MILITARY MEDICINE, 177, 2:128, 2012

Risk Factors for Medical Disability in U.S. Enlisted Marines: Fiscal Years 2001 to 2009

CDR Cynthia Sikorski, MC USN; CAPT Maura A. Emerson, MC USN†; David N. Cowan, PhD, MPH‡§; COL David W. Niebuhr, MC USA‡*

ABSTRACT Objective: To assess factors associated with medical disability in the U.S. Marine Corps. Methods: Case–control study enrolling 11,554 medical disability cases of U.S. enlisted Marines referred to the Physical Evaluation Board fiscal year 2001 to 2009 and 42,216 controls frequency matched to cases in a 4:1 ratio on year of accession into the service were analyzed utilizing bivariate and multivariate logistic regression analysis. Results: Increased age and body mass index at accession were associated with higher odds of medical disability. Females (odds ratio adjusted [OR^{adj}] = 1.3, 95% confidence interval [CI] = 1.2–1.3) have higher odds of disability than males. "Healthy Warrior Effect" was observed in that those who deployed (OR^{adj} = 0.48, 95% CI = 0.46–0.50) had decreased odds of medical disability than those who did not deploy. Medical waivers at accession (OR^{adj} = 1.12, 95% CI = 1.01–1.23) increased the odds of medical disability. Conclusions: Continued surveillance of the disability evaluation system is needed to help develop preventive measures and to help policy makers establish evidence-based policies on accession, deployment, and retention standards over the lifecycle of service members.

INTRODUCTION

Disability is a major economic, public health, and political issue confronting society today. In 2008, U.S. citizens paid more than 8.6 billion dollars of benefits to 8.5 million disabled retirees,[1] while the Department of Defense (DoD) paid 1.3 billion dollars of benefits to 86,000 disabled retirees.[2] Medical disability in the U.S. Marine Corps is as common as type 2 diabetes incidence in the United States (diabetes incidence rate 6 cases/1000 persons per year[3]) with an incidence rate of 9 to 11 cases/1000 enlisted Marines per year (Fig. 1).

From fiscal year (FY) 2001 to 2009, the Physical Evaluation Board (PEB), a component board within the Secretary of the Navy Council of Review Boards, has adjudicated almost 40,000 incident disability cases for the Navy and Marine Corps, and 75% of these were rendered disability compensation (Fig. 2). Conditions leading to medical disability in the military jeopardize force health protection by downgrading medical readiness and have the potential to threaten national security. Indirectly, the disability evaluation system (DES) consumes significant resources, including substantial medical, legal, and personnel support services, culminating in the loss of human capital. According to former Secretary of Defense Robert Gates, "apart from the war, we have no higher priority (than the DES)."[4]

Marines whose physical or mental condition(s) make them unlikely to return to active service despite optimal medical care are first referred to a Medical Evaluation Board.[5–7] In the

*Preventive Medicine Department, Uniformed Services University of Health Sciences, 4301 Jones Bridge Road, Bethesda, MD 20814.

†Secretary of the Navy Council of Review Boards, 720 Kennon Street, Washington, DC 20374-5023.

‡Division of Preventive Medicine, Department of Epidemiology, Walter Reed Army Institute of Research, 503 Robert Grant Road, Silver Spring, MD 20910.

§Allied Technology Group, Inc., 1803 Research Boulevard, Suite 601, Rockville, MD 20850.

This article has been presented at the American College of Preventive Medicine, San Antonio, Texas, as an oral presentation in February 2011 and at the Armed Forces Public Health Conference, Norfolk, Virginia, as a poster presentation in March 2011.

