

to the same process, leading to prolonged middle ear effusions and unusual acute infections.

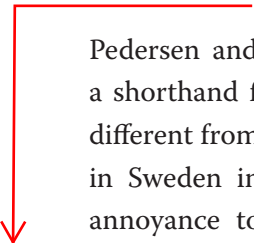
The increased asthma seen in subjects F1 and F3 may also have a connection to their frequent use of paracetamol (acetaminophen) for headaches during turbine exposure.²⁰⁹

Community noise studies and *annoyance*

Studies of community noise frequently assess a quality called *annoyance*. "Apart from 'annoyance,'" the World Health Organization writes, "people may feel a variety of negative emotions when exposed to community noise, and may report anger, disappointment, dissatisfaction, withdrawal, helplessness, depression, anxiety, distraction, agitation, or exhaustion."²¹⁰

Beyond even these negative emotions, moving out of an owned home indicates that people feel sick and under threat, judging that their survival and well-being, and that of their children, will be enhanced by moving out—even as they exhaust limited resources to do so and face unrecompensed loss of their major asset, their home.

Sick and *annoyed* are not the same thing. In English, *annoyance* carries an air of triviality, like a mosquito buzzing around one's head. *Sickness* threatens survival itself.



Pedersen and Persson Waye assessed annoyance (which may be a shorthand for the above list of negative emotions, but remains different from sickness) among 351 households near wind turbines in Sweden in 2000. They used a mailed survey and compared annoyance to modeled A-weighted sound pressure levels they

²⁰⁹ Beasley et al. 2008.

²¹⁰ World Health Organization 1999, *Guidelines for Community Noise*, p. 50.

calculated to exist outside homes near clusters of one to five turbines of power 0.15–0.65 MW (much smaller than in the current study), based on the homes' distances from turbines.²¹¹ They found people to be highly annoyed by wind turbine noise at sound pressure levels much lower than for other types of community noise. The A-weighted decibel level (in a measure averaged and weighted over time, L_{eq}) that corresponded to 15% of the people being highly annoyed was 38 dBA for wind turbines, 57 dBA for aircraft, 63 dBA for road traffic, and 70 dBA for railways. The curve for annoyance due to wind turbine noise had a steep slope, so that by 41 dBA, 35% of people were *highly annoyed*. Sixteen percent of respondents over 35 dBA reported that their sleep was disturbed by wind turbine noise.

I interpret this result as an indication of the degree to which wind turbine noise has a disturbing quality not captured by its A-weighted measurement. Since A-weighting emphasizes higher frequencies and filters out lower frequencies, the qualitative difference may be related to the presence of low frequency components. Even without directly measuring the low frequency components, this study is potentially useful with regard to regulating noise and determining setback distances for turbines. Since the study was done in units of dBA outside houses, and most community noise regulations (including for wind turbines) also use units of dBA outside houses, we can easily translate this result into the recommendation that wind turbine ordinances need to limit the turbine noise levels outside houses to less than 35 dBA. This does not mean that only 35 dB of real noise is present, but rather that in the common measurement unit of community noise—which is dBA—35 is a number that represents a significant amount

²¹¹ Pedersen E, Persson Waye K. 2004. Perception and annoyance due to wind turbine noise: a dose-response relationship. *J Acoust Soc Am* 116(6): 3460–70.