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## Hearing Difficulty, Vision Trouble, and Balance Problems Among Male Veterans and Nonveterans

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### Abstract

**Objective**—This report describes hearing difficulty, vision trouble, dual sensory impairment (hearing and vision loss), and balance problems among male veterans and nonveterans.

**Methods**—Sample adult data from the 2016 National Health Interview Survey (NHIS) were used to assess degree of hearing difficulty, vision trouble, and dual sensory impairment in men aged 18 and over by veteran status. Data from the 2016 NHIS Sample Adult Balance Supplement were also used to create estimates of balance or dizziness problems for men by veteran status.

**Results**—Male veterans were significantly less likely to have excellent or good hearing than nonveterans (72.9% compared with 84.1%), and significantly more likely to have a little or moderate trouble hearing (23.2% compared with 13.6%), as well as more likely to have a lot of hearing difficulty or to be deaf (3.9% compared with 2.4%). Male veterans were also more likely to have dual sensory impairment and balance problems than nonveterans (5.0% compared with 2.5% and 24.3% compared with 18.7%, respectively). When data were stratified by age, male veterans aged 18–44 were over three times more likely to have a little or moderate trouble hearing compared with nonveteran men in the same age group (18.0% compared with 5.3%). Male veterans in age groups 45–64 and 65–74 were also more likely to have a little or moderate trouble hearing compared with nonveteran men in the same age groups. When the data were stratified by age, male veterans and nonveterans had similar percentages of dual sensory impairment. Lastly, male veterans in age groups 45–64 and 65–74 were more likely to have balance problems than nonveteran men in the same age groups.

**Keywords:** military • hearing loss • dizziness • National Health Interview Survey

### Introduction

Of the roughly 18 million veterans in the United States in 2018, one in four had a service-connected disability (1). Loss of at least some hearing is one of the most prevalent service-connected disabilities, second only to tinnitus (a symptom

commonly described as a ringing in the ears, but it also can sound like roaring, clicking, hissing, or buzzing) (2). While the high burden of hearing loss for veterans is partly attributed to both a higher occupational exposure to loud noise and their older age profile (3), more recent veteran cohorts returning from combat have had increased blast exposure (4). Concurrent higher survival rates have resulted in a higher prevalence of ear damage and traumatic brain injury (TBI) among veterans (5). Research suggests an independent association between TBI and hearing and vision loss (4,6). Additionally, there is an established association among balance problems, hearing loss, and vision loss, through an interrelated sensory system (7). All three impairments can limit functioning of daily life and can be associated with reduced quality of life and other health outcomes, such as depression and post-traumatic stress disorder (PTSD) (8–10). Healthy People 2020 identified veterans with sensory impairments as an emerging population for whom additional information is needed to understand the full impact of TBI and ear damage, as well as the prevalence of auditory disorders (hearing loss and tinnitus) and balance disorders, such as dizziness and vertigo (11). This report provides national



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estimates of hearing difficulty, vision trouble, dual sensory impairment, and balance problems for men by veteran status and age group.

## Methods

### Data source

Data from the 2016 National Health Interview Survey (NHIS) were used to generate the estimates presented in this report. NHIS is a multipurpose health survey of the U.S. civilian noninstitutionalized population conducted continuously throughout the year by the National Center for Health Statistics (NCHS). Data are collected in person at the respondent's home using computer-assisted personal interviewing, but follow-up to complete the interviews may be conducted over the telephone. A detailed description of the 2016 NHIS sample design, content, and use of the survey questionnaire is available elsewhere (12). Briefly, the 2016 NHIS consisted of both a core set of questions that were relatively unchanged from year to year as well as supplemental questions that were not asked every year. In 2016, NHIS included supplemental questions in the Sample Adult interview on balance and related problems. Analyses in this report were based on 33,208 adults aged 18 and over from the Sample Adult Core component and the supplemental questions on balance. The response rate for the Sample Adult Core component was 54.3% for 2016 (12).

