Contribution ID: **82**   Type: **Paper**

Sleep problems mediate the association between mental health and outdoor light pollution

Monday, July 15, 2024 5:20 PM (20 minutes)

Light pollution is a growing anthropogenic health threat, particularly in cities. Limited evidence suggests that exposure to outdoor night light may affect people's mental health by disrupting sleep-wake cycles. We assessed 1) the association between outdoor night light exposure and adults'symptoms of depression and anxiety and 2) the mediating role of sleep problems.

We acquired cross-sectional data from 4,068 adults in Bulgarian cities. Depression and anxiety symptoms were measured using the Patient Health Questionnaire (PHQ-4). Outdoor night light at the residence was determined using satellite imagery. We fitted regression models adjusted for person-level characteristics, green space, and nitrogen dioxide. We also assessed effect moderation by sex, age, and income. We tested self-reported sleep problems as a mediator of the night light-PHQ-4 association.

Greater night light exposure was marginally associated with higher PHQ-4 scores. We observed no effect moderation. The mediator, sleep problems, was also positively associated with night light. The mediation effect of sleep problems was significantly positive. The average direct effect was null. The total night light effect was marginally and positively associated with PHQ-4 scores.

Our findings suggest higher levels of outdoor light pollution are associated with depression and anxiety symptoms health. Poor sleep quality is a possible pathway relating night light exposure to mental health. Considering the increasing ubiquity and intensity of urban nighttime illumination, light pollution-reducing policies may provide significant health benefits for urban populations.

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Session Classification: Paper Presentations

Track Classification: Climate Change & Health: Environmental Health