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Adequacy of essential opioid analgesic consumption for pain and perioperative care across 137 countries from 2017 to 2021

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Introduction

- Previous studies have quantified the opioid analgesic consumption using various sources till 2019.
- Consumption does not directly notify adequacy.
- New index based on human development index (HDI) called Adequacy of Opioid Consumption (AOC) Index was proposed. While useful, It does not account for health system factors.
- We improved the AOC index by adjusting it for physician anesthesia provider (PAP) density.

Conclusion

- We find that most low-and middle-income countries situated in the Global South lack adequate consumption to essential opioid analgesics.
- These point to the need for investing in anesthesia workforce and ensuring access to opioid analgesics.
- Our novel estimates can help inform policies, assist monitoring and evaluation of international programs.
- Findings are limited by data missingness and inability to account for perioperative disease burden.

Materials and Methods

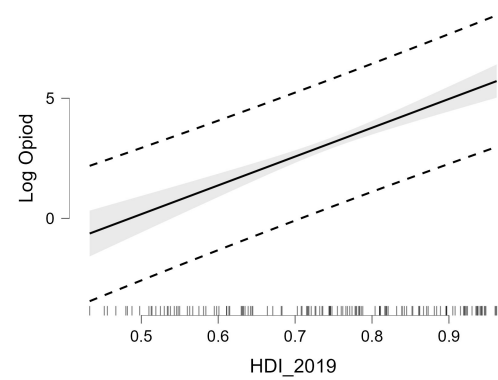**Data Sources and Variables:**
- Mean essential opioid consumption in mg/capita (2017-21): International Narcotics Control Board Annual Report 2022, United Nations year-wise population projections, WHO Model List of Essential Medicines 2023.
- Anesthesia workforce density per 100,000 people (past years): LCoGS data (194 countries; 1999-2014) and WFSA Survey (153 countries; 2015-16).
- Physician density per 100,000 people: Institute for Health Metrics and Evaluation (IHME) (204 countries; 1990-2019).
- Human Development Index (HDI): UN Human Development Report 2019.

PAP density Calculations:

$$\frac{PAP}{Physician} Ratio = \frac{2016\ PAP\ density\ (per\ 100,000)}{2016\ Projected\ Physician\ Density\ (per\ 100,000)}$$

$$2019\ PAP\ Density\ (per\ 100,000) = 2019\ Projected\ Physician\ Density\ (per\ 100,000) * \frac{PAP}{Physician} Ratio$$

Linear Regression:

- Dependent variables: 2019 PAP density and HDI
- Independent variable: mean essential opioid consumption

