

Deaf people's employment and workplaces – similarities and differences in comparison with a reference population

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This study aims to describe and analyze the characteristics of deaf people in employment and their workplaces in Sweden. A population of 2144 people born 1941–80 who attended a school for the deaf was compared to 100,000 randomly chosen individuals from the total Swedish population born 1941–80. Data on these persons consisted of registered information from the year 2005. Results showed that there are differences between the workplaces of people in the deaf and the reference population. For instance, deaf people were more commonly employed in the public sector. People in employment showed similar findings in both populations concerning sex, age and level of educational attainment: the higher the level of educational attainment, the higher the employment rate. However, deaf people more often had a higher level of educational attainment than was required for their occupation, which is an indication of discrimination in the labour market.

Keywords: deaf; employment; workplace; occupation level; Sweden

Introduction

According to the United Nations (UN), all people should have equal rights. This right is further stressed for people with disabilities in the UN convention on the rights of persons with disabilities, for instance regarding the right to work:

States Parties recognize the right of persons with disabilities to work, on an equal basis with others; this includes the right to the opportunity to gain a living by work freely chosen or accepted in a labour market and work environment that is open, inclusive and accessible to persons with disabilities. (United Nations 2006)

The Member States of the European Union also find employment important and have signed this UN convention. In Sweden, the importance of employment is further demonstrated by a law that requires individual adjustments of working conditions to be carried out by the employer (Swedish Work Environment Authority 2009). Several countries have difficulty living up to these rights for people with impairments (EIM Business and Policy Research 2001; Greve 2009). For instance, it is reported that deaf people have lower employment rates than hearing people in Denmark and Sweden (Anon 2006; Rydberg, Coniavitis Gellerstedt, and Danermark, 2010).

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This study focuses on deaf persons in Sweden and describes and compares the employed individual and his/her workplace with respect to people in a reference population. To be defined as deaf in this study, a person must have a hearing loss or deafness from an early age and to have attended a school for deaf people.

Previous studies about deaf people in employment and their workplaces

The workplaces of deaf people

Knowledge about deaf people and the labour market is limited (for a review, see Danermark 2004). In the case of the workplaces of deaf people, studies have been conducted on the work environment, such as on communication and accommodations at workplaces (see for instance Backenroth 1997; Geyer and Schroedel 1999; Foster and MacLeod 2003), although these aspects are not central to this study. Only one study was found to deal with aspects central to this study: Anon (2006) reports that deaf people to a higher extent than hearing people are employed in the public sector in Denmark. The author does not further discuss why this is the case.

Deaf people in employment

There are some studies that describe deaf employed people. For instance, Anon (2006) indicates that deaf men are more often in employment than deaf women in Denmark and that the probability of being employed increases with age. This is also the case among hearing people in Denmark (Anon 2006). That is, there is a similar pattern of employment among deaf and hearing people when it comes to sex and age.

With respect to education, it is known that deaf people in general have a lower level of educational attainment than hearing people in several countries (Anon 2006; Barnartt and Christiansen 1996; MacLeod-Gallinger 1992; Rydberg, Coniavitis Gellerstedt, and Danermark 2009). Higher education is generally demonstrated to have a positive effect on employment (Anon 2006; Welsh and Foster 1991; Welsh and MacLeod-Gallinger 1992; Winn 2007). With an increasing level of educational attainment, the difference between the employment rate of deaf and hearing people decreases but education seems to be more crucial to deaf people than to hearing people (Anon 2006). In this respect deaf people do not seem to differ from other groups of people with impairments since, as Welsh and Foster (1991) point out: for a person with a high level of educational attainment, there are more types of jobs available and the person may find a job more easily.

In addition to the studies mentioned, there are several studies that focus on occupations. Some studies state that the requirements of communication have an impact on which occupations are considered to be appropriate for deaf people (DeCaro, Mudgett-DeCaro, and Dowaliby 2001; Parasnis, Samar, and Mandke 1996; Weisel and Cinamon 2005). Even if there are conceptions about occupations appropriate for deaf people, studies done in the US show that deaf people are represented in all the occupations examined (El-Khiami 1993; Schroedel and Geyer 2000) but that they are to a higher extent employed in lower skill occupations (occupations that require a low level of educational attainment) as compared to the general population (Capella 2003; MacLeod-Gallinger 1992; Welsh and MacLeod-Gallinger 1992). Examples of low skill occupations are operators and labourers. Hearing people are comparably more often found in managerial

and professional occupations or occupations that require the highest levels of education (Capella 2003; Welsh and MacLeod-Gallinger 1992). According to Welsh and MacLeod-Gallinger (1992), deaf people are half as likely to have managerial and professional occupations as hearing people.

