Healthy Housing

NHMRC Centre of Research Excellence

BURDEN OF DISEASE SERIES PART 1

THE HEALTH IMPACT OF NOISE IN THE HOME

Exposure to persistent or high-level noise in people's homes has been identified by the World Health Organization (WHO) as a source of poor health.
Environmental noise is becoming an increasingly pervasive problem in Australia, as intensified urbanisation exposes a growing number of people to its harmful impacts.

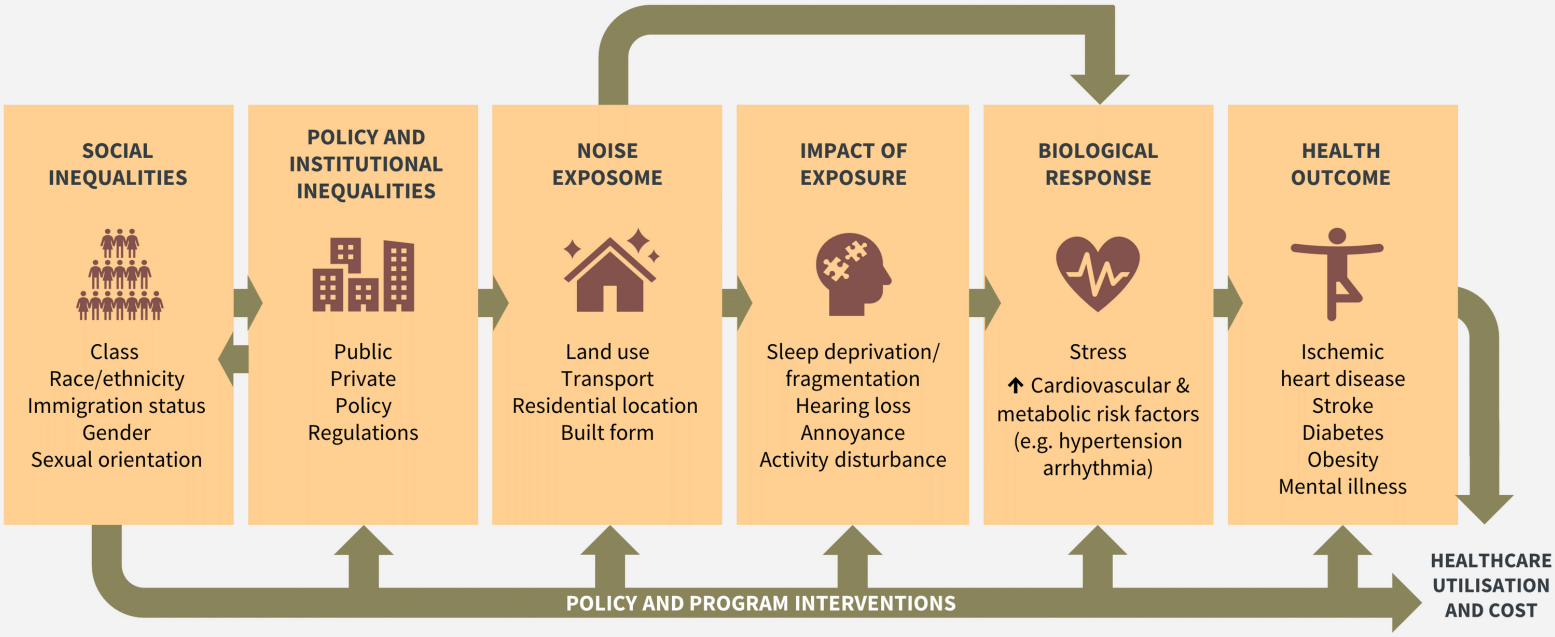
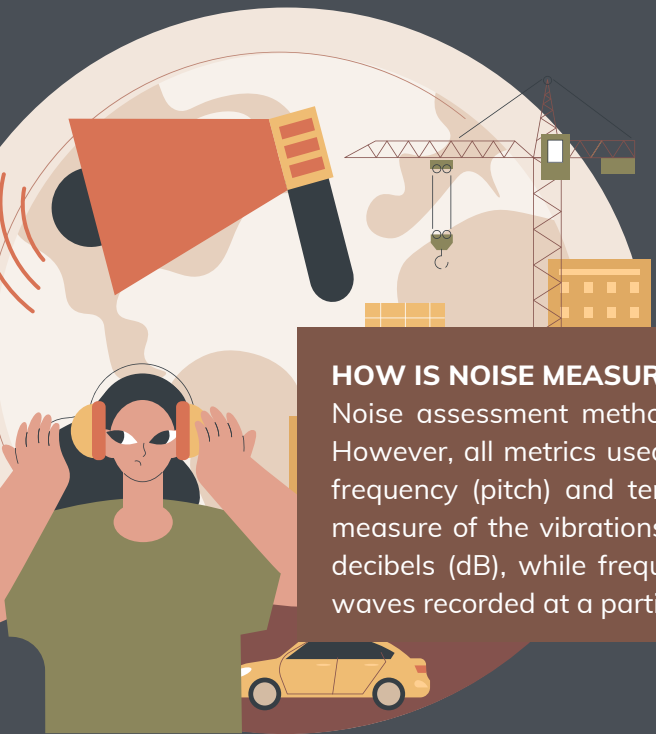


