

# Hearing aids provision claims for noise induced hearing loss (NIHL) between 1998-99 and 2008-09

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## **Executive summary**

Untreated hearing loss is closely related to quality of life and affects both the person with the hearing loss and those they communicate with. Uncorrected hearing loss gives rise to a poorer quality of life, related to isolation and reduced social activity. Difficulties in understanding speech or having to ask for repetition often leads to withdrawal from social activities, this in turn leads to reduced intellectual and cultural stimulation and increased social isolation. Reduced communication abilities also impact on a person's life chances through the reduced opportunity to gain competitive skills and employment.

Hearing loss, including noise induced hearing loss (NIHL) places an economic burden on the Australian society. The financial cost of hearing loss was estimated to be \$11.75 billion in 2005 with the largest component being productivity loss, accounting alone for 57% of all financial costs, while direct health system costs incurred for the diagnosis, treatment and management of hearing loss were estimated to be \$674 million, accounting for only 6% of all financial costs in 2005.

The aims of the current analysis were: 1) to identify occupational and demographic characteristics associated with NIHL related hearing aids provision claims in the working population between 1 July 1998 and 30 June 2009 in Victoria and 2) to compare demographic and other factors with those for impairment benefits claims. The results of this analysis should provide a better understanding of the 'at risk' groups profile and help implement strategies to improve screening and management of workers with hearing impairment.

The main findings are presented in this executive summary.

## ***Main findings***

- As in impairment benefits claims, most claimants were males (94.7%).
- Mean age of hearing aids claimants was higher than impairment benefits claimants' mean age (61.9 years versus 59.6 years) and ranged from 25 to 90 years. The highest number of claims was in the 56-65 year group which accounted for almost half of the claims (49.2%). Workers aged 66 years and above accounted for one third of hearing aids claimants (32.9%). Mean age increased steadily over the period from 58.4 years to 63.1 years. The 56-65 years and 66 year and above age groups experience the higher rise in the number of claims across the period, with a three and fivefold increase respectively.
- The manufacturing industry was by far the industry group with the highest number of hearing aids claims (43.9%), followed by construction (18.9%) and trade (11.2%). In manufacturing and construction, trend over time was not different from the overall increase in the number of claims. The rise was sharper in manufacturing compared to construction.
- As in impairment benefits claims, the three occupations with the highest number of claims were tradespersons (31.2%), intermediate production and transport workers (29.4%) and labourers and related workers (27.8%). They accounted for 88.4% of all claims. The larger rise in claims over the period was observed in tradespersons and in intermediate production and transport workers followed by labourers.
- The number of claims was 4.5 times higher in 2007-08 compared to 1998-99. A more than doubling in the number of claims over the first four-year period was followed by a three-year decrease with the lower number of claims observed in 2004-05. As observed with impairment benefits claims, it rose sharply afterwards to more than double within three years.
- The overall number of hearing aids provision claims and incidence rates followed the same pattern until 2004-05. Afterwards, the number of claims increased slightly faster than incidence rates. The number of hearing aids claims was 3.5 times higher in 2007-08 than in 1999-00 and overall claims incidence rates almost tripled from 11.7 to 33.6 new claims per 100,000 workers over the same period.

- Apart from a decrease in the number and the incidence rate of hearing aids claims between 2003 and 2005, these figures are similar to the evolution of impairment benefits claims numbers and incidence rates over the period.
- Like in impairment benefits claims, construction and manufacturing experienced the highest hearing aids claims incidence rates over the period. While incidence rates were at the same level in both industries at the beginning of the period, they increased faster in manufacturing and as a result they were higher in this industry than in construction at the end of the period.
- Public administration was the only industry to experience a clear downward trend in incidence rates over the period after a pick in 2001-02. As a result, incidence rates were almost at the same level at the beginning and the end the period (12.7 and 15.5 claims per 100,000 workers in 1999-00 and 2007-08 respectively).

## **Background**

Untreated hearing loss is closely related to quality of life and affects both the person with the hearing loss and those they communicate with. People with hearing impairment have difficulty understanding speech in background noise and localising sound sources. The reduced ability to detect sounds may also affect sounds that may signal immediate danger or sounds that are important for quality of life such as music. Not surprisingly, hearing loss was found to impact on physical, psychological and emotional well-being, people with hearing disability being reported to have lower physical and mental health status than those with no hearing disability (Hogan et al 2009a). Uncorrected hearing loss gives rise to a poorer quality of life, related to isolation and reduced social activity. Difficulties in understanding speech or having to ask for repetition often leads to withdrawal from social activities, this in turn leads to reduced intellectual and cultural stimulation and increased social isolation (Arlinger 2003). Reduced communication abilities also impact on a person's life chances through the reduced opportunity to gain competitive skills and employment (Access Economics 2006).

Hearing loss, including noise induced hearing loss (NIHL) places an economic burden on the Australian society. The financial cost of hearing loss was estimated to be \$11.75 billion in 2005 with the largest component being productivity loss, accounting alone for 57% of all financial costs. Direct health system costs incurred for the diagnosis, treatment and management of hearing loss were estimated to be \$674 million, accounting alone for 6% of all financial costs in 2005. In 2005, nearly half the people with hearing loss were of working age (15-64 years) and there were an estimated 158,876 people not employed due to hearing loss. The productivity cost arises due to lower employment rates for people with hearing loss over 45 years and subsequent losses in earnings (Access Economics 2006). Analysis of the 2003 Australian Survey of Disability, Aging and Carers (SDAC) showed that hearing loss was associated with an increased rate of non-participation in employment. Reduced participation in the labour force was greater in females with hearing loss than in males with hearing loss and in those for those having low education and communication difficulties. People with hearing loss were also less likely to be found

in highly skilled jobs and were over-represented among low income earners (Hogan et al 2009b).

Hearing loss has a negative impact on both the individual and the community. Prevention of noise exposure, early detection of NIHL and treatment of impaired workers can prevent negative personal and social consequences of hearing loss, particularly in the more vulnerable working population, i.e. less skilled workers with also lower income.

The current analysis was prompted by the dramatic increase in both impairment benefits and hearing aids claims experienced in recent years. Identification of 'at risk' groups and early management of hearing loss can improve the affected workers' life course and employment status. The aims of the current analysis were: 1) to identify occupational and demographic characteristics associated with NIHL related hearing aids provision claims in the working population between 1 July 1998 and 30 June 2009 in Victoria and 2) to compare demographic and other factors with those for impairment benefits claims. The results of this analysis should provide a better understanding of the 'at risk' groups profile and help implement strategies to improve screening and management of workers with hearing impairment.

## **Methods**

### Population

The source of data was the dataset of the Victorian workers' compensation authority (VWA), WorkSafe Victoria. The scope of the population covered all workplaces that employ workers but excluded Commonwealth workplaces that are insured through Comcare, as well as sole traders, self-employed and contractors as they usually do not have employees. A total of 36 self-insurers (as at 30 June 2010) were also excluded as they manage and are liable for their own workers' compensation claims.

The dataset included claims lodged for hearing aids services or provision until 30 June 2009. Analyses were undertaken on all claims between 1 July 1998 and 30 June 2009.

### Variables

#### *Affliction nature*

Claims were identified by the coded affliction nature. They were included in the analysis if the affliction nature was deafness (n=3673 claims). A total of 147 claims were excluded because the affliction nature was either: 1) not related to hearing (111 claims), 2) related to another disease of the ear or the mastoid (33 claims), or 3) related to a traumatic deafness from air pressure or explosion (3 claims).

#### *Allocation of a claim to a particular financial year*

Data were analysed per financial year (from 1 July to 30 June) which was allocated according to the date the claim was received by the insurer.

#### *Industry classification*

The industry in which NIHL occurred was coded using the WorkCover Industry Classification (WIC). The number of claims was small in some industries; therefore they were collapsed into one category. This category included agriculture, forestry, fishing and hunting; communication; electricity, water and gas; mining; public administration; and recreation, personal and other services.

For incidence rates calculations, the number of employees by industry was provided by WorkSafe Victoria for each quarter from financial year 1999-00. The number of employees was obtained for each financial year by calculating the mean of the four quarters.

#### *Occupational category*

Occupation at the time of the injury was recorded in the dataset following the Australian Standard Classification of Occupations (ASCO) Second Edition, July 1997 (ABS Cat. No. 1222.0). Advanced, intermediate and elementary clerical and services workers were pooled in a single category due to small sample size.

