

# Wartime Military Deployment and Increased Pediatric Mental and Behavioral Health Complaints

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## KEY WORDS

military, deployment, pediatric mental health, behavior

## ABBREVIATIONS

ICD-9—*International Classification of Diseases, Ninth Revision*

IRR—incidence rate ratio

CCS—Clinical Classification System

CI—confidence interval

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**WHAT'S KNOWN ON THIS SUBJECT:** Military deployment of a parent influences children's behavior in a variety of settings. The clinical significance of these deployment-associated behavior changes has not been determined.



**WHAT THIS STUDY ADDS:** Children experiencing separation from a parent due to wartime military deployment have an 11% increase in outpatient visits for mental and behavioral health complaints, which contrasts with a general deployment-associated decrease in health care visits in all other diagnostic categories.

## abstract

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**BACKGROUND:** Children of military personnel face stress when a parent deploys.

**OBJECTIVE:** Our goal was to determine the effect of parental military deployment on the relative rate of outpatient visits for mental and behavioral health disorders in children aged 3 to 8 years.

**METHODS:** This was a retrospective cohort study. Records of children of active-duty personnel during fiscal years 2006 and 2007 were linked with their parent's deployment records. Mental and behavioral health visits were identified by using *International Classification of Diseases, Ninth Revision*, codes. The incidence rate ratio (IRR) of visits per year according to parental deployment status was determined with random-effects negative binomial regression modeling with longitudinal data analysis.

**RESULTS:** A total of 642 397 children aged 3 to 8 years and 442 722 military parents were included. Mean child age was 5.0 years (SD: 1.9 years); 50.6% were male, and 68.0% were white. Ninety percent of the parents were male, and 90.5% were married; 32.0% of the parents were deployed during the study. There were 1 049 081 person-years with 611 115 mental and behavioral health visits (0.6 visit per year). The IRR of mental and behavioral health visits for children with a deployed parent compared with when a parent was home was 1.11 (95% confidence interval [CI]: 1.07–1.14;  $P < .001$ ). IRRs of pediatric anxiety, behavioral, and stress disorders when a parent deployed were 1.14 (95% CI: 0.98–1.32;  $P = .095$ ), 1.19 (95% CI: 1.07–1.32;  $P < .001$ ), and 1.18 (95% CI: 1.10–1.26;  $P < .001$ ), respectively. Older children and children with military fathers and married parents had larger increases in rates of mental and behavioral health visits during parental deployments. In contrast, the overall outpatient rate and rates of visits for other diagnoses decreased when a parent was deployed.

**CONCLUSIONS:** Mental and behavioral health visits increased by 11% in these children when a military parent deployed; behavioral disorders increased 19% and stress disorders increased 18%. Rates especially increased in older children and children of married and male military parents. *Pediatrics* 2010;126:000

Families experience multiple stressors associated with military service by a parent. Frequent moves, prolonged absences of a parent during military deployment, and the risk of a parent's death are examples of such stressors.<sup>1</sup> When a parent deploys, the separation of parent and child influences the child's current and future development.<sup>2,3</sup> Similar effects of child separation from a parent have been documented in a variety of settings, including divorce and parental incarceration, migration, or hospitalization.<sup>4-9</sup>

In a 2006 survey of military spouses, 20% of parents reported that their children coped poorly during military deployments.<sup>10</sup> Children of deployed parents exhibit more internalizing and externalizing behaviors, especially when a parent deploys to a combat zone.<sup>11-15</sup> Deployment of a parent has been associated with maladaptive child behaviors<sup>10,16,17</sup> and decreased academic performance.<sup>10</sup> Child maltreatment rates are also increased during deployment.<sup>18</sup> The effects of deployment can also differ depending on the gender of the deployed parent.<sup>19</sup> These observations, however, have not directly linked parental deployment to clinically significant pediatric mental or behavioral health disorders.<sup>20,21</sup> Changes in behavior that lead a caregiver to seek medical attention for a child signal a more significant impact of parent-child separation than cross-sectional measurements or surveys of child behavior. Studies that have examined the effect of parental deployment on inpatient psychiatric hospitalization have been small and provided differing results.<sup>22,23</sup> We hypothesize that military deployment of a parent leads to increased outpatient visits for pediatric mental and behavioral health complaints. The goal of this study was to determine the effect of parental military deployment on the relative rate of outpatient visits for mental and behav-

ioral health disorders in children aged 3 to 8 years.

## PATIENTS AND METHODS

All data were obtained from the Tri-care Management Activity, which oversees all health care delivery for the US military and their family members in both the civilian and military sectors (in the United States as well as abroad). Military beneficiaries aged 3 to 8 years enrolled in the military health system at the end of fiscal year 2006 or 2007 were identified from the Defense Enrollment Eligibility Reporting System (DEERS). Age was determined at the end of the fiscal year. The age range of 3 to 8 years was chosen because it excluded the younger ages at which there are frequent well-child visits, corresponded to the ages included in previous studies that documented subclinical behavior changes, and included the developmental stage at which one of the authors (Dr Gorman) had observed an increase in behavioral concerns in his pediatric practice.<sup>14,16</sup> Children of National Guard or Reserve personnel were excluded. Each subject's demographic information and enrollment date were extracted. Subjects without an electronic data interchange patient number (EDIPN), a unique identifier common to Department of Defense databases, were excluded. Likewise, subjects whose parent did not have an EDIPN were excluded.