Barnartt and Christiansen (1996) report that the percentage of deaf people that have managerial and professional occupations increased from 1972 to 1991 in the US. This is also the case from 1989 to 1999 in Schroedel and Geyer's study (2000). Such changes are associated with increasing levels of educational attainment of deaf people in both studies. Other studies confirm that level of educational attainment influences type of occupation (Capella 2003; MacLeod-Gallinger 1992; Welsh and Foster 1991; Welsh and MacLeod-Gallinger 1992). It has indeed been found that the higher the educational attainment, the more likely it is that people are employed in a skilled occupation such as managerial and professional positions and less likely to be employed in a lower skilled occupation (MacLeod-Gallinger 1992; Welsh and Foster 1991; Welsh and MacLeod-Gallinger 1992). As level of educational attainment increases, the occupational distributions of people in the deaf and the general populations become more similar (MacLeod-Gallinger 1992).

Deaf persons' level of educational attainment in relation to the educational requirements of their occupation

It was mentioned previously that the higher level of educational attainment people have, the more likely they are to be employed in a skilled occupation. However, in a study by Schroedel and Geyer (2000), it was found that 13–15% of deaf people in the US had a higher level of educational attainment than was required for their occupation. Persons who had a vocational education were also at greater risk of having this imbalance between educational attainment and job skills requirements than persons with other types of education. To reduce the possibility of becoming employed in a job below the educational skill level, the authors suggest that deaf people should be advised to acquire the highest degree they can achieve – an academic rather than a vocational degree – and also continually gain knowledge and new competence.

That there are people that have an occupation with educational requirements that is below their level of educational attainment may be regarded as an indication of discrimination. The educational requirements of the occupations can also correspond to or be higher than people's level of educational attainment. The reason for people having an occupation above their level of educational attainment could be that they acquired their competence through work experience, courses or on-the-job training instead of a high formal level of educational attainment.

Summary

Men are more often in employment than women. The probability to be employed increases with age, and higher education has a positive effect on employment and being employed in a skilled occupation. Deaf people are, however, to a higher extent than hearing people, employed in occupations that require a low level of educational attainment.

Knowledge is limited about the workplaces of deaf people and deaf people's level of educational attainment in relation to the educational requirements of their occupations. Only one study was found in each area that dealt with aspects central to

this study. These two studies report that deaf people are more often than hearing people employed in the public sector and that 13–15% of deaf people in the US work in a job below their educational skill level.

Earlier studies of deaf people with employment and their workplaces focus mainly on graduates from schools or programmes for deaf people. There are also some studies that focus on the prelingual deaf, members of a deaf association and/or sign language users.

Focus of this study including aim and research questions

To increase the knowledge about deaf people in the Swedish labour market, this study will examine their workplaces in terms of the sector of the economy, the number of employed persons at the workplace and the industrial branch.

Several relevant aspects can be examined to gain more knowledge about employed deaf people besides sex, age, level of educational attainment and occupation that were discussed above. Other relevant factors are region, immigration background, field of education, participation in employment policy programmes and self-employment. Region and field of education are interesting in connection with work since employment rates differ according to region and field of education (Statistics Sweden 2005, 2007). Immigration background is interesting, since individuals with an immigration background in Sweden generally show lower employment rates than native Swedes (Statistics Sweden 2007). Participation in employment policy programmes gives information about the extent to which people need support in gaining employment, and self-employment is interesting because it gives more information about what kind of employment people have.

This study also further investigates whether a person's level of educational attainment is lower or higher or corresponds to the educational requirements for his/her occupation. This will be done to gain a better understanding of the relation between the person's occupation and her/his level of educational attainment. If deaf people, as compared to the general population, more often have a higher level of educational attainment than is required for their occupation, this could be regarded as an indicator of discrimination of deaf people on the Swedish labour market.

The aim of this study is to describe and analyze the characteristics of deaf people with employment and their workplaces in Sweden. The research questions are: (1) What are the characteristics of workplaces in which people in a deaf population work as compared to workplaces in which people in a reference population work? (2) What are the characteristics of people with employment in a deaf population as compared to people with employment in a reference population? (3) To what extent do the educational requirements of the occupations correspond to the level of educational attainment among deaf people? Does this differ from people in a reference population and, if so, in what respect?

Method

Participants

The population consists of 2144 persons born between 1941 and 1980 who attended a special school for deaf people in Sweden and/or the Swedish National Upper Secondary School for the Deaf. This population is called the deaf population. This

represents a total population of all people born between 1941 and 1980 in Sweden who attended a special school for deaf people in Sweden and/or the Swedish National Upper Secondary School for the Deaf. This is, however, not all deaf people in Sweden because, to be included in the deaf population, the persons must have been registered in the national population register in Sweden on 31 December 2005.

