

Costs and determinants of compensation claims for noise induced hearing loss (NIHL) between 1998-99 and 2008-09

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Costs and determinants of compensation claims for noise induced hearing loss (NIHL) between 1998-99 and 2008-09

Executive summary

In 2005, it was estimated that one in five Australian adults had hearing loss. Prevalence rates for hearing loss were associated with increasing age and were higher in males than in females, the gender differences being attributed to differing levels of workplace noise exposure. Hearing loss in adults is commonly caused by the ageing process and excessive noise exposures over a period of time resulting from occupational or recreational noise. Noise induced hearing loss (NIHL) is theoretically preventable, it is however irreversible once acquired.

In Australia, 7% of the disabling hearing loss in adults is attributed to occupational noise. Occupational hearing loss represents a very significant social and economic burden for Australia. Nationally, an estimated 1 million employees in Australia may be potentially exposed to hazardous levels of noise at work. NIHL is indeed a significant cause for workers' compensation. In 2001-02 alone, it represented 19% of all disease-related claims made in Australia.

NIHL claims have some characteristics that differentiate them from other types of claims. As hearing loss is a gradual process, the time between exposure and the date of claim lodgement can vary. Furthermore, a worker is entitled to further benefits payments if deterioration of hearing occurs over time. Workers claiming for a work-related disease receive a range of entitlements, the main ones being weekly income replacement and medical payments. In general claims, impairment payments represent only 6% of the total costs. In contrast, workers with hearing loss do not usually require time off work or medical treatment but hearing aids and impairment benefits payments represent more than 90% of the payments made to hearing loss claimants.

The aim of this analysis was to describe the costs for each type of claim according to demographic and occupational characteristics, to analyse the costs depending on the number of claims and to identify the factors that were related to lodgement of a type of claim or the other or both.

Main findings

- Median payments for impairment benefits doubled from \$9,000 in 1998-99 to \$18,400 in 2008-09 while the median cost of hearing aids provision was comparable between the beginning and the end of the same period (\$5,900 versus \$5,186). The majority of hearing aids claimants were supplied with one single device (87.4%).
- Median payments for impairment benefits and median hearing aids provision costs were lower in females compared to males and decreased with increasing age. There were no significant differences between industries for both median impairment benefits and hearing aids payments.
- Median impairment benefits payments varied between occupations without any clear pattern related to white-collar or blue-collar type of work. In regards to median hearing aids costs, white collar workers received the highest median payments and within blue-collar workers, tradespersons received the highest median payments. However for each type of claim, managers and administrators received the highest median payment while labourers received the lowest median payment.
- In successful impairment benefits claimants, mean WPI percentage was significantly higher in males compared to females, in older claimants compared to claimants aged 21 to 55 years, and in small workplaces compared to large workplaces.
- Workers more often claimed for both impairment benefits and hearing aids provision (46.4%) than for impairment benefits alone (31.7%) or hearing aids provision alone (21.9%).
- Claimants lodging both types of claims in comparison with impairment benefits claimants only were more likely to be females, in older age groups, and to work in small workplaces but less likely to be employed in manufacturing or construction. Claimants lodging both types of claims did not significantly differ from hearing aids only claimants except for occupation.

- Tradespersons were more likely to lodge an impairment benefits claim only than both types of claims but also more likely to lodge both types of claims rather than only a hearing aids claim. Labourers were more likely to lodge a single claim (whatever the type) than both types of claims.
- Workers lodging an impairment benefits claim together with a hearing aids claim received higher impairment benefits payments than those lodging an impairment benefits claim only when they were males, aged under 65 years, employed in the community or transport and storage industries, tradespersons or labourers, and employed in small or large workplaces compared to medium workplaces.
- Hearing aids costs were higher for workers lodging a hearing aids claim together with an impairment benefits claim compared to those who lodged only a hearing aids claim in females, workers employed in manufacturing, transport and storage or trade, and in intermediate workers.

Background

In 2005, it was estimated that one in five Australian adults had hearing loss. Prevalence rates for hearing loss were associated with increasing age and were higher in males (60%) than in females, the gender differences being attributed to differing levels of workplace noise exposure (Access Economics 2006). Hearing loss in adults is commonly caused by the ageing process and excessive noise exposures over a period of time resulting from occupational or recreational noise. Noise induced hearing loss (NIHL) is theoretically preventable, it is however irreversible once acquired as cells in the inner ear are damaged. No treatment can replace or regenerate the cells, resulting in a permanent condition.

Worldwide, the fraction of adult-onset hearing loss attributable to occupational NIHL ranges from 7% to 21% in the various regions of the world with the effects of occupational noise exposure being larger for males than females. In Australia alone, 7% of the disabling hearing loss in adults is attributed to occupational noise (Nelson et al 2005). Occupational hearing loss represents a very significant social and economic burden for Australia. Nationally, an estimated 1 million employees in Australia may be potentially exposed to hazardous levels of noise at work. NIHL is indeed a significant cause for workers' compensation. In 2001-02 alone, it represented 19% of all disease-related claims made in Australia (ASCC 2006).

From a compensation point of view, NIHL claims have some characteristics that differentiate them from other types of claims. As hearing loss is a gradual process, the time between exposure and the date of claim lodgement can vary. Furthermore, a worker is entitled to further benefits payments if deterioration of hearing occurs over time. Workers claiming for a work-related disease receive a range of entitlements, the main ones being weekly income replacement and medical payments (37% and 21% of the costs of general claims respectively). In general claims, impairment payments represent only 6% of the total costs. In contrast, workers with hearing loss do not usually require time off work or medical treatment but hearing aids and impairment benefits payments represent more than 90% of the payments made to hearing loss claimants (38% and 54% of the total cost

respectively) (Evans et al 2009). In 2008, hearing loss claims alone represented 4% of the scheme's claims liabilities.

The recent increase in the number of NIHL claims has raised concern about their costs in the future. Depending on their eligibility, a worker may lodge one claim and/or the other. As impairment benefits and hearing aids provision do not generate the same level of costs, the aim of this analysis was to describe the costs for each type of claim according to demographic and occupational characteristics, to analyse the costs depending on the number of claims and to identify the factors that were related to lodgement of a type of claim or the other or both.

Methods

Population

The source of data was the computerised database of compensation claims of WorkSafe Victoria, the Victorian workers' compensation authority. The population covered by the database includes all Victorian insured workplaces that employ workers but the records exclude Commonwealth employers which are insured through Comcare, as well as sole-traders, self-employed and contractors as they do not have employees. Self-insurers are also excluded as they are approved by WorkSafe Victoria to be liable and manage their own workers' compensation claims.

Two separate datasets were provided, one for each type of claim. Both datasets were merged using a unique identifier which was the claimant identification number. Some workers lodged both an impairment benefits and hearing aids claim. However, because information on industry and occupation was provided at the time of claim lodgement, there could be differences for these variables between both datasets as a worker may have changed employer after lodgement of the first claim.

Analysis was performed on all claims lodged for impairment benefits payments and/or hearing aids provision between 1 July 1998 and 30 June 2009 where the affliction nature code was deafness. This included a total of 7875 claims, comprising 4202 successful (i.e. resulting in a payment) initial impairment benefits claims and 3673 hearing aids claims resulting in provision of hearing aids.

In the group of claimants who lodged both an impairment benefits and a hearing aids claim, the analysis was restricted to those who lodged both claims the same financial year because we wanted to examine demographic and occupational factors together. We thus excluded 272 claimants who did not lodge both claims the same financial year. This resulted in the analysis of 7603 claims that were lodged by 5193 workers, with 1140 hearing aids claims only, 1647 impairment benefits claims only and 2408 claims for both impairment benefits and hearing aids (2 separate claims per worker).

Variables

Each claim was allocated to a particular financial year according to the date the claim was received by the insurer. Age at the time of claim lodgement was provided in the database.

Industry and occupation were recorded according to the employer liable for the claim. The industry in which noise induced hearing loss (NIHL) occurred was classified using the WorkCover Industry Classification (WIC). Industries with small numbers of claims were collapsed in one single category including agriculture, forestry, fishing, and hunting; communication; electricity, gas, and water; mining; public administration; and recreation, personal, and other services.

Occupations at the time of NIHL were categorised according to ASCO 1997. Due to small sample size, advanced, intermediate, and elementary clerical workers were pooled in one single category. In the multivariate analyses, clerical workers, managers, professionals, and associate professionals were further pooled in one single category.

In impairment benefits claimants, workplace size and whole person impairment (WPI) percentage were provided.

Workplace size was categorised using the employer remuneration for all workplaces owned by one business. Workplaces were classified as small (up to \$1 million), medium (\$1-20 million) and large (over \$20 million).

Initial hearing loss claims for impairment benefits are assessed using 'The improved procedure for determination of percentage hearing loss' (1988 Edition) published by the National Acoustic Laboratory (NAL). Pure tone audiometry is performed at 500, 1000, 1500, 2000, 3000, and 4000 Hz frequencies. Frequency thresholds are weighted to obtain six values (one for each frequency) and added to obtain the percentage of binaural loss of hearing. They are corrected for presbycusis if applicable (men aged over 55 and women over 68). This percentage is converted into a percentage of WPI according to percentage of binaural hearing loss following the American Medical Association Guidelines fourth edition. There is a 10% WPI threshold for injuries occurring on or after 12 November 1997, in accordance with the Accident Compensation Act 1985, S91.

Data analysis

Skewness-Kurtosis test was used to test normality for impairment benefits and hearing aids payments, WPI percentage and age.

As both impairment benefits and hearing aids payments had a non-normal distribution, they were expressed as medians and non-parametric tests were used to compare groups. Two-sample Wilcoxon rank-sum (Mann-Whitney) test was used to compare the distribution of payments between two groups and Kruskal-Wallis test was used to compare more than two groups for payments distribution.

WPI percentage and age distributions did not depart from a normal distribution and were expressed as means. A Student's t-test was used to compare two groups for age and one-way analysis of variance was used to compare more than two groups for age. Tests were two-sided and p values smaller than 0.05 were considered significant. A multivariate linear regression model was used to analyse the independent effect of demographic (gender and age) and occupational factors (industry, occupation and workplace size) on WPI percentage. Regression coefficients expressed the increase or decrease in mean WPI percentage for one factor, the other ones been held fixed. Coefficients were considered significant when they were significantly different from the value of 0.

A multivariate logistic regression model was used to analyse the independent effect of gender, age, industry sector and occupation for the likelihood of lodging both types of claims compared to lodging one or the other type of claim (impairment benefits claim or hearing aids claim). The results were expressed as odds ratios and odds ratios were considered significant when their 95% confidence interval excluded the value of 1.

