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ASOPRS oculofacial surgeon practice distribution and neighborhood deprivation

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Abstract

Purpose: This study explores the relationship between the distribution of active American Society of Ophthalmic Plastic and Reconstructive Surgery (ASOPRS) oculofacial surgeons in the United States and the socioeconomic characteristics of their practice locations, as measured by the Area Deprivation Index (ADI).
Methods: In this cross-sectional study, active ASOPRS oculofacial surgeons in the United States were identified using the Oculofacial Society surgeon directory. Data on physician demographics, career stage, and practice type and location were compiled from publicly available sources. The ADI was extracted for each practice address. Chi-squared testing was performed for qualitative analysis.
Results: Overall, 580 physician addresses had obtainable state and national ADI values. The average ADI state decile was 3.5 and average national percentile was 29.9. The majority of surgeons (58.4%) practiced within the first state decile and national percentile quartile (*i.e.*, the lowest socioeconomic disadvantage). Practice locations in 41 states had average state decile values categorized as “low”, while practice locations in 36 states had average national percentile values categorized as “low.” There was no statistically significant difference between male and female presence, career stage, and practice type in low versus high ADI areas.

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Conclusion: The majority of ASOPRS oculofacial surgeons practice in neighborhoods with less socioeconomic disadvantage, as indicated by lower ADI state deciles and national percentiles, potentially contributing to healthcare disparities. Further research is warranted to understand other factors that may contribute to the ADI distribution of physicians and the role of ADI in pinpointing health care inequities.

Keywords: area deprivation index, health equity, neighborhood disparity, oculofacial, surgeon distribution

Introduction

With a growing aging population and expanding urban-rural gap, geographic disparities in provider distribution may impact access to eye care.[1-3] Proximity to and ability to afford or reliably access care may particularly affect patients requiring oculofacial surgeon services, given the subspecialty's small size.[2] Prior research demonstrates that social determinants of health (*i.e.*, non-medical factors, such as environment, education, employment, and access to resources, that may have a significant impact on a person's health) further contribute to discrepancies in access to oculofacial care, with one study showing that counties with lower income, lower cost of living, and limited access to the internet were less likely to have access to an oculofacial surgeon.[4]

As one of the primary determinants impacting health outcomes is an individual's residential neighborhood, health interventions and policies that fail to account for neighborhood disadvantage may inadequately or incompletely address the issue.[5] The Area Deprivation Index (ADI) is a validated scientific tool that combines 17 social determinants of health measures to provide a quantitative value that can be utilized to evaluate the socioeconomic disadvantage of a United States census block group, the smallest geographic division for which the United States census provides data.[6] Research thus far utilizing ADI has shown that greater neighborhood disadvantage is associated with increased hospital readmission rates, increased risk of mortality from COVID-19, and decreased clinic attendance after surgery.[7-9]

Consideration of socioeconomic disadvantage in surgeon practice location, rather than individual patient-level factors or large geographic trends, may allow for identification of inequities in access to oculofacial care in the United States. This study explores the relationship between the distribution of active oculofacial surgeons in the United States and the socioeconomic characteristics of their practice locations, as measured by the ADI. It also considers potential strategies for mitigating these disparities.

Methods

In this cross-sectional investigation, active American Society of Ophthalmic Plastic and Reconstructive Surgery (ASOPRS) oculofacial surgeons in the United States, as of December 2024, were identified using the Oculofacial Society surgeon directory.[10] Data on physician demographics, career stage, and practice type was compiled from publicly available sources, which included the American Academy of Ophthalmology, Castle Connolly, LinkedIn, US News Health, and physician's institutional websites.[11-14] Physicians were categorized as early- (0–10 years), mid- (11–20 years), or late-career (20 or more years) based on years in practice after oculoplastic fellowship completion. Practice address, including state and zip code, was compiled from the listed address on the Oculofacial Society surgeon directory.