The deaf population was found through school catalogues from the special schools for deaf people in Sweden and/or the Swedish National Upper Secondary School for the Deaf. Pupils from schools for deaf people with additional impairments were not included in the deaf population. A total of 2371 individuals and their identification numbers (which consist of the year, month and day of birth and a four-digit code) were found through an examination of the school catalogues. To minimize the risk of errors, catalogues issued every second year were examined. A few persons with incomplete identification numbers existed, and almost all were located in the national population register by using the name and date of birth. Persons with strong relations to the Swedish deaf community helped in a few cases to find the right person. Due to incomplete identification numbers, emigration from Sweden or death, 227 individuals were excluded from the deaf population.

The study also includes a reference population to which the deaf population is compared that consists of 100,000 individuals born between 1941 and 1980. The reference population was randomly chosen by Statistics Sweden from the total population living in Sweden in 2005.

Further details about the deaf population

It is not known exactly what degree of hearing loss the persons in the deaf population have and, because of that, we cannot state that they are audiologically deaf. However, as they all attended a special school for deaf people and/or the Swedish National Upper Secondary School for the Deaf, we do know that they all have a congenital or early onset deafness/hearing loss. There is no knowledge about whether the individuals in the deaf population regard themselves to be culturally Deaf and no information about their skills in sign language, although it is known that persons born 1964–80 attended school when the educational policy advocated sign language (sign language was officially recognized in Sweden in 1981) and that persons born 1941–63 attended school when the educational policy advocated the oral method. Still, sources reveal that many of the pupils that attended school during the oral educational policy used sign language. With respect to cochlear implant (CI), it is known that no person in the deaf population received a CI at an early age (CI implantation in deaf children started at the end of the 1980s in Sweden (C. Möller, personal communication, 26 October 2007)). This means that persons in the deaf population did not receive a CI at an early age, that they have a hearing loss/deafness with an onset at an early age and that they attended a school for deaf people.

As stated above, pupils from schools for deaf with additional impairments are not included in the deaf population. However, the study might include some persons with additional impairments or particular difficulties as several studies demonstrate that 14–40% of pupils from schools for deaf people in Sweden have additional impairments (Backlund 2000; Hendar 2005; Högsten 1989; Jonsson 1995; National Agency for Special Schools for the Deaf and Hard of Hearing 2001). The US show similar information; the percentage of deaf or people with hearing loss that have additional impairments varied in US national statistics between 29% and 39% during

the period 1977–97 (Holden-Pitt and Diaz 1998). This additional impairment might be significant for some deaf people in terms of position in the labour market. Persons with impairments that are significant for their position in the labour market are also included in the reference population, but it is not known to what extent in either population.

Material

Data for this study consist of registered information relating to 2005 and are taken from a database at Statistics Sweden, the ‘Integrated Database for Labour Market Research’. Ethical approval was granted by the Regional Ethical Board of Uppsala, Sweden (Dnr 2007/077).

To be defined as being employed, a person has to have worked (as employed, self-employed or employer) at least one hour during the reference week (the definition also used by the International Labour Organization). Persons that take part in employment policy programmes (during some period in 2005) are also included in the group of persons with employment. Employment is measured in a cross-section in November.

Definitions of the variables in the study

In the first part, the following variables are used to describe the workplaces in which people in the two populations work: sector of the economy, number of employed persons at the workplace and industrial branch. *Sector of the economy* is divided into three subgroups: (1) public sector, (2) private sector and (3) organizations. Organizations include the Church of Sweden and other religious organizations, trade associations, employer and employee organizations, foundations, and non-profit and financial associations. *Number of employed persons at the workplace* is divided into the five subgroups shown in Table 1. *Industrial branch* is categorized according to the Swedish Standard Industrial Classification (SNI) 2002. All production units or workplaces are given a SNI code according to the activity that is the main activity of the workplace. The variable is divided into 10 subgroups, shown in Table 1.

In the second part, the following variables are used to describe people with employment in the deaf and reference populations: sex, age (10 years in each category), region, immigration background, level of educational attainment, field of education, participation in employment policy programmes, employed/self-employed and occupation. *Region* is a grouping of municipalities according to population density and is divided into four subgroups: (1) metropolitan areas, which in this text are the cities of Stockholm, Gothenburg and Malmö and their surrounding areas, (2) other densely populated areas, which are municipalities with more than 90,000 residents within 30 km of the centre of the municipality, (3) medium populated areas, which are municipalities with more than 27,000 residents and less than 90,000 residents within 30 km of the centre of the municipality and more than 300,000 residents within 100 km of the same centre, and (4) sparsely populated areas, which are municipalities with less than 90,000 residents within 30 km of the centre of the municipality and less than 300,000 residents within 100 km of the same centre.

