

# Race and Socioeconomic Status in the Management of Vestibular Schwannomas: Interactions and trends over the past 20 years



Victoria Dreyer, BS<sup>1</sup>; Rya Neill, BS<sup>1</sup> Peter Harris, MD<sup>1</sup>; Lekhaj Daggubati, MD<sup>1</sup>  
<sup>1</sup>Department of Neurosurgery, George Washington University, Washington, DC



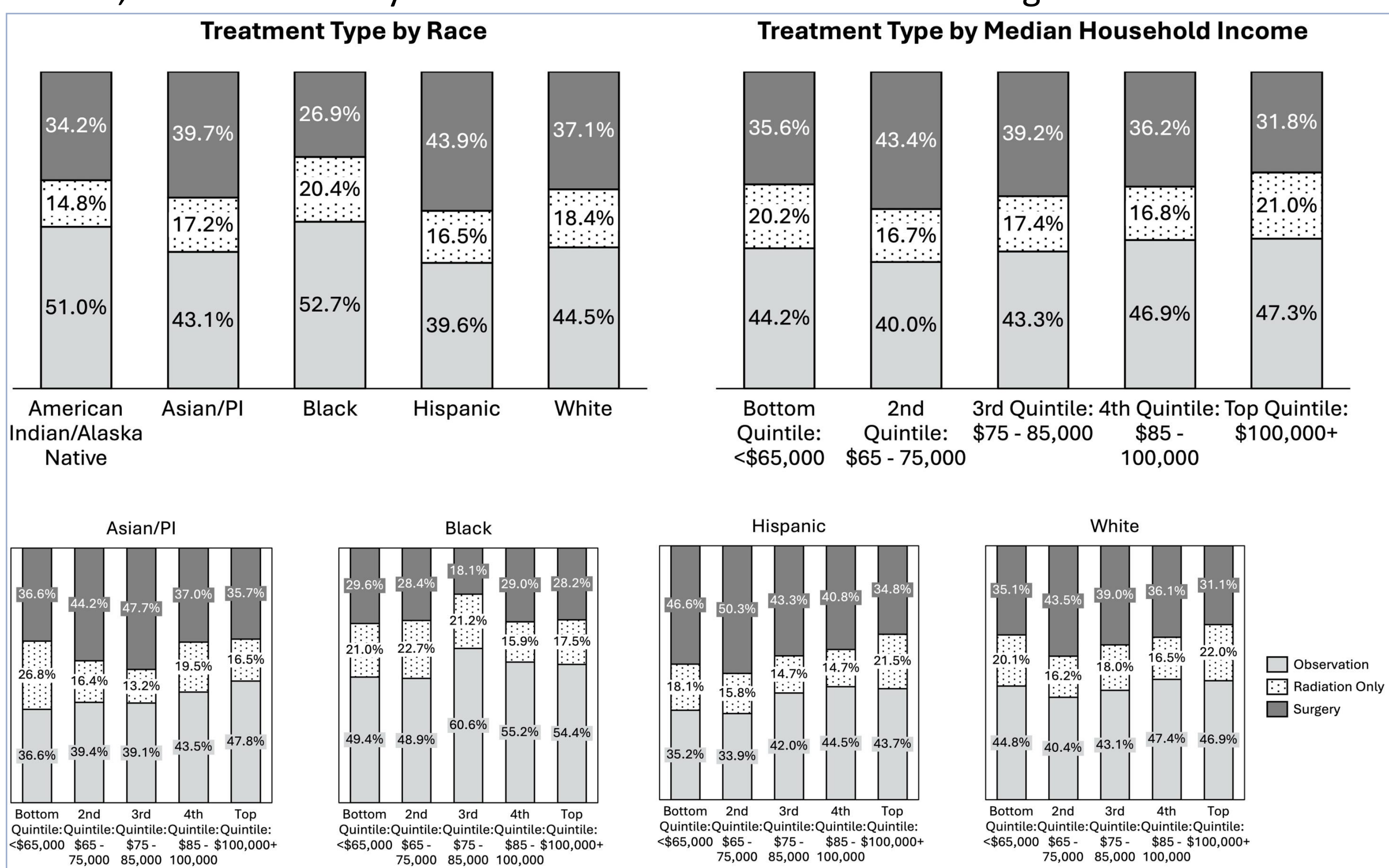
## Introduction

Vestibular schwannomas (VS) are benign tumors arising in the vestibulocochlear nerve, most commonly managed with radiotherapy, surgery, or observation. Previous research found racial disparities in surgical intervention for primary brain tumors, including VS, controlling for insurance status. This paper explores interactions between income/socioeconomic status (SES) and race in influencing VS management, and evolution over time.

