

## What You Should Know About Tinnitus

*Tinnitus is the perception of sound where no external source exists. Those who are affected describe tinnitus as a “ringing, hissing, buzzing or whooshing,” perceived in one or both ears.*

- ☞ **50 million** people in the United States experience tinnitus; of those, **16 million** have sought medical attention for their tinnitus and **2-3 million** are completely disabled from their tinnitus.
- ☞ Tinnitus is most often the result of **noise exposure**; either from a single impulse (extreme) noise, or cumulative exposure to noise. **Head and neck injury** are the second leading known cause of tinnitus.
- ☞ According to the Department of Veterans Affairs (VA), tinnitus is the **#1 service-connected disability** for veterans from all periods of service – at the end of 2010, **744,000** veterans were receiving disability compensation for tinnitus alone.
- ☞ In 2010, the VA paid out over **\$1.1 billion** to veterans for tinnitus disability compensation – at the current rate of increase, disability payments to veterans for tinnitus is expected *to exceed \$2.26 billion* by 2014.
- ☞ Between all public and private funding combined in the U.S. for tinnitus research, there exists approximately **\$10 million**.
- ☞ A 2007 study of 900 musicians found that *at least 60%* report at least occasional tinnitus.
- ☞ **30 million workers** are at risk for tinnitus from Noise Induced Hearing Loss (NIHL) from hazardous noise on the job.
- ☞ The Centers for Disease Control report that nearly **13% of children**, ages 6-19 (5 million in the U.S.) already have some form of NIHL. This means they may also have tinnitus or they are at greater risk for developing tinnitus.
- ☞ A recent Department of Defense study on Iraq service veterans indicated that **70%** of those exposed to an explosive blast reported tinnitus within the first 72 hours after the incident; **43%** of those seen one month after the incident continued to report tinnitus.
- ☞ According to the National Institute on Occupational Safety and Health, **85 decibels for 8 hours** is considered to be “safe,” meaning it is *unlikely* to do damage. **Note:** *at that level, 7-8 people will still sustain some hearing damage.*

The American Tinnitus Association exists to cure tinnitus through the development of resources that advance tinnitus research.



From the FY 2010 Department of Veterans Affairs Annual Benefits Report.

**Most Prevalent Service-Connected Disabilities for Veterans Receiving Compensation at the End of Fiscal Year 2010**

- Tinnitus 744,871
- Hearing loss 672,410
- Post traumatic stress disorder 437,310
- Scars, general 418,748
- Diabetes mellitus 332,065
- Hypertensive vascular disease 284,552
- Traumatic arthritis 279,402
- Lumbosacral or cervical strain 277,417
- Impairment of the knee, general 267,049

**Most Prevalent Service-Connected Disabilities for Veterans Who Began Receiving Compensation During Fiscal Year 2010**

*(Disability Number of Veterans Percent of Total)*

- Tinnitus 92,260 10.7%
- Hearing loss 63,583 7.3%
- Post traumatic stress disorder 37,263 4.3%
- Limitation of flexion, knee 34,456 4.0%
- Lumbosacral or cervical strain 31,881 3.7%
- Tendon inflammation 25,826 3.0%
- Degenerative arthritis of the spine 25,394 2.9%
- Diabetes mellitus 24,233 2.8%
- Limitation of motion of the ankle 20,623 2.4%
- Scars, general 20,562 2.4%

