
Prevalence of hearing loss and its relationship to leisure-sound exposure

Final Report *(within the grant period)*

Prepared for:

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Preface

The study presented in this report was conducted by the National Acoustic Laboratories (NAL) for the Commonwealth Department of Health and Aging (Office of Hearing Services, Hearing Loss Prevention Program). The overall aim of this study was to estimate the prevalence of hearing loss, estimate the exposure to leisure sound, and investigate the beliefs about the effects of loud sound on hearing, of a large, representative sample of young people. A test protocol was devised by the Hearing Loss Prevention Team (NAL) under the leadership of Dr Warwick Williams (Section Head), and Lyndal Carter (Project Leader). The study was administered from NAL (126 Greville Street, Chatswood, NSW). Assessments were conducted by a team of qualified audiologists, in a wide range of NSW community locations.



iHEAR assessments

Executive Summary

In response to growing community concern that exposure to loud sound during everyday leisure activities (in particular, loud music exposure from personal stereo players, nightclubs, and rock concerts), may be compromising the hearing health of young Australians, the Commonwealth Department of Health and Aging provided financial support for the National Acoustic Laboratories (NAL) to conduct a study, titled in full:

“Prevalence of hearing loss and its relationship to leisure-sound exposure”.

For reporting and promotional purposes, the study is referred to as “iHEAR” - “Investigation of Hearing Loss Epidemiology, Attitudes & Recreation”.

NAL undertook this work as a consultancy, signed as a contract with the Commonwealth of Australia, Department of Health and Aging, on 30th June 2008. Funding was provided through the Office of Hearing Services, Hearing Loss Prevention Program. The National Acoustics Laboratories gratefully acknowledges this support. The following report is provided, according to the contract Schedule (final report at 1 June 2011).

At the end of the grant period (May 2011) datasets were obtained for just over 1300 participants. Preliminary findings (based on analysis of the data for approximately 1000 participants, complete at the time of preparation but excluding any cases in which there were confounding aetiological factors) are as follows:

- Many respondents believe that leisure noise exposure (personal stereo players, nightclubs) pose a risk to hearing health.
- Respondents tend to perceive their own risk of hearing loss due to leisure noise exposure to be lower than other people their own age.

- A large proportion of people in the target age group report listening to music. Personal stereo players (88%), home and car stereos (93.5%), having attended a nightclub/gig (95.7%).
- On the basis of self-report, most young adults probably have reasonable (safe) levels of exposure to recreational noise, however dosimetry measures suggest a minority may be at risk of noise-related hearing damage related to leisure activities.
- While the majority of respondents report sound levels to be high in nightclubs they have attended, only around 25% report ever using hearing protectors while attending.
- Almost half of respondents have never used hearing protectors in any situation.
- Tinnitus is common in the target age group (reported by around 64% of participants), and is significantly associated with self-reported noise exposure.

Most significantly:

- The prevalence of hearing loss in the target age group may be lower than reported in previous studies, and,
- No association between reported leisure noise exposure and hearing loss or inner ear function have been identified in the preliminary analysis.

It is proposed that data collection will continue until a total number of 1500 participants have been assessed. More detailed analysis of the data will be carried out when data collection is complete and additional quality assurance of the data has been made.

In addition to regular reporting to OHS (as per the contract schedule), at the time of writing, preliminary results have been disseminated at three professional conferences, and one article has been submitted to a peer reviewed journal. At least

8 topics for publication have been identified, and detailed analysis and submission of articles for publication will continue well beyond the finalisation of the contract.

Possible areas for further research have also been identified, and a sub-project of iHEAR has already commenced. Consent for future contact has been obtained from iHEAR participants where possible, and it is hoped that a longitudinal (follow-up) study can be initiated (given appropriate funding is available to do so).



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2 Objectives & Milestones

The aim of the iHEAR study was to determine whether there is evidence that exposure to high level leisure-sound is actually causing hearing problems in the general population of young adult Australians, and/or, whether any early clinical (“warning”) signs of hearing damage can be identified. In the longer term, the information gathered will be translated into appropriate community information and hearing loss prevention strategies, specifically targeted at adolescents and young adults.

Desired Outcomes:

- a) To obtain hearing thresholds and a measure of outer hair cell function for younger and older participants, from which a prevalence of hearing loss can be calculated, and any more subtle changes to inner ear function can be determined.
- b) To determine the strength of the relationship between hearing thresholds and self-reported exposure to sound (excluding cases with reported congenital hearing loss and hearing loss known to arise from adverse health events, e.g., infection, head trauma).
- c) To examine the relationship between self-reported, and actual, exposure to leisure sound, and to investigate whether this is predictable.
- d) To relate self-reported leisure-sound exposure, to samples of actual leisure sound, in order to estimate typical exposure profiles for young people.
- e) To gain an understanding of the beliefs of a representative sample of young people about exposure to leisure noise and its effects on hearing.
- f) To determine normative audiometric data for a young adult population.
- g) To make hypotheses about individual susceptibility to high levels of leisure sound.

iHEAR Milestones:

Schedule dates:	Milestones:	Activity/Reports:
29 August 2008	16 October 2008	Submission of ethics application and refinement of project plan and protocols.
	21 October 2008	Ethics approval received from the Australian Hearing Human Research Ethics Committee (AHHREC).
October 2008	<i>June 2009</i>	Commence data collection
15 December 2008	15 December 2008	Progress report to OHS. <ul style="list-style-type: none"> - Recruitment of audiologists for field work. - Audiological test protocols finalised. - Survey instruments drafted (subject to expected input from SAVES personnel). - SAVES project start delayed.
	9 April 2009	Application to NSW Department of Education and Training- Student Engagement and Program Evaluation Bureau (SERAP).
June 2009	May 2009	Progress report to OHS. <ul style="list-style-type: none"> - iHEAR equipment and protocols in place. - Pilot data collection commenced.
	24 June 2009	Deed of Variation No [1] approved by OHS.
	24 July 2009	SERAP approval obtained from NSW Department of Education and Training. <ul style="list-style-type: none"> - Major recruitment in State High Schools commenced.
15 December 2009	17 November 2009	Progress report to OHS. <ul style="list-style-type: none"> - 200 + participants assessed (aged 11 – 17 years) - Critical review and refinement of survey instruments. - Concept of SAVES collaboration abandoned. Goals and milestones reviewed accordingly. - Extended target participant age range to 26 years.
15 May 2010	20 May 2010	Progress report to OHS. <ul style="list-style-type: none"> - 500 + participants assessed - Extended target age range to 35 years

		- Refine survey instrument for adult participant group
August 2010		Complete data collection
	August 2010	800 + participants assessed
15 December 2010	8 December 2010	Progress report to OHS.
		- 1000 + participants assessed
		- Target age range now limited to 18 -35 years
December 2010		Complete data analysis
	April 2011	Preliminary data analysis (2)
December 2010	Date TBC	Teleconference with project sponsor
15 May 2011		Draft final project report
		- 1300 + participants assessed.
1 June 2011		Final progress report to OHS
		- Proposed final n = 1500 (pending analysis)

3 Methodology

3.1 Project development

The original project concept was for the National Acoustic Laboratories (NAL) to closely collaborate with the Centre for Vision Research (CVR), University of Sydney and Westmead hospital. However, following logistical difficulties, NAL independently developed administrative, as well as experimental, protocols, and independently commenced pilot hearing data collection in June 2009 (as reported to OHS). A positive outcome was that the separation from the pre-determined protocols of SAVES allowed more flexibility in the development of the experimental protocols for the iHEAR study. The proposed strategy was critically reviewed and it was considered that 11 and 17 year old participants were unlikely to have experienced significant leisure-sound exposure (on the basis they still have considerable adult supervision and guidance, and are not legally old enough to enter many high-noise level environments, such as nightclubs). With agreement from OHS (as per Deed of Variation No [1], June 2009) the target participant age range was extended to include “young adults”. Initially, the target age range was

extended to 26 years. The first preliminary data analysis (May 2010) indicated a very low incidence of pure tone hearing loss. The target age range, therefore, was eventually extended to 35 years.

All appropriate ethics approvals were gained by NAL from the NSW Department of Education and the Australian Hearing Human Research Ethics Committee.

3.2 Participants

There were no specific criteria for participant selection, apart from being within the defined target age group.

In the first phase of data collection (target age 11 – 17 years), the majority of participants were recruited from NSW state and independent schools. When the age range was extended (to an upper age limit of 26 years), universities and TAFE colleges were an additional recruitment source. An attempt was made to encourage participation from students with a range of socio-economic backgrounds. This was achieved by making reference to Australian Bureau of Statistics (ABS, 2006) decile rankings of Sydney suburbs, and approaching schools and colleges across a range of areas. The ABS decile ranking for the participants school and home suburb have been recorded as demographic data.

Recruitment of adult participants, who were not students, was relatively difficult. Given that assessments could only take place during business hours, and the majority of people in the target age group are likely to be involved in paid employment, it was unreasonable to expect the required numbers of participants to voluntarily attend NAL for testing. It was also recognised that volunteers would most likely be recruited who lived or worked in proximity to NAL, which would potentially skew the demographic profile of the sample population. Therefore, workplaces and organisations, across a range of demographic areas were approached, and agreements were made to advertise the study to employees and to assess interested employees on-site (similar protocol to the school and college testing).

At the time of preparation of this report, approximately 150 business and organisations have been approached about the study. In an attempt to increase the diversity of the sample, a wide range of organisations have been contacted, including; government agencies, local councils, retail and financial businesses, recreational groups, infrastructure providers, media networks, health services, and unions. Of these, 23 organisations have, so far, participated.

Just over 1300 participants (between the ages of 11 and 35 years) have, so far, been assessed. Of these, 705 were female, and 611 were male. The average age was 21.7 years, and the median age was 19.6 years. Table 1 (below) shows a histogram of the distribution of participant ages (for the entire participant group, to date). With consideration to the preliminary findings to date, statistical power estimations, and cost, it is likely that a maximum number of participants in the order of one and a half thousand should yield a satisfactory outcome. Assessments will continue until this target is achieved.

