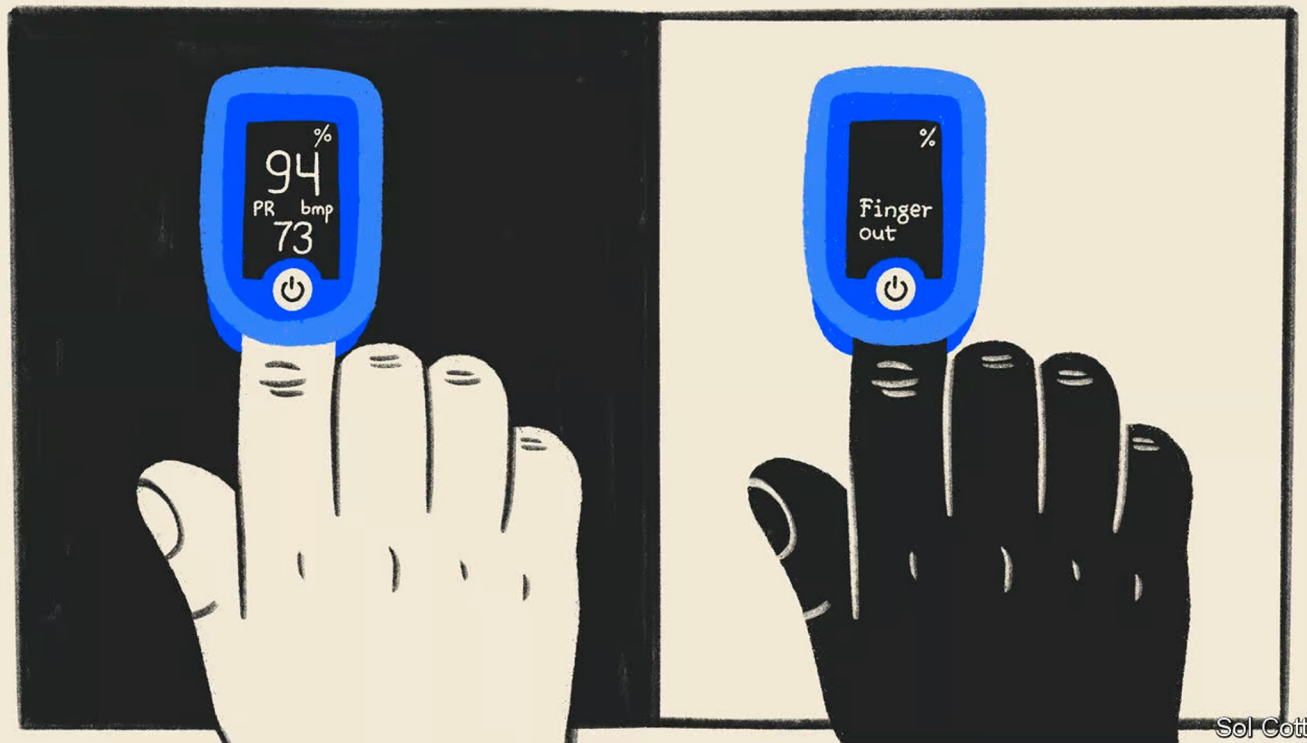
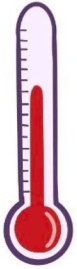




Oximeter adaptation for colored patient skins

Abtin, Nicolas and Weilin

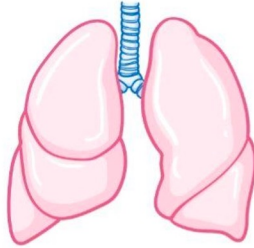
Vital Signs- Objective measurements of body's essential functions