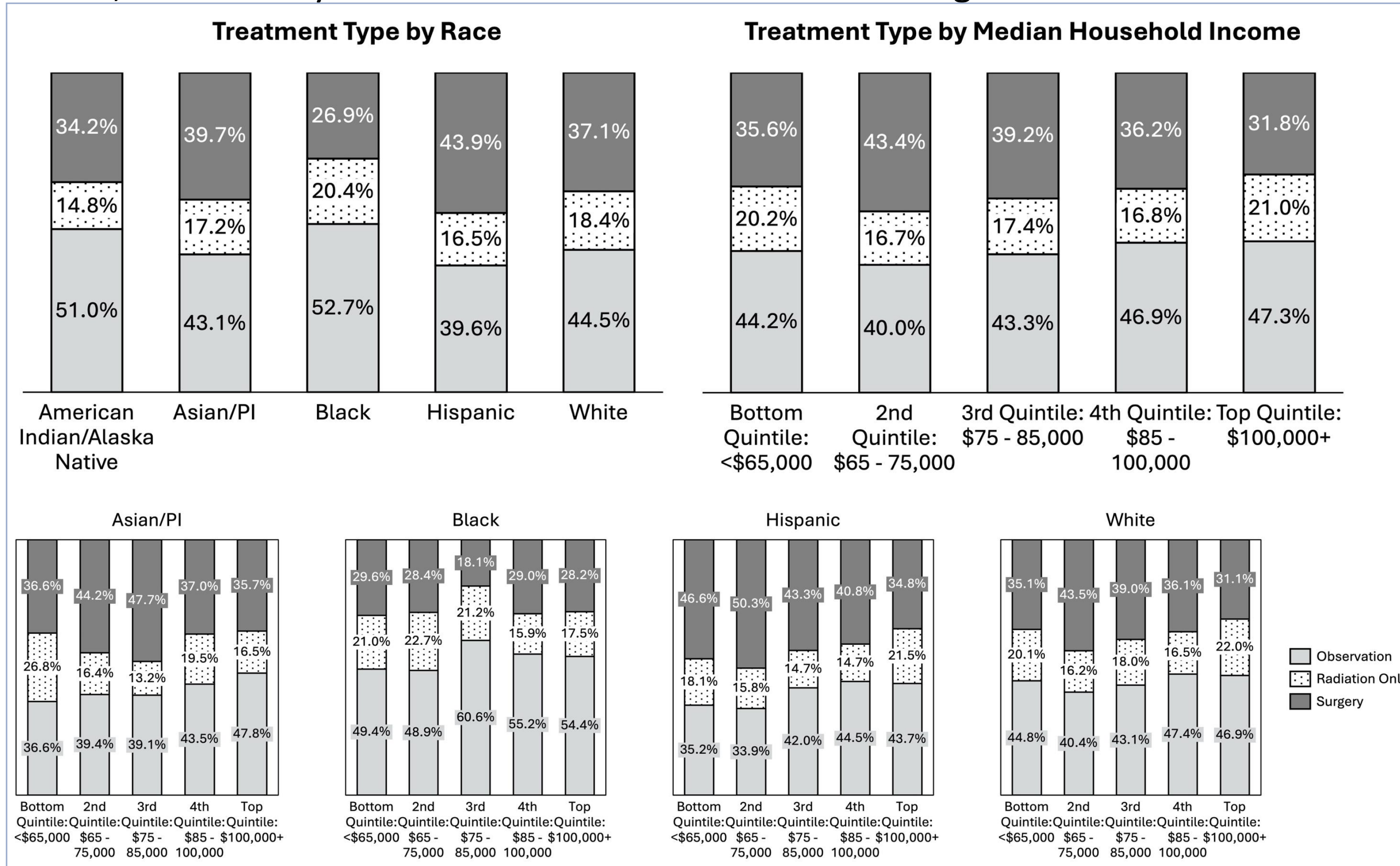
## Methods and Materials

The Surveillance, Epidemiology and End Results (SEER) database, a national database of cancer incidence and survival data which covers approximately 48% of the total US population and intended to represent the entire population was investigated. Demographic, clinical, and treatment data were gathered on 23,488 VS cases from 2004-2021. Categorical data was analyzed with chi-square and Cramer's V to calculate effect size  $\phi$ . Relationships between tumor size, SES, and race were analyzed with logistic regression. Analyses were completed for the whole cohort, then repeated for the 2016-2021 cohort only, to assess trends.