### Hearing, vision, and balance measures

Survey questions about hearing and vision were included in the Sample Adult Core questionnaire, while balance questions were included in a supplemental section on balance problems, symptoms, and related health conditions. To assess degree of hearing difficulty, sample adults were asked, "Without the use of hearing aids or other listening devices, is your hearing excellent, good, a little trouble hearing, moderate trouble, a lot of trouble, or are you deaf?" Degree of hearing difficulty was assessed by combining

"excellent" and "good" into a single category, combining "a little trouble" and "moderate trouble" into a single category, and combining "a lot of trouble" and "deaf" into a single category. Vision trouble was assessed using responses to the following question: "Do you have any trouble seeing, even when wearing glasses or contact lenses?" Respondents were also asked, "Are you blind or unable to see at all?" but because blindness could not be differentiated from other degrees of vision trouble due to how the vision trouble question was asked (yes or no), respondents answering "yes" to the blindness questions were excluded from the analyses of those with vision trouble ( $n = 142$ ) because they were not a large enough group to analyze separately. Dual sensory impairment refers to a combined vision and hearing impairment of any degree or loss. A response of a little or moderate hearing trouble or a lot of trouble or deaf for hearing difficulty, as well as a "yes" response for the vision trouble question was treated as having dual sensory impairment. Balance questions asked respondents about types of balance problems and symptoms associated with them. Respondents were asked, "These next questions are about dizziness or balance problems. Have you ever had a problem with dizziness, lightheadedness, feeling as if you are going to pass out or faint, or with unsteadiness or feeling off-balance? Do not include times when drinking alcohol." For these analyses, a positive response to this question was defined as having balance problems.

### Veteran status

Questions about armed forces service were asked of all family members aged 18 and over in the Family Core component of NHIS. Veterans were defined as adults (aged 18 and over) who had ever served on active duty in the U.S. Armed Forces, Military Reserves, or National Guard and were not currently on full-time active duty with the Armed Forces. This definition is based on the response to the questions: "[Is anyone in the household/Are you/Is alias] now on full-time active duty with the Armed Forces?" and "Have you ever served on active duty in the U.S. Armed Forces,

Military Reserves, or National Guard?" NHIS does not sample homeless persons or those in institutional settings, such as nursing homes and prisons, so veterans from these living situations were not included in the analysis.

### Age and sex

Age was categorized into four groups: 18–44, 45–64, 65–74, and 75 and over. Due to the small number of female veterans in the 2016 NHIS ( $n = 306$ ), they were excluded from these analyses. Unweighted sample sizes by age and veteran status among men are shown in [Table 1](#).

### Statistical analyses

All analyses used sample adult weights to produce national estimates. The estimates of the degree of hearing difficulty, vision trouble, dual sensory impairment, and balance problems included in this report are nationally representative of the civilian, noninstitutionalized population of adult men aged 18 and over living in households across the United States. All analyses were conducted using SAS-callable SUDAAN version 11.0 (RTI International, Research Triangle Park, N.C.) to account for the complex sample design of NHIS. Respondents with missing data or unknown information were excluded from these analyses. Where indicated, estimates were age adjusted using the projected 2000 U.S. population from the U.S. Census Bureau as the standard population (13). Unless otherwise noted, all estimates shown in this report meet NCHS standards of reliability as specified in "National Center for Health Statistics Data Presentation Standards for Proportions" (14). Linear and quadratic trends were modeled using orthogonal polynomials. Estimates were compared for statistically significant differences using two-tailed significance tests at the 0.05 level, and the critical value used was 1.96. No adjustments were made for multiple comparisons.