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

Results

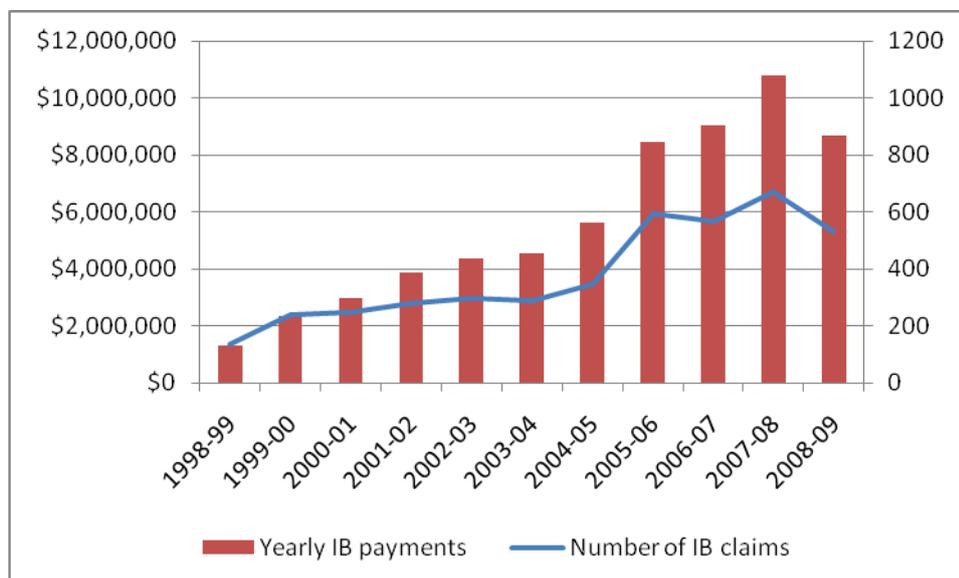
Impairment benefits payments

Analysis was performed on the 4202 successful claims lodged between 1998-99 and 2008-09 and where the affliction nature was deafness.

Overall payments

Yearly impairment benefits costs increased each year over the period from 1998-99 (\$1.33 million) until 2007-08 where the larger annual payment was observed (\$10.76 million). There was a decrease in 2008-09 with a level of payments comparable to that observed in 2005-06. The yearly impairment benefits costs increased faster than the number of claims. While the number of claims increased by less than four times during the 11-year period, the yearly impairment benefits costs increased by 6.5 times during the same period (Figure 1). The detailed figures are in the appendix.

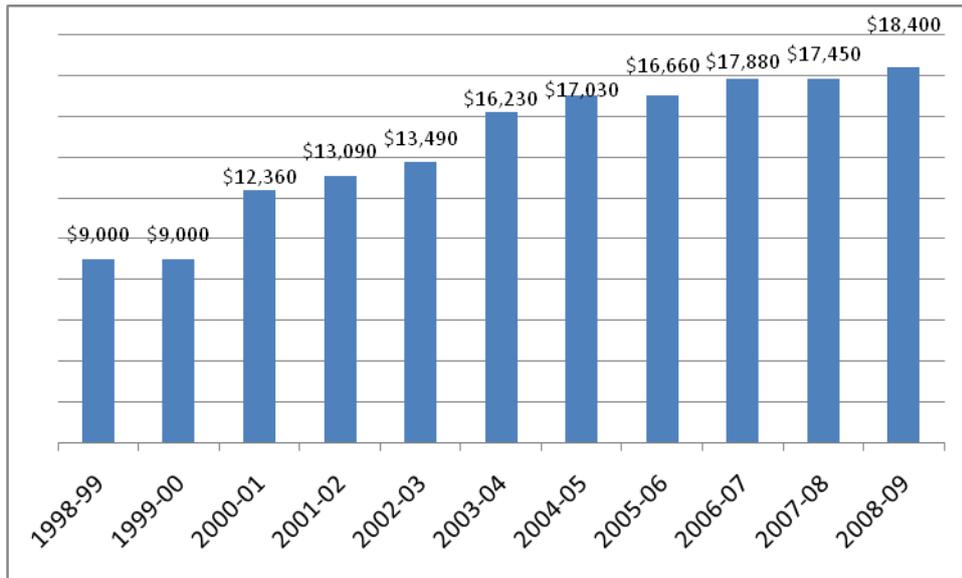
Figure 1. Number of claims and payments for impairment benefits



Overall median impairment benefits payments over the period were \$15,550 and ranged from \$1,000 to \$157,760 (only one payment was over \$50,000).

Median impairment benefits payments doubled over the period from \$9,000 in 1998-99 to \$18,400 in 2008-09 (Figure 2).

Figure 2. Median impairment benefits payments by financial year



Demographic characteristics

Gender

Impairment benefits payments were significantly lower in females compared to males (Figure 3).

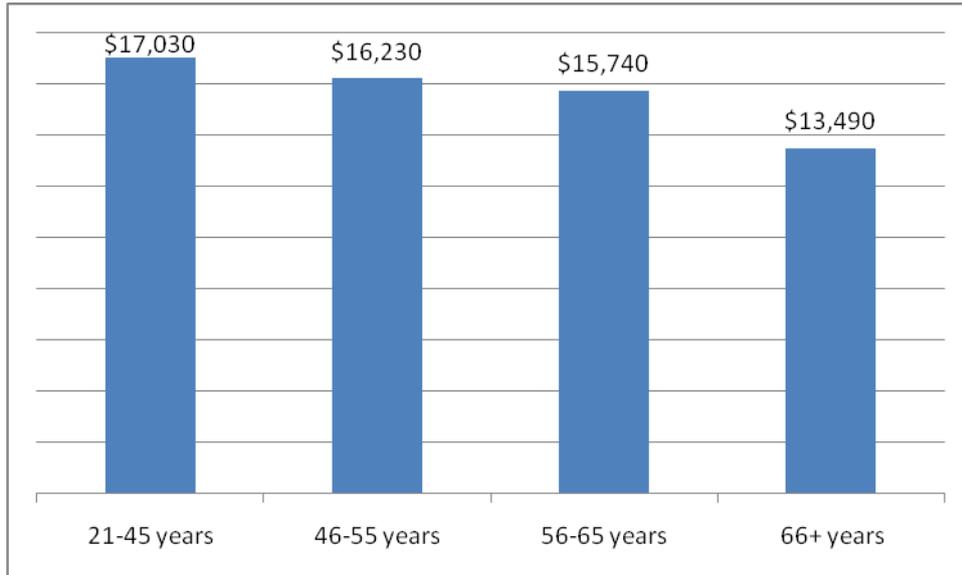
Figure 3. Median impairment benefits payments according to gender



Age

Impairment benefits payments decreased significantly with increasing age. They were 26% higher in claimants aged 21-45 years compared to claimants aged 66 years and above (Figure 4).

Figure 4. Median impairment benefits payments according to age

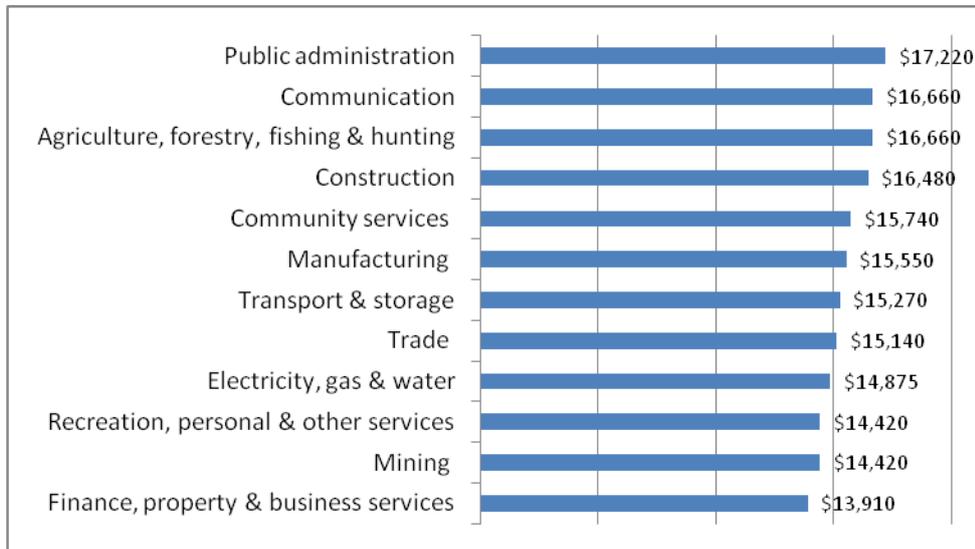


Occupational characteristics

Industry

Public administration received the highest median payments and finance, property and business services the lowest median payments. However, differences in the distribution of impairment benefits payments between industries were not significant (Figure 5).

Figure 5. Median impairment benefits payments according to industry



Occupation

There were significant differences in impairment benefits payments between occupations. Claimants receiving the highest median payments were managers followed by tradespersons. Labourers and related workers received the lowest median impairment benefits payments. Within this range, median payments varied between occupations without any clear pattern related to white-collar or blue-collar type of work (Figure 6).

Clerical workers (n=55) received higher impairment benefits payments when occupying a higher occupational level. Payments were \$17,410, \$15,000 and \$13,490 in advanced, intermediate and elementary clerical workers respectively.

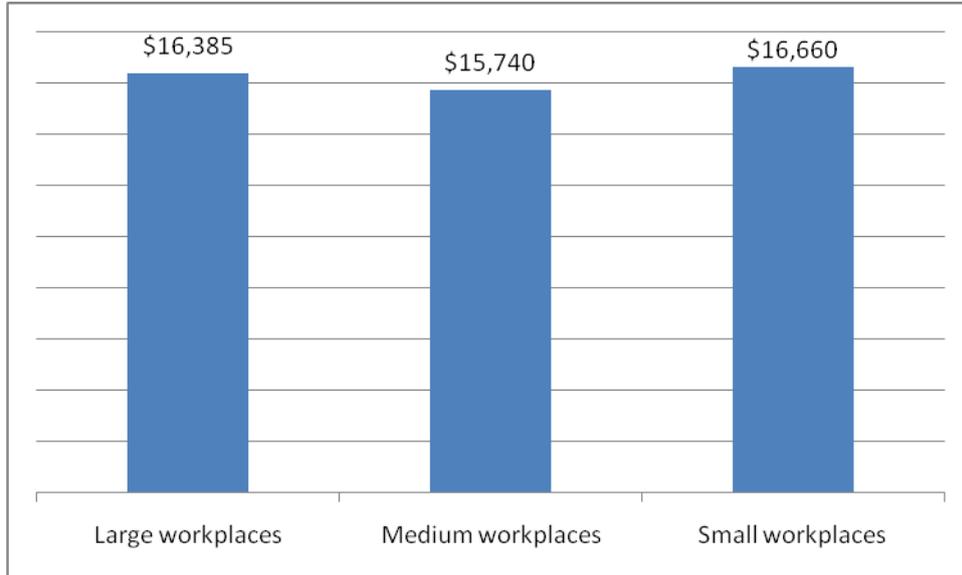
Figure 6. Median impairment benefits payments according to occupation



Workplace size

There were no significant differences in impairment benefits payments between workplaces according to their size (Figure 7).

Figure 7. Median impairment benefits payments according to workplace size



Disability and its determinants in impairment benefits claimants

Three observations with WPI percentages greater than 30% were deleted from the analysis as they departed from the other observations. The deleted observations had WPI percentages of 38%, 48% and 63% respectively.

