Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
Reduced visits to pediatric eye care among socioeconomically disadvantaged patients during the COVID-19 pandemic

Kaitlyn Brettin, MD,a,b,c Ankoor S. Shah, MD, PhD,a,c,d Jennifer Welcher, BS, MBA,c and Benjamin Jastrzembski, MDa,c,d

We hypothesized that children with low socioeconomic status (SES) had disproportionately fewer eye care visits during the early COVID-19 pandemic and that these children would be less likely to use synchronous provider-to-patient telemedicine eye care visits. This study investigated changes in patient demographics at a large, academic pediatric eye center before and after the pandemic. A retrospective review of all visits from March 18, 2019, to May 31, 2019 (pre-COVID period) and of the same date range in 2020 (COVID period) was performed. Patient addresses were used to calculate the Area Deprivation Index (ADI), a validated measure of a neighborhood’s SES. Patients who identified as non-White, and those requiring an interpreter had relatively fewer visits during the COVID period compared to the pre-COVID period. In addition, relatively fewer telemedicine visits were performed with patients who lived in a neighborhood classified as at or above the 50th ADI percentile (more disadvantaged).

The prevalence of eye disease is higher among children with low socioeconomic status (SES), yet they are less likely to see eye specialists.1-4 In the United States, the COVID-19 pandemic has disproportionately affected people with lower SES in terms of morbidity and mortality from the virus,5-7 and early evidence has suggested that vulnerable populations disproportionately lost access to care following the widespread implementation of telemedicine.8,9 This study examined how the pandemic affected visits to pediatric eye care for children with low SES.

Methods

This was a retrospective chart review using billing data for all visits completed in the Department of Ophthalmology at Boston Children’s Hospital from March 18 to May 31, 2019 (pre-COVID period), and for the same date range in 2020 (COVID period). This study was approved by the Boston Children’s Hospital Institutional Review Board and was performed in compliance with the US Health Insurance Portability and Accountability Act of 1996. The following patient data were collected: age, sex, address, self-identified race, insurance, whether an interpreter was listed as needed for each visit, and whether the visit was performed via synchronous provider-to-patient telemedicine. Area Deprivation Index (ADI), which is a validated measure of neighborhood SES that takes into account 17 different social measures across income, education, housing, and employment domains, was calculated based on home addresses.10 Socioeconomic disadvantage was defined as any of the following: (1) self-identified race not “White”; (2) having any public insurance, regardless if primary or not; (3) interpreter status listed as needed in the scheduling software; (4) patient address corresponding to an ADI ≥50th percentile nationally.

The primary outcome was a statistical comparison of visits that were for socioeconomically disadvantaged children (by definitions above) seen in the COVID period compared to the pre-COVID period. This was performed using Pearson χ² tests. The secondary outcome was a statistical comparison of in-person as well as telehealth visits during the COVID period compared with the total pre-COVID visits for each category. The secondary outcome was also assessed using Pearson χ² tests.

Results

In the pre-COVID period, there were 9,793 visits, with 27 (0.3%) conducted by telehealth. Median patient age in the pre-COVID period was 7.8 years. In the COVID period, there were 4,240 visits, with 2,939 (69.3%) conducted by telehealth; median age was 6.6 years.

For the primary outcome, visits were disproportionately decreased in the COVID period compared with the pre-COVID period among those who self-identified as non-White and those requiring an interpreter. In contrast, there was no significant decrease in the relative proportion of overall visits between the pre-COVID and COVID period among those patients with public insurance or high ADI (low SES). See Table 1.

With regard to the secondary outcome, the distribution of telehealth and in-person visits during the COVID period, similar decreases were seen for both in-person and telemedicine visits in the proportion of visits that were for non-White patients and those requiring an interpreter.

There was also underrepresentation of patients with a high ADI (low SES) in telehealth visits, even though there was no underrepresentation for this group in overall visits during the COVID period. There was no significant change in distribution of visits for either telehealth or...
in-person visits according to insurance type, compared with the pre-COVID distribution (Table 1).

Discussion

Patients requiring an interpreter and who self-identified as non-White made up a smaller percentage of visits during the COVID-19 pandemic compared to pre-pandemic visits at a large, academic pediatric eye center in the United States. Because our study examined completed visits exclusively, it is unknown whether the affected patients were either unable to access care or chose to forgo care because of concerns of COVID exposure, financial burden, or other reasons.

