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Inequality of Noise Exposures: A Portrait of the United States

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Noise pollution has been associated with adverse cardiovascular and neurological outcomes.[1] It is also unevenly distributed across cities and landscapes and—like many environmental hazards—tends to disproportionately affect lower-income and nonwhite individuals.[2] The authors of a new study in *Environmental Health Perspectives* provide an initial assessment of socioeconomic inequality in environmental noise exposures across the contiguous United States.[2]

The researchers began by comparing a national noise map against U.S. Census Bureau data on race/ethnicity, education, income (including whether individuals lived above or below the poverty level), unemployment, homeownership, and linguistic isolation (meaning households where no one over the age of 14 speaks English "very well"). The noise map, a collaboration between Colorado State University and the National Park Service, incorporates 1.5 million hours of acoustical data collected at 492 sites over 15 years.[3]

In general, estimated nighttime and daytime noise levels were higher in locations with higher proportions of nonwhite residents and people of lower socioeconomic status.[2] For example, the authors estimated a difference of 4.0 A-weighted decibels (dBA) between urban block groups with 75% versus 0% black residents, and a difference of 2.9 dBA between urban block groups with 50% versus 0% of residents living below the poverty level.

When waves of sound energy hit the human ear they are transformed into neural signals that become what the brain perceives as noise. Different people under different circumstances might perceive the same sound wave as louder or quieter. According to the American National Standards Institute guidance on noise assessment, an increase of 3 dB represents a doubling of sound energy, and an increase of 5.5 dB appears to double the percentage of people in a community who are likely to be "highly annoyed" by residential noise exposure.[4]

Although health effects of noise exposure were beyond the scope of the new paper, such variations in environmental noise could contribute to documented differences in health outcomes along racial and socioeconomic lines,[5] speculates lead author Joan Casey, a postdoctoral scholar at the University of California, Berkeley. "This very well could help explain some of the health disparities that we see between black and white residents nationwide," she says.

Actual differences in individual-level exposures could be even larger than the study predicts, Casey explains: "Any disparities in noise that we're describing are probably underestimated, because wealthy individuals are going to be able to do more things about noise than lower-income individuals, such as adding triple-pane windows or more insulation."

The researchers also evaluated how racial segregation at the metropolitan area level aligned with predicted noise exposures—a novel aspect of this study. Again consistent with previous research on air pollution in the United States,[6,7] they discovered that more segregated metropolitan areas were also noisier. This

According to lead author Joan Casey, the new findings probably underestimate disparities in the exposures of individuals to environmental noise because wealthier people have more resources to soundproof their homes than those with lower incomes. Image © v.schlichting/Shutterstock.

held true regardless of race, although all-white census blocks within segregated metro areas were quieter than census blocks that were all black, all Asian, or all Hispanic.

"In highly segregated metropolitan areas in the United States, differences in political power across race and class lines affect decision making about the siting of undesirable land uses, including major industries or roadways," says Rachel Morello-Frosch, a study coauthor and UC Berkeley professor. This can lead to demographic disparities in noise exposures and potentially increase noise levels overall for everyone.

Tobia Lakes, a professor at Humboldt University of Berlin who was unaffiliated with the new study, coauthored a 2014 paper investigating similar relationships between demographics and noise exposures within her city.[8] "It looks as if there is a clearer picture in the States than what we found in Berlin," she says. "We [expected] that we would find something like this, a clear—but ultimately unjust—result." Instead, she says, her study's noise data set failed to capture block- and building-level variations, in which poorer residents are more likely to live in units facing busier streets.

Audrey Smargiassi, an associate professor at the University of Montreal who also was unaffiliated with the new study, recently studied associations between socioeconomic status and environmental noise exposures.[9] She says the new paper is badly needed in a North American field that lags behind its European counterpart. However, Smargiassi also suggests that had the researchers included age in their demographic analysis and chosen a different noise metric—of which there are many[10]—it would have allowed for easier comparison between U.S. and European cities.

Senior author Peter James of Harvard University allows that the research is preliminary. "This is our initial foray into using this large data set," he says. "The next step is going to be seeing whether these differences in noise exposures are associated with health outcomes."

Nate Seltenrich covers science and the environment from Petaluma, CA. His work has appeared in *High Country News*, *Sierra*, *Yale Environment 360*, *Earth Island Journal*, and other regional and national publications.

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