The Tricare Management Activity maintains the Standard Ambulatory Data Record and the noninstitutional care database of all outpatient visits for military family enrollees inclusive of care received from military and civilian providers. Claims for included subjects from October 1, 2005, through September 30, 2007, were extracted when the subjects were as young as 2 years 1 day and as old as 8 years 11 months. Claims were excluded if they occurred

before the child's date of enrollment in the military health system or after the parent's exit from the military. Each claim was categorized by its primary diagnosis (*International Classification of Diseases, Ninth Revision* [ICD-9], code) into 1 of 18 multilevel diagnostic groupings, including a category for mental and behavioral health disorders, by using the Clinical Classification System (CCS) of the Agency for Healthcare Research and Quality.<sup>24</sup> In addition, each claim was categorized according to a more restrictive classification of mental and behavioral health disorders used in a similar study of US Army wives.<sup>25</sup> Claims were further subcategorized as pertaining to pediatric anxiety disorders, behavioral disorders, or stress disorders.

Deployment dates were provided by the Defense Manpower Data Center, which also supplied data on start and stop dates for all deployments and demographic information such as age, military rank, service branch, and marital status. All deployments, including but not limited to combat deployments, were included. The electronic data interchange patient number of the parent provided a link between the data sets.

Each subject's outpatient visits were merged with the parental deployment record. Each visit was categorized as occurring during or not during a period of deployment. The total number of visits according to CCS category was summed for each child for each period of exposure (deployment and nondeployment). All subjects contributed exposure time from the start of each fiscal year in which they were registered in the Defense Enrollment Eligibility Reporting System, truncated on the basis of the dates of their military benefits eligibility status.

## Variables

Variables in the analysis included child age and gender and parental marital

status, gender, military rank, and deployment status. Nonnormally distributed variables were stratified according to quartiles. Parental military rank was classified as Junior Enlisted (E0–E6), Senior Enlisted (E7–E9), Warrant Officer (WO1–O4), Junior Officer (O1–O3), and Senior Officer (O4–O10).

### Analytic Plan

The incidence rate ratio (IRR) of visits per year according to parental deployment status was determined with random-effects negative binomial regression modeling with longitudinal data analysis. Negative binomial regression can determine the relative rate of counted events such as outpatient visits. Longitudinal analysis is the analysis of data from multiple points of time for a single subject. Deployment status was considered an external time-dependent variable, meaning that it was an exposure that varied over time and was not a characteristic of the subject. Covariates considered as potential confounders were child age and gender and parental age, gender, marital status, and military rank. Interactions between deployment and potential confounders were considered for inclusion in all models. An interaction was defined as when the effect of 1 variable was different depending on the presence or absence of another variable. Stratified analyses, when separate analyses were performed after dividing subjects into separate groups, were conducted when there were significant interactions.

*P* values of  $<.05$  were considered statistically significant. Analyses were conducted by using Stata Intercooled 10 (Stata Corp, College Station, TX). The study was reviewed and approved by the responsible institutional review boards.

### RESULTS

There were 746 125 children aged 3 to 8 years in the Defense Enrollment Eligibility Reporting System database for

fiscal years 2006 and 2007. Of these children, 103 728 (13.9%) were excluded because they did not have an active-duty non–National Guard, non-Reservist parent. The remaining 642 397 (86.0%) children could be linked to an active-duty parent. The mean age of included children was 5.0 years (SD: 1.9 years); 50.6% were male, 68.0% were white, and 22.0% were black. Included children did not differ significantly from the 103 728 excluded children by gender (49% female versus 48% male) or race but were slightly and significantly older ( $5.0 \pm 1.9$  vs  $4.9 \pm 1.8$  years;  $P < .001$ ). Characteristics of included children and their parents are listed in Table 1. Included subjects contributed 1 049 081 person-years for analysis.