Immigration background is divided into two subgroups: (1) immigration background, which shows persons born abroad with both parents born abroad or at least one parent born in Sweden/persons born in Sweden with at least one parent born

Table 1. Persons with employment in the deaf and reference populations by sector of the economy, number of employed persons at the workplace and industrial branch (%).

	Deaf population ^a (n = 1340)	Reference population ^{ab} (n = 77,847)
Sector of the economy		
Public sector	49	37
Private sector	39	59
Organizations	12	4
Number of employed persons at the workplace ^c		
1–9	14	22
10–19	12	12
20–49	17	17
50–99	15	14
100 or more	42	35
Industrial branch ^d		
Agriculture, forestry and fishing	1	2
Manufacturing, mining and quarrying	28	17
Energy production, water supply and waste management	1	1
Construction	4	6
Trade, communication and transport	8	18
Financial intermediation and business services	7	14
Education and research	22	12
Health and social care services	14	17
Personal and cultural services, including hotels	10	7
Public administration	5	6

Notes: ^aThe subgroups of each variable total 100% within each population.

^bThe margin of error was 0.1–0.5% (level of confidence 99%) for the results of people in the reference population.

^cMissing data in number of employed persons at the workplace was 4.4% in the deaf population and 4.5% in the reference population.

^dMissing data in industrial branch was 1.6% in the deaf population and 1.2% in the reference population.

abroad and (2) persons born in Sweden with both parents born in Sweden. Note that people in the deaf population with an immigration background have had their education in Sweden in a school for deaf people. They are otherwise not included in the deaf population. People with an immigration background in the reference population have perhaps not had their education in Sweden and may have immigrated to Sweden after they completed their education.

Level of educational attainment is measured as the highest level of education that a person has completed. The variable has three subgroups: (1) maximum compulsory school education, (2) from one semester of upper secondary education to three years and (3) post-secondary education of one semester or more. *Field of education* is the field of the highest level of educational attainment a person has completed and is divided into nine subgroups, as shown in Table 2.

Employment policy programme is either wage subsidy, enterprise grant or employment subsidy.¹ Wage subsidy is financial compensation to employers who employ persons with impairment. The intention of this support is to convert it into a

Table 2. Percentages of persons with employment in the deaf population (DP) and the reference population (RP) in sex, age, region, immigration background, level of educational attainment and field of education, including RRR.

Variables	Deaf population (P1)	Reference population ^a (P2)	RRR ^b (%)
Employment	62.5 (N = 2144)	77.8 (N = 100,000)	-20
Sex			
Men	66 ^c (N = 1137)	80 (N = 50,365)	-18
Women	59 (N = 1007)	76 (N = 49,635)	-22
Age categories			
25-34 years	62 (N = 450)	76 (N = 24,117)	-18
35-44 years	66 (N = 630)	83 (N = 26,442)	-21
45-54 years	66 (N = 449)	83 (N = 24,173)	-21
55-64 years	56 (N = 615)	70 (N = 25,268)	-20
Region			
Metropolitan area	66 (N = 734)	77 (N = 37,550)	-14
Other densely populated areas	62 (N = 1018)	78 (N = 35,291)	-21
Medium populated areas	60 (N = 201)	79 (N = 16,383)	-24
Sparsely populated areas	51 (N = 191)	79 (N = 10,776)	-35
Immigration background			
Immigration background	61 (N = 342)	65 (N = 24,378)	-6
Born in Sweden with both parents born in Sweden	63 (N = 1802)	82 (N = 75,622)	-23
Level of educational attainment ^d			
Compulsory school education	43 (N = 430)	65 (N = 16,891)	-34
Upper secondary education	65 (N = 1415)	80 (N = 47,003)	-19
Post-secondary education	83 (N = 287)	84 (N = 34,932)	-1
Field of education ^e			
General programmes	50 (N = 570)	69 (N = 24,529)	-28
Education	78 (N = 117)	87 (N = 6924)	-10
Humanities and arts	84 (N = 111)	72 (N = 3340)	17
Social sciences, business and law	70 (N = 196)	82 (N = 16,993)	-15
Science, mathematics and computing	58 (N = 50)	78 (N = 2435)	-26
Engineering, manufacturing and construction	67 (N = 624)	83 (N = 21,783)	-19

Table 2 (Continued)

Variables	Deaf population (P1)	Reference population ^a (P2)	RRR ^b (%)
Agriculture and veterinary	58 (N = 12)	84 (N = 1622)	- 31
Health and welfare Services	75 (N = 152)	84 (N = 13,097)	- 11
	54 (N = 101)	78 (N = 5948)	- 31

Notes: ^aThe margin of error was 0.3–0.4% (level of confidence 99%) for the results of people in the reference population.

^bRRR = (P1 – P2)/P2

^c66% of the deaf men are employed, whereas 34% of the deaf men are not employed. Only the percent of the persons that are employed are presented in this table and, for this reason, it is not possible to sum the figures in the table to 100%.