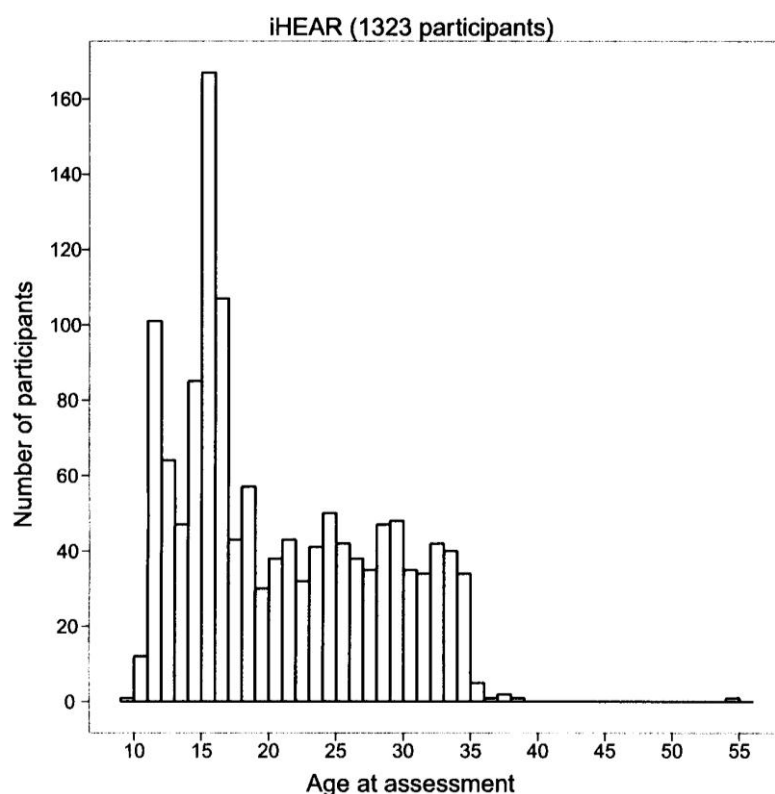


Table 1: Histogram of ages of iHEAR participants (males and females combined)

As the focus of the iHEAR study is to determine the prevalence of hearing loss that may be attributable to leisure-sound exposure, cases for which confounding factors exist have been excluded from preliminary analysis of pure tone threshold data. Datasets are excluded, for example, where there is evidence of middle ear involvement (abnormal result on tympanometry), pre-existing hearing loss (with an aetiology unrelated to noise exposure), and so on. This approach is consistent with other research, for example, Niskar et al., 2001, who reported exclusion of 19.2% of participant datasets on the basis of similar confounding variables. After exclusions (approximately 30% of cases), pure tone threshold data has been reviewed, to date, for approximately:

- 400 participants in the 11-18 year age group, and
- 550 participants in the 18 -35 year age group

3.3 Experimental protocols

The following measures were proposed in the original project plan:

Factor	Measure	Details
Hearing sensitivity (thresholds)	Pure tone audiometry.	Air conduction: 500, 1000, 2000, 4000, 6000 and 8000 Hz
	Transducers: <i>insert earphones, coupled with sound occluding earmuffs.</i>	Bone conduction: 500, 1000, 2000 and 4000 Hz (if AC thresholds > 15 dB HL, masked as required)
Inner ear function	Otoacoustic Emissions	Transient Evoked (TEOAE)
Beliefs re: effects of loud sound exposure	- Self-report	Brief questionnaire
	- Dosimetry	- Personal dosimetry measures, <i>and/or</i> - MP3 player measures

As the iHEAR study ultimately proceeded as an independent study, a more detailed protocol than initially conceived was feasible. A comprehensive assessment of inner ear function, using distortion product (DPOAE) and transient evoked (TEOAE) measures was

included, on the basis that previous research suggests that a range of OAE measures may be sensitive to the effects of noise-induced hearing loss, and it is unclear which measure (or measures) may provide the best early indicators of peripheral auditory damage (Bhagat, 2009; Davis et al., 2005; Bartnik et al., 2007; Harris & Probst, 1997; Maia & Russo, 2008; Probst, Harris & Hauser, 1993; Sexias et al., 2005). For a full description of the OAE test protocol used, refer to Appendix 1 (pg.30).

Considerably greater detail in the assessment of pure-tone thresholds was also achieved, in the independent study design. For example, a protocol to ensure test-retest reliability and exclude possible test artefact was used, based on published standards (AS/NZS 1269.4:2005 Occupational Noise Management). An additional audiometric frequency (3000Hz) was also added. Sample measurements of ambient noise levels in the test environments were recorded.

3.4 Survey instruments

The initial survey instruments, targeted at 11 – 17 year olds, were developed by NAL, with reference to previous hearing conservation/education literature, and studies (e.g., Serra et al., 2005; Biassoni et al, 2005). The instruments were designed to probe knowledge elements, believed to be integral to developing hearing conservation messages for children (Folmer, et al., 2002), such as:

- The auditory system (how the ear works), types and causes of hearing loss
- Noise, and its effect on hearing
- Warning signs of noise-related hearing damage
- Hearing loss prevention strategies
- Consequences/effects of hearing loss on quality of life

Probe questions were devised with reference to the “Health Belief Model” (Rosenstock, 1974; Rosenstock et al., 1988) which purports that positive health behaviors are impacted upon by factors such as:

- Beliefs about susceptibility (in this case, to hearing loss)
- Beliefs about the severity of hearing loss
- Beliefs about the efficacy of health behaviours/actions (i.e., the use of hearing protectors and other strategies).

It was also assumed that “social norms” may have an influence on behavior. “Social norm” theories have been described in previous literature (e.g., Blanton et al., 2008). In brief, it is suggested that people measure their behavior against the behaviour of others of the same age/circumstances, i.e., a peer group. Feelings of personal susceptibility to risk may be influenced by where individuals judge their own pattern of behaviour to be in relation to their peers. These assumptions may be largely based on an individual’s *perceptions* of the behaviour of the peer group. If these perceptions are inaccurate (i.e., they underestimate or overestimate the group’s behaviours) then their perception of individual risk may be skewed, resulting in poorer choices as regards health behaviours/strategies.

At the commencement of the study (11 - 17 year old target age group) the questions were divided in two parts:

1. A structured face-to-face (“onsite”) interview (conducted by the audiologist) on the day of the assessment.
2. A “take home” questionnaire (referred to as the “Health, Family and Hearing Questionnaire”, or HFFQ) which was intended to be completed with the help of a parent or carer. This was made available in a paper and on-line version.

In addition to the elements described above, the HFHQ included a detailed health history (relevant to hearing loss risk factors) and other demographic information about the participant and their family. The HFHQ also included self-report questions regarding leisure activity history and use of hearing protectors.

When the target age range was changed to 18 -35 years, the appropriateness of the survey questions was reviewed. An amended survey, referred to as the “iHEAR Hearing and Leisure Survey” replaced the two earlier instruments. Again, this survey was made available to participants in a paper and on-line version. The items included in the final versions of each of the three instruments are included in Appendix B (pg. 32). For brevity, participant instructions and prompts are not included. PDFs of the actual survey instruments are available from NAL.

3.4 Dosimetry

The original research proposal included physical measurements of leisure sound exposure for a sample of older adolescents, within the participant group, either dosimetry measures of leisure noise exposure (in real-life situations), or measures of MP3 player volume. For logistical reasons, it was decided that the physical measurements of leisure-sound exposure would be collected from a mainly independent participant group.

Participants to undertake dosimetry measures were recruited by advertisement thorough workplace networks (via email, posters, and flyers). Some of this promotion was directed to participants in the iHEAR cohort. The final sample was: $n = 45$ (age range 18 -35 years). The study protocol required participants to wear a personal dosimeter (CEL-350 dBadge Personal Sound Exposure meter) for a period of five consecutive days, always including Friday, Saturday and Sunday, to ensure that weekend leisure activities were captured. Participants also kept a written diary detailing their activities during the recording period, and providing a subjective estimate of the noise level of each activity they undertook.

4 Conclusions & Recommendations

The following conclusions are based on preliminary data analysis. They may be subject to change prior to scientific publication, or refinement, as analysis of the extensive dataset is worked through, and results are interpreted in consultation with the broader scientific community.

The primary aim of the iHEAR study was to determine whether there is evidence that exposure to high level leisure-sound is actually causing hearing problems in the general population of young adult Australians. Audiological criteria for determining that hearing damage has occurred are, to some extent, arbitrary. In interpreting the data, the most appropriate criteria are still being considered. For example, pure tone hearing thresholds within a maximum of 20 dB HL are generally considered to be “within normal limits” and clinically unremarkable, however “normal” hearing thresholds may not actually exclude the presence of early auditory system damage. Previous authors have devised other criteria, based on the configuration of hearing thresholds at different frequencies (“noise notches”), which are thought to be typical of noise-related hearing loss (e.g., Niskar et al., 2001). These are still being tested and considered.

Audiometric findings

Plots of the 10th, 50th, 90th, 95th and 99th percentiles for air conduction thresholds at all test frequencies (for each ear) have been calculated. These are provided in Figures 1 – 4 (below). These illustrate that the majority of participants in the sample population to date, in fact, have hearing within normal limits. However, a small percentage (in the order of around 5%), show evidence of “elevated” hearing threshold levels. Further, if Figures 1 & 2 (data for 11-17 year old participants), are compared with Figures 3 & 4 (data for 18 – 35 year old participants) hearing levels for participants in the 99th percentile are poorer than those in the younger group. Given that in the sample age range there would be no expected effect of presbycusis, and other confounding medical factors have already been excluded, it is possible that the deterioration observed is related to accumulating leisure-sound (and/or occupational-noise) exposure.

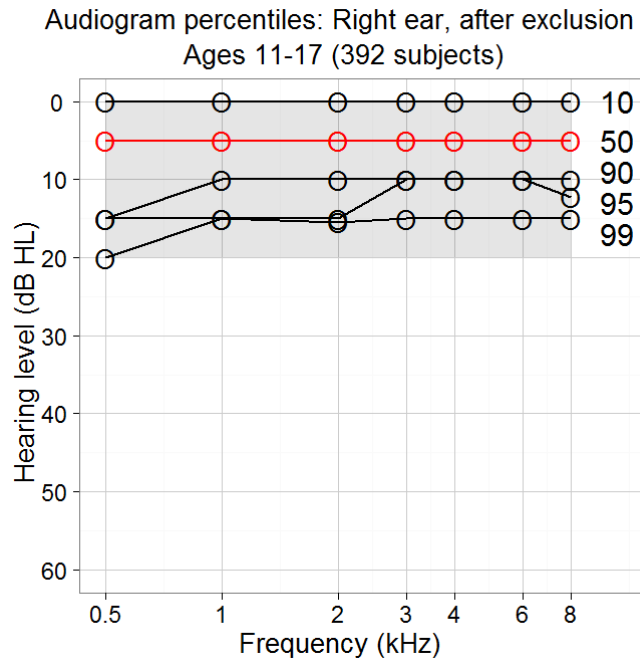


Figure 1: Audiogram percentiles: Right ear, after exclusion (Ages 11 -17 years)