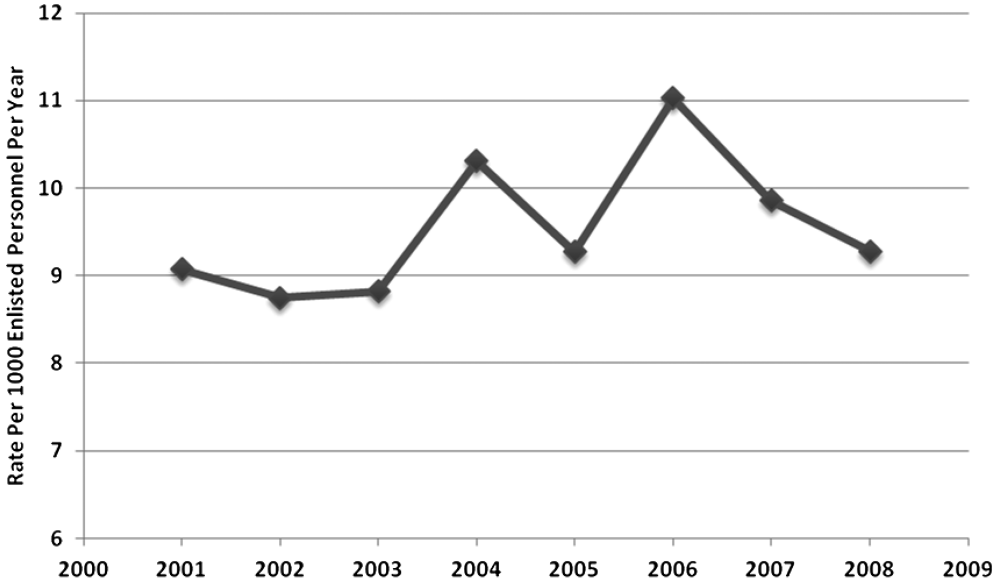

FIGURE 1. Medical disability incidence rate in U.S. enlisted Marines.
Source: Secretary of the Navy Council of Review Board Annual Reports FY 2001 to 2009, unpublished data.

Navy and Marine Corps, any service member can be placed in a limited duty (LIMDU) status for a total of 12 months over an entire military career. Additional periods of LIMDU may be requested from Navy Personnel Command. However, the usual duration of the LIMDU is 6 to 12 months. If the condition is unresolved after this time period, a referral to the PEB is usually generated.

The PEB determines a service member's fitness for duty based on the member's medical condition, nonmedical assessment from the member's command, and the ability of the member to perform the duties of his/her office, grade, rank, or rating. A member's work environment significantly impacts the determination of fitness and disability. For example, the same diagnosis that is unfitting for a Marine infantryman may not be unfitting for a Navy Personnelman.

A PEB finding of fit, as defined by SECNAVINST 1850.4E, is rendered when the disease or injury does not significantly impact the service member's ability to carry out "the duties of his/her office, grade, rank, or rating."[5] When the PEB finds a service member fit to return to duty, that finding does not imply that a service member is suitable for all assignments. From FY 2001 to 2009, the PEB rendered a finding of fit for duty in 16% of referred enlisted Marine Corps cases (Fig. 2).

If the PEB determines that a service member is unfit for continued military service, the disability rating must be assigned to each unfitting condition. The disability rating is assigned in accordance with the criteria within the Veterans Administration Schedule for Rating Disabilities (VASRD). If the total disability rating is less than 30%, a service member is separated from military service with a severance payment. If the disability rating is 30% or greater, the PEB must consider the stability of the disabling condition in order to assign placement on the Temporary Disability Retired List (TDRL) or Permanent Disability Retired List (PDRL).

Unfit service members, with a disability rating of 30% or greater, may be placed on the TDRL if the condition is not stable for VASRD rating purposes or if the member is likely to return to duty. Service members who are on the TDRL receive a monthly payment and are eligible for military health care benefits. These service members must undergo periodic medical examinations every 18 months, and the PEB must render a final disability rating within a 5 year period.