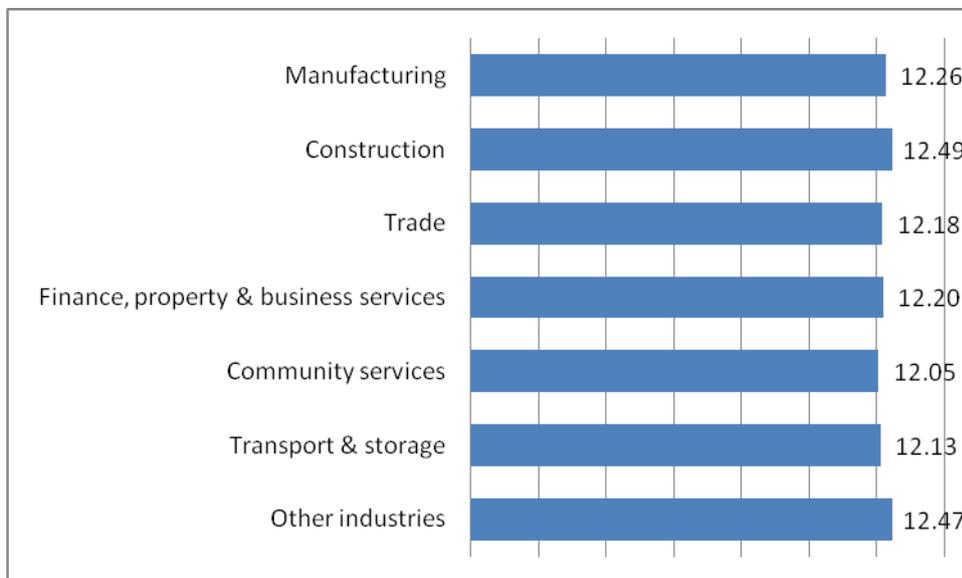
Demographic characteristics

Overall mean WPI percentage was 12.28% and ranged from 0 to 26%. It was significantly higher in males compared to females (12.29% versus 11.87%) and in claimants aged 66 years and above (12.30%), and aged 56-64 years (12.34%) compared to claimants aged 21 to 55 years (12.12%).

Occupational characteristics

Mean WPI percentage differed between industry groups. It was the lowest in community services and the highest in construction followed by industries with lower numbers of claims (Figure 8).

Figure 8. Mean WPI percentage by industry



Mean WPI percentage did not differ between occupations. It increased significantly with decreasing workplace size (12.40%, 12.27% and 12.14% in small, medium and large workplaces respectively).

Multivariate analysis

Multiple regression analysis was performed to identify and quantify the effect of demographic and occupational factors on the degree of disability, expressed by the WPI percentage when other factors are held fixed (Table 1).

Mean WPI percentage was significantly higher in males compared to females and in older claimants compared to claimants aged 21 to 55 years. However, claimants aged 66 years and above had a lower mean WPI percentage than claimants aged 56 to 65 years.

Claimants of all industries except construction had a mean WPI percentage lower than the reference industry group with lower number of claims. Mean WPI percentage did not differ between occupations. It was higher in small workplaces compared to large ones but was not significantly different between medium and large workplaces.

Table 1. WPI percentage according to demographic and occupational factors
(significant coefficients are in bold)

| Factor | Coefficient |
|---|--------------------|
| Gender | |
| Females | Reference |
| Males | 0.37* |
| Age | |
| 21-55 years | Reference |
| 56-65 years | 0.22 |
| 66+ years | 0.17 |
| Industry type | |
| Other industries | Reference |
| Transport & storage | -0.40** |
| Community services | -0.35 |
| Finance, property & business services | -0.30 |
| Trade | -0.33 |
| Construction | -0.05 |
| Manufacturing | -0.26 |
| Occupation | |
| Other occupations | Reference |
| Labourers and related workers | 0.15 |
| Intermediate production & transport workers | 0.15 |
| Tradespersons | 0.16 |
| Workplace size | |
| Large workplace | Reference |
| Medium workplace | 0.11 |
| Small workplace | 0.22 |
| Constant | 11.75 |

* Other factors being held fixed, mean WPI percentage was increased by a value of 0.37% in males compared to females.

** * Other factors being held fixed, mean WPI percentage was decreased by a value of 0.40% in transport and storage compared to other industries with smaller number of claims.

Hearing aids provision costs

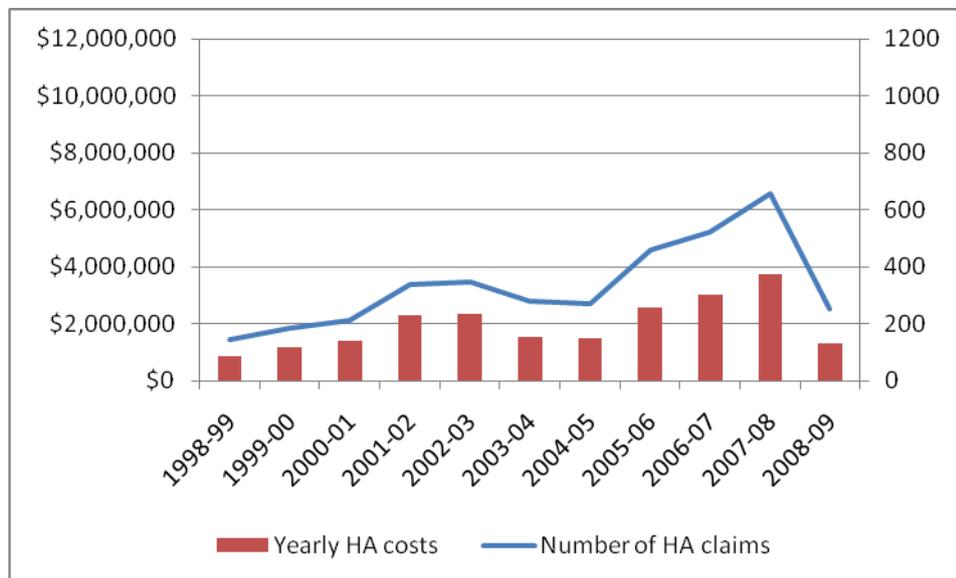
Analysis was performed on the 3673 workers who lodged a claim for hearing aids provision between 1998-99 and 2008-09 and where the affliction nature was deafness.

The same scale as that used for presentation of impairment benefits payments was used in the following Figures.

Overall payments

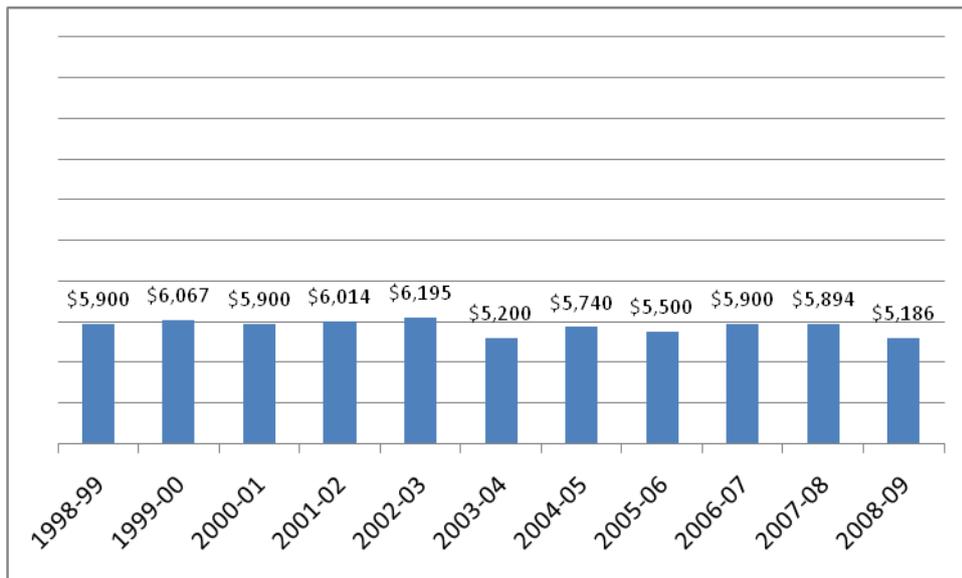
Yearly hearing aids costs increased over the period from 1998-99 (\$0.88 million) until 2001-02 where the annual payment was \$2.30 million. There was then a slow decrease until 2004-05 with a yearly level of payments of comparable to that observed in 2000-01. The yearly hearing aids costs increased in proportion to the number of claims until 2004-05. Afterwards, they increased slightly less rapidly than the annual number of claims. The larger annual hearing aids cost was in 2007-08 (\$3.74 million) (Figure 9). The detailed figures are in the appendix.

Figure 9. Number of claims and payments for hearing aids provision



Overall median impairment benefits payments over the period were \$5,845. Their level was steady until 2002-03, decreased significantly the following year and rose again from 2004-05 onwards. The median payment amount for hearing aids provision was almost the same between the beginning and the end of the period (Figure 10).

Figure 10. Median hearing aids costs by financial year

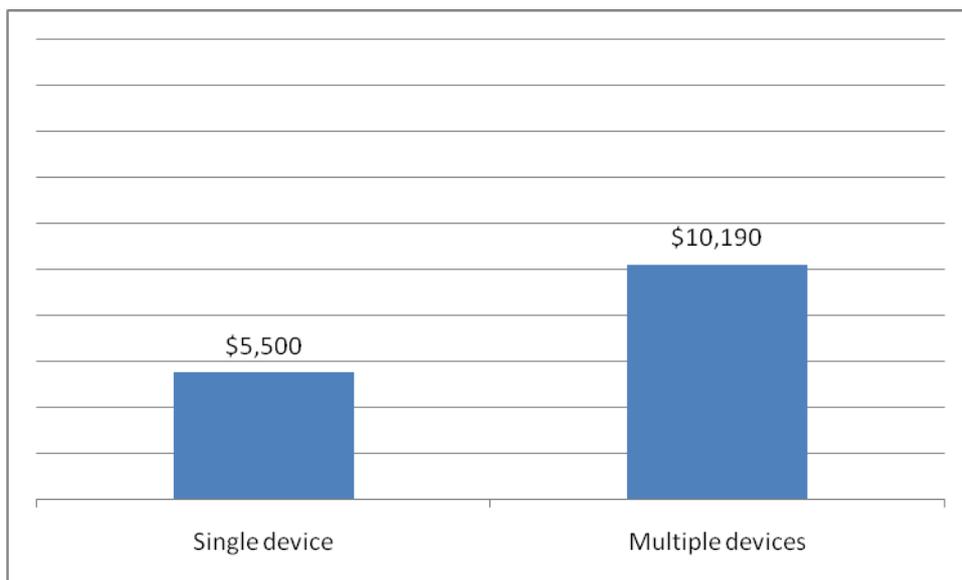


Number of devices provided per claim

Out of the 3673 claims for hearing aids provision, the majority (87.4%, n=3611) was for the provision of one single hearing aid while 12.6% (n=462) were for the provision of multiple hearing aids.

When multiple devices were supplied, the median cost of a claim was twice as high as for the provision of a single hearing aid (Figure 11).