**Figure 1.** Whole cohort 2004-2021, treatment type by race and socioeconomic status, and stratified by socioeconomic status with racial categories



**Figure 2.** 6-year 2016-2021 cohort, treatment type by race and socioeconomic status, stratified by socioeconomic status with racial categories



**Table 1.** Chi-square and Cramer's V analysis for effect of race alone and SES alone on treatment modality

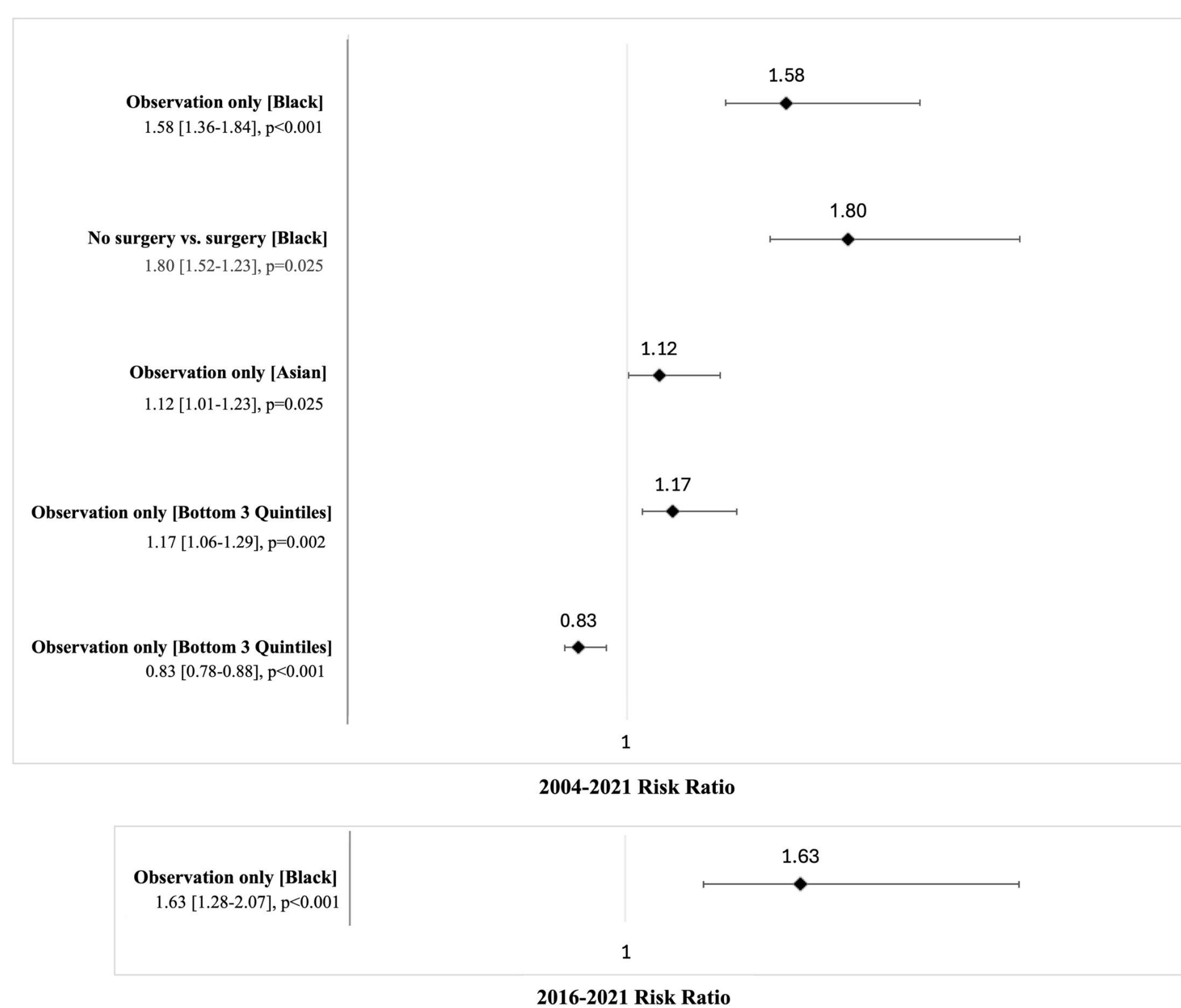
	Race		Socioeconomic Status	
	$\chi^2$	$\phi$	$\chi^2$	$\phi$
<b>2016-2021 cohort</b> <i>n=8,536 total</i>	p<0.001, df15	0.078	p<0.001, df15	0.060
<b>Overall cohort</b> <i>n=23,488</i>	p<0.001, df15	0.047	p<0.001, df15	0.050

