

## Risk Factors for Disability Retirement Among Active Duty Air Force Personnel

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**ABSTRACT** Objective: To determine risk factors for disability retirement in Air Force personnel, as well as the conditions contributing to disability retirement. Methods: A matched case-control study was conducted. Air Force personnel with accession records who were disability retired between 2002 and 2011 were included as cases. Controls were matched by accession year from the population of accessions not evaluated for disability at a ratio of 2:1. Conditional logistic regression was used to determine the odds of disability retirement. Results: Women and those aged 25 or older were significantly more likely to be disability retired. Deployment was also associated with disability retirement but was significantly protective. Among women, the odds of disability retirement did not vary when stratified by deployment history. Preexisting medical conditions were not associated with disability retirement. Psychiatric conditions were the most common condition type among those who were disability retired in the Air Force. Conclusions: Additional studies are needed to assess risk factors for psychiatric disability, the most common disability retired condition, as well as to describe the role of occupation and combat exposure in disability retirement from the Air Force.

### INTRODUCTION

Work-related disability is an ongoing concern in the United States with health, financial, and occupational implications for both the civilian and military sectors. Disability is an important and costly cause of morbidity in the military. In 2011, over three million veterans received disability benefits from the Veterans Administration,<sup>1</sup> and of the 223,007 new veterans receiving disability compensation benefits, the total disability payment reached \$1.8 billion.<sup>1</sup> Military disability retired pay entitlements also exceeded \$1 billion in 2011.<sup>2</sup> The ever-growing population of disabled service members and the associated cost of disability benefits and health care necessitate a greater understanding of the risk factors for disability while service members are healthy to decrease morbidity among veterans.

The proportion of Air Force enlistees and officers deemed unfit and awarded disability retirement (4%,  $n = 19,768$ ) in fiscal year (FY) 2011 was nearly identical to that in the Army, Navy, and Marine Corps (4%, 5%, and 4%, respectively).<sup>2,3</sup> However, the percent of disability retired Air Force service members is disproportionate to the percent of disability benefits they receive. In FY 2011, Air Force service members accounted for approximately 20% of all temporary and permanent disabled military retirees but received over 26% of the disability retired pay entitlements.<sup>2</sup>

Although the prevalence of disability evaluation in the military has decreased since 2005 in the Army and Marine

Corps,<sup>4,5</sup> disability retirement has increased in these services.<sup>4,5</sup> In the Air Force, trends in disability evaluation have not been studied, but surveillance data indicate that disability evaluation has either increased or remained relatively stable since 2007.<sup>6</sup> Previous studies have explored risk factors for disability in the military<sup>7,8</sup>; however, those studies only assessed Army and Marine Corps service members. No study to date has explored demographic and military risk factors for disability in the Air Force.

This study had two objectives: to assess demographic characteristics, medical conditions that existed at entry, and deployment characteristics as risk factors for disability retirement in Air Force personnel, and to establish the conditions contributing to disability retirement. In addition, the association between sex, deployment, and disability retirement was assessed to determine if the interactions between deployment and sex observed in the Army, Navy, and Marine Corps were present in this population.

### METHODS

Assessing a service member's eligibility for temporary or permanent disability retirement requires multiple structured medical evaluations before authorization. Injured or ill Air Force personnel receive an evaluation first by the Medical Evaluation Board—an informal board of no less than two military physicians—then by the Physical Evaluation Board (PEB)—a three-person administrative panel consisting of a presiding officer, personnel management officer, and a medical member.<sup>9</sup> A PEB evaluation occurs only if the Medical Evaluation Board determines the individual has not met medical retention standards.<sup>9</sup> The PEB is responsible for determining an individual's final disability disposition, which includes temporary and permanent disability retirement, and rating.<sup>9,10</sup>

The Walter Reed Army Institute of Research Institutional Review Board reviewed and approved this study.

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## Study Design

The association between demographic and service characteristics, and pre-enlistment medical disqualification and disability retirement in the Air Force were explored using a matched case-control study design. Active duty Air Force service members with a Medical Entrance Processing Station record who entered into military service between October 1, 2001 and September 30, 2011 were eligible for inclusion in the study. Service members were excluded from the study if their records indicated they deployed before initial accession.