Figure 11. Median claims cost according to the number of hearing aids provided



Females more often than males were provided with single hearing aids (92.3% of females versus 87.1% of males).

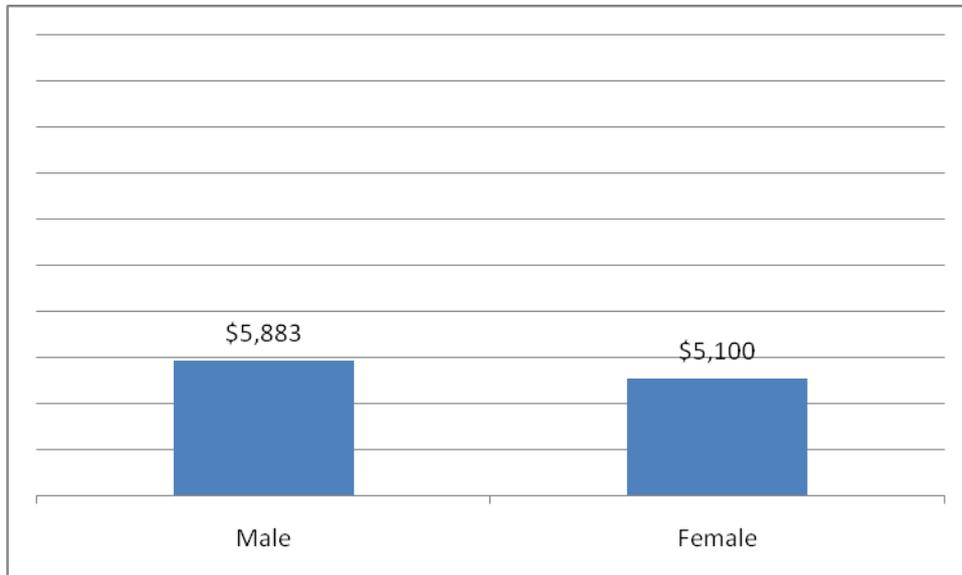
There were no significant differences in the number of hearing aids supplied by claim between age groups, industries or occupation.

Demographic characteristics

Gender

Hearing aids payments were significantly lower in females than in males (Figure 12).

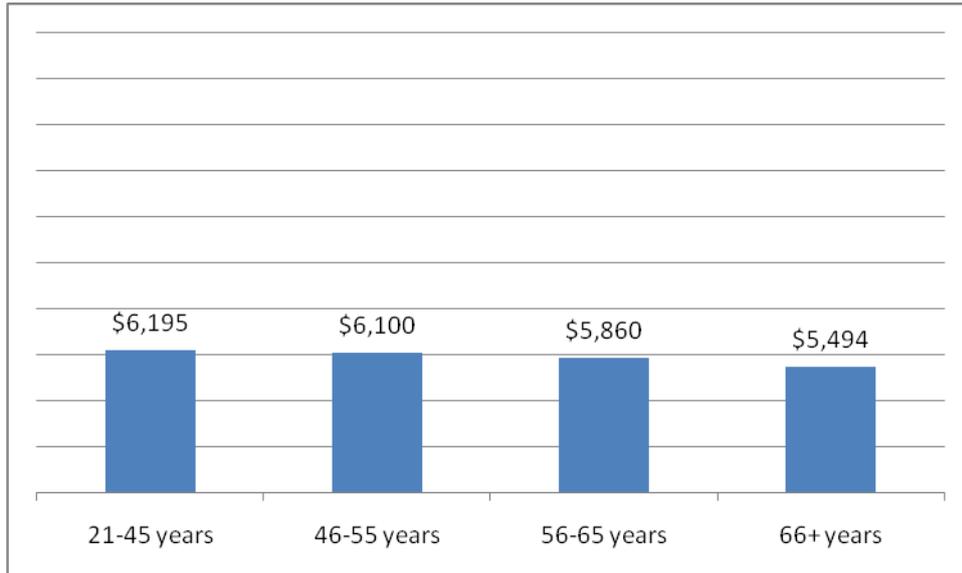
Figure 12. Median hearing aids payments according to gender



Age

Hearing aids costs decreased significantly with increasing age. They were 13% higher in claimants aged 21-45 years compared to claimants aged 66 years and above (Figure 13).

Figure 13. Median hearing aids payments according to age

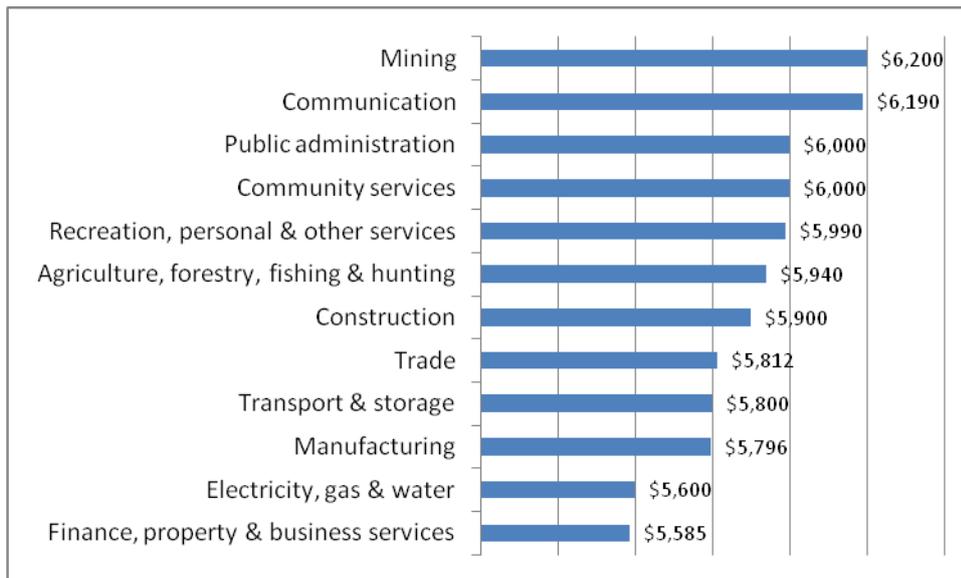


Occupational characteristics

Industry

Mining received the highest median hearing aids payments and finance, property and business services the lowest median payments. However, the differences in costs between industries were not statistically significant (Figure 14).

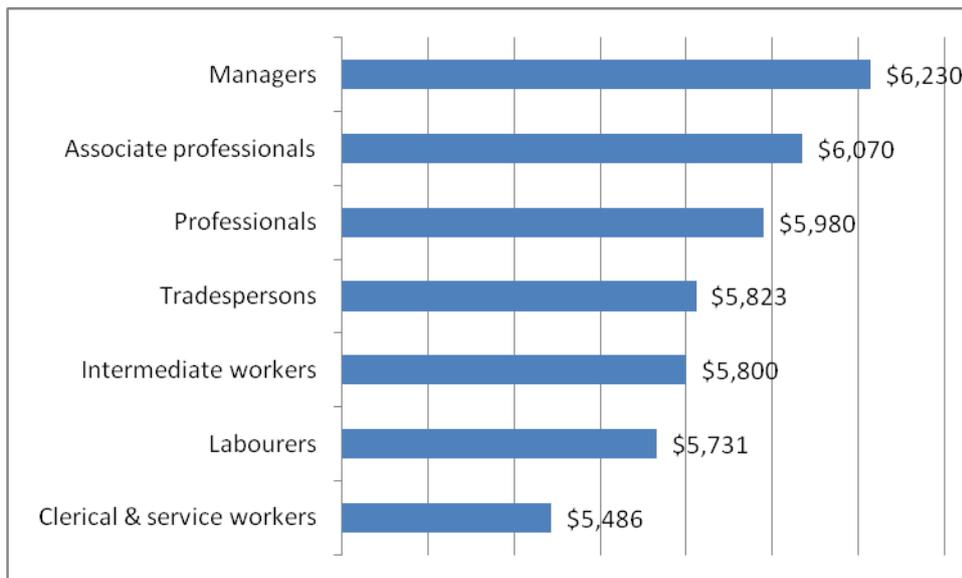
Figure 14. Median hearing aids costs according to industry



Occupation

There were significant differences in hearing aids costs between occupations. Claimants receiving the highest median payments were white-collar workers, the highest payments being in the higher occupation level, i.e. managers. Within blue-collar workers, tradespersons received the highest median payments and labourers and related workers the lowest median payments (Figure 15).

Figure 15. Median hearing aids costs according to occupation



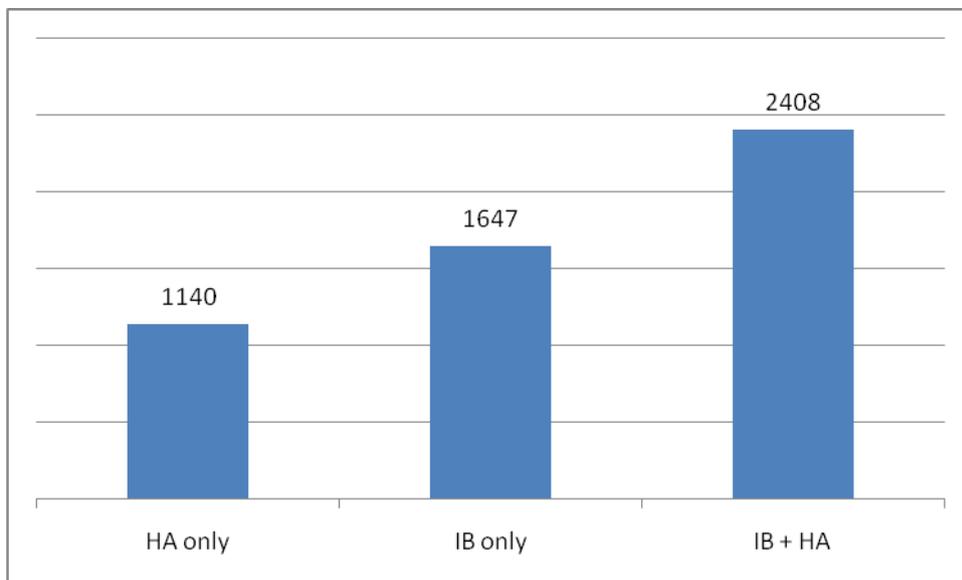
Clerical and service workers received the lowest median impairment benefits payments of all occupation groups. This small (n=34) and heterogeneous category includes advanced, intermediate and elementary workers. Median hearing aids payments were \$4,626, \$5,400 and \$5,854 in advanced, intermediate and elementary clerical workers. Higher level clerical workers attracted lower median payments. This was the opposite of what was observed with impairment benefits claims where higher level clerical workers received higher impairment benefits payments.

Comparison of claimants according to the number and type of claims

Workers more often claimed for both impairment benefits and hearing aids provision (46.4%) than for impairment benefits alone (31.7%) or hearing aids provision alone (21.9%).

Among the 4055 successful impairment benefits claimants, 59.4% also claimed for hearing aids provision while 67.9% of the 3548 hearing aids claimants also claimed for impairment benefits payment (Figure 16).

