Hearing Impairment Among North Dakotans, 2005 Report

North Dakota State Data Center
North Dakota State University
IACC Building, Room 424 - P.O. Box 5636
Fargo, North Dakota 58105
(701) 231-7980
http://www.ndsu.edu/sdc

FORWARD

Acknowledgments

This research was funded by the North Dakota School for the Deaf (http://www.state.nd.us/ndsd/), an educational institution for the education of children with severe to profound hearing loss. Special thanks to Rockyln Cofer, Superintendent, for his assistance in the study.

Authors

Dr. Richard Rathge
Ramona Danielson

Contributors

Karen Olson
Jordyn Nikle

March 2005

TABLE OF CONTENTS

Introduction **4**

Studies Reviewed **5**

Table 1. Difficulty Hearing Conversation Among Respondents 15 Years and Older in the United States: U.S. Census Bureau, 1997 . . . . . *5*
Table 2. Total Number of Persons With a Hearing Impairment in the United States: Marketrak VI Study, 2000 . . . . . *6*
Table 3. Age at Onset of Hearing Loss for Deaf or Hard of Hearing Students in North Dakota, the Midwest, and the Nation: Gallaudet Research Institute, 2002-2003 . . . . . *6*
Table 4. Degree of Hearing Loss for Deaf or Hard of Hearing Students in North Dakota, the Midwest, and the Nation: Gallaudet Research Institute, 2002-2003 . . . . . *7*
Table 5. Percent of Noninstitutionalized Population With a Hearing Impairment: National Center for Health Statistics, 1983-2002 . . . . . *8*
Table 6. Percent of Noninstitutionalized Population With a Severe Hearing Impairment: National Center for Health Statistics, 1997-2001 . . . . . *8*

Methods **10**

Table 7. Age-Specific Prevalence Rates of Hearing Impairment *10*

Limitations **10**

Findings **11**

Table 8. Hearing Impairment Among North Dakotans Ages 15 and Older: 2000, 2010, and 2015 . . . . . *13*
Table 9. Hearing Impairment Among North Dakotans Ages 15 to 44: 2000, 2010, and 2015 . . . . . *14*
Table 10. Hearing Impairment Among North Dakotans Ages 45 to 64: 2000, 2010, and 2015 . . . . . *15*
Table 11. Hearing Impairment Among North Dakotans Ages 65 to 74: 2000, 2010, and 2015 . . . . . *16*
Table 12. Hearing Impairment Among North Dakotans Ages 75 and Older: 2000, 2010, and 2015 . . . . . *17*

Figure 1. Total Hearing Impairment Among North Dakotans Ages 15 and Older: 2000, 2010, and 2015 . . . *18*
Figure 2. Total Hearing Impairment Among North Dakotans Ages 15 and Older as a Percent of Total Persons Ages 15 and Older: 2000, 2010, and 2015 . . . . . *19*
Figure 3. Severe Hearing Impairment Among North Dakotans Ages 15 and Older: 2000, 2010, and 2015 . . *20*
Figure 4. Severe Hearing Impairment Among North Dakotans Ages 15 and Older as a Percent of Total Persons Ages 15 and Older: 2000, 2010, and 2015 . . . . . *21*
Figure 5. Total Hearing Impairment Among North Dakotans Ages 75 and Older: 2000, 2010, and 2015 . . . *22*
Figure 6. Total Hearing Impairment Among North Dakotans Ages 75 and Older as a Percent of Total Hearing Impairment Among North Dakotans Ages 15 and Older: 2000, 2010, and 2015 . . . . . *23*

Bibliography **24**

INTRODUCTION

The purpose of the "Hearing Impairment Among North Dakotans, 2005 Report" is to present estimates and projections of the number of people ages 15 and older in North Dakota who have a hearing impairment, in 2000, 2010, and 2015.

Estimating the number of people with a hearing impairment is somewhat problematic because hearing loss is a complex issue. Part of the problem is related to the factors involved in hearing, which include the sensitivity of the ear, and the ability of the person to understand communications. Evaluating the degree of hearing loss, therefore, depends on an array of possible causes including abnormality in the auditory system, noise exposure, and age. Recognition of hearing loss also is problematic because often it is gradual and people learn to cope with the loss through their other perceptual abilities.

Interestingly, there appears to be no legal definition of deafness, and little consensus on what constitutes hearing impairment (Gallaudet Research Institute, 1994). The terms used to refer to hearing impairment (e.g., deaf, deafness, hard of hearing) can have a variety of meanings. The National Association of the Deaf generally defines "deaf" as those who are unable to hear well enough to rely on their hearing, and are unable to use it as a means of processing information (2005). The term "hard of hearing" refers to those who have mild to moderate hearing loss. They have some hearing, are able to use it for communication purposes, and are reasonably comfortable doing so (National Association of the Deaf, 2005). In this report, we use an overall self-reported measure of hearing impairment to distinguish between those with **low** hearing impairment and those with **severe** hearing impairment.

There are several approaches to measuring the prevalence of hearing impairment. If one is interested in understanding the societal burden of hearing loss, the most useful approach is through self-reports. The process is relatively simple and it offers a global assessment of the problem. In contrast, if one is interested in improving the ability of an individual to hear, then formal audiometry procedures to clinically measure hearing impairment are essential. According to the National Institute on Deafness and Other Communication Disorders (2004), one of the standard summary assessments used to measure hearing loss is the pure-tone-average (PTA) of the cardinal speech frequencies (500, 1000, 2000, 3000 Hz). In brief, as the PTA increases, the ability of a person to hear decreases. For example, normal hearing for speech is typically at PTA levels of 25 decibels (dB) or less. Decibels provide a relative measure of sound intensity. People are viewed as functionally handicapped when their PTA levels reach around 40 dB in both ears. These individuals typically require some form of amplification. When a person's PTA reaches 75 dB or greater, their hearing loss is severe and even hearing aids offer limited benefit.

In an effort to estimate the number of North Dakotans with a hearing impairment, we decided the best approach would be to use the more global measure that relies on self-reporting. After an extensive review of the literature, we determined that consistent patterns of age-specific prevalence rates exist that can be used to calculate rates of hearing impairment. Since these rates are not known to vary significantly by location, we felt confident in applying these age-specific prevalence rates to estimates and projections of the number of North Dakotans ages 15 and older to determine the current and future number of residents with a hearing impairment. We describe our methodological approach in more detail in the section on Methods.

STUDIES REVIEWED

An extensive review of the literature reveals a variety of studies that can be triangulated to determine the consistency of hearing impairment prevalence rates based on self-reporting. We did not review the clinical literature because our focus was on the global assessment of hearing impairment. Therefore, the studies reviewed here are based solely on survey respondents' self-reported hearing impairment.

U.S. Census Bureau: Survey of Income and Program Participation

A recurring national survey that provides information on disabilities, including hearing impairment, is the Survey of Income and Program Participation (SIPP). The SIPP is a representative household survey that excludes institutionalized individuals. Data from the surveys are used to monitor various federal programs and are typically published in reports that focus on specific program areas. The program area of most interest for this study is Americans With Disabilities. For example, the 1997 SIPP survey, which covered approximately 32,000 households nationwide, included several questions about respondents' ability to perform a number of activities. Two questions are of particular interest to us because they focus on whether the respondent had difficulty hearing normal conversation, and if their difficulty was severe or not severe. The responses to these two self-reported measures of hearing impairment were published by Jack McNeil in 2001 (see Table 1).

Table 1. Difficulty Hearing Conversation Among Respondents 15 Years and Older in the United States: U.S. Census Bureau, 1997

Age in Years	Total Respondents	Respondents Who Had Difficulty Hearing Conversation					
		Severe Difficulty		Not Severe Difficulty		Total	
		Persons	Percent	Persons	Percent	Persons	Percent
15 and Older	208,059,000	832,000	0.4	7,134,000	3.4	7,966,000	3.8
15 to 24	36,897,000	22,000	0.1	239,000	0.6	262,000	0.7
25 to 64	139,098,000	315,000	0.2	3,085,000	2.2	3,400,000	2.4
65 and Older	32,064,000	495,000	1.5	3,809,000	11.9	4,304,000	13.4

Marketrak VI: The VA and Direct Mail Sales Spark Growth in Hearing Aid Market

Presented by Sergei Kochkin (2001), this study was conducted in 2000 and included a survey mailed to 80,000 members of the National Family Opinion panel which consists of households that are proportioned to the latest U.S. Census Bureau information. The survey covered three main areas: physician screening for hearing loss, whether the household had a person who was the owner of a hearing instrument, and whether the household had a person "with a hearing difficulty in one or both ears without the use of a hearing aid." With a response rate of 72 percent, this survey helped to identify 15,800 individuals with a hearing impairment. Weighted according to Census 2000 population distributions, this translates to more than 28.6 million individuals with a hearing impairment in the United States (see Table 2). The estimate from this survey for the number of North Dakotans with a hearing impairment is 58,432.

Table 2. Total Number of Persons With a Hearing Impairment in the United States: Marketrak VI Study, 2000

Age in Years	Total Number of Persons With a Hearing Impairment*
Younger Than 18	1,242,000
18 to 34	2,350,000
35 to 44	3,918,000
45 to 54	6,137,000
55 to 64	5,002,000
65 to 74	5,217,000
75 to 84	4,019,000
85 and Older	737,000
Total	28,622,000

*Weighted according to Census 2000 population distributions

Gallaudet Research Institute: Annual Survey of Deaf and Hard of Hearing Children and Youth

A data series that offers some insight into hearing impairment of children is provided by The Gallaudet University's Research Institute (GRI). It has been producing the Annual Survey of Deaf and Hard of Hearing Children and Youth since 1968. The major drawback of this survey is its restricted sample, since the survey is limited to children who are identified as receiving educational services related to their deafness. Results of the 2002-2003 State Summary (2003) are presented in Table 3 and Table 4.