^dMissing data in level of educational attainment was 0.6% in the deaf population and 1.2% in the reference population.

^eMissing data in the field of education amounted to 10% in the deaf population and 3% in the reference population.

regular employment without financial support. Enterprise grant is a grant that a person may receive when starting a business, and an employment subsidy may be granted to an employer who hires a person who has been unemployed for a long period of time (Swedish National Labour Market Board 2007).

Occupation is categorized according to the Swedish Standard Classification of Occupations from 1996 into nine subgroups (see Table 3). One of the subgroups is *elementary occupations*, which comprises occupations without educational requirements. It should be noted that it is also possible for persons to be in the armed forces but that these results are not presented since the number of persons among the deaf population is too small. In the reference population, 0.4% is in the armed forces. The persons that are in the armed forces are included in the missing data to make comparisons between the deaf and the reference population similar. The information about the employed person's occupation mainly refers to 2005 (this holds for 76% of

Table 3. Persons with employment in the deaf and reference populations by occupation (%).

Occupation ^a	Deaf population (n = 1340)	Reference population ^b (n = 77,847)
Legislators, senior officials and managers	1	6
Professionals	15	20
Technicians and associate professionals	12	20
Clerks	10	9
Service and shop sales workers	18	19
Skilled agricultural and fishery workers	1	1
Craft and related trades workers	12	9
Plant, machine operators and assemblers	12	10
Elementary occupations	19	6
Total	100	100

Notes: ^aMissing data: 3% in the deaf population and 5% in the reference population.

^bThe margin of error was 0.1%–0.4% (level of confidence 99%) for the results of people in the reference population.

the employed deaf population and 75% of the employed reference population) or to one or a couple of years earlier.

The third part describes the occupation level of people with employment in the deaf and the reference populations. *Occupation level*² is constituted by level of educational attainment and the educational requirements of occupations (shown in Table 4). The variable consists of three subgroups: (1) occupation level lower than the level of educational attainment, (2) occupation level corresponding to the level of educational attainment and (3) occupation level higher than the level of educational attainment. The categorization is made with the assumption that people with compulsory school education cannot have an occupation level lower than their level of educational attainment and that people with post-secondary education cannot have an occupation level higher than their level of educational attainment.

Statistical analysis

Data were analyzed by frequencies, cross tables, relative risk reduction (RRR)³, and odds and logistic regression using the Statistical Package for the Social Sciences (SPSS). The RRR $((P1-P2)/P2)$ (Swinscow and Campbell 2002) was used to compare the results of the deaf and the reference populations in Table 2. For example, Table 2 shows that 62.5% of the people in the deaf population are employed and that the corresponding percentage is 77.8% in the reference population. The RRR is -20% $((62.5 - 77.8)/77.8 = -0.20 = -20\%)$.

The odds ratio (OR) used here describes the odds for one group (here the deaf population) to belong to a subgroup of *occupation level* in relation to the odds for another group (here the reference population). When ORs are higher than one, the odds for the deaf population are higher than the odds of the reference population to belong to that subgroup. The ORs are shown both with and without adjustments for differences between the two populations concerning age, sex, region and immigration background. Adjustments for level of educational attainment are not done because this variable co-varies with occupation level, since the level of educational attainment is part of the occupation level as defined above.

A margin of error (at the 99% level of confidence) was calculated for the frequencies of the reference population, a chi-square test was made for the cross table and confidence intervals (at the 99% level of confidence) were calculated on the ORs concerning both populations. The results of the tests are presented in the tables. These tests were carried out since the reference population is a sample from the total population in Sweden (which totals about nine million people in 2005 according to Statistics Sweden). Since the deaf population is a total population, the results of the deaf population represent the total group.

The size of missing data is reported in each table.

Results and discussion

The workplaces in which people in the two populations work

There are several differences between the workplaces that persons in the deaf and the reference populations work. As Table 1 reports, people in the deaf population are more often employed in the public sector and people in the reference population are more often employed in the private sector. A Danish study shows the same results (Anon

Table 4. Occupation's educational requirements by level of educational attainment in the deaf population (DP) and reference population (RP) (%).

	Occupation that requires the competence of compulsory school education		Occupation that requires the competence of upper secondary education		Occupation that requires the competence of post-secondary education	
	DP	RP	DP	RP	DP	RP
Compulsory school education	26	36	15	19	5	5
Upper secondary education	72	54	77	68	46	27
Post-secondary education	2	10	8	13	49	68
Total (%)	100	100	100	100	100	100
Total (n)	246	4088	688	35,768	362	33,671

Notes: Missing data in the deaf population are 3.3% and in the reference population 5.5%.