#### *Workplace size*

Unlike in the impairment benefits claims dataset, this information was not provided in the hearing aids dataset.

#### Data analysis

Age was expressed as mean. Analysis of variance was used to compare more than two groups for age. Groups for categorical variables (gender, age groups, industry and occupation) were compared using a Pearson chi square test and trends over time were compared using a chi square trend test. Tests were two-sided and p values smaller than 0.05 were considered significant.

Yearly incidence rates were expressed per 100,000 workers and were calculated as the number of new cases divided by the number of workers covered by WorkSafe Victoria during each financial year. They were calculated by industry using the ANZSIC 2006 first edition classification.

Data analysis was performed using the Stata 9 statistical software package.

## Results

### Description of hearing aids claims

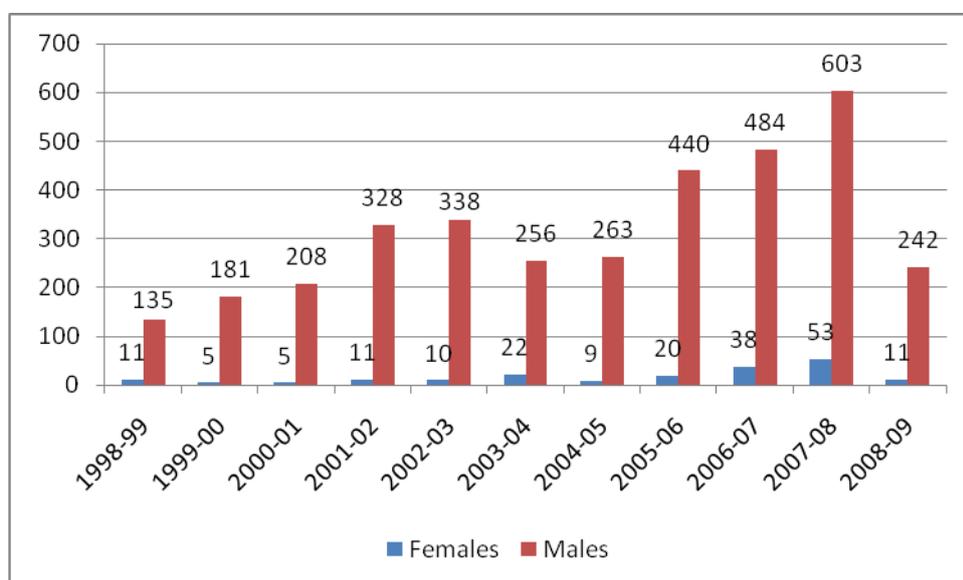
#### *Number of claims*

The number of hearing aids claims where the affliction nature was deafness was 3673.

Men were predominant in the successful hearing aids claimants' population (n=3478, 94.7%) while women accounted only for 5.3% of the claimants (n=195).

The number of claims was 4.5 times higher in 2007-08 compared to 1998-99. The number of claims increased steadily until 2001-02 to more than double over this four-year period. This increase was followed by a three-year decrease with a lower number of claims observed in 2004-05. As observed with impairment benefits claims, the number of claims for hearing aids provision rose sharply afterwards to more than double within three years. As a result, the highest number of claims was recorded in 2007-08. It was followed by a more than twofold decrease in 2008-09 (Figure 1).

Figure 1. Number of claims by financial year

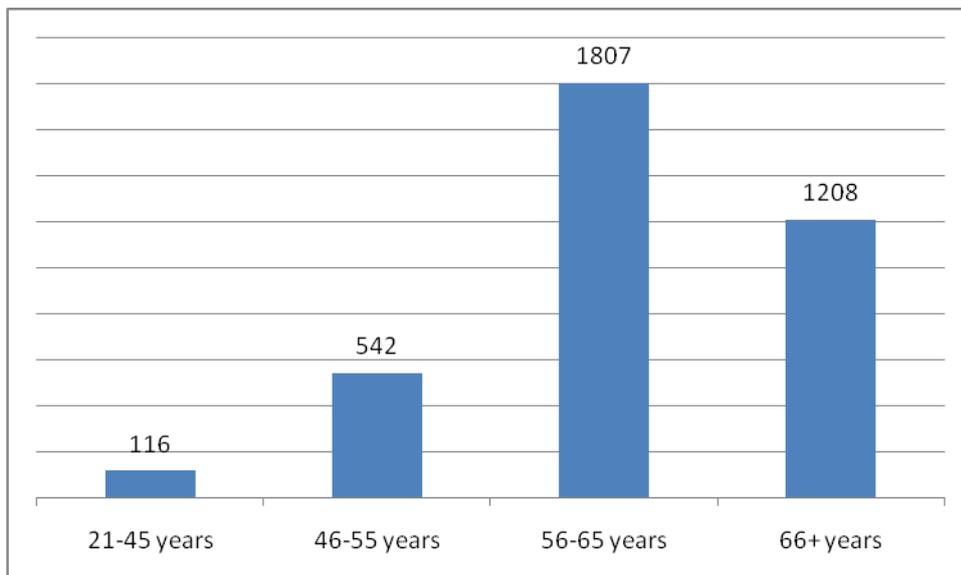


## Age

Hearing aids claimants were older than impairment benefits claimants (mean age of 61.9 years in hearing aids claimants versus 59.6 years in impairment benefits claimants) and hearing aids claimants' age ranged from 25 to 90 years.

As in impairment benefits claimants, the number of claims increased sharply from age 21-45 to 56-65 years and decreased after 65 years. The highest number of claims was in the 56-65 years age group (49.2%). The decrease in number of claims was less pronounced after 65 years in hearing aids claimants compared to impairment benefits claimants (32.9 % versus 22.6%) (Figure 2).

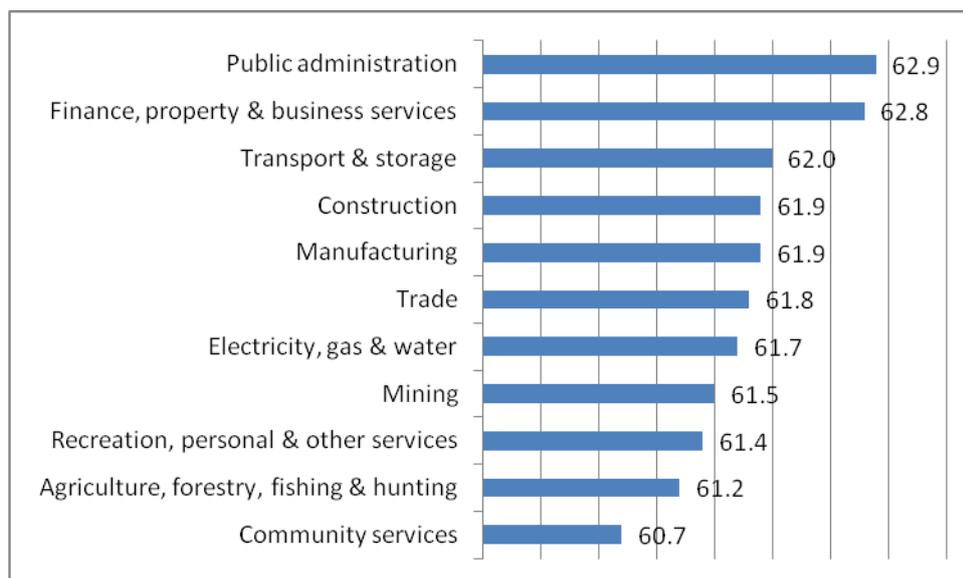
Figure 2. Distribution of claims according to age



While there were no significant differences between industry and occupation types for mean age in impairment benefits claimants, mean age differed significantly across industry and occupation groups in hearing aids claimants.