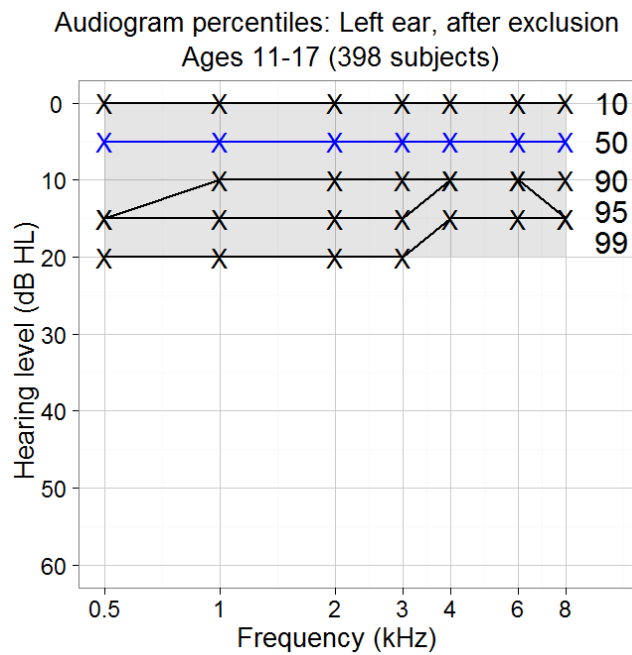


Figure 2: Audiogram percentiles: Left ear, after exclusion (Ages 11 -17 years)

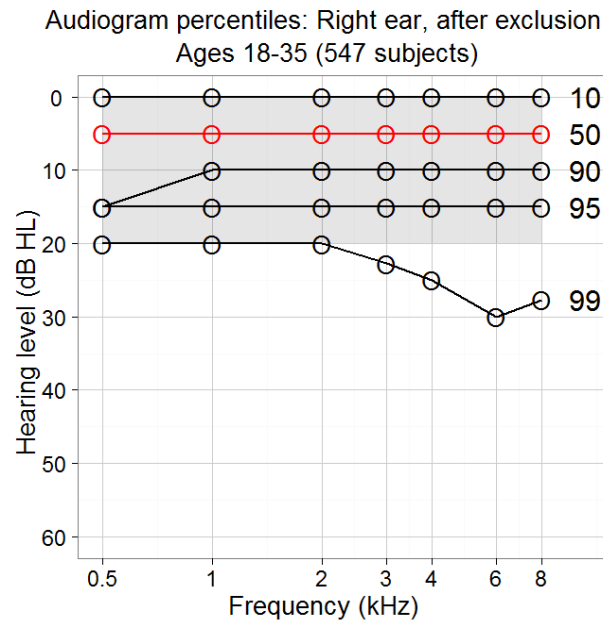


Figure 3: Audiogram percentiles: Right ear, after exclusion (Ages 18 -35 years)

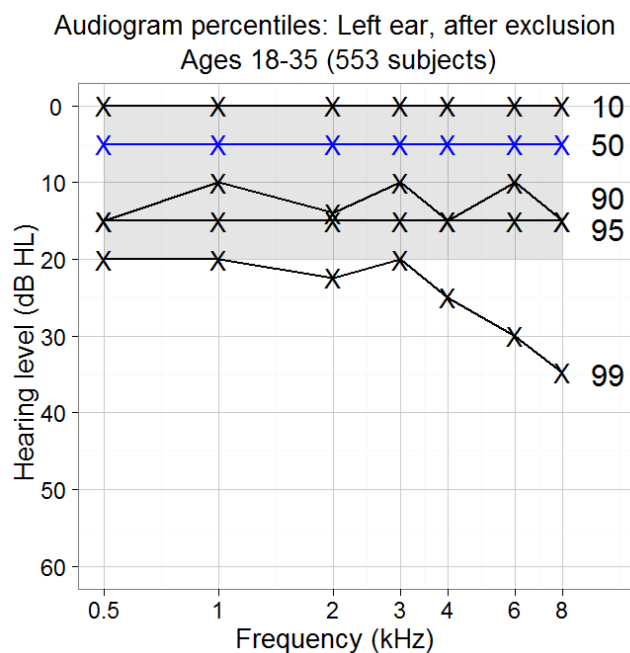


Figure 4: Audiogram percentiles: Left ear, after exclusion (Ages 18 -35 years)

Previous estimates of the prevalence of noise-induced threshold shift in young people have suggested a higher incidence of hearing loss than this iHEAR data would suggest, however figures were based on different criteria. For example, Niskar et al. (1994) estimated that overall, 14.9% of children in a US health study of 6 to 19 year olds (collected in the period

1988 – 1994), had a hearing loss, based on a criteria of a high-frequency, or low-frequency average hearing level of >16 dB HL. Niskar et al. (2001) published a second analysis of the data, in which it was estimated that approximately 12.5% of participants had evidence of noise-induced threshold shift. This was based on the configuration of the thresholds, rather than an absolute threshold criterion. Further, Shargorodosky et al. (2010) compared data collected in the same location during 2005-2006, with these earlier data, concluding that the prevalence of hearing loss among a sample of 12 -19 year old was greater in this period than earlier.

It is possible that a number of factors, including methodological differences, may account for the apparent discrepancy between iHEAR and earlier reported findings. For example, in the 1988-1994 study reported by Niskar et al., otoscopic examination was not part of the test protocol. Given the strict audiological protocols followed in the iHEAR study, it is possible that actual prevalence of hearing loss in this age group (in particular, which may be associated with noise-exposure) could actually be lower than previously reported. If so, this is of great significance, in terms of targeting future research, and critiquing current approaches to community hearing health promotion.

Measures of inner ear function (otoacoustic emissions) are also regarded as a possible indicator of early auditory system damage (occurring before damage is evident in the pure tone audiogram), and iHEAR OAE findings are also a critical subject for analysis.

Association between reported noise exposure and audiological measures

Multiple regression analysis of preliminary data was undertaken with the following response variables:

- Hearing threshold levels (average of pure tone thresholds at 4 & 6 kHz).
- “Notch” measurement (according to a criterion relating the 4 kHz threshold to the 1 and 8 kHz thresholds).
- DP and TE OAE signal-to-noise ratios (SNRs).

Predictor variables were:

- Gender, age, self-reported leisure noise exposure and work noise exposure.

Leisure noise has not, so far, been demonstrated to be significantly associated with any of the response variables. The most notable significant association was between gender and the OAEs, with females having greater SNRs

As described previously, the iHEAR study has obtained a very large and detailed dataset of otoacoustic emissions (OAEs), measured using a range of test protocols. There is still much work to be done in analysing the relationship between the various OAE measures and test parameters for individuals, as well as comparing the OAE results with pure tone threshold and self-report data (symptoms, leisure sound exposure). It is hoped that referencing of the iHEAR OAE data against the large body of previous OAE literature, may shed further light on the applicability of OAE measures as an indicator of early noise-induced hearing loss, and also help determine which test protocols are most clinically relevant.

Survey findings

The survey questions, developed for the iHEAR study, are also very comprehensive, and provide a possibly unique level of detail regarding patterns of leisure activity (particularly, when paired with a broad range precise audiological measures). Preliminary analysis has revealed a number of interesting findings.

1. Tinnitus is common in the target age group (reported by around 64% of participants). Fitting of a proportional odds logistic model to the preliminary data set suggests that tinnitus is significantly associated with noise exposure, even after controlling for age (although it is recognised that the correlation between noise exposure and tinnitus could be confounded by age, because age is positively correlated with both noise exposure and tinnitus).

2. Many respondents show awareness of the possibility of damage to hearing due to excessive noise levels, with many believing that leisure noise exposure (e.g., personal stereo players, nightclubs) pose a risk to hearing health. For example, 97.5% of younger participants indicated that personal stereo use may potentially damage hearing. It is interesting to note, however, that as participant age increases the perception of risk decreases. This was found to be highly statistically significant. Another interesting observation is that there is a tendency to perceive one's own risk of hearing loss due to leisure noise exposure to be lower than other people of the same age. This was also statistically significant.

3. The surveys, in combination with measures from the dosimeter studies, suggest that most young adults are exposed to acceptable (safe) levels of noise during leisure and work activities. However, the results of the dosimetry studies also show that the noise exposures of a minority of young adults, in the sample population, pose a risk of long-term hearing damage. The results provide confirmation of the leisure activities which impart the most risk, e.g., music concerts, nightclubs, motorbikes, playing in a band, bars and pubs.

4. The majority of iHEAR survey respondents report sound levels to be high in nightclubs they have attended, however only around 25% report ever using hearing protectors while attending. Overall, almost half of the iHEAR respondents reported no prior experience at all with using hearing protectors. Future prevention activities targeted to those who engage in "at risk" activities are likely to be more effective than those that take a more broad-based approach to the issue. This is an important area for further analysis, interpretation and translation into community education practice

5. Results, also suggest that individuals are reasonably able to estimate the loudness of significant noisy events they experience, including how much noise they are exposed to on an average daily basis, and so may be capable of assessing their own degree

of hazard exposure. This may be significant information for those interested in producing effective, and cost effective, hearing health programs.

Further analysis is planned to investigate the possible relationships between many factors.

5 Dissemination of Research Findings

There is already substantial public interest in the possible impacts of leisure noise on hearing, which has been evident in the enthusiasm and interest of the iHEAR participants, schools and workplaces that took part. NAL will provide a summary of findings directly to each of the organisations involved in the project.

During the grant period, Australian Hearing/NAL launched a relevant report, titled “Binge Listening”, which describes the results of an online survey of 1000, 18-35 year olds (probing individual perceptions of noise, perceived causes of hearing loss and attitudes towards hearing protection). This report attracted considerable media attention, and it is expected that findings of iHEAR will be worthy of similar interest. It is hoped that once the iHEAR data is interpreted (with appropriate peer review), that some of the results will be relayed directly to the community through media channels.

Results will also be widely disseminated through scientific publications, and at conferences and seminars in audiology and public health disciplines.

Dissemination of preliminary findings to date:

Conference presentations (oral papers):

Beach EF, Freeston K. & Pang J. (2011) Leisure-noise induced hearing loss: Prevalence, profiles, and prevention *Australian Health Promotion Association 20th National Conference*. Cairns, Australia.

Carter L, Dillon H. NAL iHEAR Project. “*Hearing in the Hill*” Silver Jubilee Seminar. Broken Hill NSW, 1- 4 October 2010.

Beach EF, Williams W, & Gilliver M (2010). The contribution of leisure noise to overall noise exposure. *20th International Congress on Acoustics*, Sydney.

Carter, L, Williams, W, Gilliver, M, Macoun, D, Rosen, J, Pang, J, Gibian, M, Freeston, K, Dillon, H. *Prevalence of hearing loss and its relationship to leisure-sound exposure - iHEAR.* XIX National Conference of the Audiological Society of Australia Inc., Sydney, May 2010.

Gilliver, M, Carter, L, Williams, W, Freeston, K, Macoun, D, Rosen, J, Pang, J, Gibian, M, Dillon, H. Music to their ears: How can young people's perceptions about their listening habits aid prevention? *XIX National Conference of the Audiological Society of Australia Inc.* Sydney, May 2010.