Additionally, we observed decreased utilization of telehealth visits in particular among patients living in more deprived neighborhoods as measured by ADI, non-White patients and patients requiring an interpreter. There was no decrease in relative number of overall visits for high ADI (low SES) patients during the COVID period, suggesting there may be barriers specific to telehealth. Low-income individuals are less likely to own smartphones, have home broadband, and use the internet.11

The limitations of our study primarily pertain to the quality of the demographic data available. Although missing data for interpreter and insurance status was small, there was a large percentage of missing data for ADI (20% in the pre-COVID period and 17% in the COVID period) and race (32% in the pre-COVID period and 39% in the COVID period).

Table 1. Visits in Pre-COVID and COVID periods by race, interpreter need, and Area Deprivation Index (ADI)

|                      | Pre-COVID total visits (%) | COVID total visits (%) | P valuea | COVID in-person visits (%) | P valuea | COVID telehealth visits (%) | P valuea |
|----------------------|---------------------------|------------------------|----------|---------------------------|----------|-----------------------------|----------|
| **Race**             |                           |                        |          |                           |          |                             |          |
| White                | 4243 (63)                 | 1779 (68)              | <0.0001  | 525 (70)                  | 0.0002   | 1254 (68)                   | 0.0006   |
| Non-White            | 2464 (37)                 | 824 (32)               | 0.2362   | 716 (55)                  | 0.9919   | 1664 (57)                   | 0.1336   |
| **Insurance**       |                           |                        |          |                           |          |                             |          |
| Private              | 5391 (55)                 | 2380 (56)              | 0.2362   | 585 (45)                  | 0.9919   | 1275 (43)                   | 0.1336   |
| Public               | 4402 (45)                 | 1860 (44)              |          | 104 (8)                   | 0.0381   | 2712 (93)                   | <0.0001  |
| **Interpreter status** |                        |                        |          |                           |          |                             |          |
| No interpreter needed | 8650 (90)                 | 3902 (93)              | <0.0001  | 1190 (92)                 | 0.0381   | 2712 (93)                   | <0.0001  |
| Interpreter needed   | 945 (10)                  | 299 (7)                |          | 104 (8)                   | 0.0381   | 2712 (93)                   | <0.0001  |
| **ADI**              |                           |                        |          |                           |          |                             |          |
| High socioeconomic status | 7171 (92)                 | 3221 (92)              | 0.5787   | 970 (90)                  | 0.0208   | 2251 (93)                   | 0.0278   |
| Low socioeconomic status | 652 (8)                   | 281 (8)                |          | 113 (10)                  |          | 168 (7)                     |          |

aP values compare to pre-COVID total visits.
bMissing data for race is 32% for pre-COVID period and 39% for COVID period.
cNo missing data for insurance category.
dMissing data for interpreter status is 2% for pre-COVID period and 1% for COVID period.
eMissing data for ADI is 20% for pre-COVID period and 17% for COVID period.

References

1. Stein JD, Andrews C, Musch DC, Green C, Lee PP. Sight-threatening ocular diseases remain underdiagnosed among children of less affluent families. Health Affairs (Project Hope) 2016;35:1359-66.
2. Ehrlich JR, Anthopolos R, Tootoo J, et al. Assessing geographic variation in strabismus diagnosis among children enrolled in Medicaid. Ophthalmology 2016;123:2013-22.
3. Majeed M, Williams C, Northstone K, Ben-Shlomo Y. Are there inequities in the utilisation of childhood eye-care services in relation to socio-economic status? Evidence from the ALSPAC cohort. Br J Ophthalmol 2008;92:965-9.
4. Ganz ML, Xuan Z, Hunter DG. Prevalence and correlates of children’s diagnosed eye and vision conditions. Ophthalmology 2006;113:2298-306.
5. Dyer O. Covid-19: Black people and other minorities are hardest hit in US. BMJ 2020;369:m1483.
6. Khunti K, Singh AK, Pareek M, Hanif W. Is ethnicity linked to incidence or outcomes of covid-19? BMJ 2020;m1548.
7. Kirby T. Evidence mounts on the disproportionate effect of COVID-19 on ethnic minorities. Lancet Respir Med 2020;8:547-8.
8. Nouri Sarah, Khoong Elaine C, Lyles Courtney R, Karliner Leah. Addressing equity in telemedicine for chronic disease management during the COVID-19 pandemic. NEJM Catalyst May 4, 2020.
9. Aziz K, Moon JY, Parikh R, Lorch AC, Friedman DS, Miller JB, et al. Association of patient characteristics with delivery of ophthalmic telemedicine during the COVID-19 pandemic. JAMA Ophthalmol 2021;139:1174-82.
10. Kind AJH, Buckingham WR. Making neighborhood-disadvantage metrics accessible — the neighborhood atlas. N Engl J Med 2018;378:2456-8.
11. Demographics of Internet and home broadband usage in the United States 2018 and 2019. Pew Research Center. Available from: http://www.pewinternet.org/fact-sheet/internet-broadband/.