Study shines light on impact of environment on neurocognitive outcomes in survivors of pediatric brain tumors

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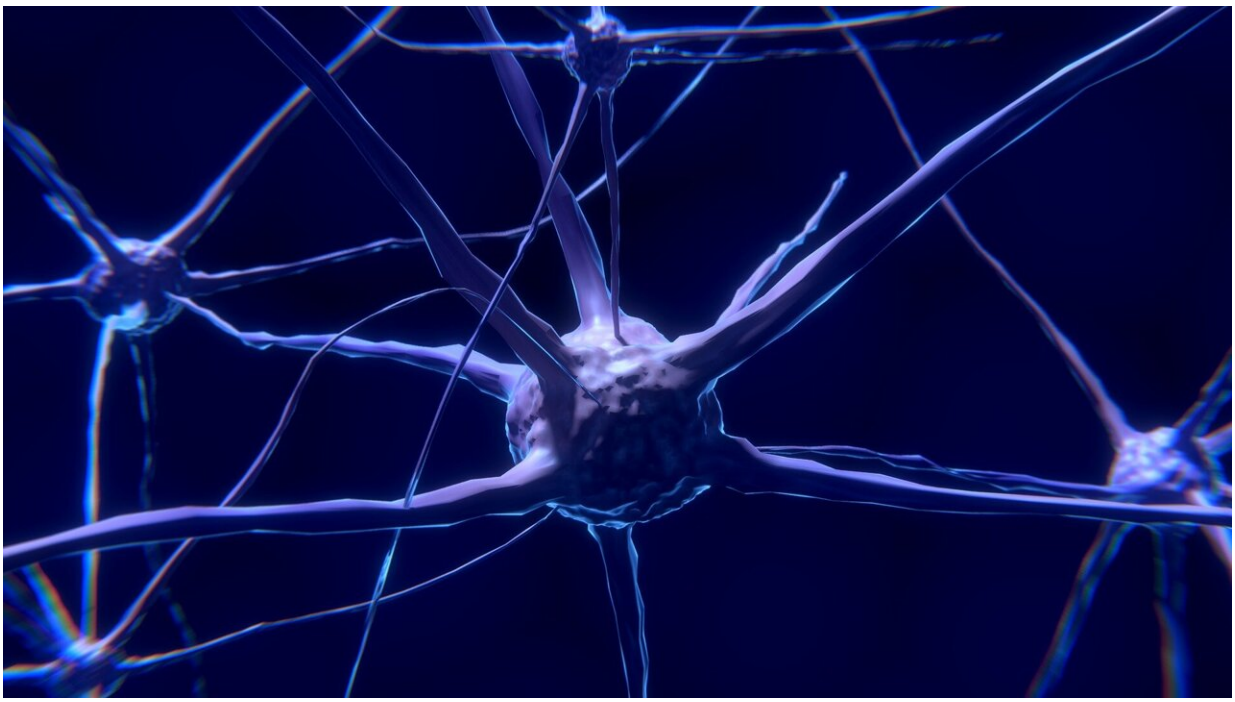

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To gain a clearer understanding of the differences between childhood cancer patients when it comes to the impact of radiation therapy on cognition, scientists at St. Jude Children's Research Hospital studied the effect of their environment. Their work showed that children with

supportive environments fared better than children living in neighborhoods with economic hardship.

Those in areas with greater economic hardship had worse baseline and long-term cognitive outcomes. The results imply that policies and resources providing support at a neighborhood level may help protect high-risk pediatric brain tumor patients from cognitive decline. The findings were published recently in *Neuro-Oncology*.

"At the simplest level, we found a patient's environment matters," said corresponding author Heather Conklin, Ph.D., St. Jude Department of Psychology and Biobehavioral Sciences. "It's not just the diagnosis or treatment the patient receives. It's also the family, neighborhood and support they can access that predicts cognitive outcomes."

The study used a framework called the economic hardship index (EHI) to study how a patient's neighborhood could correlate with cognitive outcomes. The researchers found that higher EHI score was associated with patients who entered treatment with lower cognitive abilities as well as those who had a greater cognitive decline, especially in math skills, after treatment.

"Economic hardship at the neighborhood level predicted how these patients performed cognitively at baseline, before radiation therapy, and then also based on what EHI quartile they were, how much they declined or stayed stable over time," Conklin said.

This predictive power rivaled that of already known risk factors for cognitive decline in these patients.

"The gaps that were present prior to treatment widened over time and had more of a relative impact than the well-established clinical factors, such as age at radiation therapy," Conklin said.

Assessing patients at the neighborhood level

While a preliminary analysis, using the EHI is a way to account for the environment surrounding patients. It includes information on six factors: unemployment, dependency, education, income, crowded housing and poverty. That information is collected and presented at the Census block level, groups of 250 and 550 housing units, including almost every neighborhood in the United States.

"This is the first time someone in the oncology space has used a neighborhood level variable rather than a family specific measure to predict cognitive outcomes in children treated for brain tumors," Conklin said. "The reason that's important is that it gives us more nuanced information about the context in which the child is living. It also opens new areas where we can develop interventions to improve cognitive outcomes."

The paper follows a growing body of research showing that lower socioeconomic status can predict worse cognitive outcomes in pediatric brain tumor patients treated with radiation. St. Jude patients in the study all received similar state-of-art care at no expense, therefore at least some of the differences in outcomes were likely due to non-treatment factors, such as living in a high poverty area. Within the overall EHI score components, the factor that most correlated with poor outcomes was neighborhood-level poverty.

"Even though St. Jude is at the forefront of pediatric brain tumor care, there are still challenges for our patients," Conklin said. "St. Jude patients receive physical, occupational and speech therapy while they're here, but they still go back home to their neighborhoods that maybe are higher in crime or have poorer schools or are overcrowded. They may not have access to the same level of resources once their treatment concludes and they return to their community."

This suggests environmental conditions in high poverty areas, not individual choice, has a strong effect on long-term outcomes. Therefore, patients are likely to benefit if physicians and policymakers come up with solutions to address these factors for current and future pediatric patients with brain tumors.

Changing practice to protect cognitive outcomes

While the research demonstrated that EHI can be used to predict poor cognitive outcomes beyond traditional treatment and clinical risk factors, it is not ready to be widely adopted into clinical practice. There is still more to learn about the drivers of cognitive differences. Therefore, clinicians need to be sensitive and resourceful when trying to help patient families from high EHI areas proactively protect their child's cognitive health.

"I think in terms of how we practice, as a clinician I have to think about how I bring this to my families," Conklin said. "Clinicians need to learn how to talk effectively to families about factors related to economic hardship. We should be thinking creatively about how to help families we know are in a riskier category."

"For example, we can suggest enriching activities that may fit with caregiver's schedule and resources to help prevent cognitive decline like going to parks, going to libraries and reading regularly at home," Conklin explained. "We just need to take into account the family's context—these activities need to be things families can do that are free, don't require them to take off from work and allow single parents of multiple kids to figure out how to work this into their lifestyle."

One of the study's bright spots is the finding that some of these social or policy interventions may help. Patients with a low EHI (those from neighborhoods of higher socioeconomic status) had better baseline and

long-term cognitive outcomes. That fact gives some hope—by increasing access to the resources available to families from lower socioeconomic status, clinicians and policymakers may be able to be better protect against cognitive decline in pediatric patients treated with radiation for brain tumors.

More information: Taylor N Mule' et al, Social Determinants of Cognitive Outcomes in Survivors of Pediatric Brain Tumors Treated with Conformal Radiation Therapy, *Neuro-Oncology* (2023). DOI: 10.1093/neuonc/noad080

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