Peer-reviewed publications:

Submitted:

Gilliver, M, Carter, L, Macoun, D, Rosen, J, Williams, W. Music to whose ears? The effect of social norms on young people's risk perceptions of hearing damage resulting from their music listening behaviour. *Noise and Health.*

Accepted:

Beach E, Williams W, Gilliver M. The objective - subjective assessment of noise: Young adults successfully estimate loudness of events and lifestyle noise. *Ear and Hearing.*

Proposed topics for future publication:

1. Prevalence/epidemiology of hearing loss in adolescents (11-17 year olds) and young adults (18-35 year olds).
2. Relationship between reported otological symptoms, leisure-sound exposure, pure-tone hearing loss and inner ear function (OAEs).
3. OAEs, and/or the acoustic reflex, as an early indicator of peripheral auditory system damage.
4. Adolescent's knowledge and beliefs about hearing and loud-sound exposure, motivation and behaviour.
5. Dosimetry results: profiling of leisure-sound environments, development of a reference database, and identification of "at risk" activities and participant groups.
6. The relationship between self-reported profiles of leisure-sound exposure, and sound-pressure levels (recorded in the leisure-sound profile database).
7. The accuracy of subjective assessment of loudness, and perceptions of risk.
8. Implications of iHEAR data for future Hearing Health Promotion programs.

6 Prevention strategies (future directions)

The iHEAR dataset is very substantial, and should inform the field of hearing loss prevention well into the future. As discussed, there remains a considerable volume of further work, to ensure that the iHEAR data is appropriately interpreted, and that the maximum community benefit is obtained from the detailed data that has been collected. The findings of the iHEAR study will be widely disseminated through peer reviewed journals and at professional conferences (refer to section 5, above). In addition, a wide range of potential areas for further research are already apparent.

Future research

Although more detailed analysis of the iHEAR data is needed, it seems that the estimated prevalence of hearing loss in the target age group may well be lower than expected. However, close analysis of the correlation between loud-sound exposure, hearing thresholds, and OAE measures, must be made before drawing conclusions, or redirecting the current approach to community education, particularly with respect to health warnings about the impact of excessive leisure-noise exposure on hearing. If, however, no correlations are found, and few participants have hearing outside normal limits, evidence of an audiometric configuration typically associated with noise-exposure (“noise notch”), or other evidence of early inner ear damage, it is possible that leisure noise may, at most, contribute to hearing loss that develops at a later stage in life. The only means of investigating this further will be through a prospective longitudinal study of hearing levels, middle, and inner ear function.

In September 2009 the Australian Senate initiated an enquiry into hearing health in Australia, through the Senate Community Affairs References Committee. Findings and recommendations were published in the following year (Commonwealth of Australia, 2010). The adequacy of current hearing health

research programs was a specific subject of this enquiry, and a recommendation in this report was that “the Australian Government fund the National Acoustic Laborator[ies] to undertake longitudinal research into the long-term impacts of recreational noise, particularly exposure to personal music players” (Recommendation 15; 6.48). In response to this, ethics approval was sought to retrospectively request permission from iHEAR participants (and parents of younger participants), for contact details to be maintained on a database. Given the opportunity to access further funding, NAL is therefore in the fortunate position of having a large database of potential participants, with detailed baseline audiometric data. For the purposes of monitoring hearing over time, it is also useful that the majority of these potential participants have good hearing thresholds as a baseline.

In addition to this, applications for NHMRC funding, for three high priority projects has also been submitted, as follows:

1. Title of Project: Hearing, hearing aid use, and leisure in adolescence and early adulthood “iHEAR2” (APP1033814).

A limitation of the iHEAR study is that there are very low numbers of young people in the sample who already have a degree of (non-noise related) permanent hearing loss, requiring the use of hearing aids. This is, perhaps, not surprising, as young people affected with permanent hearing loss undergo exhaustive tests of auditory function and were therefore unlikely to be motivated to have their hearing assessed as part of the iHEAR study. However, the risk of leisure-sound exposure is as much, if not more, of a concern for this group of young Australians. Hearing loss has many personal and social impacts, including on a person’s capacity to work (Access Economics, 2006). Deterioration in the residual hearing of young hearing aid wearers has the potential to result in significant personal and productivity losses.

The aim of the proposed iHEAR2 study will be to compare findings for a large group of young people who already have permanent hearing loss (and wear hearing aids and/or cochlear implants) with the iHEAR sample cohort. In brief, this project will aim to survey young people (11 – 35 years) using similar items to those in the iHEAR project. The attitudes and beliefs of parents of younger participants, of both cohorts, will also be investigated. In addition, the iHEAR2 study will investigate the progression of sensorineural hearing loss in the target group, and investigate whether there is a relationship between deterioration in hearing and leisure-sound exposure. The self-reported profiles of leisure-sound exposure of the two cohorts will also be compared. The current project leader of the iHEAR study has enrolled in a PhD program with the University of Sydney, Faculty of Health Sciences, and will undertake this research in fulfilment of candidature. Ethics approval for this study has already been obtained, and the development of test protocols and survey instruments is progressing.

2. Project title: Noise reduction and hearing protection in the Australian entertainment industry (APP1032528).

The preliminary findings of the iHEAR study, and the results of personal dosimetry measurements, suggest that some activities are a greater source of risk than others. In order to ensure the most efficient use of available community resources for hearing loss prevention, projects are to be developed that target situations known to be of particular concern. Nightclub venues have been identified as one of the situations of greatest leisure-sound exposure (as well as occupational exposure to musicians and other staff). This study will seek to improve noise reduction in venues and promote hearing protection in the entertainment industry, for both employees and patrons.

To achieve this aim, two studies are planned. The first study seeks to develop and trial hearing protection strategies for employees working in the entertainment industry. The aim of the second study is to trial the use of hearing protectors (earplugs) by patrons of loud music venues.

3. Project title: "Hear Today Hear Tomorrow" Implementing an Innovative Australian Hearing Program: Enabling students to make informed decisions about their hearing (APP1032976).

Many innovative school based hearing programs already exist, that are successful in improving knowledge about noise as a hazard and addressing attitudes towards hearing loss prevention. A previous literature review (conducted by NAL), however, suggests that they have common limitations, in particular, their ability to be widely accepted and implemented, and to be sustained in the long-term. The aim of this proposed research is to improve the way hearing health programs are implemented in primary schools. To achieve this aim, this study seeks to develop and trial two hearing education workshops for educators. The first aims at training teachers to teach an innovative hearing health prevention program. The second workshop aims at training educators to train others, thus making the program available to more students and making the program more sustainable. The findings of the iHEAR (and potentially the iHEAR2) study, particularly relating to school-age participants, will provide an extremely valuable and contemporary evidence-base from which to critique existing programs and to steer this new project.

7 Project evaluation

A range of project evaluation activities have taken place, or are planned:

1. Feedback from the project sponsor (Office of Hearing Services), and internally (NAL/Australian Hearing).
2. Periodic checklists have been submitted to the AHHREC, according to requirements. In addition, regular progress reports have been submitted to the Australian Hearing Research Committee.
3. Data cleaning (auditing).

When data collection is complete, further quality assurance (e.g., double entry) will be carried out, on a sample of the data for some measures, and on others (e.g., pure tone threshold data), the complete dataset. Note that, in the original project proposal, much

of this work was to be sub-contracted to the SAVES project, which had existing administrative infrastructure. As an alternative, NAL engaged an external consultant to create a comprehensive and secure data base, with functions to support quality assurance and other data management functions.

4. Participant feedback.

As part of the study protocol, all participants have received an individual report of their findings, their pure tone audiogram, and information about the ear, hearing function and hearing loss prevention. A sample of parents of participants aged 11-17 years are to be contacted (in writing) and invited to give feedback about the usefulness of the iHEAR information package provided. Written feedback may also be sought from individual workplaces and organisations which cooperated in allowing their employees to participate.

5. Sharing of test protocols

It would be beneficial if additional data were obtained from other populations, using the same test protocols, for purposes of comparison. NAL has already shared the iHEAR protocols with personnel (engaged in hearing loss prevention research) at the University of Queensland, and will continue to provide professional interactions to assist in collection and interpretation of new data wherever possible. Additionally, some of the measures in the iHEAR test protocols were included after consultation with other organisations interested in hearing loss prevention research, with the intention that there will be further collaboration in analysing and interpreting results, and in critically appraising the project outcomes (in particular, the University of Auckland, New Zealand).

6. Publication of findings.

As discussed in the previous section, it is expected that there will be a number of papers prepared for publication, covering a wide range of iHEAR results and identified issues. Critical evaluation of the study will come from the peer review process, and from the response of the broader scientific community. It is also anticipated that selected findings of the iHEAR study will be submitted for oral presentations at conferences, both in Australia and overseas over the next few years.

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9 Appendix A: Otoacoustic Emission (OAE) test protocols

The OAE system used was the Mimosa Acoustics Inc. HearID system. It was selected for the iHEAR project because of the following features:

- Capability to perform both TE and DP measures
- Insert earphone (foam) transducer coupling
- Flexibility in data retrieval and management (MATLAB capability).

"DPGRAM1"

Min F2 (Hz): 1500 Artefact rejection: on
 Max F2 (Hz): 8000
 DP definition 2f1-f2
 F1 level: 70
 F2 level: 70

Total points: 8
 Pts/Octave: 3 (*system can accommodate up to 50 points/oct*)
 T.A. (secs): 2
 F2/F1: 1.2

"DPGRAM2"

Min F2 (Hz): 1500 Artefact rejection: on
 Max F2 (Hz): 8000
 DP definition 2f1-f2
 F1 level: 70
 F2 level: 60

Total points: 8
 Pts/Octave: 3
 T.A. (secs): 2
 F2/F1: 1.2

Input – Output function

"DPIO2K"

Min F2 (Hz): 2000 Artefact rejection: on
 Max F2 (Hz): 2000
 DP definition: 2f1-f2 Total points: 8
 F1 level: 70 Pts/Octave: 3
 F2 level: 60 T.A. (secs): 2
 F2/F1: 1.21

Point details:

F1	F2	2f1-f2	TL1	TL2	TA	Min S/N	Min DP
1688	2016	1334	70	60	2	6	-10
1688	2016	1334	65	55	2	6	-10
1688	2016	1334	60	50	2	6	-10
1688	2016	1334	55	45	2	6	-10
1688	2016	1334	50	40	2	6	-10
1688	2016	1334	45	35	2	6	-10
1688	2016	1334	40	30	2	6	-10
1688	2016	1334	35	25	2	6	-10

TE OAE

"Default-presets"

Stimulus parameters
 Level: 80 dB SPL (peak) polarity: ISI: 20

	1	ms
Stimulus: rectangular click	waveform length: 4.104 ms (n=197)	
Width: 83.3 μ s	Total buffer length: 26.104 ms (n= 11)	
Stimulus filter		
High pass (on): cut off: 1000 Hz	bw 500 Hz	f_3dB= 720.8, n= 3
		f_3dB= 501.7, n=
Low pass (on): cut off 500 Hz		11