Marginal Effect Plot of HDI 2019 on mean essential opioid consumption adjusted for 2019 PAP density
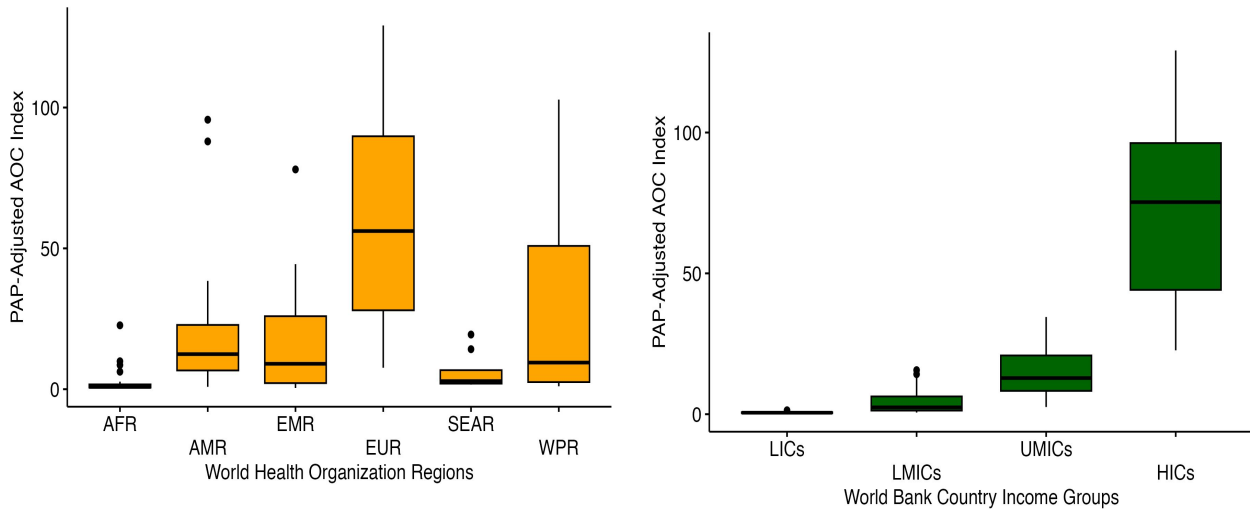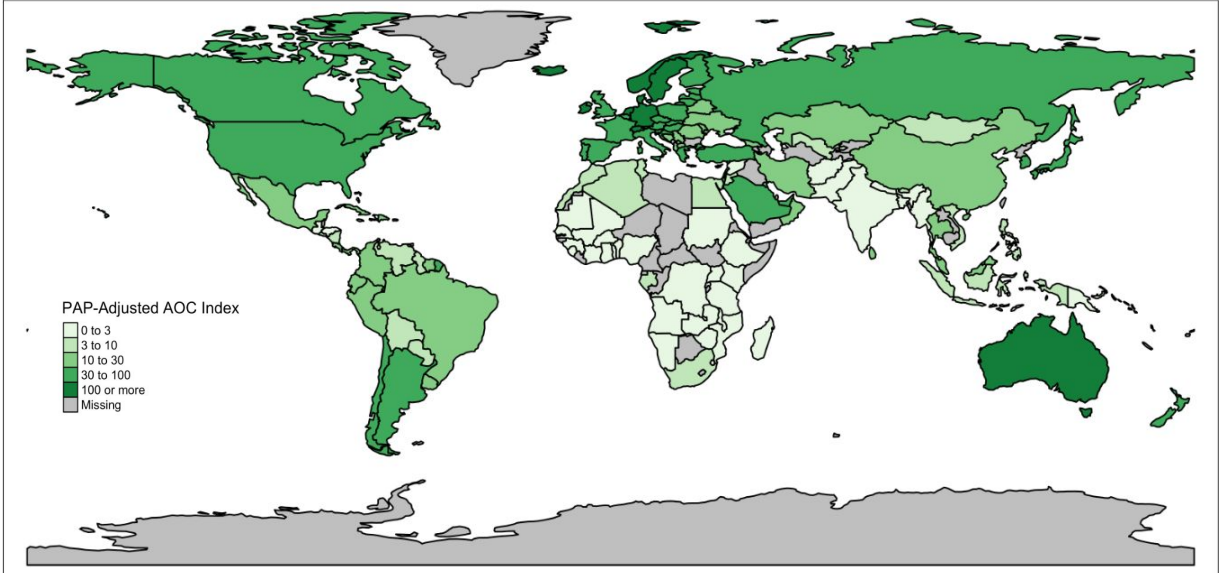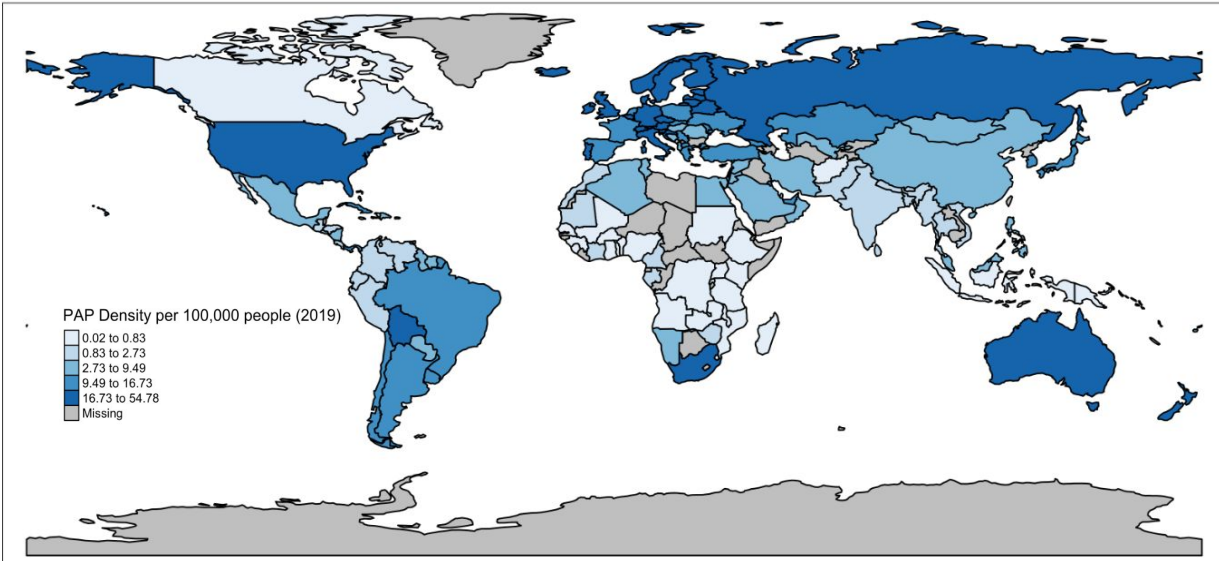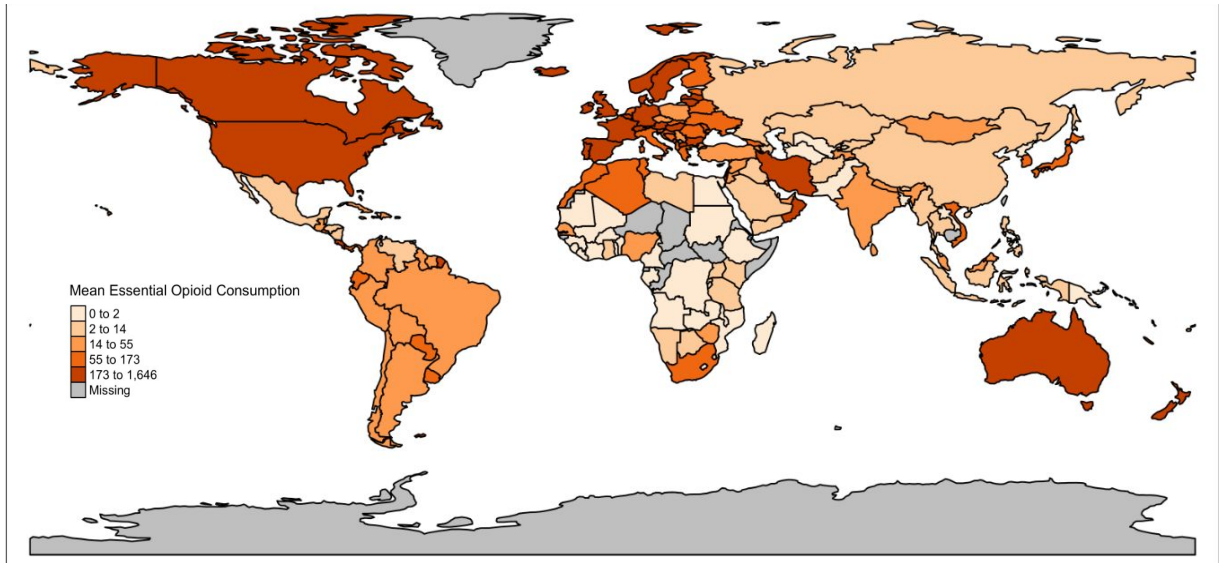
$$Log(PAP\ adjusted\ opioid\ analgesic\ consumption\ values) = X * HDI\ 2019 + Y * Mean\ of\ Log(PAP\ Density\ 2019) + C$$