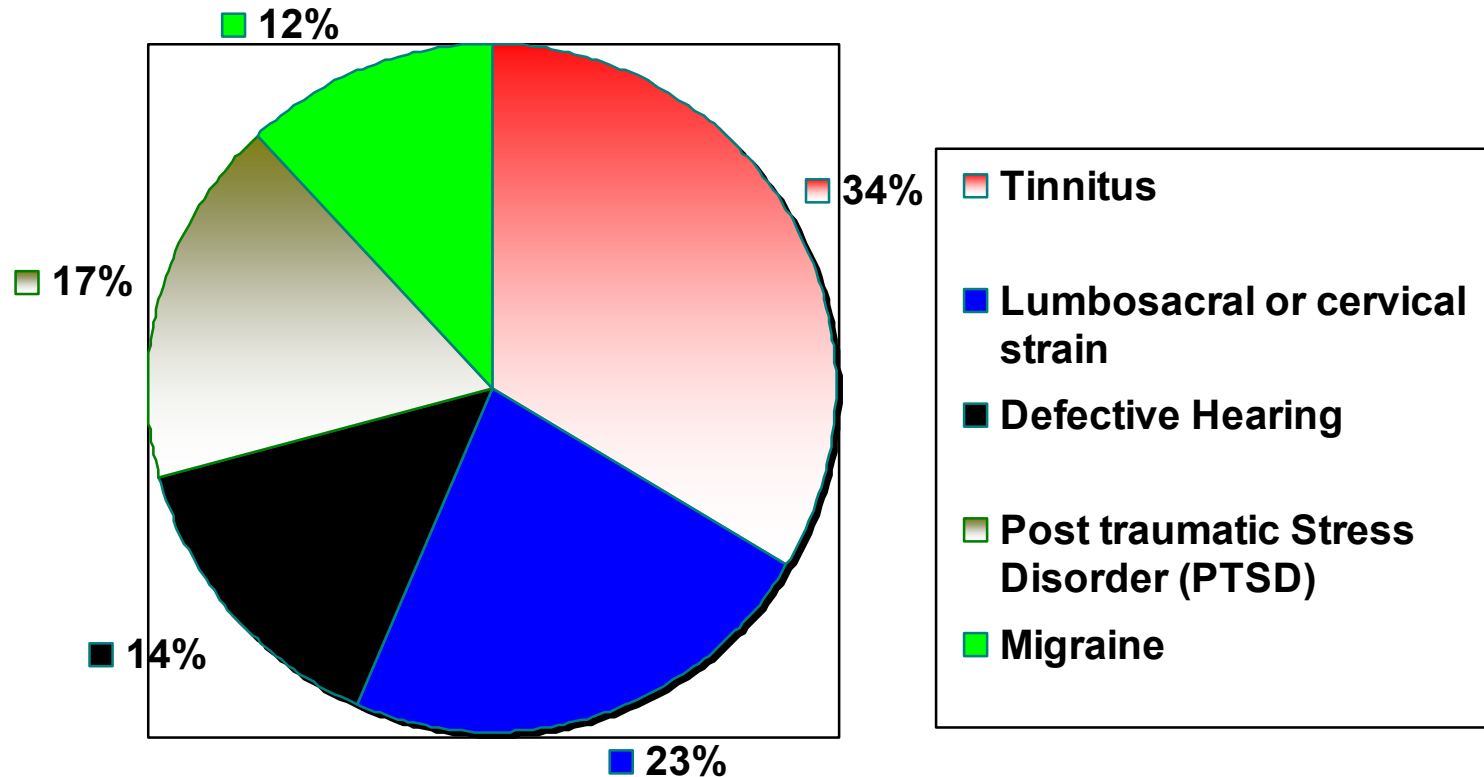
Most Prevalent Disabilities by Period of Service at the End of Fiscal Year 2010

**717,463 male veterans and 27,408 female veterans are rated for tinnitus; and 632,627 male veterans and 9,710 female veterans are rated for hearing loss.**

**Rank by Period of Service (Compare these new numbers with the following page – to see the changes since 2008.**

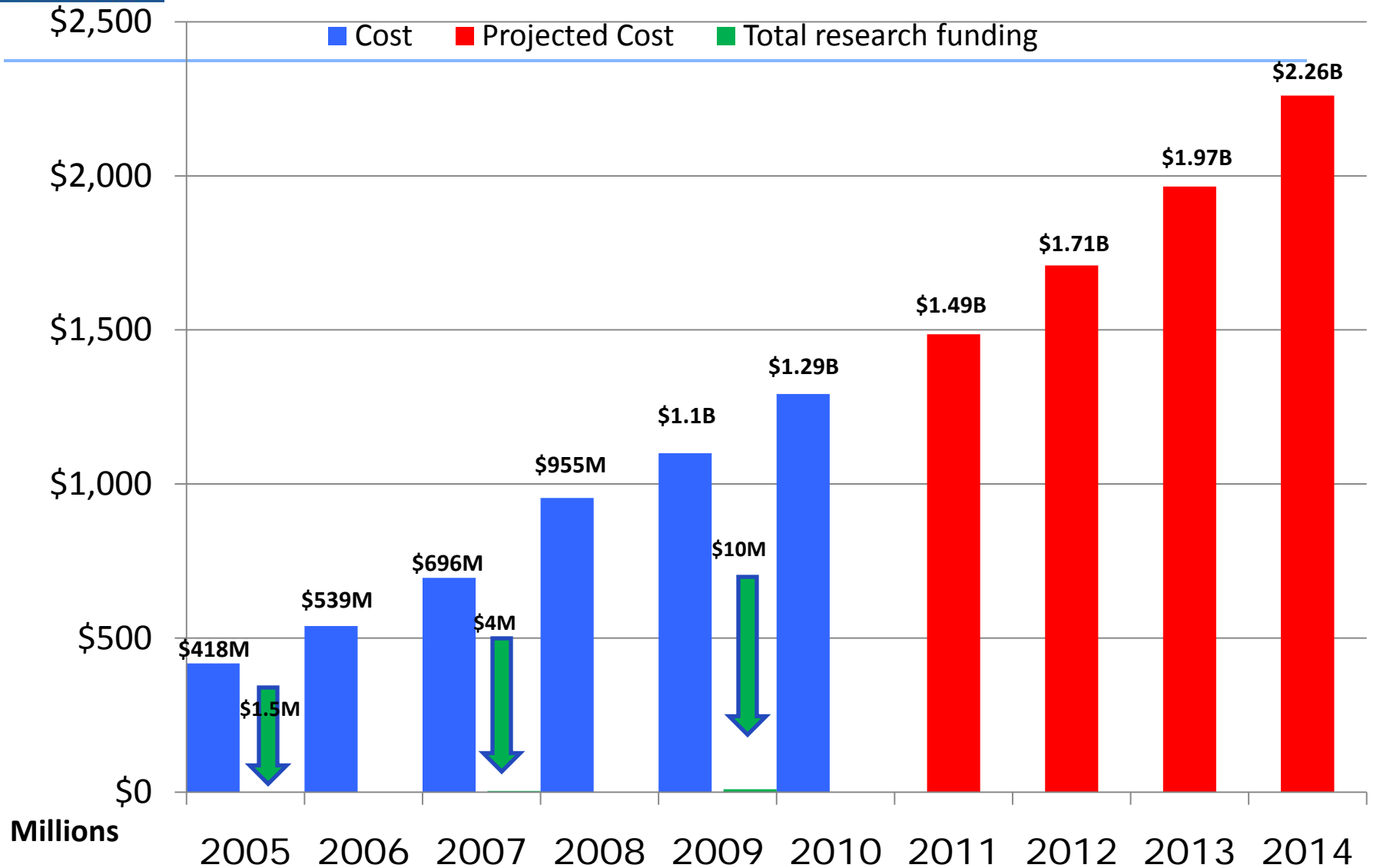
Period	Hearing Loss	Tinnitus
WWII	#1	#2
Korean War	#1	#2
Vietnam War	#3	#4
Gulf War	#6	#1
Peacetime	#1	#2

## Most common service-connected disabilities for Iraq and Afghanistan veterans as of July 2009



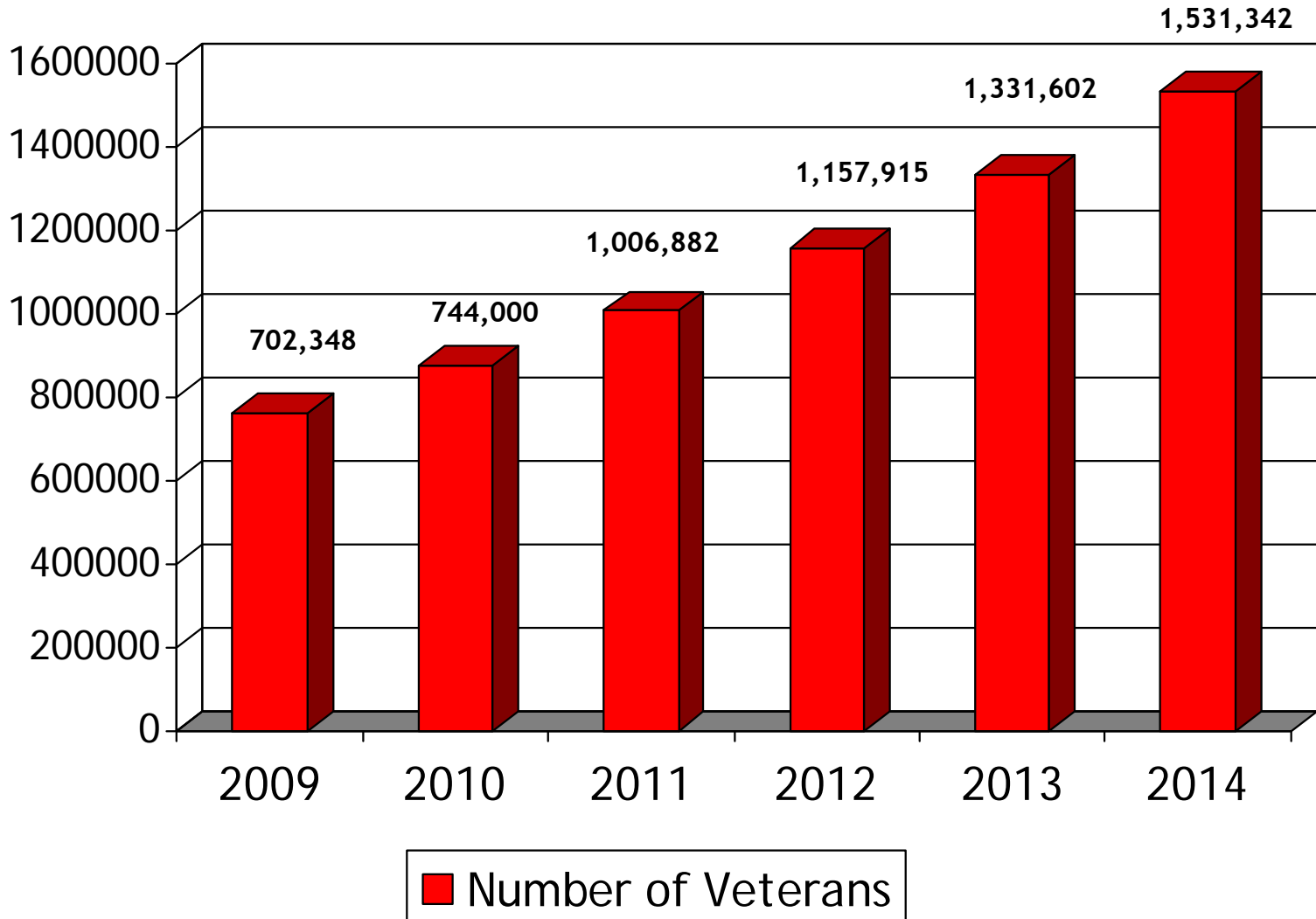
*Information courtesy of VA Office of Public Affairs and VBA*

# Cost to the VA for Tinnitus Disability Compensation



# Projected number of Veterans who will be service-connected for tinnitus

*Analysis based on previous five year trend*



**Research finds connection between Tinnitus and PTSD**  
"The Association between Tinnitus and Post-Traumatic Stress Disorder"  
Published in the *American Journal of Audiology*, December 2007

**Summary:**

A recent Veterans Affairs Medical Center study on tinnitus in the veteran population supports the critical need for increased tinnitus research. A better understanding of causal mechanisms and gaps in research between tinnitus and PTSD, in both the veteran and general populations is essential. The study further supports the need for standardized protocols for tinnitus evaluation and treatment VA wide. The findings address both *physical and psychological* relations between tinnitus and PTSD.

**Background:**

A pronounced need for tinnitus services prompted the opening of a specializing clinic in the Audiology Clinic at Tennessee's James H. Quillen Veterans Affairs Medical Center in 2001. This study analyzed 300 veterans at the clinic over a four year period. The results showed high correlations between veterans with tinnitus and post-traumatic stress disorder (PTSD). It evaluated patient reports citing tinnitus severity, suddenness of tinnitus onset, sound-tolerance problems, and sound-triggered exacerbation of tinnitus. Similarities between tinnitus and PTSD include exaggerated startle response and decreased loudness tolerance.

**Key Findings of the study:**

- ☞ 34% of patients initially enrolled at the VAMC tinnitus clinic also carried a diagnosis of PTSD.
- ☞ Tinnitus severity, sudden onset and sound-triggered exacerbation of tinnitus were more common in those carrying the dual diagnosis of tinnitus and PTSD.
- ☞ Tinnitus was often worsened by PTSD related anxiety.
- ☞ Those with dual diagnosis required test protocols and referrals that addressed BOTH of these formidable conditions.

**Conclusion and Request:**

- ☞ 2007 VA data showed tinnitus to be the **#1** service connected disability for returning veterans of the Global War on Terror
- ☞ This latest study expands previous studies and supports the need to include tinnitus research in conjunction with PTSD research. Several neural mechanisms linked to both tinnitus and PTSD affect auditory behaviors. Therefore, it is imperative that these conditions are researched in conjunction to better understand causal mechanisms of both conditions and to find accurate and effective means of treating and curing both conditions.

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**Military research demonstrates link between Tinnitus and TBI**  
**'Blast Injuries of the Ear - an update from the Global War on Terror'**  
Published in the *Journal of Military Medicine* July 2007

**Summary:** The results of research to date on tinnitus caused by blast exposure for military personnel serving in the Global War on Terror supports the critical need for pre- and post-deployment hearing evaluations that include tinnitus, to ensure accurate diagnosis of patients with TBI and other related conditions. Such screening will improve treatment and patient outcomes and promote research on causes and prevention strategies for tinnitus; currently ranked as the number one service connected disability by the Department of Veterans Affairs (VA). In the absence of tinnitus screening, patients with blast injury symptoms could fail to receive proper evaluation and treatment.

**Background:** A study analyzing pre and post deployment medical data of over 250 OIF (Operation Iraqi Freedom) and OEF (Operation Enduring Freedom) patients suffering from blast related injuries was conducted at the Army Audiology and Speech Center, Walter Reed Army Medical Center (WRAMC) between April 2003 and August 2005. Patients served in the United States Army, Air Force, Marines, Navy, and included civilians employed by the Department of Defense (DoD). The purpose of the study was to describe the auditory consequences of blast exposure. This study is the most comprehensive study to date on blast exposure and tinnitus conducted from the Global War on Terror.

Previous studies by Defense and Veterans Brain Injury Center, found a high correlation between TBI and tinnitus for patients exposed to blast: 61% had TBI and 49% had tinnitus.

**Key Finding of the Study and Recommendation:**

**Half of the patients were diagnosed with tinnitus.** These findings also suggest that hearing injury, including tinnitus, is more pervasive than patients initially reported following exposure to blasts.

- Ⓢ Results from this study underline the need for documentation of pre, post deployment hearing tests that include testing for tinnitus, and prompt otologic evaluation with the blast-exposed population.
- Ⓢ Previous studies have shown that close proximity to blasts from IED's produce sound levels in excess of 140 dBA; loud enough to do permanent severe damage to hearing and cause tinnitus.
- Ⓢ Otologic (ear) injury from blasts such as tinnitus and hearing loss can decrease performance and situational awareness thus compromising a soldier's ability to hear and execute commands properly, resulting in reduced ability to meet mission requirements.

**Request:** Include tinnitus screening and evaluation as part of pre- and post- deployment health assessment. Protocols exist which both the Department of Veterans Affairs and National Institutes of Health that have been pilot tested and used in clinical applications have developed through research.

## Hearing Loss

**HEARING LOSS AND TINNITUS:**

*The Veterans Health Administration needs to provide a full continuum of audiology services.*

Historically, tinnitus, commonly referred to as “ringing in the ears,” has been a leading disability for veterans and in FY 2010 it topped the list as the most prevalent service-connected disability for returning personnel from Operations Enduring and Iraqi Freedom (OEF/OIF).<sup>117</sup> Similarly, with regard to veterans who served in previous conflicts, tinnitus has always been one of the top 10 service-connected disabilities for veterans from any period of service (including peacetime).<sup>118</sup> With noise exposure and hearing damage being the number-one cause of tinnitus, it is not hard to understand why tinnitus is so prevalent within veteran and active duty military populations. There is currently no cure for tinnitus; treatment options are limited; and efficacy varies depending on the patient.

**How Tinnitus Manifests**

Acoustic trauma has been part of military life since muskets and cannons were part of the arsenal, and OEF/OIF is no exception. America’s future veterans are exposed to some of the noisiest battlegrounds ever: improvised explosive devices (IEDs)—the signature weapon of the insurgency—regularly hit patrols, which leads to a wealth of problems, including hearing loss and tinnitus. The noise emitted from IEDs is a main source of the disproportionate increases of tinnitus in veterans, but tinnitus can also be caused from head and neck trauma. Traumatic brain injury (TBI), one of the signature wounds of these conflicts, is producing a whole new generation of veterans with both mild and severe head injuries that are often accompanied by tinnitus. Head and neck trauma is the second most frequently reported cause of tinnitus. Blast-related TBI produces significantly greater rates of hearing loss and tinnitus compared with nonblast-related TBI, affecting up to 60 percent of these patients.<sup>119</sup>

**Tinnitus and TBI**

In particular, mild traumatic brain injury or mild TBI often includes tinnitus as a manifestation of injury. As defined by the Department of Defense policy for mild traumatic brain injury, TBI is the presence of a documented head trauma or blast exposure event, followed by a change in mental and physical status, which includes multiple symptoms, one of which could be tinnitus. A recent DOD study on Iraq veterans indicated that 70 percent of those exposed to a blast reported tinnitus within the first 72 hours after the incident; 43

percent of those seen one month after exposure to blast continued to report tinnitus. While the rate decreases over time, tinnitus rates exceeded hearing loss rates at all time points. These findings also demonstrate the need for more comprehensive diagnostics and broader range of therapeutic approaches for tinnitus, particularly when it is not accompanied by hearing loss, which can only be achieved by continued and additional research on the condition.

Another research finding on the OEF/OIF veteran population, conducted at the James H. Quillen Veterans Affairs Medical Center Tinnitus Clinic, in Mountain Home, Tennessee, noted the increasing association between tinnitus and post-traumatic stress disorder (PTSD). Of the first 300 patients enrolled at the clinic, 34 percent also carried a diagnosis of PTSD.<sup>120</sup>

These indications of the direct connections between tinnitus and TBI, as well as tinnitus and PTSD, point to the urgent need to address any gaps in research and treatment modalities provided by both the Departments of Defense and Veterans Affairs. Steps to address these conditions and gap areas have begun to be addressed by Congress, VA, and the DOD; however, much more needs to be done to adequately address the growing needs of America’s veterans.

**Invisible Injury**

Many service members returning from war are physically disabled. Those types of injuries are easily seen, diagnosed, and treated by physicians. Veterans exposed to blasts from roadside bombs often suffer internal injuries that are not as easy to detect and treat. Tinnitus is one of the most prevalent invisible injuries. In September 2010, the Invisible Wounds Caucus held a meeting to specifically address tinnitus. This was the first time a Congressional body had addressed tinnitus in a meeting on veterans’ health and was an excellent step toward better understanding tinnitus. We hope Congress will continue to address tinnitus at future caucus meetings as well as within the VA committees when appropriate to do so.