Measurement parameters

Mode: stimulus on speaker 1

Averages: 400 = 41.797 s

Rejects: 400 = 41.797 s

Stop averaging for "pass" result: on

Time window:

Apply:

on Window begins: 2.00ms Window length: 18ms Ramp: 2.5 ms

Subaveraging: n=4 (3 normal - 1 big) Subpos= 4

Stimulus inversion: on

A/D overflow check: on

A/D input gain: 22.5 dB

Response filter

High pass (on): cut off: 1000 Hz	bw 500 Hz	f_3dB= 720.8, n= 3
		f_3dB= 501.7, n=
Low pass (on): cut off 500 Hz		11
LP-Max flat (off)		

10 Appendix B: Survey Questions

iHEAR – “ONSITE” INTERVIEW

- 1 a) School student_[1] University/ college student_[2]
 b) Uni/college subject area (if applicable)
- 2 a) Employed part-time_[1] Employed full-time _[2]
 b) Average hours per week
 c) Occupation/s (if applicable)
- 3 **Are there any problems with your ears today?** (sore, blocked, not hearing well?)
- 4 **Are there any situations in which you have trouble hearing?**
- 5 a) **Have you ever had ringing or buzzing sounds in your ears?**
 b) **Does it seem to be in one ear or both?**
 c) **When does it happen?**
 d) **How long does it usually last?**
- | | | | | |
|--------------|---------------|---------------|-------|----------|
| 1 | 2 | 3 | 4 | 5 |
| < one minute | A few minutes | Up to an hour | Hours | Constant |
- e) **What does the tinnitus sound like?**
- 6 a) **Have you ever had an ear problem that just lasted a while, e.g., your hearing felt a bit dull, your ears seemed a bit blocked or sore, or there was fluid coming out of your ear?**
 b) **Does it/did it happen in one ear or both?**
 c) **What happened/ happens?**
- 7 a) **Do you ever find sound particularly loud or uncomfortable – do you think you are particularly sensitive to loud noises?**
 No _[1] Yes, sometimes _[2] Yes, often _[3]
 b) **If yes, describe the sounds or situations**
- 8 a) **In the last week or so have you done anything loud e.g. listened to music up very loud, used power tools, been to a concert or party?**
 In the last 2 hours _[2]
 In the last 2-12 hours _[3]
 More than 12 hours, but less than 2 days ago _[4]
 More than 2 days ago _[5]

b) What were you doing?

c) How long were you doing it for?

9 What things do you think would be difficult to do if you couldn't hear well? What might you miss out on if you didn't have good hearing?

10 We're interested in what you think about how many people in each age group might have a hearing problem.

	None _[1]	Very few people _[2]	Some people _[3]	Most people _[4]	All _[5]
Older people (i.e., people your grandparents age or older)					
Adults (i.e., people around your parents age)					
Young adults (i.e., 20's to 30's, who just left school/ started work)					
High School kids					
Primary School kids					
Babies					

11 What do you think is the main reason people have hearing problems?

**12 a) Do you think there are any particular activities people do that could damage their hearing?
b) If yes, please list any you can think of**

13 Do you worry or feel concerned about the possibility of your hearing changing in the future?

- Not at all _[1] A little bit _[2] A lot _[3]

14 How likely do you think it is that YOUR hearing will change in the future?

1	2	3
Unlikely	Maybe	Very Likely

Comments (optional)

15 If it did change, what age do you think it might start to change?

16 a) Do you listen to music through earphones or headphones (e.g., Ipod, MP3)?

b) How often do you listen through earphones or headphones?

TICK ONE		Hours per month on average
	Less than once a month	
	1-3 times a month	
OR		Hours per week on average
	1-3 days a week	
	4-5 days a week	
	6-7 days week	

c) How long each time on average?

d) How many years in total have you been listening through earphones?

e) What situations are you in?

f) Do you usually listen through one or two of the earphones?

Always two ears_[1]

Mainly two ears, sometimes one (e.g. if someone talking next to me)

In this case, which ear do you prefer? > right_[2] > left_[3] right or left _[4]

Usually one ear only

In this case, which ear do you prefer? > right_[5] > left_[6] right or left _[7]

17 a) Do you listen to music through home or car stereo speakers?

b) On average, how often do you listen through speakers?

TICK ONE		Hours per month on average
	Less than once a month	
	1-3 times a month	
OR		Hours per week on average
	1-3 days a week	
	4-5 days a week	
	6-7 days week	

c) What situations are you when you are listening through speakers?

18 If you listen through both earphones/headphones AND speakers, which do you do more?

- Earphones/headphones_[1] Speakers_[2] Equal amount with both_[3]

19 On a scale of 1 – 10 (where 1 is VERY SOFT and 10 is VERY LOUD) how loud do you usually listen to music through earphones or headphones (if applicable)?

1	2	3	4	5	6	7	8	9	10
Soft				Medium					Loud
(low volume)				(half volume)					(full volume)

20 On a scale of 1 – 10 (where 1 is VERY SOFT and 10 is VERY LOUD) how loud do you usually listen to music through speakers (if applicable)?

1	2	3	4	5	6	7	8	9	10
Soft				Medium					Loud
(low volume)				(half volume)					(full volume)

21 a) Do you think there are any ways you can look after (protect) your hearing?

b) What are some ways you might protect it?

22 a) Do you know where you might get equipment to help protect your hearing?

b) Where might you get it?

23 a) Have you ever used some type of hearing protection?

b) What did you use?

c) Where did you use hearing protection?

24 a) Have you ever been exposed to a sudden, very loud sound? For example, been near an explosion (gun or firecracker), or a very loud machine or tool?

b) What was the sound/s?

25 a) What is the loudest situation you think you have ever been in?

b) How often have you been in this situation?

- Once ever_[1] A few times_[2] Often_[3]

c) On average, how long were you in this situation?

d) If you are in this situation regularly, what is the total number of years you have been doing it? (e.g., I used tools in my TD class once a week for two years)

e) Did you use hearing protection in this situation?

- No (never)_[1] Sometimes_[2] Always_[3]

26 a) Do you think that using an ipod/MP3 can be a risk for people’s hearing?

b) If yes, at what volume do you think people might put themselves at risk of hearing problems if they use an ipod/MP3 regularly?

1	2	3	4	5	6	7	8	9	10
Soft (low volume)				Medium (half volume)					Loud (full volume)

27 a) Have you ever avoided situations or activities because you were concerned or worried that they would be too loud (e.g., decided to miss a school dance because it would be too loud/noisy)?

1	2	3
Never	Once or twice	Often

b) If yes, describe situation/(s)

28 a) Have you ever left a situation because you were concerned or worried that it was too loud (e.g., walked out of a noisy concert, moved to a quieter room at a party)?

1	2	3
Never	Once or twice	Often

b) If yes, describe situation/(s)

29 a) Have you ever noticed that you were not hearing as well as usual, after you have been in a very loud situation?

b) Describe what the loud situation was.

c) About how long did your hearing seem to be affected?

1	2	3	4	5
A few minutes	Under one hour	1-3 hours	Until the next day	More than a day

30 On a scale of 1 – 10 (where 1 is VERY SOFT and 10 is VERY LOUD) how loud do you think most of your friends usually listen to music through headphones/earphones ?

1	2	3	4	5	6	7	8	9	10
Soft				medium					loud

31 On a scale of 1 – 10 (where 1 is VERY SOFT and 10 is VERY LOUD) how loud do you think most of your friends usually listen to music through speakers ?

1	2	3	4	5	6	7	8	9	10
Soft				medium					loud

32 a) Do you know anything about how the ear works, or how we hear (prompt, do you know any of the parts of the ear)?

HEALTH, FAMILY AND HEARING QUESTIONNAIRE**1.1 Participant's details**

Date of birth: ____/____/____

Male Female

Are you of Aboriginal or Torres Strait Islander Origin?

What language(s) do you mainly use at home?

What other language(s) do you use?

Which high school do you (or did you) attend?

What suburb or town is this school in?

If you are still at school, what year are you currently in?

If you have finished school, what was the highest year you completed? (e.g., year 11)

and, what year did you leave high school (e.g. 2003)

What is your Current Educational & Employment Status (tick ALL that apply):**I am:**

- At High School^[1]
- At TAFE/College^[2]
- At University^[3]
- Working Full-time^[4]
- Working Part-time^[5]
- Working Casually^[6]

If you are working, which of the following best describes your occupation (tick one)?

- Community / Personal worker^[1]
- Clerical / Administrative worker^[2]
- Labourer^[3]
- Machinery operator / Driver^[4]
- Manager^[5]
- Professional^[6]
- Sales worker^[7]
- Technician / Trade Worker^[8]

Occupation categories refer to Australian Bureau of Statistics, Information Paper: ANZSCO—Australian and New Zealand Standard Classification of Occupations, Appendix 3, 2005.

2.1 Where were you born?

Hospital name

State

Town/City Country

2.2 When were you born?

- Around the due date (37- 41 weeks gestation)^[1]
- Late (42 weeks or more)^[2]
- Early/premature (32-36 weeks gestation)^[3]
- Very early/premature (31 weeks or earlier)^[4]

2.3 Were there any complications during the pregnancy, delivery, or during the days following delivery?

- no [1]
- yes [2] → please give details

2.4 Was a hearing screening test given to you at, or soon after, birth?

- yes [2]
- no [1]
- don't know [3]

2.5 Have you, your parents, or anyone else, had any concerns about your ability to hear?

- a) In quiet situations yes [2] no [1]
- b) In noisy situations yes [2] no [1]
- c) In the classroom yes [2] no [1]

2.6.1 Have you ever had any other type of hearing screening or hearing test?

- don't know [3]
- no [1]
- yes [2] →

2.6.2 If yes, why was your hearing first tested?

- referred for assessment following hospital newborn hearing screening [1]
- following a serious illness or injury (e.g., meningitis) [2]
- parent(s) were concerned about you and asked for a hearing test [3]
- another family member or friend was concerned about your hearing [4]
- referred because a professional (e.g., nurse, teacher, doctor) was concerned [5]
- other [6] → please describe

2.7.1 Have you had a full hearing assessment by a health professional (i.e., an Audiologist or Ear, Nose, and Throat specialist)? Don't count screening checks by Child Health or community nurse or family doctor.

2.7.2 If yes,

a) Approximately how many times have you seen the hearing specialist for a hearing assessment?

a) About how old were you when you most recently had a hearing test?

b) What was the result of the last hearing test?

- normal hearing in both ears
- not sure
- poor hearing in both ears [5]
- poor hearing in **left** ear only [3]
- poor hearing in **right** ear only [4]

2.8 If the test showed that your hearing was poor (outside the normal range), what was the reason as far as you know?

- wax in the ear canal^[1]
- glue ear (fluid in the middle ear, middle ear infection) ^[2]
- permanent hearing loss (i.e., a hearing loss that can't be improved by medical treatment) ^[3]
- not sure ^[4]
- other ^[5] (please describe)

2.9 If you already know that you have a permanent hearing loss -

a) At about what age was the hearing loss first confirmed?

b) Has the cause of the hearing loss been medically investigated (e.g., by an Ear, Nose, and Throat specialist, Paediatrician or Geneticist)?

