

Public Consultation on NHMRC Draft Information Paper: Evidence on Wind Farms and Human Health

CEO Invitation to Comment

I am pleased to release the *NHMRC Draft Information Paper: Evidence on Wind Farms and Human Health* for public consultation. The draft Information Paper provides the Australian community with a summary of the evidence, based on a comprehensive review of the existing scientific literature on the potential health effects of wind farms commissioned by NHMRC. This document was developed by NHMRC's Wind Farms and Human Health Reference Group.

The existing body of evidence relating to wind farms and health remains small and mostly of poor quality and further high quality research is needed.

Following public consultation, any new high quality literature not included in the evidence review will be considered as a part of finalising NHMRC's Information Paper and the Public Statement will be amended if necessary. NHMRC has been monitoring research that has been published since the independent evidence review commenced in October 2012 and all emerging evidence will be considered after public consultation.

In our 2010 *Public Statement: Wind Turbines and Health*, NHMRC previously recommended that relevant authorities take a precautionary approach in the regulation of wind farms and continue to monitor research outcomes to adjust their policies accordingly. We also recommended that people experiencing health problems should consult with their GP promptly. This advice remains current.

I intend to release a Targeted Call for Research in this area once NHMRC's Information Paper has been finalised, post public consultation.

Professor Warwick Anderson AM
Chief Executive Officer

Why is NHMRC looking at this issue?

NHMRC is responsible for ensuring that Australians receive the best available, evidence-based and reliable advice on matters relating to improving health, and to preventing, diagnosing and treating disease. Some members of the community have reported that living in proximity to a wind farm has affected their health. Therefore NHMRC is investigating whether there is reliable evidence that exposure to specific emissions from wind farms — noise, shadow flicker and electromagnetic radiation — could cause health effects in humans.

The draft Information Paper provides an update on NHMRC's previous work in this area. It is based on a comprehensive review of the available scientific evidence,¹ following well-established systematic review principles. It is subject to revision in light of the submissions that are received during public consultation.

How did NHMRC conduct the review?

NHMRC commissioned independent reviewers to examine the evidence on the health effects of wind farms. To ensure that the review process was robust and transparent, internationally recognised methods were used to direct the identification, assessment and collation of the evidence.

The development of the literature review was guided by the Wind Farms and Human Health Reference Group (Reference Group). The Reference Group has expertise in public and environmental health, research methodology, acoustics, psychology and sleep, and includes a consumer representative.

The Reference Group's role included:

- assisting the reviewers to develop research questions;
- reviewing and commenting on drafts of the evidence review report;
- providing scientific advice on the interpretation of the evidence;
- guiding the development of the draft Information Paper; and
- identifying gaps in the evidence base to make recommendations for further research.

Systematic review

A systematic review was conducted to find all of the available evidence on exposure to wind turbines and possible health effects. This was considered the *direct* evidence.

The reviewers undertook a comprehensive search of the literature. NHMRC also called for public submissions of relevant literature to ensure that all new and emerging evidence was considered.

For information to be considered in the systematic review, it had to:

- be publicly available;
- look at exposure to wind farm emissions;
- *not* choose participants only because they had reported health effects (which creates selection bias);
- compare two or more groups with different levels of exposure to wind turbines (for example, a "near" group and a "far" group);
- explain how the data were collected;
- report on health (or health-related) outcomes; and
- analyse the results.

During this process, some individuals submitted their personal stories, opinions and, in some cases, their personal medical records. This material was not considered in the review.

The reviewers assessed the design, quality, relevance and strength of each publication included in the review. The overall body of evidence was then analysed for its quality and consistency. Some studies provide stronger evidence than others because of the way they are designed and conducted.

Reliable evidence comes from comparative studies that are well designed, include enough participants and are done to a high quality standard. The results of single studies need to be repeated by other independent studies, to make sure that any findings are consistently shown and have not arisen simply by chance.

An international expert organisation (independent from the reviewers) assessed the methodology and quality of the systematic review to ensure it was conducted in a robust and transparent manner.

Background literature review

In addition to the systematic review of direct evidence, a background literature review was conducted to find additional *indirect* evidence on whether:

- the type and level of emissions (noise, shadow flicker and electromagnetic radiation) coming from wind farms might affect healthy functioning of the human body; and
- health effects have been observed from similar emissions from sources other than wind farms.

The reviewers looked for key publications in the peer-reviewed literature, as well as technical reports and analyses prepared by expert panels and environmental health agencies.

What evidence did NHMRC find?

Systematic review evidence

The systematic review process identified 2850 references and 506 public submissions were received. Only seven studies (described in eleven papers) met the inclusion criteria listed above.²⁻¹²

All of the included studies examined the effects of estimated wind farm **noise** or **proximity** to wind farms on one or more health or health-related outcomes (health-related outcomes included annoyance, disturbed sleep and poorer quality of life).

- The one Australian study also considered the effects of **shadow flicker** from wind turbines on annoyance.⁹
- No studies were identified that explicitly considered possible effects on human health of **infrasound and low-frequency noise** or **electromagnetic radiation** produced by wind turbines.