Figure 1: Noise exposure pathway
Adapted from Daiber et al. (2019)



WHAT IS ENVIRONMENTAL NOISE?

Noise is unwanted or undesired sound that causes disturbance. Sources of environmental noise include transportation (road, rail, and air traffic), private industry, public works, and the neighbourhood.[2]

HOW IS NOISE MEASURED?

Noise assessment methods differ depending on the type of noise under consideration.[3] However, all metrics used to describe noise consider its amplitude (sound pressure level), frequency (pitch) and temporal variation (duration).[2, 4] Sound pressure level, which is a measure of the vibrations in air that create sound, is calculated on a logarithmic scale in decibels (dB), while frequency, measured in Hertz (Hz), expresses the quantity of sound waves recorded at a particular point per second.[2]

HOW DOES ENVIRONMENTAL NOISE AFFECT HEALTH?

Excessive noise may have an impact on **cardiovascular disease, annoyance, sleep disturbance, cognitive impairment, hearing impairment and tinnitus, birth outcomes, metabolic outcomes and mental health and wellbeing.**[5] The influence of environmental noise on cardiovascular outcomes is well established, with a wealth of research demonstrating its association with hypertension, ischemic heart disease (IHD) and stroke, among other endpoints.[6] Several possible casual pathways have been proposed. Most common among these is that noise acts as a stressor, increasing arousal of the autonomic nervous and endocrine systems.[6, 7] Stress is recognised as an intermediary in the development of noise-induced health and wellbeing outcomes.[8]

Robust evidence has enabled the development of dose-response relationships with respect to specific noise sources and cardiovascular endpoints. For instance, epidemiological evidence substantiating the association between road traffic noise and IHD is regarded as the most comprehensive, with a meta-analysis commissioned by the WHO indicating a statistically significant 8% increase in risk of IHD per 10 dB (L_{DEN}) within the approximate range of 40–80 dB L_{DEN}.[6]

In recent years, the literature in this field has broadened beyond cardiovascular health outcomes to examine the effects of environmental noise on mental health and wellbeing, such as risk of depression and anxiety, as well as cancer and dementia.[5, 7, 9-11]

Despite this evidence, when compared to cardiovascular effects of environmental noise, the current quality and breadth of research on the mental health and wellbeing outcomes of environmental noise is currently insufficient to confirm a causal relationship.[7]

