The Importance of Understanding Neighborhood Environments in Neurology Care

Rosemarie Kobau, MPH,
Epilepsy Program, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Harvard Medical School.

Lidia M. V. R. Moura, MD MPH
Department of Neurology, Massachusetts General Hospital, Harvard Medical School.

Compared with US adults without epilepsy, adults with epilepsy are more likely to report an inability to afford prescription medicine and specialty care and delayed care because of transportation barriers or were in families having problems paying medical bills.[1] Although social needs (e.g., public transportation and medication assistance programs) are experienced at the individual level, they may reflect community-level resources that, when present, foster health and, when absent, thwart it. Social determinants of health (SDOH) include the social, economic, institutional, and environmental factors that affect health outcomes.[2,3] Although substantial research has documented disparities in individual-level social needs in people with epilepsy, scant research exists examining associations between community-level SDOH and epilepsy outcomes.[3-5]

In this issue of *Neurology*®, Busch et al.[5] publish a study that examined the associations between neighborhood deprivation and neuropsychological function in older adolescents and adults with temporal lobe epilepsy (TLE), primarily from Ohio and surrounding states. The authors are commended for conducting a timely study aimed at bringing greater attention to the role of SDOH on neurologic status and outcomes. As the authors suggest, relative to what is known about the role of social deprivation on brain health (e.g., reduced volume, connectivity, and declines in cognitive performance and mood), this study highlights an important gap in the neurologic field, in general, and in epilepsy more specifically. The authors not only described known disease-related factors associated with poor neuropsychological outcomes among those with TLE (e.g., age at seizure onset and dominant-sided seizures) but also noted a research gap related to understanding "the impact of neighborhood deprivation, more broadly, on cognitive and mood outcomes." Simply put, the experiences and outcomes of people with similar TLE histories and profiles might differ depending on where they live.

The authors demonstrate benefits of using both population-level data and healthcare system data with which to examine study outcomes through an observational cross-sectional study design. Study data were derived from electronic health records to ultimately identify 800 patients with pharmacoresistant epilepsy aged 16 years or older (median age 38.3 years)

Correspondence Ms. Kobau, rmk4@cdc.gov.

who underwent evaluation for epilepsy surgery at the Cleveland Clinic between 1986 and 2021. Select patient-level data were based on the first neuropsychological functioning assessment (e.g., cognitive, mood, and anxiety), sociodemographic characteristics, and address during 1986–2021. Authors applied the International Classification of Cognitive Disorders in Epilepsy to operationalize 4 cognitive phenotypes based on the level of impairment.[6]

Data on neighborhood deprivation were derived from the publicly available Neighborhood Atlas that has operationalized an indicator called the Area Deprivation Index (ADI), based on American Community Survey data.[7] The ADI ranks neighborhoods by socioeconomic disadvantage using 17 indicators (e.g., housing, education, and poverty) by geographic level of interest (e.g., census block groups, state or national levels). ADI data are commonly used to examine whether neighborhood factors beyond individual-level factors affect health and social outcomes and have recently been used to examine disparities in COVID-19 mortality.[8] The authors used the latest available 2018 ADI dataset.[7] Using ADI percentiles, they generated quintiles to categorize neighborhoods into 5 groups where higher quintiles represented increasing disadvantage.

The authors conducted both descriptive and multivariate analyses to examine associations between neighborhood-level and individual-level characteristics. Although they adjusted for a limited set of sociodemographic (e.g., age, sex, and race/ethnicity) and epilepsy-related factors (number of antiseizure medications [ASMs] and side of seizure), their operationalization of some epilepsy-related factors was unclear (e.g., assessment period of ASM use), and the potential for residual confounding was insufficiently addressed.

Although the authors observed no substantial differences among quintiles for epilepsy-related factors, they noted disparities in sociodemographic characteristics. Despite most of the sample being non-Hispanic White (90%), patients from the 4th and 5th quintiles, representing higher neighborhood disadvantage, displayed an overrepresentation of racial and ethnic minorities and lower educational attainment. Even so, 64% of quintile 5 comprised non-Hispanic White individuals. Notably, the authors reported an association between increased ADI and declines across cognitive domains, heightened depression and anxiety, and a more severe cognitive phenotype.

