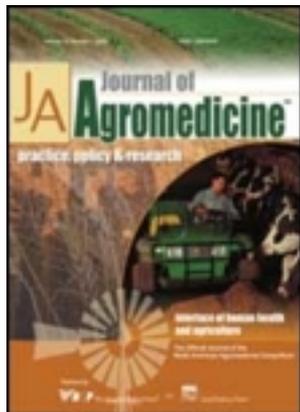


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The Consequences of Noise-Induced Hearing Loss on Dairy Farm Communities in New Zealand

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ORIGINAL RESEARCH

The Consequences of Noise-Induced Hearing Loss on Dairy Farm Communities in New Zealand

Karen Canton, MSc
Warwick Williams, PhD

ABSTRACT. *The objective of this study* was to investigate how noise-induced hearing loss (NIHL) or noise injury (NI) affects individuals and others of dairy farm communities in New Zealand. Using “grab” or opportunistic sampling at DairyNZ discussion groups and a recreational function, a survey questionnaire was completed by 74 participants from two dairy farming communities in New Zealand. Self-reported hearing difficulties were highlighted by 48% (42) of the 74 participants. The effects of NI on individuals and others included communication difficulties leading to the development of coping strategies, social isolation; decreased employment opportunities, loss of productivity, and increased effort and adjustments by family and work colleagues. Frustration, anxiety, stress, resentment, depression, and fatigue are also negative consequences that may contribute to a loss of quality of life and contribute to further health costs. Increased lateness, absenteeism, sickness and other behavioral aspects were not expressed as normal issues in the workplace, as the majority of the individuals are/were self-employed or working in a family business. This study shows that each year in New Zealand NI results in significant negative social, psychological, and economic consequences for those individuals affected, along with their families, friends, and work colleagues.

KEYWORDS. Agriculture, effects of hearing loss, noise-induced hearing loss, noise injury, social consequences

INTRODUCTION

Noise-induced hearing loss is a major cause of disability and compensation in New

Zealand.^{1,2} Excessive noise exposure can cause noise-induced hearing loss (NIHL), which is a permanent condition of the inner ear characterized by loss of hearing ability particularly in the

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voice recognition range. The extent of noise-induced hearing loss/noise injury (NIHL/NI) depends on the intensity of the noise, its duration, and its frequency.¹

A New Zealand study of farmers from different farming types reported in 2009 a prevalence of NI as 19% and 13% amongst sample groups,³ whereas the Accident Compensation Commission (ACC) of New Zealand indicated in media releases that more than 50% of farmers tested at Field-days showed some level of hearing loss in 2008,⁴ and that NI cost New Zealand in excess of \$55 million during the July 2007–June 2008 financial year.⁵ Previous studies have shown that predominantly middle-aged and older men are significantly burdened by exposure to noise and the resultant hearing loss.^{2,3,6}

In New Zealand, farming is mainly a family occupation; most dairy farms are classed as small businesses (defined as employing less than 10 people), and often involve the entire family. Studies reveal that farmers are frequently exposed to everyday sources of noise, often the exposure to noise does not exceed the recommended New Zealand noise exposure criteria ($L_{Aeq,8h}$) of 85 dB, such as driving tractors or working grain augers, but there are also intermittent intense noise such as that from particularly loud vehicles, firearms, and hand-held machinery often used by individuals without hearing protection.^{6,7}

There are a number of effects of NI, such as the loss of ability to hear high-frequency sounds and inability to discriminate speech sounds, particularly in the presence of background noise,^{2,8} as well as the reduced ability to detect, identify, and localize sounds quickly and reliably, such as warning signals, music, and birds singing.⁹ Difficulty communicating and understanding conversations often results in the person with NI limiting verbal interactions, thereby increasing social isolation,¹⁰ giving rise to a poorer quality of life and an increased prevalence of symptoms of depression.⁹ The increased effort required to follow conversation can also lead to fatigue, anxiety, and stress.¹¹

One of the main outcomes of NI is that people develop strategies to cope with hearing loss in order to minimize or prevent the disadvantages

of living with a hearing loss. These strategies themselves may have consequences on other people such as family members, close friends, and work colleagues. Men with NI show a clear preference for avoiding and minimizing strategies such as denial in conjunction with verbal and nonverbal communication strategies such as repetition, lip reading, and positioning oneself.¹²