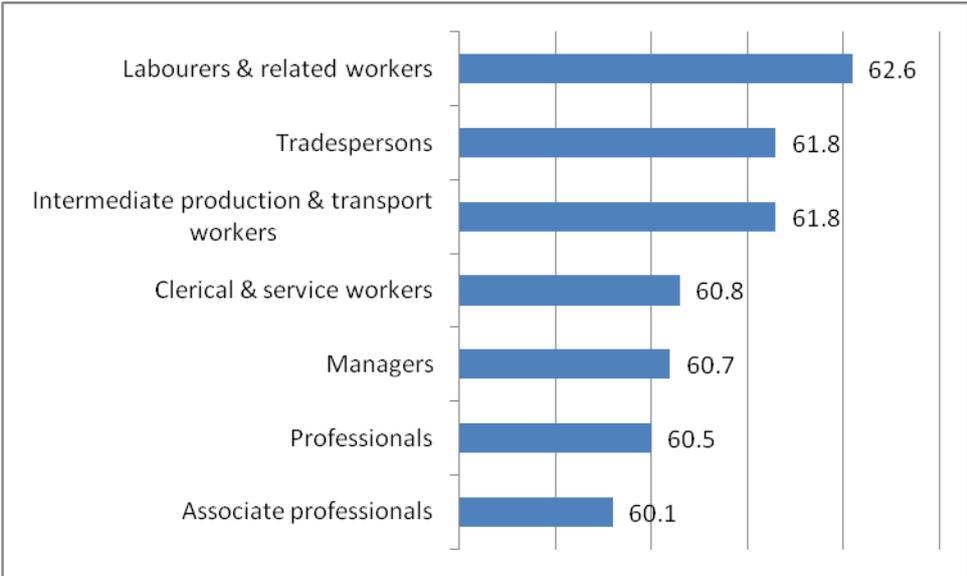
Claimants' higher mean age was observed in public administration and in finance, property, and business services and lower mean age in agriculture, forestry and fishing, and in community services (Figure 3).

Figure 3. Mean age by industry



Higher mean age was observed in labourers and related workers and lower mean age in associate professionals claiming for hearing aids (Figure 4).

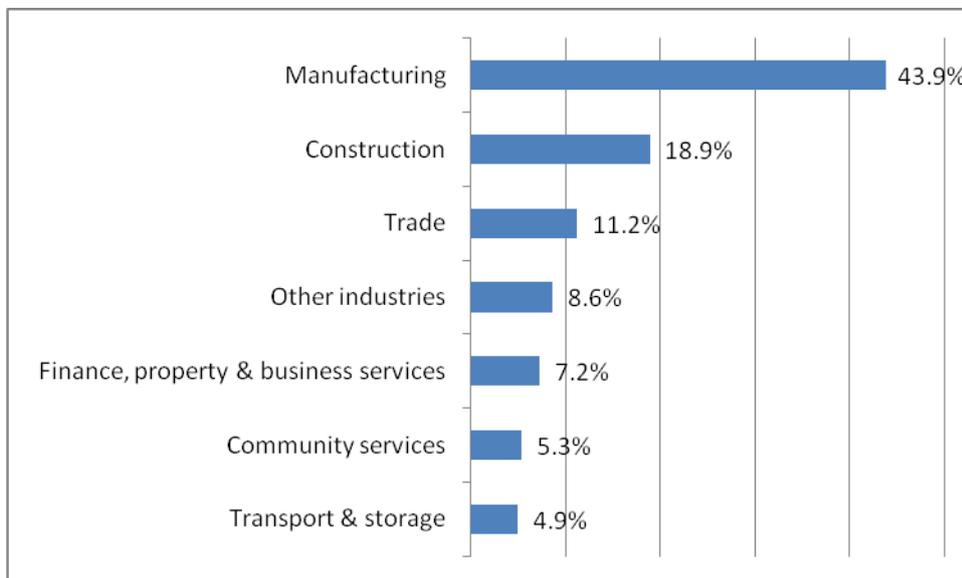
Figure 4. Mean age by occupation



## Industry

As in impairment benefits claims, three industries accounted for three-fourth of overall hearing aids claims (manufacturing 43.9%, construction 18.9% and trade 11.2%) (Figure 5). However in manufacturing, the percentage of hearing aids claimants was significantly higher compared to the percentage of impairment benefits claimants (43.9% versus 36.0%). The percentage of claims generated by the other industries ranged from 7.2% (finance, property and business services) to 0.8% (mining).

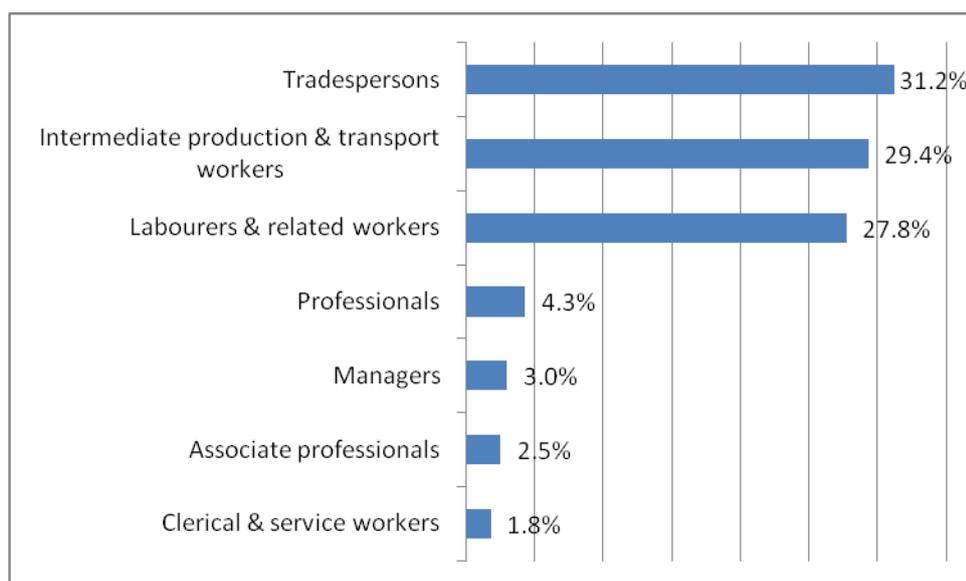
Figure 5. Percentage of claims by industry



### *Occupation*

As in impairment benefits claims, the three occupations with the highest number of claims were tradespersons and related workers, intermediate production and transport workers, and labourers and related workers with comparable percentage of claims (31.2%, 29.4% and 27.8% respectively) (Figure 6). These occupations accounted for 88.4% of all claims.

Figure 6. Percentage of claims by occupation



### *Workplace size*

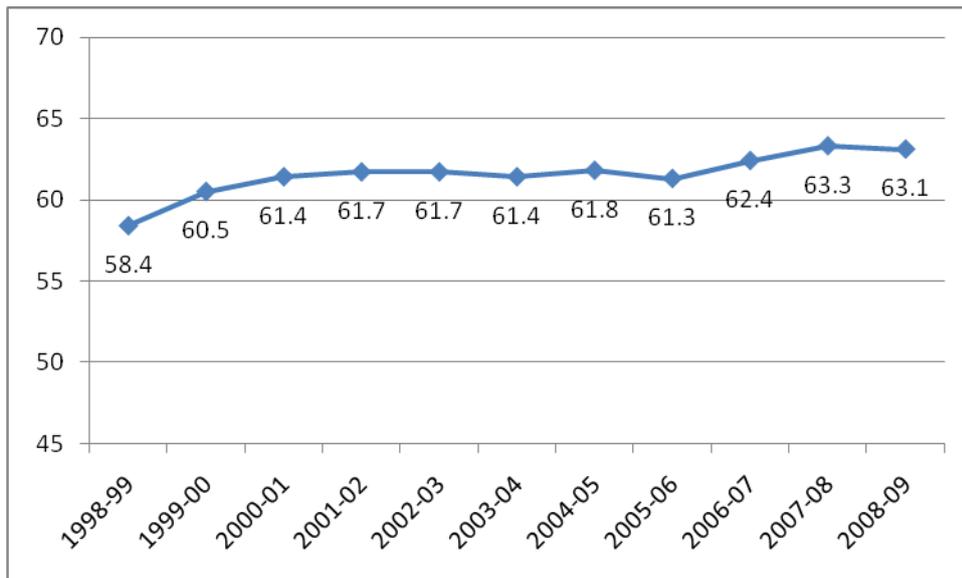
This information was not provided in the hearing aids claims dataset.

## Characteristics of hearing aids claims over time

### *Age*

Mean age at claim lodgement increased steadily over the period from 58.3 years to 63.1 years (Figure 7).