Included children were linked to 442 722 active-duty parents. The median age of the parents was 34 years (interquartile range: 28–39 years). Forty-five percent of the parents

**TABLE 1** Clinical Characteristics of 642 397 Children and Their 442 722 Military Parents

Parameter	All Patients
Age, mean $\pm$ SD, y	5.0 $\pm$ 1.9
Male, %	50.6
Race, %	
White	68
Black	22
Other	10
Parent deployed during time period, %	32
Age of parent, median (IQR)	34 (28–39)
Male military parent, %	90
Branch of service of parent, %	
Army	45
Air Force	26
Navy	13
Marines	7.4
Married parents, %	90.5
Rank of Parent, %	
Junior Enlisted (E1–E6)	12.4
Senior Enlisted (E7–E9)	65.8
Warrant Officer (WO1–WO4)	2.4
Junior Officer (O1–O3)	7.8
Senior Officer (O4–O10)	11.6

IQR indicates interquartile range; E1, first and lowest enlisted rank; WO1, first and lowest warrant officer rank; O1, first and lowest officer rank.

served in the Army, 26.0% in the Air Force, 13.4% in the Navy, and 7.4% in the Marines. Military parents were predominately male (90.0%), and the majority (90.5%) were married. Enlisted parents comprised 78.3%, and 11.5% had a rank of E6 or below. Thirty-two percent of the parents were deployed during the 2-year period; for these parents, the median number of days deployed was 196 (interquartile range: 118–343 days). Military parents contributed 125 219 person-years of deployment time, which was 11.9% of the person-years of the included children.

There were 4 121 624 outpatient visits recorded by Tricare Management Authority during fiscal year 2006 and 4 263 809 outpatient visits in fiscal year 2007 for children aged 3 to 8 years. Visits at civilian facilities accounted for 65.0% of visits. Of all visits, 1 700 875 (20.2%) were excluded because they could not be linked to an included child. In addition, 74 439 duplicate claims (0.9%), were excluded and 13 776 claims (0.2%) were excluded because they had no electronic data interchange patient number.

Visits included in the analysis numbered 6 505 771 (60.0% from non-military facilities). The individual outpatient-visit rate was 6.2 visits per year. There were 611 115 outpatient visits in CCS category 5 (mental and behavioral health). The rate of mental and behavioral health outpatient visits in this population during fiscal years 2006 and 2007 was 0.58 visit per year. The most frequent (30.1%) primary diagnosis of identified mental and behavioral health visits were for attention-deficit disorder (ICD-9 code 314.xx). Adjustment disorders (ICD-9 code 309.xx [14.6%]) and autistic disorders (ICD-9 code 299.xx [12.1%]) were the next most frequent diagnoses. The most frequent mental and behavioral health diagnoses in this

**TABLE 2** Leading Mental and Behavioral Health Diagnoses of 642 397 Children of Military Parents During Fiscal Years 2006 and 2007

Diagnosis <sup>a</sup>	Percentage of All Mental Health Diagnoses
Attention-deficit disorder	30.1
Adjustment disorders	14.6
Autistic disorders	12.1
Speech and language disorders	11.0
Mood disorder	3.6
Anxiety disorders	3.3
Oppositional defiant disorder	2.8
Conduct disturbance NOS	2.5
Hyperkinetic syndrome NOS	2.3
Developmental coordination disorder	2.2
Developmental delay NOS	2.0
Posttraumatic stress disorder	1.2
Enuresis	0.7
Separation anxiety	0.7

NOS indicates not otherwise specified.

<sup>a</sup> Diagnoses classified as CCS5 by the Agency for Healthcare Research and Quality CCS.

study are listed in Table 2. Among these visits, there were 23 561 visits for pediatric anxiety disorders, 40 600 visits for behavioral disorders, and 95 796 visits for stress disorders. The rates of anxiety disorders, behavioral disorders, and stress disorders were

22.4, 38.7, and 91.3 visits per 1000 person-years, respectively.

### Outpatient Visits: Unadjusted Analyses

During 923 972 person-years when a military parent was at home, there were 5 746 830 outpatient visits recorded for included children. During 125 219 person-years when a parent was deployed, there were 729 725 outpatient visits recorded. In unadjusted longitudinal analysis, the IRR of outpatient visits during a parent's deployment compared with when a parent was home was 0.89 (95% CI: 0.88–0.90;  $P < .001$ ).

Rates of all outpatient visits suggested an interaction between the military parent's gender and deployment. When a mother deployed, the outpatient visit IRR was 0.73 (95% CI: 0.72–0.73;  $P < .0001$ ) compared with 0.96 (95% CI: 0.959–0.964;  $P < .0001$ ) when a father deployed.

