

Socioeconomic Influence on Surgical Management and Outcomes in Patients with Craniosynostosis

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Introduction

- Craniosynostosis is the premature fusion of one or more cranial sutures that can negatively impact natural brain and cognitive development.¹
- Non-syndromic craniosynostosis is a common condition affecting 5.2 per 10,000 live births globally.²
- Surgical management options for craniosynostosis include strip craniectomy, which can be done endoscopically, or cranial vault remodeling, which can be performed later than strip craniectomy.¹
- Despite a recent surge in interest in comprehending the socioeconomic inequalities in craniosynostosis management, a comprehensive and systematic summary of such disparities is currently lacking.

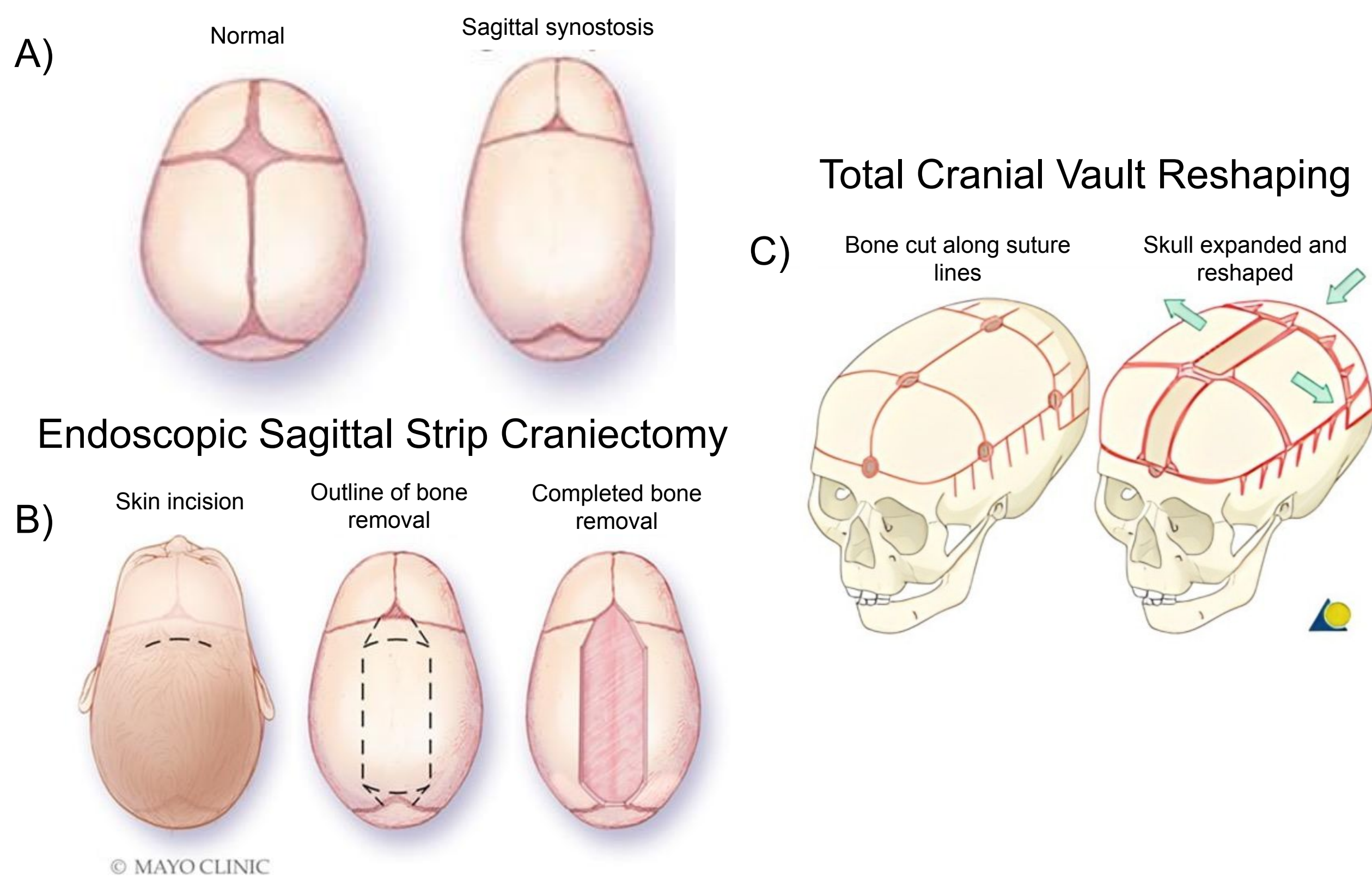


Figure 1: Reference for Sagittal Synostosis Repair. A) Comparison of a normal cranium vs. patient with sagittal synostosis.³ B) Sagittal synostosis is removed through sagittal strip craniectomy.³ C) Cranium is cut along multiple suture lines and expanded through total cranial vault reshaping.⁴

Purpose

This systematic review summarizes and assesses evidence on possible differences in surgical care including procedure type and age at surgery, and differences in surgical outcomes such as complications, length of hospital stay, and child development based on SES.

Methods

- Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) was used to identify articles to be reviewed.
- Search Terms: craniosynostosis, socioeconomic, insurance, zip code, disparity, access.
- Inclusion Criteria: English, craniosynostosis population, socioeconomic status measures, treatment outcomes.
- Exclusion Criteria: review articles, current clinical trials, commentaries, abstracts/full-text not available, no socioeconomic status measures, wrong patient population.