Table 3. Age at Onset of Hearing Loss for Deaf or Hard of Hearing Students in North Dakota, the Midwest, and the Nation: Gallaudet Research Institute, 2002-2003

	North Dakota		Midwest		Nation	
Age at Onset of Hearing Loss	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Total Students	148	100.0	9,408	100.0	40,282	100.0
Information NOT Reported	1	0.7	368	3.9	1,839	4.6
Total Known Information	147	100.0	9,040	100.0	38,443	100.0
At Birth	42	28.6	3,470	38.4	16,073	41.8
Younger Than 3 Years	11	7.5	1,589	17.6	7,431	19.3
3 Years and Older	2	1.4	537	5.9	2,189	5.7
Age Unknown	92	62.6	3,444	38.1	12,750	33.2

Table 4. Degree of Hearing Loss for Deaf or Hard of Hearing Students in North Dakota, the Midwest, and the Nation: Gallaudet Research Institute, 2002-2003

	North Dakota		Midwest		Nation	
Degree of Hearing Loss	**Number**	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Total Students	148	100.0	9,408	100.0	40,282	100.0
Information NOT Reported	2	1.4	1,124	11.9	5,500	13.7
Total Known Information	146	100.0	8,284	100.0	34,782	100.0
Normal (less than 27 dB)	68	46.6	1,820	22.0	5,678	16.3
Mild (27 to 40 dB)	21	14.4	1,182	14.3	4,082	11.7
Moderate (41 to 55 dB)	22	15.1	1,212	14.6	4,511	13.0
Moderate-severe (56 to 70 dB)	4	2.7	1,020	12.3	4,288	12.3
Severe (71to 90 dB)	6	4.1	1,080	13.0	5,363	15.4
Profound (91 dB and above)	25	17.1	1,970	23.8	10,860	31.2

National Center for Health Statistics: National Health Interview Survey

The most comprehensive national survey of health information comes from the National Center for Health Statistics (NCHS). This organization, based out of the U.S. Department of Health and Human Services, provides national estimates of the prevalence of chronic conditions through its annual National Health Interview Survey (NHIS). The survey has two important limitations. First, it only encompasses the noninstitutionalized population. Second, it includes only those 18 years of age and older. Nonetheless, it offers the most encompassing overview of chronic conditions by age, sex, and race. Though hearing impairment data are not collected each year, the survey is conducted annually. Therefore, it provides an opportunity to examine the changes in the prevalence of chronic health conditions over time.

Our interest in the survey centered on a self-reported measure of hearing impairment. This measure is similar to that used on the Survey of Income and Program Participation (SIPP) survey conducted by the U.S. Census Bureau. However, instead of using two questions, the NHIS measures degree of hearing loss by asking respondents, "Which statement best describes your hearing (without a hearing aid): good, a little trouble, a lot of trouble, or deaf?" Unfortunately, a distinction between the latter two categories cannot be made because the low number of respondents who answered "deaf" was combined with respondents who answered "a lot of trouble." Nonetheless, the survey does offer a wealth of objective and generalizable data to develop reliable estimates of the prevalence of hearing impairment by age. For our purposes, if the respondent answered "a little trouble," "a lot of trouble," or "deaf," they were considered hearing impaired. If the respondent answered "a lot of trouble" or "deaf," they were considered to have a severe hearing impairment.

In Table 5, we present an overview of the proportion of noninstitutionalized persons in the U.S. who report having a hearing impairment based on their answer to the question. The table provides estimates of the prevalence of hearing impairment by age over a 20-year period based on results from the NHIS. The table clearly demonstrates that there is considerable stability in the prevalence of

hearing impairment within age categories. It also shows that hearing impairment dramatically increases with age.

In Table 6, we focus our attention specifically on severe hearing impairment. The table provides estimates of the prevalence of severe hearing impairment by age over a 5-year period based on results from the NHIS. Once again, the table clearly demonstrates that there is considerable stability in the prevalence of severe hearing impairment within age categories over time, and that severe hearing loss increases with age.

Table 5. Percent of Noninstitutionalized Population With a Hearing Impairment: National Center for Health Statistics, 1983-2002

Age in Years	Percent With a Hearing Impairment ("a little trouble," "a lot of trouble," or "deaf")					
	1983-1985 3-Year Average	1990-1991 2-Year Average	1996	2001	2002	Average of Time Points
18 to 44	5.1	4.4	4.2	8.6	6.7	5.8
45 to 64	14.9	12.6	13.1	20.5	17.5	15.7
65 to 74	26.1	29.1	25.5	34.7	29.7	29.0
75 and Older	38.1	29.1	37.0	47.1	45.9	39.4

Table 6. Percent of Noninstitutionalized Population With a Severe Hearing Impairment: National Center for Health Statistics, 1997-2001

Age in Years	Percent With a Severe Hearing Impairment ("a lot of trouble" or "deaf")					
	1997	1998	1999	2000	2001	5-Year Average
18 to 44	1.0	0.9	0.9	0.9	1.0	0.9
45 to 64	3.1	2.9	3.1	3.0	3.2	3.1
65 to 74	6.6	6.8	6.8	7.3	8.1	7.1
75 and Older	14.0	15.0	14.1	14.3	16.2	14.7

DISCUSSION

After a review of the literature and an examination of relevant prevalence rates, we concluded that there is a relatively consistent relationship between age and hearing loss. As reported in Table 5, the rate of hearing impairment among U.S. residents ages 18 to 44 has remained fairly consistent over the past 20 years, averaging 5.8 percent. After the age of 45, the prevalence of hearing impairment increases systematically with age. For those between the ages of 45 and 64, the average rate increases to 15.7 percent. It jumps to 29.0 percent for individuals between the ages of 65 and 74. The average rate of hearing impairment reaches more than one in three (39.4 percent) for individuals 75 years of age and older. This dramatic increase in hearing impairment by age is compelling, especially for a

state like North Dakota where its resident population is older than the national average. Our review of the literature does not indicate that rates of hearing impairment differ by gender, thus we focused our analysis on the total population and did not report gender-specific distributions.

The studies reviewed in this section reflect research in which participants have self-reported their level of hearing impairment. According to other impairment research, such as the "Visual Impairment Among North Dakotans, 2005 Report," prevalence rates from surveys in which participants rated their own visual impairment are much higher than the rates in studies in which impairment is clinically measured (see Rathge and Danielson, 2005). Therefore, it is reasonable to conclude that the hearing impairment estimates and projections presented in this report will reflect the number of North Dakotans who feel they have problems with their hearing, but that the actual number of North Dakotans who would have a clinically-measured hearing impairment would be smaller.

It should be noted that our estimates of hearing impairment are more than twice as high as model-based estimates reported by the U.S. Census Bureau using 1990 Census data (see http://www.census.gov/hhes/www/disability/census/disapick.html). The estimates of individuals with disabilities produced by the U.S. Census Bureau were generated using a model that calculated the probability of a specific disability using data from the 1990 Content Reinterview Survey (a reinterview of a sample of addresses that received a census long form) and corresponding records from the same individuals collected during the 1990 Census. These records provided a global measure of residents with any disability based on questions they answered on the Census long form. The prevalence rate for a specific disability (e.g., hearing impairment) was obtained from the U.S. Census Bureau's Survey of Income and Program Participation (SIPP). A logistic regression model was used to combine these data sets and produce estimates of hearing impairment for states and counties. However, the prevalence rates from the SIPP data (see Table 1) are distinctly lower than those generated by averaging results over multiple years from the National Center for Health Statistic's National Health Interview Survey (NHIS) (see Table 5 and Table 6).

We believe the prevalence rates from the NHIS (see our discussion of Methods in the next section) reflect a more accurate picture of hearing impairment in North Dakota because they are more age sensitive. Our review of the literature offers a compelling case that hearing impairment increases dramatically with age. Therefore, more refined age-specific prevalence rates, especially with the older age cohorts, should produce more accurate results. The SIPP data only offer three age-specific categories (i.e., 15 to 24, 25 to 64, and 65 and older); the oldest age group lumps all individuals 65 and older together. In contrast, the NHIS data offer four age-specific categories (i.e., 18 to 44, 45 to 64, 65 to 74, and 75 and older). More importantly, these categories reflect more refined older age groupings. Therefore, we were more confident using the prevalence rates reported by NHIS in our calculations of the number of North Dakotans with a hearing impairment.

METHODS

The prevalence rates used in calculating hearing impairment estimates and projections for North Dakota were drawn from the National Health Interview Survey from the National Center for Health Statistics. We took an average of the age-specific rates reported over the time period from 1983 to 2002 presented in Table 5, and 1997 to 2001 presented in Table 6. We decided not to attempt to estimate hearing impairment for those younger than age 15 because generalizable data at the national level were not available. We separated hearing impairment into two categories. The first reflects the number of persons with a severe hearing impairment (synonymous with "a lot of trouble" or "deaf") while the second focuses on those with a low hearing impairment ("a little trouble"). We also report total hearing impairment.

The analysis was conducted in two steps. First, we applied age-specific prevalence rates for total hearing impairment and severe hearing impairment (see Table 7) to the state's population as reported in Census 2000. Low hearing impairment was calculated as the residual difference between the number of persons with a severe hearing impairment and the total number of persons with a hearing impairment. Next, we applied the rates to age-specific population projections for 2010 and 2015 for each county published by the North Dakota State Data Center (see Rathge, et. al., 2002). The population projections were modeled using a standard cohort-survival technique with Census 2000 data as a baseline and 3-year trend lines for age-specific mortality, fertility, and migration.