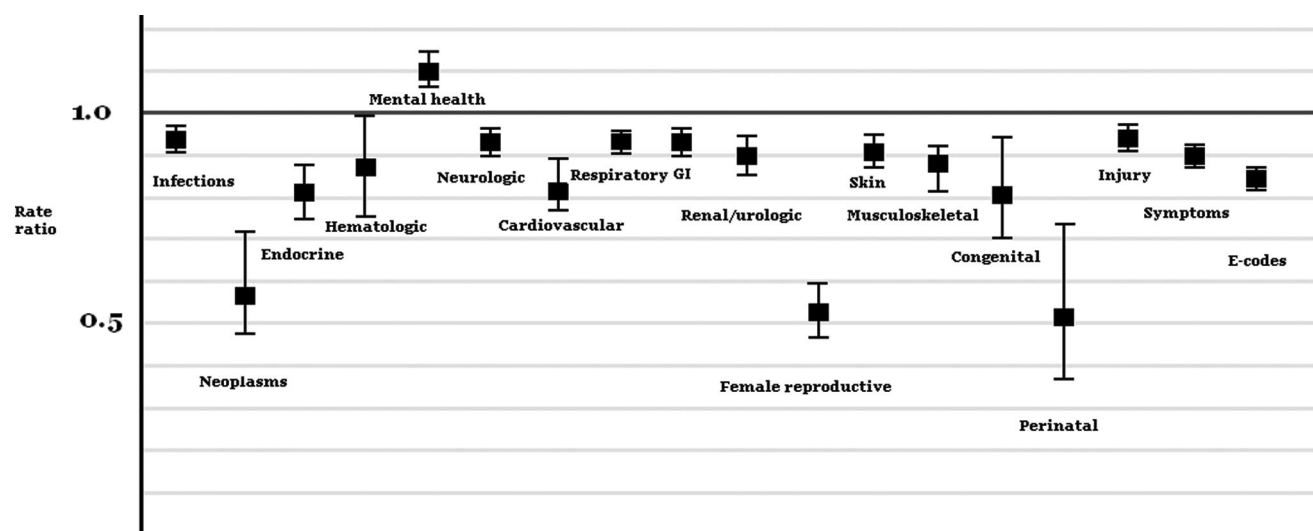
### Mental and Behavioral Health Visits: Unadjusted Analyses

In unadjusted longitudinal analysis, the IRR of outpatient mental and be-

havioral health visits during a parent's deployment compared with when a parent was home was 1.11 (95% CI: 1.07–1.14;  $P < .001$ ). Unadjusted rates for all other categories of outpatient pediatric visits decreased when a parent was deployed (Fig 1).

Rates of pediatric anxiety disorders, behavioral disorders, and stress disorders increased for children when their parent deployed (Table 3). There were 26.7 excess visits per 1000 person-years (95% CI: 17.5–36.0) for anxiety disorders when a parent was deployed. There were 6.5 (95% CI: 5.3–7.8) and 22.3 (95% CI: 20.3–24.2) excess visits per 1000 person-years when a parent was deployed for behavioral and stress disorders, respectively. The relative rate of anxiety disorders in children when their parent was deployed was 1.14 (95% CI: 0.98–1.32;  $P = .095$ ). The relative rate for pediatric behavioral disorders was 1.19 (95% CI: 1.07–1.32;  $P = .001$ ), and it was 1.18 (95% CI: 1.10–1.26;  $P < .001$ ) for stress disorders.

Rates of mental and behavioral health visits also suggested an interaction between military parent's gender and de-



**FIGURE 1**

Unadjusted rate ratios of outpatient visits of 3- to 8-year-old children of military parents based on parental deployment, according to clinical category. Point estimates and 95% CIs are depicted for effect of deployment versus nondeployment derived from unadjusted negative binomial regression using longitudinal data analysis. Clinical categories were determined by primary ICD-9 codes classified by the CCS of the Agency for Healthcare Research and Quality.

**TABLE 3** Unadjusted Rate Ratios of Pediatric Anxiety, Behavioral, and Stress Disorders According to Parental Deployment Status in 642 397 Children Aged 3 to 8 Years

Diagnosis	Visits		RR	P
	Parent at Home (125 219 Person-Years)	Parent Deployed (923 962 Person-Years)		
Anxiety disorders	3107	20 454	1.12 (1.08–1.16)	<.001
Pediatric behavioral disorders	15 568	35 052	1.17 (1.14–1.21)	<.001
Stress disorders	13 892	81 904	1.25 (1.23–1.27)	<.001

Diagnoses categorized according to primary ICD-9 code and classification system of Mansfield et al.<sup>28</sup> RR indicates rate ratio.

**TABLE 4** Results of Multivariate Negative Binomial Regression on the Rates of Mental and Behavioral Health Visits of Children of Military Parents According to Parental Deployment Status

	$\beta$ Coefficient	95% CI	P
Deployment of parent	−1.88	−2.13 to −1.63	<.001
Age of child (by year)	0.381	0.368 to 0.395	<.001
Married parents	−0.108	−0.182 to −0.0359	.004
Male child	0.887	0.836 to 0.937	<.001
Male military parent	0.106	0.0259 to 0.186	.009
Deployment of parent + child age interaction	0.0812	0.0539 to 0.109	<.001
Deployment of parent + male military parent interaction	0.487	0.286 to 0.687	<.001
Deployment of parent + married military parent interaction	0.349	0.211 to 0.488	<.001
Constant	−2.92	−3.04 to −2.80	<.001

Analyses were clustered by child. Pseudo-log-likelihood: −302235.3; model  $\alpha$  = 44.0 (95% CI: 43.4–44.7;  $P$  < .001).

ployment. Children of female military parents experienced an IRR of 0.70 (95% CI: 0.67–0.73;  $P$  < .0001) for mental and behavioral health visits when the mother was deployed compared with an IRR of 1.19 (95% CI: 1.19–1.20;  $P$  < .0001) for children of male military parents when the father deployed. An interaction between deployment and parent marital status also existed. For children of single parents, the IRR when the military parent was deployed was 0.91 (95% CI: 0.89–0.93;  $P$  < .0001) compared with 1.21 (95% CI: 1.20–1.22;  $P$  < .0001) for children of married military parents. No interaction between child gender and parental gender was evident.