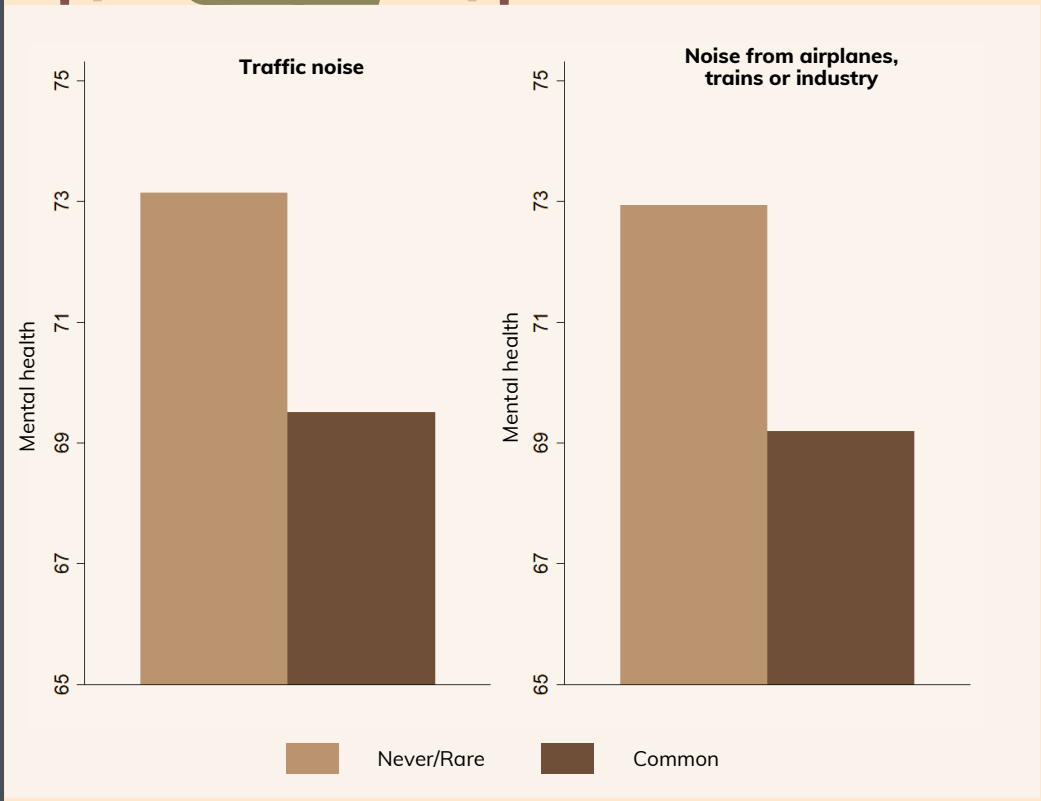


Figure 2: Difference in mental health by noise level
Source: HILDA, 2018. Mental health is measured by SF-36 mental summary scores, where a lower score indicates poorer mental health

Our descriptive analyses of longitudinal data from the Household, Income and Labour Dynamics (HILDA) survey in Australia (Figure 2) suggests that **frequent exposure to traffic noise and noise from airplanes, trains and industry is highly correlated with poorer self-reported mental health** in Australia.

ENVIRONMENTAL NOISE INEQUALITIES

Children, older adults, chronically ill persons, shift workers and lower socioeconomic groups are among those likely to be most affected by environmental noise.[12] Children, for instance, when still undergoing cognitive growth and development, may lack the coping strategies required to mitigate the impact of excessive noise.[13] Additionally, recent research on the disparities in exposure to noise demonstrates that areas with concentrations of lower socioeconomic status residents experience more environmental noise.[14] This may be due to these households not having the means to afford an adequately insulated dwelling or a residence in a quiet area.

GAPS IN CURRENT GUIDANCE

In Australia, environmental noise is the responsibility of state and local authorities. As such, noise legislation varies across jurisdictions. Mechanisms to reduce the impact of noise can include zoning, timeframes to mitigate unreasonable noise, and noise limits.

However, there is no common approach to the assessment and measurement of noise across states. Based on the evidence highlighting the consequences of environmental noise for health and wellbeing, standardised regulations limiting noise are needed to mitigate its impact on the Australian community.
In lieu of local legislation, Australia can benefit from existing recommendations detailed in the WHO Environmental Noise Guidelines which provide evidence-based noise standards that aim to reduce the impact of harmful noise on the community.

References

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Data

This publication uses unit record data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey. The HILDA Project was initiated and is funded by the Australian Government Department of Social Services (DSS) and is managed by the Melbourne Institute of Applied Economic and Social Research (Melbourne Institute). The findings and views reported in this paper, however, are those of the author and should not be attributed to either DSS or the Melbourne Institute.

The data that support the findings of this publication are openly available at the National Centre for Longitudinal Data Dataverse (Australian Government Department of Social Services) at https://dataverse.ada.edu.au/dataverse/ncld.