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Perceived neighborhood safety and sleep quality: a global analysis of six countries

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ABSTRACT

Objective: Building on previous North American and European studies of neighborhood context and sleep quality, we tested whether several self-reported sleep outcomes (sleep duration, insomnia symptoms, sleepiness, lethargy, and overall sleep quality) vary according to the level of perceived neighborhood safety in six countries: Mexico, Ghana, South Africa, India, China, and Russia.
Methods: Using data ($n = 39{,}590$) from Wave I of the World Health Organization's Longitudinal Study on Global Ageing and Adult Health (2007–2010), we estimated a series of multinomial and binary logistic regression equations to model each sleep outcome within each country.
Results: Taken together, our results show that respondents who feel safe from crime and violence in their neighborhoods tend to exhibit more favorable sleep outcomes than respondents who feel less safe. This general pattern is especially pronounced in China and Russia, moderately evident in Mexico, Ghana, and South Africa, and sporadic in India. Perceptions of neighborhood safety are strongly associated with insomnia symptoms and poor sleep quality (past 30 days), moderately associated with sleepiness, lethargy, and poor sleep quality (past 2 days), and inconsistently associated with sleep duration (past two days).
Conclusions: We show that perceived neighborhood safety is associated with more favorable self-reported sleep outcomes in six understudied countries. Additional research is needed to replicate our findings using longitudinal data, more reliable neighborhood measures, and more direct measures of sleep quality in these and other regions of the world.

1. Introduction

Studies consistently show that living in a disadvantaged neighborhood that is characterized by poverty, social disorganization, and disorder is associated with a range of adverse sleep outcomes [1–13]. This growing body of work is impressive because it is remarkably stable across studies of younger and older populations, objective (census indicators of neighborhood socioeconomic disadvantage) and perceived (fear of crime in the neighborhood) neighborhood characteristics, and clinical (obstructive sleep apnea) and self-reported (sleep duration and sleep problems) sleep outcomes. Although previous research has made significant contributions to our understanding of neighborhood contextual variations in sleep outcomes, it is unclear whether these general patterns extend beyond the United States. Some studies in Canada [2,3], England [13], and Germany [11] have been conducted, but regions of the world beyond North America and Europe remain largely unexamined.

In this paper, we build on previous research by testing whether several self-reported sleep outcomes (sleep duration, insomnia symptoms, sleepiness, lethargy, and overall sleep quality) vary according to the level of perceived neighborhood safety (PNS) in six countries: Mexico, Ghana, South Africa, India, China, and Russia. PNS refers to the subjective experience of security and vulnerability to crime and violence in the neighborhood environment. Researchers speculate that, because sleep is an adaptive behavior, neighborhoods that are characterized by noise (from neighbors, busy streets, and crowding), dilapidation (substandard housing), and crime (fear of victimization) may directly undermine the ability of residents to initiate and/or maintain sleep [4–6,12]. Studies also suggest that stressful neighborhood conditions could contribute to poor sleep quality through various psychological and physiological pathways. For example, perceptions of noise and crime could elicit short-term feelings of annoyance, fear, and hopelessness [5,6,12]. These feelings could effectively activate the stress response and trigger the release of stress hormones (epinephrine and cortisol) that promote

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mental and physiological arousal [14–16]. In accordance with previous empirical work and these theoretical perspectives, we expect that respondents who feel safe from crime and violence in their neighborhoods will tend to exhibit more favorable sleep outcomes than respondents who feel less safe in their neighborhoods.

2. Material and methods

2.1. Data

The data for this investigation come from Wave I of the World Health Organization's (WHO) longitudinal Study on Global Ageing and Adult Health (SAGE). The primary purpose of the SAGE is to examine the health and well-being of adult populations and the aging process around the world (http://www.who.int/healthinfo/sage/en/). The SAGE is based on a multistage cluster sample of adults aged 50 years and older and a smaller comparison sample of adults aged 18–49 years. The SAGE includes nationally representative samples from six countries: Mexico ($n = 2756$), Ghana ($n = 5110$), South Africa ($n = 4223$), India ($n = 11{,}230$), China ($n = 14{,}813$), and the Russian Federation ($n = 4355$). The data were collected between 2007 and 2010. Overall, response rates ranged from 51% (Mexico) to 90% (China). For most countries, response rates ranged from 70% (India) to 80% (Ghana, South Africa, and Russia). Due to missing information on our focal variables, our final analytic samples were reduced as follows: Mexico ($n = 2625$), Ghana ($n = 4370$), South Africa ($n = 3854$), India ($n = 11{,}077$), China ($n = 14{,}046$), and Russia ($n = 3618$).

2.2. Measures

PNS, our focal predictor variable, is measured as the mean response to two items: "How safe do you feel when walking down your street alone after dark?" and "In general, how safe from crime and violence do you feel when you are alone at home?" Responses for both items range from (1) not safe at all to (5) completely safe, so that higher values on the index indicate higher levels of PNS. Reliability and correlation estimates for these two items are as follows: Mexico ($\alpha = 0.68$, $r = 0.52$), Ghana ($\alpha = 0.79$, $r = 0.66$), South Africa ($\alpha = 0.75$, $r = 0.61$), India ($\alpha = 0.84$, $r = 0.73$), China ($\alpha = 0.68$, $r = 0.54$), and Russia ($\alpha = 0.60$, $r = 0.43$).