### Multivariate Analysis

In the multivariate models, there was a significant interaction between the parent's deployment and child age, and the parent's gender and marital status (Table 4). The strongest interaction involved a positive interaction between male military parents and deployment.

The IRRs of the effect of deployment on mental and behavioral health visits for these 3- to 8-year-old children, stratified according to the gender of the military parent, parental marital status, and child's age, are shown in Table 5. In all strata of child age and parental marital status, the IRR was higher for children of male military parents than female military parents. This effect was more pronounced in children of married parents than those of single parents. IRRs also increased with child age in all strata of military parent's gender and marital status. Similar patterns were observed in subanalyses of pediatric anxiety, behavioral, and stress disorders (data not shown).

### DISCUSSION

Results of this study show a clinically significant 11% increase in outpatient visits for mental and behavioral health care complaints for these children of military parents during a parent's deployment. Pediatric behavioral and stress disorders increased 18% and 19%, respectively, when a parent was

deployed. The significance of these increased rates is more marked when contrasted with an 11% decrease in all health care visits for this population when a parent was deployed. The general decrease in outpatient visits may reflect increased demands of a functionally single caregiver who must choose which conditions merit the effort of bringing a child to medical attention. There was a significant interaction between military deployment and the gender of the military parent on outpatient mental and behavioral health care rates; children of male military parents had increased rates compared with children of female military parents. This result suggests parental gender-specific differences in the behavioral response of children to deployment, recognition of child issues during deployment, the inability to bring these issues to professional attention, or a combination of these factors. A child's age and the parent's marital status also interacted with the parental deployment; older children and children of married parents had increased rates of outpatient mental and behavioral health visits. Our results add to the findings of recent previous studies that documented deployment-related changes in child behavior by linking them to clinically apparent psychological and behavioral issues that merit the clinical attention of a pediatric provider.<sup>14,16</sup>

Previous research has documented the differences between paternally and maternally separated children.<sup>19</sup> One possible explanation is that the mothers remaining at home may be more likely to manifest their own mental health issues or that mothers are more likely to transfer their own mental health symptoms onto the child. In the 2006 Military Spouse Survey, 62% of spouses reported an increase in anxiety during a deployment.<sup>10</sup> Twenty-nine percent of spouses (mostly fe-

**TABLE 5** Adjusted IRRs of Mental and Behavioral Health Visits of 642 397 Children Aged 3 to 8 Years During Times at Which a Parent Was Deployed Compared With Time at Which the Parent Was Home

	Male Military Parent			Female Military Parent		
	IRR	95% CI	P	IRR	95% CI	P
Married parents						
Age of child, y						
3	1.41	1.23, 1.61	<.001	0.78	0.62, 0.98	.03
4	2.24	1.98, 2.53	<.001	1.24	0.99, 1.54	.06
5	3.55	3.15, 4.01	<.001	1.96	1.58, 2.45	<.001
6	5.64	4.99, 6.39	<.001	3.12	2.50, 3.90	<.001
7	8.97	7.85, 10.2	<.001	4.96	3.95, 6.22	<.001
8	14.2	12.3, 16.4	<.001	7.87	6.22, 9.96	<.001
Single parent						
Age of child, y						
3	1.11	0.93, 1.32	.26	0.61	0.49, 0.76	<.001
4	1.76	1.48, 2.08	<.001	0.97	0.78, 1.20	.79
5	2.79	2.36, 3.30	<.001	1.54	1.25, 1.91	<.001
6	4.43	3.74, 5.26	<.001	2.45	1.98, 3.04	<.001
7	7.04	5.89, 8.42	<.001	3.89	3.12, 4.86	<.001
8	11.2	9.26, 13.51	<.001	6.18	4.91, 7.78	<.001

Point estimates and CIs were determined by negative binomial regression clustered according to child.

male) of deployed Marines in 2003 were seen by a mental health specialist.<sup>26</sup> Maternal depression is associated with increased perception of mental health issues in their children, as well as an increased number of outpatient visits for these concerns.<sup>27–29</sup> Paternal depression has also been associated with child behavioral problems.<sup>30</sup> Future studies that adjust for parental depression and differential rates of depression of male and female nondeployed parents would help determine if this theory explains the gender effect seen in this study.