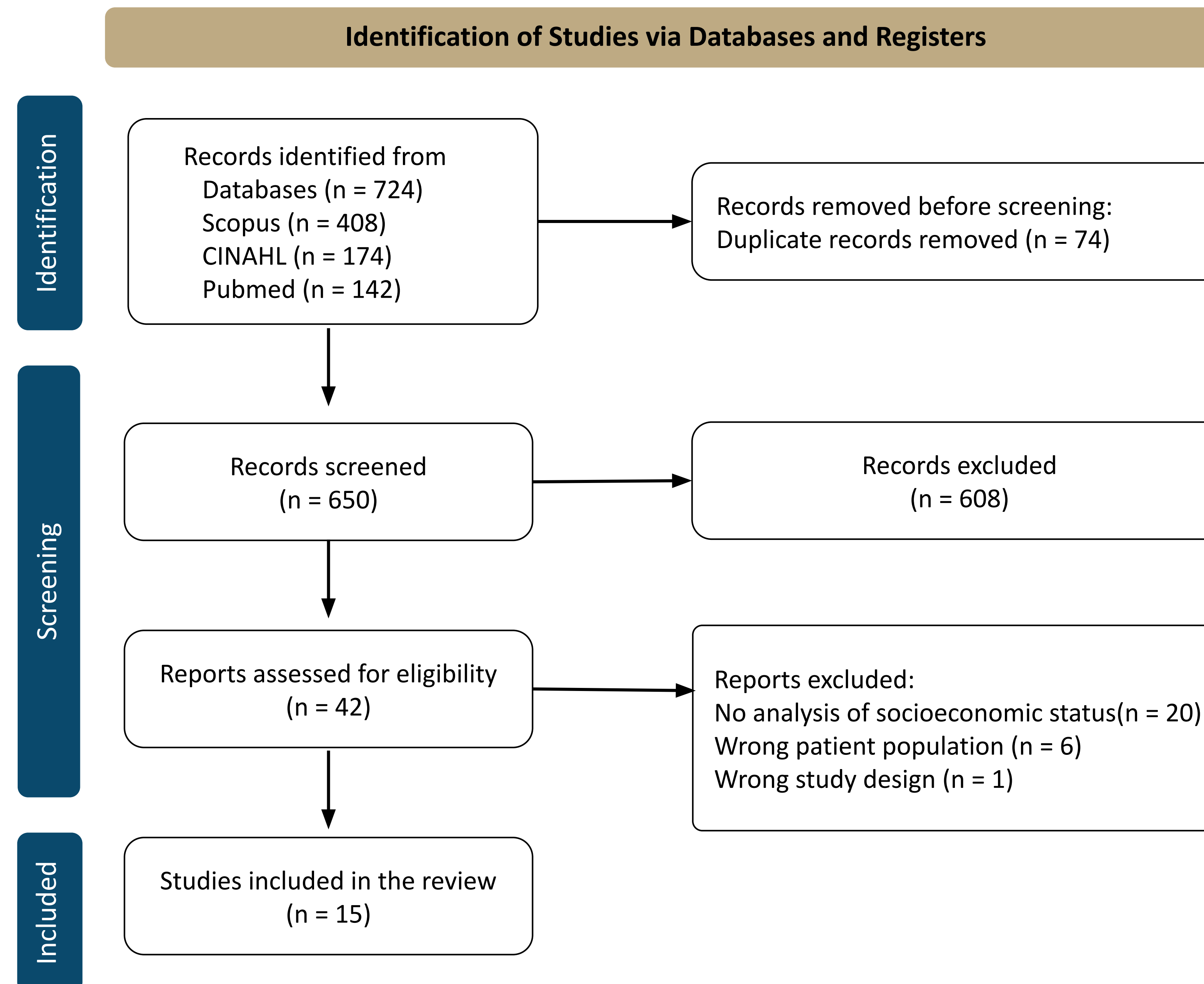


Figure 2: Preferred Reporting Items for Systematic Reviews and Meta-Analyses Search Methodology. Three independent reviewers screened 724 articles in a standardized manner resulting in 15 studies included in this systematic review.