Active Duty Airmen who were permanently or temporarily disability retired between FY 2002 and 2011 following a PEB evaluation by the U.S. Air Force Physical Disability Division made up the retired disability case population of this study. Temporary disability retirement applies to individuals with medical conditions deemed unstable and apt to change over time, whereas permanent disability retirement applies to those with conditions considered "of a permanent nature and stable."<sup>10</sup> Both permanent and temporary disability retired dispositions were included in the retired cases population, as previous research has shown that more than 80% of service members placed on the temporary disability retirement list will receive a permanent disability retirement.<sup>11</sup> Cases were excluded if they were missing a disposition date or had a disposition date that predated their accession date, which indicates data errors. Controls consisted of active duty Air Force service members who did not have a disability evaluation record. If the service member received a disability evaluation, regardless of the result, they were excluded from the eligible control population. Two controls were frequency matched to each case by fiscal year of accession.

## Data Sources

Demographic information including date of birth, race, education level, and marital status as well as medical, service, and administrative data for all Air Force applicants was provided by the U.S. Military Entrance Processing Command. Air Education and Training Command provided all data regarding medical accession waivers granted to Air Force personnel including date of waiver and waived condition. Accession and deployment data, which includes demographic information as well as accession dates, separation dates, and deployment information, were provided by the Defense Manpower Data Center. Air Force Personnel Center provided all information from the PEB evaluation of disability retirement cases.

## Measures

Demographic characteristics were collected at time of accession for both cases and controls. Service length for all study participants was assessed by calculating the months between accession and separation dates. Deployment length in months was calculated from the start and end dates of the deployment. Body mass index (BMI) at accession was grouped

using standard classifications from the National Institutes of Health: underweight ( $<18.5 \text{ kg/m}^2$ ), normal weight ( $18.5\text{--}24.9 \text{ kg/m}^2$ ), overweight ( $25.0\text{--}29.9 \text{ kg/m}^2$ ), and obese ( $\geq 30 \text{ kg/m}^2$ ).<sup>12</sup> As the prevalence of obesity in cases and controls was very low, less than 1%, the overweight and obese categories were combined for analysis.

During the initial enlistment application process, an individual may face disqualification from military service if he or she is found to have any medical conditions considered incompatible with military service.<sup>13</sup> For those who receive a permanent disqualification, a medical waiver may be obtained from the Air Force after further review of the records, or if the medical condition is corrected by surgical or other methods. Individuals who received a medical waiver as the result of medical disqualification before enlistments were classified as waived.

Veterans Administration Schedule of Rating Disabilities (VASRD) codes assigned at PEB evaluation were used to assign disability conditions to body systems. Body systems were grouped for each disability condition present using the body system categories assigned in the VASRD. When more than one body system was evaluated for retirement, disability evaluated cases were assigned to both. However, each case was only assigned to a given body system once regardless of the number of conditions present within a body system.

## Statistical Analysis

The primary risk factors assessed in this study included demographic, medical, and service variables. For this analysis, these variables were categorized and presented as counts and percentages. The outcome of interest, disability retirement, included those with a disposition of either temporary or permanent disability retirement.

Conditional logistic regression was used for analysis to account for matching. Crude odds ratios and their 95% confidence intervals were calculated using univariate conditional logistic regression. Given the exploratory nature of this study, adjusted odds ratios (AOR) accounted for all variables from the univariate analysis in the fully adjusted model using conditional logistic regression. Statistical significance level was set at  $\alpha = 0.05$ . Crude odds ratios (OR) and AOR are presented with the 95% confidence limits. OR and AOR were considered statistically significant if the 95% confidence limits did not include the value 1.00.

For disability retirement cases, the prevalence of the five most common condition types (defined by body system) at retirement was calculated for men and women. Because a service member can have multiple unfitting conditions within multiple body systems, individuals may appear in more than one body system category. Calculated percentages, therefore, represent the proportion of disability cases with at least one condition in the list body system category. Data analysis was performed using Statistical Analysis Software (SAS) version 9.3 (SAS Institute Inc., Cary, North Carolina).

**RESULTS**

The majority of study participants were male (73%), between the ages of 20 and 24 (47%), white (75%), and had a high school diploma or general education development (89%). After applying the appropriate exclusion criteria to the eligible case population (*n* = 3,106), there were 3,089 active duty Air Force service members remaining. Of the 301,418 eligible controls, 6,178 were randomly selected for analysis using 2:1 matching by fiscal year of accession.