Table 7. Age-Specific Prevalence Rates of Hearing Impairment

Age in Years	Severe Hearing Impairment	Total Hearing Impairment
15 to 44	0.009	0.058
45 to 64	0.031	0.157
65 to 74	0.071	0.290
75 and Older	0.147	0.394

LIMITATIONS

The data in this report are calculated using national prevalence rates and are based on the assumption that these rates accurately reflect the profile in North Dakota. In addition, we are using prevalence rates based on self-reported hearing impairment. Prevalence rates based on clinically-measured hearing impairment would likely be more conservative and result in more conservative figures of the number of North Dakotans who are hearing impaired. Finally, we are using population projections which assume that age-specific fertility, mortality, and migration rates will remain constant and follow historical trends. Although the limitations noted are reasonable, it is wise to use these figures of hearing impairment with caution. They should be used as one tool among others in policy and decision making.

FINDINGS

North Dakotans Ages 15 and Older

An estimated 70,433 North Dakotans ages 15 and older had a hearing impairment in 2000 (see Table 8). This number is expected to increase by 19.6 percent over the next 10 years and reach 84,235 by the year 2015. The largest numbers of North Dakotans with a hearing impairment are found in Cass, Burleigh, Grand Forks, and Ward counties, following county population trends overall (see Figure 1). However, the counties with the highest proportion of residents with a hearing impairment are several of North Dakota's more rural and more sparsely populated counties (see Figure 2). While 12 counties were estimated to have 17.5 percent or more of their population experiencing hearing impairment in 2000, that number is expected to nearly triple to 35 counties by 2015.

Three-fourths (75.6 percent) of all persons with a hearing impairment in 2000 had a low hearing impairment (see Table 8). An estimated 53,518 residents in North Dakota ages 15 and older had a low hearing impairment in 2000. The number of residents in the state with a low hearing impairment is expected to reach 62,740 by the year 2015.

It is estimated that 17,215 residents in North Dakota ages 15 and older had a severe hearing impairment in 2000 (see Table 8). It is expected that this number will reach 21,495 by the year 2015. The largest numbers of North Dakotans with a severe hearing impairment in 2000 were found in Cass, Burleigh, Ward, and Grand Forks counties, following county population trends overall (see Figure 3). However, the counties with the highest proportion of residents with a severe hearing impairment are several of North Dakota's more rural and more sparsely populated counties (see Figure 4). While 16 counties were estimated to have 4.5 percent or more of their population experiencing a severe hearing impairment in 2000, that number is expected to reach 40 counties by 2015.

North Dakotans Ages 15 to 44

The proportion of residents in the state between the ages of 15 and 44 is expected to decline slightly over the next 10 years (see Table 9). Since this age group has a fairly constant rate of hearing impairment, our projections indicate that there will be a modest decline in the number of North Dakotans between the ages of 15 and 44 who have a hearing impairment over the next 10 years. We estimate that 16,180 residents in this age group had a hearing impairment in 2000, and this number is expected to drop to 13,791 by the year 2015. The number of residents in the state between 15 and 44 who had a severe hearing impairment is expected to drop from 2,510 in 2000 to 2,141 by 2015. Similarly, the number of residents in this age category with a low hearing impairment is expected to decline from 13,670 in 2000 to 11,650 by 2015.

North Dakotans Ages 45 to 64

The proportion of residents in the state between the ages of 45 and 64 is expected to increase markedly over the next five years and then begin declining (see Table 10). This uneven trend is a result of the trailing edge of the baby boom generation moving through this age group, and the leading edge of the baby bust period moving into this age group. In brief, there was a dramatic decline in births after 1964, a period known as the baby bust era. This dramatic decline will impact the 45 to 64 age group starting in 2010. Thus, the age group from 45 to 64 will drop off markedly between 2010 and 2015. Since the prevalence of a hearing impairment is slightly elevated in this age group, the number of

residents age 45 to 64 with a hearing impairment is expected to increase modestly between 2000 and 2010 and then decline. We estimate that 21,804 residents in this age group had a hearing impairment in 2000 and this number is expected to increase to 26,935 by the year 2010 and hold fairly constant until 2015. The number of residents in the state between 45 and 64 who had a severe hearing impairment is expected to increase modestly from 4,309 in 2000 to 5,317 by 2010 and then hold relatively stable until 2015. Similarly, the number of residents in this age category with a low hearing impairment is expected to increase from 17,495 in 2000 to 21,618 by 2010 and hold steady through 2015.

North Dakotans Ages 65 to 74

The proportion of residents in the state between the ages of 65 and 74 is expected to increase only modestly over the next 10 years because they represent the trailing edge of the baby boom generation (see Table 11). Since this age group has a slightly elevated rate of hearing impairment, our estimates indicate that there will be a modest increase in the number of North Dakotans between the ages of 65 and 74 who have a hearing impairment over the next 10 years. We estimate that 13,308 residents in this age group had a hearing impairment in 2000 and this number is expected to rise to 17,599 by the year 2015. The number of residents in the state between 65 and 74 who had a severe hearing impairment is expected to grow from 3,258 in 2000 to 4,307 by 2015. Similarly, the number of residents in this age category with a low hearing impairment is expected to increase from 10,050 in 2000 to 13,292 by 2015.

North Dakotans Ages 75 and Older

One of the fastest growing age groups in North Dakota are those ages 75 and older (see Table 12). Our estimates indicate that this cohort is expected to increase by 37.1 percent between 2000 and 2015. This means an additional 18,001 residents will be age 75 or older in 2015 relative to 2000. Since this is the age group with the highest prevalence for hearing impairment, the number of persons ages 75 and older with a hearing impairment will rise rapidly. For example, in 2000, 19,141 residents ages 75 and older had a hearing impairment; 7,138 had a severe impairment (see Table 12). It is expected that by the year 2015, 26,232 North Dakotans ages 75 and older will have a hearing impairment; 9,792 will have a severe impairment. The largest numbers of North Dakotans ages 75 and older with a hearing impairment are found in Cass, Burleigh, Ward, and Grand Forks counties, following county population trends overall (see Figure 5). In 2000, the proportion of North Dakotans with a hearing impairment who are ages 75 and older was at least 36 percent in 11 counties (see Figure 6). By 2015, at least 36 percent of residents with a hearing impairment will be ages 75 and older in 30 counties.

Table 8. Hearing Impairment Among North Dakotans Ages 15 and Older: 2000, 2010, and 2015

Area	North Dakotans Ages 15 and Older											
	2000 Estimates				2010 Projections				2015 Projections			
		With a Hearing Impairment				With a Hearing Impairment				With a Hearing Impairment		
	Total	Total	Severe	Low	Total	Total	Severe	Low	Total	Total	Severe	Low
North Dakota	512,354	70,433	17,215	53,218	529,259	79,585	19,996	59,589	534,641	84,235	21,495	62,740
Adams	2,123	373	100	273	1,899	360	98	262	1,782	358	101	257
Barnes	9,691	1,516	393	1,123	9,761	1,664	437	1,227	9,765	1,744	468	1,276
Benson	4,906	684	168	516	5,322	772	193	579	5,421	817	207	610
Billings	731	107	26	81	684	113	28	85	626	112	28	84
Bottineau	5,910	967	251	716	5,761	1,051	280	771	5,591	1,099	299	800
Bowman	2,640	434	112	322	2,724	479	129	350	2,657	488	133	355
Burke	1,886	330	86	244	1,656	301	81	220	1,528	291	77	214
Burleigh	55,501	7,201	1,693	5,508	59,108	8,327	1,988	6,339	60,789	8,926	2,156	6,770
Cass	99,143	11,511	2,607	8,904	112,911	15,078	3,564	11,514	119,974	17,094	4,121	12,973
Cavalier	3,906	673	176	497	3,465	660	179	481	3,250	652	181	471
Dickey	4,652	752	199	553	4,462	768	205	563	4,381	786	214	572
Divide	1,934	370	103	267	1,619	346	100	246	1,432	332	99	233
Dunn	2,819	434	109	325	2,647	459	117	342	2,562	474	124	350
Eddy	2,238	389	104	285	2,232	437	122	315	2,173	452	128	324
Emmons	3,472	618	165	453	3,426	692	195	497	3,322	715	206	509
Foster	2,967	478	124	354	2,946	537	147	390	2,830	555	154	401
Golden Valley	1,534	252	67	185	1,474	263	70	193	1,435	270	73	197
Grand Forks	53,124	6,085	1,384	4,701	55,338	6,687	1,561	5,126	55,806	7,005	1,657	5,348
Grant	2,348	414	110	304	1,950	387	108	279	1,764	375	107	268
Griggs	2,279	408	111	297	2,012	394	111	283	1,866	380	107	273
Hettinger	2,225	397	105	292	1,906	386	108	278	1,728	376	108	268
Kidder	2,270	388	101	287	2,004	391	108	283	1,855	382	107	275
LaMoure	3,835	647	169	478	3,650	683	185	498	3,472	685	188	497
Logan	1,889	344	92	252	1,722	351	100	251	1,673	347	101	246
McHenry	4,887	804	209	595	4,813	860	229	631	4,781	891	243	648
McIntosh	2,876	578	165	413	2,613	590	176	414	2,491	585	178	407
McKenzie	4,335	651	162	489	4,249	717	187	530	4,120	747	200	547
McLean	7,621	1,248	322	926	7,444	1,388	370	1,018	7,338	1,467	398	1,069
Mercer	6,712	955	232	723	6,559	1,097	282	815	6,226	1,132	301	831
Morton	19,872	2,755	668	2,087	22,534	3,496	875	2,621	23,793	3,907	992	2,915
Mountrail	5,143	796	204	592	5,260	860	219	641	5,280	908	236	672
Nelson	3,107	573	156	417	3,162	635	179	456	3,106	653	190	463
Oliver	1,646	239	56	183	1,587	257	63	194	1,535	265	68	197
Pembina	6,948	1,095	280	815	6,873	1,178	308	870	6,762	1,215	321	894
Pierce	3,812	652	175	477	3,851	719	199	520	3,813	736	204	532
Ramsey	9,640	1,482	381	1,101	9,558	1,595	419	1,176	9,381	1,643	436	1,207
Ransom	4,709	765	200	565	4,804	869	237	632	4,878	917	253	664
Renville	2,153	355	91	264	1,996	351	95	256	1,918	350	95	255
Richland	14,431	1,984	492	1,492	14,454	2,198	558	1,640	14,397	2,270	583	1,687
Rolette	9,566	1,176	270	906	10,598	1,500	359	1,141	10,726	1,664	411	1,253
Sargent	3,418	521	131	390	3,478	564	144	420	3,456	584	153	431
Sheridan	1,429	259	68	191	1,307	252	70	182	1,221	239	66	173
Sioux	2,693	282	58	224	2,999	341	73	268	3,038	374	82	292
Slope	632	94	23	71	577	100	27	73	542	101	27	74
Stark	18,007	2,526	624	1,902	18,439	2,806	710	2,096	18,411	2,945	759	2,186
Steele	1,783	282	70	212	1,770	302	80	222	1,760	305	80	225
Stutsman	17,899	2,645	663	1,982	17,721	2,944	776	2,168	17,609	3,065	822	2,243
Towner	2,332	401	108	293	2,100	383	103	280	2,061	373	100	273
Traill	6,785	1,045	272	773	6,615	1,099	287	812	6,598	1,129	297	832
Walsh	9,945	1,561	401	1,160	9,260	1,538	398	1,140	8,905	1,541	403	1,138
Ward	46,019	5,876	1,401	4,475	45,267	6,200	1,532	4,668	44,853	6,338	1,606	4,732
Wells	4,201	747	201	546	3,959	779	218	561	3,776	782	222	560
Williams	15,730	2,314	577	1,737	14,733	2,381	609	1,772	14,184	2,394	625	1,769

