Treatment for Obstructive Sleep Apnea by Area Socioeconomic Deprivation in Six Million Adults

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Introduction

What is Obstructive Sleep Apnea?

Obstructive sleep apnea (OSA) is the most common sleep-related breathing disorder. OSA can occur when the throat muscles relax and block the airway while sleeping and it causes people to repeatedly stop breathing throughout the night. OSA is linked to multiple comorbid conditions such as obesity, cardiovascular disease, and diabetes.

What is Area Socioeconomic Deprivation?

Area socioeconomic deprivation, as measured by the Area Deprivation Index (ADI), is associated with numerous adverse health and economic outcomes such as cardiovascular risk, hospital readmissions, and Alzheimer's disease. The composite ADI score is usually ranked on a scale of 1-100 and is based on 17 health disparities indicators including income, education, employment, and housing. It is used to rank relative disadvantage across communities and is a widely utilized key social determinant of health and a validated marker of health risk. The purpose of this study was to determine the association between the ADI and OSA testing and diagnosis.

In this study, we explore the relationship between the ADI and the prevalence of treatment for OSA. We analyze the following treatment modalities: CPAP, Inspire, and oral appliance. This analysis shows access to different types of treatment for OSA at different levels of socioeconomic deprivation.

The Dataset

Our data source was the All-Payer Claims Database (APCD) for the Wisconsin Health Information Organization from 2017-2022 and linked to the publicly available ADI at the census block level.

The APCD includes claims data (e.g., healthcare visits, procedures, pharmacy information) from health insurers, employers, and Medicaid.

The Dataset Continued

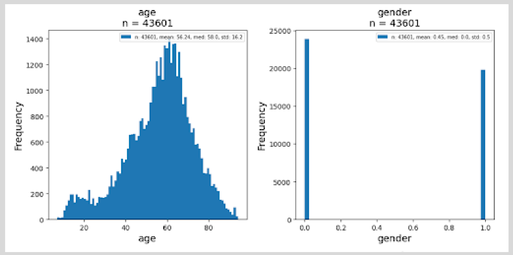
Of the N=6,026,463 participants in the overall sample, n=1,310,286 of which met initial inclusion criteria, n=154,821 underwent OSA diagnostic testing and n=43,601 were subsequently diagnosed with OSA.

Methodology

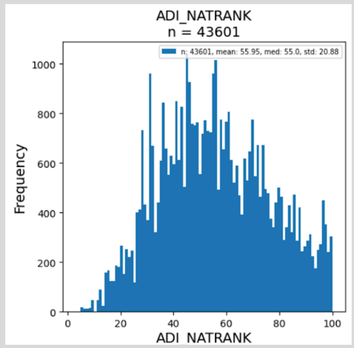
Sociodemographic variables were extracted from APCD including race, gender, and age. Inclusion criteria included continuous enrollment coverage for a minimum of 12-months prior to the date of OSA diagnosis (defined by ICD code G47.33) and a diagnostic sleep test (based on CPT codes).

OSA treatment initiation was defined using Healthcare Common Procedure Coding System (HCPCS) codes. ADI was measured at both state and national levels. Rates of OSA treatment initiation were compared between individuals with OSA living in the highest and lowest ADI quantiles (e.g., the areas of greatest and least socioeconomic deprivation) using ordinary least squares (OLS) regression analysis to evaluate the directionality and significance of their association.

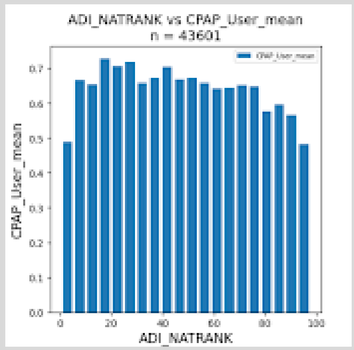
Performance



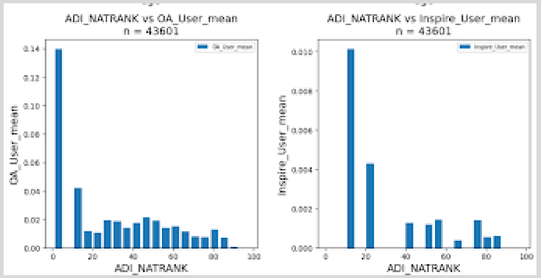
This chart outlines the ages and genders of our testing group.



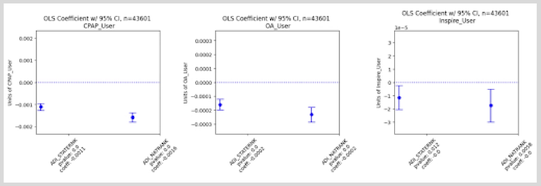
This chart outlines the national rank of ADI across the dataset population.



This chart outlines the national rank of ADI against CPAP Usage.



This chart outlines the ADI Rank vs. OA users and Inspire users.



the overal OLS Coefficient for CPAP users, OA Users, and Inspire Users.

Results

Of N=6,026,463 participants in the overall sample, N=154,821 underwent OSA diagnostic testing, and N=43,601 were subsequently diagnosed with OSA.

OSA treatment initiation was significantly, negatively associated with area socioeconomic deprivation based on National-ADI (Slope: -0.0011, p< 0.0050) and State ADI (Slope: -0.0016, p< 0.0050).

The highest rates of OSA treatment were observed in areas of greatest socioeconomic advantage (>70% in ADIs 15-25).

Conversely the lowest OSA treatment initiation rates were observed in areas of greatest socioeconomic disadvantage (< 50% in ADIs 90-100), reflecting a 20% difference in the likelihood of OSA treatment between the highest and lowest levels of socioeconomic disparity.

Conclusions

Area socioeconomic deprivation measured by ADI is associated with a small but significant increase in OSA testing. Individuals in areas with higher socioeconomic advantage were less likely to be tested for OSA.

Future Work

Future research should seek to increase access to OSA care in areas of socioeconomic disadvantage to improve sleep health equity and reduce global health disparities. We should seek to understand why individuals in disadvantaged areas have a higher testing rate than those in more advantaged areas.