PAP Adjusted Adequacy of Opioid Analgesic Consumption Index Calculation

$$PAP\ Adjusted\ AOC\ Threshold = \frac{\sum PAP\ Adjusted\ Opioid\ Consumption\ of\ Top\ 20\ Countries}{20}$$

$$PAP\ Adjusted\ AOC\ Index\ (for\ a\ given\ country) = \frac{PAP\ Adjusted\ Opioid\ Consumption\ (of\ a\ given\ country)}{PAP\ Adjusted\ AOC\ Threshold} * 100$$

- PAP-adjusted AOC index classified as High (AOC >100), moderate (< 100 and >30), low (< 30 and >10), very low (< 10 and >3), and extremely low (< 3)

Results

Mean Essential Opioid Consumption
- 0 to 2
- 2 to 14
- 14 to 55
- 55 to 173
- 173 to 1,646
- Missing

PAP Density per 100,000 people (2019)
- 0.02 to 0.83
- 0.83 to 2.73
- 2.73 to 9.49
- 9.49 to 16.73
- 16.73 to 54.78
- Missing

PAP-Adjusted AOC Index
- 0 to 3
- 3 to 10
- 10 to 30
- 30 to 100
- 100 or more
- Missing

- Five year mean essential opioid analgesic consumption globally was 227.59mg/capita.
- Median PAP density for 2019 estimated to be 5.31 (IQR: 1.29-15.23), ranged from 106.01 (95% UI: 154.15, 73.56) in Niue to 0.02 (95% UI: 0.01, 0.03) in Guinea
- PAP-adjusted AOC threshold was 234.39 mg/capita.
- PAP-adjusted AOC index values ranged from 129.14 for Switzerland to 0.23 for Mali.
- Only 7.3% had a high, 23.36% had moderate and 69.35% Low to Extremely Low AOC
- PAP-adjusted AOC different significant;y across WHO regions and World Bank Income Groups.

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