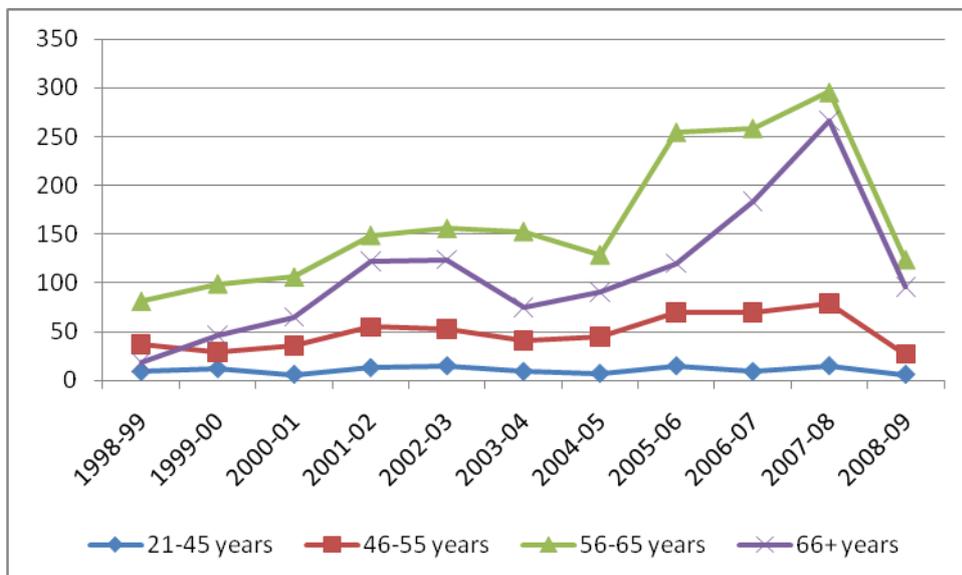
Figure 7. Mean age at claim lodgement by financial year



The 56-65 age group had the highest number of claims, followed by the 66+ age group. Both age groups had also the highest rise in the number of claims across the period, the number of claims in these age groups increased by threefold and fivefold respectively. This increase was lower than the increase in the number of claims observed in these age groups in impairment benefits claimants which experienced a four and tenfold rise respectively. However when not taking into account the 2008-09 financial year, the increase was thirteen fold in older claimants.

In all claimants, the number of claims rose at the beginning of the period and decreased until 2003-04 / 2004-05. An upward trend was observed afterwards. In 56-65 year claimants, the number of claims doubled within one year between 2004-05 and 2005-06 and increased further the two following years to reach a maximum in 2007-08. In 66 years and above hearing aids claimants, the number of claims rose to result in a 3.5 fold increase between 2003-04 and 2007-08. In claimants aged 45 years and below, the number of claims doubled over the period (Figure 8).

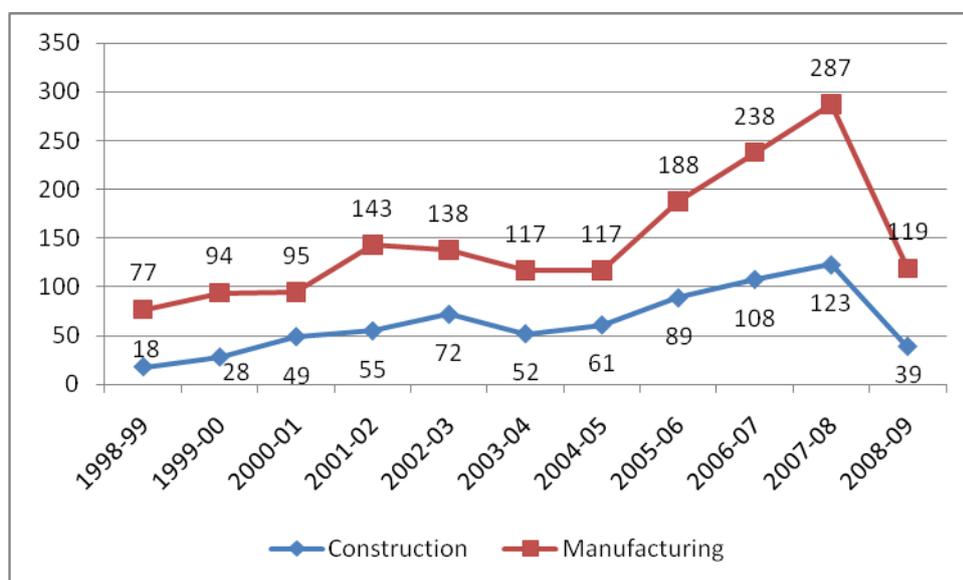
Figure 8. Number of claims by age and financial year



## Industry

In the two industries with higher numbers of hearing aids claims, trend over time was not different from the overall increase in the number of claims with a slight decrease in the middle of the period followed by a rise afterwards. As a whole, the number of claims in the two higher risk industries increased over the period in both industries. However, the rise was sharper in manufacturing compared to construction (Figure 9).

Figure 9. Evolution of the number of claims in the two higher risk industries



In these industries with highest numbers of claims, the number of claimants increased more over the period in higher age groups, which was a similar pattern to that seen for the overall number of hearing aids claims.

## Occupation

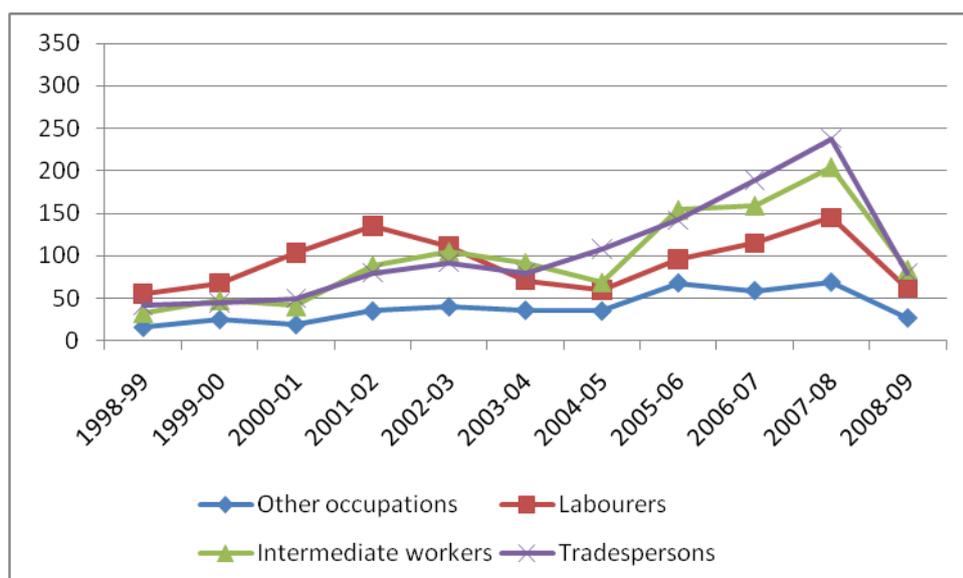
The larger rise in claims was observed in tradespersons and in intermediate production and transport workers followed by labourers. Trends over time differed between these occupation groups.

In tradespersons, unlike the overall claims trends where there was a decrease in the middle of the period followed by a rise, the number of claims increased all over the period. The rise was steady during the first part of the period and sharper the following years.

In intermediate production and transport workers, the pattern followed the overall trend, decreasing slightly until 2004-05 and rising more sharply afterwards.

Labourers and related workers experienced an increase in the percentage of claims during 3 consecutive years between 1999 and 2002, accounting for the main cause of hearing aids claims during this period. This pattern was similar to the pattern of impairment benefits claims during the same period in this occupation. Afterwards, the number of claims in labourers and related workers increased steadily, but with a lower slope compared to tradespersons and intermediate workers (Figure 10).

Figure 10. Evolution of the number of claims according to occupation groups



In tradespersons and intermediate workers, the increase in the number of claims followed the general pattern with a higher rise over time in older claimants. As in impairment benefits claims, the sharper increase was observed in claimants aged 66 years and above. Between 1998-99 and 2007-08, there was a fifteen fold rise in this age group in tradespersons and a ninefold increase in intermediate production and transport workers. In workers aged 56 to 65 years, the rise was around five and sixfold in tradespersons and intermediate workers respectively. In workers aged 56 to 65 years, the rise was around five and sixfold in tradespersons and intermediate workers respectively (Figures 11 and 12).