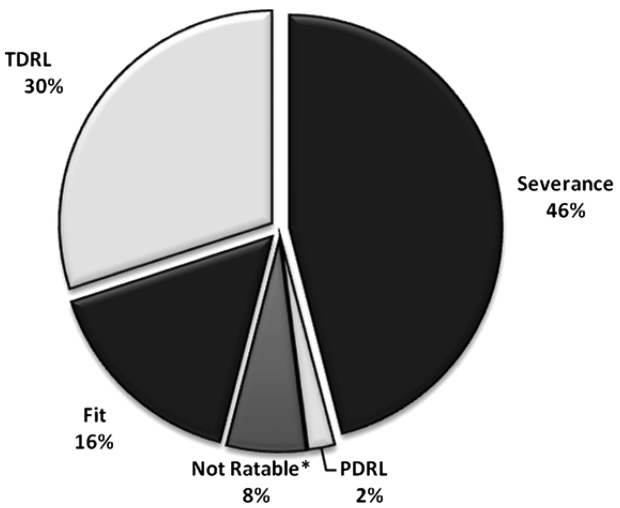

FIGURE 2. PEB, incident dispositions of U.S. active duty enlisted Marines, FY 2001 to 2009.
Source: Secretary of the Navy Council of Review Boards Annual Reports FY 2001 to 2009, unpublished data.
*Includes separations not eligible for disability rating.

Alternatively, service members with a disability rating of 30% or greater and stable conditions are placed on the PDRL. These members receive monthly payments and retain all other benefits of military retirement, including eligibility for military health care benefits. Rarely, a member may be separated without benefits if the disabling condition did not occur in the line of duty or the condition existed before and was not aggravated by active service. In these circumstances, the condition is classified as not ratable.

Historical research on military medical disability has shown that conditions in the Army parallel those in the civilian population.[8] Musculoskeletal conditions account for the vast majority of medical disability cases in the United States and in the Navy and Marine Corps. PEB data from 1999 to 2009 showed that musculoskeletal conditions were the most common of all unfitting diagnoses[1,9] (Secretary of the Navy Council of Review Boards Annual Reports FY 2001–2009, unpublished data).

Others have studied various demographic characteristics related to military attrition.[10–13] Bell et al[14] reported that rates of disability cases in the Army have increased more rapidly for women, junior enlisted, and younger soldiers. Analyzing Army and Air Force disability data, the Accession Medical Standards Analysis and Research Activity found sex, accession age, accession body mass index (BMI), and accession educational level to be predictive of medical disability retirement.[11] Females, higher BMI at accession, and older age at accession were associated with higher odds of disability. Higher education at accession such as a college degree was protective of disability.

Occasionally, a military applicant may have a preaccession medical condition that is disqualifying for service in the Marine Corps. Depending on the nature of the condition and the needs of the service, the Marine Corps, via the Bureau of Medicine and Surgery, may authorize a medical waiver at accession to allow the applicant to enter active service.[15] Prior research for various conditions has shown that these medical waivers usually do not adversely affect attrition.[16–20] However, medical waiver status at accession and its impact on medical disability as an outcome has not been previously studied.

A review of the "return to work" literature spans many fields and is complex. Prior research has focused on particular diseases, conditions, or occupations. Several researchers have noted that psychosocial factors such as job satisfaction, lower pay and rank, and high mental stress at work are associated with disability.[12–28] Krause et al[28] noted that "work disability is not a unique biomedical process; but is influenced by a variety of social, psychological, and economic factors which are not necessarily specific to the underlying injury or illness." A study of Army personnel with the same injury showed that psychosocial factors were more predictive of disability than the actual diagnosis.[23]

To our knowledge, no prior analysis of Marine Corps disability risk factors has been conducted. The purpose of this study is to identify risk factors associated with medical disability in the U.S. Marine Corps.

METHODS

Study Design

To determine the various factors associated with medical disability in the Marine Corps, a case–control study was employed. Data was obtained from several sources including: U.S. Military Entrance Processing Command Integrated Records System, Defense Manpower Data Center, the Bureau of Medicine and Surgery, and the Joint Tracking Disability Evaluation System.

Subjects

Only enlisted Marines who entered active service in FY 1995 to 2009 are included in this report. Cases were selected from among all those referred to the PEB during FY 2001 to 2009 and were defined as Marines with a finding of "unfit" as determined by the PEB with a medical board date before their disability date.

Controls (n = 46,216) were limited to active duty enlisted Marines without a PEB record who were frequency matched to cases in a ratio of 4 to 1 on the year of accession into the Marine Corps. A control had to be on active duty when the case's disposition was determined. The flow chart for subjects is shown in Fig. 3.