There is a substantial burden on family and friends, including the effort and irritation of having to repeat themselves and acting as an interpreter, as well as restrictive communication in family relationships and decreased social participation and entertainment opportunities. A number of psychological effects may result, including stress and anxiety, and feelings of frustration, anger, resentment, and guilt.^{8,13}

Difficulties commonly arise in the workplace where an individual with NI may be perceived as having behavioral problems, which result in social isolation and impact on the productivity of the group.¹⁴ Employment opportunities and earnings of the hearing-impaired person may also be affected,¹⁵ along with limited social participation within the community, barriers to educational and vocational information, and possible safety hazards in an active farm environment.^{16,17}

This paper reports the results of a study examining the social, psychological, and economic consequences of hearing loss on individuals, family, friends, and in the workplaces of several dairy farm communities in the northern Waikato and Taranaki in New Zealand. It also characterizes the sample group, and its knowledge of NI, noise hazards, use of noise management practices, and noise education preferences.

It should be noted at this stage that NI is frequently aggravated by the additional effects of presbycusis or the degeneration of hearing with respect to age² where the hearing loss due to noise injury and age combine to create a greater hearing difficulty.

METHODS

A total of 74 individuals from two separate dairy farming communities completed a survey questionnaire of both closed and open questions.

Closed questions elicited demographic data and specific information on hearing health and hearing loss. Open-ended questions collected information on the effects of noise-induced hearing loss on the individual, effects on friends and family, problems in the work place, psychological and economic effects, and coping strategies, by asking participants to consider someone within their farming community that they believe have a hearing loss. Records were only kept of those individuals who participated in the study.

The initial group of 13 individuals was recruited when attending a dairy farming community recreational function in northern Waikato. Their survey questionnaires were taken home and returned when complete by hand or post. A further 21 individuals from northern Waikato and 40 individuals from Taranaki were recruited from DairyNZ active discussion groups. These participants completed and submitted a survey questionnaire on the same day. The northern Waikato and Taranaki areas are from the upper central and western areas of the North Island of New Zealand and traditionally contain significant numbers of active dairy farms and dairy farming communities.

The 10-minute survey questionnaire was developed using the literature reviewed with a mix of quantitative and qualitative questions.^{18–25} Several “impartial” people initially trialed the questionnaire to see if it was satisfactory and the first 13 Waikato participants acted as a pilot group. On initial analysis, the pilot group responses were considered satisfactory in that respondents interpreted the questions as intended and so no changes were required to be made to the final questionnaire.

Due to the nature of the research project, the statistical analysis was purely descriptive in nature. Percentages were generated for discrete questions and ranking of responses was undertaken where appropriate. For open-ended, qualitative questions, common themes were ranked according to the most frequent responses.

Ethics approval was obtained through the University of New South Wales Science and Engineering Human Research Ethics Advisory Panel. The final survey questionnaire is presented in Appendix A.

RESULTS

Characteristics of the Participants

Of the 74 participants, 69% (51) were male and 31% (23) were female, with the most frequent age grouping between 31 and 45 years (34%), followed by the 16–30 years (26%) age group. Seventy-five percent (55) of participants (owner/operator, sharemilker, or employed as farm manager) were in a position on farms to make decisions about issues relating to equipment and procedures that produce significant noise. The other 25% (19) were farm workers, family members, or people who serviced the farming community such as veterinary and rural bank professionals. There was an even distribution of the years farming over the total sample, and 97% (72) of the participants had an association with a farm less than 499 hectares in size.

A total of 42% (31) participants had either confirmed or self-reported hearing loss. A total of 26% (19) participants suffered from tinnitus at some time, as indicated by a “yes” or “sometimes” response. Sixty percent (19) of males had confirmed or self-reported hearing loss between the ages of 31 and 60 years. Overall 43% (32) self-reported wearing hearing protectors “always” or “often,” 38% (28) “sometimes” during noisy activities. Nineteen percent (14) reported that they “rarely” or “never” wear hearing protectors. Organization of work so there is no over exposure to noise was consistently reported as being poorly addressed.

