

A New Definition of Noise

By Daniel Fink, MD

There's a new definition of noise: *Noise is unwanted and/or harmful sound.*¹ The new definition replaces the obsolete definition—*Noise is unwanted sound.* This change was adopted by the International Commission on Biological Effects of Noise at its 14th Congress in June.²

Why is a new definition needed? The American National Standards Institute and Acoustical Society of America Standard 2.32 definition is *Noise. (a) Undesired sound. By extension, noise is any unwanted disturbance within a useful frequency band, such as undesired electric waves in a transmission channel or device. (b) Erratic, intermittent, or statistically random oscillation.*³ (Other organizations and many dictionaries use the definition *noise is unwanted sound.*) This definition, developed by the Acoustical Society of America almost 100 years ago in the early days of acoustical science, misses two main problems. First, it puts the onus on anyone complaining about noise, implying that we are complainers, weak, neurotic, or perhaps trying to stop the advance of progress. Second, it ignores what is now known about the adverse auditory and non-auditory health effects of noise exposure.⁴

Noise has been called “the new secondhand smoke.”⁵ With the old definition of noise, those of us who want a quieter world were in the same place as we were in the 1980s and 1990s, when we wanted smoke-free restaurants, stores, doctors' waiting rooms, workplaces, planes, and trains. Smoking was seen as a harmless habit, and those who asked that someone refrain from smoking in their presence were viewed as fussy or self-centered, trying to interfere with the smoker's harmless pleasure. That changed to a certain extent in 1964, when the first Surgeon General's Report on Smoking and Health was published⁶, but smoking was still commonplace. Much greater progress was made after 1993, when the Environmental Protection Agency determined that environmental tobacco smoke, commonly called secondhand smoke, was a health hazard causing cancer with no known safe lower level of exposure.⁷ Our concerns about secondhand smoke suddenly became health concerns. Regulators and legislators started listening to us—despite Big Tobacco's claims that smokers' freedom to smoke was being restricted, a sneaky campaign by Big Tobacco raising doubts about the dangers of tobacco smoke and postulating other causes of cancer in smokers⁸ and those in the hospitality business expressing concerns about decreased revenue if people couldn't smoke in their establishments. Of course, there were no major causes of lung cancer in smokers other than smoking, and multiple studies show that if smokers didn't patronize restaurants and bars that didn't allow smoking, others who didn't want a side order of secondhand smoke with their meal were glad to return to restaurants.⁹ The end result, with cigarette taxes increased, cigarette advertising limited, and smoking becoming socially unacceptable, was that millions of smokers quit and the United States became largely smoke-free.



Hospitalizations and deaths from cancer and heart disease in both smokers and those exposed to secondhand smoke dropped dramatically, and asthma hospitalizations in children decreased. This is one of the twentieth century's greatest public health successes¹⁰, joining clean air and water in the early part of the century and vaccinations and immunizations against infectious diseases in the middle of the century in providing great health benefits to individuals and populations.

The new definition of noise has three important implications: 1) Noise causes hearing loss in the public, not just in workers with occupational exposure.¹¹ Wanted noise, whether from a rock concert or use of power tools, can cause auditory damage. 2) Unwanted noise is stressful¹², and stress is bad for human health.¹³ 3) Noise pollution, largely from transportation noise, is generally accepted as part of modern life in industrialized societies, but it harms our health. Transportation noise causes increased cardiovascular disease and death. A full discussion of these adverse health effects is beyond the



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scope of this editorial, but exposure to transportation noise activates involuntary physiological stress responses, causing increases in blood pressure and heart rate, increases in stress hormone levels, and inflammation of the arterial lining.^{14,15} Despite thinking that we are used to the hum of road traffic outside our homes and schools and workplaces, and in many locations noise from trains or airplanes, we don't habituate to these involuntary physiological responses, which lead to increased cardiovascular disease and death. The physiological impacts on each individual may be small, but when more than 100 million Americans are exposed to transportation noise, the population health impacts are large.¹⁶

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Awareness of the dangers of smoking led to decreased voluntary exposure to wanted tobacco smoke by smokers and to decreased involuntary exposure to unwanted second-hand tobacco smoke by non-smokers. Similarly, defining noise as *unwanted and/or harmful sound* may have two main impacts. First, as people become aware of the dangers of noise for hearing, recognizing that hearing loss in old age isn't part of normal physiological aging but largely represents noise-induced hearing loss¹⁷, at least some will attempt to reduce voluntary noise exposure for themselves and their children. Hearing loss, currently affecting about 15% of the population, should decrease over time. Second, when

people become aware of the non-auditory health impacts of noise—that unwanted noise is literally sickening and killing them—with involuntary exposure to noise pollution out of their control, others may push their elected officials to pass legislation and to enforce existing regulations about transportation noise.

What are the next steps for the new definition? I have already contacted the Acoustical Society of America's Standards Committee and its Working Group on Acoustical Terminology and asked them to start the process of revising their definition of noise. I have reached out to international contacts and asked them to contact the International Standards Organization about rewriting its definition. I have contacted dictionaries about updating their entries on the definition of noise. I plan to inform organizations like the American Speech-Language-Hearing Association and support groups like the Hearing Loss Association of America and the American Tinnitus Association about the new definition. I hope audiologists, otolaryngologists, and hearing health professionals more broadly will push their respective professional organizations to adopt the new definition of noise. *Noise is unwanted and/or harmful sound.*

And I hope that adoption of a new definition of noise will help everyone recognize the auditory and non-auditory health impacts of noise, eventually leading to reduced voluntary and involuntary noise exposure. If something sounds loud, it's *too* loud, and one's auditory health is at risk. If one can hear transportation noise, even if one is used to it, one's overall health is at risk.

A quieter world will be a better and healthier world for all. 

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References for this article can be found at <http://bit.ly/HJcurrent>.