Product Disclosure

Labels that disclose the noise emitted from products promote informed consumer choice. Mandatory labeling of noise emissions is required for certain products in China, Argentina, Brazil, and the European Union (NAE 2010). Disclosure will inform consumer choice only if the consumer understands the implications of what the label discloses, so we discuss product disclosures with the assumption that they will be accompanied by education.

The NCA requires that the U.S. EPA adopt regulations that label products that emit noise capable of adversely affecting the public health or welfare (NCA 1972b). The U.S. EPA implemented this mandate only for portable air compressors, even though there are many other, more noisy products, including children's toys (Hawks 1998). Individuals without access to education may still experience some benefit from product disclosures that are easily understood, such as warnings based on red, yellow, and green colors. The U.S. EPA could resume its work mandating disclosures with NPS leadership and Congressional funding.

Mapping

Geographic noise maps alter the informational environment and are one way to ensure that noise control policy is based on objective and accurate information. The NPS seeks to expand and increase access to information technology and integrated data systems. Governments in the European Union have already prepared noise maps of roads, railways, and airports (Commission to the European Parliament and the Council 2011). Although the U.S. government does not map noise levels to protect the public, the National Oceanic and Atmospheric Administration (2012) has created a noise map of the world's oceans to investigate the impact of noise on marine species. Cities such as San Francisco have mapped traffic noise, but most cities and states would need federal support and guidance to initiate comprehensive mapping. Measurement and mapping of noise levels—following the example of the CDC's air and water quality databases—would identify priorities for additional evaluation and help inform protective measures. Congress can appropriate funding to the U.S. EPA, ONAC, or CDC to support this work. However, mapping efforts will require a substantially increased and ongoing noise monitoring effort.

State and local action. The NPS addresses the complex interactions between federal, state, tribal, local, and territorial policies addressing community environments. The NCA was first enacted at the behest of industry trade groups that argued that national standards would protect manufacturers from the imposition of disparate and inconsistent state and local standards. However, after it was enacted, industry groups asked for a defunding of the NCA by asserting that it was best to control noise at the local level (Shapiro 1991).

State and local governments can enact regulations on sources of noise not already regulated by the U.S. EPA or another federal agency. Theoretically, a mixed system where federal and state jurisdiction overlap increases functionality. In the case of noise control, however, few states and localities attempt direct regulations because they do not have sufficient market power and resources and because of preemption challenges from other law (Air Transport Association of America *v.* Crotti 1975). Municipal regulation evolved into noise ordinances that regulate the timing and intensity of noise, are expensive and difficult to enforce, and have not proven to be effective at reducing noise (Dunlap 2006).

Given these considerations, we believe that the most cost-effective legal interventions at the state and local levels are through *a*) spending and procurement, and *b*) altering the built environment.

Spending and procurement. A number of municipal noise sources, including emergency sirens, transit vehicles, garbage and street maintenance equipment, and construction equipment (Bronzaft and Van Ryzin 2007), may be reduced through careful purchasing and contractual agreements. Some countries go so far as to require contractors to pay for temporary relocation of citizens seeking relief from construction noise (BSM 2012). Adoption of procurement policies intended to reduce community noise is an opportunity for government to lead by example (Perdue et al. 2003).

Altering the built environment. The NPS recommends that governments take steps to ensure safe and healthy housing because health suffers when people live in poorly designed physical environments (Perdue et al. 2003). Although altering the built environment can influence individual noise exposures, it often does not reduce noise source levels. In addition, it can be construed as inherently inequitable because the recipients of noise bear the burden of exposure reduction, and those creating the noise continue to have no incentive to reduce emissions. Therefore, this intervention requires thorough analysis and careful planning.

Sustainable building design programs, such as Leadership in Energy and Environmental Design (LEED), offer the possibility of achieving noise reductions through good acoustical design (U.S. Green Building Council 2013). LEED standards incorporate American National Standards Institute recommendations regarding background noise and encourage sound-absorptive finishes to limit reverberation in schools (U.S. Green Building Council 2010). Improvements in construction materials, siting considerations (e.g., siting sensitive structures such as homes and schools well away from noise sources such as high traffic roads and hospitals), and design can have a dramatic impact on noise levels inside buildings—and improve the occupants' quality of life in the process.

Although the Federal Highway Administration does not currently provide federal funding for low-noise pavement (NAE 2010), such pavement can reduce noise by up to 6 dB in areas where vehicles travel at speeds > 35 miles/hr. For slower traffic, planning can reduce high noise from delivery trucks within city limits by encouraging adoption of smaller electric delivery vehicles. This scheme has already been implemented in several other countries (Allen et al. 2012) and also has the potential to reduce air pollution and traffic fatalities.

Conclusion

We have identified a number of opportunities to lower noise exposures and ultimately improve public health while additional research is being conducted. Updated national-level estimates of individual noise exposures are needed; our use of 1981 U.S. EPA data introduces a substantial amount of uncertainty into our estimates and highlights the need for an updated national survey of noise exposures in the United States. Although prevention of different health effects will require additional research to identify appropriate exposure limits, once informed and supported by ongoing research, federal leaders can focus on lowering noise at its source, and states can prioritize altering the built environment. Meanwhile, local government can adjust their procurement policies and encourage building approaches that reduce community noise.

Correction

In the manuscript originally published online, the reported annual noise level that may increase risk for hypertension, the reported estimate of the number of people exposed at or above the annual noise level, and the authors' estimate of the number of people at potential risk of hypertension due to noise in 2013 were incorrect in the second paragraph of the "Prevalence of Harmful Noise Exposure" section. They have been corrected here.

References

Air Transport Association of America *v.* Crotti. 1975. 389 F. Supp. 58 (N.D. Cal. 1975). District Court, N.D. California.

Allen J, Browne M, Woodburn A, Leonardi J. 2012. The role of urban consolidation centres in sustainable freight transport. Transport Rev 32:473–490.

Babisch W, Pershagen G, Selander J, Houthuijs D, Breugelmans O, Cadum E, et al. 2013. Noise annoyance—a modifier of the association between noise level and cardiovascular health? Sci Total Environ 452–453:50–57.