Editorial

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Medication use as an outcome variable in environmental (noise) epidemiology

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In environmental epidemiological investigations, information on morbidity in terms of diagnoses are usually collected from registers or self-reports in questionnaires or interviews. The presence of symptoms is also collected via questionnaires or interviews. Researchers may try to improve the validity of self-reported diagnoses by specifically asking for physician-diagnosed disease. Another way is to enquire about medication used for certain diseases or symptoms that also may be available in registers. This can be an efficient way of finding patients with diseases associated with very specific drugs, such as levodopa in the case of Parkinson's disease (1, 2).

Studies with questionnaire items about physician-diagnosed hypertension and antihypertensive medication is an example from environmental noise research (3–10). Self-reports about the use of antihypertensives or other pharmaceuticals may, however, suffer from information bias, for example due to patients' misunderstanding about the classification of drugs. A paper in the present issue of the *Scandinavian Journal of Work, Environment & Health* (11) focuses on antidepressant, anxiolytic, and hypnotic medications and associations with noise exposure using objective data on these drugs. It could be assumed that individuals taking such medication would have more pronounced symptoms than those responding positively to questions on mood changes, anxiety, or sleep disturbances but not using any medications. Individuals may acknowledge symptoms in a questionnaire even if they are transient, while medication requires more long-lasting symptoms and is usually prescribed in response to an illness diagnosed by a doctor. Objective data on medications were also recently reported in a cohort study on occupational noise and hypertension (12). In this case, individual data on antihypertensive medications were collected from the Danish national Prescription Registry. We found, however, no reports using similar objective data on psychotrophic drugs among workers occupationally exposed to noise.

Halonen et al (11) performed a cross-sectional study of the association between modeled road traffic noise at the facades of residential addresses and questionnaire data on self-rated health and register data on certain prescribed drugs (antidepressants, anxiolytics, hypnotics) in a Finnish cohort of 15 000 people from three cities. Road traffic noise was expressed in L_{den}, a measure in which noise in the evening and night is weighted more than noise exposure during the day. Information about medication was collected at the individual level. Such objective data should be more valid than self-reported information on medication obtained from questionnaires.

The authors found no association between modeled road traffic noise and prescribed medications. They did find an association between noise and self-rated poor health (poor+average versus good+very good) among 3 000 men but not 12 000 women. Among men, the point estimate odds ratio (OR) was 1.5 in the noise stratum >60 dB, however, this was based on a relatively small sample in this noise stratum. The authors have previously reported associations between noise and sleep disturbance in part (two of the cities, N=7 000) of the same cohort (13). Symptoms of insomnia were found to be more common among women with modeled night-time noise >55 dBA. This effect was only found among women.

Relatively few studies have previously collected data on medications for psychiatric symptoms. Knipschild (14) found increased purchase (per inhabitant) of hypnotics and tranquilizers in an area with high aircraft noise levels close to the Schiphol airport, compared with a control area. There was also a higher prevalence of hypnotics and tranquilizers among patients treated by general practice physicians (15). The study design was ecological, that is the associations between noise and medications could be assessed only on area and not the individual level.

A few other studies have examined associations between traffic noise and psychotropic medication at the individual level, but have relied on self-reported data on medications. De Kluizenaar (8) found no association between road traffic noise and medications (sleeping pills or tranquilizers). Franssen et al (4) found a non-significant association (OR 1.25 per increase of L_{den} with 10 dBA) between aircraft noise around Schiphol and prescribed medication. However, there was a significantly increased OR of 2.3 (per 10 dB L_{den}) for non-prescribed medications, but these are less likely to be a marker for confirmed disease. Lercher et al (9) found a significantly increased OR of 1.53 between railway noise (65–75 dBA, L_{den}) and sleep medication in a phone interview in an Alpine valley study. Floud et al (2011) showed a significantly increased association (OR 1.28 per 10 dB increase) between aircraft noise and self-reported use of anxiolytics in seven European airports in the HYENA (HYpertension and Exposure to Noise near Airports) study (10). One additional issue that may complicate these studies of psychotropic medications is that, as well as hypnotics, anxiolytics and antidepressants may also be prescribed for sleep problems.

The only previous study using objective data on the individual level, studied the association between road traffic noise and use of anxiolytics or hypnotics in Marseille, France (16). Among 181 000 individuals, there was no overall association, but a weak and significant association (OR 1.16) when comparing night-time noise levels >55 dBA in the least socioeconomically deprived areas. No such association was found in the more deprived areas. The authors speculate that the calculation of noise levels has less misclassification in less deprived areas with a large fraction of single-family houses compared with areas including many multi-apartment houses. Possibly also in more deprived areas, there are more socioeconomically-linked confounding factors that may obscure the association of noise exposure with anxiolytics and hypnotics.

In summary, two studies with objective data on the individual level (11, 16) and one study relying on self-reports (8) showed no overall associations between road traffic noise and antidepressants, anxiolytics or hypnotics. Three studies of aircraft noise showed positive associations between noise and medications, but, in two of the studies, data on medications were self-reported (4, 10), and the one using objective data had an ecological design (14, 15).

Regarding hypertension, both objective data (14, 15) and self-reports (3–8, 10) have been used. The additional value of obtaining objective data on use of medications may be larger for psychiatric symptoms than for hypertension, as the latter condition is diagnosed by a physician, and if physician-diagnosed hypertension is requested, the additional information from use of medication is probably limited.

Future research should study the effects of traffic noise on psychotropic medication using data collected through registers and also link medication data in relation to noise exposure to psychiatric diagnoses and outpatient and inpatient hospital attendance data.

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