Table I shows selected demographic characteristics of the study population for both cases and controls; also included are the crude OR of disability retirement associated with the categorized risk factors. Women had an OR of 1.43 (1.33–1.54). Compared to those age 20–24, the OR for those who

**TABLE I.** Demographic, Service, and Medical Characteristics of the Study Population at Accession: Disability Retirement Cases Versus Controls

	Cases		Controls		Crude ORs	
	<i>n</i>	%	<i>n</i>	%	OR	95% CI
Sex						
Female	1,052	34.1	1,408	22.8	1.43	(1.33–1.54)
Male (Ref)	2,037	65.9	4,769	77.2	1.00	—
Age						
<20	1,287	41.7	2,851	46.2	0.91	(0.85–0.98)
20–24 (Ref)	1,490	48.2	2,878	46.6	1.00	—
≥25	312	10.1	447	7.2	1.21	(1.07–1.36)
Race						
White (Ref)	2,333	75.5	4,627	74.9	1.00	—
Black	504	16.3	986	16.0	1.01	(0.92–1.11)
Other	174	5.6	421	6.8	0.87	(0.75–1.02)
Unknown	78	2.5	144	2.3	1.05	(0.84–1.32)
Education						
Less Than HS	10	0.3	22	0.4	0.92	(0.49–1.72)
HS Diploma/GED (Ref)	2,758	89.3	5,454	88.3	1.00	—
Some College/Higher	25	0.8	57	0.9	0.91	(0.61–1.35)
Marital Status						
Married	327	10.6	468	7.6	1.26	(1.13–1.42)
Unmarried (Ref)	2,762	89.4	5,710	92.4	1.00	—
Deployment						
Yes	1,201	38.9	3,162	51.2	0.71	(0.66–0.76)
No (Ref)	1,888	61.1	3,016	48.8	1.00	—
BMI						
Underweight	118	3.8	248	4.0	0.99	(0.82–1.19)
Normal (Ref)	1,974	63.9	4,058	65.7	1.00	—
Overweight/Obese	972	31.5	1,816	28.8	0.88	(0.78–0.99)
Medical Waiver						
Yes	111	3.59	221	3.58	1.00	(0.83–1.21)
No (Ref)	2,978	96.41	5,957	96.42	1.00	—
Months of Service (SD)	53.6 (26.8)		40.2 (27.9)			
Months Deployed (SD)	6.8 (4.6)		7.9 (5.1)			
Total Individuals	3,089		6,178			

Ref, referent group; 95% CI, 95% confidence interval; HS, high school; GED, general education development; SD, standard deviation.

**TABLE II.** Adjusted Odds Ratios for Disability Retirement by Demographic, Service, and Medical Characteristics

	Adjusted OR <sup>a</sup>	
	OR	95% CI
Sex		
Female	1.41	(1.31–1.53)
Male (Ref)	1.00	—
Age		
<20	0.92	(0.85–0.99)
20–24 (Ref)	1.00	—
≥25	1.22	(1.07–1.39)
Race		
White (Ref)	1.00	—
Black	0.99	(0.90–1.09)
Other	0.89	(0.76–1.04)
Unknown	1.03	(0.82–1.29)
Education		
Less Than HS	0.96	(0.52–1.80)
HS Diploma/GED (Ref)	1.00	—
Some College/Higher	0.70	(0.46–1.06)
Marital Status		
Married	1.13	(1.00–1.28)
Unmarried(Ref)	1.00	—
Deployment		
Yes	0.74	(0.68–0.79)
No (Ref)	1.00	—
BMI		
Underweight	0.97	(0.81–1.17)
Normal (Ref)	1.00	—
Overweight/Obese	1.11	(1.03–1.20)
Medical Waiver		
Yes	0.99	(0.82–1.20)
No (Ref)	1.00	—

Ref, referent group; HS, high school; GED, general education development; SD, standard deviation. <sup>a</sup>Adjusted for sex, age, race, education, marital status, deployment, BMI, and waiver.

were <20 was 0.91 (0.86–0.98), whereas the OR for those ≥25 was 1.21 (1.07–1.36). Race, education, BMI, and the presence of a medical waiver at accession were not significantly associated with disability retirement. Being married had an OR of 1.26 (1.13–1.42), whereas a history of deployment had a protective OR of 0.71 (0.66–0.76).