Independent Variables

The independent variables included in the study were sex, age, race, education level, Armed Forces Qualification Test scores, medical waiver status, and history of deployment (either Operation Iraqi Freedom or Operation Enduring Freedom).

BMI at accession was obtained from measured values on entrance physical examinations (weight in kilograms divided by the square of the height in meters [kg/m^2]). BMI was analyzed both as a continuous variable and as a categorical variable utilizing standard classifications ($<$18.5 [underweight], 18.5–24.9[normal weight], 25–29.9 [overweight], and $\geq$30 [obese]).

Disability Outcome Measure

The outcome variable of disability was determined by the PEB's finding of "unfit," which included the following dispositions: PDRL, TDRL, severance, and not ratable. The time to disability was defined as the period between entrance in the Marine Corps and the PEB's disposition determination date.

Statistical Analysis

Baseline characteristics were recorded as categorical variables. All categorical variables were reported by count and percentage and were analyzed using χ^2. Non-normally distributed continuous variables such as disability time and disability age were reported as medians with interquartile range (IQR) and analyzed using Mann–Whitney U tests. Crude odds ratios were calculated using bivariate unconditional logistic regression, and adjusted odds ratios were

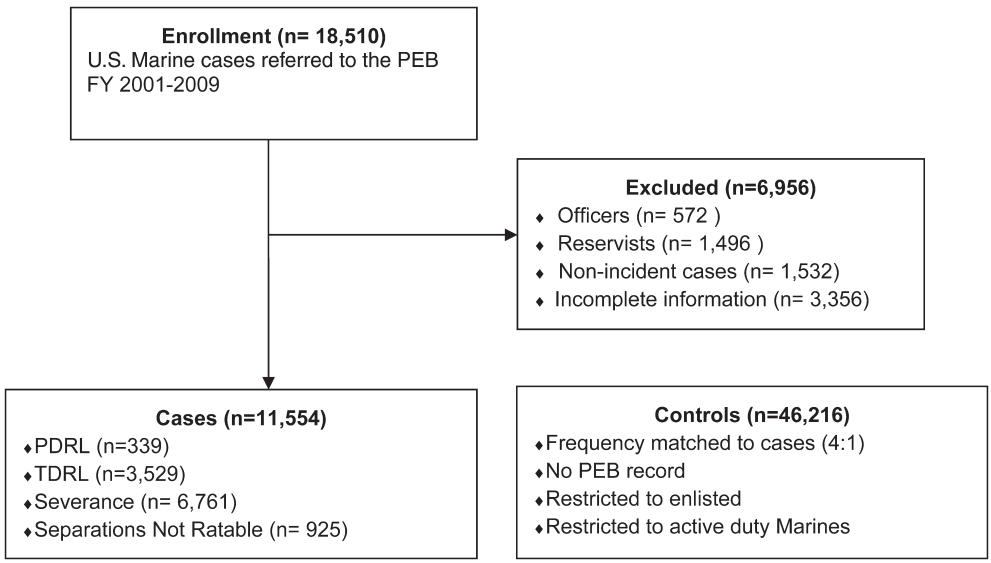

FIGURE 3. Marine Corps medical disability case–control study design.

calculated using forward selection unconditional logistic regression. To identify the most parsimonious model, variables which were not significantly associated with disability were not included in the final model. With 11,554 cases and 46,216 controls, we had a 95% power to detect a difference in a case group proportion of 52% and a control group proportion of 50% (odds ratio of 1.1). We considered p values < 0.05 to be statistically significant. All tests were two-sided.

The missing-indicator method was employed for missing data.[29] Missing data included: BMI $n = 2378$, race $n = 4688$, waiver $n = 80$, education $n = 2$, and occupation $n = 36$. Effect modifiers were examined and reported if significant. A parallel analysis was conducted with Navy active duty enlisted disability cases.

This study was considered "nonhumans" research and designated "exempt" by the Investigation Review Boards at both the Uniformed Services University of Health Sciences and Walter Reed Army Institute of Research. All statistical analyses were performed using Statistical Package for Social Sciences 16 and Stata-11.