While the study provides valuable information, the cross-sectional design of the study is limited to identifying associations but not causal relationships between social stressors or neighborhood disadvantage and measures of brain health. It is possible that the observed relationship between social determinants and mental health outcomes may be confounded by reverse causation[9] or other factors unaccounted for in the study. The authors note other study limitations around discrepant data ascertainment periods for each dataset and provide some evidence that the ADI methodology is robust to temporal variation and confirmation that a sensitivity analysis looking only at a subset of patients seen from 2014 to 2018, which directly aligns with the ADI data, yielded similar findings on cognition. Moreover, they note that study findings based on patients with TLE from 1 geographic region in the US Midwest do not generalize to other epilepsy types or geographic regions in the United States.

Overall, Busch et al.[5] suggested that the ADI was associated with neuropsychological functioning in this cross-sectional complete case analysis. Additional prospective studies with valid and comprehensive longitudinal data are needed to address the methodological limitations (e.g., selection, confounding, and information biases) observed in this descriptive study. Studies that identify environmental exposures and their temporal relationship with mental health outcomes could inform the development of interventions.

For providers, these study findings elevate the need to consider patients' broader social context not only in considerations of functional assessments specifically but also in relation to the role of SDOH generally on patient outcomes. As more healthcare systems align with community-based partners to address SDOH, adoption of SDOH screening tools,[10] use of mapping tools such as the ADI to help identify areas of need for clinical populations served,[7] and linking patients with social needs to healthcare system community health improvement initiatives, nonprofit or public service providers who address SDOH may help reduce SDOH disparities among patients with epilepsy.

Disclosure

Study Funding

References

1. Tian N, Kobau R, Zack MM, Greenlund KJ. Barriers to and disparities in access to health care among adults aged 18 Years with epilepsy — United States, 2015 and 2017. MMWR Morb Mortal Wkly Rep. 2022;71(21):697–702. [PubMed: 35617131]

2. Hacker K, Houry D. Social needs and social determinants: the role of the centers for disease control and prevention and public health. Public Health Rep. 2022;137(6):1049–1052. [PubMed: 36367214]

3. Szaflarski M. Social determinants of health in epilepsy. Epilepsy Behav. 2014;41:283–289. [PubMed: 24998313]

4. Cihan E, Hesdorffer DC, Brandsoy M, et al. Socioeconomic disparities in SUDEP in the US. Neurology 2020;94(24):e2555–e2566. [PubMed: 32327496]

5. Busch RM, Dalton JE, Jehi L, et al. Association of neighborhood deprivation with cognitive and mood outcomes in adults with pharmacoresistant temporal lobe epilepsy. Neurology. 2023;100(23):e2350–e2359. [PubMed: 37076308]

6. Norman M, Wilson SJ, Baxendale S, et al. Addressing neuropsychological diagnostics in adults with epilepsy: introducing the international classification of cognitive disorders in epilepsy: the IC CODE initiative. Epilepsia Open. 2021;6(2):266–275. [PubMed: 34033259]

7. 2014-2018 Area Deprivation Index. University of Wisconsin School of Medicine and Public Health. Available at: neighborhoodatlas.medicine.wisc.edu. Accessed February 11, 2023.

8. Hu J, Bartels CM, Rovin RA, Lamb LE, Kind AJH, Nerenz DR. Race, ethnicity, neighborhood characteristics, and in-hospital coronavirus disease-2019 mortality. Med Care. 2021;59(10):888–892. [PubMed: 34334737]

9. Besser LM, Brenowitz WD, Meyer OL, Hoermann S, Renne J. Methods to address self-selection and reverse causation in studies of neighborhood environments and brain health. Int J Environ Res Public Health. 2021;18(12):6484. [PubMed: 34208454]

10. The Accountable Health Communities Health-Related Social Needs Screening Tool. Centers for Medicare and Medicaid Services. Available at: innovation.cms.gov/files/worksheets/ahcm-screeningtool.pdf. Accessed February 11, 2023.