If yes, what were you told has, or is most likely to have, caused the hearing loss (e.g., meningitis, inherited hearing loss)? If the cause could not be determined please write "unknown".

3.1 Have you had any significant health problems that required high level medical treatment or a stay in hospital?

Please briefly describe the health problems and how long you were ill

3.2 Have you had any head injury/trauma/blow to the ear that required medical treatment or a stay in hospital?

3.3 Have you ever been exposed to sudden, very loud sound (e.g., an explosion, a firework close to your ear, a close gun-shot)? *You may need to ask your parent/guardian about things that happened when you were very young.*

3.4 Over the last 12 months has there been any (confirmed or suspected) change, fluctuation or deterioration in your hearing?

Please describe what happens, and how often it occurs

3.5 Over the last 12 months have you had any discharge (fluid) coming from your ear, apart from earwax?

- no ^[1]
- yes, occasionally ^[2]
- yes, often ^[3]

3.6 Have you ever had ear surgery (e.g., grommets, mastoidectomy)?

please briefly describe

3.7 Have you ever had ringing or buzzing noises in the ears (i.e., "tinnitus")?

please briefly describe

3.8.1 Have you received a cochlear implant, hearing aids, or personal FM system?

3.8.2

	Device worn	Age device fitted (years)
Left Ear		
Right Ear		

3.9 Do you have any other medical conditions/ disabilities/ special needs (suspected or diagnosed)?

3.9.3 Do you currently receive any intervention/habilitation services specifically related to these condition/s?

3.9.4 Which disability or condition causes you the most problems or difficulty overall?

3.10.1 Apart from personal hearing aids or a cochlear implant, do you use any other assistive listening equipment to help you hear in specific situations (e.g., FM system)?

- Never [1]
- At home [4]
- Other situations [7]
- At school [2]
- For the telephone [5]
- For television [3]
- Unsure [6]

3.10.2 What device(s) do you use? (Tick ALL that apply)

- Personal FM system (e.g. teacher transmitter, student receiver) [1]
- Classroom sound field amplification system [2]
- Assistive amplifier device for TV [3]
- Teletext captions for TV [4]
- Amplified telephone [5]
- Telephone Typewriter (TTY) [6]
- Other [7] (please describe)

3.11 (For school students only) Have you seen a school counsellor/psychologist during the last 12 months?

3.12 Are there any other concerns about your health that you think may be relevant to this survey?

4.1 a) Do any immediate family members (e.g., your brother, sister, mother, father, aunts, uncles, cousins, grandparents) have permanent hearing problems? Please don't include temporary problems, such as "glue ear" (otitis media with effusion) or ear wax.

4.1 b) Please provide details below:

Write their relationship to you (e.g., mother)	TICK ---> Born with a permanent hearing loss? <i>[1]</i>	Developed a hearing loss during childhood? <i>[2]</i>	Developed a hearing loss in adulthood (i.e., 20-60 yrs)? <i>[3]</i>	Developed a hearing loss in older age (i.e., after 60) <i>[4]?</i>	Write the cause of the hearing loss (If known) (e.g., genetic, working in noise, meningitis)

4.2 Where do you live (tick whichever you do most of the time)?

- With parent(s)/family *[1]*
- Independently (own or shared accommodation) *[2]*
- School/College/University accommodation *[3]*
- Other *[4]* → Please Describe

4.3 Please complete the following information about your parents or guardians

	A. PARENT/GUARDIAN 1 (e.g., mother)	B. PARENT/GUARDIAN 2 (e.g., father). If you have only one parent or guardian, you do not need to complete this column.
Parent/Guardian's Gender	<input type="checkbox"/> male <i>[1]</i> <input type="checkbox"/> female <i>[2]</i>	<input type="checkbox"/> male <i>[1]</i> <input type="checkbox"/> female <i>[2]</i>
Parent/Guardian's Year of birth		
Parent/Guardian's current home post-code		
Their relationship to you	<input type="checkbox"/> parent <i>[1]</i> <input type="checkbox"/> step-parent <i>[2]</i> <input type="checkbox"/> foster parent <i>[3]</i> <input type="checkbox"/> grandparent <i>[4]</i> <input type="checkbox"/> other <i>[5]</i> → specify _____	<input type="checkbox"/> parent <i>[1]</i> <input type="checkbox"/> step-parent <i>[2]</i> <input type="checkbox"/> foster parent <i>[3]</i> <input type="checkbox"/> grandparent <i>[4]</i> <input type="checkbox"/> other <i>[5]</i> → specify _____
Parent/Guardian's country of birth		
Main language used by Parent/Guardian		
Other languages used by Parent/Guardian <i>Please list all languages</i>		

What is the Parent/Guardian's current hearing level? <i>(if known)</i>	Left Ear <input type="checkbox"/> Normal hearing ^[1] <input type="checkbox"/> Mild loss ^[2] <input type="checkbox"/> Moderate loss ^[3] <input type="checkbox"/> Severe loss ^[4] <input type="checkbox"/> Profound loss ^[5] <input type="checkbox"/> Don't know ^[6]	Right Ear <input type="checkbox"/> Normal hearing ^[1] <input type="checkbox"/> Mild loss ^[2] <input type="checkbox"/> Moderate loss ^[3] <input type="checkbox"/> Severe loss ^[4] <input type="checkbox"/> Profound loss ^[5] <input type="checkbox"/> Don't know ^[6]	Left Ear <input type="checkbox"/> Normal hearing ^[1] <input type="checkbox"/> Mild loss ^[2] <input type="checkbox"/> Moderate loss ^[3] <input type="checkbox"/> Severe loss ^[4] <input type="checkbox"/> Profound loss ^[5] <input type="checkbox"/> Don't know ^[6]	Right Ear <input type="checkbox"/> Normal hearing ^[1] <input type="checkbox"/> Mild loss ^[2] <input type="checkbox"/> Moderate loss ^[3] <input type="checkbox"/> Severe loss ^[4] <input type="checkbox"/> Profound loss ^[5] <input type="checkbox"/> Don't know ^[6]
Has Parent/Guardian had any difficulty (now or in childhood) with reading and/or writing? <i>Leave blank if unknown</i>	<input type="checkbox"/> no ^[1] <input type="checkbox"/> yes ^[2] → please describe		<input type="checkbox"/> no ^[1] <input type="checkbox"/> yes ^[2] → please describe	
Highest level of education completed by Parent/Guardian	<input type="checkbox"/> University qualification ^[1] <input type="checkbox"/> Diploma or certificate (e.g., TAFE) ^[2] <input type="checkbox"/> Completed Year 12 (or equivalent) ^[3] <input type="checkbox"/> Completed Year 10 (or equivalent) ^[4] <input type="checkbox"/> Left High School before Year 10 ^[5] <input type="checkbox"/> Less than 7 years school attendance ^[6]		<input type="checkbox"/> University qualification ^[1] <input type="checkbox"/> Diploma or certificate (e.g., TAFE) ^[2] <input type="checkbox"/> Completed Year 12 (or equivalent) ^[3] <input type="checkbox"/> Completed Year 10 (or equivalent) ^[4] <input type="checkbox"/> Left High School before Year 10 ^[5] <input type="checkbox"/> Less than 7 years school attendance ^[6]	
Current employment status of Parent/Guardian	<input type="checkbox"/> No paid employment ^[1] <input type="checkbox"/> Full time employment ^[2] <input type="checkbox"/> Part time employment ^[3] <input type="checkbox"/> Casual employment ^[4] <input type="checkbox"/> Retired ^[5]		<input type="checkbox"/> No paid employment ^[1] <input type="checkbox"/> Full time employment ^[2] <input type="checkbox"/> Part time employment ^[3] <input type="checkbox"/> Casual employment ^[4] <input type="checkbox"/> Retired ^[5]	
What is Parent/Guardian's main occupation?				
If currently employed, tick which best describes Parent/Guardian's main occupation (if not currently employed, but has been employed in the last 12 months please indicate last occupation). TICK ONE ONLY	<input type="checkbox"/> Community / Personal worker ^[1] <input type="checkbox"/> Clerical / Administrative worker ^[2] <input type="checkbox"/> Labourer ^[3] <input type="checkbox"/> Machinery operator / Driver ^[4] <input type="checkbox"/> Manager ^[5] <input type="checkbox"/> Professional ^[6] <input type="checkbox"/> Sales worker ^[7] <input type="checkbox"/> Technician / Trade worker ^[8] <small>Occupation categories refer to Australian Bureau of Statistics, Information Paper: ANZSCO—Australian and New Zealand Standard Classification of Occupations, Appendix 3, 2005.</small>		<input type="checkbox"/> Community / Personal worker ^[1] <input type="checkbox"/> Clerical / Administrative worker ^[2] <input type="checkbox"/> Labourer ^[3] <input type="checkbox"/> Machinery operator / Driver ^[4] <input type="checkbox"/> Manager ^[5] <input type="checkbox"/> Professional ^[6] <input type="checkbox"/> Sales worker ^[7] <input type="checkbox"/> Technician / Trade worker ^[8]	

4.4. If you are still living at home with your Parent/Guardian: Does your parent/guardian hold any of the following Centrelink (benefit) cards (NB- not medicare card)? (Tick all that apply)

- Health Care Card^[1]
- Pension Concession Card^[2]
- Disability Support Pension Card^[3]
- Other^[4] (specify) _____

4.5 Does your Parent/Guardian receive a Centrelink Carer's Allowance for you?

- no, family does not receive allowance [1]
 yes, family receives allowance [2]

5A. Activities in Past Month

	Activity #1	Activity #2	Activity #3
Name three activities you have participated in during the last month that involved loud sound (either pleasant or unpleasant)			
How often did you do these activities during the month?	/month	/month	/month
On average, how long did this activity last for?	_____ hours	_____ hours	_____ hours

5B. Listening to Recorded Music**5B. 1 Home/Car Stereo**

5B.1 a) Do you own or have access to a stereo/sound system with speakers (e.g., Hi Fi, MP3 player with docking station etc) (select one)

- Don't own or have access to (go to Q2) [1]
 Own [2]
 Have access to [3]

5B.1 b) About how long do you spend listening to stereo/sound systems?

5B.1 c) How loud do you usually listen to stereo/sound systems?