The findings may also be explained by differing abilities to recognize or tolerate childhood mental health disorders. Children of single military parents had lower relative rates of mental and behavioral health visits during parental deployment. During their parent's deployment, most of these children live with extended family or temporary guardians who may not know how to access health care services for the child. In addition, temporary guardians may not be familiar with the child's "normal" or baseline behavior and therefore may be unable to detect behavior changes that are caused by

the parent's absence. This concept of awareness of a child's baseline behavior may also be supported by the more pronounced effect of deployment in children of male married military parents seen in this study. Because most mothers identify themselves as the primary caregiver, fathers may not recognize changes in behavior during a mother's deployment as readily as mothers do during a father's deployment.

Increased mental and behavioral health issues during times of parent-child separation have been reported for other populations. School-aged children of divorced parents display many of the internalizing and externalizing behaviors reported by parents and caregivers of military children when separated from their parents.<sup>4–6</sup> Although family conflict is a potent confounder in linking parent separation to child mental and behavioral health issues, the decreased psychosocial quality of life of young children of divorced parents is partially mitigated by increased contact with the noncustodial parent.<sup>31</sup> There are also strong confounders in examinations of the mental health impact of separation of

children caused by parental incarceration, especially propensity to social dysfunction. Separation caused by migration of a parent in the developing world has been linked to an increase in somatic illnesses,<sup>9</sup> in contrast to our findings. Parent-child separation caused by prolonged parental hospitalizations may most closely resemble the separation experienced by children of military families in terms of its potential for parental mortality and its repetitive nature, but this situation does not occur on the same scale as the separation caused by military deployments as described in this study.

Future analyses will be needed to determine if the effects of deployment on parent-child separation persist into adulthood. In long-term studies of children evacuated and separated from their parents during World War II bombings in Europe, increased rates of mental health problems have been reported 6 to 7 decades after the experience.<sup>32,33</sup> However, Finnish adults who were separated from their father in World War II because of military deployment had no adult mental health sequelae because of their experience, which is in contrast to children separated from their parents as a result of evacuation.<sup>33</sup>

Our study was limited by reliance on clinical diagnosis and provider coding for identification of mental and behavioral health diagnoses and not on standardized clinical definitions. Initial diagnoses of mental and behavioral health conditions could not be identified. In military treatment facilities where provider compensation is not linked to coding, there is little incentive for providers to code outpatient visits completely. The restriction of our analysis to primary diagnoses limits the effect of misdiagnoses and captures the true nature of the chief complaint of these visits. We also included outpatient visits billed by nonmilitary provid-

ers, who presumably have greater financial incentive to accurately code.

The CCS categorized some conditions (eg, developmental delay, autism, speech disorders) that may develop independently of parent deployment as mental and behavioral health disorders, although previous authors have made an association between developmental delay and parental mental health.<sup>34–37</sup> We did not attribute these diagnoses directly to parental deployment; however, we did include them in the definition, because there may be increased recognition of these disorders or worsening of the clinical manifestations, especially when there is family stress.<sup>38</sup> The use of this accepted classification system for claims data, as well as previously published categories of more tightly defined mental and behavioral health diagnoses, decreases ascertainment bias and improves reproducibility.

We could not identify families in which both parents were in the military. In the US military, 2.5% of active-duty, service-member parents are married to military spouses.<sup>39</sup> This limitation could have conflicting effects on the observed relative rates in families of dual-military parents. Increased rates may occur because of higher stress from both parents being alternately deployed or because of ascertainment bias from the other military parent having better access to the military health system. Conversely, the effect of deployment might be attenuated because the nondeployed spouses have built-in support systems in their military unit. Unidentified dual-military families may lead to time misclassified as nondeployed exposure time when the second military parent is deployed.

We also did not subcategorize military deployments into predeployment, deployment, or postdeployment phases.<sup>12,40–42</sup> There may be specific periods in a deployment cycle when mental health complaints are more likely to surface. Because our analysis covered 2 fiscal years and included parents who deployed multiple times for varying durations, we believe stratifying time-at-risk into similar phases may lead to misclassification.

Potential confounders were also not included in the analysis. Because we did not have access to the parents' medical records, depression and other mental health conditions could not be factored into our analyses. Although parents' perception of their children's mental health reliably predicts clinical conditions,<sup>43</sup> there may be a differential ascertainment bias because depressed mothers perceive their children's mental health problems more frequently than nondepressed mothers—the “depression-distortion hypothesis.”<sup>44–46</sup> Because depression and other mental health disorders are common among female spouses of deployed male military members, this phenomenon should caution against assigning direct causality between parental deployment and pediatric visits for mental and behavioral health issues.<sup>25</sup>

This study's primary strength is the large number of included children during a period of intense deployment stress. The rate of US military deployments was high during the study period and included combat operations and increased coverage by the media. An integrated database with direct linkages between a parent's deployment history and a child's medical record strengthens the precision of timing the outcomes and exposures

used in the study. Longitudinal data techniques excluded between-subject variation as a source of error. Previously published classification systems for identification of the primary outcome measure reduced possible error or bias.