Our focal dependent variables include seven common indicators of sleep quality, including short sleep duration (past two days), long sleep duration (past two days), insomnia symptoms (past 12 months), sleepiness (past 24 hours), lethargy (past 30 days), overall sleep quality (past two days), and overall sleep quality (past 30 days).

Sleep duration (past two days) is measured as the mean response to two items: hours of sleep last night and the night before. Depending on the day of the interview, both of these items could refer to weekdays or weekends. The continuous distribution of sleep hours was divided into three categories to indicate short sleep (<7 h), long sleep (>8 h), and normal sleep (7–8 h). Reliability and correlation estimates for these two items are as follows: Mexico (data not available), Ghana ($\alpha = 0.62$, $r = 0.46$), South Africa ($\alpha = 0.69$, $r = 0.53$), India ($\alpha = 0.81$, $r = 0.68$), China ($\alpha = 0.85$, $r = 0.74$), and Russia ($\alpha = 0.12$, $r = 0.08$).

Insomnia symptoms (past 12 months) are measured with a single item: "[During the last 12 months] did you notice any problems falling asleep?" Responses to this item are dummy-coded (1) yes and (0) no.

Sleepiness (past 24 hours) is measured with a single item: "Looking at the whole day (morning, afternoon, AND evening), did you feel sleepiness?" Responses to this item are dummy-coded (1) yes and (0) no.

Lethargy (past 30 days) is measured with a single item: "Overall in the last 30 days, how much of a problem did you have due to not feeling rested and refreshed during the day (for example, feeling tired, not having energy)?" Original response categories included (1) none, (2) mild, (3) moderate, (4) severe, and (5) extreme/cannot do. We dummy-coded these responses as (1) severe or extreme/cannot do and (0) none, mild, or moderate.

Overall sleep quality (past 2 days) is measured as the mean response to two items: "Please rate the quality of your sleep last night" and "Please rate the quality of your sleep the night before last." The original responses for these items included (1) very good, (2) good, (3) moderate, (4) poor, and (5) very poor. We dummy-coded these responses as (1) poor or very poor and (0) very good, good, or moderate. Reliability and correlation estimates for these two items are as follows: Mexico (data not available), Ghana ($\alpha = 0.80$, $r = 0.67$), South Africa ($\alpha = 0.79$, $r = 0.66$), India ($\alpha = 0.78$, $r = 0.64$), China ($\alpha = 0.90$, $r = 0.81$), and Russia ($\alpha = 0.74$, $r = 0.59$).

Overall sleep quality (past 30 days) is measured with a single item: "Overall in the last 30 days, how much of a problem did you have with sleeping, such as falling asleep, waking up frequently during the night or waking up too early in the morning?" Original response categories included (1) none, (2) mild, (3) moderate, (4) severe, and (5) extreme/cannot do. Consistent with previous work [17], we dummy-coded these responses as (1) severe or extreme/cannot do and (0) none, mild, or moderate. This item is similar to question 6 of the Pittsburgh Sleep Quality Index, and is often used to measure sleep quality [18].

Following previous research [4–6,17,19], subsequent multivariate analyses control for age (continuous years), gender (1 = female; 0 = male), education (1 = ≥ high school; 0 = < high school), employment status (1 = employed; 0 = unemployed), and household income (within-country quartiles). Because ambient threats to security in the neighborhood environment are often correlated with realized threats [20], we also adjust for the potential confounding influence of personal victimization (1 = victim of a violence crime; 0 = no victimization).

2.3. Statistical procedures

Our analyses begin with the presentation of descriptive statistics for all study variables, including variable ranges (minimum and maximum values across countries), means, and standard deviations (Table 1). We use multinomial logistic regression to model sleep duration (Table 2). In these analyses, midrange or normal sleep is the reference category against which short and long sleep are compared. We also use binary logistic regression to model insomnia symptoms, sleepiness, lethargy, and both sleep quality measures (Table 2). In both sets of analyses, we present odds ratios and 95% confidence intervals for corresponding independent variables. The odds ratios are interpreted as the estimated difference in the odds of being classified in the category of interest for those who are one unit apart on a given predictor variable, controlling for all other predictors in the model. All analyses were performed using Stata 12.

3. Results

3.1. Descriptive analyses

According to Table 1, the mean levels of PNS vary across countries. The average respondent in Ghana, India, and China reports feeling "very safe" from crime and violence and when walking down their street alone after dark. Respondents in Mexico and Russia report feeling "moderately safe." Respondents in South Africa report feeling only "slightly safe." In Ghana, India, China, and Russia, respondents report sleeping just over 7 h per night (averaged over the past two nights). South African respondents report sleeping over 8 h. Consistent with these patterns, nearly half of the respondents in Ghana, India, China, and Russia were classified as normal sleepers (7–8 h per night), while only one third of South African respondents were classified in this way. In fact, over half