$p < 0.001$

Occupation level lower than the level of educational attainment

Occupation level corresponding to the level of educational attainment

Occupation level higher than the level of educational attainment

2006). Possible reasons for this result could be that deaf people have a relevant education, that policies of accessibility of public services are met by employing deaf people and that employers within the public sector are supposed to be in the front line in non-discrimination employment policies and therefore more often employ deaf people.

Table 1 also shows that a three times higher percentage of deaf than hearing people is employed in Organizations, e.g. a deaf association. It is easier for deaf people to gain employment in these associations because they know the language and have great knowledge in the deaf field. These factors may also contribute to a deaf person's desire to be employed in that field and for the association to want to employ that person. Many associations in Sweden receive federal subsidies. Recently, however, there was a reduction in these subsidies, which would mean that the percentage of deaf persons employed in organizations of this kind may decrease.

People in the deaf population are more often employed at workplaces with 100 or more employed persons, whereas persons in the reference population are more often employed at workplaces with one to nine employees (Table 1). It might be easier for employers with many employees to arrange for employees that need sign language interpreters, which would include financing interpreting, and deaf people may thus more often be employed at a workplace with 100 or more employees.

With respect to the industrial branch, Table 1 shows that the deaf population has a higher percentage in *manufacturing, mining and quarrying* and *education and research* than the reference population. These two branches together stand for 50% of the employment of deaf people; the corresponding figure for the reference population is 29%. Employers in these branches seem to be more open to employing deaf people than employers in other branches. In the fields of *manufacturing, mining and quarrying*, people with such occupations as *plant, machine operators and assemblers* and people with *elementary occupations* are employed. A higher percentage of people in the deaf population than in the reference population have these occupations. It is not surprising that employers in *education and research* employ many deaf people, as there are several schools for deaf people where it is an advantage to know sign language.

People with employment in the two populations

In the deaf population, 62.5% had an employment in November 2005; the corresponding figure in the reference population was 77.8%. Because of this lower employment rate of people in the deaf population than in the reference population, the deaf population will also show a lower proportion in other variables connected to employment. This lower proportion or underrepresentation is also shown in the RRR in Table 2. The RRR measures the relative under- or overrepresentation of the deaf population in comparison with the reference population. For instance, in terms of employment, the deaf population is underrepresented (–20%) in comparison with the reference population.

The results shown in Table 2 demonstrate that the employment rates for men are higher than employment rates for women in both populations. Moreover, in both populations, the highest employment rates are found in the ages of 35–54 years. Although this age category has the highest employment rate, employed deaf people 25–34 years of age show the greatest equality with employed people in the reference population (–18 in RRR). Similar patterns concerning sex and age in deaf and hearing populations are reported in Anon's study (2006).

The results for the deaf population as concerns region show that the more populated the area, the higher the employment rate (see Table 2). Deaf people may prefer more populated areas since there are better and more opportunities for employment and good chances of meeting other deaf people. There is only a small difference between regions in the reference population.

People born in Sweden with both parents born in Sweden have higher employment rate than people with an immigration background in the reference population (82% versus 65%). This result agrees with national statistics (Statistics Sweden 2007). In the deaf population, people born in Sweden with both parents born in Sweden and people with an immigration background have quite similar employment rates (63% and 61%). However, the two groups of people with immigration backgrounds are not similar, which might affect the result. People with an immigration background in the deaf population have had their education in Sweden while some people with an immigration background in the reference population have come to Sweden after having completed their education. A consequence of this is that the period living in Sweden is on average longer among people with immigration background in the deaf population than in the reference population and this might affect the employment rate. Another plausible explanation is that deaf people with an immigration background are part of the deaf community in Sweden and this might be a mechanism that reduces the impact of having an immigration background when it comes to employment. In order to further increase our knowledge about this important observation we need more in depth research about the interplay of immigration background and deafness in relation to employment.

Both populations report similar results regarding the level of educational attainment; the higher level of educational attainment, the higher percentage of people in employment (see Table 2). This is also confirmed in other studies (Anon 2006; Welsh and Foster 1991; Welsh and MacLeod-Gallinger 1992; Winn 2007). Anon (2006) reported that, with an increasing level of educational attainment, the difference between the employment rates of deaf and hearing people decreases. This is also the case in this study (see both the frequencies and the RRR in Table 2). However, in terms of deaf people in general, a previous study that used the same dataset as this study showed that a higher level of educational attainment does not make the difference between deaf and hearing's employment rate disappear (Rydberg, Coniavitis Gellerstedt, and Danermark 2010).

