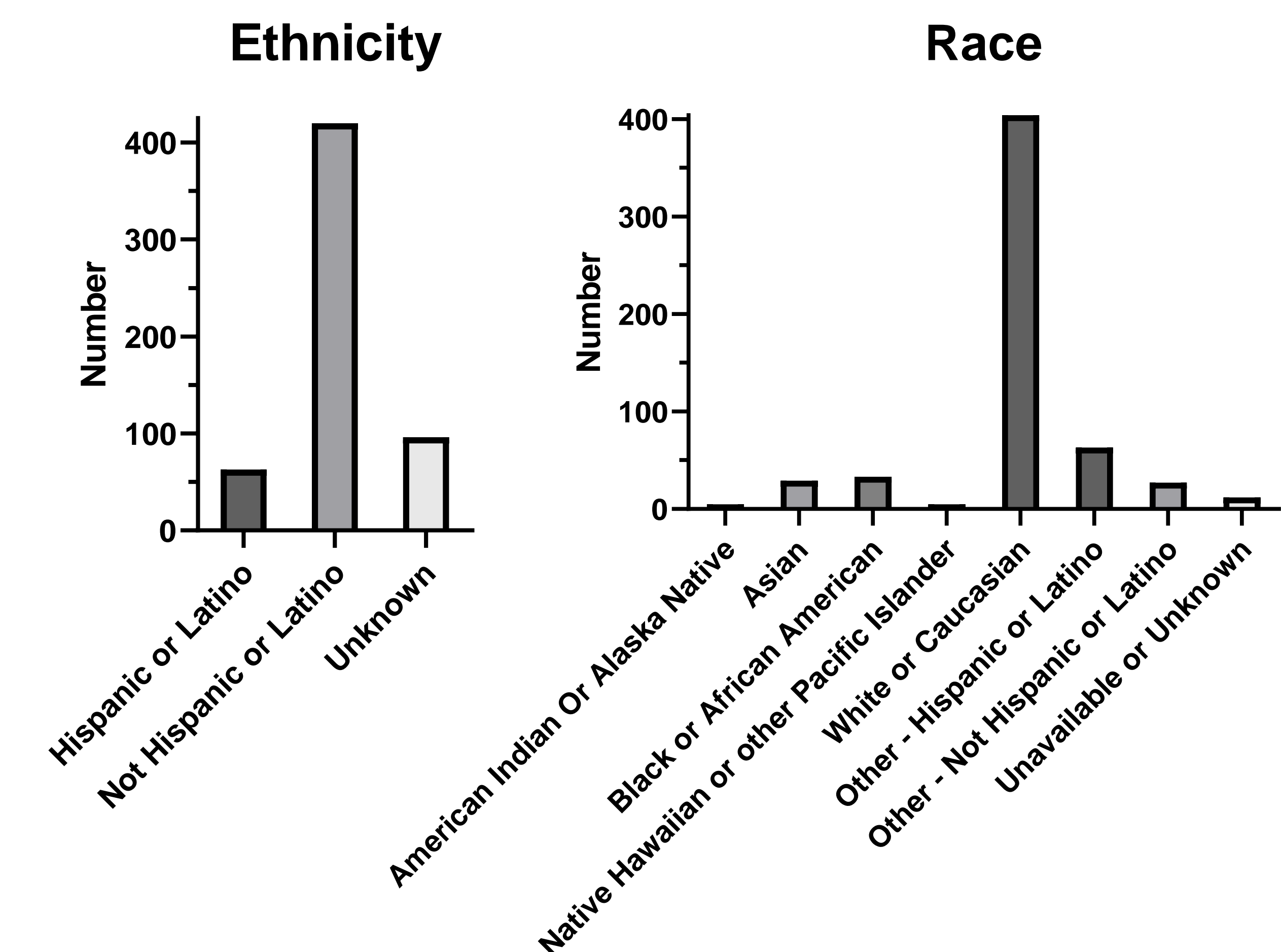
No correlation found between incidence of occult hypoxemia and darker skin color



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Results

- Race and ethnicity provide limited characterization of the population.
- For PaO₂ values ≤ 125 mmHg, any statistical differences fall within the expected range of accuracy for pulse oximeters.



Discussion

- These trends suggest no increase in occult hypoxemia with respect to Massey Skin Scale.
- Standardized skin color scale better characterizes differences than patient identified race
- Further research is needed to assess effect of skin color on SpO₂ measurement

Limitations / Next Steps

- Limitation: Lack of exact time-matched SpO₂ values with corresponding SaO₂ and PaO₂ values; Massey scales are skewed to lower values
- Next steps: conduct prospective study to better assess matched real-time SpO₂ values with ABG values.

References

1. Sjoding, M. W., Dickson, R. P., Iwashyna, T. J., Gay, S. E., & Valley, T. S. (2020). Racial Bias in Pulse Oximetry Measurement. *The New England journal of medicine*, 383(25), 2477–2478. <https://doi.org/10.1056/NEJMc2029240>
2. Massey, D. S., Charles, C.Z., Lundy, G., Fischer, M.J. (2003). *The Source of the River: The Social Origins of Freshmen at America's Selective Colleges and Universities*. Princeton: Princeton University Press.