Of the seven studies, only one was conducted in Australia. The remaining studies were conducted in the Netherlands, Canada, the United States of America and Sweden.

All the studies used a cross-sectional design, meaning that they were carried out at a single point in time and could not indicate whether a health outcome first occurred before or after the wind turbine exposure began. Other weaknesses in the design of the studies included: absent or incomplete masking of the purpose of the study from participants; low participation rates of people invited to take part in the study; and self-reporting of health effects. These weaknesses could result in selection and information bias. Generally, the studies did not consider or adjust appropriately for factors other than wind farm noise that may have been more common among people living near wind farms and could have influenced health or health-related outcomes (e.g. chronic diseases, socioeconomic status, attitude to wind farms, visibility of wind farms and economic benefit from wind farms). There was also inconsistency in the results of different studies.

Wind turbine noise was not directly measured at participants' homes in any of the studies. Rather people's exposure to wind farm noise was assessed based on how far they lived from the nearest wind turbine (proximity) or by using mathematical models to estimate the level of sound where they lived. Even where consistent associations were found between estimated wind turbine noise and health-related outcomes (such as annoyance), it was not possible to tell whether the noise was driving the association, or whether the association could be explained by one or more other factors that are more common among people living close to wind farms (such as attitude to, visibility of or economic benefit from wind farms).

Background evidence

Background evidence identified through the review included World Health Organization reports on health effects associated with environmental noise¹⁴ and on electromagnetic radiation emissions from household appliances and the environment,^{15,16} a United States report on the impact of wind farms,¹⁷ and South Australian data on infrasound levels near wind farms and other environments.¹⁸ Laboratory studies on changes in functioning of the human body due to exposure to infrasound or low-frequency noise¹⁹⁻²¹ and epidemiological studies on exposure to electromagnetic radiation²² were also reviewed.

Summary of the evidence

Statement on the evidence

There is no reliable or consistent evidence that wind farms directly cause adverse health effects in humans.

Noise

- There is no reliable or consistent evidence that proximity to wind farms or wind farm noise directly causes health effects.
- There is consistent but poor quality evidence that proximity to wind farms is associated with annoyance and, less consistently, with sleep disturbance and poorer quality of life. Finding an *association* between wind farms and these health-related effects does not mean that wind farms *cause* these effects. These associations could be due to selection or information bias or to confounding factors.
- There is no direct evidence that specifically considered possible health effects of infrasound or low-frequency noise from wind turbines.
- It is unlikely that substantial wind farm noise would be heard at distances of more than 500–1500 m from wind farms. Noise levels vary with terrain, type of turbines and weather conditions.
- Noise from wind turbines, including its content of low-frequency noise and infrasound, is similar to noise from many other natural and human-made sources. There is no evidence that health or health-related effects from wind turbine noise would be any different to those from other noise sources at similar levels.
- People exposed to infrasound and low-frequency noise in a laboratory (at much higher levels than those to which people living near wind farms are exposed) experience few, if any, effects on body functioning.

Shadow flicker

- There is insufficient direct evidence to draw any conclusions on an association between shadow flicker produced by wind turbines and health outcomes.
- Flashing lights can trigger seizures among people with a rare form of epilepsy called photosensitive epilepsy. The risk of shadow flicker from wind turbines triggering a seizure among people with this condition is estimated to be very low.

Electromagnetic radiation

- There is no direct evidence on whether there is an association between electromagnetic radiation produced by wind farms and health outcomes.
- Extremely low-frequency electromagnetic radiation is the only potentially important electromagnetic emission from wind turbines.
- Limited evidence suggests that the level of extremely low-frequency electromagnetic radiation close to wind farms is less than average levels measured inside and outside Australian suburban homes.
- There is no consistent evidence of human health effects from exposure to extremely low-frequency electromagnetic radiation at much higher levels than is present near wind farms.

How did NHMRC determine whether wind farms cause health effects?

The direct evidence showed no consistent association between wind farms and health effects; but there was consistent evidence that proximity to wind farms is associated with annoyance and, less consistently, with sleep disturbance and poorer quality of life. Finding an *association* between wind farms and these health-related effects in the direct evidence, however, does not mean that wind farms *cause* these effects. It was also necessary to consider the quality of the direct evidence and its consistency with relevant background evidence.

Due to the many weaknesses of the direct evidence and even though there was support for some of these associations in studies of effects of noise from other sources, NHMRC considered that there was insufficient evidence to establish that wind farms *cause* health effects or the health-related effects annoyance, sleep disturbance and poorer quality of life.

What further evidence is needed?

The body of evidence relating to wind farms and health is small and of poor quality.

Further high quality research is needed — particularly exploring relationships between noise at varying distances from wind farms and annoyance, sleep and quality of life — to address the concerns that some people have about the possible effects of wind farms on human health.

NHMRC is developing a targeted call for research on wind farms and human health which will be finalised after public consultation. The targeted call for research will ask Australia's best researchers to address gaps in the evidence through a call for applications.

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