RESULTS

Characteristics for categorical variables for both cases and controls are presented in Table I. Significant differences at accession were noted between cases and controls for sex, age, race, BMI, medical waiver status, and deployment as shown in Table I. Table II shows the median time in service to disability and age at disability by sex and deployment status. Time in service to disability was substantially and significantly shorter for women (33 months vs. 40 months for men) and nondeployers (32 months vs. 49 months for deployers).

TABLE I. Characteristics of Marines Corps Disability Cases and Controls

Variable	Disability Case $N = 11,554$, n (%)	Control Group $N = 46,216$, n (%)	χ^2 p-value
Sex			<0.01
Female	1190 (10.3)	3303 (7.1)	
Male	10364 (89.7)	42913 (92.9)	
Age at accession (years)			<0.01
<20	7663 (66.3)	33199 (71.3)	
20–24	3284 (28.4)	11578 (25.1)	
25–29	544 (4.7)	1322 (2.9)	
≥30	63 (0.6)	117 (0.3)	
Race			<0.01
White	9371 (81.1)	35749 (77.4)	
Black	1077 (9.3)	4879 (10.6)	
Other	354 (3.1)	1652 (3.6)	
Missing	752 (6.5)	3936 (8.5)	
BMI at accession			<0.01
Underweight	364 (3.2)	1,452 (3.2)	
Normal weight	6458 (55.9)	27649 (59.8)	
Overweight	3396 (29.4)	12475 (27.0)	
Obese	878 (7.6)	2720 (5.9)	
Missing	458 (4.0)	1920 (4.2)	
Medical Waiver at accession			<0.01
Yes	582 (5.0)	2039 (4.4)	
No	10947 (94.7)	44122 (95.5)	
Missing	25 (0.2)	55 (0.1)	
Deployment OIF/OEF			<0.01
Yes	3723 (32.2)	23360 (50.6)	
No	7831 (67.8)	22856 (49.4)	
Missing	582 (5.0)	2039 (4.4)	

BMI, body mass index; OIF, Operation Iraqi Freedom; OEF, Operation Enduring Freedom.

TABLE II. Time to Disability and Age at Disability by Sex and Deployment Status

Variable	Time to Disability (Months) Median, IQR	Age at Disability (Years) Median, IQR	Mann–Whitney U Test for Time and Age at Disability
All Disability Retired $N = 11{,}554$	39 (37)	23 (4)	
Sex			<0.01
Male	40 (37)	23 (4)	
Female	33 (37)	22 (5)	
Deployment			<0.01
Yes	49 (37)	22 (4)	
No	32 (35)	23 (5)	

IQR, interquartile range.

TABLE III. Crude and Adjusted Odds Ratios for Medical Disability

Variable	Crude OR	95% CI	Adjusted OR[a]	95% CI[a]
Sex				
Male (Ref)	1.00	—	1.00	—
Female	1.49	1.39–1.60	1.39	1.3–1.5
Age at Accession				
<20 years (Ref)	1.00	—	1.00	—
20–24	1.23	1.2–1.3	1.16	1.11–1.22
25–29	1.78	1.6–2.0	1.64	1.48–1.82
≥30	2.33	1.7–3.2	2.25	1.64–3.08
Body Mass Index				
Underweight	1.07	1.0–1.2	1.06	0.94–1.19
Normal (Ref)	1.00	—	1.00	—
Overweight	1.17	1.1–1.2	1.17	1.11–1.23
Obese	1.38	1.3–1.5	1.38	1.27–1.50
Deployment				
No (Ref)	1.00	—	1.00	—
Yes	0.47	0.45–0.49	0.34	0.28–0.41
Medical Waiver (Ref: no)				
No (Ref)	1.00	—	1.00	—
Yes	1.15	1.04–1.26	1.12	1.01–1.23
Race				
White (Ref)	1.00	—	1.00	—
Black	0.84	0.79–0.90	0.79	0.73–0.84
Other	0.82	0.73–0.92	0.86	0.77–0.97

[a]Adjusted for age, sex, race, deployment history, medical waiver status at accession, and BMI.

