

# La valutazione dell'esposizione professionale al rumore: procedure, errore di misura, criterio di decisione

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## KEY WORDS

Noise; exposure assessment; sampling strategies; measurement error

## SUMMARY

**«Assessment of occupational noise exposure: methodology, measurement error, evaluation criteria».** **Background:** Occupational noise exposure can be monitored directly by personal sampling or indirectly by area sampling. Personal sampling is performed using an integrating sound level meter, worn by the worker while performing his/her job. When area sampling is used, measurements need to be made in all locations where a typical worker stays while performing his/her tasks; the respective partial lengths of exposure need to be accurately monitored, and the time-weighted average sound level of the measured noise levels must be calculated. **Objectives:** Current regulations identify three different thresholds, corresponding to different types of action, but they do not propose any standard criteria to decide whether a threshold has been exceeded. Defining standard procedures to assess occupational noise exposure and identifying such thresholds is crucial. **Methods:** Using empirical data collected in the field, the effects are illustrated of the number of sampling locations and of the partial lengths of exposure on area sampling measurements, and the effects of duration of noise exposure on both area and personal samplings. **Results:** When dealing with area samplings, an accurate definition of both sampling locations and partial lengths of exposure is crucial. When arbitrary decisions are taken in selecting sampling locations and/or establishing partial lengths of exposure, spatial changes in noise level and operator's displacements while performing his/her tasks may affect results. Sampling for less than the duration of noise exposure is the major contributor to measurement error; particularly under conditions of unpredictable variation in noise level. In fact, as noise level in the non-monitored time fraction is unknown, measurement error cannot be determined. We estimate that, even under the most favorable circumstances, sampling should last not less than 40% of the duration of a given noise-generating occurrence, for repeated measurements to be dispersed within a range not wider than that generated by the instrumental error. Inter-daily variability is another important aspect in personal noise exposure evaluation. This is a general occurrence, whose effects cannot be controlled by simply considering weekly instead of daily exposures. Results of an investigation, covering about 60 different jobs within a primary aluminum plant, show an inter-daily variability in noise exposure greater than 5 dBA in about 75% of cases. **Conclusions:** Personal sampling, when correctly performed and covering the total duration of exposure, provides the most reliable result as it integrates noise over all locations where the worker actually stays while performing his/her tasks, and over the total length of time spent in each task. We propose extending personal sampling to the total duration of actual noise exposure as the standard procedure for monitoring daily personal noise exposure, and valid for the majority of work places. When the range of daily noise exposure

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*includes one regulatory threshold, corresponding to a given type of action, we propose as a standard decision criterion to refer prudentially to the upper 95% confidence limit of the LEP,d arithmetic mean. Such criterion would allow to standardize procedures and decision methods, with the prospect of further improvements in the assessment of exposure to noise.*