Body
Temperature



Heart Rate
Pulse



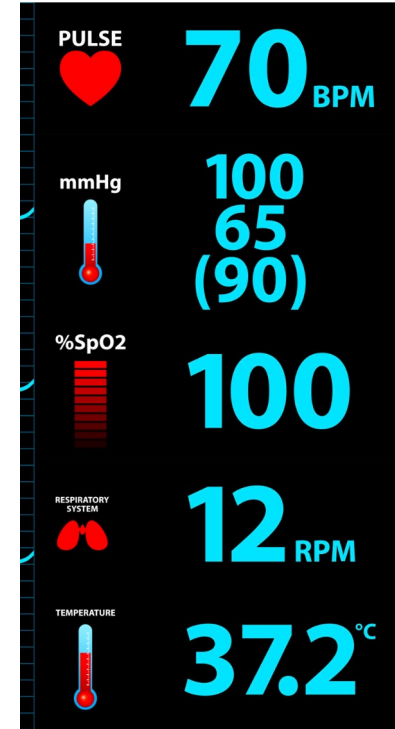
Respiratory
Rate



Blood
Pressure



Oxygen
Saturation



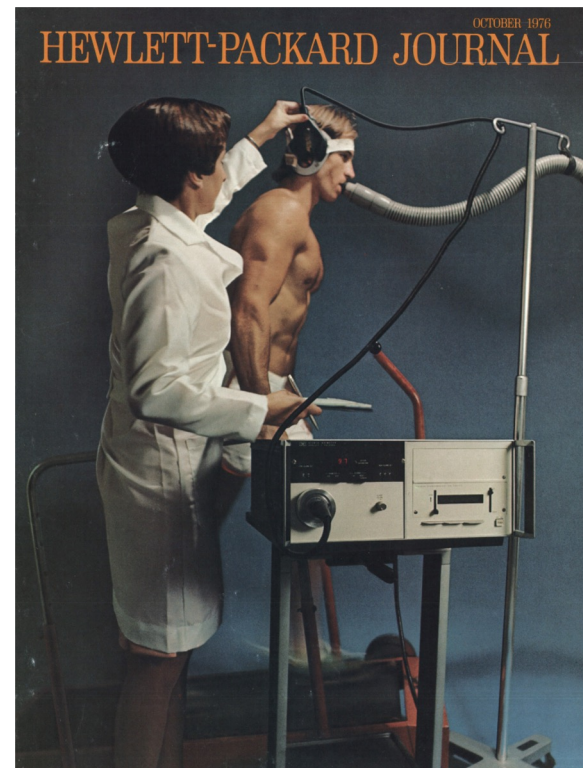
Pulse oximeter readings

- An ideal oxygen level is between 96% and 99%

Observation	Oxygen saturation (SpO2) %
Normal readings	96% or more
Acceptable to continue home monitoring	95%
Seek advice from your GP	93-94%
Need urgent medical advice – call 999	92% or less

