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METHODS

Prior health care utilization as a potential determinant of enrollment in a 21-year prospective study, the Millennium Cohort Study

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Abstract Results obtained from self-reported health data may be biased if those being surveyed respond differently based on health status. This study was conducted to investigate if health, as measured by health care use preceding invitation, influenced response to invitation to a 21-year prospective study, the Millennium Cohort Study. Inpatient and outpatient diagnoses were identified among more than 68,000 people during a one-year period prior to invitation to enroll. Multivariable logistic regression defined how diagnoses were associated with response. Days spent hospitalized or in outpatient care were also compared between responders and nonresponders. Adjusted odds of response to the questionnaire were similar over a diverse range of inpatient and outpatient diagnostic categories during the year prior to enrollment. The number of days hospitalized or accessing outpatient care was very similar between responders and nonresponders. Study findings demonstrate that, although there are some small differences between responders and nonresponders, prior health care use did not affect response to the Millennium Cohort Study, and it is unlikely that future study findings will be biased by differential response due to health status prior to enrollment invitation.

Keywords Cohort studies · Military medicine · Military personnel · Response bias · Veterans

Abbreviations

CI	Confidence interval
ICD-9-CM	*International Classification of Diseases*, Ninth Revision, Clinical Modification
OR	Odds ratio

Introduction

The decision to participate in epidemiologic health studies is multifaceted, and information on nonresponse is often

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lacking for a variety of reasons. It has been well documented that certain groups may be less likely to respond to surveys, including men, young adults, those of lower socioeconomic status, and unmarried individuals [1–4]. Basic survey research asserts that the prime motivation to respond is based on the perceived salience of the study to the subject. Heberlein and Baumgartner conducted a statistical analysis of over 90 methodological articles published on response rate to mailed questionnaires, and concluded that the number of subject contacts and the importance of the questionnaire were the largest determinants to response rate [5].

In the conduct of an epidemiologic health study that utilizes self-reported data, the investigators should be cognizant that response bias may occur if invitees choose to participate based on actual or perceived differences in health status. To evaluate the presence or absence of response bias contingent upon health status, the investigators must have access to health information on responders and nonresponders. Since health care usage data are largely unavailable for nonresponders, it may be very difficult for US investigators to assess the health status of these individuals. In fact, most studies of nonresponder health have been conducted in Europe where universal health coverage is more common [1–4, 6–9]. Several of these studies found that individuals who were more likely to respond to health surveys were those who frequently experienced pain and/or utilized health care [6, 8, 9], among the "worried well" [1], reported poorer subjective health and less-healthy lifestyle habits [3], and were not receiving a disability benefit [2, 4].

Results from these European studies prompted investigation into whether a response bias due to health differences prior to enrollment exists among a US military population in the Millennium Cohort Study. Current literature suggests that a response bias due to differential health status between responders and nonresponders would likely cause more individuals with poor health to join the Cohort [6, 8, 9]. Should this participation bias occur and remain unknown, it may have significant inferential limitations or even lead to misleading conclusions. For nonresponse bias to impact study findings, the respondents and nonrespondents must differ on reported data and the response rate must be sufficiently low so that this difference can have an appreciable effect [10]. For example, with a low response rate, prevalence estimates derived from cross-sectional surveys may be biased if these two conditions exist to an appreciable degree. In contrast, when conducting a longitudinal study, the effect of response bias may be less intrusive as the outcome measure is often assessed at follow-up and dependent upon baseline health status. Because the Millennium Cohort Study is a longitudinal prospective study, nonresponse bias is less likely to affect results in comparison to studies of cross-sectional design. Yet, it remains prudent for researchers to investigate where possible, response biases that may result from self-selection and over or under-representation of healthy or ill participants in a study population. In a longitudinal health study such as this, military personnel of poorer health are less likely to deploy and be exposed to deployment related exposures. This would likely bias prevalence estimates and might impact longitudinal studies, limiting the utility of the Cohort.