Figure 11. Evolution of the number of claims according to age in tradespersons

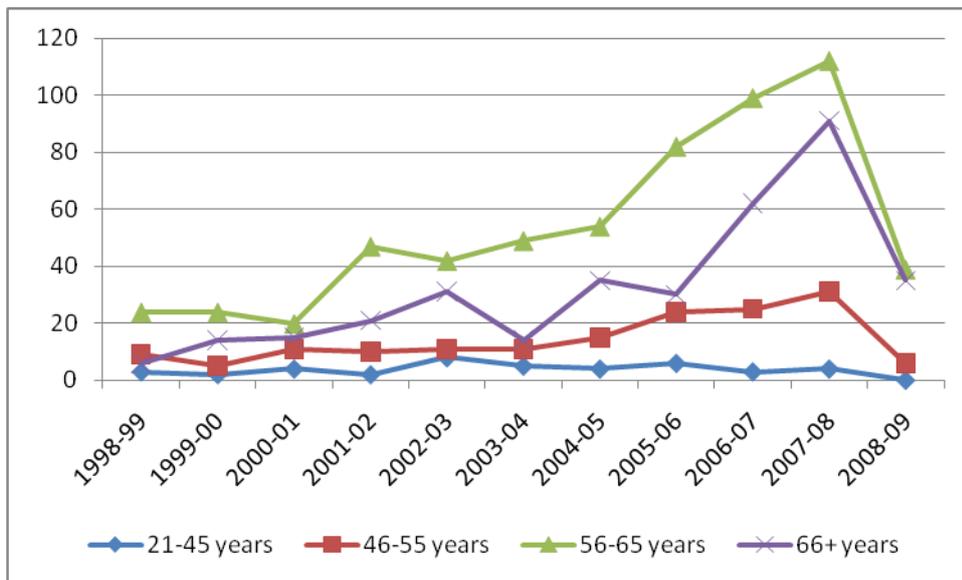
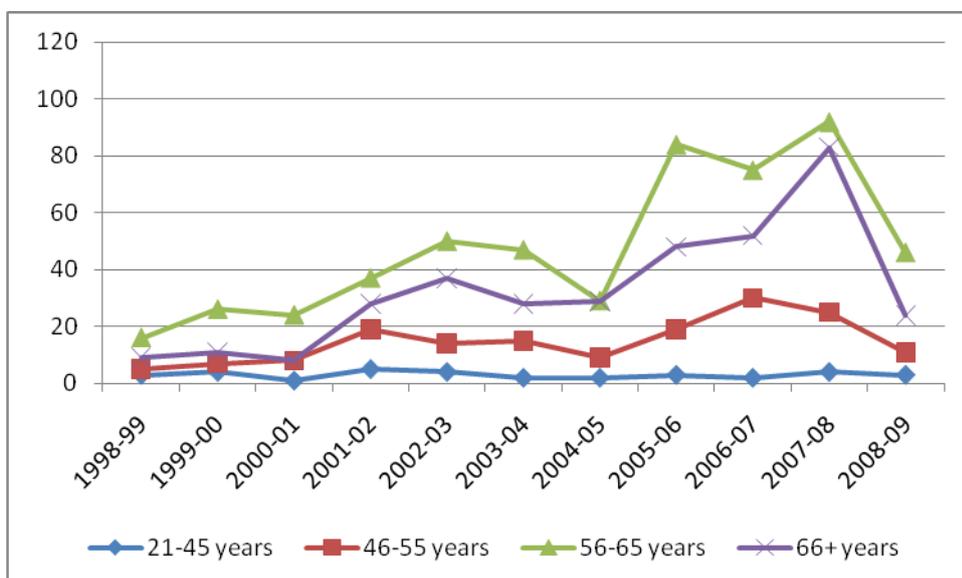
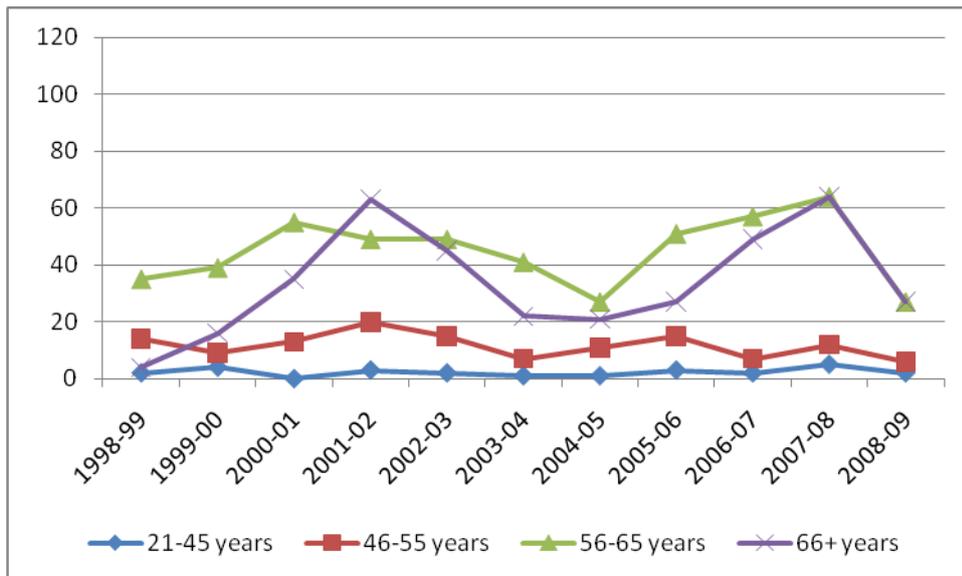


Figure 12. Evolution of the number of claims according to age in intermediate workers



In labourers and related workers, trends over time did not follow the general pattern. The number of claims was higher in older claimants all over the period but a decrease from 2001-02 resulted in lower numbers in 2004-05, followed by a rise afterwards. Variations in the number of claims were more pronounced in claimants aged 66 years and above with a sixteen fold rise across the period in this age group compared to a twofold increase in workers aged 56 to 65 years (Figure 13).

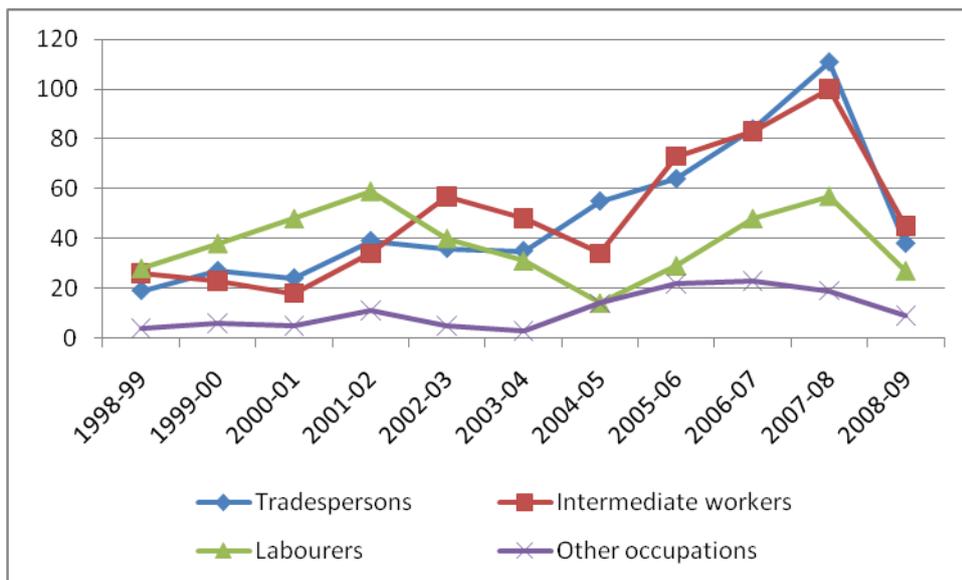
Figure 13. Evolution of the number of claims according to age in labourers



In manufacturing, the evolution of the number of claims over the period in the three higher risk occupations was similar to the general pattern.

As a whole and like in impairment benefits claims, in the manufacturing industry the higher rise in claims over the period was observed in tradespersons with a sixfold increase, followed by intermediate production and transport workers, and labourers and related workers (four and twofold increase respectively) (Figure 14).