The AOR for disability retirement are shown in Table II. All AOR were very similar to the crude OR, indicating a lack of substantial confounding between variables. After accounting for covariables, female sex, age, and marital status remained significant risk factors for disability retirement. Although insignificant in crude analysis, the OR associated with overweight/obese BMI at accession was significant in adjusted analyses, 1.11 (1.03–1.21). Deployment continued to be significantly protective, with an AOR of 0.73 (0.68–0.79). The AOR for obtaining a medical waiver was 0.99 (0.82–1.20). Pre-existing medical conditions that required an accession medical waiver were not significant predictors of disability retirement in either crude or adjusted analysis.

Table III presents crude and adjusted OR for disability retirement stratified by deployment. In both crude and adjusted analysis, the OR for females was significantly higher

**TABLE III.** Crude and AOR for Disability Retirement for Females Versus Males Stratified by Deployment

	Crude		Adjusted <sup>a</sup>	
	OR	95% CI	OR	95% CI
Deployed				
Female	1.38	(1.22–1.57)	1.44	(1.26–1.65)
Male (Ref)	1.00	—	1.00	—
Not Deployed				
Female	1.35	(1.23–1.49)	1.39	(1.27–1.53)
Male (Ref)	1.00	—	1.00	—

<sup>a</sup>Adjusted for sex, age, race, education, marital status, deployment, BMI, and waiver.

than that of males, with an OR of 1.4 regardless of strata. No differences in the OR for sex were observed when comparing deployed and nondeployed.

The five leading VASRD body systems associated with disability retirement among male and female Air Force service members are shown in Table IV. The same five disability systems reported accounted for 89% of all reported disabilities among women and 90% among men. Men and women who were disability retired had similar disability types by body system. These codes did not differ substantially when stratified by deployment status. Psychiatric conditions were most common with 37% of men and 42% women who were disability retired having such a condition. Psychiatric conditions were more common among female disability retired cases, but the proportion of men and women that had disability conditions within the other body system categories was similar.

**DISCUSSION**

Risk factors significantly associated with disability retirement in the Air Force included female sex, older age, marriage, deployment experience, and being overweight/obese. These variables, excluding deployment, were all positively associated with disability retirement. Air Force service members with at least one deployment experience had 27% lower odds of disability, suggesting a healthy warrior effect—

**TABLE IV.** Most Common Disability Body Systems Among Disability Retired Cases

	System	n	%
Male	Psychiatric	749	37
	Musculoskeletal	482	24
	Neurological	448	22
	Respiratory	360	18
	Digestive	116	6
	Total		2,037
Female	Psychiatric	437	42
	Musculoskeletal	231	22
	Respiratory	218	21
	Neurological	217	21
	Digestive	35	3
	Total		1,052

a phenomenon in which those with better predeployment health deploy more frequently than those with poorer health. No association between pre-existing medical conditions requiring a medical waiver and disability retirement was found. In addition, no evidence of an interaction between deployment and sex was found. Psychiatric conditions were the leading cause of disability retirement for both men and women, but were slightly more common in women than in men. When stratified by sex, the most common causes of disability did not vary.

Psychiatric conditions have been previously identified as a leading cause of attrition in the Air Force.<sup>14–16</sup> This study shows that psychiatric conditions are the most common conditions among disability retirement cases in the Air Force. These findings conflict with the results of previous studies of disability in the Air Force<sup>17</sup> as well as other services.<sup>7,8</sup> A 1994 study of Air Force service members found the musculoskeletal system was the most commonly affected VASRD body system.<sup>17</sup> Such a finding is consistent with results from disability risk factor studies in other military services as musculoskeletal VASRD conditions topped the list among service members in the Marine Corps<sup>8</sup> and among deployed men in the Army.<sup>7</sup> Existing Marine Corps and Army risk factor studies identified several of the same risk factors—age, sex, BMI, and deployment.<sup>7,8</sup>

This study found no evidence of interaction of the effects of sex and deployment on disability retirement. In both crude and adjusted analysis, OR for disability retirement across deployment and sex strata did not vary. Previous studies of risk factors for disability in the Army and Navy/Marine Corps have shown an interaction between sex and deployment that was not replicated in this study.<sup>7,8</sup> This discrepancy across services may be attributable to interservice differences in occupational specialty, demographic distribution, and deployment characteristics. For example, it is possible that all Air Force personnel, both men and women, have similar experiences and exposures during deployment, and these experiences and exposures are substantially different than found among Soldiers and Marines (e.g., shorter duration and less combat exposure). Further research is necessary to determine the precise reasons for these differences.