ADI is a mapping tool which considers 17 different measures, including metrics of income, housing quality, education, and employment to rank neighborhoods by socioeconomic disadvantage based on United States Census Blocks. The Neighborhood Atlas is a compiled database, with data from 2017–2022, created by the University of Wisconsin Madison to identify the ADI for any given United States address.[6] When an address is inputted into the Neighborhood Atlas, its neighborhood is given both a state decile (1–10) and a national percentile (1–100), with lower values indicating areas with less disadvantaged block groups. In areas of high group quarters (such as on college campuses, residential treatment centers, group homes, correctional facilities, or military barracks), low population, low housing, or questionable data integrity, the ADI tool delivers a result of "Suppression" and the reason for suppression. Suppressed values of ADI were excluded from this analysis.

Using the physicians' practice addresses, state decile and national percentile ADI values were obtained. These values were organized into quartiles at the state (1–3, 4–5, 6–7, 8–10) and national (1–25, 26–50, 51–75, 76–100) levels. Additionally, ADI values were categorized as "low" (state 1–5 or national 1–50) and "high" (state 6–10 or national 51–100) for comparison with qualitative factors. Mean and range of state decile and national percentiles were calculated for each state. Chi-squared analysis was performed for qualitative analysis of ADI's relation to gender, physician training length, and practice type in Microsoft Excel. Significance was determined as $p < 0.05$.

Results

The Oculofacial Society surgeon directory identified 660 active ASOPRS oculofacial surgeons in the United States. Among these surgeons, 80 practice locations received a "Suppressed" result from the tool—indicating areas of high group quarter populations, low population, low housing, or questionable data integrity—and were removed from analysis, leaving a total of 580 physician practice addresses with extractable state and national ADI values.

The average ADI state decile for oculofacial surgeon practice location was 3.5 and average national percentile was 29.9 (Table 1). The majority of surgeons (58.4%) practiced within the lowest state decile quartile (*i.e.*, the lowest socioeconomic disadvantage). This trend was reflected in the national percentiles as well, with 50.3% of practice locations in the lowest quartile. There was a statistically significant difference between the number of oculoplastic surgeons in low versus high ADI settings at the state (75.5% vs. 24.4%, χ^2=151.04, $p < 0.001$) and national levels (79.7% versus 20.3%, $\chi^2 = 204.4$, $p < 0.001$).

Overall, 46 states (including the District of Columbia) had at least 1 active ASOPRS oculofacial surgeon listed in the Oculofacial Society surgeon directory (Appendix); Montana, Wyoming, North Dakota, South Dakota, and New Mexico did not have any listed oculofacial surgeons. Alaska, District of Columbia, Iowa, and Oklahoma comprised the states with oculofacial surgeon practice locations at the lowest state decile (state decile = 1) and Rhode Island and Hawaii represented the states with oculofacial surgeon practice locations at the highest state decile (state decile = 10). Provider location in District of Columbia was associated with the lowest national percentile at 1, while provider locations in Rhode Island, Maine, and Arkansas were associated with the 3 highest national percentiles, at 86.0, 76.0, and 70.7, respectively. Practice locations in 41 states had average state decile values categorized as “low” (less than or equal to 5) and practice locations in 36 states had average national percentile values categorized as “low” (less than or equal to 50).

There was no statistically significant difference between male and female presence in low vs. high ADI areas at both state ($\chi^2 = 0.172$, $p = 0.678$) and national ($\chi^2 = 0.781$, $p = 0.377$) levels (Table 2). Additionally, physician designation of early-, mid-, or late-career had no statistically significant relationship with their likelihood of practicing within low versus high ADI areas at both the state ($\chi^2 = 2.157$, $p = 0.342$) and national ($\chi^2 = 0.629$, $p = 0.730$) levels. Finally, practice type had no statistically significant relationship with low versus high ADI areas at the state ($\chi^2 = 3.833$, $p = 0.147$) and national level ($\chi^2 = 3.336$, $p = 0.189$).