While I am listening to it, I

- can still hear someone 1 metre away - if they are whispering [1]
 can still hear someone 1 metre away - if they are talking normally [2]
 can still hear someone 1 metre away - if they are talking loudly [3]
 can still hear someone 1 metre away - if they are shouting [4]
 can NOT hear someone 1 metre away - even if they are shouting [5]

5B. 2 Personal Music Player

5B. 2 a) Do you own/have access to a personal music player (e.g., iPod, MP3 player, mobile phone etc) with headphones/ earphones (or linked to hearing aids)? (select one)

- Don't own or have access to (go to Q3) [1]
 Own [2]
 Have access to [3]

5B.2 b) For about how long have you been using a personal music player regularly?

5B.2 c) About how long do you spend listening to a personal music player?

5B.2 d) How loud do you usually listen to your personal music player?

While I am listening to it, I

- can still hear someone 1 metre away - if they are whispering [1]
- can still hear someone 1 metre away - if they are talking normally [2]
- can still hear someone 1 metre away - if they are talking loudly [3]
- can still hear someone 1 metre away - if they are shouting [4]
- can NOT hear someone 1 metre away - even if they are shouting [5]

5B.2 e) What type of headphones/earphones do you usually wear?

- Standard headphones (e.g. headphones or headsets that sit over the ear) [1]
- Active/Noise Cancelling headphones (e.g. headphones that include technology to decrease background noise) [2]
- Earphones/Earbuds (e.g. "in the ear" style ear pieces) [3]
- Other [4]

5B.2 f) Do your family/friends ever complain to you about hearing music coming from headphones/earphones while you are wearing them?

- Very rarely [1]
- Occasionally [2]
- Sometimes [3]
- Often [4]
- Most of the time [5]

If you are still living with your Parent/Guardian, how often can they hear music coming from your headphones/earphones (ask your Parent/Guardian for the answer to this question)?

- Very rarely [1]
- Occasionally [2]
- Sometimes [3]
- Often [4]
- Most of the time [5]

5B. 3 Approximately how often do you listen to music (stereo, or MP3 etc) each week in these environments?

- a) At home _____ hours/week
- b) While travelling on a train/bus _____ hours/week
- c) While exercising alone (e.g. walking/jogging) _____ hours/week
- d) During a fitness class _____ hours/week
- e) At the gym _____ hours/week
- f) At school/college/uni _____ hours/week
- g) Other (Please list) _____ hours/week

ACTIVITIES (Q. 5C- 5E)

5C. Entertainment Venues	FREQUENCY									Total number of YEARS	Hearing protection used?		
	0	1	2	3	4	5	6	7	A		B	C	
	0 = Never 1 = Once or twice EVER 2 = 1-2 times a year 3 = Once every 4-6 months 4 = Once a month 5 = Once every 2-3 weeks 6 = Once a week 7 = More than once a week												
Go to the Cinema / movie theatre	0	1	2	3	4	5	6	7		A	B	C	
Go to a live music performance – small venue (e.g., hall or performance room)	0	1	2	3	4	5	6	7		A	B	C	
Go to a live music performance – large venue (e.g., entertainment centre, stadium etc)	0	1	2	3	4	5	6	7		A	B	C	
Go to live theatre / a musical (professional or amateur)	0	1	2	3	4	5	6	7		A	B	C	
Go to a venue playing recorded music (e.g., DJ, dance party or similar, school dances)	0	1	2	3	4	5	6	7		A	B	C	
Go to a one-day outdoor music festival (e.g., Big Day Out)	0	1	2	3	4	5	6	7		A	B	C	
Go to a multi-day outdoor music festival (e.g., Splendour in the Grass)	0	1	2	3	4	5	6	7		A	B	C	
Go to a games/video arcade (e.g., Timezone etc)	0	1	2	3	4	5	6	7		A	B	C	
Go to firework displays	0	1	2	3	4	5	6	7		A	B	C	
Watch live sports (e.g., football at stadium)	0	1	2	3	4	5	6	7		A	B	C	
Watch live motor sports (e.g., car racing)	0	1	2	3	4	5	6	7		A	B	C	
Go to pub/club with music playing (band, Jukebox)	0	1	2	3	4	5	6	7		A	B	C	
Do motor sports (e.g., motor bikes, quad bikes, go-carts etc)	0	1	2	3	4	5	6	7		A	B	C	
Go shooting (e.g., pistol club, cadet training, target shooting etc) - whether using the gun or standing close to someone else who is	0	1	2	3	4	5	6	7		A	B	C	
Use power tools (including woodworking/metalworking tools, and gardening tools – e.g., mower, leaf blower, edge trimmer etc)	0	1	2	3	4	5	6	7		A	B	C	

Use electronic games or other games/toys that make sounds (e.g., Nintendo DS, Wii).	0	1	2	3	4	5	6	7		A	B	C
Go to religious/church services with amplified music (e.g., church band)	0	1	2	3	4	5	6	7		A	B	C
Play in a (rock) band (amplified music)	0	1	2	3	4	5	6	7		A	B	C
Play in an orchestra/concert band	0	1	2	3	4	5	6	7		A	B	C
Play/learn a musical instrument	0	1	2	3	4	5	6	7		A	B	C
Sing in a choir/group	0	1	2	3	4	5	6	7		A	B	C
Go to the gym/exercise/dance classes	0	1	2	3	4	5	6	7		A	B	C
Swimming/Water sports (e.g., in an indoor swimming centre)	0	1	2	3	4	5	6	7		A	B	C
Team sports (e.g., netball, soccer, football etc)	0	1	2	3	4	5	6	7		A	B	C
Watch TV/DVDs	0	1	2	3	4	5	6	7		A	B	C
Talking on a mobile phone	0	1	2	3	4	5	6	7		A	B	C
Other (Please describe)	0	1	2	3	4	5	6	7		A	B	C

5E. Work (paid or unpaid)

Work Activity/Situation	FREQUENCY								Total number of YEARS	Hearing protection used?		
	0	1	2	3	4	5	6	7		A	B	C
	0 = Never 1 = Once or twice EVER 2 = 1-2 times a year 3 = Once every 4-6 months 4 = Once a month 5 = Once every 2-3 weeks 6 = Once a week 7 = More than once a week									A = Never B = Sometimes C = Mostly/Always		
Work activity/situation (describe) Hours/week_____	0	1	2	3	4	5	6	7		A	B	C

5F.1 What do you think is the loudest sound that you have been exposed to? *You might need to check with your Parent/Guardian about things that happened when you were very young.*

5F.2 Name three common activities/situations that you would describe as very loud (these do not have to be activities that you do)

5F.3 Are you ever exposed to other loud sounds in your environment? (e.g., Being near someone else using power tools, sibling's band/music practice, etc)

iHEAR - Hearing & Leisure Survey

(for participants 18 – 35 years)

1 a) Where were you born? (tick one) Australia Other _____ (country)

b) Do you identify as an Aboriginal or Torres Strait Islander? (tick one) No Yes

c) What is the main language you use? English Other _____ (language)

d) What other language(s) do you use with family? _____

e) What is the highest level of education you have completed? (tick one)

Less than 7 years school attendance

Left High School before Year 10

Completed Year 10 (or equivalent)

Completed Year 12 (or equivalent)

Diploma or certificate (e.g., TAFE)

University qualification

f) What is the name of the last high school you attended? _____

g) Location of school? Town _____ State _____ Country (if overseas) _____

2 a) What is your current occupation? (tick all that apply)

Completing Higher School certificate

At TAFE or college

At University

Working full-time

Working part-time

Unemployed

Other (describe) _____

b) If you are working, please describe your type of work _____

c) Average number of hours you work each week _____ hours/week

d) If you are working, which best describes your current job? (tick ONE)

Community/Personal worker

Clerical/Administrative worker

Labourer

Machinery operator/driver

Manager

Professional

Sales worker

Technician/Trade worker

Occupation categories from Australian Bureau of Statistics

3 Do you generally have trouble hearing? (tick one response for each situation)

- a) In quiet situations? No A little A lot b)
- In noisy situations? No A little A lot c)
- In classes or lectures? No A little A lot d) In other situations? No A little A lot

Describe other situations:

e) If you do have hearing problems, has your hearing already been tested?

No go to → Q.4 Yes

f) Did your hearing test(s) show that you have a permanent hearing problem?

No go to → Q.4 Yes

g) About what age were you when this hearing loss was first confirmed?

_____ years of age

h) Has the cause of your hearing loss been medically investigated (e.g., by an Ear, Nose, and Throat specialist, Paediatrician or Geneticist)?

No go to → Q.4 Yes

i) What were you told is most likely to have caused the hearing loss? (e.g., meningitis, inherited hearing loss). If the cause could not be determined please write "unknown".

j) Do you use hearing aids, a cochlear implant, or other assistive hearing device?

No Yes → Please complete table below

	Device worn	Age device fitted (years)
Left Ear		
Right Ear		

4 a) Have you ever had any ear problems, e.g., ear infections, fluid (discharge) coming out of your ear/s? (tick one)

No go to → Q.5 Yes, once/sometimes Yes, often Yes, all the time

b) Have you had any of the following? (tick all that apply)

- Ear infection
- Fluid (discharge) from the ear/s
- Burst (perforated) eardrum/s
- Ear operation (surgery) (describe) _____
- Other (describe) _____

19 What do you think tinnitus (noises in the head or ears), after exposure to loud sound, could mean? (you may tick more than one reason if you wish)

- The hearing system will recover but has been very slightly damaged
- Nothing important, it is harmless and goes away with time
- A normal physiological response to loud sound is occurring
- A significant permanent hearing loss is likely to develop in the future
- The hearing system is stressed but will recover

Your sound-exposure profile

20 a) Have you ever been to a nightclub, dance party, gig etc.?

No go to → Q.22 Yes

b) Over what time period(s) (i.e., at what stages of your life) have you gone to nightclubs, dance parties etc.?

Period 1: FROM _____ years of age **TO** _____*years of age

AND if applicable

Period 2: FROM _____ years of age **TO** _____*years of age

* your age now if you still attend

c) During this time, on average how often have you attended nightclubs, dance parties, gigs etc.? (tick one response for each time period)

- | | |
|--|---|
| <p><i>Period 1</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> Less than once a year <input type="checkbox"/> Once or twice a year <input type="checkbox"/> Once every few months <input type="checkbox"/> 1 – 3 times a month <input type="checkbox"/> 1 – 3 times a week <input type="checkbox"/> 4 or more times a week | <p><i>Period 2</i></p> <ul style="list-style-type: none"> <input type="checkbox"/> Less than once a year <input type="checkbox"/> Once or twice a year <input type="checkbox"/> Once every few <input type="checkbox"/> 1 – 3 times a month <input type="checkbox"/> 1 – 3 times a week <input type="checkbox"/> 4 or more times a week |
|--|---|

d) On average, how long would you spend at a nightclub, dance party etc., each time you were there?

