

## Traffic noise and risk of mortality from diabetes

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Dear Editor,

Research on traffic noise has focused on cardiovascular effects [1] and recently on respiratory effects [2]. Road traffic noise at normal urban levels can lead to stress and sleep disturbances, which may lead to higher risk for type-2 diabetes [3]. A recent cohort study long-term exposure to road traffic noise was associated with a higher risk of diabetes [4]. Otherwise, air pollution caused by traffic has also been associated with short-term mortality from diabetes [5]. However, the impact of traffic noise on diabetes-related deaths has not been investigated yet.

We examined the association between daily diabetes-related deaths (International Classification of Diseases, 10th Revision: E10–E14) and noise levels in the city of Madrid (Spain), from 2001 to 2009, using a time-stratified case-crossover design. We used overdispersed Poisson regression adjusting for time-trend and seasonality, temperature, and primary chemical air pollutants (PM<sub>2.5</sub> and NO<sub>2</sub>). We examined short-term effects up to 3 days lag. Daily mortality from diabetes was obtained from the Madrid Regional Inland Revenue Department and daily

average levels of diurnal equivalent noise (for the 8–22-h period, Leqd) and night-time equivalent noise (for the 22–8-h period, Leqn) from background stations of the Madrid's Municipal Automatic Air Pollution Monitoring Network that also measure real-time equivalent noise levels.

Diurnal average noise was 65.1 dB(A), and average night time was 60.5 dB(A). Daily death counts from diabetes ranged from 0 to 6, 95 % aged more than 65 years. Noise levels showed low-moderate correlation with chemical air pollutants ( $r = 0.01$  and  $r = 0.28$ , for PM<sub>2.5</sub> and NO<sub>2</sub>, respectively). The strongest effect for diurnal noise was at lag 0 (Fig. 1) with a risk of mortality of 3.2 % (95 % confidence interval (CI) [−0.3, 6.9]) for a rise of 0.5 db(A) ( $p = 0.078$ ). For night-time noise, the strongest effect was at lag 1, with a risk of 4.6 % (95 % CI [1.5, 7.8]) ( $p = 0.004$ ). Noise effects did not change after adjusting for air pollutants.

The mechanisms of action about how long-term exposure to traffic noise might contribute to type-2 diabetes have already been stated [3, 4]. It is also known that diabetics are more susceptible to the effects of environmental risk factors [5]. However, although our finding could be consistent with short-term effects mainly produced by reduction in sleep quality and duration, since the strongest effect was found with night-time noise levels, further research is needed for a proper understanding of the mechanisms of action for short-term exposure to traffic noise on diabetes. Otherwise, the short-term effect of traffic noise on cardiovascular mortality has been reported in Madrid also showing an independent effect of chemical air pollutants [1]. However, PM<sub>2.5</sub> and NO<sub>2</sub> were not associated with mortality from diabetes, suggesting that the effect of noise levels is self-sufficient.

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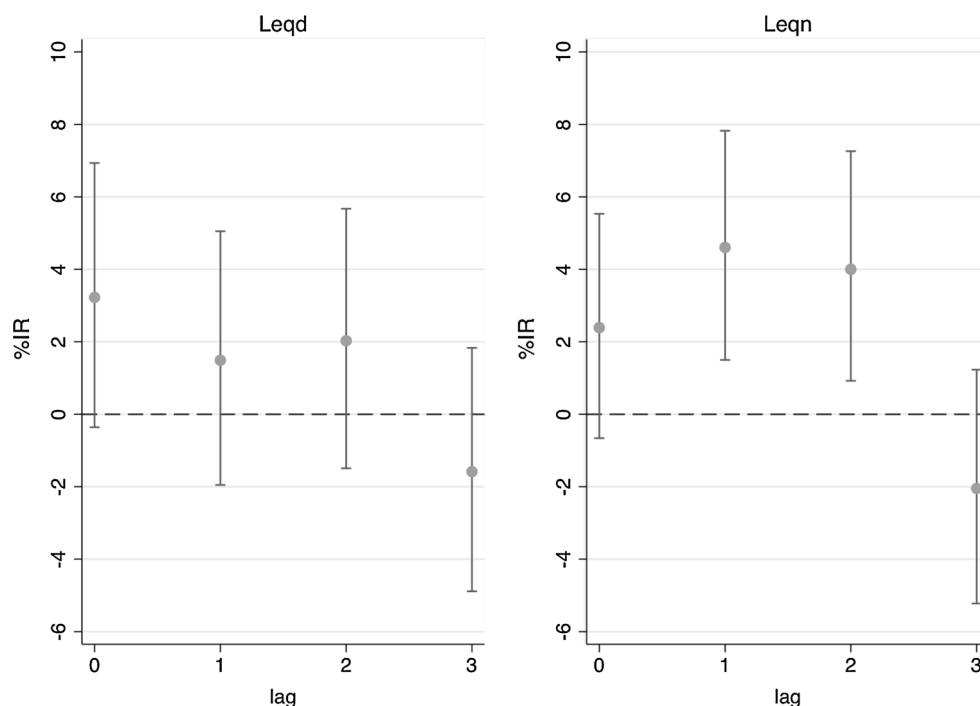
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**Fig. 1** Percentage increase in risk (%IR) of mortality from diabetes by an increase of 0.5 db(A) of diurnal (Leqd) and night-time (Leqn) equivalent noise in Madrid for the study period 2001–2009



This association could apparently be surprising, but noise and diabetes incidence have also recently been related [4]. Furthermore, the strongest effect was found for night-time noise, which mainly leads to excess of stress hormones due to reduction in sleep quality and increasing the risk of diabetes. This suggests that the health-effects of exposure to high-noise levels are non-spurious.

**Conflict of interest** Aurelio Tobías, Julio Díaz, Alberto Recio and Cristina Linares declare that they have no conflict of interest.

**Human and Animal Rights disclosure** In this ecological study no experiments have been carried out on human subjects.

**Informed consent disclosure** Daily counts of deaths from diabetes were provided by Madrid Regional Inland Revenue Department according to privacy rules omitting all identifying details, and being lawfully stored and managed.

## References

1. Tobías A, Recio A, Díaz J, Linares C (2014) Noise levels and cardiovascular mortality: a case-crossover analysis. *Eur J Prev Cardiol*. doi:10.1177/2047487314528108
2. Tobías A, Recio A, Díaz J, Linares C (2014) Does traffic noise influence respiratory mortality? *Eur Respir J*. doi:10.1183/09031936.00176213
3. Chiodini I, Torlontano M, Scillitani A, Arosio M, Bacci S, Di LS et al (2005) Association of subclinical hypercortisolism with type 2 diabetes mellitus: a case-control study in hospitalized patients. *Eur J Endocrinol* 153:837–844
4. Sørensen M, Andersen ZJ, Nordsborg RB, Becker T, Tjønneland A, Overvad K, Raaschou-nielsen O (2013) Long-term exposure to road traffic noise and incident diabetes: a cohort study. *Environ Health Perspect* 121:217–222
5. Goldberg MS, Burnett RT, Yale JF, Valois MF, Brook JR (2006) Associations between ambient air pollution and daily mortality among persons with diabetes and cardiovascular disease. *Environ Res* 100:255–267