Discussion

Oculofacial surgeons are significantly more likely to practice in areas of low neighborhood deprivation, as verified by ADI value analysis, both within an individual state and across the country. Surgeon demographic factors, such as gender and career stage, and practice type had no significant impact on a surgeon’s likelihood of practicing in a low versus high ADI area. These results are concordant with prior reports noting a higher oculofacial surgeon concentration in urban areas and an association between lower socioeconomic status and less access to oculofacial surgeon care.[3,4]

Table 1. Number and proportion of ASOPRS oculofacial surgeon practice locations by Area Deprivation Index state and national quartiles

Area Deprivation Index metric	Number and proportion of surgeons, *N* (%)
State quartile	
1 (1–3.25)	339 (58.5)
2 (3.25–5.5)	99 (17.1)
3 (5.5–7.75)	76 (13.1)
4 (7.75–10)	66 (11.4)
National quartile	
1 (1–25.75)	292 (50.3)
2 (25.75–50.5)	170 (29.3)
3 (50.5–75.25)	89 (15.3)
4 (75.25–100)	29 (5.0)

Table 2. Physician demographics and practice type by practice location Area Deprivation Index

Variable	Average State Decile	Average National Percentile
Gender		
Male	3.5	30.6
Female	3.5	28.4
Career stage		
Early-career	3.6	30.0
Mid-career	3.6	29.7
Late-career	3.4	30.2
Practice Type		
Private practice	3.5	29.9
Academic	3.9	33.4
Private and academic	3.0	25.3
Military	6.0	45.0

Socioeconomic deprivation has been associated with lower access to cataract surgery, negatively impacted visual outcomes after viral retinitis and retinal detachment, and lower rates of glaucoma testing, highlighting the need to consider this social determinant of health within the field of ophthalmology.[15-17] Among oculoplastic concerns, multiple studies have found significant connections between socioeconomic status and patient health outcomes. One study found that higher socioeconomic status, private insurance, and treatment at a high-volume facility were all factors that significantly influenced 10-year-survival in eyelid melanoma patients.[18] When managing facial trauma concerns, a study found that patients with private insurance were more likely to receive an ophthalmology consult than those without.[19] Another study found that higher annual income, employment, and higher educational level were associated with less risk of eye loss after ocular tumor and trauma.[20,21] Socioeconomic status of patients must be a factor of consideration throughout the clinic, perioperative, and postoperative evaluation for patients utilizing oculoplastic services. The current lack of oculoplastic surgeon presence in areas of higher neighborhood deprivation may represent a notable cause of disparities in care outcomes as already vulnerable populations have less access to key services, potentially impacting their visual, eye health, and mortality outcomes.

Developing strategies to mitigate these distribution discrepancies is imperative. As observed, oculofacial surgeons tend to practice in areas of low ADI or high affluence. This may, in part, be a result of desired area of private residence, target patient population, higher patient volumes, and access to large hospital systems and referring providers. In the literature, described strategies to promote practice migration or involvement to areas of higher ADI include increasing reimbursements for oculoplastic procedures, increasing patient understanding and education of offered services, and building robust telehealth connections.[4] Increasing and/or optimizing reimbursements may provide surgeons with an incentive to establish practice locations in areas of greater neighborhood disadvantage.[22] Expanding patient education on periocular pathologies and highlighting the importance of targeted care for qualifying individuals could encourage use of oculoplastic services and allow for expansion of geographic impact; utilization of social media may also play a role in increasing visibility to a larger and more diverse audience of patients.[23,24] An additional technological solution includes telemedicine, an often-proposed strategy to bridge the gap of requiring transportation and time to meet with a provider. Postoperative visits, functional non-surgical evaluations, eyelid lesion evaluations, and eyelid malposition assessments are a few of the potential visit categories that could be addressed during a telemedicine encounter.[25] Notably, the communities that may benefit the most from telehealth visits are often less likely to have access to the internet or have knowledge on how to utilize these services.[26] Infrastructure to improve patient access to telehealth technology and education on how to navigate services could be one strategy to alleviate these concerns. Community centers for computer access in private areas or use of image-based

eyelid lesion management services, which could enroll community-based optometrists for image procurement, are potential ideas.[27] Finally, there is an area of opportunity for the creation of a curriculum within the ASOPRS framework for education on health disparities within the field. Such a curriculum could highlight the impact of social determinants of health, such as income, access to transportation, food security, or housing, on patient considerations and outcomes in clinic and surgical settings.[28,29]