Table 9. Hearing Impairment Among North Dakotans Ages 15 to 44: 2000, 2010, and 2015

Area	North Dakotans Ages 15 to 44											
	2000 Estimates				2010 Projections				2015 Projections			
	Total	With a Hearing Impairment			Total	With a Hearing Impairment			Total	With a Hearing Impairment		
		Total	Severe	Low		Total	Severe	Low		Total	Severe	Low
North Dakota	279,012	16,180	2,510	13,670	247,467	14,356	2,228	12,128	237,863	13,791	2,141	11,650
Adams	800	46	7	39	599	35	5	30	524	30	5	25
Barnes	4,576	265	41	224	3,830	222	34	188	3,697	214	33	181
Benson	2,617	152	24	128	2,710	157	24	133	2,626	152	24	128
Billings	340	20	3	17	232	13	2	11	188	11	2	9
Bottineau	2,518	146	23	123	1,847	107	17	90	1,525	88	14	74
Bowman	1,147	67	10	57	1,013	59	9	50	895	52	8	44
Burke	689	40	6	34	514	30	5	25	452	26	4	22
Burleigh	31,222	1,811	281	1,530	28,077	1,628	253	1,375	27,437	1,591	247	1,344
Cass	63,088	3,659	568	3,091	59,550	3,454	536	2,918	59,056	3,425	532	2,893
Cavalier	1,471	85	13	72	1,048	61	9	52	933	54	8	46
Dickey	2,146	124	19	105	1,828	106	16	90	1,735	101	16	85
Divide	653	38	6	32	404	23	4	19	293	17	3	14
Dunn	1,260	73	11	62	897	52	8	44	779	45	7	38
Eddy	919	53	8	45	644	37	6	31	531	31	5	26
Emmons	1,342	78	12	66	980	57	9	48	802	47	7	40
Foster	1,373	80	12	68	1,026	60	9	51	807	47	7	40
Golden Valley	681	39	6	33	517	30	5	25	455	26	4	22
Grand Forks	34,755	2,016	313	1,703	34,233	1,986	308	1,678	33,539	1,945	302	1,643
Grant	875	51	8	43	578	34	5	29	459	27	4	23
Griggs	861	50	8	42	593	34	5	29	491	28	4	24
Hettinger	810	47	7	40	515	30	5	25	395	23	4	19
Kidder	922	53	8	45	573	33	5	28	458	27	4	23
LaMoure	1,607	93	14	79	1,136	66	10	56	959	56	9	47
Logan	689	40	6	34	529	31	5	26	521	30	5	25
McHenry	2,082	121	19	102	1,738	101	16	85	1,646	95	15	80
McIntosh	956	55	9	46	656	38	6	32	574	33	5	28
McKenzie	2,009	117	18	99	1,629	94	15	79	1,461	85	13	72
McLean	3,119	181	28	153	2,185	127	20	107	1,855	108	17	91
Mercer	3,329	193	30	163	2,357	137	21	116	1,974	114	18	96
Morton	10,508	609	95	514	9,474	549	85	464	9,190	533	83	450
Mountrail	2,361	137	21	116	2,107	122	19	103	1,984	115	18	97
Nelson	1,115	65	10	55	940	55	8	47	851	49	8	41
Oliver	731	42	7	35	565	33	5	28	514	30	5	25
Pembina	3,149	183	28	155	2,485	144	22	122	2,274	132	20	112
Pierce	1,625	94	15	79	1,304	76	12	64	1,151	67	10	57
Ramsey	4,685	272	42	230	3,846	223	35	188	3,488	202	31	171
Ransom	2,137	124	19	105	1,754	102	16	86	1,676	97	15	82
Renville	917	53	8	45	753	44	7	37	709	41	6	35
Richland	8,087	469	73	396	6,683	388	60	328	6,382	370	57	313
Rolette	5,711	331	51	280	5,159	299	46	253	4,559	264	41	223
Sargent	1,558	90	14	76	1,461	85	13	72	1,418	82	13	69
Sheridan	490	28	4	24	413	24	4	20	387	22	3	19
Sioux	1,813	105	16	89	1,839	107	17	90	1,681	97	15	82
Slope	283	16	3	13	185	11	2	9	149	9	1	8
Stark	9,656	560	87	473	8,547	496	77	419	8,191	475	74	401
Steele	777	45	7	38	682	40	6	34	689	40	6	34
Stutsman	8,943	519	80	439	7,395	429	67	362	7,027	408	63	345
Towner	957	56	9	47	688	40	6	34	714	41	6	35
Traill	3,333	193	30	163	2,655	154	24	130	2,537	147	23	124
Walsh	4,554	264	41	223	3,622	210	33	177	3,298	191	30	161
Ward	27,397	1,589	247	1,342	25,300	1,467	228	1,239	25,369	1,471	228	1,243
Wells	1,638	95	15	80	1,142	66	10	56	949	55	9	46
Williams	7,731	448	70	378	6,030	350	54	296	5,609	325	50	275

Table 10. Hearing Impairment Among North Dakotans Ages 45 to 64: 2000, 2010, and 2015

Area	North Dakotans Ages 45 to 64											
	2000 Estimates				2010 Projections				2015 Projections			
	Total	With a Hearing Impairment			Total	With a Hearing Impairment			Total	With a Hearing Impairment		
		Total	Severe	Low		Total	Severe	Low		Total	Severe	Low
North Dakota	138,864	21,804	4,309	17,495	171,563	26,935	5,317	21,618	169,515	26,613	5,255	21,358
Adams	699	110	22	88	666	105	21	84	579	91	18	73
Barnes	2,783	437	86	351	3,258	512	101	411	3,004	472	93	379
Benson	1,348	212	42	170	1,534	241	48	193	1,587	249	49	200
Billings	249	39	8	31	299	47	9	38	265	42	8	34
Bottineau	1,870	294	58	236	2,196	345	68	277	2,065	324	64	260
Bowman	786	123	24	99	950	149	29	120	957	150	30	120
Burke	635	100	20	80	664	104	21	83	552	87	17	70
Burleigh	15,639	2,455	485	1,970	21,200	3,328	657	2,671	21,825	3,427	677	2,750
Cass	24,154	3,792	749	3,043	35,897	5,636	1,113	4,523	38,186	5,995	1,184	4,811
Cavalier	1,328	208	41	167	1,269	199	39	160	1,097	172	34	138
Dickey	1,277	200	40	160	1,334	209	41	168	1,238	194	38	156
Divide	607	95	19	76	553	87	17	70	457	72	14	58
Dunn	934	147	29	118	1,043	164	32	132	979	154	30	124
Eddy	637	100	20	80	826	130	26	104	815	128	25	103
Emmons	1,023	161	32	129	1,171	184	36	148	1,148	180	36	144
Foster	791	124	25	99	1,033	162	32	130	1,066	167	33	134
Golden Valley	443	70	14	56	524	82	16	66	517	81	16	65
Grand Forks	12,001	1,884	372	1,512	13,839	2,173	429	1,744	13,893	2,181	431	1,750
Grant	770	121	24	97	665	104	21	83	570	89	18	71
Griggs	710	111	22	89	747	117	23	94	691	108	21	87
Hettinger	732	115	23	92	683	107	21	86	588	92	18	74
Kidder	686	108	21	87	748	117	23	94	713	112	22	90
LaMoure	1,128	177	35	142	1,369	215	42	173	1,303	205	40	165
Logan	577	91	18	73	521	82	16	66	471	74	15	59
McHenry	1,500	236	47	189	1,629	256	50	206	1,551	244	48	196
McIntosh	760	119	24	95	740	116	23	93	690	108	21	87
McKenzie	1,426	224	44	180	1,502	236	47	189	1,359	213	42	171
McLean	2,602	409	81	328	2,968	466	92	374	2,810	441	87	354
Mercer	2,150	338	67	271	2,636	414	82	332	2,411	379	75	304
Morton	5,671	890	176	714	8,335	1,309	258	1,051	8,790	1,380	272	1,108
Mountrail	1,608	252	50	202	1,852	291	57	234	1,810	284	56	228
Nelson	973	153	30	123	1,056	166	33	133	989	155	31	124
Oliver	622	98	19	79	680	107	21	86	598	94	19	75
Pembina	2,125	334	66	268	2,609	410	81	329	2,474	388	77	311
Pierce	1,060	166	33	133	1,327	208	41	167	1,413	222	44	178
Ramsey	2,689	422	83	339	3,270	513	101	412	3,178	499	99	400
Ransom	1,322	208	41	167	1,596	251	49	202	1,577	248	49	199
Renville	661	104	20	84	665	104	21	83	593	93	18	75
Richland	3,598	565	112	453	4,743	745	147	598	4,663	732	145	587
Rolette	2,530	397	78	319	3,528	554	109	445	3,788	595	117	478
Sargent	1,120	176	35	141	1,121	176	35	141	1,055	166	33	133
Sheridan	484	76	15	61	439	69	14	55	387	61	12	49
Sioux	654	103	20	83	850	133	26	107	976	153	30	123
Slope	212	33	7	26	249	39	8	31	236	37	7	30
Stark	4,841	760	150	610	5,913	928	183	745	5,587	877	173	704
Steele	564	89	17	72	601	94	19	75	562	88	17	71
Stutsman	5,094	800	158	642	5,706	896	177	719	5,385	845	167	678
Towner	705	111	22	89	794	125	25	100	703	110	22	88
Traill	1,829	287	57	230	2,295	360	71	289	2,252	354	70	284
Walsh	3,001	471	93	378	3,311	520	103	417	3,087	485	96	389
Ward	11,281	1,771	350	1,421	11,518	1,808	357	1,451	9,891	1,553	307	1,246
Wells	1,237	194	38	156	1,441	226	45	181	1,400	220	43	177
Williams	4,738	744	147	597	5,200	816	161	655	4,734	743	147	596

Table 11. Hearing Impairment Among North Dakotans Ages 65 to 74: 2000, 2010, and 2015

Area	North Dakotans Ages 65 to 74											
	2000 Estimates				2010 Projections				2015 Projections			
		With a Hearing Impairment				With a Hearing Impairment				With a Hearing Impairment		
	Total	Total	Severe	Low	Total	Total	Severe	Low	Total	Total	Severe	Low
North Dakota	45,901	13,308	3,258	10,050	49,375	14,317	3,504	10,813	60,685	17,599	4,307	13,292
Adams	279	81	20	61	283	82	20	62	293	85	21	64
Barnes	1,005	291	71	220	1,189	345	84	261	1,431	415	102	313
Benson	486	141	35	106	495	144	35	109	578	168	41	127
Billings	73	21	5	16	70	20	5	15	89	26	6	20
Bottineau	696	202	49	153	757	220	54	166	970	281	69	212
Bowman	337	98	24	74	277	80	20	60	300	87	21	66
Burke	300	87	21	66	207	60	15	45	274	79	19	60
Burleigh	4,514	1,309	320	989	4,828	1,400	343	1,057	6,087	1,765	432	1,333
Cass	6,054	1,756	430	1,326	8,580	2,488	609	1,879	12,332	3,576	876	2,700
Cavalier	544	158	39	119	504	146	36	110	527	153	37	116
Dickey	536	155	38	117	568	165	40	125	612	177	43	134
Divide	279	81	20	61	247	72	18	54	249	72	18	54
Dunn	304	88	22	66	344	100	24	76	401	116	28	88
Eddy	312	90	22	68	284	82	20	62	319	93	23	70
Emmons	551	160	39	121	491	142	35	107	510	148	36	112
Foster	408	118	29	89	331	96	24	72	343	99	24	75
Golden Valley	174	50	12	38	186	54	13	41	195	57	14	43
Grand Forks	3,120	905	222	683	3,220	934	229	705	4,038	1,171	287	884
Grant	329	95	23	72	286	83	20	63	302	88	21	67
Griggs	301	87	21	66	210	61	15	46	250	73	18	55
Hettinger	333	97	24	73	295	86	21	65	308	89	22	67
Kidder	333	97	24	73	269	78	19	59	257	75	18	57
LaMoure	541	157	38	119	473	137	34	103	507	147	36	111
Logan	313	91	22	69	262	76	19	57	244	71	17	54
McHenry	645	187	46	141	650	189	46	143	694	201	49	152
McIntosh	504	146	36	110	414	120	29	91	374	108	27	81
McKenzie	422	122	30	92	513	149	36	113	609	177	43	134
McLean	873	253	62	191	1,034	300	73	227	1,302	378	92	286
Mercer	597	173	42	131	674	195	48	147	830	241	59	182
Morton	1,917	556	136	420	2,143	621	152	469	2,851	827	202	625
Mountrail	529	153	38	115	625	181	44	137	738	214	52	162
Nelson	448	130	32	98	435	126	31	95	473	137	34	103
Oliver	161	47	11	36	169	49	12	37	242	70	17	53
Pembina	789	229	56	173	736	213	52	161	943	273	67	206
Pierce	498	144	35	109	439	127	31	96	437	127	31	96
Ramsey	1,016	295	72	223	991	287	70	217	1,227	356	87	269
Ransom	576	167	41	126	548	159	39	120	658	191	47	144
Renville	273	79	19	60	241	70	17	53	256	74	18	56
Richland	1,267	367	90	277	1,232	357	87	270	1,469	426	104	322
Rolette	708	205	50	155	1,023	297	73	224	1,272	369	90	279
Sargent	355	103	25	78	477	138	34	104	496	144	35	109
Sheridan	235	68	17	51	196	57	14	43	196	57	14	43
Sioux	148	43	11	32	203	59	14	45	255	74	18	56
Slope	87	25	6	19	64	19	5	14	65	19	5	14
Stark	1,700	493	121	372	1,784	517	127	390	2,235	648	159	489
Steele	243	70	17	53	222	64	16	48	231	67	16	51
Stutsman	1,879	545	133	412	1,935	561	137	424	2,265	657	161	496
Towner	281	81	20	61	245	71	17	54	298	86	21	65
Traill	714	207	51	156	689	200	49	151	817	237	58	179
Walsh	1,108	321	79	242	1,045	303	74	229	1,234	358	88	270
Ward	3,617	1,049	257	792	3,877	1,124	275	849	4,473	1,297	318	979
Wells	621	180	44	136	522	151	37	114	532	154	38	116
Williams	1,568	455	111	344	1,593	462	113	349	1,797	521	128	393

Table 12. Hearing Impairment Among North Dakotans Ages 75 and Older: 2000, 2010, and 2015

Area	North Dakotans Ages 75 and Older											
	2000 Estimates				2010 Projections				2015 Projections			
	Total	With a Hearing Impairment			Total	With a Hearing Impairment			Total	With a Hearing Impairment		
		Total	Severe	Low		Total	Severe	Low		Total	Severe	Low
North Dakota	48,577	19,141	7,138	12,003	60,854	23,977	8,947	15,030	66,578	26,232	9,792	16,440
Adams	345	136	51	85	351	138	52	86	386	152	57	95
Barnes	1,327	523	195	328	1,484	585	218	367	1,633	643	240	403
Benson	455	179	67	112	583	230	86	144	630	248	93	155
Billings	69	27	10	17	83	33	12	21	84	33	12	21
Bottineau	826	325	121	204	961	379	141	238	1,031	406	152	254
Bowman	370	146	54	92	484	191	71	120	505	199	74	125
Burke	262	103	39	64	271	107	40	67	250	99	37	62
Burleigh	4,126	1,626	607	1,019	5,003	1,971	735	1,236	5,440	2,143	800	1,343
Cass	5,847	2,304	860	1,444	8,884	3,500	1,306	2,194	10,400	4,098	1,529	2,569
Cavalier	563	222	83	139	644	254	95	159	693	273	102	171
Dickey	693	273	102	171	732	288	108	180	796	314	117	197
Divide	395	156	58	98	415	164	61	103	433	171	64	107
Dunn	321	126	47	79	363	143	53	90	403	159	59	100
Eddy	370	146	54	92	478	188	70	118	508	200	75	125
Emmons	556	219	82	137	784	309	115	194	862	340	127	213
Foster	395	156	58	98	556	219	82	137	614	242	90	152
Golden Valley	236	93	35	58	247	97	36	61	268	106	39	67
Grand Forks	3,248	1,280	477	803	4,046	1,594	595	999	4,336	1,708	637	1,071
Grant	374	147	55	92	421	166	62	104	433	171	64	107
Griggs	407	160	60	100	462	182	68	114	434	171	64	107
Hettinger	350	138	51	87	413	163	61	102	437	172	64	108
Kidder	329	130	48	82	414	163	61	102	427	168	63	105
LaMoure	559	220	82	138	672	265	99	166	703	277	103	174
Logan	310	122	46	76	410	162	60	102	437	172	64	108
McHenry	660	260	97	163	796	314	117	197	890	351	131	220
McIntosh	656	258	96	162	803	316	118	198	853	336	125	211
McKenzie	478	188	70	118	605	238	89	149	691	272	102	170
McLean	1,027	405	151	254	1,257	495	185	310	1,371	540	202	338
Mercer	636	251	93	158	892	351	131	220	1,011	398	149	249
Morton	1,776	700	261	439	2,582	1,017	380	637	2,962	1,167	435	732
Mountrail	645	254	95	159	676	266	99	167	748	295	110	185
Nelson	571	225	84	141	731	288	107	181	793	312	117	195
Oliver	132	52	19	33	173	68	25	43	181	71	27	44
Pembina	885	349	130	219	1,043	411	153	258	1,071	422	157	265
Pierce	629	248	92	156	781	308	115	193	812	320	119	201
Ramsey	1,250	493	184	309	1,451	572	213	359	1,488	586	219	367
Ransom	674	266	99	167	906	357	133	224	967	381	142	239
Renville	302	119	44	75	337	133	50	83	360	142	53	89
Richland	1,479	583	217	366	1,796	708	264	444	1,883	742	277	465
Rolette	617	243	91	152	888	350	131	219	1,107	436	163	273
Sargent	385	152	57	95	419	165	62	103	487	192	72	120
Sheridan	220	87	32	55	259	102	38	64	251	99	37	62
Sioux	78	31	11	20	107	42	16	26	126	50	19	31
Slope	50	20	7	13	79	31	12	19	92	36	14	22
Stark	1,810	713	266	447	2,195	865	323	542	2,398	945	353	592
Steele	199	78	29	49	265	104	39	65	278	110	41	69
Stutsman	1,983	781	292	489	2,685	1,058	395	663	2,932	1,155	431	724
Towner	389	153	57	96	373	147	55	92	346	136	51	85
Traill	909	358	134	224	976	385	143	242	992	391	146	245
Walsh	1,282	505	188	317	1,282	505	188	317	1,286	507	189	318
Ward	3,724	1,467	547	920	4,572	1,801	672	1,129	5,120	2,017	753	1,264
Wells	705	278	104	174	854	336	126	210	895	353	132	221
Williams	1,693	667	249	418	1,910	753	281	472	2,044	805	300	505