## Results

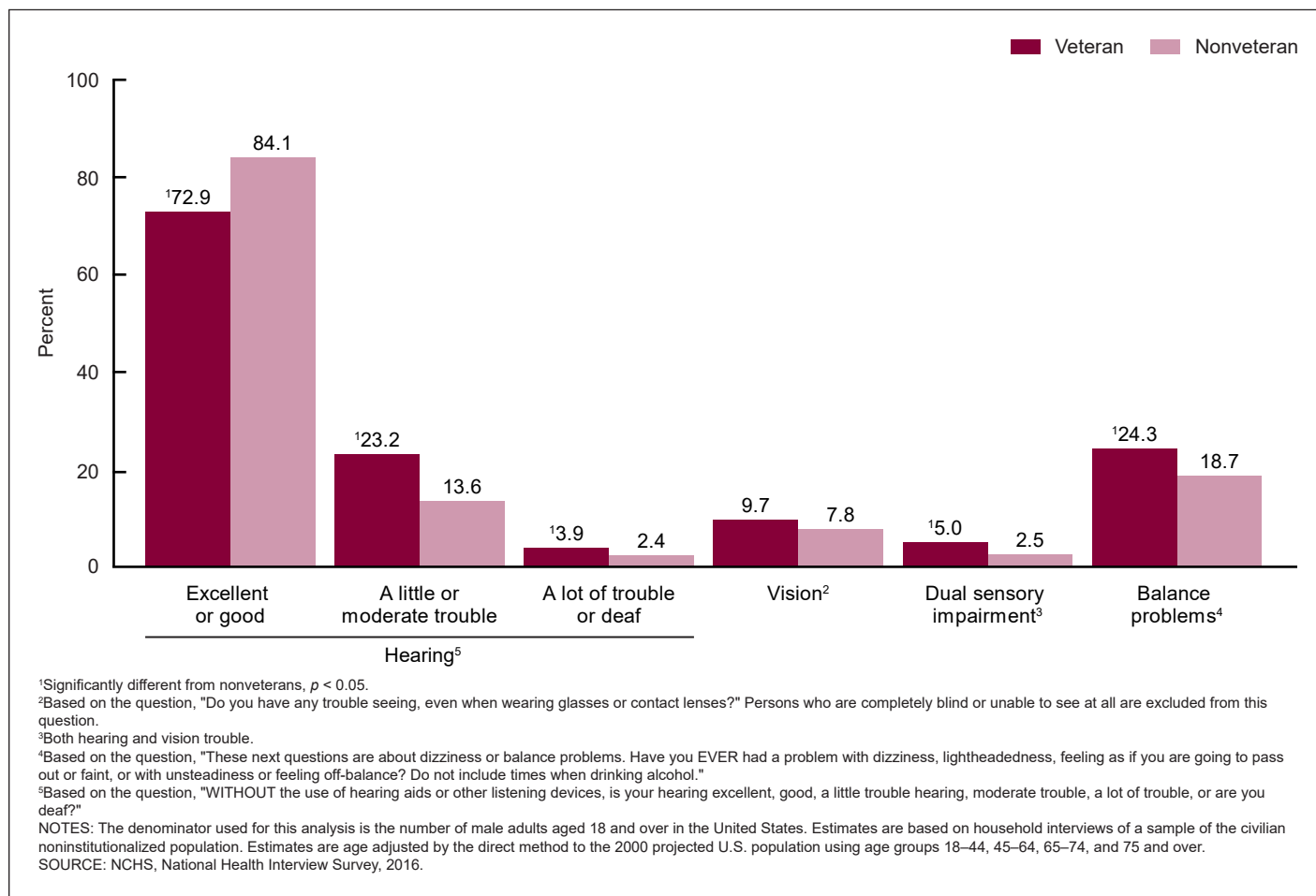
In 2016, degree of hearing difficulty varied among men by veteran status. Male veterans (72.9%) were less likely to have excellent or good hearing compared with male nonveterans (84.1%) (Figure, Table 2), while male veterans (23.2%) were more likely to have a little or moderate trouble hearing compared with male nonveterans (13.6%). Male veterans were also more likely to have a lot of trouble hearing or to be deaf (3.9%) compared with nonveterans (2.4%). Male veterans and nonveterans were comparable in the percentages with vision trouble (9.7% of veterans and 7.8% of nonveterans). Male veterans were twice as likely to have dual sensory impairment when compared with nonveterans (5.0% and 2.5%, respectively). Nearly one-quarter of male veterans had balance problems, a significant difference when compared with nonveterans (24.3% and 18.7%, respectively).

When the data were stratified by age, male veterans aged 18–44 were less likely than nonveterans to have excellent or good hearing (80.2% compared with 94.3%) (Table 3). Male veterans aged 18–44 were over three times more likely to have a little or moderate trouble hearing than nonveterans in the same age group (18.0% compared with 5.3%). Male veterans aged 45–64 were less likely to have excellent or good hearing, more likely to have a little or moderate trouble hearing, and more likely to have a lot of trouble hearing or to be deaf compared with nonveterans in the same age group (72.3% compared with 81.4%, 24.1% compared with 16.7%, and 3.6% compared with 1.9%, respectively). Additionally, male veterans aged 65–74 were less likely to have excellent or good hearing, and more likely to have a little or moderate trouble hearing when compared with nonveterans in the same age group (57.2% compared with 62.7% and 37.8% compared with 31.2%, respectively).

Male veterans and nonveterans aged 75 and over had similar percentages across all three levels of hearing difficulty.

For male veterans and nonveterans, the percentage with excellent or good hearing generally decreased with age, while the percentage with a little or moderate trouble hearing or with a lot of trouble hearing or who were deaf generally increased with age, at least up through age 74. The largest differences between veterans and nonveterans were observed for men aged 18–44.