TABLE IV. Interaction Between Sex and Deployment on Risk of Medical Disability

		Crude OR	95% CI
Female	Nondeployed	1.00	
	Deployed	0.34	0.28–0.41
Male	Nondeployed	1.00	
	Deployed	0.48	0.46–0.51
Deployed	Female	1.00	
	Male	1.06	0.88–1.27
Nondeployed	Female	1.00	
	Male	0.74	0.68–0.80
	Deployed	0.34	0.28–0.41

Outcome Measurements

Table III shows the crude and adjusted odds ratios for medical disability cases. All crude and adjusted odds ratios were similar, indicating little confounding between variables. Females were more likely than males to be disabled as were Marines who had a BMI in the overweight or obese categories, all age groups over 20 years, and those with a medical waiver. Those of black or other race and those who had been deployed were at reduced risk of disability.

Employing stepwise methodologies, the following covariates provided the best fitting model: age, sex, race, deployment history, and medical waiver status at accession. (Pearson goodness of fit, $p = 0.27$.)[30]

Significant interaction was noted with regard to sex and deployment (Table IV). Among both females and males, deployment was protective for disability with a 66% and 52% reduction in risk, respectively. Among those who deployed, there was no significant difference in odds of disability by sex. By contrast, among nondeployers, males were 26% less likely to be disabled.

Navy and Marine Corps cases are often evaluated for more than one condition. Because a case could have more than one VASRD code associated with it, the percentages in Table V can exceed 100%. The most common VASRD categories associated with medical disability cases among men and women, deployed, and nondeployed were musculoskeletal conditions. Among deployed men and women, mental health conditions were the second most common. Neurological conditions were also common among all groups.

A parallel analysis was conducted with Navy PEB data including 10,905 disability cases and 43,620 controls from FY 2001 to 2009 (results not shown). The findings were similar to the Marine Corps analysis in that medical waivers (*odds ratio* adjusted [OR^{adj}] = 1.33, 95% confidence interval [CI] = 1.22–1.46), female sex (OR^{adj} = 1.8, 95% CI = 1.7–1.9), and elevated BMI and age at accession were associated with higher odds of medical disability. Deployment history was protective of medical disability (OR^{adj} = 0.39, 95% CI = 0.36–0.44).

DISCUSSION

Sex, age, BMI, deployment, medical waiver at accession, and race were all associated with medical disability although some factors were associated with increases and other with decreases in risk. In this study, the majority of all obese subjects at accession were less than 20 years of age, which demonstrates the profound effect of the American obesity epidemic.

This study supports prior research with women having a higher risk of medical disability than men. The reasons for this observation are not known, but others have speculated

TABLE V. Most Common VASRD Categories by Sex and Deployment Status

	Male		Female	
	Deployed	Not Deployed	Deployed	Not Deployed
VASRD Category[a]	% of All Cases (n = 3,577)	% of All Cases (n = 6,787)	% of All Cases (n = 146)	% of All Cases (n = 1,044)
Musculoskeletal	50	48	52	62
Mental Health	35	9	30	10
Neurological	31	17	14	12
Respiratory	2	4	2	4
Dermatological	4	1	3	3
Sensory	5	4	1	4
All Others	8	6	8	7

[a]VASRD category percentages are not mutually exclusive with some cases having more than one diagnosis. VASRD, Veterans Administration Schedule for Rating Disability.

that women may be more prone to injury in mixed sex training environments.[13] It is also possible that women may be more likely than men to present for care and their evaluation ultimately results in a medical disability evaluation.

As noted in other occupational studies, the "Healthy Warrior Effect" was demonstrated in that those who deployed were 66% less likely to be medically retired. This finding might also reflect some selection bias in that healthier Marines are more likely to deploy.

Musculoskeletal conditions were most commonly associated with medical disability cases. The young median age of disability (23 years) and shorter length of service (overall median of 39 months) suggest an acute nature of the medical conditions leading to disability. Injury prevention efforts need to be aggressively continued in the hopes of limiting future medical disability retirement and loss of valuable human capital. The short time interval from accession to disability and the finding of all cause accession medical waivers as a risk factor for disability suggest consideration of more restrictive medical accession standards to prevent medical disability retirement. Ultimately, continued surveillance of the disability system should be used to develop preventive measures in terms of policies and practices to limit the burden of disability.