Because all inpatient and outpatient encounters for medical care under the US Military Health System are electronically recorded for active-duty service members, this study represents a unique opportunity to study response bias based on the health care use of both responders and nonresponders. Furthermore, these results may be generalizable to the other populations. For example, previous reports have assessed the similarities in the distribution of job titles among members of the US civilian workforce and US military. Sulsky has compared the distribution of job titles among members of the US Army who were serving on active duty in 2001 to information published in the 2000 US Bureau of Labor Statistics, Occupational Employment Statistics Survey. With the exception of soldiers working in military-specific jobs, there was a high degree of correlation in the types of job titles. While the percent of civilian and military workforce in transportation, and construction were similar, the percent of military working in other jobs was over- or under-represented compared to their civilian counterparts [11]. In summary, it is important to understand possible biases associated with the Millennium Cohort Study, the largest prospective study to ever be conducted with a military population. Additionally, this study may provide one of the few opportunities to accurately assess the health of invitees in the year prior to study invitation in a large population-based Cohort of US military personnel, comparable in many ways to civilian populations.

Materials and methods

Population and data sources

The invited Millennium Cohort Study participants were randomly selected from all US military personnel serving in October 2000, oversampling those who had been previously deployed, Reserve and National Guard members, and women, to ensure sufficient power to detect differences in smaller subgroups of the population. The probability-based sample, representing ~11.3% of the 2.2 million men and women in service as of October 1, 2000, was provided by the Defense Manpower Data Center in California.

World Wide Web and US Postal Service-based enrollment began in July 2001, and a modified Dillman approach was utilized to contact the invited service members. The enrollment cycle ended on June 30, 2003, with 77,047 consenting participants. The methodology of the Millennium Cohort Study has been described elsewhere in detail [12]. For the purposes of this analysis, only those invited personnel on active duty were considered ($n = 140{,}842$), since comparable health care utilization records for Reserve and National Guard personnel may not exist. The population for this study was further restricted by excluding those active-duty service members who were deployed to a combat area at any time during the year prior to enrollment or during the enrollment cycle itself, due to the likelihood of differential access to care. This research was conducted in compliance with all applicable federal regulations governing the protection of human subjects in research (Protocol NHRC.2000.007).

Electronic personnel data as of sample construction in October 2000 included gender, birth date, highest education level, marital status, race/ethnicity, service branch (Army, Navy, Coast Guard, Air Force, and Marine Corps), primary and secondary military occupations, and a personal identifier. Additionally, missing electronic data on age, education, marital status, race/ethnicity, and occupation were supplemented with available electronic personnel data from July 2000 to January 2001. This process of backfilling missing information reduced the percentage of individuals missing data for at least one important demographic characteristic from 2.8% to 1.1% of the invited personnel, resulting in an analysis population of 68,103.

Health care data

To assess the effect of prior health care use on enrollment into the Millennium Cohort, the frequency and types of health care encounters were captured using Department of Defense electronic hospitalization and outpatient records during the period from July 1, 2000 to June 30, 2001. Through an existing data use agreement, worldwide electronic hospitalization and outpatient records for all US service members were accessed through a secure portal. Through this service, hospitalization and outpatient records for all US service members were downloaded to a secure server and then matched to study participants by personal identifier. Because healthcare is provided at no cost to all US service members, we expect to non-differentially capture all hospitalizations and outpatient visits for both responders and nonresponders represented in this study.

Hospitalization data included admission date and up to eight discharge diagnoses, while outpatient data included care date with up to four diagnoses. Diagnoses were coded according to the *International Classification of Diseases*, Ninth Revision, Clinical Modification (ICD-9-CM) [13]. Odds of response to the Millennium Cohort questionnaire among those hospitalized for "any cause" were examined, excluding diagnoses for complications of pregnancy, childbirth, and puerperium. In addition, each of the 15 broad ICD-9-CM categories, and the supplementary categories for factors influencing health status and contact with health services, were investigated separately to calculate the odds of response to the questionnaire among those with a diagnosis in each category. Analysis of individual diagnoses within the broad diagnostic categories of hospitalizations significantly associated with response focused on the five most frequent three-digit diagnostic codes to examine their association with response. Additionally, specific ICD-9-CM diagnoses that have previously been indicative of chronic multisymptom illness were explored [14–25]. To further evaluate health care usage differences between responders and nonresponders, the mean number of days spent hospitalized or in outpatient care during the year prior to enrollment was also compared.

Statistical analysis

Descriptive analyses of demographic and military characteristics, by both hospitalization and survey response status, were completed. Univariate analyses, including χ^2 tests, were employed to assess the significance of unadjusted associations. An exploratory analysis was conducted to examine regression diagnostics, significant associations, and possible confounding, while simultaneously adjusting for other variables. Multivariable logistic regression was used to compare the adjusted odds of response to the Millennium Cohort questionnaire among those with and without hospitalization experience for any cause during the year prior to enrollment. Individual multivariable logistic regression models [26] were constructed for each diagnostic category, as previously defined. All models were adjusted for age, gender, race/ethnicity, education, marital status, military pay grade, military branch of service, and military occupation.

Lastly, the mean number of days that responders and nonresponders utilized inpatient, outpatient, and both types of care was calculated and compared by response status using analysis of variance. Of the 3,833 individuals who appeared in the hospitalization database, 207 did not have a computable length of stay, so the mean length of stay for all hospitalizations (mean = 3.499 days) was assigned. The total number of days lost to care over the year was considered to be total days hospitalized plus one half-day lost to care for each outpatient visit.

All analyses were completed using SAS software (version 9.1, SAS Institute, Inc., Cary, North Carolina), and adjusted odds ratios (ORs), 95% confidence intervals (CIs), and adjusted means were calculated for personnel with complete covariate data [27].

Results

Descriptive analyses are shown in Table 1. Those more likely to be hospitalized were women, those younger than 24 or older than 45 years of age, those with a high school diploma or less, enlisted personnel, those not married, members of the Army, and participants in various occupations, most notably health care workers ($p < 0.05$). Several demographic factors were also associated with survey response (Table 2). There was no association, however, between any-cause hospitalization and response (adjusted OR = 0.93, 95% CI: 0.85, 1.02) after adjusting for gender, age, race/ethnicity, educational level, military rank, marital status, service branch, and occupation.

Millennium Cohort responders and nonresponders were also evaluated for the time spent accessing inpatient or outpatient care in the year prior to enrollment. The mean and median number of days spent in aggregated inpatient or outpatient care differed by less than a half-day and was statistically significant at the $\alpha = 0.05$ level (Table 3).

In separate multivariable logistic regression analyses, adjusted odds of response were calculated for 16 broad categories of ICD-9-CM coded diagnoses. There was no association between response and hospitalizations, except that responders were at significantly lower adjusted odds for mental disorder hospitalizations (Fig. 1). When outpatient diagnoses were examined, responders were less likely to have outpatient visits for mental disorders (OR = 0.88, 95% CI: 0.83, 0.93). In addition, responders were significantly more likely to have outpatient visits for neoplasms; diseases of the nervous, circulatory, musculoskeletal, and respiratory systems; diseases of the skin and subcutaneous tissues; endocrine, nutritional, and metabolic diseases; and for supplementary (V) codes, after adjusting for all variables in the models, although these adjusted ORs were all less than 1.2 (Fig. 2).

Those ICD-9-CM categories with statistically significant results were further evaluated to identify the top-five most frequent diagnoses. The five most common inpatient mental disorder diagnoses included nondependent abuse of drugs, adjustment reactions, affective psychoses, alcohol dependence syndrome, and personality disorders; those hospitalized for adjustment reactions and personality disorders were significantly less likely to respond (Table 4). Because diseases such as asthma, fibromyalgia, and chronic fatigue syndrome were reported to be more prevalent in 1990–1991 Gulf War veterans than nondeployed veterans of the same era, we sought to determine if there was a response bias based on these medical conditions. After adjusting for gender, age, education, marital status, race/ethnicity, pay grade, branch of service, and occupation, there was no association between response status and asthma, fibromyalgia, or chronic fatigue syndrome as measured by either hospitalizations or outpatient visits (data not shown).

Discussion

In this study, we found no substantial health differences between Millennium Cohort responders and nonresponders when measured by health care use in the 12 months preceding study invitation. With the exception of mental disorders, there were no differences in response based on prior hospitalization experiences between responders and nonresponders. Responders were slightly more likely to have utilized outpatient health care across eight broad ICD-9-CM categories, although the small ORs observed were close to unity, implying little to no clinically meaningful differences. Additionally, findings demonstrated that responders and nonresponders were very similar in terms of the number of days spent utilizing inpatient and outpatient health care services.

Responders and nonresponders appeared to be of comparable health based on inpatient data. This finding likely provides the best assessment that responders and nonresponders did not have significant health differences in the year prior to invitation for enrollment. Becoming hospitalized generally involves an objective decision by a medical provider indicating the patient's condition warrants hospitalization. In contrast, the decision to seek outpatient care may be a personal decision to seek consultation, preventive medicine, or medical treatment services.

In further analyses of outpatient visits (data not shown), we observed that responders were more likely to have an outpatient diagnosis for unspecified neoplasms, disorders of lipoid metabolism, diseases of capillaries, contact dermatitis and other eczema, other and unspecified disorders of joints, and acute pharyngitis, and allergic rhinitis, all of which appear to indicate that responders may have a higher disease burden than nonresponders. However, responders were also more likely to have sought medical consultation without complaint or sickness, to have completed follow-up examinations, or had a visit to correct a disorder of vision refraction and accommodation, indicating that responders also appear to utilize health care for reasons other than disease or injury treatment. Additionally, individual decisions to seek outpatient health care may be

Table 1 Characteristics associated with hospitalization in the year prior to invitation among active-duty members invited to participate in the Millennium Cohort in 2001[a]

Characteristics[b]	Total (n = 68,103) n (%)	Hospitalized (n = 2,335) n (%)	Not hospitalized (n = 65,768) n (%)
Gender			
Male	50,447 (74.1)	1,543 (66.1)	48,904 (74.4)
Female	17,656 (25.9)	792 (33.9)	16,864 (25.6)
Age (years)			
17–24	19,054 (28.0)	714 (30.6)	18,340 (27.9)
25–34	17,709 (26.0)	563 (24.1)	17,146 (26.1)
35–44	18,101 (26.6)	543 (23.3)	17,558 (26.7)
≥45	13,239 (19.4)	515 (22.1)	12,724 (19.4)
Race/ethnicity			
White, non-Hispanic	41,471 (60.9)	1,404 (60.1)	40,067 (60.9)
Black, non-Hispanic	15,185 (22.3)	563 (24.1)	14,622 (22.2)
Other	11,447 (16.8)	368 (15.8)	11,079 (16.9)
Highest educational level			
High school diploma or less	40,433 (59.4)	1,560 (66.8)	38,873 (59.1)
Some college	18,587 (27.3)	530 (22.7)	18,057 (27.5)
Bachelor's degree	4,976 (7.3)	125 (5.4)	4,851 (7.4)
Graduate school	4,107 (6.0)	120 (5.1)	3,987 (6.1)
Rank			
Enlisted	60,828 (89.3)	2,160 (92.5)	58,668 (89.2)
Officer	7,275 (10.7)	175 (7.5)	7,100 (10.8)
Marital status			
Single	25,019 (36.7)	888 (38.0)	24,131 (36.7)
Married	39,826 (58.5)	1,313 (56.2)	38,513 (58.6)
Other	3,258 (4.8)	134 (5.7)	3,124 (4.8)
Service branch			
Army	22,909 (33.6)	1,017 (43.6)	21,892 (33.3)
Air Force	20,483 (30.1)	576 (24.7)	19,907 (30.3)
Navy and Coast Guard	18,000 (26.4)	554 (23.7)	17,446 (26.5)
Marine Corps	6,711 (9.9)	188 (8.1)	6,253 (9.9)
Occupational codes			
Combat specialists	12,522 (18.4)	442 (18.9)	12,080 (18.4)
Functional support and admin	14,567 (21.4)	509 (21.8)	14,058 (21.4)
Electrical/mechanical equip. repair	11,442 (16.8)	373 (16.0)	11,069 (16.8)
Electronic equipment repair	6,383 (9.4)	179 (7.7)	6,204 (9.4)
Health care	6,228 (9.1)	267 (11.4)	5,961 (9.1)
Communications/intelligence	5,627 (8.3)	168 (7.2)	5,459 (8.3)
Service and supply	5,567 (8.2)	217 (9.3)	5,350 (8.1)
Craft workers	2,102 (3.1)	64 (2.7)	2,038 (3.1)
Other technical and allied	1,862 (2.7)	50 (2.1)	1,812 (2.8)
Students, prisoners, and other	1,803 (2.7)	66 (2.8)	1,737 (2.6)

[a] Selected based on the following criteria: must have served on continuous active-duty throughout health care observation period and not deployed at any time during the health care observation period or study enrollment period

[b] Characteristics defined as of October 2000 when the potential participant pool was identified. All χ^2 tests of significance, except race/ethnicity, were statistically significant at $P < 0.05$

influenced by accessibility, perceived condition severity, concerns over social stigmatization associated with health-related personal habits, or illness conditions. Furthermore, military members who receive flight and other specialty pay jeopardize these earnings should they be diagnosed with certain duty-limiting medical conditions. All of these possibilities make the use of outpatient care a more ambiguous measure of health in comparison with inpatient health care use.

Invitees with inpatient or outpatient visits for mental disorders were significantly less likely to participate in the study. Upon closer examination of these data, nondependent abuse of drugs and adjustment reactions were the two most frequent three-digit ICD-9-CM diagnoses in both the

Table 2 Characteristics associated with response to invitation to enroll in the Millennium Cohort among active-duty members invited in 2001

Characteristics[a]	Non-responders ($n = 47{,}036$) n (%)	Responders ($n = 21{,}067$) n (%)	OR[b]	95% CI[b]
Hospitalization in year prior to invitation				
Not hospitalized	45,403 (96.5)	20,365 (96.7)	1.00	
Hospitalized	1,633 (3.5)	702 (3.3)	0.93	0.84, 1.03
Gender				
Male	35,304 (75.1)	15,143 (71.9)	1.00	
Female	11,732 (24.9)	5,924 (28.1)	1.43	1.37, 1.49
Age (years)				
17–24	15,520 (33.0)	3,534 (16.8)	1.00	
25–34	12,988 (27.6)	4,721 (22.4)	1.47	1.39, 1.55
35–44	11,067 (23.5)	7,034 (33.4)	2.45	2.31, 2.59
≥45	7,461 (15.9)	5,778 (27.4)	2.71	2.54, 2.89
Race/ethnicity				
White, non-Hispanic	27,734 (59.0)	13,737 (65.2)	1.00	
Black, non-Hispanic	11,568 (24.6)	3,617 (17.2)	0.56	0.53, 0.58
Other	7,734 (16.4)	3,713 (17.6)	0.81	0.77, 0.85
Highest educational level				
High school diploma or less	29,459 (62.6)	10,974 (52.1)	1.00	
Some college	12,745 (27.1)	5,842 (27.7)	1.15	1.07, 1.23
Bachelor's degree	2,842 (6.0)	2,134 (10.1)	1.16	1.07, 1.27
Graduate school	1,990 (4.2)	2,117 (10.1)	1.20	1.06, 1.35
Rank				
Enlisted	43,328 (92.1)	17,500 (83.1)	1.00	
Officer	3,708 (7.9)	3,567 (16.9)	1.45	1.32, 1.60
Marital status				
Single	19,536 (41.5)	5,483 (26.0)	1.00	
Married	25,428 (54.1)	14,398 (68.3)	1.28	1.23, 1.34
Other	2,072 (4.4)	1,186 (5.6)	1.15	1.05, 1.25
Service branch				
Army	15,115 (32.1)	7,794 (37.0)	1.00	
Air Force	14,060 (29.9)	6,423 (30.5)	0.60	0.56, 0.64
Navy and Coast Guard	12,770 (27.2)	5,230 (24.8)	0.64	0.61, 0.67
Marine Corps	5,091 (10.8)	1,620 (7.7)	0.67	0.63, 0.72
Occupational codes				
Combat specialists	8,915 (19.0)	3,607 (17.1)	1.00	
Functional support and admin	9,887 (21.0)	4,680 (22.2)	1.21	1.14, 1.28
Electrical/mechanical equip. repair	8,241 (17.5)	3,201 (15.2)	1.22	1.15, 1.30
Electronic equipment repair	4,193 (8.9)	2,190 (10.4)	1.41	1.31, 1.51
Health care	3,954 (8.4)	2,274 (10.8)	1.32	1.23, 1.41
Communications/intelligence	3,791 (8.1)	1,836 (8.7)	1.32	1.23, 1.42
Service and supply	3,947 (8.4)	1,620 (7.7)	1.09	1.02, 1.18
Craft workers	1,540 (3.3)	562 (2.7)	1.13	1.01, 1.26
Other technical and allied	1,250 (2.7)	612 (2.9)	1.30	1.17, 1.46
Students, prisoners, and other	1,318 (2.8)	485 (2.3)	1.22	1.08, 1.37

[a] Selected based on the following criteria: must have served on continuous active duty throughout health care observation period and not deployed at any time during the health care observation period or study enrollment period. Characteristics defined as of October 2000 when the potential participant pool was identified

[b] ORs and associated 95% CIs from multiple logistic regression were adjusted for gender, age, education, marital status, race/ethnicity, pay grade, branch of service and occupation. CIs that exclude 1.00 were significant at the $P < 0.05$ level

inpatient and outpatient setting. Responders were significantly less likely to have inpatient or outpatient diagnoses of adjustment reactions, and significantly less likely to have outpatient visits for nondependent abuse of drugs. Finding less participation by those with mental disorders is not widely reported. In an analysis of nonparticipants for the

Table 3 Number of days spent in inpatient and outpatient care in the year prior to invitation among active-duty Millennium Cohort survey responders and nonresponders

Data source	Mean[a]	Median, IQR[b]	*P*-value[c]
Inpatient hospitalization			
Responder	0.21	0.00, 0.00	0.034
Nonresponder	0.25	0.00, 0.00	
Outpatient encounters			
Responder	4.94	3.00, 5.50	<0.001
Nonresponder	4.58	2.50, 5.00	
Combined			
Responder	5.15	3.00, 5.50	<0.001
Nonresponder	4.83	3.00, 5.00	

[a] Mean number of days was calculated for the year prior to Millennium Cohort Study enrollment, July 1, 2000, to June 30, 2001

[b] Interquartile range indicates the difference between the third quartile and the first quartile

[c] *P*-value significance was calculated by analysis of variance

Canadian Study of Health and Aging, the authors found that cognitively impaired subjects had higher refusal rates [28]. It is also possible that individuals diagnosed with nondependent abuse of drugs and other mental disorders feel a certain degree of social stigmatization and prefer not to share their health information with strangers. For example, Hoge et al. documented that some military members are likely to avoid seeking health care for mental disorders due to perceived concerns over the social stigmatization and the

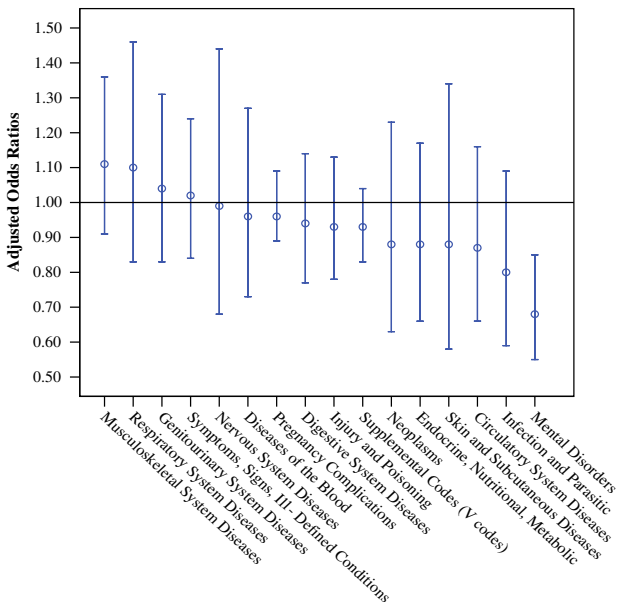

Fig. 1 Adjusted ORs and 95% CIs for odds of response to the Millennium Cohort questionnaire, adjusted for gender, age, education, marital status, race/ethnicity, pay grade, branch of service and occupation for responders and nonresponders who were hospitalized from July 1, 2000, to June 30, 2001, 1 year prior to the start of study enrollment

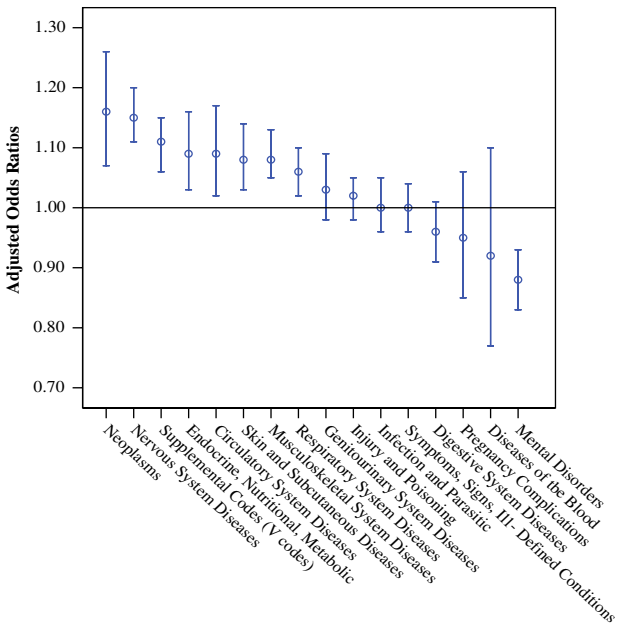

Fig. 2 Adjusted ORs and 95% CIs for odds of response to the Millennium Cohort questionnaire, adjusted for gender, age, education, marital status, race/ethnicity, pay grade, branch of service and occupation for responders and nonresponders who utilized outpatient care from July 1, 2000, to June 30, 2001, 1 year prior to the start of study enrollment

possible adverse impact mental disorder diagnoses may have on careers [29, 30]. It is also plausible that those with adjustment reactions felt overwhelmed at the time of invitation and felt that they were unable to add additional responsibilities, such as committing to a 21-year follow-up, thus making them less likely to respond.

These findings must be interpreted within the limitations and strengths of the study. One potential limitation is that this study was restricted to those Millennium Cohort members whose health care data were available during the entire observation period, which meant removing service members in the Reserve or Guard and those who had deployed during the observation period or during study enrollment. This restriction was implemented to ensure responders and nonresponders had equal opportunity to access military health care. Because healthier service members may be selected to deploy, this restriction may have made this sample less representative of the entire Millennium Cohort, or the US military in general. However, we have no reason to believe that this restriction would have differentially selected responders or nonresponders with poorer health for these analyses.

In contrast to potential limitations, this study should be considered robust by several measures. First, it was based on 21,067 responders and 47,036 nonresponders, representing one of the largest studies ever of nonresponse bias to enrollment invitation. Second, objective hospitalization and

Table 4 Frequencies of the five most common inpatient diagnoses among statistically significant broad ICD-9-CM diagnostic categories for Millennium Cohort Study responders and nonresponders with prior year hospitalizations[a]

ICD-9-CM category[b]	Diagnoses	Frequency of diagnoses				Odds ratio[d]	95% CI[d]
		Responders (n = 21,067)		Non-responders (n = 47,036)[c]			
		n	(%)	n	(%)		
Mental disorders (codes 290–319)							
305	Nondependent abuse of drugs	33	0.2	109	0.2	0.74	0.49, 1.10
309	Adjustment reaction	24	0.1	117	0.2	**0.57**	**0.36, 0.90**
296	Affective psychoses	30	0.1	80	0.2	0.96	0.62, 1.49
303	Alcohol dependence syndrome	14	0.1	55	0.1	0.59	0.32, 1.09
301	Personality disorders	4	0.0	52	0.1	**0.26**	**0.09, 0.74**

[a] Hospitalizations were observed from July 1, 2000, to June 30, 2001, 1 year prior to the start of Millennium Cohort Study enrollment

[b] ICD-9-CM, *International Classification of Diseases*, Ninth Revision, Clinical Modification

[c] The reference group for the multiple logistic regression models is nonresponders

[d] ORs and associated 95% CIs from multiple logistic regression were adjusted for gender, age, education, marital status, race/ethnicity, pay grade, branch of service and occupation. Measures in bold were statistically significant at the $P < 0.05$ level

outpatient medical data were utilized to investigate diagnostic categories associated with enrollment as well as to compute measures of days utilizing hospitalization and outpatient care, allowing for a thorough analysis of this subject. Finally, because military health care is equally accessible, irrespective of gender, age, or pay grade, all responders and nonresponders should have had equal access to health care during the observation period, reducing the potential for bias dependent on socioeconomic differences.

In conclusion, these analyses illustrated that responders and nonresponders were comparable with regard to health at the onset of the Millennium Cohort Study, as measured by hospitalization and days spent accessing health care services. No substantial or clinically relevant health-related response bias was found among the participants, providing reassurance that individuals in the Millennium Cohort exhibit comparable health attributes that are representative of the target population for this study.

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