Figure 16. Number and type of claims



Out of the 1140 hearing aids only claimants, 104 workers had also unsuccessfully lodged an impairment benefits claim the same financial year, resulting in no impairment benefits payment.

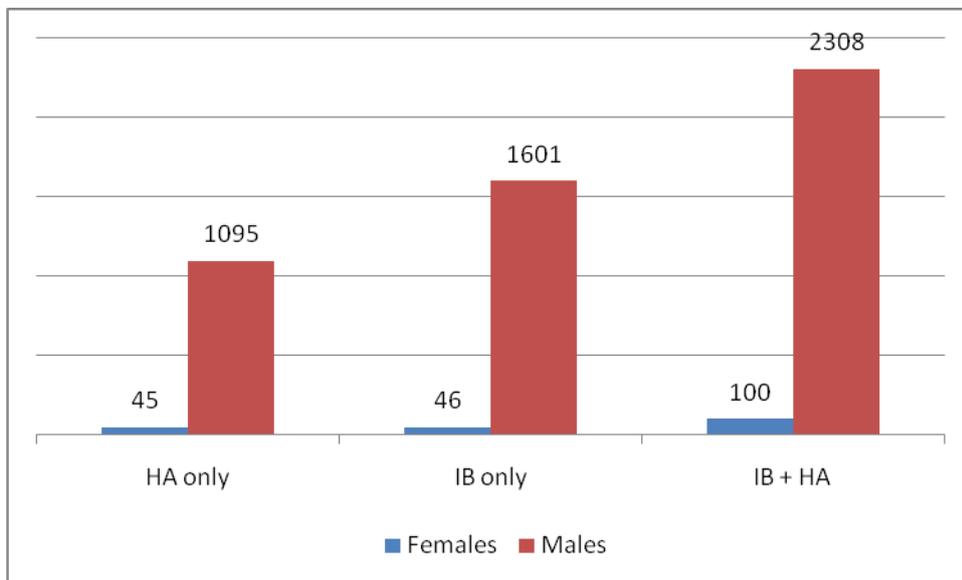
By demographic characteristics

Gender

Females claimed for both impairment benefits payments and hearing aids more often than males (52.3% of females' NIHL claims versus 46.1% of males' NIHL claims).

When lodging a single claim, females claimed in the same proportion for either hearing aids only (23.6% of females' claims) or for impairment benefits payments only (24.1% of females' claims). In contrast, when males lodged a single claim, they more often lodged an impairment benefits claim (32.0% of males' claims) than a hearing aids claim (21.9% of males' claims) (Figure 17).

Figure 17. Number and type of claims according to gender



Age

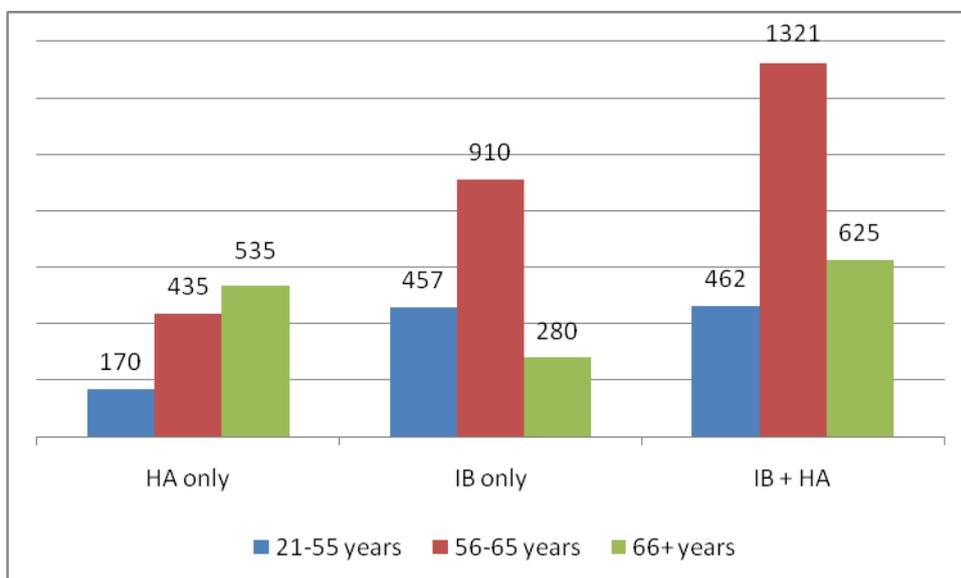
Workers lodging only a hearing aids claim were the claimants with the highest mean age (64.1 years) and those lodging only an impairment benefits claim had the lowest mean age (58.2 years). Mean age of claimants lodging both an impairment benefits and a hearing aids claim was 60.4 years.

Workers aged 56 to 65 years formed more than half of overall claimants (51.3%) as a whole. The overall percentage of claimants aged below 56 years and above 65 years was 21% and 27.7% respectively.

The percentage of workers aged 66 years and above who claimed only for hearing aids (37.1%) was more than twice as high compared to younger workers (16.3% and 15.6% in workers aged 56 to 65 years and workers under 56 years respectively).

The percentage of workers aged 66 years and above who claimed only for impairment benefits (19.4%) was twice as low compared to younger workers (34.1% and 42% in workers aged 56 to 65 years and workers under 56 years respectively) (Figure 18).

Figure 18. Number and type of claims according to age

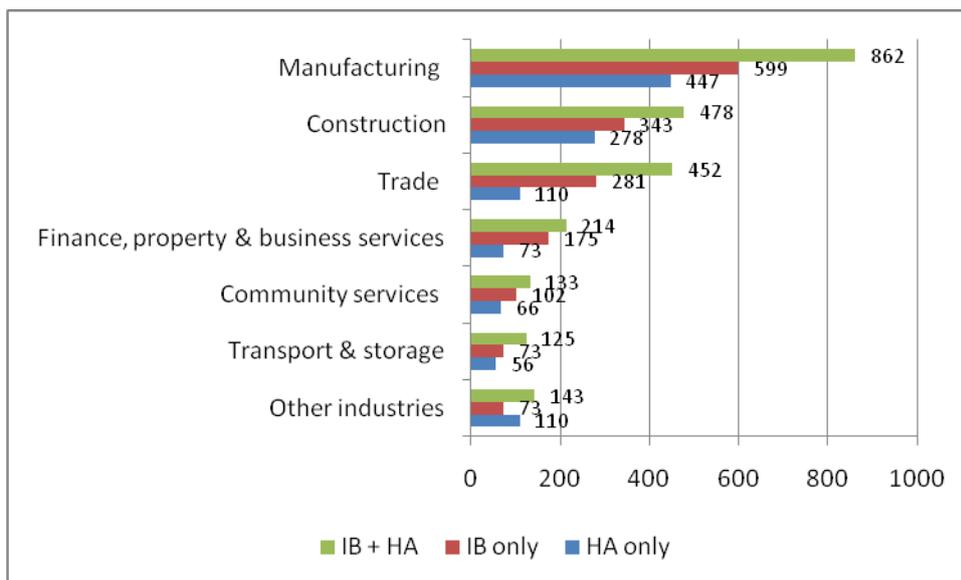


By occupational characteristics

Industry

In industries with higher numbers of claims, workers more often claimed for both impairment benefits payment and hearing aids provision than for one single type of claim. When they lodged one single claim, they lodged an impairment benefits claim more often than a hearing aids claim (Figure 19).

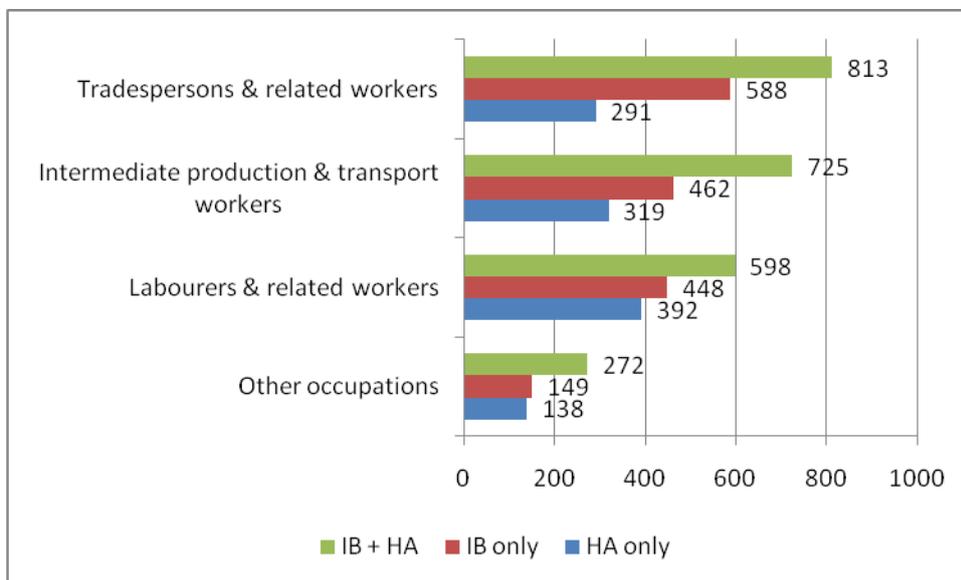
Figure 19. Number and type of claims by industry



Occupation

In all occupation groups, workers more often claimed for both impairment benefits and hearing aids provision than for one single type of claim. In tradesperson, intermediate workers and labourers, when workers lodged one single claim, they lodged an impairment benefits claim more often than a hearing aids claim. In the other occupation groups that are more office-based occupations, the number of single impairment benefits claims was not significantly different from single hearing aids claims (Figure 20).

Figure 20. Number and type of claims by occupation

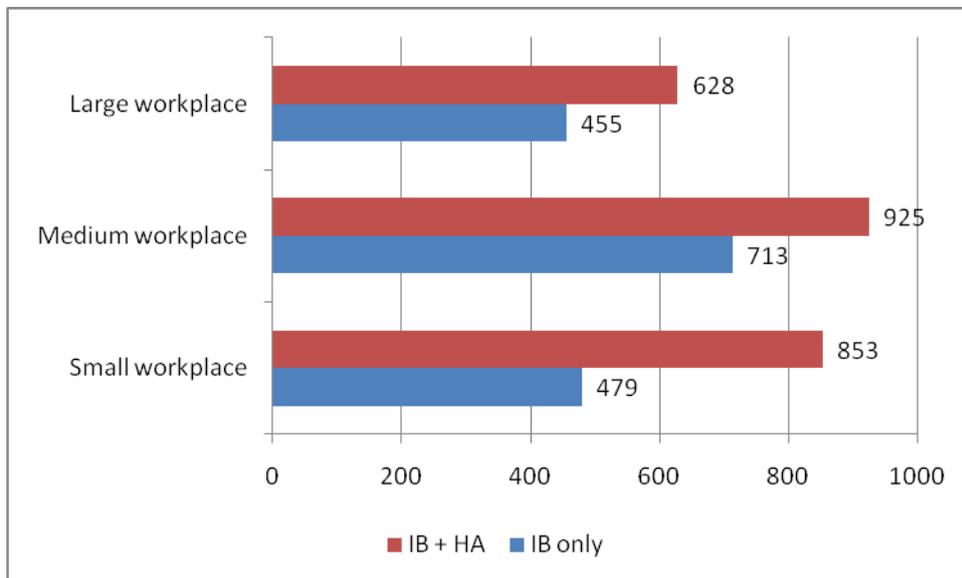


Workplace size

Workplace size defined by the employer remuneration was not provided in the hearing aids dataset. We therefore only present results in impairment benefits claimants.