## Results

Black patients across all socioeconomic statuses are less likely to have VS surgery than non-Black patients ( $p<0.001$ ) (Fig 1). For other races, patients in the top quintile of SES tend to have the lowest rates of surgical intervention within their respective race categories (Asian: 35.7%, Hispanic: 34.8%, white: 31.1%). This trend is not observed in Black patients, where all except for the middle quintile have similar surgical rates in the 2004-2021 cohort. Black patients of all quintiles are less likely undergo surgery than patients of any SES in other race categories, a trend that persisted in the 2016-2021 cohort (Fig 2).

Chi-square analysis supported a significant association of SES with treatment modality for Hispanic, Asian, and white populations ( $p<0.001$  for all) but only approaching significance in Black patients ( $p=0.095$ ). This trend persisted in the 2016-2021 cohort (Fig 2). The effect size of race / SES on treatment was  $\phi=0.047 / 0.050$  respectively, but  $\phi=0.078 / 0.060$  in the 2016-2021 cohort. Logistic regression for treatment modality included SES and race as factors and tumor size as a covariate (Fig 2). For the whole cohort and when analysis was restricted to 2016-2021, race, SES, and tumor size were all significant predictors of treatment (all  $p<0.001$ ).

**Figure 3.** Forest plot of odds ratios with SES and race factors, 2004-2021 (top) and 2016-2021 (bottom)



## Discussion

Though previous analyses using SEER data controlled for insurance status, stratification of treatment rates by SES within each race group provides further evidence that race plays a significant role for treatment of VS in Black patients regardless of income. Indeed, chi-square and Cramer's V analysis for the impact of SES within each race group found that SES did not make a significant difference in treatment for Black patients ( $p=0.095$ ), but was significant for all other race categories ( $p<0.001$ ). These data provide strong support for the idea that race and socioeconomic status both independently impact treatment modality and interact differentially to influence treatment. Though significant overall, income does not appear to influence VS treatment in the Black population. Within the socioeconomic category, race did not significantly influence treatment in the top 2 income quintiles. Moreover, these relationships are not static, and specific disparities in treatment by race and socioeconomic status have shifted over time.