Results

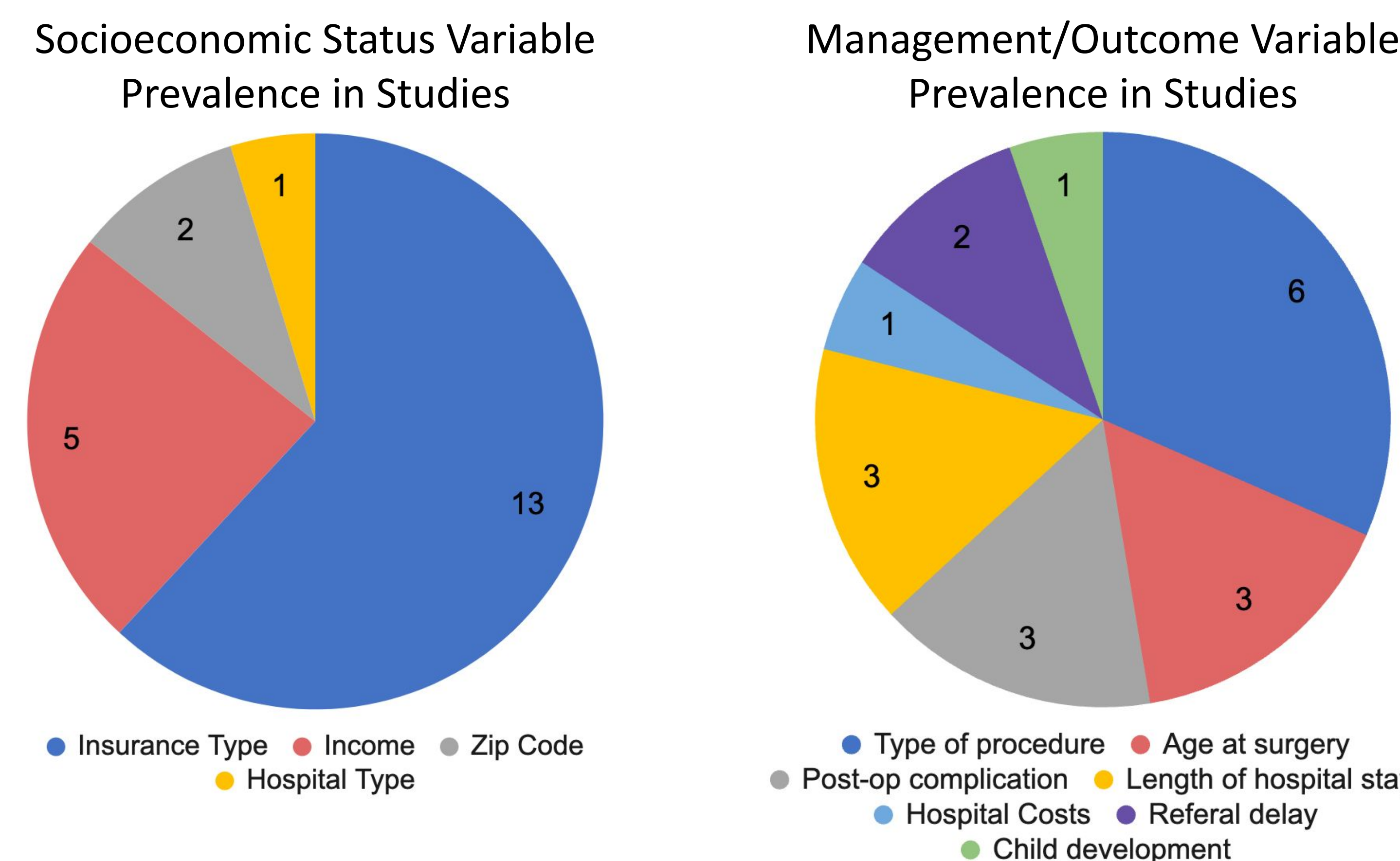


Figure 3: Prevalence of Variables in Included Studies. The chart to the left displays socioeconomic status variables measured in the included studies, with Insurance Type being the most commonly measured among them. The chart to the right displays craniosynostosis management or outcome variables measured in the included studies, with Type of Procedure being the most commonly measured among them.

Type of procedure

- Of the six studies conducted, four comparing open versus endoscopic surgery found that patients with private insurance were more likely to undergo endoscopic surgery, with statistical significance observed in one study.
- Of the six studies compared, three comparing SC versus CVR found that patients with private insurance were more likely to undergo SC, with statistical significance observed in two studies.

Age at Surgery

- All three studies found that a majority of patients with public insurance and/or low income status were admitted at older ages, two of which reported significant values.

Post-op complications

- In two out of three studies, postoperative complications were found to not have a significant association with SES variables.
- One study found patients with medicaid to be 1.7x more likely to experience postoperative complications.

Length of hospital stay

- One of two studies found a significant relationship between patients with private insurance and a reduced length of hospital stay.
- The second study reported no significant link between insurance and length of hospital stay.