The percentage of workers who claimed for both impairment benefits payment and hearing aids provision was higher in those employed by small workplaces (65%) compared to workers employed by medium and large workplaces (56.5% and 58% respectively) (Figure 21).

Figure 21. Number and type of claims by workplace size



Multivariate analysis

Determinants of impairment benefits only claims

Two multivariate models were used (Table 2). Model 1 model included the workplace size as this information was provided in the impairment benefits claims dataset. In comparison to Model 1, odds for the factors other than workplace size did not change in magnitude in Model 2.

When taking demographic and occupational factors into account together, three factors increased significantly the odds of claiming for both impairment benefits and hearing aids rather than for impairment benefits payments only, i.e. being a female, higher age and small workplace size.

Compared to females, males were 1.5 times less likely to lodge both types of claims rather than an impairment benefits claim only. Impairment benefits claimants aged 66 years and above were more than twice more likely than claimants aged 21 to 55 years to also lodge a hearing aids claim. Claimants working in small workplaces were 1.3 times more likely than those working in large workplaces to lodge the two types of claims. These results are consistent with the univariate analyses shown above.

Compared to industries with lower numbers of claims, workers employed in the two industries with the highest number of claims (i.e. manufacturing and construction) were 1.4 times less likely to also claim for hearing aids when claiming for impairment benefits.

Tradespersons and labourers were respectively 1.3 and 1.4 times less likely than office-based occupations to claim for hearing aids together with impairment benefits.

Table 2. Likelihood of lodging both an impairment benefits and hearing aids claim compared to lodging an impairment benefits claim only (significant odds ratios are in bold)

| Comparison to claimants lodging an impairment benefits claim only | Model 1 | Model 2 |
|---|--------------|--------------|
| Gender | | |
| Females | Reference | Reference |
| Males | 0.66* | 0.66* |
| Age | | |
| 21-55 years | Reference | Reference |
| 56-65 years | 1.45 | 1.47 |
| 66+ years | 2.19 | 2.22 |
| Industry type | | |
| Other industries | Reference | Reference |
| Transport | 0.84 | 0.85 |
| Community services | 0.67 | 0.64 |
| Finance, property & business services | 0.62 | 0.62 |
| Trade | 0.81 | 0.81 |
| Construction | 0.72 | 0.75 |
| Manufacturing | 0.73 | 0.73 |
| Occupation | | |
| Other occupations | Reference | Reference |
| Labourers and related workers | 0.72 | 0.71 |
| Intermediate production & transport workers | 0.84 | 0.82 |
| Tradespersons | 0.75 | 0.76 |
| Workplace size | | |
| Large workplace | Reference | -- |
| Medium workplace | 0.96 | -- |
| Small workplace | 1.27 | -- |

* The odds of claiming for impairment benefits only compared to claiming for both impairment benefits and hearing aids were increased by 1.52 (=1/0.66) in males compared to females.

Determinants of hearing aids only claims

Results are presented in Table 3.

Gender, age and industry did not modify the odds of lodging both types of claims compared to lodging only a hearing aids claim.

Only two occupations significantly modified the odds of lodging both types of claims compared to lodging only a hearing aids claim. Labourers were 1.3 times less likely to lodge both types of claims compared to lodging only a hearing aids claim. To the contrary, tradespersons were 1.4 times more likely to lodge both types of claims rather than only a hearing aids claim.

Table 3. Likelihood of lodging both an impairment benefits and hearing aids claim compared to lodging a hearing aids claim only (significant odds ratios are in bold)

| | Likelihood of lodging both types of claims versus lodging a hearing aids claim only |
|---|---|
| Gender | |
| Females | Reference |
| Males | 1.12 |
| Age | |
| 21-55 years | Reference |
| 56-65 years | 1.03 |
| 66+ years | 1.16 |
| Industry type | |
| Other industries | Reference |
| Transport & storage | 1.28 |
| Community services | 0.90 |
| Finance, property & business services | 0.72 |
| Trade | 0.83 |
| Construction | 0.85 |
| Manufacturing | 1.12 |
| Occupation | |
| Other occupations | Reference |
| Labourers and related workers | 0.75* |
| Intermediate production & transport workers | 1.07 |
| Tradespersons | 1.37** |

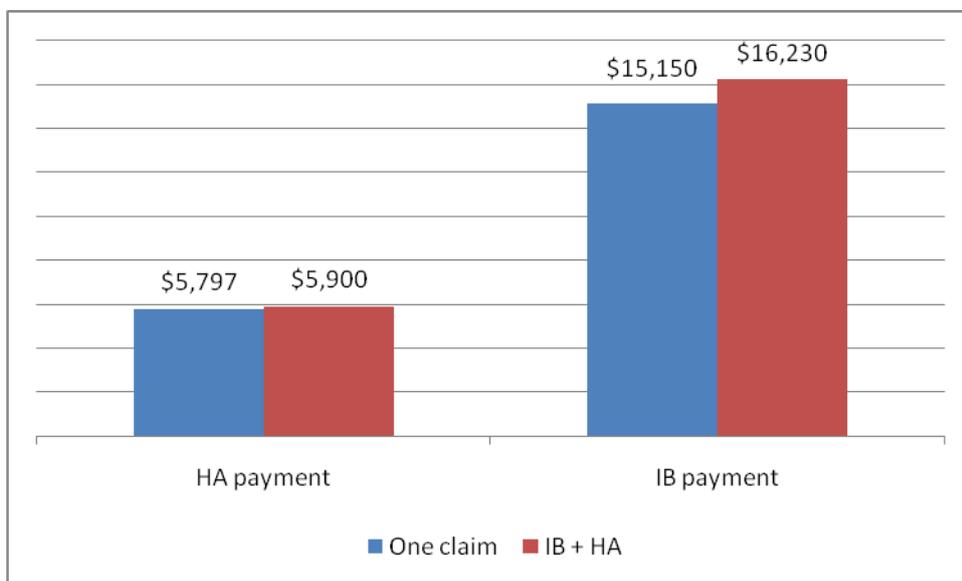
* The odds of claiming for hearing aids provision only compared to claiming for both impairment benefits and hearing aids were increased by 1.3 (1/0.75) in labourers compared to office-based occupations.

Claims costs according to the number and type of claims lodged

Impairment benefits payments were significantly higher in workers claiming for both impairment benefits and hearing aids compared to workers claiming for impairment benefits payment only (median payment of \$16,230 in workers lodging both types of claims versus \$15,150 in workers lodging only an impairment benefits claim).

There were no significant differences in hearing aids costs between workers lodging both types of claims and those lodging only a hearing aids claim (Figure 22).

Figure 22. Claims costs according to the number of claims



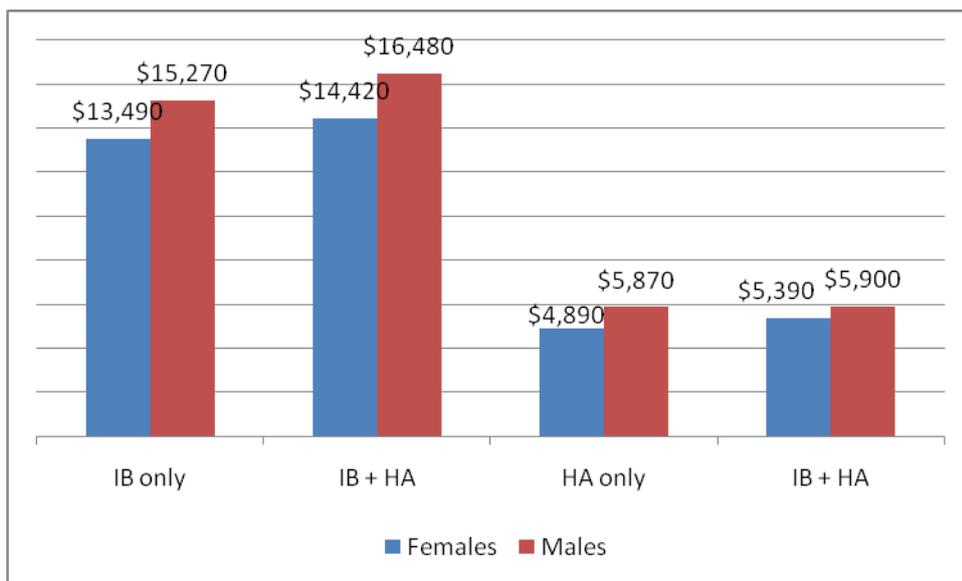
Demographic characteristics

Gender

Median payments were lower in females than in males for both impairment benefits and hearing aids provision. The differences were significant for hearing aids where females had lower payments than men regardless of an associated impairment benefits claim.

In females, hearing aids costs were significantly lower when claiming for hearing aids provision only compared to claiming for both types of compensation while in males, impairment benefits payments were significantly lower when claiming for impairment benefits only compared to claiming for both types of compensation (Figure 23).

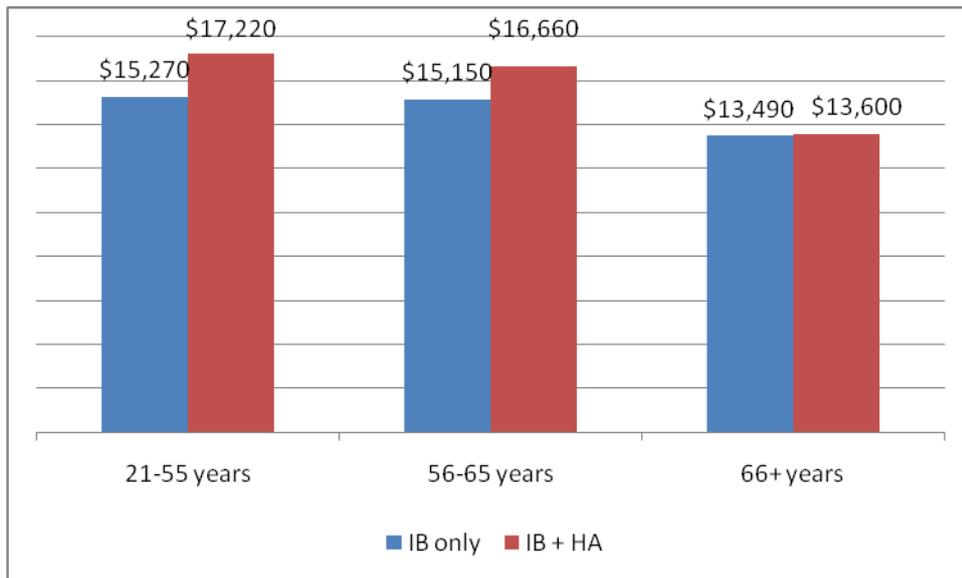
Figure 23. Claims costs according to gender