**Tinnitus Prevalence**

For millions of Americans, tinnitus becomes more than an annoyance. Chronic tinnitus can leave an individual feeling isolated and impaired in the ability to communicate with others. This isolation can cause anxiety, de-

pression, and feelings of despair. Tinnitus can be so debilitating that some affected individuals cannot work, interact with family and friends, or even sleep. Tinnitus impacts some 50 million Americans to some degree. Sixteen million individuals are chronically afflicted and 2 million are incapacitated by their tinnitus.<sup>121</sup> It is estimated that 250 million people worldwide experience chronic tinnitus.<sup>122</sup>

### Adding to the Rolls Every Year

The number of veterans who are receiving disability compensation for tinnitus has risen steadily over the past 10 years. Since 2005, service-connected disability for tinnitus has increased alarmingly by 15 percent per year. At the end of 2009, nearly 800,000 veterans from all periods of service were service-connected for their tinnitus. A veteran with tinnitus may be awarded up to a 10 percent disability, which currently equals \$123 a month. Although tinnitus is a condition and not a disease, it is considered a “disease of the ear” according to title 38, United States Code.

Translated into financial terms, the government paid out approximately \$1.1 billion in VA disability compensation for tinnitus in 2009. At the current rate of increase, service-connected disability payments to veterans for tinnitus will cost \$2.26 billion annually by 2014.<sup>123</sup> While the government will spend increasing amounts to compensate veterans with tinnitus, its investment in research pales in comparison (less than 1 percent of current compensation payments combined).

The scientific community has made groundbreaking discoveries about tinnitus in the past 10 years, such as better understanding of the genesis of tinnitus in the brain and which brain systems are involved with tinnitus perception. We now know that tinnitus originates in the brain and not the ear. Because of these discoveries, and the increases in tinnitus prevalence in both military and civilian populations, it is imperative that we continue to support increased tinnitus research to help expedite further discovery. This support will help to acquire to bet-

ter treatments and an eventual cure for all who suffer from tinnitus. There have been early steps toward collaboration on these research efforts by VA, the DOD, and the National Institutes of Health (NIH), including a two-day workshop in August of 2009 specifically addressing the current state of tinnitus research. *The Independent Budget* encourages continued collaboration by NIH, the DOD, and VA to ensure the best possible outcomes for America’s veterans with tinnitus.

### Noise-Induced Hearing Loss and Tinnitus

During present-day combat, a single exposure to the impulse noise of an IED can cause immediate tinnitus and hearing damage. An impulse noise is a short burst of acoustic energy, which can be either a single burst or multiple bursts of energy. According to the National Institute for Occupational Safety and Health, prolonged exposure from sounds at 85+ decibel levels (dBA) can be damaging, depending on the length of exposure. For every three-decibel increase, the time an individual needs to be exposed decreases by half, and the chance of noise-induced hearing loss and tinnitus increases exponentially. At 140+ dBA, the sound pressure level of an IED, damage occurs instantaneously. Table 4 shows a few common military operations and associated noise levels, all exceeding the 140 dBA threshold.<sup>124</sup>

It’s no surprise that service members using weaponry that emits such high decibel levels, in training or combat, are at greater risk of this type of disability than their civilian counterparts.

### Hearing Conservation

Hearing conservation programs have been in place since the 1970s to protect and preserve the ears of our military service personnel. However, a study released by the Institute of Medicine in 2005, titled *Noise and Military Service* reviewed these hearing conservation programs and concluded they were not adequately protecting the auditory systems of service members. Additional studies conducted to assess the job performance of those exposed to extremely noisy environments in the military concluded that the noise not only caused disabilities, but put the overall safety of the service member and their team at risk. Reaction time can be reduced as a result of tinnitus, thus degrading combat performance and the ability to understand and execute commands quickly and properly.