Of the 64 participants who responded to the question (no. 12) focusing on “is NI preventable,” 24% (15) replied “no.” On the question (no. 14) examining reasons why hearing protectors are not worn, of the 116 responses marked, 13% (15) indicated “it [NI] will never happen to me.” Intermittent intense noises such as shooting and use of fence post rams were not well understood as being potential significant impulse noise hazards. The predominant way participants would like to be educated or informed about how to prevent or reduce exposure to noise hazards (Question 16) was by FarmSafe courses, followed by the Media, local health services, and the DairyNZ Web site.

The Consequences of Hearing Loss (Summarized From Open-Ended Questions)

The most prevalent negative effects of hearing loss on an individual were listening and communication problems resulting in social isolation (22%), loss of productivity, and the need to develop coping strategies such as repetition, lip reading, moving closer to the speaker, settings with low background noise, or avoidance of group meetings. Feelings of anxiety, stress, frustration, depression, fatigue, and negative self-image were further consequences (38%), along with loss of employment opportunities, loss of potential earnings, health costs, and the additional cost of hearing aids (49%).

The predominant burdens on family and friends were the increased efforts and adjustments made to support the hearing-impaired person (38%). These contribute to feelings of frustration, anger, and resentment (30%) as well as restricted communication and difficulties in family relationships (17%), ultimately leading to loss of quality of life for spouses, families, and those affected by the hearing loss.

In the workplace, productivity issues such as inability to complete tasks and errors in work caused through instructions not being heard or properly understood (28%) and loss of time because of verbal repetition (13%) were the main problems. A lack of environmental awareness of hazards, warning signals, and verbal speech by an individual with hearing loss give rise to stress and tension in the workplace (20%), as well as a reduced ability to undertake a job (6%), social isolation (39%), and general safety concerns. Increased lateness, absenteeism, and sickness were not responses given by participants. Economic costs were identified as those associated with loss of productivity (10%) and ACC levies (12%) as part of an increased possibility of costs associated with accidents, personal injury, and machinery damage.

Participants had little understanding of the economic costs associated with the loss of hearing other than what impacted them directly, such as loss of employment opportunities (33%) and health costs (26%). In the workplace, loss of

productivity due to errors and verbal repetition were not often translated as economic costs. The economic costs to the community or government such as enforcement, investigation, payments of medical expenses, treatment, rehabilitation, compensation, and support services and education were poorly considered by respondents in this survey.

DISCUSSION

This study confirms that a loss of hearing for an individual in the dairy farming community frequently results in negative consequences for the individual, family, and friends, in the workplace, and for the community as a whole. The prevalence of self-reported hearing loss (42–48%) in the sample group is similar to that reported by ACC (more than 50%)⁴ but much greater than other studies of farmers in New Zealand (11.6%⁶ and 13% and 19%⁴).

The survey findings on social and psychological effects for an individual are very comparable to that found in literature.^{8,13} Other effects not identified by participants but found in the literature include barriers to educational and vocation information¹⁷; listening problems in large rooms or halls such as evening classes, cinema, or church; inability to hear car radio on normal volume; inability to hear the telephone ringing; and communication problems in the car.²⁶ The literature reports an increase in compensation claims for the main reason that most farmers know they can claim for “industrial deafness.”⁴ The survey questionnaire did not specifically address whether social consequences may become economic consequences through loss of opportunities and loss of quality of life.²⁷ Respondents indicated that they would like further information and education on how to prevent or reduce their exposure to noise hazards. This information could then be used to better manage noisy tasks and noise exposure in their workplaces.

The survey results of social and psychological effects for family and friends are very comparable to that found in the literature.^{8,13} There were several significant responses not given by participants such as loss of intimate communication, or restricted social participation and leisure

activities such as entertainment or going out. However, the questionnaire was not specifically intended to facilitate such responses.