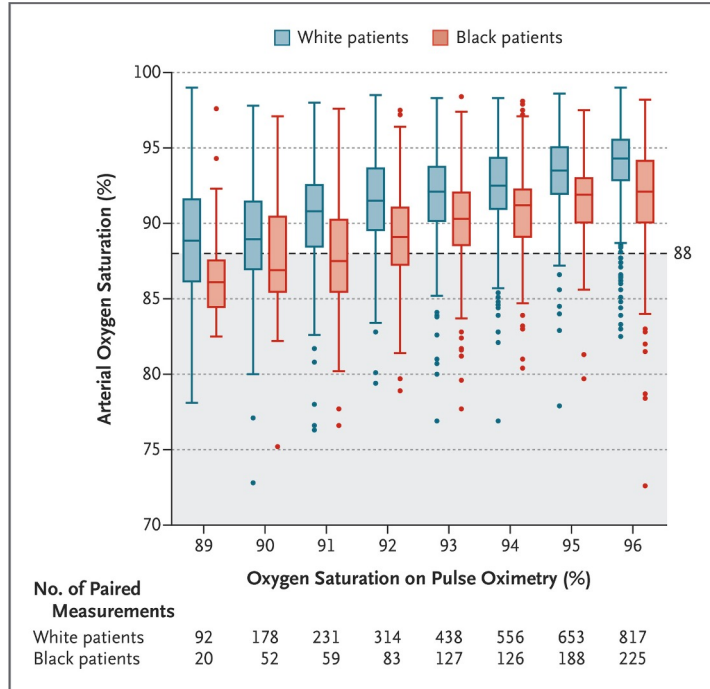
Inequity kept in the dark

- As early as 1976, scientists at Hewlett-Packard recognized that pulse oximeters needed to be calibrated to different skin tones.
 - "Because skin pigmentation and other absorbers affect the measurement, the method is not capable of making absolute measurements"
- Other scientists began picking up on the discrepancy as early as the 1990s, but it didn't break into the medical mainstream.
- The few papers on racial bias in pulse oximeters were not reaching medical textbooks or top tier journals.



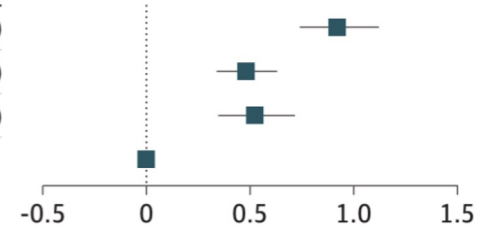
<http://hparchive.com/Journals/HPJ-1976-10.pdf>

Flawed pulse oximeter readings among colored patients can be life-threatening



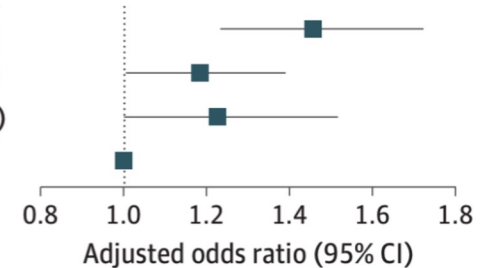
A Association of race with pulse oximeter accuracy

Black	0.93 (0.74-1.12)
Hispanic	0.49 (0.34-0.63)
Other	0.53 (0.36-0.72)
White	Reference



B Association of race with unrecognized need for COVID-19 therapy

Black	1.46 (1.23-1.72)
Hispanic	1.18 (1.01-1.39)
Other	1.23 (1.00-1.52)
White	Reference



Sjoding et al., 2020. *The New England journal of medicine*, 383(25), 2477–2478.
<https://doi.org/10.1056/NEJMc2029240>

Fawzy, et al., 2023. *JAMA network open*, 6(8), e2330856.
<https://doi.org/10.1001/jamanetworkopen.2023.30856>

Fifty shades of pigmentation - the many hues of skin tones



<https://www.science.org/content/article/new-gene-variants-reveal-evolution-human-skin-color>



Solution

1

MULTIPLE WAVELENGTHS

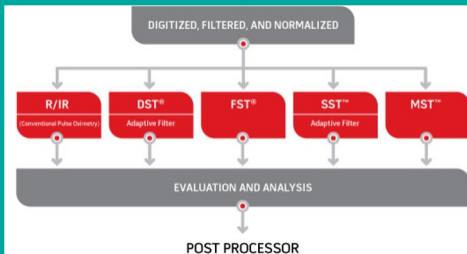


Masimo Rad7

- Utilizes 7 wavelengths to correct for artifacts
- > 2000\$

2

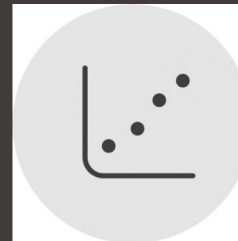
ADJUSTMENT ALGORITHMS



- Using special algorithms, the effect of artifacts could be minimized
- Movement artifact, Hand or finger tremor, Coughing, Big breath

3

MANUAL CORRECTION



- Calibration with empirical data using a large number of volunteers

1 Utilizing Approved Oximeters

Utilizing FDA-cleared oximeters that are already in use in the hospitals (5% inaccuracy).