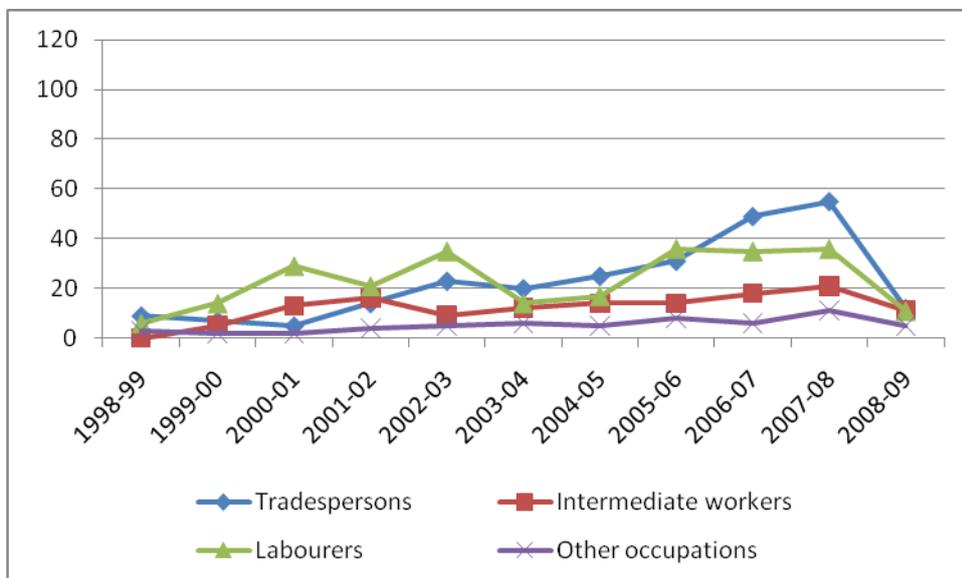
Figure 14. Proportion of claims by occupation in manufacturing



In construction, the increase in claims over the period followed the general pattern in tradespersons and labourers and related workers with a sixfold increase in both occupation groups.

However, the number of claims in intermediate workers was lower than that of tradespersons and labourers over the whole period. This was in contrast with the distribution of overall claims and of claims lodged by intermediate workers in the manufacturing industry where it followed the distribution of claims lodged by tradespersons (Figure 15).

Figure 15. Proportion of claims by occupation in construction



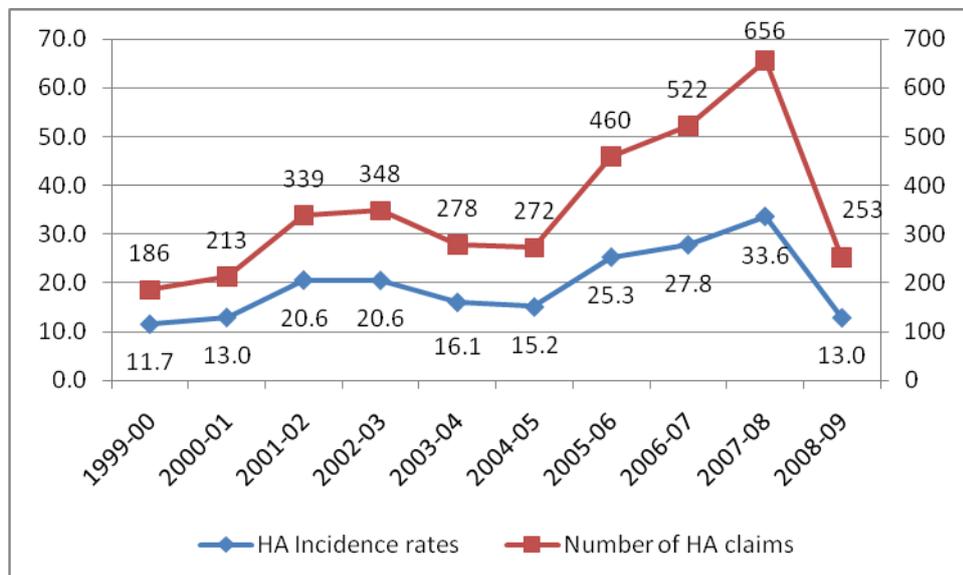
## Incidence rates

### *Overall rates*

The overall number of hearing aids provision claims and incidence rates followed the same pattern until 2004-05. Afterwards, the number of claims increased slightly faster than incidence rates, meaning that the number of workers covered by WorkSafe Victoria has increased over this period. The number of hearing aids claims was 3.5 times higher in 2007-08 than in 1999-00 and overall claims incidence rates almost tripled from 11.7 to 33.6 per 100,000 workers over the same period (Figure 16).

Apart from a decrease in the number and incidence rate of hearing aids claims between 2003 and 2005, these figures are similar to the evolution of impairment benefits claims numbers and incidence rates over the period.

Figure 16. Number of hearing aids claims and incidence rates (per 100,000 workers) by financial year



### *Industry-specific incidence rates*

Incidence rates were calculated using the employee count as a denominator. These numbers were provided by WorkSafe Victoria by industry coded following the 2006 ANZSIC classification. The number of employees by industry was calculated as the mean count of the four quarters for each financial year from 1999 to 2009.

As there were differences between the ANZSIC and WIC classifications, we collapsed WIC categories when appropriate to match the ANZSIC classification.

Industry-specific rates expressed per 100,000 workers are shown in Table 1.

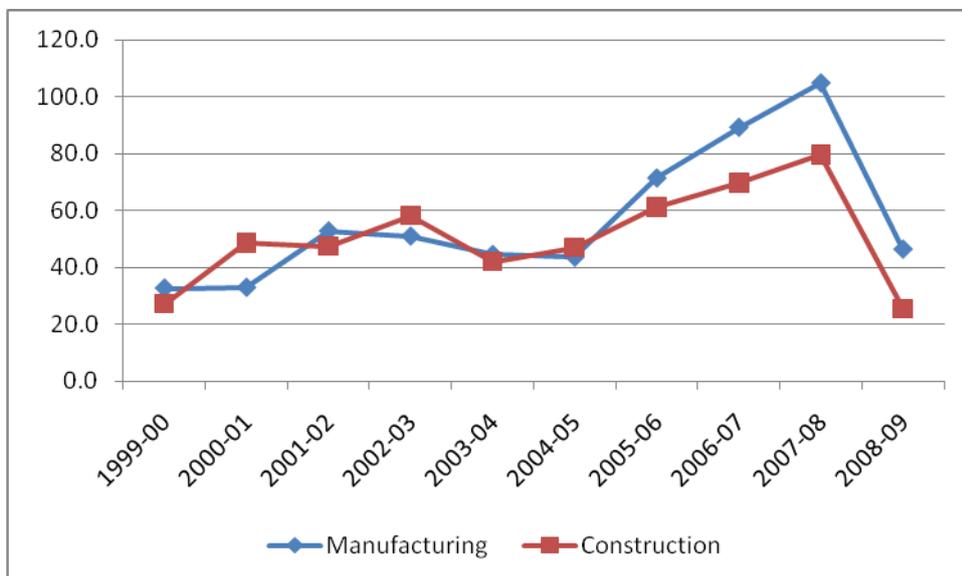
Table 1. Industry-specific hearing aids claims rates expressed per 100,000 workers

<b>Total incidence for HA claims</b>	<b>1999-00</b>	<b>2000-01</b>	<b>2001-02</b>	<b>2002-03</b>	<b>2003-04</b>	<b>2004-05</b>	<b>2005-06</b>	<b>2006-07</b>	<b>2007-08</b>	<b>2008-09</b>
Agriculture, forestry, fishing & hunting	3.1	3.1	12.9	16.3	7.6	14.4	13.2	21.8	19.3	6.3
Community services	17.3	9.2	34.0	25.3	29.5	16.4	37.9	33.3	45.9	17.6
Construction	27.2	48.5	47.4	58.3	42.1	47.0	61.2	69.7	79.6	25.5
Electricity, gas & water	11.3	17.0	42.4	109.7	31.1	36.2	17.2	28.5	41.0	10.3
Finance, property & business services	17.2	22.4	29.4	28.2	22.4	17.0	44.3	39.9	48.9	17.2
Manufacturing	32.6	32.9	52.8	50.9	44.4	43.5	71.4	89.2	104.9	46.3
Mining	20.9	66.5	88.5	46.7	18.6	82.9	42.4	68.7	61.8	11.0
Public administration	12.7	42.9	87.3	59.2	25.8	28.9	18.4	24.0	15.5	13.9
Recreation, personal & other services	12.8	28.7	31.3	23.9	12.4	15.8	17.3	11.3	28.3	7.9
Trade	7.0	6.2	11.9	7.7	9.9	7.7	22.1	18.5	27.6	11.4
Transport & storage	12.8	7.1	17.9	27.8	23.2	14.0	25.1	29.7	37.8	15.8
<b>Total</b>	<b>11.7</b>	<b>13.0</b>	<b>20.6</b>	<b>20.6</b>	<b>16.1</b>	<b>15.2</b>	<b>25.3</b>	<b>27.8</b>	<b>33.6</b>	<b>13.0</b>

As in impairment benefits claims, construction and manufacturing experienced the highest hearing aids claims incidence rates over the period.