Age

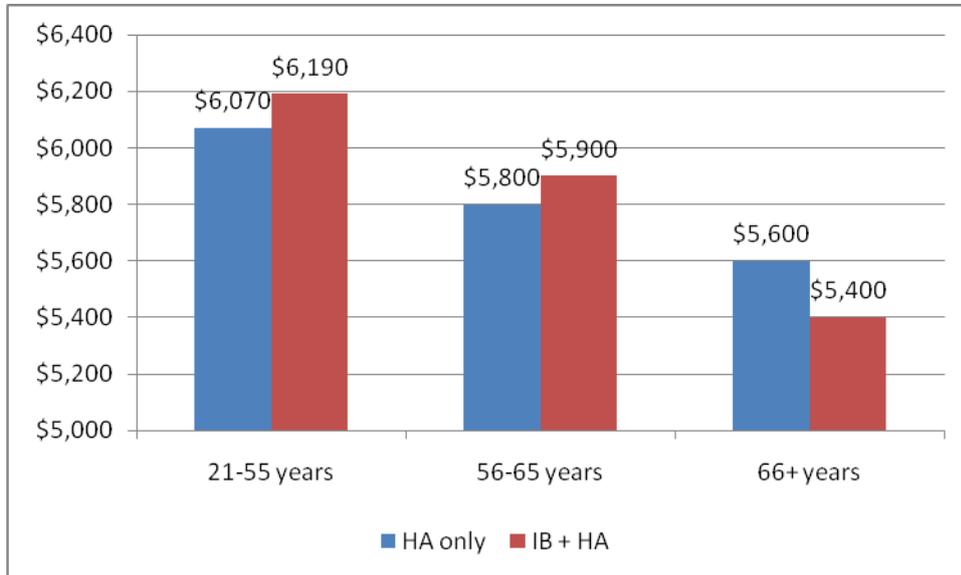
In workers claiming for both impairment benefits and hearing aids, impairment benefits payments and hearing aids costs decreased significantly with increasing age (Figures 24 and 25). However in workers aged 65 years and below, impairment benefits payments were significantly higher in those claiming for both types of claims compared to those claiming for impairment benefits only (Figure 24).

Figure 24. Impairment benefits payments according to age



In each age group, there were no significant differences in hearing aids costs between those lodging both types of claims and those lodging a single hearing aids claim (Figure 25).

Figure 25. Hearing aids costs according to age

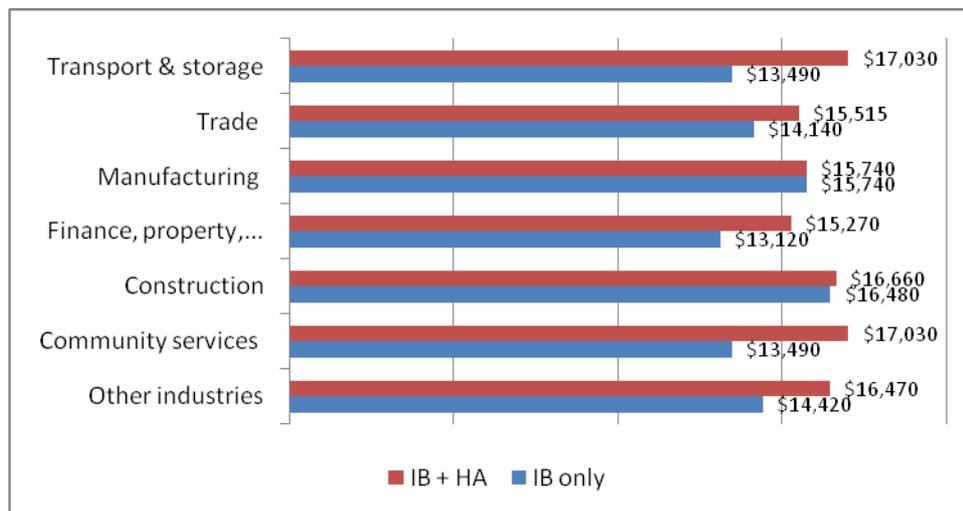


Occupational characteristics

Industry

In trade, community services, and transport and storage, impairment benefits payments were higher in the group lodging both types of claims compared to the group lodging an impairment benefits claim only. However, these differences were not significant (Figure 26).

Figure 26. Impairment benefits payments according to industry



In hearing aids only claimants, hearing aids costs varied significantly between industries, with higher costs in community services and lower costs in transport and storage. In manufacturing, transport and storage and in trade, hearing aids costs were significantly lower in workers claiming for hearing aids only compared to those lodging both types of claims (Figure 27).

Figure 27. Hearing aids costs according to industry

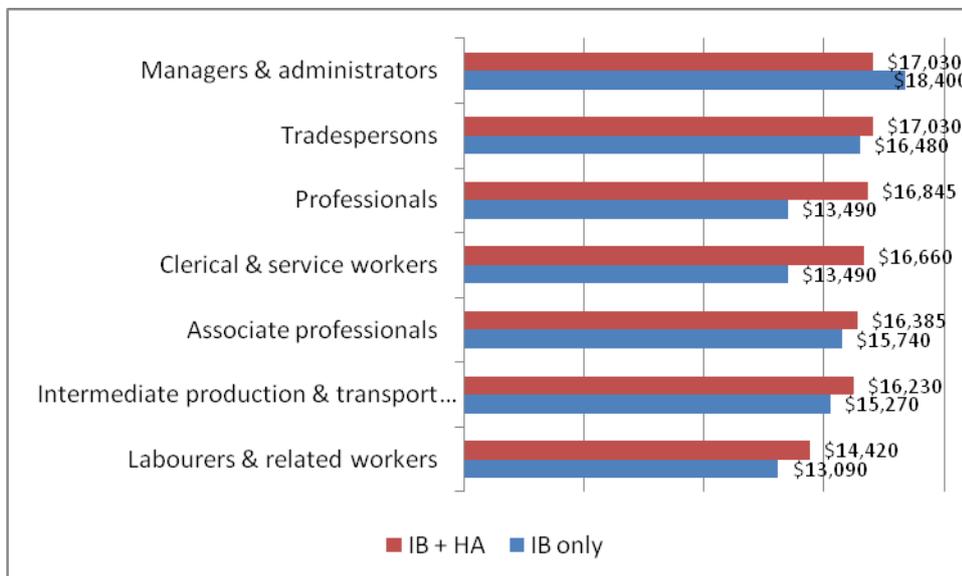


Occupation

There were significant differences for impairment benefits payments between occupations in both workers claiming for both types of compensation and those claiming for impairment benefits only. In both groups, labourers received the lowest payments and managers received the highest payments.

Tradespersons and labourers were the two only occupations where impairment benefits payments were significantly lower in impairment benefits only claimants (Figure 28).

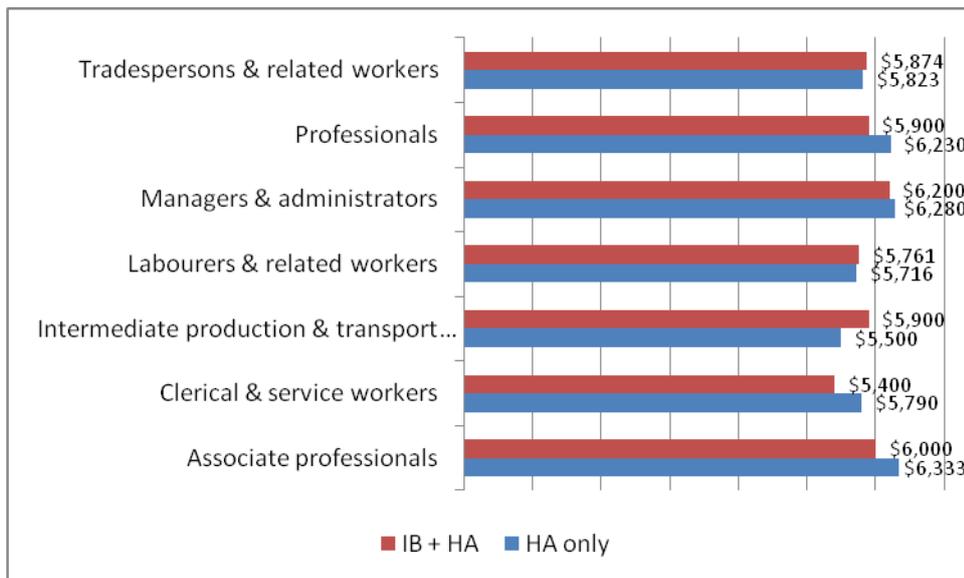
Figure 28. Impairment benefits payments according to occupation



Hearing aids costs differed significantly between occupations in the group of workers who lodged both types of claims. The highest costs were in managers and the lowest costs in clerical workers.

In intermediate workers only, hearing aids costs were higher in those who lodged both types of claims compared to those who lodged only a hearing aids claim (Figure 29).

Figure 29. Hearing aids costs according to occupation

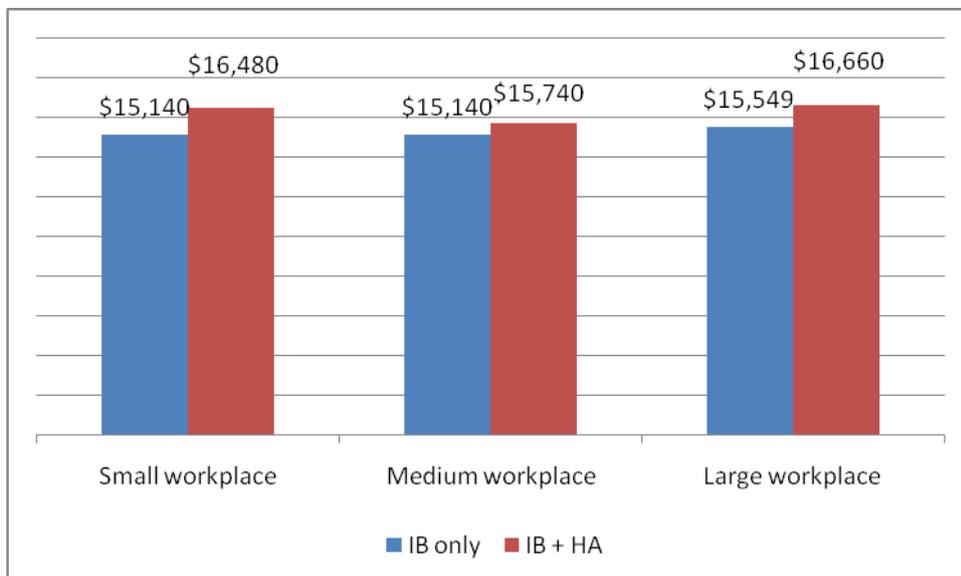


Workplace size

There were no significant differences in impairment benefits payments between workplaces according to their size within both groups of workers claiming only for impairment benefits and those claiming for impairment benefits payment together with hearing aids provision.

Impairment benefits payments were higher in workers claiming for both types of claims than in those claiming for impairment benefits payments only. This difference was however not significant between medium workplaces (Figure 30).