Survey responses on the workplace showed a lack of comment from hearing-impaired persons (HIP) concealing their hearing loss at work and experiencing denial, or stigma. As discussed in the literature, coworkers often recognize or view the HIP as having behavioral attitudes or problems such as an unwillingness to communicate rather than a hearing problem.^{8,14} The results agree with the literature given in reference to loss of productivity by errors,²⁸ lost time because of verbal repetition,¹⁷ as well as a possible increased risk of further accidents and injury.^{29, 30}

Lack of attendance at group encounters such as discussion groups where farmers are able to contribute their knowledge, experience, and leadership skills and transfer timely business information, as found in an earlier Canadian study,¹⁷ was not reported in this survey. This could be a consequence of the sampling method used in this survey, as participants were basically recruited from social gatherings.

Frequent lateness, absenteeism, sickness, and early retirement were not responses provided by participants as workplace problems. This does agree with a recent study reported in 2009 on New Zealand farmers,²³ but does not mirror noisy industrial settings where the consequences of NI can manifest as high levels of lateness and absenteeism from affected workers, increased staff turnover, and reduced tenure of staff.^{14,31} This is a notable difference and most likely arises because farm workplaces tend to be small, usually family owned with a majority of self-employed individuals with no "reporting" mechanisms.

Limitations of Survey

One of the effects of having NI (and also age-related hearing loss) is that those affected have been found to usually avoid large group meetings. Thus sampling from discussion groups may have led to a bias in the sample toward those more interested in their hearing and hearing health. There is a possibility of a social desirability bias in the responses given by

participants for wearing of hearing protectors, or reporting on noise management.

In the latter part of the survey questionnaire there was a lack of personal opinion expressed in the open-ended questions, which resulted in few responses on the more intimate effects of hearing loss, such as the feeling of being stigmatized for an individual or the lack of intimate communication within a couple. Individual interviews of participants as a verification of data did not take place due to time and resource restrictions on the project.

Questions on the psychological affects and economic costs were poorly responded to, with a 53% (39) and 50% (37) response rate, respectively.

Conclusion

NIHL costs New Zealand millions of dollars each year in compensation and produces negative social, psychological, and economic consequences for those individuals affected, along with their families, friends, work colleagues, and the communities in which they live. Dairy farming communities need to be better informed of impulse noise hazards and the general levels of noise for farming activities, and be aware that noise-induced hearing loss is preventable. In this way, they will be able to better organize work to minimize exposure to noise hazards.

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APPENDIX A. Survey Questionnaire

The Effect of Noise Induced Hearing Loss Questionnaire PIN

Thank you for participating in this survey. To maintain your confidentiality, privacy and anonymity survey questionnaires will be destroyed at the end of this project. Using a personal identifier number, only answers to the questionnaire questions and interview questions will be documented and kept. This information will be stored electronically on a password secure computer.

1. **What is your age at your last birthday?**
 < 16 16–30 31–45 46–60 61 +
2. **What is your gender?**
 Female Male
3. **What is your relationship to the dairy farm community you are in today?**
 Owner/operator
 Sharemilker
 Employed farm manager
 Family member
 Farm worker
 Other, please specify _____ (IPRU³)
4. **How long have you been involved with farming?** _____
5. **What size is the property you are presently involved with? (1 hectare is about 2.5 acres)**
 0–99 hectares
 100–499 hectares (or last involved with, if retired)
 500–999 hectares
 >1000hectares (IPRU³)
6. **Do you suffer from Tinnitus (Ringing or Buzzing in the ear)**
 Yes No Sometimes
7. **Do you think you have a hearing loss?**
 Yes confirmed by hearing test Yes possibly No (Williams¹⁹)
8. **Does any close friend or family member think you have a hearing loss?**
 Yes No (Williams¹⁹)
9. **Do you have trouble carrying on a conversation in background noise (eg TV, radio, restaurant, children playing)?** (Williams¹⁹)
 Yes No Sometimes
10. **Which of these do you consider a Noise Hazard?**

<input type="checkbox"/> Tractor with Cab;	<input type="checkbox"/> Lawn mowing;
<input type="checkbox"/> Tractor without cab;	<input type="checkbox"/> Shooting;
<input type="checkbox"/> Milking Shed;	<input type="checkbox"/> Loud music;
<input type="checkbox"/> Milking shed without sound protected vacuum pump;	<input type="checkbox"/> Preparation of Firewood
<input type="checkbox"/> Chain sawing;	<input type="checkbox"/> Leaf blowing;
<input type="checkbox"/> Use of heavy machinery eg Digger or Bulldozer;	<input type="checkbox"/> Use of ATV;
<input type="checkbox"/> Use of handheld power tools;	<input type="checkbox"/> Use of Motor bike;
<input type="checkbox"/> Post fence ramming;	<input type="checkbox"/> Other, please state _____

