Cardiovascular burden of disease from environmental noise-evidence, uncertainties and public health implications

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ABSTRACT

Systematic research on the effects of noise on the cardiovascular system has been carried out for more than 50 decades. Animal experiments, laboratory and field studies carried out on humans revealed significant associations between noise and physiological endpoints that are related to cardiovascular health. The hypothesis that chronic long-term exposure to environmental noise increases the risk of cardiovascular diseases has been confirmed in large epidemiological studies. Road traffic noise and aircraft noise have been shown to be associated with a higher risk of hypertension, ischemic heart diseases - including myocardial infarction - stroke and metabolic syndrome - including diabetes mellitus. Chronic sleep disturbance is considered as a mediator of the effect. Noise policies rely on a quantitative assessment of the noise burden of disease. Meta-analyses have been carried out to derive exposure-response relationships between noise and cardiovascular health outcomes and to identify possible sources of heterogeneity between study results. Using regularly published WHO data regarding the annual incidence of chronic diseases and the available large-scale noise exposure data from available noise maps, quantitative estimates of the number of cases attributed to the noise can be calculated. Uncertainties of the relationship between noise and disease refer to incomplete exposure information and potentially confounding factors, including air pollution. Traffic volume and proximity to the source are determinants of both, traffic noise and traffic-related air pollutants. However, studies show that the effects are largely independent of one another due to different biological mechanisms.