While vision trouble was reported more frequently among male veterans than nonveterans aged 18–44, the estimate for veterans did not meet reliability criteria and the difference was not statistically significant. For the other age groups, the percentages of male veterans with vision trouble were comparable to those for nonveterans (Table 3). For veteran men, vision trouble generally increased with age, while for nonveteran men, vision trouble more than



**Figure. Age-adjusted percentage of degree of hearing difficulty, vision trouble, dual sensory impairment, and balance problems in men aged 18 and over, by veteran status: United States, 2016**

doubled from age 18–44 to age 45–64, and then increased more slowly through age 75 and over.

Data for all men aged 18 and over showed that male veterans were more likely to have dual sensory impairment than male nonveterans (Table 2); however, when the data were stratified by age, the differences were not significant and the estimate for male veterans aged 18–44 did not meet statistical reliability criteria (Table 3). The pattern of increase with age by veteran status for dual sensory impairment was similar to the pattern seen for vision impairment.

More than one-quarter of male veterans aged 45–64 and one-third of male veterans aged 65–74 had balance problems (26.3% and 33.0%, respectively). Within both age groups, male veterans were more likely to have balance problems than male nonveterans. For both veteran and nonveteran men, balance problems increased through age 65–74, and then were stable for men aged 75 and over.

## Discussion

This report examined degree of hearing difficulty, vision trouble, dual sensory impairment, and balance problems among men aged 18 and over, by veteran status and age group. Male veterans were significantly less likely to have excellent or good hearing compared with male nonveterans. Additionally, male veterans were significantly more likely to have a little or moderate trouble hearing, a lot of trouble hearing, or to be deaf compared with their male nonveteran counterparts. Male veterans and nonveterans had similar percentages of vision trouble; however, male veterans were significantly more likely to have dual sensory impairment and balance problems than male nonveterans.

The results of the age-stratified analyses of hearing difficulty were similar for men aged 18–44, 45–64, and 65–74: within each age group, male veterans were significantly less likely to have excellent or good hearing, and significantly more likely to have a little or moderate trouble hearing. Male veterans aged 45–64 were also more likely to have a lot of trouble hearing or to be deaf than male nonveterans in

the same age group. Among men in the oldest age group (75 and over), veterans and nonveterans had similar percentages of hearing difficulty. The age-stratified analyses of the vision and dual sensory impairment measures did not show any significant differences for male veterans compared with male nonveterans within age groups. Finally, the age-stratified analyses showed that male veterans aged 45–64 and 65–74 were more likely to have balance problems than male nonveterans in the same age group. In summary, age-stratified analysis showed differing patterns in the age trends by veteran status, largely due to a higher burden of sensory impairment among young veterans.

The observed differences in hearing difficulty for men by veteran status found in these analyses are consistent with prior research that has shown a higher prevalence of hearing loss among male veterans when compared with male nonveterans (15); however, these results provide additional information on degree of hearing difficulty that may be useful for understanding how different service periods may be associated with the prevalence of hearing difficulties among veterans. Male veterans aged 18–44 were three times more likely to have a little or moderate trouble hearing compared with their nonveteran counterparts, a finding that may reflect veterans with more recent military service. However, the age-stratified analyses show differences in hearing difficulty for male veterans aged 45–64 and 65–74 as well. Existing research has shown that hearing loss increases with age in the general population (16,17); however, these findings suggest that while hearing difficulty generally increases with age for both male veterans and nonveterans, veterans experience greater hearing loss at younger ages compared with their nonveteran counterparts. This may reflect different exposures in the combat setting by age, which result from changes in types of (and survival from) warfare over time.

Although prior research has shown that veterans are at increased risk of vision problems and dual sensory impairment (4), these results only show an overall age-adjusted difference in dual sensory impairment. The lack of

significant findings on the vision and dual sensory impairment measures by age may be due, in part, to the crude measure of vision trouble that exists in NHIS, which does not ask about degree or type of vision difficulty. These analyses also exclude the small number of NHIS sample adult respondents who said they are blind. Additionally, small sample sizes for some groups after the data were stratified by age may have hindered the ability to detect significant differences.

These analyses show that among men overall, veterans were more likely to experience balance problems than nonveterans. Additionally, male veterans aged 45–64 and 65–74 were significantly more likely to have balance problems when compared with their nonveteran counterparts in the same age groups, and balance problems increased with age, even at the younger age groups. Existing research has shown that balance problems increase with older age in the general population (18); however, the relationship between balance problems and age has not been previously shown in nonelderly adults. Moreover, few studies have examined balance problems in veterans. One recent study showed increased prevalence of balance problems in a small cohort of veterans with mild TBI (10); however, further research may be needed to understand this relationship.

These analyses are not without some limitations. The results presented in this report are meant to be largely descriptive, and do not account for other characteristics that might explain differences between male veterans and nonveterans. Additionally, the hearing, vision, and balance data used in these analyses are based on self-reported information. While clinical measures for these outcomes are considered the gold standard, some research suggests that self-reported hearing information has acceptable validity when compared with clinical data for some populations (19,20). Also, NHIS has very limited information on TBI, which is strongly associated with hearing trouble, vision trouble, and dual sensory impairment in veterans, particularly those with combat experience in Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) (4,6). Therefore, TBI could not be assessed in relation to other outcomes in

this report. NHIS also does not collect specific information on limb injury or loss, both of which could also affect balance. Additionally, supplemental questions on tinnitus and other vestibular disorders that could affect balance were only asked of a subsample of adult respondents with balance problems; therefore, those data could not be used for these analyses. NHIS also does not collect information on veterans living in long-term care facilities or homeless veterans, which are populations of veterans that may experience sensory impairment. Finally, although female veterans are a priority group for the Veterans Health Administration (21), the number of female veterans included in NHIS in 2016 was not large enough to support national estimates for hearing difficulty, vision trouble, or balance problems among female veterans.

Despite these limitations, the findings in this report provide information about hearing difficulty, vision trouble, dual sensory impairment, and balance problems in male veterans. Several of these estimates are among the first for a nationally representative population of male veterans, and confirm findings shown in smaller studies. The population of post-9/11 veterans is increasing relative to the population of veterans from previous combat cohorts (22) and includes those who have served in OIF and OEF. Further research might expand on these findings and explore other demographic and health comorbidities that may be related to hearing loss and other sensory impairments in veterans.

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**Table 1. Sample sizes for male adults, by age and veteran status: National Health Interview Survey, 2016**

Characteristic	Total <sup>1</sup>	Veteran	Nonveteran
All .....	14,991	3,181	11,801
Age			
18–44 .....	5,943	383	5,557
45–64 .....	5,290	885	4,403
65–74 .....	2,285	1,000	1,282
75 and over .....	1,473	913	559

<sup>1</sup>Total includes adult men of unknown veteran status ( $n = 9$ ).

SOURCE: NCHS, National Health Interview Survey, 2016.

**Table 2. Age-adjusted percentages (and 95% confidence intervals) of men aged 18 and over with a degree of hearing difficulty, vision trouble, dual sensory impairment, or balance problems, by veteran status: United States, 2016**

Selected characteristic	Veteran	Nonveteran
Hearing <sup>1</sup> :		
Excellent or good .....	<sup>2</sup> 72.9 (69.6–76.0)	84.1 (83.1–84.9)
A little or moderate trouble .....	<sup>2</sup> 23.2 (20.3–26.3)	13.6 (12.7–14.4)
A lot of trouble or deaf .....	<sup>2</sup> 3.9 (2.9–5.2)	2.4 (2.0–2.8)
Vision trouble <sup>3</sup> .....	9.7 (7.2–12.6)	7.8 (7.2–8.4)
Dual sensory impairment <sup>4</sup> .....	<sup>2</sup> 5.0 (3.4–6.9)	2.5 (2.2–2.9)
Balance problems <sup>5</sup> .....	<sup>2</sup> 24.3 (21.1–27.7)	18.7 (17.7–19.7)

<sup>1</sup>Based on the question, "WITHOUT the use of hearing aids or other listening devices, is your hearing excellent, good, a little trouble hearing, moderate trouble, a lot of trouble, or are you deaf?"

<sup>2</sup>Significantly different from nonveterans,  $p < 0.05$ .

<sup>3</sup>Based on the question, "Do you have any trouble seeing, even when wearing glasses or contact lenses?" Persons who are blind or unable to see at all are excluded from this question.

<sup>4</sup>Both hearing and vision trouble.

<sup>5</sup>Based on the question, "These next questions are about dizziness or balance problems. Have you EVER had a problem with dizziness, lightheadedness, feeling as if you are going to pass out or faint, or with unsteadiness or feeling off-balance? Do not include times when drinking alcohol."