Although there were notable similarities between this study and prior studies of risk factors for disability in the military,<sup>7,8</sup> differences in the study populations may preclude direct comparisons. Sikorski et al<sup>8</sup> evaluated all disability cases that resulted in discharge from service and disability evaluated were excluded from the control group. Niebuhr et al<sup>7</sup> considered anyone not disability retired during the study period eligible for inclusion in the control population in a cohort that was largely disabled before the onset of combat operations in Iraq and Afghanistan. This study only included those disability retired as cases, controls had no record of disability evaluation, and subjects were selected from a period when combat operations in Iraq and Afghanistan were underway.

Studies of military disability that include Air Force personnel are limited, but military attrition studies provide additional comparable findings. Past research has consistently shown overweight and obesity to be a risk factor for attrition in the U.S. military.<sup>5,18-22</sup> In the Air Force in particular, Poston et al<sup>21</sup> have shown overweight Air Force service members are more likely to be medically discharged compared to normal weight service members during basic training. This study has shown 11% higher odds of disability retirement among overweight/obese individuals versus normal weight individuals. This study extends previous findings by showing that being overweight/obese is somewhat associated with receiving a disability retirement from the Air Force in addition to attrition.

Several studies have shown an association between sex and training injuries, attrition, and disability in the military population.<sup>7,8,19,20,22-25</sup> Women have a higher risk of injury during recruit training relative to men and the rate of injury in women is two times that observed in men in all services.<sup>19,20,23</sup> Specifically in the Air Force, the risk of injury for women was twice as high as that for men.<sup>26</sup> Attrition has also been associated with sex in all services.<sup>21,27-29</sup> These findings have been duplicated in studies of disability in the military where women have been more frequently disabled than men in the Army, Navy, and Marine Corps.<sup>7,8,24,25</sup> This study has shown that women are at increased odds of disability retirement compared to men, and that musculoskeletal conditions are a common cause of disability retirement, consistent with previous findings.

The main strengths of this study include the large sample size, which ensured there was enough power to detect statistically significant results, the complete capture of endpoints, and the availability of sufficient controls. In addition, there were very few variables missing observations; no more than 0.9% of data were missing for any variable. By using various data sources, this study was also able to capture much demographic, service, and medical information about the subjects. There were a number of limitations, including the inability to identify personnel with potentially disqualifying conditions who died or left the Air Force (either voluntarily or involuntarily) without pursuing a Disability Evaluation System assessment. As these data were collected during wartime, and many of the endpoints were potentially related to physical trauma (psychiatric, musculoskeletal, and neurologic system conditions), this study is further limited by an inability to determine if battle injury played a role in the disability. Others have noted that up to 50% of disability cases may be because of injury<sup>17</sup> and the majority of outpatient visits in the Armed Forces health care system were related to injuries.<sup>30</sup> In addition, military occupational specialty categories were not fully categorized; such information would have provided additional insight into the potential role occupation in disability retirement in the Air Force.

Psychiatric conditions lead in terms of both disability retirement and attrition<sup>14-16</sup> in the Air Force; as such, further

research into accession screening for pre-existing psychiatric conditions and factors associated with increased risk for new-onset psychiatric conditions in Air Force applicants is merited. Such studies may result in recommendations for reducing the magnitude of psychiatric disability in the Air Force. In addition, BMI has been identified as a risk factor for attrition<sup>21</sup> as well as for disability retirement.<sup>7,8</sup> Although it is not strongly nor consistently related in this study, given that it is a modifiable characteristic, it may also be considered for targeted interventions. This study fills a gap in the existing research on disability in the military, as it is the first study to assess risk factors for disability retirement in the Air Force, and complements the similar studies of the Army<sup>7</sup> and Navy/Marine Corps.<sup>8</sup> Furthermore, it provides additional insight into areas of future research as well as potential targeted interventions designed to reduce psychiatric and musculoskeletal conditions in particular and occupational and financial burden of disability retirement in the Air Force. Additional insight may be gained by re-evaluating the data for the Army, Navy, Marine Corps, and the Air Force, using consistent definitions of disability, and by incorporating additional information that may be available, such as predisability medical encounters.

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