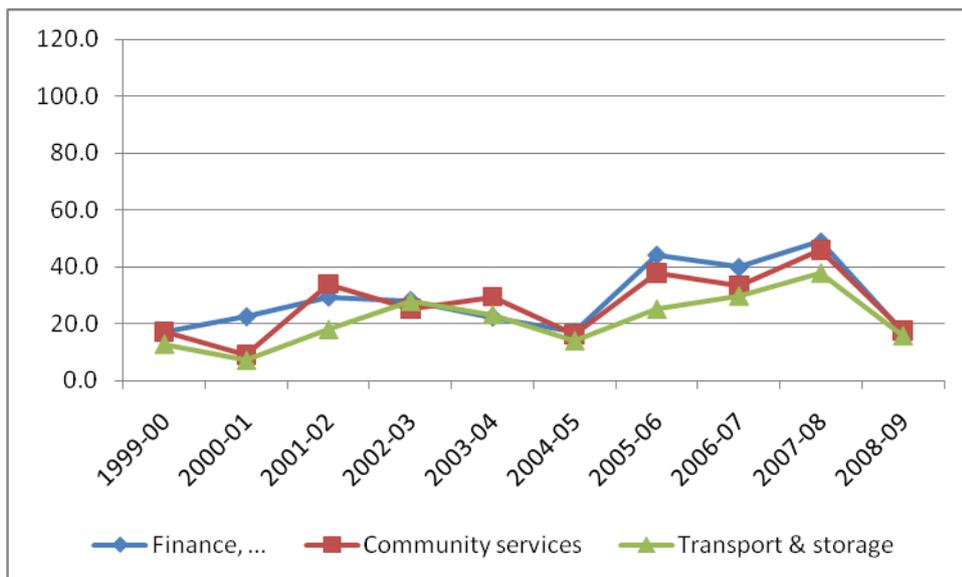
In both industries, there was a 1.5 increase in incidence rates until 2003-04, followed by steady rates until 2005. Afterwards, incidences rates rose sharply to increase by 2.4 times in manufacturing and by 1.9 times in construction within three years. As a result, manufacturing and construction experienced their highest incidence rates in 2007-08. However, while incidence rates were at the same level in both industries at the beginning of the period, they were higher in manufacturing than in construction at the end of the period (Figure 17).

Figure 17. Incidence rates in manufacturing and construction by financial year



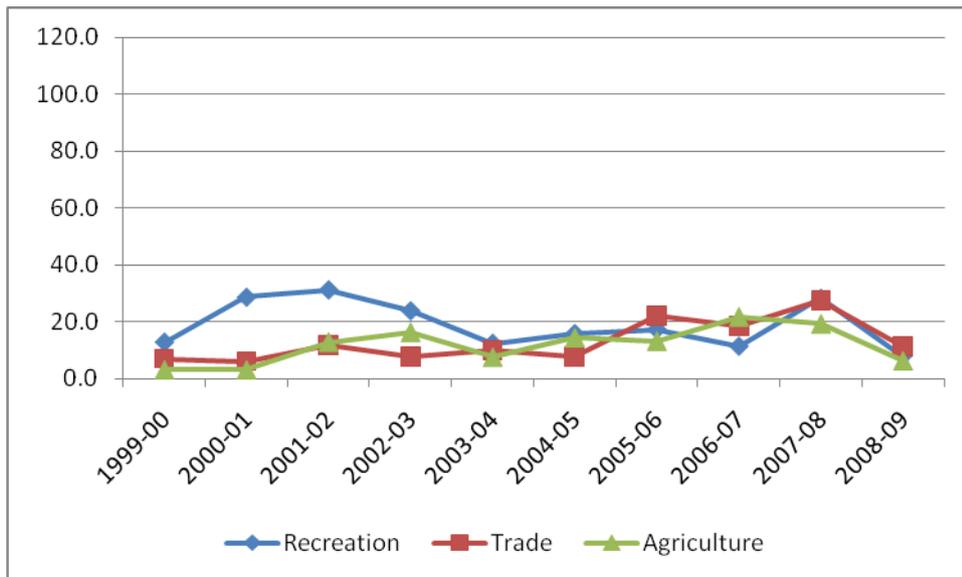
In finance, property and business services, community services, and transport and storage, incidence rates almost tripled between 1999-00 and 2007-08. All three industries experienced a decrease in incidence rates in 2004-05 followed by a rise until 2007-08 (Figure 18).

Figure 18. Incidence rates in finance, property and business services, community services, and transport and storage by financial year



Recreation, personal and other services, trade, and agriculture experienced the same incidence rates over the period. However, rates were the highest in the recreation industry at the beginning of the period but reached the same levels as the two other industries at the end of the period (Figure 19).

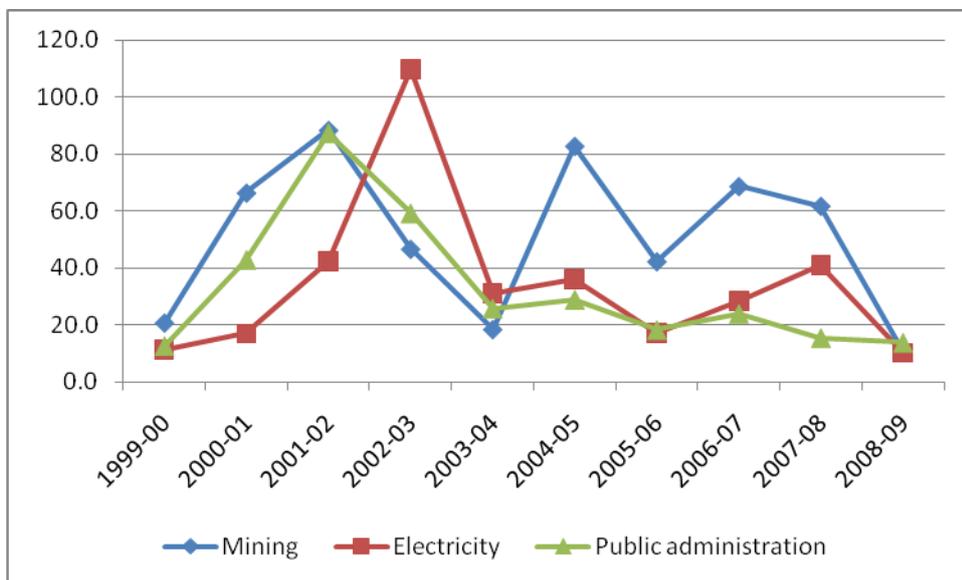
Figure 19. Incidence rates in recreation, personal and other services, trade, and agriculture by financial year



Due to small denominators, particularly in the mining industry, incidence rates fluctuated widely over the period (Figure 20).

After a pick in incidence rates in public administration, there has been a clear downward trend in incidence rates from 2001-02 onward. As a result, incidence rates were at the same level at the beginning and the end the period (12.7 and 15.5 claims per 100,000 workers in 1999-00 and 2007-08 respectively).

Figure 20. Incidence rates in mining, electricity, gas and water, and public administration by financial year



## **Limitations**

### Results for financial year 2008-09

The sharp reduction in claims numbers and incidence rates in 2008-09 compared to the previous year is unlikely to be due to an actual decrease in claims. Allocation of a claim to a financial year is made according to the date the claim is received by the insurer but claim resolution may take time and thus delay by several months the inclusion onto the database.

The results for the last financial year should therefore be interpreted with caution until consolidated data are available.

### Industry classification and incidence rates

WorkSafe Victoria uses the WorkCover Industry Classification for industry coding. On the other hand, employee count was provided by WorkSafe Victoria using the 2006 Australian and New Zealand Standard Industry Classification (ANZSIC).

Both WIC and ANZSIC classifications have similar categories (agriculture, forestry and fishing; mining; manufacturing; electricity, gas, water and waste services; construction) but some ANZSIC categories are collapsed in the WIC classification.