This study has several limitations. We started with over 18,000 disability cases and were only able to fully evaluate 11,000 cases. Because of the characterization of deployment as Yes/No, we were unable to study the effects of multiple deployments or the duration of the deployment and its association with disability. We did not have access to the nature and extent of combat exposure during the deployment. Onset of the medical condition relative to deployment could not be assessed with available data. Additionally, occupational information was not available at the time of discharge from the service for study subjects. BMI at accession was associated with higher odds of medical disability; however, BMI at accession may not correlate with disability BMI. Furthermore, information on smoking and alcohol, which has been shown in the past to be associated with medical disability, was not available. Because the determination of "fitness" is unique to a member's occupation and work environment, the generalizability of this study to other service branches may be limited.

CONCLUSIONS

This study provides insights about Marine Corps medical disability risk factors. Future research should consider an economic analysis of these risk factors to help guide policy makers in decisions regarding accession policies. Further analysis of postdeployment surveys could provide new insights into disability risks with not only deployment duration but also other potential exposures such as combat. Additionally, more research on specific diagnosis categories and potential indicators of disability should be conducted. DES studies will enhance the ability of DoD, Combatant Commands, and Services' policy makers to establish evidence-based medical accession, deployment, and retention standards over the lifecycle of its service members.

ACKNOWLEDGMENTS

The authors thank Secretary of the Navy Council of Review Boards staff: Robert Gaines, Ryan Ferguson, and Keith Rosdahl COL USMC; WRAIR Division of Preventive Medicine staff: Elizabeth Packnett, Caitlin Blandford, and Janice Gary; and Uniformed Services University of Health Sciences staff: Tomoko Hooper MD, and Cara Olsen PhD.

REFERENCES

1. Annual Statistical Report on the Social Security Disability Insurance Program, 2008 SSA Publication No. 13-11826. Washington DC, 2009.
2. Department of Defense: Statistical Report on the Military Retirement System, Fiscal Year 2008. Available at http://actuary.defense.gov/statbook08.pdf; accessed June 9, 2011.
3. National Diabetes Fact Sheet, 2011. Available at http://www.cdc.gov/diabetes/pubs/pdf/ndfs_2011.pdf; accessed February 13, 2011.
4. Senior Oversight Committee quote which was modified from original speech from Robert Gates, Secretary of Defense. 2007. Available at http://www.defense.gov/speeches/speech.aspx?speechid=1131; accessed June 1, 2010.
5. Secretary of the Navy Instruction 1850. 4E (SECNAVINST). Available at http://doni.daps.dla.mil/Directives/01000%20Military%20Personnel%20Support/01-800%20Millitary%20Retirement%20Services%20and%20Support/1850.4E.pdf; accessed June 9, 2011.