Other

- High hospital costs were found to have a significant association with public insurance in one study.
- Child verbal development was moderately positively correlated with high income in one study.

Conclusion

- This systematic review demonstrated that SES may be associated with several differences in the management of patients with craniosynostosis, though insufficient data precluded any definitive, quantifiable results.
- Further investigation into the impact of SES on the management of patients with craniosynostosis is warranted.

References

1. Proctor, M. R., & Meara, J. G. (2019). A review of the management of single-suture craniosynostosis, past, present, and future: JNSPG 75th Anniversary Invited Review Article. *Journal of Neurosurgery: Pediatrics*, 24(6), 622–631. <https://doi.org/10.3171/2019.7.PEDS18585>
2. Shlobin, N. A., Baticulon, R. E., Ortega, C. A., Du, L., Bonfield, C. M., Wray, A., Forrest, C. R., & Dewan, M. C. (2022). Global Epidemiology of Craniosynostosis: A Systematic Review and Meta-Analysis. *World Neurosurgery*, S1878875022007331. <https://doi.org/10.1016/j.wneu.2022.05.093>
3. Mayo Foundation for Medical Education and Research. (2018). Endoscopic Sagittal Strip Craniectomy. Mayo Clinic. Retrieved from <https://www.mayoclinic.org/medical-professionals/neurology-neurosurgery/news/minimally-invasive-surgery-for-craniosynostosis/mac-20438762>.
4. Total cranial vault reshaping. (n.d.). Children's Hospital of Philadelphia. Retrieved from <https://www.chop.edu/treatments/surgical-treatment-craniosynostosis>.