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"Effects of Neighborhood Deprivation and Cortisol on Cognition in Patients with Multiple Sclerosis"

Background: Social Drivers of Health (SDOH) are the conditions under which individuals learn, work, socialize, and live. Individuals in environments that are associated with adverse SDOH conditions are left more vulnerable to negative healthcare outcomes (Vrtikapa, 2025). The Area Deprivation Index (ADI) is a validated measure of neighborhood environmental and social factors that can influence health (i.e., income, education access, housing) (Kind & Buckingham, 2018). It uses an index number to compare each neighborhood's conditions to state deciles (SD-ADI) of neighborhoods. One social factor which influences health outcomes is stress, a feeling which can be tangibly measured by hair cortisol concentration (HCC) levels (Moody, 2026). Multiple Sclerosis (MS) is an autoimmune disease of the central nervous system where the body attacks myelin, the fatty sheath which protects the axons of the nerve cells, leading to neurological symptoms such as blurred vision, mobility issues, and importantly cognitive decline such as trouble with memory, concentration, and thinking (*NIH-NINDS*, n.d.).

Objective: We set out to examine whether there is an association between HCC and patients' neighborhood ADI, and if this relationship impacts cognition in patients with MS.

Methods: The Symbol Digit Modalities Test (SDMT) was administered to 88 patients with MS to measure cognition. SDMT raw scores were standardized using age and education (T-Scores or SDMT-t). Using provided participant address information, we determined each individual's ADI number using the ADI Wisconsin Neighborhood Atlas Use Map. A subset (N=58) also provided hair samples collected from the parietal region of the scalp and were assayed for cumulative cortisol. Multiple Sclerosis Severity Score (MSSS) was computed using patient Expanded Disability Severity Scores. Correlations for variables of interest, t-tests, and regression models were run using JASP v 0.96.3.

Results: SD-ADI was negatively correlated with both SDMT-t (r=-0.31, p<0.01) and HCC (r=-0.31, p=0.02). A regression analysis was conducted with SDMT-t as the dependent variable and ADI, cortisol levels, and race entered as independent variables. The overall model was significant, $F(3, 50) = 3.82$, $p = .02$, and accounted for 19% of the variance in SDMT-t (adjusted $R^2 = .14$). Cortisol levels were negatively associated with SDMT-t scores, $t = -2.26$, $p = .03$. SD-ADI and race were not significant predictors.

Conclusion: We hypothesized that people living with more neighborhood stress would have higher levels of cortisol; this was not supported. Living in worse neighborhood conditions and increased HCC were associated with lower SDMT-t-scores. However, in our full model it was stress, not neighborhood or race, that remained significantly associated with cognition.