## CONCLUSIONS

Separation of a child from a parent because of the parent's military deployment was associated with an 11% increase in the rate of outpatient visits for mental and behavioral health conditions in these 3- to 8-year-old children despite associated decreases in visits for all other categories of outpatient visits. Mental health and behavioral conditions came to clinical attention at greater rates during parental military deployment for older children, for children of married parents, and for children of male military service members. These findings are especially important for nonmilitary pediatricians, who provide almost two-thirds of outpatient care for the children of military parents. Providers and policy makers should continue their focus on supporting military families before, during, and after deployments in developmentally appropriate ways. Our results reinforce the importance of providing additional support to children of parents who are frequently deployed and the parent or caregiver who remains at home to care for them.

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## REFERENCES

- Haas DM, Pazdernik LA, Olsen CH. A cross-sectional survey of the relationship between partner deployment and stress in pregnancy during wartime. *Womens Health Issues*. 2005;15(2):48–54
- Stroufe LA, Carlson EA, Levy AK, Egeland B. Implications of attachment theory for developmental psychopathology. *Dev Psychopathol*. 1999;11(1):1–13
- Letourneau N, Duffett-Leger L, Salmani M. The role of paternal support in the behavioural development of children exposed to postpartum depression. *Can J Nurs Res*. 2009;41(3):86–106
- Stadelmann S, Perren S, Groeben M, von Klitzing K. Parental separation and children's behavioral/emotional problems: the impact of parental representations and family conflict. *Fam Process*. 2010;49(1):92–108
- Japel C, Tremblay RE, Vitaro F, Boulerice B. Early parental separation and the psychosocial development of daughters 6–9 years old. *Am J Orthopsychiatry*. 1999;69(1):49–60
- Holroyd R, Sheppard A. Parental separation: effects on children; implications for services. *Child Care Health Dev*. 1997;23(5):369–378
- Guidubaldi J, Perry JD. Divorce and mental health sequelae for children: a two-year follow-up of a nationwide sample. *J Am Acad Child Psychiatry*. 1985;24(5):531–537
- Murray J, Farrington DP. Parental imprisonment: effects on boys' antisocial behaviour and delinquency through the life-course. *J Child Psychol Psychiatry*. 2005;46(12):1269–1278
- Schmeer K. Father absence due to migration and child illness in rural Mexico. *Soc Sci Med*. 2009;69(8):1281–1286
- 2006 Survey of Active-Duty Spouses: Administration, Datasets, and Codebook. Survey & Program Evaluation Division, Defense Manpower Data Center, Arlington, VA; 2008
- Kelley ML, Hock E, Smith KM, Jarvis MS, Bonney JF, Gaffney MA. Internalizing and externalizing behavior of children with enlisted Navy mothers experiencing military-induced separation. *J Am Acad Child Adolesc Psychiatry*. 2001;40(4):464–471
- Kelley ML. The effects of military-induced separation on family factors and child behavior. *Am J Orthopsychiatry*. 1994;64(1):103–111
- Zeff KN, Lewis SJ, Hirsch KA. Military family adaptation to United Nations Operations in Somalia. *Mil Med*. 1997;162(6):384–387
- Flake EM, Davis BE, Johnson PL, Middleton LS. The psychosocial effects of deployment on military children. *J Dev Behav Pediatr*. 2009;30(4):271–278
- Chandra A, Lara-Cinisomo S, Jaycox LH, Tanielian T, Burns RM, Ruder T, et al. Children on the homefront: the experience of children from military families. *Pediatrics*. 2010;125(1):16–25
- Chartrand M, Frank DA, White LF, Shope TR. Effect of parents' wartime deployment on the behavior of young children in military families. *Arch Pediatr Adolesc Med*. 2008;162(11):1009–1014
- Barker LH, Berry KD. Developmental issues impacting military families with young children during single and multiple deployments. *Mil Med*. 2009;174(10):1033–1040
- Gibbs DA, Martin SL, Kupper LL, Johnson RE. Child maltreatment in enlisted soldiers' families during combat-related deployments. *JAMA*. 2007;298(5):528–535
- Applewhite L, Mays R. Parent-child separation: a comparison of maternally and paternally separated children in military families. *Child Adolesc Social Work J*. 1996;13(1):23–39
- Jensen PS, Martin D, Watanabe H. Children's response to parental separation during operation desert storm. *J Am Acad Child Adolesc Psychiatry*. 1996;35(4):433–441
- Rosen LN, Teitelbaum JM, Westhuis DJ. Children's reactions to the Desert Storm deployment: initial findings from a survey of Army families. *Mil Med*. 1993;158(7):465–469
- Levai M, Kaplan S, Ackermann R, Hammock M. The effect of father absence on the psychiatric hospitalization of Navy children. *Mil Med*. 1995;160(3):104–106
- Koshes RJ, Rothberg JM. Use of inpatient psychiatric services on a U.S. Army combat support post during Operations Desert Shield and Desert Storm: the stress of non-deployment. *Mil Med*. 1994;159(6):454–456
- HCUP Clinical Classifications Software (CCS) for ICD-9-CM. Healthcare Cost and Utilization Project (HCUP). 2000–2003. Agency for Healthcare Research and Quality, Rockville, MD. [www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp](http://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp). Accessed July 11, 2005
- Mansfield AJ, Kaufman JS, Marshall SW, Gaynes BN, Morrissey JP, Engel CC. Deployment and the use of mental health services among US Army wives. *N Engl J Med*. 2010;362(2):101–109
- McNulty PA. Does deployment impact the health care use of military families stationed in Okinawa, Japan? *Mil Med*. 2003;168(6):465–470
- Kelley ML, Finkel LB, Ashby J. Geographic mobility, family, and maternal variables as related to the psychosocial adjustment of military children. *Mil Med*. 2003;168(12):1019–1024
- Conrad M, Hammen C. Role of maternal depression in perceptions of child maladjustment. *J Consult Clin Psychol*. 1989;57(5):663–667
- Mowbray CT, Lewandowski L, Bybee D, Oyserman D. Children of mothers diagnosed with serious mental illness: patterns and predictors of service use. *Ment Health Serv Res*. 2004;6(3):167–183
- Davé S, Sherr L, Senior R, Nazareth I. Associations between paternal depression and behaviour problems in children of 4–6 years. *Eur Child Adolesc Psychiatry*. 2008;17(5):306–315
- Eymann A, Busaniche J, Llera J, De Cunto C, Wahren C. Impact of divorce on the quality of life in school-age children [in Portuguese]. *J Pediatr (Rio J)*. 2009;85(6):547–552
- Rusby JS, Tasker F. Long-term effects of the British evacuation of children during World War 2 on their adult mental health. *Aging Ment Health*. 2009;13(3):391–404
- Pesonen AK, Raikkonen K, Heinonen K, Kajantie E, Forsen T, Eriksson JG. Depressive symptoms in adults separated from their parents as children: a natural experiment during World War II. *Am J Epidemiol*. 2007;166(10):1126–1133
- van Batenburg-Eddes T, de Groot L, Huizink AC, et al. Maternal symptoms of anxiety during pregnancy affect infant neuromotor development: the generation R study. *Dev Neuropsychol*. 2009;34(4):476–493
- Lung FW, Chiang TL, Lin SJ, Shu BC. Parental mental health and child development from six to thirty-six months in a birth cohort study in Taiwan. *J Perinat Med*. 2009;37(4):397–402
- Paulson JF, Keefe HA, Leiferman JA. Early parental depression and child language development. *J Child Psychol Psychiatry*. 2009;50(3):254–262
- Cox AD, Puckering C, Pound A, Mills M. The impact of maternal depression in young children. *J Child Psychol Psychiatry*. 1987;28(6):917–928
- Herring S, Gray K, Taffe J, Tonge B, Sweeney D, Einfeld S. Behaviour and emotional problems in toddlers with pervasive develop-