Figure 30. Impairment benefits payments according to workplace size



Limitations

In both impairment benefits payments and hearing aids claims but particularly in hearing aids claims, there was a decrease in the number and in the yearly cost of claims during the last financial year which was not in line with the rise observed in the previous years. Figures for 2008-09 may be underestimated as there may be a gap of several months between claim lodgement and its resolution. Consolidated data will confirm whether there is a true decline.

Compensation payments are paid if the hearing loss converted to an impairment percentage is at or above a minimum WPI threshold. We did not have access to the actual hearing threshold for each frequency of interest. The WPI percentage is not readily convertible to hearing loss in decibels and the clinical significance of small differences in mean WPI percentage between groups may not be easy to grasp.

In these analyses, we identified factors associated with the likelihood of lodging both an impairment benefits and a hearing aids claim compared to lodging only an impairment benefits claim or only a hearing aids claim. Analyses were conducted using either the variables of the impairment benefits dataset (to compare impairment benefits claims versus both types of claims) or the variables of the hearing aids dataset (to compare hearing aids claims versus both types of claims). In both logistic regression analyses, the variables of interest were those coded in the dataset at the time of the impairment benefits claim lodgement. There were slight differences in age, occupation and industry for the same claimant between the impairment benefits and the hearing aids claims datasets. To avoid larger discrepancies and because the aim was to identify factors of interest at the time of lodgement of both types of claims, we limited the analyses to those claimants who lodged both types of claims the same financial year, eliminating 272 claimants who did lodge their claims at different periods.

We were not able to compare workers who lodged only an impairment benefits claim with those who lodged only a hearing aids claim. This is because the data was provided in two separate datasets that were merged.

Discussion

Determinants and costs according to the type of claim lodged

People with a work-related NIHL are entitled to be paid impairment benefits and/or reasonable costs of hearing services and devices. Each entitlement is conditioned to lodging a separate claim. Workers may lodge one or the other type of claim or both. Impairment benefits payments are made to compensate for irreversible health deterioration caused by work. While a 10% whole person impairment is required to be eligible for impairment benefits payment, there is no threshold for entitlements for hearing aids. However, provision of hearing devices is subject to the assessment by an audiologist or audiometrist of the worker's hearing (air and bone conduction audiometry) and of communication goals (for example understand speech in background noise, to hear the television or to hear another person from a distance).

Impairment is measured by the hearing threshold converted to a WPI percentage but it is different from hearing disability which is functional. The WPI percentage reflects the severity of hearing loss. A worker may have hearing loss that is sufficient to entitle them to impairment benefits payment but they may not be eligible for hearing aids provision if they are able to communicate appropriately and can hear sounds in their everyday life. A worker can also have functional hearing loss and not meet the criteria for impairment benefits payment. This can depend on the frequencies at which the hearing loss has occurred. Our results showed that only a small number of unsuccessful claimants for impairment benefits claimed for hearing aids. This may mean that while these workers did not meet the criteria for impairment benefits payments, they may however suffer from communication disturbance that were sufficient for them to benefit from hearing aids.

A worker's decision to apply for hearing aids provision may be driven by disability caused by impaired communication and particularly difficulty in understanding a conversation or by limitations in social life (Poshnoi et al 2004). A hearing loss threshold of at least 25 dB has been found to cause a disability or handicap (Giordano et al 2008). Our analysis suggests that age is a major determinant for lodging a hearing aids claim. Older workers were more likely to lodge a hearing aids claim either alone or together with an impairment benefits claim. This can be partly explained by the addition of NIHL and deterioration of hearing with age. The

combination of both causes of hearing loss reaches a level where communication becomes problematic and leads the worker to seek hearing aids provision.

Prolonged noise exposure together with the effects of aging may result in increased hearing loss with involvement of additional frequencies (ACOEM 2003).

Almost half the claimants lodged both an impairment benefits and a hearing aids claim. Claimants lodging both types of claims were more likely than those who lodged an impairment benefits claim only to be females, older workers and to work in small workplaces. They were however less likely to work in the two industries with higher incidence rates, i.e. manufacturing and construction. Labourers were more likely to lodge one single claim whatever the claim. This may be due to a lack of information about entitlements in relation to occupational hearing loss in high risk industries mainly employing low skilled workers. This underlines the fact that this category of workers may also have a weak knowledge of exposure to occupational noise and its consequences on health.

Claims costs

In the Victorian compensation scheme, median impairment benefits payments doubled over the eleven-year period. Impairment benefits payments are indexed on annual inflation. This increase is likely to be due to increasing living costs and is in line with national data that showed that between 1998-99 and 2007-08, total health expenditure has been multiplied by 2.1 (AIHW 2009). On the other hand, over the eleven-year period, the median cost for hearing aids provision and management was \$5,845 and did not vary greatly over time. The outcome of most claims was the provision of one single hearing aid with a median cost of \$5,500 but when multiple devices were supplied, the median cost of a claim was twice as high as for the provision of a single hearing aid (\$10,190). No information was provided on the type of hearing aid supplied but fast improving hearing aids technology and concurrence between providers may have kept prices steady.

NIHL is a bilateral sensori-neural damage and usually symmetrical. Speech is better understood when two ears are combined, rather than with each ear separately. Two ears are required to determine the location of a voice and to discriminate it from background noise. Whenever possible, treatment for hearing impairment involves providing the best possible hearing to each ear (O'Leary et al 2008). However in the

Victorian compensation scheme, the majority of claimants were provided with a single hearing device. An evaluation of the benefits of using a single hearing aid versus bilateral hearing aids in terms of improved disability and communication would help target appropriate rehabilitation outcomes.

Surprisingly, our analysis found that the cost of each type of claim could be significantly different depending on the number of claims lodged and on demographic and occupational factors. The amount of impairment benefits payments is objectively set after conversion of the measured hearing thresholds to an impairment percentage. On the other hand, hearing aids provision needs are assessed in a more subjective way, communication goals being an important component of this assessment. Other factors could explain differences in costs but we could not explore this further with the information provided.

Apart from the compensation scheme that pays for hearing services in relation to occupational hearing loss, adults of working age are provided the same services through the free market while patients aged 65 years and above are mainly provided with hearing aids services through the Office of Hearing Services. The price of one single device in the private market in 2005 was estimated to be \$2,500 and the estimated cost of batteries and device maintenance was \$137 per person per year (Access Economics 2006). This cost is twice as low in the rest of the health sector as in the Victorian compensation scheme.

Both the Government Hearing Services Program and WorkSafe Victoria publish a fee schedule for the provision of hearing services by contracted providers. Assessment, fitting, hearing device and maintenance costs are included in both schemes. However, description of services by item is different from one scheme to the other. It was therefore difficult to compare them. For example in the WorkSafe scheme, hearing review and/or device maintenance is payable to the audiologist or audiometrist on an hourly basis with a maximum of 7 hours paid over a period of 5 years. The Government Hearing Program includes rehabilitation in fitting services. When adding all the services in each scheme, the total sum does not equate to the median costs of hearing aids claims. Other costs that are not shown in the fee schedule may be included in the total claim costs.

Whichever the scheme, annual costs will depend on the number of persons suffering from hearing disability who apply for hearing aids provision, and the number of hearing aids per person as well as costs of hearing services.

Estimated prevalence of hearing loss

Our analyses showed a higher mean WPI percentage and increased odds of claiming for both impairment benefits and hearing aids provision in older claimants and in small workplaces. These workers had higher hearing loss thresholds compared to younger workers and workers employed in larger workplaces. Males had a higher mean WPI than females but they less often than females claimed for both impairment benefits and hearing aids provision.

National prevalence data consistently reported an increase in prevalence of hearing loss with age and higher rates in males compared to females as found in the Victorian compensation claims data. However, national data take into account hearing loss due to any cause and do not differentiate NIHL from other causes.

According to the Victorian arm of the 2007-08 National health Survey (NHS), 278,000 males and females aged 25 to 64 years and 211,000 persons aged 65 years and above reported partial or complete deafness (ABS 2009). Hearing loss prevalence in Australia has also been reported based on audiometric measurement and the level of hearing loss reported was taken as an average of the threshold in three frequencies (500 Hz, 1,000Hz and 2,000 Hz) and measured hearing loss severity was defined as mild (greater or equal to 25 dB and less than 45dB), moderate (greater or equal to 45 dB and less than 65dB) or severe (greater or equal to 65 dB) (Access Economics 2006). In 2005, there were an estimated 2.6 million Australians with hearing loss causing disability. This represented 12.9% of the population with hearing loss greater or equal to 25 dB and approximately 2% experience considerable disability with losses greater or equal to 45 dB or worse. Almost two-third (62%) of Australian adults with hearing loss were males. 72.4% were aged over 60 years with 42.6% aged 70 years or more (Access Economics 2006). This compares with the prevalence of 16.6% of a representative South Australian adult population with measured mild hearing loss in the better ear (Wilson et al 1999).

No national prevalence data on hearing loss in small workplaces was available but the National Hazard Exposure Worker Surveillance (NHEWS) survey reported that workers employed by small workplaces were less likely to report noise control measures when they were exposed to noise (Safe Work Australia 2010). This is also consistent with Victorian impairment benefits claims data that showed higher incidence rates in small workplaces particularly in high risk industries such as manufacturing and construction.

Conclusion

There were gender and occupational differences in behaviours in regards to compensation claim lodgement. Particularly, low skilled workers employed in industries with the highest NIHL incidence rates (i.e. manufacturing and construction) were those less likely to apply for hearing aids. This highlights differences in access to appropriate management of NIHL and the need for targeted information on treatment options and entitlements.

Analysis of compensation claims costs for NIHL in Victoria showed differences in median impairment benefits payments and costs of hearing aids services between workers according to their demographic and occupational characteristics. Females and older workers were more likely to receive significantly lower payments. This result needs further investigation.

Hearing aids costs were higher than those reported in the rest of the health sector. This highlights the need for further evaluation of services provided in the compensation scheme and their costing.

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Appendix

Table 4. Number of claims and yearly payments for each type of claim

| | Impairment benefits claims | | Hearing aids claims | |
|---------|----------------------------|--------------|---------------------|-------------|
| | Number | Yearly cost | Number | Yearly cost |
| 1998-99 | 138 | \$1,326,913 | 146 | \$880,761 |
| 1999-00 | 240 | \$2,343,937 | 186 | \$1,182,138 |
| 2000-01 | 249 | \$2,971,120 | 213 | \$1,397,846 |
| 2001-02 | 281 | \$3,890,967 | 339 | \$2,298,069 |
| 2002-03 | 297 | \$4,378,222 | 348 | \$2,338,894 |
| 2003-04 | 289 | \$4,534,286 | 278 | \$1,555,444 |
| 2004-05 | 345 | \$5,629,340 | 272 | \$1,501,764 |
| 2005-06 | 595 | \$8,467,385 | 460 | \$2,571,249 |
| 2006-07 | 568 | \$9,040,302 | 522 | \$3,040,124 |
| 2007-08 | 669 | \$10,800,000 | 656 | \$3,744,715 |
| 2008-09 | 531 | \$8,664,003 | 253 | \$1,297,871 |

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