6. Manual of the Medical Department (MANMED), U.S. Navy (NAVMED P-177); Chapter 18: Medical Evaluation Boards, Department of the Navy; 2005. Available at http://www.brooksidepress.org/Products/ManMed/Changes/manmed%20change%20120.pdf; accessed June 9, 2011.
7. Department of Defense Instruction 1332.38: Physical Disability Evaluation, 2006. Available at http://www.dtic.mil/whs/directives/corres/pdf/133238p.pdf; accessed June 9, 2011.
8. Bergman BP, Miller SA: Unfit for further service: trends in medical discharge from the British Army 1861–1998. J R Army Med Corps 2000; 146(3): 204–11.
9. Bohnker BK, Telfair T, McGinnis JA, Malakooti MA, Sack DM: Analysis of Navy Physical Evaluation Board diagnoses (1998–2000). Mil Med 2003; 168(6): 482–5.
10. Reis JP, Trone DW, Macera CA, Rauh MJ: Factors associated with discharge during marine corps basic training. Mil Med 2007; 172(9): 936–41.
11. Accession Medical Standards Analysis and Research Activity (AMSARA) 2009 Annual Report. Available at http://www.amsara.amedd.army.mil/reports/archiveindex.asp; accessed June 9, 2011.
12. Sulsky SI, Mundt KA, Bigelow C, Amoroso PJ: Case-control study of discharge from the U.S. Army for disabling occupational knee injury: the role of gender, race/ethnicity, and age. Am J Prev Med 2000; 18(3S): 103–11.
13. Geary KG, Irvine D, Croft AM: Does military service damage females? An analysis of medical discharge data in the British armed forces. Occup Med (Lond) 2002; 52(2): 85–90.
14. Bell NS, Schwartz CE, Harford T, Hollander IE, Amoroso PJ: The changing profile of disability in the U.S. Army: 1981–2005. Disabil Health J 2008; 1: 14–24.
15. Department of Defense Instruction 6130.4: Medical Standards for Appointment, Enlistment, or Induction in the Armed Forces. Available at http://biotech.law.lsu.edu/blaw/dodd/corres/html/61304.htm; accessed June 9, 2011.
16. Jankosky C, Niebuhr DW, Powers TE, Krauss MR: Attrition of military enlistees with a medical waiver for chronic headache, 1995–2000. Mil Med 2006; 1719(12): 1235–8.
17. Millikan AM, Weber NS, Niebuhr DW, et al: Evaluation of data obtained from military disability medical administrative databases for service members with schizophrenia or bipolar disorder. Mil Med 2007; 172(10): 1032–8.
18. Niebuhr DW, Scott CT, Li Y, Bedno SA, Han W, Powers TE: Preaccession fitness and body composition as predictors of attrition in U.S. Army recruits. Mil Med 2009; 174(7): 695–701.
19. Niebuhr DW, Li Y, Powers TE, Krauss MR, Chandler D, Helfer T: Attrition of U.S. military enlistees with waivers for hearing deficiency, 1995–2004. Mil Med 2007; 172(1): 63–9.
20. Otto WC, Niebuhr DW, Powers TE, Krauss MR, McVeigh FL, Tarbett AK: Attrition of military enlistees with a medical waiver for myopia, 1999–2001. Mil Med 2006; 171(1): 1137–41.
21. Lincoln AE, Smith GS, Amoroso PJ, Bell NS: The natural history and risk factors of musculoskeletal conditions resulting in disability among US Army personnel. Work 2002; 18(2): 99–113.
22. Borg K, Hensing G, Alexanderson K: Predictive factors for disability pension—an 11-year follow up of young persons on sick leave due to neck, shoulder, or back diagnoses. Scand J Public Health 2001; 29: 104–12.
23. Dunn WR, Lincoln AE, Hinton RY, Smith GS, Amoroso PJ: Occupational disability after hospitalization for the treatment of an injury of the anterior cruciate ligament. J Bone Joint Surg Am 2003; 85-A(9): 1656–66.
24. Lincoln AE, Smith GS, Amoroso PJ, Bell NS: The effect of cigarette smoking on musculoskeletal-related disability. Am J Ind Med 2003; 43(4): 337–49.
25. Hoge CW, Toboni HE, Messer SC, Bell N, Amoroso P, Orman DT: The occupational burden of mental disorders in the U.S. military: psychiatric hospitalizations, involuntary separations, and disability. Am J Psychiatry 2005; 162(3): 585–91.
26. Kim TS, Pae CU, Hong CK, et al: Interrelationships among pain, disability, and psychological factors in young Korean conscripts with lumbar disc herniation. Mil Med 2006; 171(11): 1113–6.
27. Teasdale TW, Engberg AW: Disability pensions in relation to traumatic brain injury: a population study. Brain Inj 2000; 14(4): 363–72.
28. Krause N, Frank JW, Dasinger LK, Sullivan TJ, Sinclair SJ: Determinants of duration of disability and return-to-work after work-related injury and illness: challenges for future research. Am J Ind Med 2001; 40(4): 464–84.
29. Huberman M, Langholz B: Application of the missing-indicator method in matched case-control studies with incomplete data. Am J Epidemiol 1999; 150(12): 1340–45.
30. Hosmer D, Lemeshow S: Applied Logistic Regression. New York, John Wiley & Sons, 2000.