Many military personnel develop tinnitus and other hearing impairments prior to active combat as a result of

**Table 4. Noise Levels—Common Military Operations**

Type of Artillery	Position	Decibel Level (dBA) (Impulse Noise)
105 mm Towed Howitzer	Gunner	183
Hand Grenade	At 50 Feet from Target	164
Rifle	Gunner	163
9 mm Pistol	N/A	157
F18C Handgun	N/A	150
Machine Gun	Gunner	145

training. If a service member is disabled prior to combat, his or her effectiveness already may be compromised at the beginning of combat exposure. A study in *Tank Gunner Performance and Hearing Impairment* concluded that hearing impairments may delay a service member's ability to identify a target by as much as 50 seconds and be the cause of other inefficiencies and impairments in the line of duty.<sup>125</sup>

### The Role of Medical Research

Research has increased our knowledge about hearing loss and how it occurs, while less has been discovered about tinnitus—but that knowledge is growing. So much more is known today about tinnitus and its origins than was known 10 years ago. This knowledge better informs health professionals on how to best treat a patient with a particular subset of symptoms.

Tinnitus is a condition of the auditory system that originates in the brain. This finding reinforces the connection between TBI and tinnitus and may help explain why this population of veterans is experiencing tinnitus in record numbers. Of 692 TBI patients at Walter Reed Army Medical Center between January 2003 and March 2006, nearly 90 percent had nonpenetrating head injuries.<sup>126</sup> The extent and epidemiology of how tinnitus and TBI are affecting each other will remain unknown unless the federal government funds more medical and prosthetic research as encouraged by *The Independent Budget*.

Even though tinnitus research has come a long way, especially in recent years, much more needs to be learned. With so many veterans being added to the rolls every year for service-connected tinnitus, VA, the DOD, and NIH need to continue working collaboratively to continue as the leaders in tinnitus research. As of July 2009, more than 120,000 OEF/OIF veterans had been awarded service-connected disability for tinnitus. Prior to that, there were approximately 650,000 veterans from previous conflicts already on the rolls for tinnitus. VA estimates show that it is likely that the actual number of veterans who have tinnitus sustained from combat and active duty is closer to 3 to 4 million.<sup>127</sup>

## Recommendations:

The Veterans Health Administration must rededicate itself to the excellence of programs for treatment of tinnitus and all associated polytraumatic injuries of war including hearing loss, traumatic brain injury, and post-traumatic stress disorder.

Congress must continue providing funding for VA and the DOD to prevent, treat, and cure tinnitus.

<sup>117</sup> Department of Veterans Affairs, Veterans Benefits Administration, *Annual Benefits Report, FY 2010*, 5.

<sup>118</sup> Lucille Beck, *Audiology Care in the VA* (Washington, DC: VBA Office of Performance and Analysis, November 2007).

<sup>119</sup> Stephen Fausti, Debra J. Wilmington, Frederick J. Gallun, et al., "Auditory and Vestibular Dysfunction Associated with Blast-related Traumatic Brain Injury," *Journal of Rehabilitation Research & Development* 46 (November 6, 2009): 797–8.

<sup>120</sup> Marc A. Fagelson, "The Association between Tinnitus and Posttraumatic Stress Disorder," *American Journal of Audiology* 16 (2007): 107–17.

<sup>121</sup> G. C. Curhan, W. R. Farwell, and J. Shargorodsky, "Prevalence and Characteristics of Tinnitus among US Adults," *American Journal of Medicine* 123, no. 8 (August 2010): 711–8.

<sup>122</sup> Munna Vio and Ralph H. Holme, "Hearing Loss and Tinnitus: 250 Million People and a U.S. \$10 Billion Potential Market," *Drug Discovery Today* 10, no. 19 (October 1, 2005): 1263–5.

<sup>123</sup> American Tinnitus Association analysis of Department of Veterans Benefits Administration Data (January 2010).

<sup>124</sup> U.S. Army Center for Health Promotion and Preventative Medicine, <http://chppm-www.apgea.army.mil/>.

<sup>125</sup> Georges Garinther and Leslie Peters, "Tank Gunner Performance and Hearing Impairment," *Army RD&A Bulletin* (January–February 1990): 1–5.

<sup>126</sup> Neil Shea, "Iraq War Medicine—The Heroes, The Healing: Military Medicine from the Front Lines to the Home Front," *National Geographic* (December 2006) <http://www.nationalgeographic.com>.

<sup>127</sup> [ncrar.research.va.gov](http://ncrar.research.va.gov).