NOTES: The denominator used for this analysis is the number of male adults aged 18 and over in the United States. Estimates are based on household interviews of a sample of the civilian noninstitutionalized population. Estimates are age adjusted by the direct method to the 2000 projected U.S. population using age groups 18–44, 45–64, 65–74, and 75 and over.

SOURCE: NCHS, National Health Interview Survey, 2016.

**Table 3. Percentages (and 95% confidence intervals) of men aged 18 and over with a degree of hearing difficulty, dual sensory impairment, vision trouble, or balance problems, by age group and veteran status: United States, 2016**

Age group and veteran status	Hearing <sup>1</sup>			Vision trouble <sup>4-6</sup>	Dual sensory impairment <sup>4,5,7</sup>	Balance problems <sup>4,5,8</sup>
	Excellent or good <sup>2,3</sup>	A little or moderate trouble <sup>4,5</sup>	A lot of trouble or deaf <sup>4,5</sup>			
<b>18-44</b>						
Veteran . . . . .	<sup>9</sup> 80.2 (74.2-85.3)	<sup>9</sup> 18.0 (13.2-23.7)	1.8 (0.4-5.2)	*	*	19.9 (14.5-26.3)
Nonveteran . . . . .	94.3 (93.5-95.1)	5.3 (4.6-6.1)	0.4 (0.2-0.6)	4.8 (4.1-5.6)	0.6 (0.4-0.9)	14.2 (12.9-15.6)
<b>45-64</b>						
Veteran . . . . .	<sup>9</sup> 72.3 (67.9-76.4)	<sup>9</sup> 24.1 (20.1-28.4)	<sup>9</sup> 3.6 (2.4-5.3)	11.1 (8.7-13.9)	5.1 (3.4-7.3)	<sup>9</sup> 26.3 (22.4-30.6)
Nonveteran . . . . .	81.4 (79.8-82.9)	16.7 (15.3-18.2)	1.9 (1.5-2.5)	10.2 (9.1-11.4)	3.2 (2.6-3.8)	21.1 (19.5-22.7)
<b>65-74</b>						
Veteran . . . . .	<sup>9</sup> 57.2 (52.8-61.4)	<sup>9</sup> 37.8 (33.5-42.2)	5.0 (3.6-6.9)	12.6 (10.1-15.4)	6.8 (5.0-8.9)	<sup>9</sup> 33.0 (29.2-37.1)
Nonveteran . . . . .	62.7 (59.3-66.1)	31.2 (28.0-34.6)	6.0 (4.2-8.3)	11.3 (9.3-13.6)	5.1 (3.9-6.7)	27.1 (24.0-30.4)
<b>75 and over</b>						
Veteran . . . . .	45.0 (40.7-49.3)	37.3 (33.4-41.2)	17.8 (15.0-20.9)	14.8 (12.1-17.8)	10.6 (8.3-13.2)	36.3 (32.3-40.5)
Nonveteran . . . . .	50.2 (44.6-55.7)	36.4 (31.2-41.9)	13.4 (10.2-17.2)	14.4 (11.0-18.4)	9.7 (6.8-13.3)	30.1 (25.3-35.2)

\* Estimate does not meet NCHS standards of reliability and is not shown.

<sup>1</sup>Based on the question, "WITHOUT the use of hearing aids or other listening devices, is your hearing excellent, good, a little trouble hearing, moderate trouble, a lot of trouble, or are you deaf?"

<sup>2</sup>Significant decreasing linear trend across age groups for veterans.

<sup>3</sup>Significant decreasing quadratic trend across age groups for nonveterans.

<sup>4</sup>Significant increasing linear trend across age groups for veterans.

<sup>5</sup>Significant increasing quadratic trend across age groups for nonveterans.

<sup>6</sup>Based on the question, "Do you have any trouble seeing, even when wearing glasses or contact lenses?" Persons who are blind or unable to see at all are excluded from this question.

<sup>7</sup>Both hearing and vision trouble.

<sup>8</sup>Based on the question, "These next questions are about dizziness or balance problems. Have you EVER had a problem with dizziness, lightheadedness, feeling as if you are going to pass out or faint, or with unsteadiness or feeling off-balance? Do not include times when drinking alcohol."

<sup>9</sup>Significantly different from nonveterans,  $p < 0.05$ .

NOTES: The denominator used for this analysis is the number of male adults aged 18 and over in the United States. Estimates are based on household interviews of a sample of the civilian noninstitutionalized population.

SOURCE: NCHS, National Health Interview Survey, 2016.

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