This investigation has several limitations. Active oculofacial surgeons and their practice locations in the United States were identified using the Oculofacial Society surgeon directory. Errors in data reporting or data extraction may influence the reported distribution and representation of surgeons. Further, surgeons may practice at additional locations not listed in the database or change their location mid-practice, limiting a complete analysis of geographic distribution. The Neighborhood Atlas was last updated in 2022 and has compiled information from the 5 preceding years, 2017–2022, which may not fully represent geographic trends. Finally, ADI was used as a proxy for neighborhood deprivation and socioeconomic status in this study. Although individual and regional variation is possible, it is a validated tool and has the advantage of including multiple factors such as education, employment, income, and housing quality.

Conclusion and future perspectives

The majority of ASOPRS oculofacial surgeons practice within neighborhoods with less socioeconomic disadvantage, as indicated by lower ADI state deciles and national percentiles, potentially contributing to healthcare disparities. Demographic factors such as gender, career stage, and practice type are not correlated with choice of practice location neighborhood deprivation. Further research is warranted to understand other factors that may contribute to the geographic distribution of physicians and the role of ADI in pinpointing health care inequities.

Declarations

Ethics approval and consent to participate
None required.

Competing interests
None to declare.

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Appendix

A. Deprivation index state and national metrics by state

State	Min state decile	Max state decile	Average state decile	Min national percentile	Max national percentile	Average national percentile
Alabama	2	10	4.0	47	99	61.8
Alaska	1	1	1.0	6	6	6.0
Arizona	2	10	4.3	19	100	38.9
Arkansas	2	8	4.3	54	92	70.7
California	1	10	3.4	1	71	10.8
Colorado	1	10	4.7	6	99	26.5
Connecticut	1	10	3.5	1	76	26.1
Delaware	1	9	5.3	17	63	42.0
District of Columbia	1	1	1.0	1	1	1.0
Florida	1	8	4.1	3	69	37.3
Georgia	1	8	3.0	8	99	37.9
Hawaii	10	10	10	39	39	39.0
Idaho	1	8	4.2	12	57	35.0
Illinois	1	9	3.3	9	90	37.3
Indiana	1	7	2.0	6	80	22.0
Iowa	1	1	1.0	16	35	29.5
Kansas	1	4	2.0	11	63	34.4
Kentucky	1	8	3.3	30	91	52.7
Louisiana	1	3	1.8	5	56	27.3
Maine	8	8	8.0	76	76	76.0
Maryland	1	8	5.0	2	55	30.8
Massachusetts	1	10	4.4	2	81	20.8
Michigan	1	6	3.5	29	74	51.4
Minnesota	1	9	5.3	12	71	44.7
Mississippi	1	2	1.3	12	62	42.3

State	Min state decile	Max state decile	Average state decile	Min national percentile	Max national percentile	Average national percentile
Missouri	1	10	2.6	6	97	37.1
Nebraska	2	7	4.0	40	73	55.7
Nevada	2	4	3.0	22	30	26.0
New Hampshire	1	7	3.8	15	49	31.0
New Jersey	1	8	3.6	1	44	18.8
New York	1	9	3.3	1	80	17.8
North Carolina	1	10	2.8	9	98	34.9
Ohio	1	6	2.5	16	74	40.9
Oklahoma	1	1	1.0	23	41	32.0
Oregon	1	7	2.5	7	40	15.7
Pennsylvania	1	9	2.7	2	88	34.6
Rhode Island	10	10	10	86	86	86.0
South Carolina	1	5	2.8	9	64	39.8
Tennessee	1	7	4.5	23	76	57.3
Texas	1	10	2.6	1	96	28.7
Utah	5	9	6.9	30	46	37.8
Vermont	7	7	7.0	57	57	57.0
Virginia	1	7	3.2	3	57	23.9
Washington	1	9	4.8	1	45	20.7
West Virginia	2	2	2.0	60	60	60.0
Wisconsin	1	7	3.3	7	67	38.9
Total	**1**	**10**	**3.5**	**1**	**100**	**29.9**