Community-Driven ML Updates 4

Use community data in well-equipped areas to refine ML algorithms, updating correction factors for precise pulse oximetry.

Fast result adjustments and easy calibration with three nurse-selected options for seamless patient care.

2 Quick Correction

Seamlessly enhance oximeters with a low-cost amodule, requiring no design modifications, at an estimated cost of \$5-10.

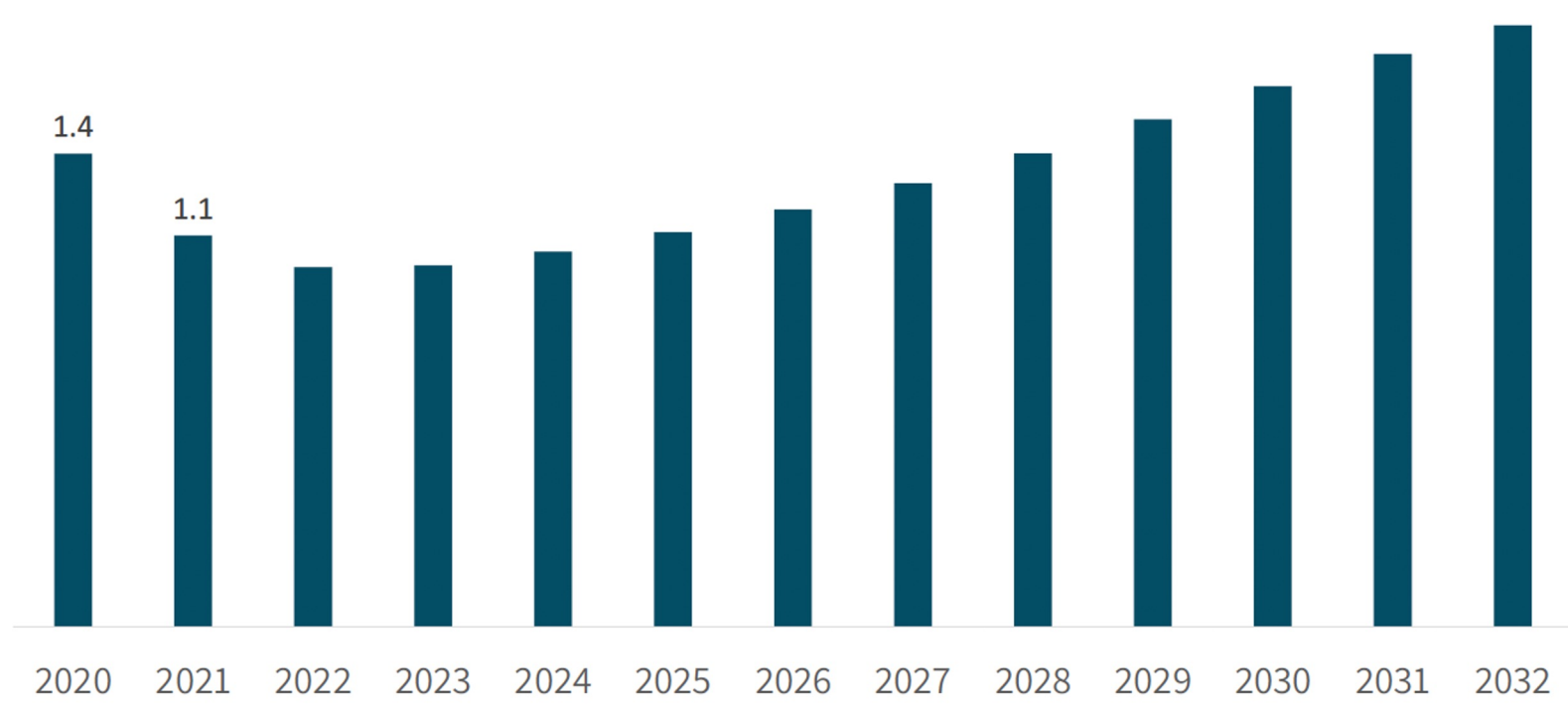
Affordable 3 Module Upgrade

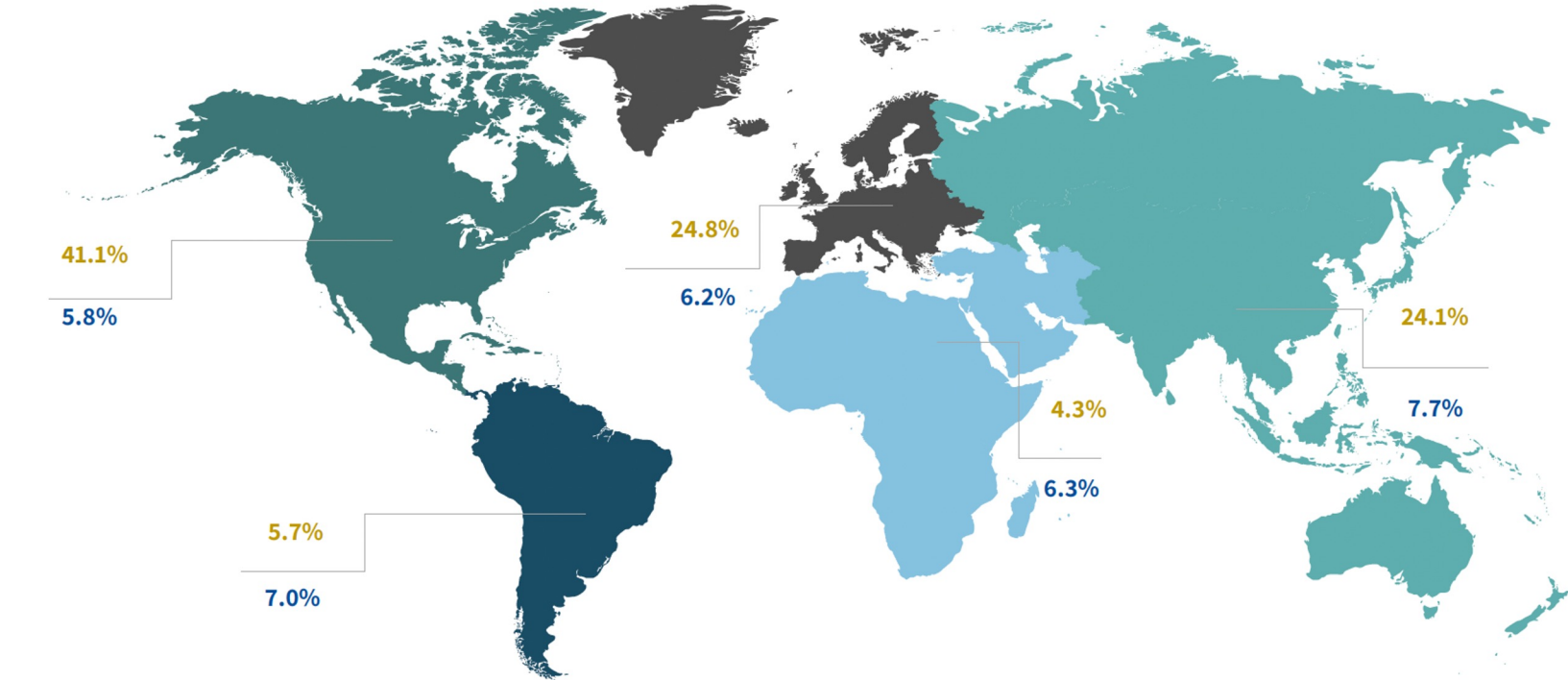




Market Analysis

North America Pulse Oximeter Market Size, 2020 -2032 (USD Billion)





Market Share (2022)

CAGR (2023-2032)

Steady growth prognosis for bedside pulse oximeters