- mental disorders and developmental delay: associations with parental mental health and family functioning. *J Intellect Disabil Res.* 2006;50(pt 12):874–882
39. Office of the Deputy Undersecretary of Defense for Military Community and Family Policy. Demographics report. Available at: [http://www.cfs.purdue.edu/mfri/pages/military/2005\\_Demographics\\_Report.pdf](http://www.cfs.purdue.edu/mfri/pages/military/2005_Demographics_Report.pdf). Accessed June 25, 2009
  40. Peebles-Kleiger MJ, Kleiger JH. Reintegration stress for Desert Storm families: wartime deployments and family trauma. *J Trauma Stress.* 1994;7(2):173–194
  41. Cozza SJ, Chun RS, Polo JA. Military families and children during operation Iraqi freedom. *Psychiatr Q.* 2005;76(4):371–378
  42. Amen DG, Jellen L, Merves E, Lee RE. Minimizing the impact of deployment separation on military children: stages, current preventive efforts, and system recommendations. *Mil Med.* 1988;153(9):441–446
  43. Glascoe FP. Parents' evaluation of developmental status: how well do parents' concerns identify children with behavioral and emotional problems? *Clin Pediatr (Phila).* 2003;42(2):133–138
  44. Kiss E, Gentzler AM, George C, et al. Factors influencing mother-child reports of depressive symptoms and agreement among clinically referred depressed youngsters in Hungary. *J Affect Disord.* 2007;100(1–3):143–151
  45. Gartstein MA, Bridgett DJ, Dishion TJ, Kaufman NK. Depressed mood and maternal report of child behavior problems: another look at the depression-distortion hypothesis. *J Appl Dev Psychol.* 2009;30(2):149–160
  46. van der Toorn SL, Huizink AC, Utens EM, Verhulst FC, Ormel J, Ferdinand RF. Maternal depressive symptoms, and not anxiety symptoms, are associated with positive mother-child reporting discrepancies of internalizing problems in children: a report on the TRAILS Study. *Eur Child Adolesc Psychiatry.* 2010;19(4):379–388

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