Figure 1. Total Hearing Impairment Among North Dakotans Ages 15 and Older: 2000, 2010, and 2015

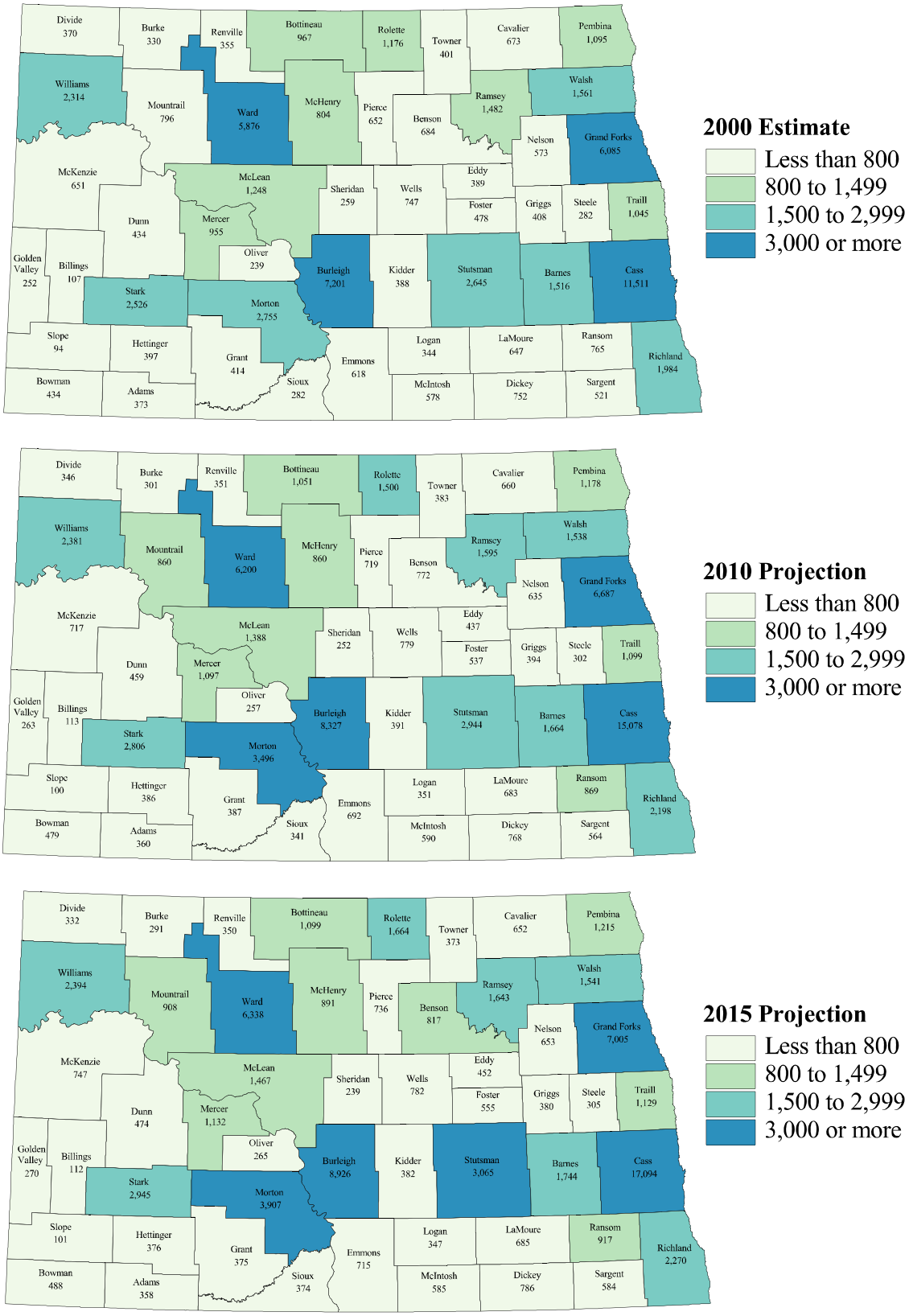


Figure 2. Total Hearing Impairment Among North Dakotans Ages 15 and Older as a Percent of Total Persons Ages 15 and Older: 2000, 2010, and 2015

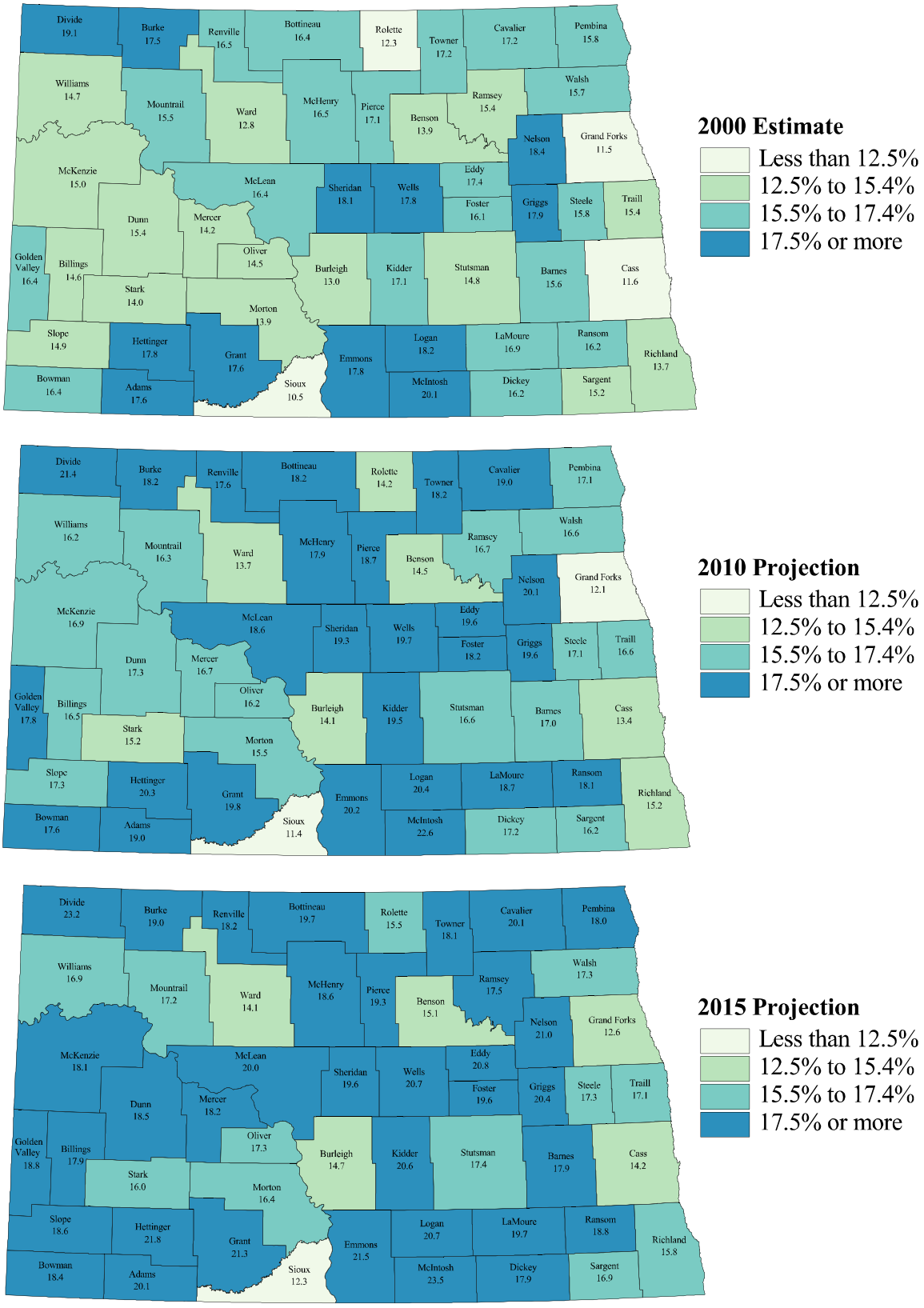


Figure 3. Severe Hearing Impairment Among North Dakotans Ages 15 and Older: 2000, 2010, and 2015