Compared to the 2006 ANZSIC classification, retail and wholesale trade are coded in one single category in the WIC, financial and insurance services are collapsed with rental, hiring and real estate services to form the finance, property and insurance services category, accommodation and food services are coded together with arts and recreational services, community services are the combination of education and training together with health care and social assistance, while public administration is the combination of public administration and safety, and administrative and support services in the WIC.

In order to calculate incidence rates with the information provided, we collapsed employee count categories to match with the WIC coding. This broad matching may have led to some misclassification.

## **Discussion**

### Number and incidence rates of compensation claims in relation to noise regulations

Both compensation claims for impairment benefits and hearing aids provision followed the same general pattern over the eleven-year period between 1998-99 and 2008-09. The number of each type of claim rose at a same magnitude with a 4.0 and 4.5 fold increase within ten years between 1998-99 and 2007-08 for impairment benefits and hearing aids claims respectively. The larger rise was observed during the last two to three years and resulted in a twofold increase in the number of both types of claims within this period. The same way, overall yearly incidence rates of impairment benefits and hearing aids claims respectively doubled and almost tripled between 1999-00 and 2008-09. This was mainly due to a sharp rise from 2004-05 onwards that coincided with changes in noise regulations.

The Occupational Health and Safety (Noise) Regulations 1992 were replaced by new noise regulations that came into effect in Victoria in 2004. In both regulations, audiometric testing was undertaken when employers were required to provide their employees with hearing protectors.

Audiological examination was required for different criteria between both regulations. While both regulations triggered audiological examination when there was a reduction in hearing levels greater than or equal to 15 dB at 3000 Hz, 4000 Hz or 6000 Hz compared to a previous audiometric testing, previous regulations also took into account sole hearing threshold levels at 4000 Hz which increased with age but which were higher than 15 dB. Even when the threshold criteria were met, the previous regulations recommended that an audiological examination be performed only if the employee had not previously been recommended for a medical or audiological examination at the same hearing level while the new regulations did not limit audiological referral.

Changes in Victorian noise regulations in 2004 may partly explain the rise in the number and incidence rate of NIHL claims observed in recent years. These new regulations may have increased access to a hearing specialist, resulting in the diagnosis of hearing impairment in workers who would have otherwise not been

diagnosed, advice on treatment options including fitting of a hearing aid on those diagnosed with NIHL and increased awareness about a worker's entitlements.

The Occupational Health and Safety (Noise) Regulations 2004 were revoked and the current Occupational Health and Safety Regulations 2007 include employers' duties regarding exposure to noise of their employees. Criteria for audiometric testing and audiological examination provision have however not changed since 2004.

#### Possible underreporting of compensable NIHL in regards to hearing aids provision

The reported number of workers compensation hearing aids claims is lower than the number of workers claiming for impairment benefits. Two main reasons can contribute to this phenomenon.

First, some eligible persons can be unaware of this type of claim and access hearing devices through the Australian Government Hearing Services Program. Adults who hold a pensioner concession card or those who need employment support as well as hearing aids from a Disability Employment Service (<http://www.health.gov.au/hear>) can access the Government scheme. This can be the case for workers who are retired or those who are unemployed as a result of their hearing condition or for other reasons. NIHL may impact on capacity to work and employment. In 1994, it was estimated that the employment rate for adults aged 45 to 64 years with hearing loss was 20.5% and 16.5% lower than that for people without hearing loss for males and females respectively. In the younger age group (under 45 years), there were no significant differences for employment outcome by hearing loss (cited in Access Economics 2006 (source: South Australian Health Omnibus data 1994)). More recent data showed no differences in males under 45 years of age but a 9% differential in females with hearing loss compared to females without hearing loss. In the 45 to 54 years age group, employment rates were 4% and 20% lower in males and females respectively (Hogan et al 2009b).

Second, adults with hearing loss have been reported to be reluctant to accept hearing aids. A study conducted in a representative South Australian adult population reported that at best 38% of people with moderate hearing impairment used a hearing aid on a daily basis (Wilson 1999). Another Australian study, the Australian Blue Mountains Hearing Study, which assessed the hearing of 2,956

people aged 49 and over in the Blue Mountains region west of Sydney between 1997 and 2003 found that only 50% of older persons with moderate or worse levels of measured hearing loss had hearing aids (Smith et al 2005). The figures seem to be different between first users and regular users of hearing devices. A recent Finnish study exploring changes in hearing aid use over the past 20 years showed an increase in the use of hearing aids during this period. The number of first-time hearing aid users who did not use their hearing aids had decreased by sixfold from 33% in 1983 to 5% in 2005 and the number of regular users had risen from 41% to 57%. The users were better able to use their hearing aids and were more satisfied with them. However in this study, the majority of participants were of retiring age and possibly more keen to use hearing aids than younger people who might avoid stigmatisation related to their condition (Vuorialho et al 2006).

#### Number and incidence rates of claims by industry and occupation

For both impairment benefits and hearing aids claims, the manufacturing and construction industries experienced the highest claims number and incidence rates. Manufacturing alone accounted for almost half of the number of hearing aids claims. In this industry, incidence rates of hearing aids claims were higher compared to incidence rates of impairment benefits claims while in construction, the reverse was observed (i.e. incidence rates of hearing aids claims were lower compared to incidence rates of impairment benefits claims). Hearing loss can impair workers speech discrimination and communication and impact on their safety in their job setting. Depending on the requirements of a job, workers who experience such constraints in their job may apply for hearing aids more often than workers who do not. This can be the case in manufacturing more than in construction.

#### Age as a determinant

Hearing aids claimants were older than impairment benefits claimants. Workers aged 66 years and above accounted for one third of hearing aids claimants. While the rate of hearing loss is greater during the first ten to fifteen years of noise exposure and decreases as the hearing threshold increases, presbycusis accelerates over time (ACOEM 2003). Therefore, older workers were more likely than younger workers to have impairment in relation to combined occupational and age-related hearing loss and to lodge an application for hearing aids provision. They may also want to hold a

claim up to after retirement, either because they prefer to lodge a claim once they are no longer in contact with their employer or because at an older age, they more easily accept wearing hearing aids.

## **Conclusion**

This analysis enabled us to describe hearing aids claimants according to their demographic and occupational characteristics and to calculate incidence rates in the different industry sectors. Results are congruent with impairment benefits claims data. This again highlights the need for effective prevention measures in workers exposed to high levels of noise.

In general, workers who have been exposed to excessive noise may be more likely to claim for hearing devices in the future than in the past. Changes in noise regulations may have increased workers' awareness about their hearing status and progress has been made in hearing aids size and technology. Hearing devices are usually customised to fit the size and shape of the person's ear canal and new technologies provide clearer and more natural sound.

Some workers who have communication and safety requirements in their job may more often than others seek hearing aids provision to fulfil their job and avoid either safety issues or jeopardising their employment. However, compared to younger workers suffering from NIHL, older claimants may more easily acknowledge their hearing disability and accept wearing hearing aids as part of the aging process. Older age groups are therefore more potential future claimants, especially as the general population is aging.

## References

1. Hogan A, Loughlin K, Miller P, Kendig H. The health impact of a hearing disability on older people in Australia. *J Aging Health* 2009a;21:1098-11.
2. Arlinger S. Negative consequences of uncorrected hearing loss – a review. *Int J Audiol* 2003;42:2S17-S20.
3. Access Economics. The economic impact and cost of hearing loss in Australia, 2006.
4. Hogan A, O'Loughlin K, Davis A, Kendig H. Hearing loss and paid employment: Australian population survey findings. *Int J Audiol* 2009b;48:117-22.
5. Wilson DH, Walsh PG, Sanchez L, Davis AC, Taylor AW, Tucker G, Meagher I. The epidemiology of hearing impairment in an Australian adult population. *Int J Epidemiol* 1999;28:247-52.
6. Smith JL, Mitchell P, Wang JJ, Leeder SR. A health policy for hearing impairment in older Australians: what should it include? *Aust New Zealand Health Policy* 2005;2:31.
7. Vuorialho A, Sorri M, Nuojua I, Muhli A. Changes in hearing aid use over the past 20 years. *Eur Arch Otorhinolaryngol* 2006;263:355-60.
8. American College of Occupational and Environmental Medicine. ACOEM evidence-based statement: noise-induced hearing loss. *J Occup Environ Med* 2003;45:579-80.

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