As concerns the field of education, national statistics show that the employment rate generally differs according to the specific field of education (Statistics Sweden 2007). This was also found to be the case in both the deaf and the reference populations. There is a higher rate of employment in the reference population than in the deaf population in all fields of education except *humanities and art*, where the deaf population has a 12 percentage point higher employment rate or a relative overrepresentation in the labour market amounting to 17% (RRR in Table 2). People in the deaf population that have an education in the *humanities and art* are more often employed than people in the reference population in this field of education. Both populations have the lowest employment rate in *general programmes* (see Table 2). Thus it seems to be more difficult to gain employment with a broad education field than if the person has a specialized education and even harder for deaf persons (the employment rate of deaf people with an education in *general programmes* is lower than the employment rate of people in the reference population in this field of education). However, it is important to keep in mind that the field of education is not necessarily

the actual field of occupation, as people may be working in another field than their field of education. It would be interesting to investigate the extent to which deaf people in comparison with hearing people continue to work in their field of education.

A substantially higher percentage of people with employment in the deaf population than in the reference population participated for a shorter or longer time during 2005 in an employment policy programme (35% versus 3%). These results show that the deaf population has a more exposed situation on the labour market than the reference population. Without the employment policy programmes, a higher proportion of the deaf population might not be as active in the labour market.

For self-employment, persons in the reference population are self-employed to a higher extent than persons in the deaf population (10% versus 1%). One reason for this could be that they have to pay much of the costs of using sign language interpreters. In Sweden, county councils pay for some of the sign language interpreting in connection with work, for example during staff meetings and wage negotiations. In other situations, it is primarily the company that must pay these costs. Small companies may not be able to pay for them.

The results that concern occupation in this study show that the deaf population is represented in all types of occupations, as previous studies also do (El-Khiami 1993; Schroedel and Geyer 2000), and that there are similar proportions of the deaf population and the reference population in some occupations (see Table 3). It seems, then, that people in the deaf population have not allowed the requirements of communication to influence the choice of occupation, as other studies demonstrate (DeCaro, Mudgett-DeCaro, and Dowaliby 2001; Parasnis, Samar, and Mandke 1996; Weisel and Cinamon 2005).

Table 3 further shows that the highest proportions of individuals in the deaf population have *elementary occupations*, which are occupations without educational requirements, and occupations as *service and shop sales workers*. In the reference population, the highest proportions are seen in the occupations of *professionals, technicians and associate professionals* as well as in the occupations of *service and shop sales workers*. The greatest difference between the deaf and the reference populations is in *elementary occupations*, where the percentage of the deaf population is more than three times higher than the percentage of the reference population. As seen in Table 3, the deaf population is employed to a higher extent in occupations that require low levels of educational attainment as compared to the reference population. This is confirmed by other studies, including the results that the deaf population is employed to a lower extent in occupations that require the highest levels of educational attainment (Capella 2003; MacLeod-Gallinger 1992; Welsh and MacLeod-Gallinger 1992). Both Barnartt and Christiansen (1996) and Schroedel and Geyer (2000) say that the percentage of deaf people in occupations that require higher levels of educational attainment has increased over the years. In a study by Welsh and MacLeod-Gallinger done in 1992, deaf people were half as likely to have occupations that require a high level of educational attainment. In this study, which refers to 2005, the percentage of deaf people with occupations that require a high level of educational attainment is much higher than in Welsh and MacLeod-Gallinger's study in 1992.

Occupation level lower, higher or corresponding to the level of educational attainment

This study shows that the higher the level of educational attainment, the higher the employment rate. Still, will a high level of educational attainment imply an occupation that requires this educational level?

Table 4 shows the educational requirements of the various occupations by the level of educational attainment of persons that are employed in the deaf and reference populations. In occupations that require a competence of compulsory school education, 26% in the deaf population and 36% in the reference population with employment have a compulsory school education or, in other words, have an occupation level corresponding to their level of educational attainment. In occupations that require competence that can be gained in post-secondary education, a lower percentage of the deaf population than the reference population also has an occupation level corresponding to the level of educational attainment (49% and 68% respectively). However, in occupations that require upper secondary education competence, a higher percentage of the deaf population than the reference population has an occupation level corresponding to the level of educational attainment (77% and 68% respectively).

In terms of having an occupation level lower than the level of educational attainment, the deaf population in comparison with the reference population has a higher percentage in occupations that require compulsory school education competence (72 + 2% versus 54 + 10%) and a lower percentage in occupations that require a competence of upper secondary education (8% versus 13%) (see Table 4).

In an occupation level higher than the level of educational attainment, the deaf population in comparison with the reference population has a lower percentage engaged in occupations that require upper secondary education competence (15% and 19% respectively) and a higher percentage in occupations that require post-secondary education competence (51% versus 32%).