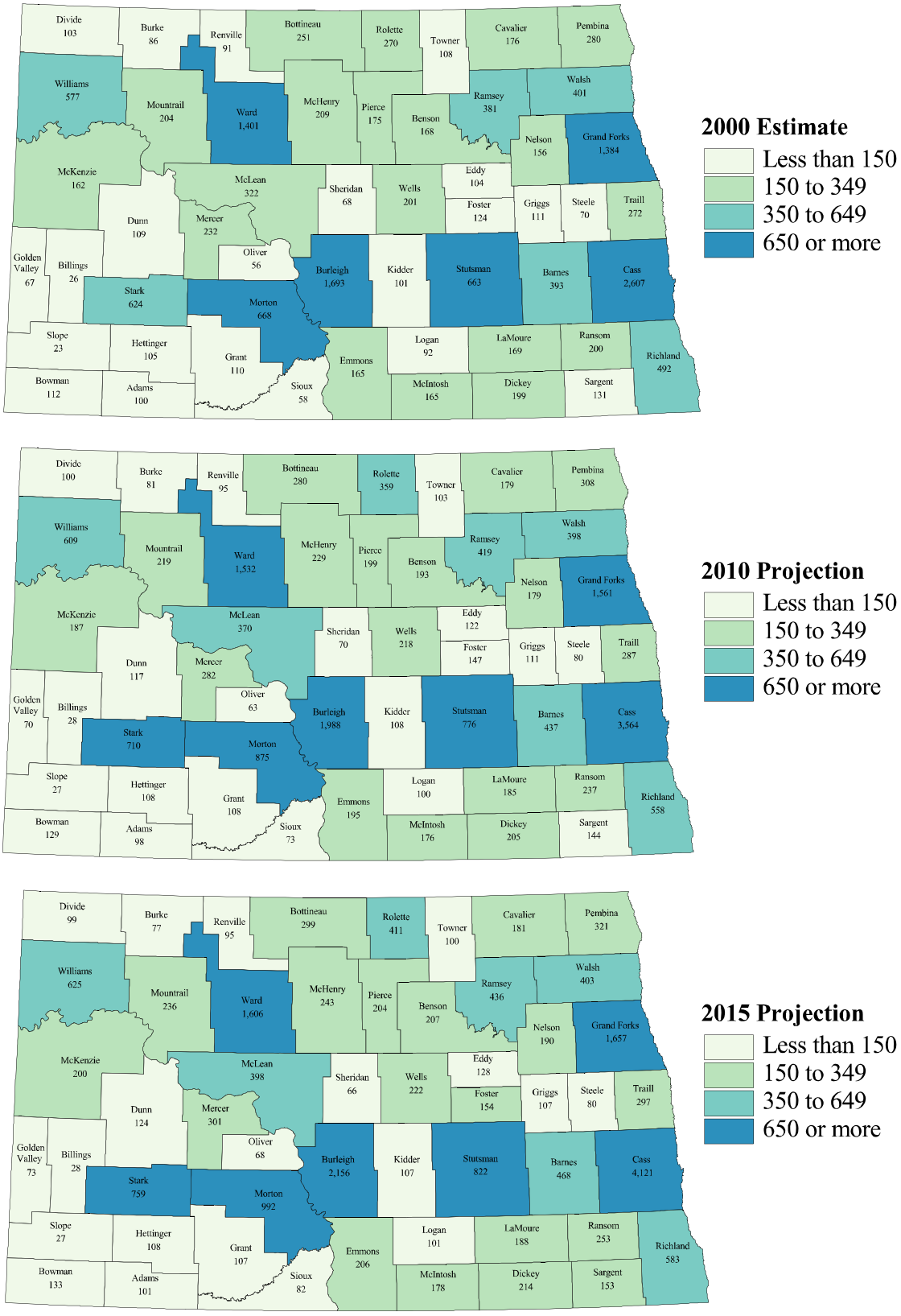


Figure 4. Severe Hearing Impairment Among North Dakotans Ages 15 and Older as a Percent of Total Persons Ages 15 and Older: 2000, 2010, and 2015

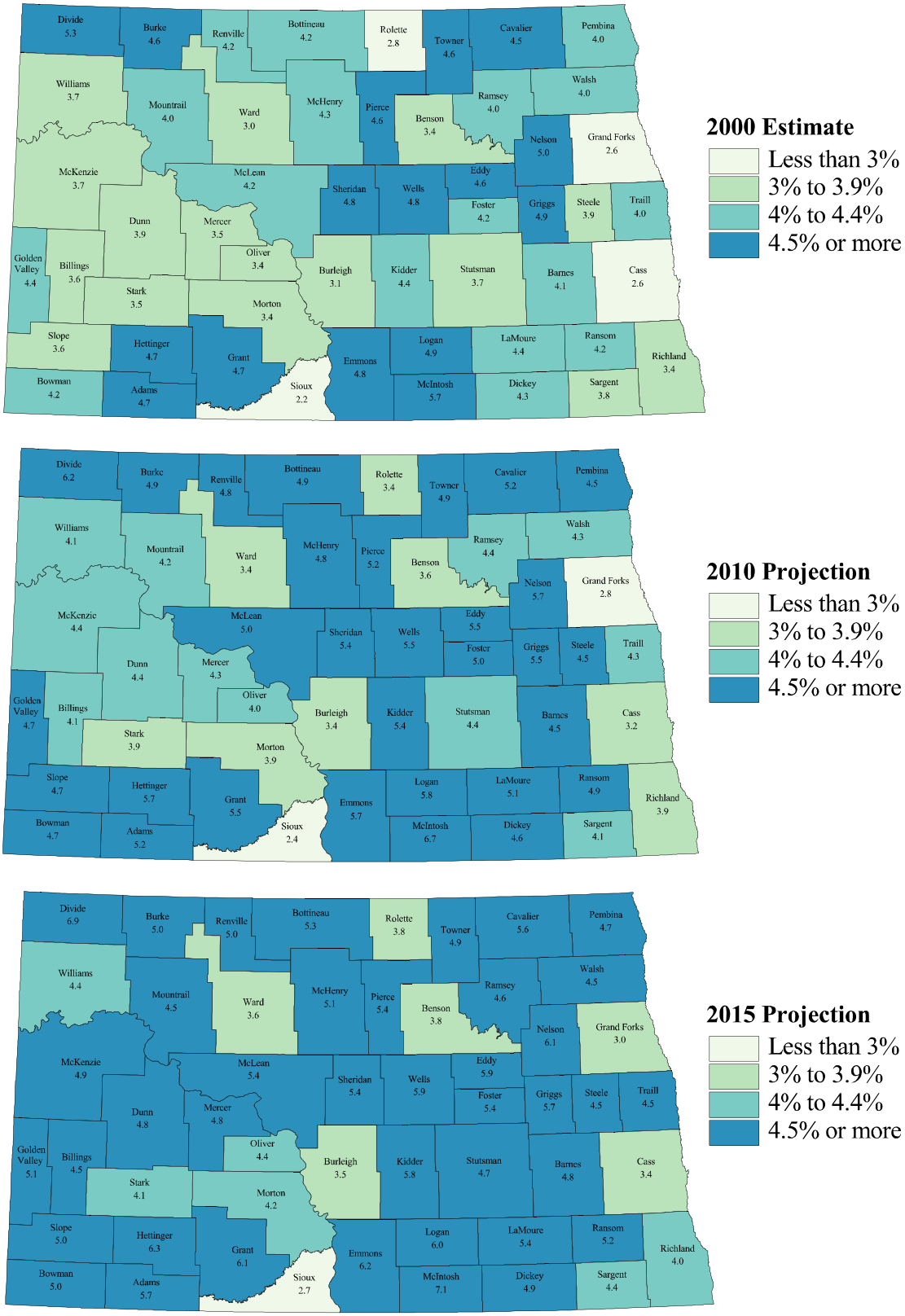


Figure 5. Total Hearing Impairment Among North Dakotans Ages 75 and Older: 2000, 2010, and 2015

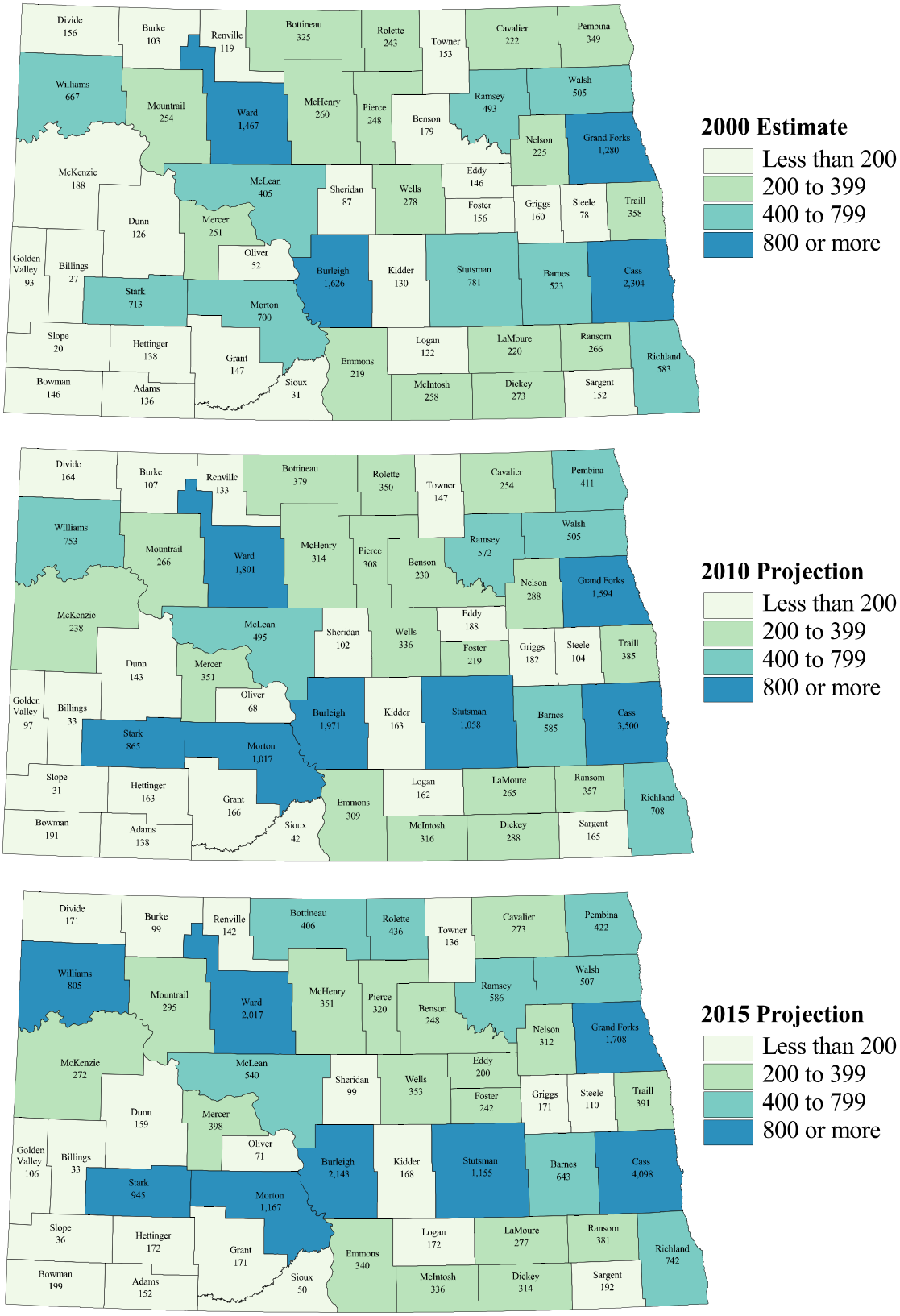
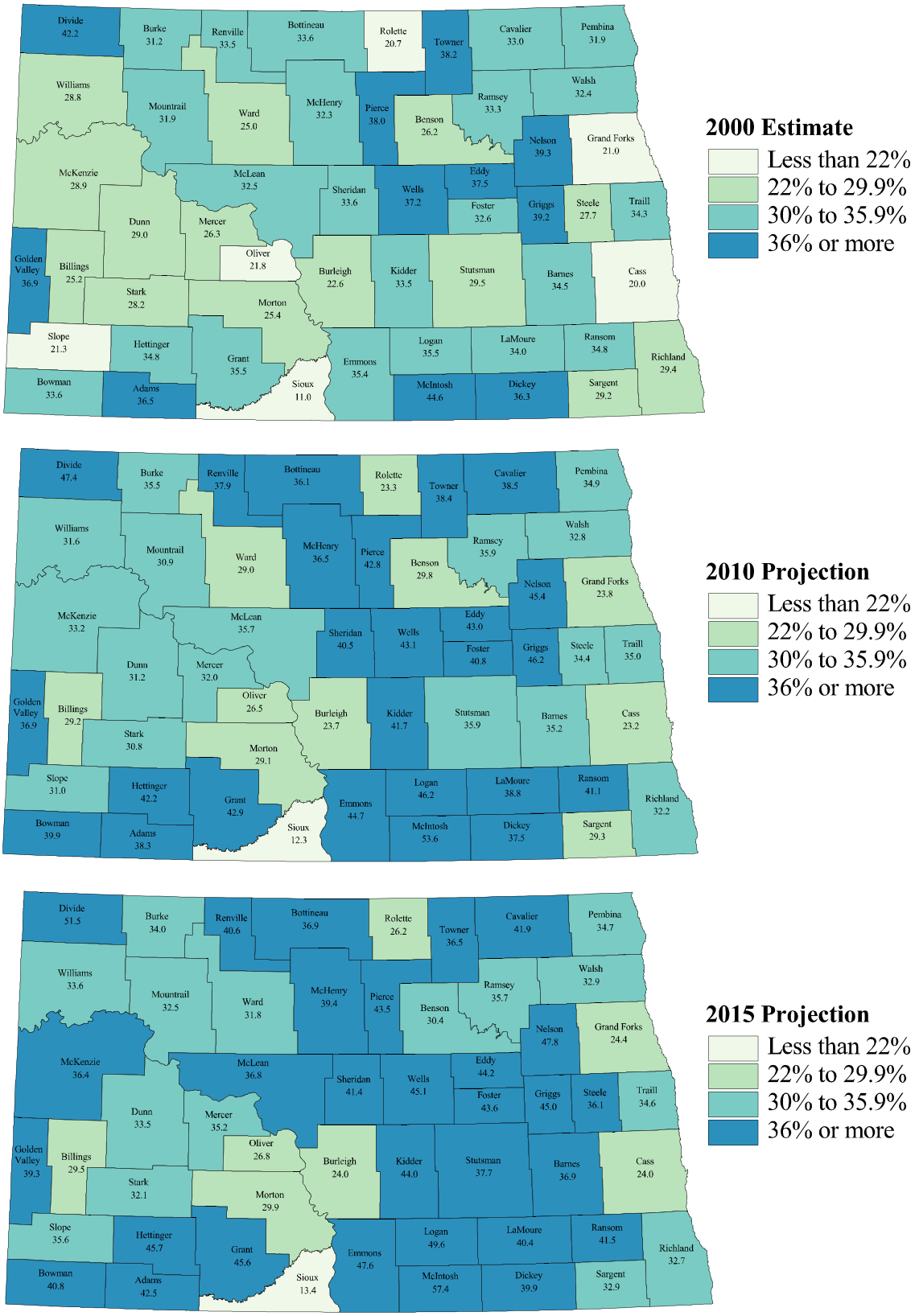


Figure 6. Total Hearing Impairment Among North Dakotans Ages 75 and Older as a Percent of Total Hearing Impairment Among North Dakotans Ages 15 and Older: 2000, 2010, and 2015



BIBLIOGRAPHY

Gallaudet Research Institute. 1994. "Demographic Aspects of Hearing Impairment: Questions and Answers, Third Edition." Washington, DC: GRI, Gallaudet University. Accessed online at: http://gri.gallaudet.edu/Demographics/factsheet.html (February 9, 2005).

Gallaudet Research Institute. December 2003. "State Summary Report of Data from the 2002-2003 Annual Survey of Deaf and Hard of Hearing Children and Youth." Washington, DC: GRI, Gallaudet University. Accessed online at: http://gri.gallaudet.edu/Demographics/States/2003/ND.pdf (February 9, 2005).

Kochkin, Sergei. 2001. "Marketrak VI: The VA and Direct Mail Sales Spark Growth in Hearing Aid Market." Accessed online at: http://www.betterhearing.org/pdfs/MR44.pdf (February 9, 2005).

McNeil, Jack. 1997. "Americans with Disabilities: Household Economic Studies." *Current Population Report*. P70-73. Washington, DC: U.S. Department of Commerce, U.S. Census Bureau. Accessed online at: http://www.census.gov/prod/2001pubs/p70-73.pdf (February 9, 2005).

National Association of the Deaf. "Difference Between Deaf and Hard of Hearing." Accessed online at: http://www.nad.org/site/pp.asp?c=foINKQMBF&b=180410 (February 9, 2005).

National Center for Health Statistics. May 1988. "Prevalence of Selected Chronic Conditions, United States, 1983-85." *Advance Data Reports from the National Health Interview Survey*. No. 155: Table 6. Hyattsville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. Accessed online at: http://www.cdc.gov/nchs/about/major/nhis/nhisadr.htm (February 9, 2005).

National Center for Health Statistics. March 1994. "Prevalence and Characteristics of Persons with Hearing Trouble: United States, 1990-91." *Vital and Health Statistics*. Series 10. Data from the National Health Interview Survey. No. 188: Table F. Hyattsville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. Accessed online at: http://www.cdc.gov/nchs/products/pubs/pubd/series/sr10/ser10.htm (February 9, 2005).

National Center for Health Statistics. 1997-2002. "Summary Health Statistics for U.S. Adults." *Vital and Health Statistics*. Series 10. Data from the National Health Interview Survey. No. 205, 209, 212, 215, 218, and 222: Table 11. Hyattsville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. Accessed online at: http://www.cdc.gov/nchs/products/pubs/pubd/series/sr10/ser10.htm (February 9, 2005).

National Center for Health Statistics. October 1999. "Current Estimates from the National Health Interview Survey, 1996." *Vital and Health Statistics*. Series 10. No. 200: Table 56. Hyattsville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. Accessed online at: http://www.cdc.gov/nchs/products/pubs/pubd/series/sr10/ser10.htm (February 9, 2005).

National Institute on Deafness and Other Communication Disorders. "Statistics About Hearing Disorders, Ear Infections, and Deafness." Accessed online at: http://www.nidcd.nih.gov/health/statistics/hearing.asp (November 17, 2004).

Rathge, Richard, Mandy Clemenson, and Ramona Danielson. 2002. *North Dakota Population Projections: 2005 to 2020*. Fargo, ND: North Dakota State Data Center, North Dakota State University. Available online at: http://www.ndsu.edu/sdc/publications.htm.

Rathge, Richard and Ramona Danielson. 2005. *Visual Impairment Among North Dakotans, 2005 Report*. Fargo, ND: North Dakota State Data Center, North Dakota State University.

U.S. Census Bureau, Housing and Household Economic Statistics Division. 1990. "Table 3. Selected Population Characteristics for States and Counties Including Model-Based Estimates of the Prevalence of Specific Disabilities Among Persons 16 and Over." Washington, DC: U.S. Department of Commerce, U.S. Census Bureau. Accessed online at: http://www.census.gov/hhes/www/disability/census/disapick.html (February 9, 2005).