_____ minutes **OR** _____ hours, each time

Comments? _____

If you have been to nightclubs etc. ONCE A MONTH OR MORE

e) On average, how many times each month do you/did you attend? _____ times

OR _____ (write a number, e.g, 10 times)

If you have been to nightclubs etc. LESS THAN ONCE A MONTH

f) On average, how many times each year do you/did you attend? _____ times

- Always two ears
- Mainly two ears, sometimes one ear (e.g., if someone is talking next to me)
- Usually one ear only

h) If you do listen with one ear, which ear do you usually listen with?

(tick one)

- Left ear Right ear Left or Right (no preference)

i) Imagining a scale of 1 – 10 (where 1 is VERY SOFT and 10 is **VERY LOUD), how loud do you listen to music through your personal stereo (earphones or headphones) most of the time? (circle your best estimate on the scale below)**

- | | | | | | | | | | |
|------------------------|---|---|---|---|---------------|---|---|---|-------------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Soft | | | | | Medium | | | | Loud |
| (lowest player volume) | | | | | (half volume) | | | | (full-on player volume) |

j) Listening through earphones or headphones at this volume - I can still hear someone 1 metre away - (tick one)

- if they are whispering
 - if they are talking normally
 - if they are talking loudly
 - if they are shouting
- OR**
- I CANNOT hear someone 1 metre away - even if they are shouting

k) What type of headphones/earphones do you usually wear? (tick all that apply)

- Standard headphones (i.e., headphones or headsets that sit over the ear)
- Active/Noise Cancelling headphones (i.e., headphones that include electronics and are powered by batteries, designed to reduce background noise)
- Earphones/Earbuds (i.e., "in the ear" style ear pieces)
- Other describe

23 a) Have you ever been exposed to a sudden, very loud sound(s)? For example, been near an explosion (e.g., gunshot or firecracker close to your ear)

- No go to → Q.24 Yes

b) What were the sudden loud sound(s) you were exposed to?

Describe briefly what was involved, how many times the exposure occurred, and how long it lasted (on average), e.g., *I was once next to a petrol tank when it exploded- the sound lasted for only a second.*

24 a) Do you prefer to avoid some places (e.g., clubs, dance parties), or activities (e.g., motor sports) because they are too loud? (tick one)

- No go to → Q. 25 Yes - somewhat Yes - very much so

b) Please describe the situation(s) or activity(s) you have tended to avoid

c) Why do you avoid the situation(s) or activity(s)? (tick all that apply)

- Risk of hearing damage Painful/ Uncomfortable
 Too hard to hear conversation Other reasons

Describe other reasons _____

25 a) Have you ever left a place, or stopped doing an activity, because it was too loud? (e.g., walked out of a rock concert, moved to a quieter room at a dance party)? (tick one)

- Never go to → Q.26 Occasionally Often

b) Please describe the situation(s) you have left because they were too loud


c) Why have you left loud situation(s)? (tick all that apply)


- Risk of hearing damage Painful/ Uncomfortable
 Too hard to hear conversation Other reasons



Describe other reasons _____

26 Your Leisure Activity History –

EXAMPLE: Perform in a **band** that has amplified music (e.g., rock band)
 Played drums with a group of friends (approx. 1 ½ hours each time- from age 18- 28 years)

<p>How often have you done this activity, on average?</p> <p><input type="checkbox"/> Never →go to next activity</p> <p><input type="checkbox"/> Less than once a year</p> <p><input type="checkbox"/> 1-2 times a year</p> <p><input type="checkbox"/> Once every few months</p> <p><input type="checkbox"/> Once a month</p> <p><input type="checkbox"/> Once every 2-3 weeks</p> <p><input type="checkbox"/> Once a week</p> <p><input checked="" type="checkbox"/> More than once a week</p>	<p>How many times a week? (if done weekly)</p> <p><u> 2 </u> times/week</p> <p>About how long do (did) you do this activity each time?</p> <p><u> 1.5 </u> hours each time</p> <p>How old were you when you first did this activity?</p> <p><u> 18 </u> years of age</p> <p>How many years altogether have you done this activity?</p> <p><u> 10 </u> years in total</p>	<p>Used hearing protection?</p> <p><input type="checkbox"/> Never</p> <p><input checked="" type="checkbox"/> Some of the time</p> <p><input type="checkbox"/> Mostly/Always</p> <p>Type (if used)</p> <p><u> Earmuffs </u></p> <div style="text-align: center;">  </div>
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a) Go to a live music performance at a large venue (e.g., entertainment centre, stadium etc.)		
<p>How often have you done this activity, on average?</p> <p><input type="checkbox"/> Never →go to next activity</p> <p><input type="checkbox"/> Less than once a year</p> <p><input type="checkbox"/> 1-2 times a year</p> <p><input type="checkbox"/> Once every few months</p> <p><input type="checkbox"/> Once a month</p> <p><input type="checkbox"/> Once every 2-3 weeks</p> <p><input type="checkbox"/> Once a week</p> <p><input type="checkbox"/> More than once a week</p>	<p>How many times a week? (if done weekly)</p> <p>_____ times/week</p> <p>About how long do (did) you do this activity each time?</p> <p>_____ hours each time</p> <p>How old were you when you first did this activity?</p> <p>_____ years of age</p> <p>How many years altogether have you done this activity?</p> <p>_____ years in total</p>	<p>Used hearing protection?</p> <p><input type="checkbox"/> Never</p> <p><input type="checkbox"/> Some of the time</p> <p><input type="checkbox"/> Mostly/Always</p> <p>Type (if used)</p> <p>_____</p> <div style="text-align: center;">  </div> <p>Multiple fields- for each activity description</p>
b) Go to live music (e.g., bands, concerts, musicals) at smaller venues e.g., hall, theatre, club etc.		
c) Go to an outdoor music festival (e.g., Big Day Out)		
d) Go to pub or local club with background noise (e.g., loud talking, music playing, band, Jukebox)		
e) Attend live sports matches (e.g., go to football at stadium)		
f) Attend live motor sports (e.g., go to car racing)		
g) Do motor sports (e.g., motor bikes, quad bikes, go-carts etc.)		
h) Go shooting (e.g., pistol club, cadet training, target shooting etc.) - whether using the gun or standing close to someone else who is		
i) Use power tools including woodworking/metalworking tools, and gardening tools (e.g., mower, leaf blower etc.)		
j) Perform in a band that has amplified music (e.g., rock band)		
k) Perform in an orchestra or concert band		
l) Sing in a choir or ensemble		
m) Electronic gaming (PC based or games consoles, e.g. Nintendo, Xbox, Wii)		
n) Go to the gym/exercise/dance classes (with amplified music)		
o) Play/learn musical instrument(s) <i>There is space for TWO different instruments below. If you play, or have played, more than two instruments please describe at the end of the survey.</i>		

<p>MUSICAL INSTRUMENT 1. <i>Multiple fields</i></p> <p>Describe: _____</p> <p>How often have you done this activity, on average?</p> <p><input type="checkbox"/> Less than once a year <input type="checkbox"/> 1-2 times a year <input type="checkbox"/> Once every few months <input type="checkbox"/> Once a month <input type="checkbox"/> Once every 2-3 weeks <input type="checkbox"/> Once a week <input type="checkbox"/> More than once a week</p>	<p>How many times a week? (if done weekly) _____ times/week</p> <p>About how long do (did) you do this activity each time? _____ hours each time</p> <p>How old were you when you first did this activity? _____ years of age</p> <p>How many years altogether have you done this activity? _____ years in total</p>	<p>Used hearing protection?</p> <p><input type="checkbox"/> Never <input type="checkbox"/> Some of the time <input type="checkbox"/> Mostly/Always</p> <p>Type (if used) _____</p> 
<p>p) <u>Other LOUD activities</u> Describe <u>any</u> other loud situations (e.g., listening to friend's band practice, watching a parent using power tools). There is space for up to THREE activities below. If you have more examples, note at the end of the survey.</p>		
<p>Other LOUD activity <i>Multiple fields</i></p> <p>Describe: _____</p> <p>How often have you done this activity, on average?</p> <p><input type="checkbox"/> Less than once a year <input type="checkbox"/> 1-2 times a year <input type="checkbox"/> Once every few months <input type="checkbox"/> Once a month <input type="checkbox"/> Once every 2-3 weeks <input type="checkbox"/> Once a week <input type="checkbox"/> More than once a week</p>	<p>How many times a week? (if done weekly) _____ times/week</p> <p>About how long do (did) you do this activity each time? _____ hours each time</p> <p>How old were you when you first did this activity? _____ years of age</p> <p>How many years altogether have you done this activity? _____ years in total</p>	<p>Used hearing protection?</p> <p><input type="checkbox"/> Never <input type="checkbox"/> Some of the time <input type="checkbox"/> Mostly/Always</p> <p>Type (if used) _____</p> 

27 If you have tried to protect your hearing during leisure activities, which of the following methods have you used? (tick all that apply)

- | | |
|--|---|
| <input type="checkbox"/> Foam earplugs | <input type="checkbox"/> Other over-the-counter earplugs |
| <input type="checkbox"/> Custom* musician's earplugs | <input type="checkbox"/> Custom* general purpose earplugs |
| <input type="checkbox"/> Earmuffs | <input type="checkbox"/> Removed or turned off hearing aids |

Other (describe) _____

* custom plugs = plugs moulded by a hearing professional to fit your ear exactly


28 Have you ever worked in jobs that involve exposure to loud sound?

Include full-time or part-time, paid or voluntary work

Yes

No Go to → Q.31 (last question)

29 Your Work Activity History

<p>WORK ACTIVITY <i>Multiple fields</i></p> <p>Describe: _____</p> <p>How often have you done this activity, on average?</p> <p><input type="checkbox"/> Less than once a year <input type="checkbox"/> 1-2 times a year <input type="checkbox"/> Once every few months <input type="checkbox"/> Once a month <input type="checkbox"/> Once every 2-3 weeks <input type="checkbox"/> Once a week <input type="checkbox"/> More than once a week</p>	<p>How many times a week? (if done weekly) _____ times/week</p> <p>About how long do (did) you do this activity each time? _____ hours each time</p> <p>How old were you when you first did this activity? _____ years of age</p> <p>How many years altogether have you done this activity? _____ years in total</p>	<p>Used hearing protection?</p> <p><input type="checkbox"/> Never <input type="checkbox"/> Some of the time <input type="checkbox"/> Mostly/Always</p> <p>Type (if used) _____</p> <div style="text-align: center;">  </div>
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30 If you have tried to protect your hearing during work activities, which of the following methods have you used? (tick all that apply)

- | | |
|--|---|
| <input type="checkbox"/> Foam earplugs | <input type="checkbox"/> Other over-the-counter earplugs |
| <input type="checkbox"/> Custom* musician’s earplugs | <input type="checkbox"/> Custom* general purpose earplugs |
| <input type="checkbox"/> Earmuffs | <input type="checkbox"/> Removed or turned off hearing aids |

Other (describe) _____

* custom plugs = plugs moulded by a hearing professional to fit your ear exactly.

31 Do you have any other comments about your hearing or exposure to loud sound?