Odds ratios (ORs)

ORs are given in Table 5 to summarize the information and comparisons shown in Table 4. The results show that having an occupation level corresponding to or higher

Table 5. Odds ratios (OR) with confidence intervals for people with employment in the deaf population in relation to people with employment in the reference population for the levels of occupation with and without adjustments for differences in age, sex, region and immigration background.^a

	Unadjusted		Adjusted ^b	
	OR	CI (99%)	OR	CI (99%)
Occupation level lower than the level of educational attainment	2.1	1.8–2.5	2.2	1.8–2.7
Occupation level corresponding to the level of educational attainment	0.8	0.7–0.9	0.8	0.6–0.9
Occupation level higher than the level of educational attainment	0.9 ^c	0.8–1.1	0.8 ^c	0.7–1.0

Notes: ^aThe reference population is the reference category (OR = 1).

^bAdjusted for differences in age, sex, region and immigration background.

^cResult not significant.

than the level of educational attainment is somewhat lower in the deaf population than in the reference population.

Table 5 also shows that it is twice as common for the deaf population as for the reference population to have an occupation level lower than the level of educational attainment. This shows that a high level of educational attainment will not automatically mean that a deaf person will achieve an occupation with such educational requirements although, as mentioned earlier, a high level of educational attainment improves the chances of deaf people to gain employment.

When the ORs were adjusted for differences between the populations as regards age, sex, region and immigration background, they changed by only 0.1 (see Table 5). This means that differences in sex, age, region and immigration background in the populations do not affect the odds of having any of the occupation levels. Instead, it might be that certain working conditions are insufficient at the workplace, which makes it impossible for a deaf person to take a job that corresponds to their educational skill level. This indicates that many employers do not obey the law. In Sweden, there is a law that prescribes individual adjustments of working conditions (Swedish Work Environment Authority 2009). It could also be that there is an uncertainty among employers with regard to deaf people's competence (including their social competence), despite the fact that they can prove this to some degree by their level of educational attainment, that makes them employ other persons instead of deaf persons. Since deaf people more often than hearing people have a higher level of educational attainment than is required for their occupation, this is an indication of discrimination of deaf people in the Swedish labour market.

This study confirms that there are difficulties in living up to the rights of the UN convention.

Final comment

This study has described and analyzed the characteristics of deaf people with employment and their workplaces. The complex interaction between individual and environmental factors has however been examined only to a certain extent here. Further research on why deaf people more often than hearing people have a higher level of educational attainment than is required for their occupation, why persons in the deaf population are more often employed in the public sector, whether deaf people continue to work within their field of education and whether immigration background affects the position in the labour market of deaf people is needed to gain better knowledge of the area of deaf people and their position in the labour market.

Methodological considerations

The inclusion criteria for the deaf population in this study were that the person had attended a school for deaf people. For this reason, we do not know whether the people in the deaf population are audiotically and/or culturally deaf. People in the deaf population may have different degrees of hearing loss and may not consider themselves to belong to the deaf community.

As compared to other studies in this field, it must be stressed that this study has few known missing data. However, since the data were originally gathered and registered for reasons and in ways that are beyond the control of the researcher, there are risks of unknown errors in the data sets. Furthermore, because of the design of

this study, there is a possibility for carrying out a longitudinal study (the database is updated yearly). There is also a reference population, and the deaf population is a total population. Owing to these characteristics of this study, the precision in the results is high.

Conclusions

The characteristics of workplaces in which deaf people work differ from the characteristics of workplaces in which people from the reference population work. For instance, deaf people are more commonly than people from the reference population employed in the public sector and at workplaces with 100 or more employees. Employers with many employees might employ many deaf people since it might be easier for them to arrange for employees that need sign language interpreters and to arrange for paying for the costs of interpreters. This might also be the reason why deaf people are not self-employed to the same extent as people in the reference population.

The deaf population has a lower employment rate than the reference population. Among the factors that describe people in employment, sex, age and level of educational attainment showed similar results in both populations. For instance, the higher the level of educational attainment, the higher the employment rate. However, a high level of educational attainment does not automatically imply an occupation with those educational requirements. It is twice as common for the deaf population as for the reference population to have lower educational requirements than their level of educational attainment. Differences in sex, age, region and immigration background in the populations do not affect this result. That deaf people more often than hearing people have a higher level of educational attainment than is required for their occupation is an indication of discrimination against deaf people in the Swedish labour market.

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Notes

1. Public sheltered employment is also an employment policy programme. It has the same purpose as a wage subsidy but focuses on, in this case, deaf persons with additional impairments. Since deaf persons from schools for deaf people with additional impairments are excluded in this study, public sheltered employment is not mentioned.
2. The analysis concerning *occupation level* is originally constructed by Tomas Boman, doctoral student at the Swedish Institute for Disability Research, in his thesis concerning disability, occupation and discrimination (work in progress).
3. Relative risk reduction is a method often used in epidemiology and, since it includes the term *risk*, it is associated with a negative aspect. However, there are studies that use this method to achieve a positive outcome. These studies recommend a switch of the term *risk* to *event rate*.

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