## Conclusions

When apparent racial disparities are discovered, the question of socioeconomic status as a confounding factor often arises. However, our results support that decreased surgical intervention in VS for Black patients is not solely attributable to SES. SES was found to have a significant impact on treatment for all except Black patients. The effect sizes for race and SES on treatment in the overall cohort are similar. For the 2016-2021 cohort, the effect size of race is much greater than that of SES, supporting a relatively stronger role for race compared to SES in influencing VS management. This trend may be partly explained by the 2010 passage of the Affordable Care Act. Race remains a determinant of treatment modality in the 2016-2021 cohort despite increased awareness of racial health disparities accelerated by the COVID-19 pandemic.

## Contact

Victoria Dreyer  
The George Washington University School of  
Medicine and Health Sciences  
[address]  
victoria.dreyer@gwu.edu  
980-240-9512

## References

- Gupta VK, Thakker A, Gupta KK. Vestibular Schwannoma: What We Know and Where We are Heading. Head Neck Pathol. 2020;14(4):1058-1066. doi:10.1007/s12105-020-01155-x
- Kim JS, Yang-Sun C. Growth of vestibular schwannoma: Long-term follow-up study using survival analysis. Acta Neurochir. 2021;08/163(8):2237-2245. doi:10.1007/s00701-021-04870-8.
- Leon J, Lehrer EJ, Peterson J, et al. Observation or stereotactic radiosurgery for newly diagnosed vestibular schwannomas: A systematic review and meta-analysis. J Radiosurg SBRT. 2019;6(2):91-100. doi: 10.3171/2013.1.JNS121370. Epub 2013 Feb 22. PMID: 23432451.
- Tsao MN, Sahgal A, Xu W, et al. Stereotactic radiosurgery for vestibular schwannoma: International Stereotactic Radiosurgery Society (ISRS) Practice Guideline. J Radiosurg SBRT. 2017;5(1):5-24. doi:10.1177/019459815590105
- Carlson ML, Habermann EB, Wagie AE, et al. The Changing Landscape of Vestibular Schwannoma Management in the United States—A Shift Toward Conservatism. Otolaryngol Head Neck Surg. 2015;153(3):440-446. doi:10.1177/019459815590105
- Butterfield JT, Golzarian S, Johnson R, et al. Racial disparities in recommendations for surgical resection of primary brain tumours: a registry-based cohort analysis. The Lancet (British edition). 2022;400(10368):2063-2073. doi:10.1016/S0140-6736(22)00839-X
- Babu R, Sharma R, Bagley JH, Hafez J, Friedman AH, Adamson C. Vestibular schwannomas in the modern era: epidemiology, treatment trends, and disparities in management. J Neurosurg. 2013 Jul;119(1):121-30. doi: 10.3171/2013.1.JNS121370. Epub 2013 Feb 22. PMID: 23432451.
- Carlson ML, Marston AP, Glasgow AE, Habermann EB, Sweeney AD, Link MJ, Wanna GB. Racial differences in vestibular schwannoma. Laryngoscope. 2016 Sep;126(9):2128-33. doi: 10.1002/lary.25892. Epub 2016 Feb 24. PMID: 26917495.
- National Cancer Institute. Characteristics of the SEER Population Compared with the Total United States Population. 2020 Census Data. <https://seer.cancer.gov/registries/characteristics.html>
- Reznitsky M, Petersen MMBS, West N, Stangerup SE, Cayé-Thomasen P. The natural history of vestibular schwannoma growth-prospective 40-year data from an unselected national cohort. Neuro Oncol. 2021;23(5):827-836. doi:10.1093/neuonc/noaa230