11. During noisy activities do you wear hearing protection such as earmuffs or earplugs?

- Always Often Sometimes Rarely Never

12. Which is true of Noise Induced Hearing Loss (Circle your answer)

- a/ Painless b/ Progressive c/ Permanent d/ Preventable e/ All answers a-d

13. Consider the Noise management practices on a farm you have had most recent involvement with.

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know
Management considers 'Health of Hearing' and Noise injury prevention is incorporated into business plan					
Employees understand duties of responsibilities in wearing hearing protectors or using other noise control methods as required by law					
Sufficient resources are made available for preventing noise injuries					
Reporting of noise related injuries recorded					
Opportunities exist to raise noise related maintenance issues					
Work is organised so there is no over exposure to noise hazards					
Long term plans are made to reduce noise exposure through elimination or isolation of noise hazard, eg Tractor with cab, improved muffler systems, isolation of vacuum pump in milking shed					
Work is monitored or audited to give feedback on work habits such as use of hearing protectors					

14. Do you (or did you, if retired) use any of the following excuses in reference to using hearing protectors or using noise control methods? (Sutherland²⁴)(Lovelock²³)

- "Makes me look ridiculous"
- Creates interpretations of being 'soft'
- "They are uncomfortable"
- "They restrict my ability to communicate"
- "I didn't realise I needed them"
- "I don't like being told what to do"
- "It will never happen to me" (Noise Injury)
- We have industry guidelines in place and only do what we have to e.g. legislation
- "Why should I make my staff do what I think is unnecessary?"
- Lose too much time when putting on Hearing protectors
- Hearing protectors are never there when I need them
- Cost of purchasing the Hearing Protectors
- Cost of purchasing new farm machinery or equipment with reduced sound or sound protection
- "Focusing on the prevention of Injury and disease is not a positive experience and I do not want to do it"
- I don't make excuses

15. Do you think having Noise Induced Hearing Loss or Tinnitus encourages or acts as a positive influence for the use of hearing protectors and noise management practices?

- Yes No Undecided

16. How would you like to be informed and educated about how to prevent or reduce exposure to noise hazards?

(Choose 3)

- Media (TV, Radio, Newspaper)
 Farming organisations Who? _____
 ACC website
 DairyNZ website
 FarmSafe courses
 Journals – Which ones? _____
 Pamphlet in post
 Pamphlet distributed by local Farming outlets
 Educational speakers
 Field Days
 Local Health Services
 Other, specify _____

It is thought that for every one person with hearing loss 10 others are affected. The other people that may be affected include co - workers, friends and family, and others in the community, burdens may be placed on health service providers and compensation providers. Most people do have some hearing loss with age. Noise Induced Hearing Loss can affect people at any age and this is cumulative with age related hearing loss exacerbating the problem.

FOR THE NEXT PART OF THE QUESTIONNAIRE CONSIDER SOMEONE WITHIN YOUR FARMING COMMUNITY THAT YOU BELIEVE HAS A HEARING LOSS

17. Describe how hearing loss affects the individual.

18. What burden does a hearing loss place on friends and family?

19. Describe problems that arise in the workplace. (E.g. safety, productivity, ability to undertake particular job tasks.)

20. Describe any psychological effects on the person with a hearing loss?

(E.g. social isolation, depression, fatigue, loss of self-esteem, stress)

21. What economic losses or burdens have been associated with hearing loss for the individual, at work, or in the community?

(Eg employment opportunities, productivity, loss of earnings, early retirement, ACC levies, and health costs,)

22. What strategies has the person used to conceal their hearing loss or help with hearing loss?

(E.g. Lip reading, avoidance of social occasions, sitting closer to speaker, asking people to repeat themselves, investment in hearing aids)

Should you be interested in receiving feedback of the results from this survey or would considering further interviewing on your personal experiences as someone with Noise Induced Hearing Loss please write your contact details below.

Name:

Email address:

Phone. No.:

Contact Postal Address: