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TITLE: Mental Health Disorders, Suicide Risk, and Treatment seeking among Formerly Deployed National Guard and Reserve Service Member seen in Non-VA Facilities

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PREPARED FOR: U.S. Army Medical Research and Materiel Command
Fort Detrick, Maryland 21702-5012

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14. ABSTRACT

The focus of the current study was to assess the prevalence of and risk factors for mental health disorders, variations in service use among National Guard and Reserve service members seem in non-VA facilities following deployments, compared to other era service members. Of the 1,730 veterans surveyed, 95% were male, 44% were under 64 years old, 96% were white race, 40% reported multiple warzone deployments, and 38% (n=665) had served as National Guard/Reserve service members. In addition, 23% (n=396) serviced in Iraq, Afghanistan, or Global War on Terrorism. The prevalence of current PTSD was 5.4% (probable PTSD = 7.6%), current depression was 8%, 23% had used mental health services in the past year and 50% had used the VA in the past year. The most common current disorder was related to alcohol misuse, with 24% screening positive on the AUDIT scale. In addition, 28% reported a history of concussion during military service. Analyses indicated that PTSD, depression, mental health service use, alcohol misuse, suicidality, and stressful life events were more common among National Guard/Reserve veterans, compared to other era veterans (p-values < 0.05). However, other era veterans were more likely to rate themselves in "fair" or "poor" health and to report a service-connected disability (p-values < 0.05). Nevertheless, multivariable analyses that adjusted for demographic differences, level of combat exposure, current life stressors, and current social support, found no differences in mental health status and mental health service use among the veteran groups. To date, analyses suggest that while deployed National Guard/Reserve service members tended to have a higher prevalence of mental health disorders and mental health service use, when the data were adjusted for demographic difference and potential confounders, there were few differences in outcomes between the veteran groups.

15. SUBJECT TERMS
PTSD, Depression, Service Use, Suicidality, Alcohol Misuse, Concussion, Deployment, VA Service Use, National Guard/Reserve

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
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Table of Contents

Page

- **INTRODUCTION:**

The focus of the current study is to assess the prevalence of and risk factors for mental health disorders, variations in service use, and outcomes among National Guard and Reserve service members following warzone deployments. This study is important because most veterans have private and/or other health insurance coverage and often receive their care from non-VA institutions. The knowledge gained from studying National Guard and Reserve veterans in non-VA healthcare systems is highly relevant. The availability of healthcare options for veterans has increased in recent years through changes in VA policy and insurance coverage. Today most veterans are not seen in VA facilities, but in non-VA systems. The Geisinger Clinic, the community partner for the current study, is a large, non-profit integrated healthcare organization located in central and northeastern Pennsylvania. This system serves more than 3 million residents throughout more than 44 counties in Pennsylvania. Geisinger has more than 30,000 employees, including a 1,600-member multi-specialty group practice, ten hospital campuses, a 551,000-member health plan, and a medical school (Geisinger Commonwealth Medical School), and is one of the largest employers in the state (see: www.geisinger.org). The knowledge gained from studying veterans in non-VA healthcare systems is important for the monitoring the quality of care, diagnostic screening, and for outcomes research. Currently, Geisinger has over 30,000 current and former service members who use this system for their healthcare. Many of these patients currently are or were former members of the National Guard or the Reserves.

- **KEYWORDS:**

Mental Health Disorders, Service Use, Substance Misuse, Deployment, Treatment Outcomes, Traumatic Brain Injury, Concussion, National Guard, Reserves.

- **ACCOMPLISHMENTS:**

  - **What were the major goals of the project?**

YEAR 1

Major Goal 1: Study Start, Instrument/Protocol Finalization, Local IRB, DoD IRB Approval

Subtask 1: Convene initial study meetings with study group (+1 month)
Subtask 2: Review and update study instruments and protocol from pilot study, pilot test revised protocol (+1/2 months)
Subtask 3: Submit revised protocol to Geisinger's IRB and obtain approval (+2 months)
Subtask 4: Submit protocol for DoD's IRB review (+3 months)
Milestone: Finalize study protocol/instruments received required IRB approvals (+3/4 months)

Major Goal 2: Survey Data Collection, Baseline EHR Data Collection, DNA Collection, Data Cleaning, Preliminary Data Analyses

Subtask 1: Pull baseline electronic health record (EHR) data from Geisinger's Information Technology (IT) Systems, including veteran status data, outpatient, inpatient, emergency department, and laboratory data
Subtask 2: Conduct survey data collection
Subtask 3: Collect DNA Samples by Mail
Subtask 4: Conduct preliminary data analyses
Milestones Achieved: Survey data collected, baseline EHR data collected, DNA collected, preliminary analyses being completed

Yearly Patient Enrollment

Table 1. (planned)	**Year 1***			
Target Survey Enrollment (per quarter)	**Q1**	**Q2**	**Q3**	**Q4**
Geisinger Site	1500	200	100	0
Target/Planned Enrollment (cumulative)	**1500**	**1700**	**1800**	**1800**

***Due to recruitment difficulties, only 1,289 veterans were recruited in Year 1.**

YEAR 2

Major Goal 3: Bio-bank DNA, Complete Genotyping, Merge Survey, EHR, and Genotype Data, Complete Analyses for Study Aim 1 (Prevalence Study) and for Aim 2 (PTSD Study), Prepare Manuscripts for Review

Subtask 1: Complete genotyping of selected study SNPs
Subtask 2: Merge genotype data into survey and EHR datasets
Subtask 3: Continue analyses related to study Aims 1 and 2
Subtask 4: Convene study team conference to review study results
Subtask 4: Prepare and submit posters/manuscripts for peer review
Subtask 5: Complete and review preliminary genetic analyses
Subtask 6: Prepare additional posters/manuscripts for internal review and peer review submission
Milestones Achieved: DNA Bio-banked, complete genotyping, merge survey, EHR, and genotype data, complete additional analyses for study Aims 1 and 2, prepared & submit year 2 posters/manuscripts for peer review

Yearly Patient Enrollment

Table 1. (actual)	**Year 2***			
Target Survey Enrollment (per quarter)	**Q1**	**Q2**	**Q3**	**Q4**
Target Enrollment (cumulative)	**1600**	**1800**	**1800**	**1800**

***Due to recruitment difficulties, only 1,730 total veterans were recruited by end of Q2 in Year 2, after which recruitment was stopped.**

YEAR 3

Major Goal 4: Complete Follow-up EHR data pull from Geisinger IT Systems, Merge Follow-up Data, Complete Analyses for Study Aim 3 (Effectiveness) and for Aim 4 (Genetics), Prepare Final Manuscripts for Review and Submission, Convene Final Conferences and meetings

Subtask 1: Conduct Follow-up data pull from Geisinger's EHR Systems, using outpatient, inpatient, emergency department and laboratory data
Subtask 2: Merge and clean/code data/ and run preliminary analyses
Subtask 3: Complete analyses for Aims 3 and 4
Subtask 4: Prepare final manuscripts for review and submission
Subtask 5: Prepare and submit proposals for additional genetic and follow-up research funding
Subtask 6: Prepare documentation/datasets for bio-banking and data-sharing of study data
Subtask 6: Complete follow-up EHR data pull from Geisinger EHR/IT Systems, merge follow-up data, completed analyses for Aims 3 and 4, Prepare Final manuscripts for review and submission, convene final conference meeting, prepare documentation and datasets for data sharing.

- **What was accomplished under these goals?**

YEAR 3

Major Goal 4:
Quarter 1-

- We have received 1140 saliva samples and have genotyped the DNA samples using 39 SNP assays.
- Continued to merge DNA results with survey data and started to analyze these results.
- Three posters were presented at the International Society for Traumatic Stress Studies, Chicago, Illinois on November 9-11, 2017:
    1. Female Military Veterans' Risk and Protective Factors in Predicting Overall Functioning: A Biomedical Sample of Outpatients from Geisinger Clinic (Figley, et al.)

2. Mental Health Impact of Homecoming Experience among Deployed Veterans from the Vietnam War to Current Warzone Conflicts: Results from the Veterans' Health Study (Boscarino, et al.)
3. Risk and Protective Factors for Suicide among Formerly Deployed U.S. Service Members: Results from the Veterans' Health Study (Boscarino, et al.)

- Response to formal comments submitted to DoD on November 21, 2017, based on Research Command Presentation & Review; Fort Detrick, MD, September 12-14, 2017.

Quarter 2-

- We received 1140 usable saliva samples from the veterans, isolated the DNA, and genotyped the genetic variants using SNP assay kits for these samples. The quality of the DNA is good. Generally, less than 2% of samples did not amplify properly. A summary report of these results were previously sent to DoD. Genotype analyses continued the on the remaining SNPs.
- We are now merged these DNA results with survey data and are analyzing these results.
- We have now also completed our follow-up data pull from Geisinger's EHR system, using outpatient, inpatient, ED data. These data are now being merge with the main survey data and these analyses have begun. A summary report of 40 different EHR health outcomes were previously sent to DoD.
- One poster was accepted for presentation at HCSRN Conference, Minneapolis, MN April 11-13, 2018: Hoffman, et al., ***Grapheme-color Synesthesia is Associated with PTSD: A Confirmation of Previous Findings and Research.***
- Three manuscripts have been submitted to medical Journals: (1) Boscarino et al., **Mental Health Impact of Homecoming Experience among 1,730 Formerly Deployed Veterans from the Vietnam War to Current Conflicts: Results from the Veterans' Health Study**, *Journal of Nervous and Mental Disease*; (2) Urosevich et al. **Visual Dysfunction and Associated Co-Morbidities as Predictors of Mild Traumatic Brain**, *Military Medicine*; (3) Adams et al., **Veteran Identity as a Protective Factor against Suicide Ideation: Implications for Theory and Intervention**, *Journal of Traumatic Stress*.
- IRB approval was granted for administration of a supplemental survey that included questions omitted in the original survey due to length. This survey provides additional data related to mental health treatment outcomes, sleep disorders, and the effects of "burn pit" exposures during deployment.
- Data Analyses related to completion of Aims 3 and 4 was begun.
- Year 3 Subtasks 3-6 were started.

Quarter 3-

- We continued to merge these DNA results with survey data and analyzing these results.
- One poster was presented at HCSRN Conference, Minneapolis, MN April 11-13, 2018: Hoffman, et al., ***Grapheme-color Synesthesia is Associated with PTSD: A Confirmation of Previous Findings and Research.***
- Two manuscripts were resubmitted to the medical Journals: (1) Boscarino et al., **Mental Health Impact of Homecoming Experience among 1,730 Formerly Deployed Veterans from the Vietnam War to Current Conflicts: Results from the Veterans' Health Study**, *Journal of Nervous and Mental Disease*; (2) Adams et al., **Veteran Identity as a Protective Factor against Suicide Ideation: Implications for Theory and Intervention**, Traumatology.
- One manuscript has been published on line: Urosevich et al. **Visual Dysfunction and associated co-morbidities as predictors of mild Traumatic Brain**, *Military Medicine* and another one was accepted for publication and is current in press: Boscarino et al., **Mental Health Impact of Homecoming Experience among 1,730 Formerly Deployed Veterans from the Vietnam War to Current Conflicts: Results from the Veterans' Health Study**, *Journal of Nervous and Mental Disease.*
- National Guard Outcomes, Suicide, Substance Use, and Treatment Outcome papers are currently in progress.
- IRB approval was granted for administration of a supplemental survey that included questions omitted in the original survey due to length. This supplement survey is now complete. This survey is

providing additional data related to mental health treatments, sleep disorders, and the health effects of "burn pit" exposures during deployment.

- Data Analyses related to completion of Aims 3 and 4 are continuing.
- Annual US Army Research Command Presentation & Review; Fort Detrick, MD, was completed by Dr. Boscarino on September 28, 2018.

- **What opportunities for training and professional development has the project provided?**
  Drs. Hoffman and Figley participated in poster presentations, as well as junior staff.

- **How were the results disseminated to communities of interest?**
  Two publications were accepted for publication and four posters were presented.

- **What do you plan to do during the next reporting period to accomplish the goals?**
  Our primary goal is to complete data analyses and submit final manuscripts for peer review and publication.

4. **IMPACT:**

- **What was the impact on the development of the principal discipline(s) of the project?**
  Nothing to Report.
- **What was the impact on other disciplines?**
  Nothing to Report.
- **What was the impact on technology transfer?**
  Nothing to Report.
- **What was the impact on society beyond science and technology?**
  Nothing to Report.

5. CHANGES/PROBLEMS: The were no substantive changes submitted to the Department of Defense during Year 3. However, the main problem faced related recruitment of Guard/Reserve service members.

- **Changes in approach and reasons for change**:
  With DoD and Geisinger IRB approval, we administered an additional telephone survey asking patients questions we omitted from the original survey due to survey length. We will continue analyses of these data and the dissemination findings through conference presentations and research publications.
- **Actual or anticipated problems or delays and actions or plans to resolve them.**
  The difficulty in the recruitment of Guard/Reserve service members has delayed our data analyses. We have added additional data analysis staff and were also granted a no-cost extension to complete this work.
- **Changes that had a significant impact on expenditures**
  Due to data collection delays, our budget is under spent at this time.
- **Significant changes in use or care of human subjects, vertebrate animals, biohazards, and/or select agents**:
  Nothing to Report
- **Significant changes in use or care of human subjects:**
  Nothing to Report
- **Significant changes in use or care of vertebrate animals:**
  Nothing to Report
- **Significant changes in use of biohazards and/or select agents:**
  Nothing to Report

6. PRODUCTS:

- **Publications, conference papers, and presentations**
  Journal publications.
  Urosevich, T; Hoffman, S; Kirchner, H.L; Boscarino, J.J; Adams, R; Figley, C; Dugan, R; Withey, C; Boscarino, J.A Visual Dysfunction and associated co-morbidities as predictors of mild Traumatic Brain Injury seen among Veterans in non-VA Facilities: Implications for Clinical Practice Military Medicine *Military Medicine* 2018 (Published online).

Boscarino, J.A; Hoffman, S; Urosevich, T; Kirchner, H.L; Boscarino, J.J; Adams, R; Withey, C; Dugan, R; Figley, C. Mental Health Impact of Homecoming Experience among 1,730 Deployed Veterans from the Vietnam War to Current Conflicts: Results from the Veterans' Health Study *Journal of Nervous of Mental Disease*. 2018 (in-press).

- **Books or other non-periodical, one-time publications.**
  Nothing to Report
- **Other publications, conference papers, and presentations.**

A poster was presented by Dr. Figley entitled "Female Military Veterans' Risk and Protective Factors in Predicting Overall Functioning: A Biomedical Sample of Outpatients from Geisinger Clinic." at the International Society for Traumatic Stress Studies, Chicago, November 9, 2017.

A poster was presented by Dr. Boscarino entitled "Risk and Protective Factors for Suicide among Formerly Deployed U.S. Service Members: Results from the Veterans' Health Study," at the International Society for Traumatic Stress Studies, Chicago, November 9, 2017.

A poster was presented by Dr. Boscarino entitled " Mental Health Impact of Homecoming Experience among Deployed Veterans from the Vietnam War to Current Warzone Conflicts: Results from the Veterans' Health Study," at the International Society for Traumatic Stress Studies, Chicago, November 10, 2017

One poster was presented at the 2018 HCSRN Conference in Minneapolis, MN on April 11-13, 2018, Hoffman, et al. "Grapheme-color Synesthesia is Associated with PTSD: A Confirmation of Previous Findings and Research"

- **Journal publications (in-direct products from pilot study)**
  Adams RE, Urosevich TG, Hoffmann SN, Kirchner, HL, Hyacinthe JC, Figley CR, Boscarino JJ, Boscarino JA. Social Support, Help-Seeking, and Mental Health Outcomes Among Veterans in Non-VA Facilities: Results from the Veterans' Health Study. Military Behavioral Health 2017;5(4):393-405.

  Lent MR, Hoffman SN, Kirchner HL, Urosevich TG, Boscarino JJ, Boscarino JA. Attitudes about Future Genetic Testing for Posttraumatic Stress Disorder and Addiction among Community-Based Veterans. Front Psychiatry. 2017 May 15;8:76. doi: 10.3389/fpsyt.2017.00076. eCollection 2017.

- **Website(s) or other Internet site(s)**
  https://www.geisinger.edu/en/research/research-and-innovation/find-an-investigator/2017/04/03/13/38/joe-boscarino
- **Technologies or techniques**
  Nothing to Report
- **Inventions, patent applications, and/or licenses**
  Nothing to Report
- **Other Products**
  See in-direct product publications from pilot study listed above.

7. PARTICIPANTS & OTHER COLLABORATING ORGANIZATIONS

- **What individuals have worked on the project?**

Name:	***Joseph A. Boscarino***
Project Role:	*Principle Investigator, Geisinger Clinic*
Researcher Identifier (e.g. ORCID II	N/A
Nearest person month worked:	*36*
Contribution to Project:	*Wrote study application, secured study funding, directed overall study execution, monitored study progress and budget, prepared and reviews study presentations a*

	manuscripts for dissemination. Traveled to regional/national professional meeting to present study results.
Name:	**Charles Figley**
Project Role:	*Co-Investigator, Tulane University*
Researcher Identifier (e.g. ORCID II	N/A
Nearest person month worked:	35
Contribution to Project:	Participated in conference calls and personal meetings with PI to discuss study measurements, data analysis, conceptual focus, coordination of IRB approval with Tulane University's IRB, and review of data collection instruments for current stud Prepared and reviews draft manuscripts and presentations related to study. *Traveled to regional/national professional meetings to present study results.*
Name:	**Richard Adams**
Project Role:	*Co-Investigator, Kent State University*
Researcher Identifier (e.g. ORCID II	N/A
Nearest person month worked:	35
Contribution to Project:	Participated in conference calls and personal meetings with Study PI to discuss planned study measurements, data analysis, conceptual focus of study, coordinatio of IRB approval with Kent State's IRB, and review of data collection instruments planned for current study. Prepared and reviewed draft manuscripts and presentations related to study findings. *Traveled to regional/national professional meetings to present study results.*
Name:	**Thomas Urosevich**
Project Role:	*Co-Investigator, Geisinger Clinic*
Researcher Identifier (e.g. ORCID II	N/A
Nearest person month worked:	35
Contribution to Project:	Participated in conference calls and personal meetings with PI to discuss planned study measurements, data analysis, conceptual focus of study, identification genotypes for study, and identification of key TBI measures to be used in study. Prepared and reviewed draft manuscripts and presentations related to study finding *Traveled to regional/national professional meetings to present study results.*
Name:	**Stuart Hoffman**
Project Role:	*Co-Investigator/Neuroscience Consultant*
Researcher Identifier (e.g. ORCID II	N/A
Nearest person month worked:	35
Contribution to Project:	Participated in conference calls and personal meetings with PI to discuss planned study measurements, data analysis, conceptual focus of study, identification of key genotypes for study, and identification of key neurological and sleep disturbance measures to be used in study. Prepared and reviewed draft manuscripts and presentations related to study findings. *Traveled to regional/national professional meetings to present study results.*
Name:	**H. Lester Kirchner**
Project Role:	*Co-Investigator, Geisinger Clinic*
Researcher Identifier (e.g. ORCID II	N/A
Nearest person month worked:	35

Contribution to Project:	Contribution to Project: Consulted with Study PI regarding biostatistics, study database, and data dictionary planned for study, and met with his study staff assigned to the project. Prepared and reviewed draft manuscripts and presentations related to study findings.
Name:	**Xin Chu**
Project Role:	*Genetic Consultant, Geisinger Clinic*
Researcher Identifier (e.g. ORCID II	N/A
Nearest person month worked:	34
Contribution to Project:	Ordered Inventory of needed supplies and assays for study and oversaw the genotyping and bio-banking of DNA being collected for study. Reviewed draft manuscripts and presentations related to study findings.
Name:	**Carrie Withey**
Project Role:	*Project Manager, Geisinger Clinic*
Researcher Identifier (e.g. ORCID II	N/A
Nearest person month worked:	13
Contribution to Project:	Application and document preparation, regulatory compliance, budgeting, and operational management of study. Prepared and reviewed draft manuscripts and presentations related to study findings.
Name:	**Johanna Hyacinthe**
Project Role:	*Former Project Manager, Geisinger Clinic*
Researcher Identifier (e.g. ORCID II	N/A
Nearest person month worked:	18
Contribution to Project:	Application and document preparation, regulatory compliance, budgeting, and operational management of study. Prepares and reviews draft manuscripts and presentations related to study findings. *Traveled to regional/national professional meetings to present study results.*
Name:	**James Pitcavage**
Project Role:	*Former Project Manager, Geisinger Clinic*
Researcher Identifier (e.g. ORCID ID):	*N/A*
Nearest person month worked:	*3*
Contribution to Project:	Completed study IRB application and document preparation, regulatory compliance, budgeting, and operational management of study.
Name:	**Eric Snover**
Project Role:	*Former Research Assistant, Geisinger Clinic*
Researcher Identifier (e.g. ORCID II	*N/A*
Nearest person month worked:	*6*
Contribution to Project:	Did study mailings, mailed and tracks study incentives, DNA kits, consent forms, etc. and was responsible for overall tracking of patient participation. Assisted with the daily operations of study.
Name:	**Brielle Evans**

Project Role:	*Former Research Assistant, Geisinger Clinic*
Researcher Identifier (e.g. ORCID II	N/A
Nearest person month worked:	4
Contribution to Project:	Mailed of incentives, DNA kits, consent forms, etc. and was responsible for overal tracking of patient participation. Assisted with the daily operations of study.
Name:	**Melinda Hatt**
Project Role:	*Former Research Assistant, Geisinger Clinic*
Researcher Identifier (e.g. ORCID II	*N/A*
Nearest person month worked:	*4*
Contribution to Project:	Mailed incentives, DNA kits, consent forms, etc. and was responsible for overall tracking of patient participation. Assisted with the daily operations of study.
Name:	**Jared Pajovich**
Project Role:	*Former Research Assistant, Geisinger Clinic*
Researcher Identifier (e.g. ORCID II	*N/A*
Nearest person month worked:	*11*
Contribution to Project:	Completed Certificate of Confidentiality application, mailed incentives, DNA kits, consent forms, etc. and was responsible for overall tracking of patient participation Assisted with the daily operations of study.

- **Has there been a change in the active other support of the PD/PI(s) or senior/key personnel since the last reporting period?**
  Nothing to Report
- **What other organizations were involved as partners?**
  Nothing to Report

8. SPECIAL REPORTING REQUIREMENTS

- **QUAD CHART:** *Submitted as an attachment*

9. APPENDICES

- **Research Products:** *Submitted as attachment*s.

Female Military Veterans' Risk and Protective Factors in Predicting Overall Functioning: A Biomedical Sample of Outpatients from Geisinger Clinic

Joseph A. Boscarino[3]; Charles Figley[1]; Richard E. Adams[2]; Thomas G. Urosevich[3]; Stuart N. Hoffman[3]; H. Lester Kirchner[3]; Johanna C. Hyacinthe[3]; Joseph J. Boscarino[4]; Carrie A. Withey[3]
[1]Tulane University, [2]Kent State University, [3]Geisinger Clinic, [4]Williams James College

Presented at: Annual Conference of International Society for Traumatic Stress Studies, Chicago, IL, November, 2017

Geisinger

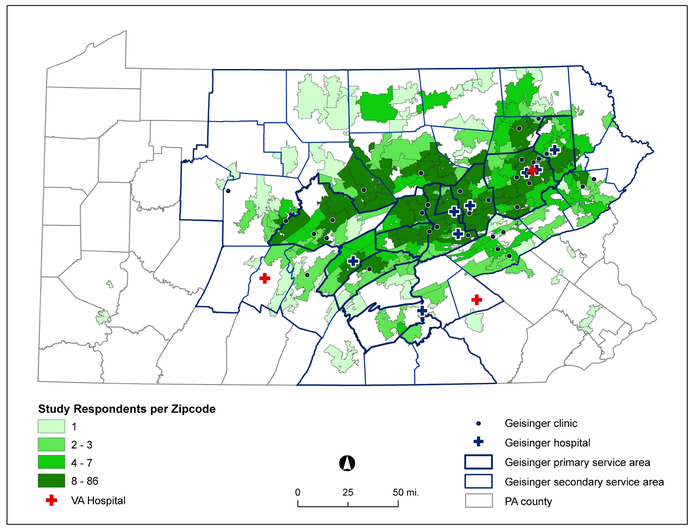
Study Objectives

- Our primary objective was to assess the prevalence of mental health disorders and treatment seeking among deployed US military service members seen in non-VA Facilities.
- Our secondary objective was to assess the risk and protective factors for the onset of post-deployment mental disorders, including PTSD and substance use disorders.
- Our tertiary objective was to assess effectiveness of post-deployment health interventions.

Methods

- We surveyed 1,730 veterans who were patients in the largest hospital system in Central & Northeastern PA and collected their DNA & electronic health data to assess their post-deployment health status.
- The study included patients identified as veterans from three main cohorts: Vietnam, Gulf War, and the Global War on Terrorism.
- Our hypothesis was that veterans with higher trauma exposures would have higher rates of mental health disorders post deployed, but women were thought to be at higher risk.

Figure 1. Study respondents per PA zip code



Main Study Assessments

- Demographic Risk Factors, Including Sex
- Combat Exposure & Lifetime Trauma History
- Medical & Mental Health Services Use
- Psychotropic Medication Use
- Alcohol Use/Abuse
- Opioid Use/Abuse
- Post-traumatic Stress Disorder (PTSD)
- Major Depression
- Generalized Anxiety
- Suicide History
- Traumatic Brain Injury (TBI)

Table 1. Differences by Female vs. Male Sex (N=1,730)

Study Variables	(N)	% Total	Sex %Female	Sex %Male	OR	χ^2 p-value
Age: 18-64	(751)	43.7	95.3	41.0	0.034	<0.001
White Race	(1655)	95.7	90.6	95.9	0.409	0.018
Married	(1340)	77.5	50.6	78.8	0.275	<0.001
College Graduate or Higher	(429)	24.8	47.1	23.6	2.870	<0.001
Iraq/Afghanistan Veteran	(396)	22.9	54.1	21.3	4.364	<0.001
Multiple Tours	(686)	39.7	29.4	40.3	0.618	0.046
Deployed NG/Reserve	(408)	23.6	58.8	21.8	5.136	<0.001
High Combat Exposure	(408)	23.6	2.4	24.7	0.074	<0.001
Enlisted Rank	(1562)	90.3	87.1	90.5	1.409	0.302
Low Unit Support	(364)	21.0	31.8	20.5	1.807	0.013
Stressful Events Past Yr	(375)	21.7	29.4	21.3	1.542	0.076
Anxiety High	(213)	12.4	19.0	12.0	1.719	0.057
Obese (BMI < 30)	(779)	45.0	36.5	45.5	0.688	0.104
Current Depression Disorder	(143)	8.3	17.6	7.8	2.540	0.001
PTSD Past Year - Full Criteria	(93)	5.4	10.6	5.1	2.201	0.029
PTSD Lifetime Estimate	(216)	12.5	29.4	11.6	3.172	<0.001
Heavy Drinking Past 30 Days	(208)	12.0	2.4	12.5	0.168	0.005
Used Opioids 3+ Mo. Past Yr.	(258)	14.9	14.1	15.0	0.935	0.833
Ever used VA Services	(1073)	62.0	61.2	62.1	0.963	0.869
Currently Using VA Service	(864)	49.9	43.5	50.3	0.762	0.225
Current VA Disability	(629)	36.4	24.7	37.0	0.560	0.022
Low Psych Resilience	(439)	25.4	45.9	24.3	2.639	<0.001
Low Social Support	(314)	18.2	23.5	17.9	1.414	0.187
Smoked 20+ Pack Years	(564)	32.6	8.2	33.9	0.175	<0.001
Used Psych Services Past Yr.	(406)	23.5	43.5	22.4	2.666	<0.001
Used Psychotropics Past Yr.	(384)	22.2	37.6	21.4	2.218	<0.001
Fair/Poor Current Health	(633)	36.7	26.2	37.2	0.599	0.041
Concussion in Service	(491)	28.4	14.1	29.1	0.400	0.003
Probable ADHD	(342)	19.8	34.1	19.0	2.204	0.001
Extraverted Personality	(508)	29.4	45.9	28.5	2.126	0.001
Ever Suicidal Thoughts	(196)	11.3	27.1	10.5	3.156	<0.001

Table 2. Multivariate Logistic Regression: Lifetime PTSD

Logistic regression — Number of obs = 1728; LR chi2(12) = 380.42; Prob > chi2 = 0.0000; Log likelihood = -460.84881; Pseudo R2 = 0.2922

PTSD lifetime	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
female	3.36928	1.134232	3.61	0.000	1.741764	6.517557
age	.9857054	.0076307	-1.86	0.063	.9708623	1.000775
white	2.026102	.9757201	1.47	0.143	.7883951	5.206894
married	1.41254	.2968755	1.64	0.100	.9356265	2.132549
college	.7291081	.1548451	-1.49	0.137	.4808583	1.10552
guard/reserve	1.424761	.3099584	1.63	0.104	.9301695	2.182337
trauma hi	2.649445	.4869787	5.30	0.000	1.847995	3.798475
combat hi	3.975677	.7287366	7.53	0.000	2.775792	5.694234
resilience low	3.457436	.6138276	6.99	0.000	2.441368	4.89638
neglect hi	2.075412	.4110096	3.69	0.000	1.407779	3.059668
stress hi	3.983622	.7165589	7.68	0.000	2.800059	5.667468
low social supp	1.856722	.377055	3.05	0.002	1.247064	2.764428

Table 3. Multivariate Logistic Regression: Current Depression

Logistic regression — Number of obs = 1728; LR chi2(12) = 411.76; Prob > chi2 = 0.0000; Log likelihood = -704.41248; Pseudo R2 = 0.2262

Current depress	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
female	2.533126	.7364722	3.20	0.001	1.432786	4.478496
age	.9724876	.0059196	-4.58	0.000	.9609542	.9841593
white	.8380223	.2695945	-0.55	0.583	.4460887	1.574309
married	1.153383	.1896957	0.87	0.386	.8355592	1.592098
college	.7483578	.1232598	-1.76	0.078	.5418891	1.033495
guard/reserve	.8744556	.1560275	-0.75	0.452	.6163955	1.240555
trauma hi	1.859033	.2870318	4.02	0.000	1.373608	2.516004
combat hi	2.072237	.3104249	4.86	0.000	1.544998	2.7794
resilience low	3.512046	.4964878	8.89	0.000	2.662124	4.633318
neglect hi	2.578742	.4155041	5.88	0.000	1.880428	3.536382
stress hi	2.904663	.4320139	7.17	0.000	2.170179	3.887729
low social supp	1.734416	.2876104	3.32	0.001	1.253148	2.400514

Table 4. Multivariate Logistic Regression: Ever Suicidal Thoughts

Logistic regression — Number of obs = 1728; LR chi2(12) = 167.16; Prob > chi2 = 0.0000; Log likelihood = -527.47135; Pseudo R2 = 0.1368

Suicide thoughts	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
female	2.328164	.7334459	2.68	0.007	1.255619	4.316872
age	.9864068	.0072073	-1.87	0.061	.9723814	1.000635
white	1.187274	.4786467	0.43	0.670	.5387548	2.61644
married	1.295555	.2578188	1.30	0.193	.8771308	1.913582
college	.8844654	.1729252	-0.63	0.530	.6029193	1.297486
guard/reserve	.9348548	.1984688	-0.32	0.751	.6166445	1.417273
trauma hi	1.335966	.2519399	1.54	0.125	.9231526	1.93338
combat hi	1.320792	.2434685	1.51	0.131	.9202967	1.895574
resilience low	3.225661	.5484098	6.89	0.000	2.311542	4.501274
neglect hi	2.702144	.487124	5.51	0.000	1.89784	3.84731
stress hi	1.645739	.3014305	2.72	0.007	1.149361	2.356489
low social supp	1.457161	.2810841	1.95	0.051	.9984176	2.126685

Table 5. Multivariate Logistic Regression: Current Psych Service Use

Logistic regression — Number of obs = 1728; LR chi2(12) = 350.60; Prob > chi2 = 0.0000; Log likelihood = -766.79207; Pseudo R2 = 0.1861

Current psych	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
female	1.944741	.5436527	2.38	0.017	1.124368	3.363685
age	.9861427	.0057538	-2.39	0.017	.9749297	.9974847
white	1.079104	.3383988	0.24	0.808	.5836234	1.995233
married	.8887967	.1366089	-0.77	0.443	.6576153	1.201249
college	.8920046	.1365956	-0.75	0.455	.6607236	1.204244
guard reserve	1.542354	.2570633	2.60	0.009	1.112538	2.138225
trauma hi	1.978805	.2935363	4.60	0.000	1.47957	2.646491
combat hi	2.536833	.3577099	6.60	0.000	1.924275	3.34439
resilience low	2.798395	.3851323	7.48	0.000	2.136788	3.664853
neglect hi	1.925601	.3053016	4.13	0.000	1.411268	2.627382
stress hi	2.578024	.3712498	6.58	0.000	1.944058	3.41873
low social supp	1.256182	.2048393	1.40	0.162	.912539	1.729234

Table 6. Multivariate Logistic Regression: Current VA Service Use

Logistic regression — Number of obs = 1728; LR chi2(12) = 116.48; Prob > chi2 = 0.0000; Log likelihood = -1139.5177; Pseudo R2 = 0.0486

Current VA use	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
female	1.255132	.310783	0.92	0.359	.7725447	2.039179
age	1.02691	.0050132	5.44	0.000	1.017131	1.036783
white	.6143317	.1540856	-1.94	0.052	.3757561	1.004384
married	1.115599	.1394998	0.87	0.382	.8731121	1.425432
college	.9213104	.1076173	-0.70	0.483	.7327874	1.158334
guard/reserve	1.131998	.1571436	0.89	0.372	.8623471	1.485967
trauma hi	1.077869	.1415547	0.57	0.568	.8332575	1.394289
combat hi	2.268208	.2771314	6.70	0.000	1.785182	2.88193
resilience low	1.272739	.1548531	1.98	0.047	1.002708	1.61549
neglect hi	1.443289	.2007377	2.64	0.008	1.098918	1.895577
stress hi	1.337216	.1748704	2.22	0.026	1.034876	1.727885
low social supp	1.349343	.1846094	2.19	0.029	1.031967	1.764326

Study Limintations

- Veterans identified in a regional healthcare system
- Survey response rate was ~60%
- Institutionalized/impaired veterans not assessed
- Survey based on self-reported symptoms/utilization
- Medical records were not complete on all veterans
- Study sample was 96% white race
- Study sample was 95% male sex

Conclusion

- Despite findings that women in our study were younger and single/formerly married, more educated, more likely to be in the Reserve/National Guard, have fewer deployments, they were more likely to have PTSD, current depression, have suicidal thoughts, use more mental health services, have low psychological resilience and more ADHD symptoms, compared to males, confirming our research as well as others. At least five separate studies have founded that compared to men, female veterans are considerably different than male veterans in terms of post-deployment mental health that mirrors findings in the civilian sector.
- We (Boscarino, et al, 2012) developed the first PTSD risk scale (NYPRS) that appears to be effective in predicting PTSD among at-risk populations and overall results appeared robust, with predictions differing by gender. Similar to current findings, for women, core PTSD symptoms contributed more to the prediction of PTSD than for men. For men, depression symptoms, sleep disturbance, and trauma exposure contributed more to the PTSD prediction score. Men also had higher cut-off scores for PTSD compared to women. There were other gender-specific differences as well. However, consistent with other medical research, this instrument appears to require male and female versions to be the most effective. Our recent study further confirms the need for gender-specific measures of PTSD.

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Risk and Protective Factors for Suicide among Formerly Deployed U.S. Service Members: Results from the Veterans' Health Study

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Geisinger

Study Background/Rationale

- The post-deployment health of service members has been a concern, especially in rural areas.
- Rural areas have fewer resources and access to services may be more difficult.
- Service members were recruited through Geisinger Clinic, the largest healthcare system in Central/NE PA.
- Study included deployed veterans from multiple conflicts: Vietnam, Persian Gulf, and Iraq/Afghanistan.
- **Military Relevance:** Study collected extensive medical, psychosocial and trauma data, as well as genetic information, to study deployment outcomes.

Overall Study Objectives

- Primary objective was to assess the prevalence of mental health outcomes and treatment seeking among deployed service members seen in non-VA Facilities.
- Secondary objective was to assess the risk and protective factors for the onset of post-deployment health problems, including PTSD and suicidality.
- Tertiary objective was to assess the effectiveness of post-deployment health interventions.

Methods

- Studied random sample of 1,730 veterans who were patients in the largest non-VA hospital system in Central/NE PA to assess health status, service use, and health outcomes.
- Study included patients identified as veterans from: Vietnam, Gulf War, Iraq/Afghanistan; Geisinger collects veteran status on all outpatients.
- One hypothesis was that deployed Guard/Reserve veterans would have higher rates of health issues and treatment seeking than other veterans.

Measures/Analyses/Study Sites

- Combat exposure & trauma history assessed
- Health service & medication use assessed
- Self-reported VA service use/Disability claim history
- PTSD, substance use, suicidality assessed
- Onset of chronic diseases/sleep disorders assessed
- Concussion history assessed
- Genetic factors studied
- Psychosocial & social support factors studied
- GIS information, including distance to local VA hospitals
- Analyses: Descriptive & multivariable
- Key study groups: Guard/Reserve (n=665) vs. Other vets (n=1,065)
- Study site covered 25,000 sq miles of central/NE PA (see map)
- Sample N=1,730; powered to detect small differences

Veterans Studied and Geisinger/VA Facilities in Service Area

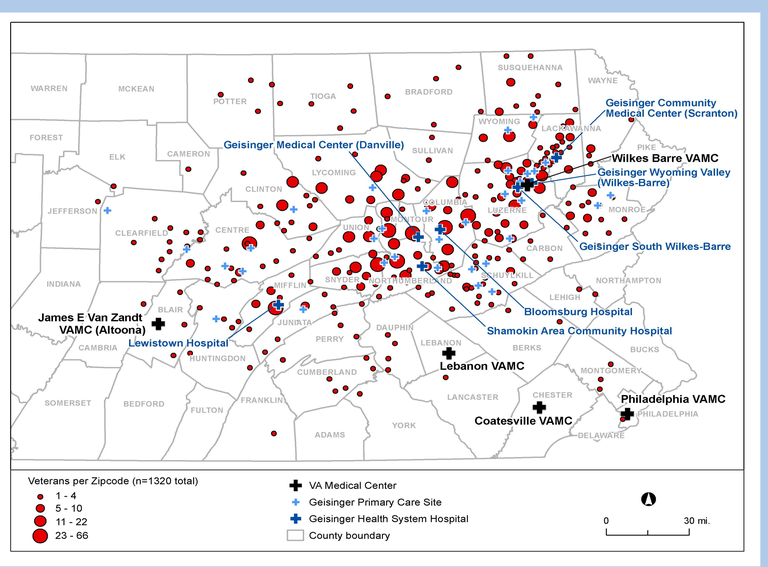

Table 1. Suicidal thoughts by key study variables

Study Variables			Ever Suicidal Thoughts			
	(N)	% Total	% No	% Yes	OR	χ^2 p-value
Age: 18-64	(751)	43.7	41.9	57.1	0.542	<0.001
Iraq/Afghanistan Veteran	(396)	22.9	21.9	30.6	1.573	0.006
Vietnam Veteran	(972)	56.2	57.8	43.4	0.559	<0.001
Deployed NG/Reserve	(408)	23.6	22.8	29.6	1.422	0.035
High Combat Exposure	(408)	23.6	22.8	30.1	1.462	0.022
Low Unit Support	(364)	21.0	19.4	34.2	2.163	<0.001
Childhood Neglect High	(288)	16.6	14.1	36.7	3.543	<0.001
High Stress Past Year	(375)	21.7	19.3	40.3	2.824	<0.001
Used Alcohol/Drugs to Cope	(310)	17.9	15.3	38.3	3.426	<0.001
Anxiety High	(213)	12.4	8.8	40.5	7.070	<0.001
Current Depression Disorder	(143)	8.3	5.5	30.1	7.434	<0.001
PTSD Past Year - Full	(93)	5.4	3.5	19.9	6.808	<0.001
PTSD Past Year - Partial	(132)	7.6	5.2	26.5	6.563	<0.001
PTSD Lifetime Estimate	(216)	12.5	9.4	36.7	5.605	<0.001
CAGE Alcohol Dependence	(238)	13.8	12.8	21.4	1.862	0.001
Pain Interferes Past Month	(578)	33.4	30.7	54.6	2.713	<0.001
Used Opioids 3+ Mo. Past Yr	(258)	14.9	13.8	24.0	1.978	<0.001
Ever used VA Services	(1073)	62.0	60.6	73.5	1.803	<0.001
Currently Using VA Service	(864)	49.9	48.0	64.8	1.990	<0.001
Has Current VA Disability	(629)	36.4	34.0	54.6	2.331	<0.001
Low Self Esteem	(400)	23.1	18.1	62.2	7.449	<0.001
Low Social Support	(314)	18.2	16.6	30.6	2.223	<0.001
Used Sleep Aids Past Year	(415)	24.0	21.3	45.4	3.082	<0.001
Used Psych Services Past Year	(406)	23.5	18.8	60.2	6.545	<0.001
Used Psychotropic Meds Past Yr	(384)	22.2	17.3	60.2	7.211	<0.001
Fair/Poor Current Health	(633)	36.7	35.0	49.5	1.819	<0.001
Concussion in Service	(491)	28.4	26.9	39.8	1.794	<0.001
Current TBI Symptoms	(481)	27.8	25.0	50.0	3.005	<0.001
ADHD Symptoms	(342)	19.8	16.5	45.4	4.211	<0.001
Anti-Social Personality	(504)	29.1	27.2	43.9	2.087	<0.001
Extraverted Personality	(508)	29.4	30.6	19.9	0.564	0.002
Conscientious Personality	(792)	45.8	48.0	28.6	0.434	<0.001
Difficulty Falling Asleep	(683)	39.5	36.4	63.3	3.004	<0.001
Difficulty Staying Asleep	(862)	49.8	47.1	70.9	2.735	<0.001
Used Alc//Drugs to Sleep	(415)	24.0	21.3	45.4	3.082	<0.001
Ever Used Marijuana 2+ Times	(659)	38.1	36.8	48.0	1.581	0.003

Table 2. Stepwise Regression: Ever Suicide Thoughts
(Point Prevalence = 11%)

```
Logistic regression                                 Number of obs   =       1699
                                                    LR chi2(11)     =     401.68
                                                    Prob > chi2     =     0.0000
Log likelihood = -402.60277                         Pseudo R2       =     0.3328
------------------------------------------------------------------------------
Ever Suicidal Thought | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf. Interval]
---------------------+--------------------------------------------------------
              Female |   2.315532   .7866813     2.47   0.013     1.189769    4.506495
       Conscientious |   .6445704   .1293352    -2.19   0.029     .4349846    .9551396
       Somatization  |   .4616434   .1286126    -2.77   0.006     .2674018    .7969831
  Low Home Support   |   1.587006   .3651944     2.01   0.045      1.01089    2.491455
  Veteran Identity   |   .5761969   .1250064    -2.54   0.011     .3766188    .8815355
     Abuse/Neglect   |   1.767951   .3602773     2.80   0.005     1.185797    2.635907
       Depression    |   6.390778    1.38252     8.57   0.000     4.182278       9.7655
   Low Self-esteem   |   2.593334   .5394397     4.58   0.000     1.725043    3.898674
   Global Severity   |   1.870186   .5306988     2.21   0.027     1.072361    3.261583
Ever Psych Serv. Use |   4.174185   1.148867     5.19   0.000     2.433852    7.158948
------------------------------------------------------------------------------
area under ROC curve   =   0.8885
```

Table 3. Stepwise Regression: Recent Suicidal Thoughts
(Point Prevalence = 5%)

```
Logistic regression                                 Number of obs   =       1699
                                                    LR chi2(10)     =     221.10
                                                    Prob > chi2     =     0.0000
Log likelihood = -223.92211                         Pseudo R2       =     0.3305
------------------------------------------------------------------------------
Recent Suicide |
  Thoughts     |  Odds Ratio   Std. Err.      z    P>|z|     [95% Conf. Interval]
---------------+--------------------------------------------------------------
Social Support |   .3679537    .123294    -2.98   0.003     .1907973    .7096007
Substance Cope |   1.793019   .4913341     2.13   0.033     1.047933    3.067866
  Ever Used VA |   3.072893   1.329088     2.60   0.009     1.316394    7.173137
 Abuse/Neglect |   1.876155   .5291791     2.23   0.026     1.079401    3.261028
   High Trauma |   .5258562   .1593762    -2.12   0.034     .2903256    .9524642
Low Self-esteem|   2.887371   .9553344     3.20   0.001     1.509623    5.522512
Low Resilience |   2.272569   .7009538     2.66   0.008     1.241571    4.159706
Global Severity|   7.132382   2.319814     6.04   0.000      3.77034   13.49239
  Curr. Use VA |    .348763   .1414652    -2.60   0.009     .1574948    .7723152
------------------------------------------------------------------------------
area under ROC curve   =   0.8995
```

Table 4. Stepwise Regression: Ever Suicide Plan or Attempt
(Point Prevalence = 12%)

```
Logistic regression                                 Number of obs   =       1699
                                                    LR chi2(9)      =     368.19
                                                    Prob > chi2     =     0.0000
Log likelihood =  -449.4377                         Pseudo R2       =     0.2906
------------------------------------------------------------------------------
Ever Suicide plan or Attempt | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf. Interval]
-----------------------------+--------------------------------------------------
       Restless Leg Syndrome |   1.465378   .2599755     2.15   0.031     1.03499    2.074736
             Marijuana Use   |   1.493163   .2609803     2.29   0.022     1.060061    2.103213
          Low Home Support   |   1.952714   .4152287     3.15   0.002     1.287175    2.962372
            Low Self-esteem  |   2.098857   .3851837     4.04   0.000     1.464771    3.007432
              Depression     |   4.020929   .7769755     7.20   0.000     2.753254    5.872277
       Agreeable Personality |   .5365883   .1284288    -2.60   0.009     .3356696    .8577693
           Abuse/Neglect     |   2.137654   .4035991     4.02   0.000     1.476477    3.094912
        Ever Psych Serv. Use |    4.02505   .9934856     5.64   0.000     2.481263    6.529345
------------------------------------------------------------------------------
area under ROC curve   =   0.8679
```

Findings

- Suicidal thoughts not uncommon among veterans: 12% reporting ever having these thoughts
- In past month, 5% of veterans had recent suicidal thoughts
- In addition, 12% of veterans ever had serious suicide thoughts, a plan or had attempted suicide in the past
- Common predictors of suicide risk were depression, childhood abuse/ neglect, low self-esteem and high anxiety
- Positive personality traits were protective for suicide
- Marijuana use was a risk factor for suicidality, but deployment & higher combat exposure were ***not***

Study Conclusions

- Suicidal thoughts are common among veterans: In past month, 5% of veterans had these thoughts
- In addition, 12% of veterans ever had serious thoughts, a suicide plan or had attempted suicide in the past
- Common predictors of suicide risk were depression, childhood abuse/ neglect, low self-esteem, high anxiety, but not deployment s or higher combat exposures
- Marijuana may be risk factor for suicidality for vets; additional research is recommended
- Study is consistent with previous study of suicide risks among a large cohort of Vietnam vets (Boscarino, 2006)

Study Limitations

- Veterans identified in a regional healthcare system
- Survey response rate was ~60%
- Institutionalized/impaired veterans not assessed
- Survey based on self-reported symptoms/utilization
- Medical records were not complete on all veterans
- Study sample was 96% white race
- Study sample was 95% male sex

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Mental Health Impact of the "Homecoming" Experience among Deployed Veterans from the Vietnam War to Current Warzone Conflicts: Results from the Veterans' Health Study

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Geisinger

Study Background/Rationale

- The post-deployment health of service members has been a concern, especially in rural areas.
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- Service members were recruited through Geisinger Clinic, the largest healthcare system in Central/NE PA.
- Study included deployed veterans from multiple conflicts: Vietnam, Persian Gulf, and Iraq/Afghanistan.
- Relevance: Study collected extensive medical, psychosocial and trauma data, as well as genetic information, to study deployment outcomes.

Overall Study Objectives

- **Primary objective** was to assess the prevalence of mental health outcomes and treatment seeking among deployed service members seen in non-VA Facilities.
- **Secondary objective** was to assess the risk and protective factors for the onset of post-deployment health problems, including PTSD and suicidality.
- **Tertiary objective** was to assess the effectiveness of post-deployment health interventions.

Methods

- Surveyed random sample of 1,730 veterans who were patients in the largest non-VA hospital system in Central/NE PA to assess health status, service use, and health outcomes.
- Geisinger collects veteran status and military history on all patients.
- Study included veterans from: Vietnam, Gulf War, Iraq/Afghanistan.
- Our hypothesis was veterans with poor home-coming experiences would have higher rates of health issues & treatment seeking post-deployment.

Study Measures

- Combat exposure & trauma history assessed
- Health service & medication use assessed
- Deployment Risk & Resilience Inventory used to assess homecoming
- Self-reported VA service use/Disability claim history collected
- PTSD, depression, substance use, suicidality assessed
- Onset of chronic diseases/sleep disorders assessed
- Concussion history assessed
- Genetic risk factors studied
- Psychosocial & social support factors studied
- Analyses: Descriptive & multivariable included
- Key study groups: Guard/Reserve (n=665) vs. Other vets (n=1,065)
- Study site covered 25,000 sq miles of central/NE PA (see map)
- Sample N=1,730; powered to detect small differences

Veterans Studied and Geisinger/VA Facilities in Service Area

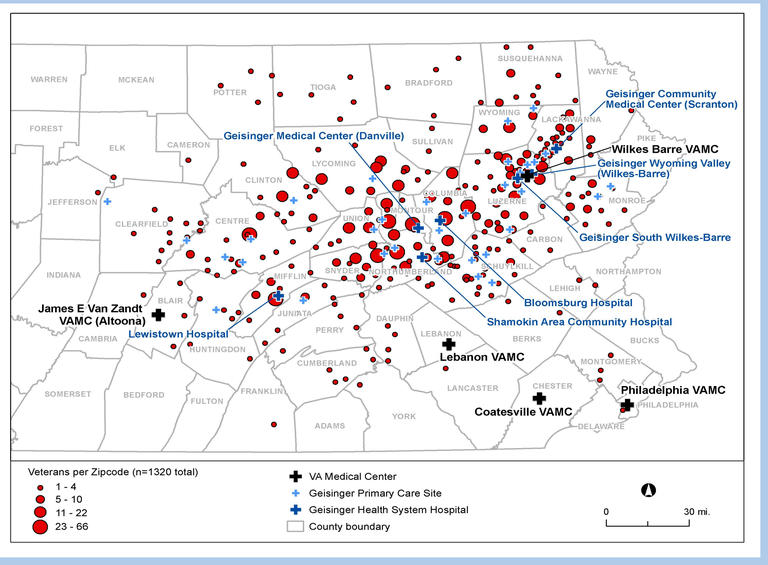

Table 1. Homecoming experience by key study variables

Study Variables	(N)	%Total	Low Home Supp. % Yes	Low Home Supp. % No	OR	χ^2 p-value
Age: 18-64	(751)	43.7	9.0	56.1	12.918	<0.001
White Race	(1655)	95.7	97.2	95.1	1.749	0.068
College Graduate or Higher	(429)	24.8	20.4	26.4	0.712	0.010
Income $100K +	(386)	22.3	15.5	24.7	0.559	<0.001
Iraq/Afghanistan Veteran	(396)	22.9	2.2	30.3	0.051	<0.001
Vietnam Veteran	(972)	56.2	94.3	42.5	22.429	<0.001
Gulf War Veteran	(275)	15.9	1.1	21.2	0.041	<0.001
Multiple Tours	(686)	39.7	33.9	41.8	0.714	0.003
Deployed NG/Reserve	(408)	23.6	3.7	30.7	0.053	<0.001
High Combat Exposure	(408)	23.6	35.7	19.2	2.326	<0.001
Enlisted Rank	(1562)	90.3	94.1	88.9	0.504	0.001
Drafted	(300)	17.3	27.6	13.7	1.854	<0.001
Low Unit Support	(364)	21.0	34.6	16.2	2.737	<0.001
Childhood Neglect High	(288)	16.6	26.0	13.3	2.300	<0.001
High Stress Past Year	(375)	21.7	18.6	22.8	0.775	0.063
Used Alcohol to Cope Post Deoloy.	(310)	17.9	19.7	17.3	1.174	0.249
Anxiety High	(213)	12.4	16.7	10.8	1.651	0.001
Current Depression Disorder	(143)	8.3	8.1	8.3	0.970	0.878
PTSD Past Year - Full Criteria	(93)	5.4	7.0	4.8	1.496	0.072
PTSD Past Year - Partial Criteria	(132)	7.6	11.2	6.4	1.849	0.001
PTSD Lifetime Estimate	(216)	12.5	15.8	11.3	1.466	0.014
AUDIT-C Positive	(417)	24.1	14.9	27.4	0.463	<0.001
CAGE Positive	(238)	13.8	10.5	14.9	0.669	0.019
Pain Interferes Past Month	(578)	33.4	40.7	30.8	1.543	<0.001
Used Opioids 3+ Mo. Past Year	(258)	14.9	19.7	13.2	1.613	0.001
Ever used VA Services	(1073)	62.0	68.9	59.5	1.507	<0.001
Currently Using VA Service	(864)	49.9	60.2	46.3	1.755	<0.001
Current VA Disability	(629)	36.4	44.9	33.3	1.629	<0.001
Low Self Esteem	(400)	23.1	28.2	21.3	1.454	0.003
Low Social Support	(314)	18.2	23.9	16.1	1.632	<0.001
Used Sleep Aids Past Year	(415)	24.0	27.8	22.6	1.316	0.027
Used Psychotropic Meds Past Yr.	(384)	22.2	26.0	20.8	1.339	0.021
Fair/Poor Current Health	(633)	36.7	49.5	32.1	2.072	<0.001
Concussion in Service	(491)	28.4	38.1	24.9	1.854	<0.001
High Current TBI Symptoms	(481)	27.8	38.1	24.1	1.935	<0.001
Difficulty Falling Asleep	(683)	39.5	45.1	37.5	1.370	0.004
Ever Suicidal Thoughts	(196)	11.3	14.7	10.1	1.524	0.009
Ever Suicide Serious/Plan/Attempt	(215)	12.4	18.8	10.1	2.056	<0.001

Table 2. Vietnam Veteran Status by Post-deployment Support, PTSD & Depression

Variables	Vietnam Veteran No (N)	Vietnam Veteran No %	Vietnam Veteran Yes (N)	Vietnam Veteran Yes %	OR	95% C.I.	P-value
Male	(675)	89.1	(970)	99.8	0.02	0.01 - 0.07	<0.001
Age 65 and over	(55)	7.3	(914)	94.8	232.99	156.89- 345.99	<0.001
White Race	(708)	93.4	(947)	97.4	2.68	1.64 - 4.37	<0.001
Married	(560)	73.9	(780)	80.2	1.44	1.15 - 1.80	0.002
Multiple Deployments	(382)	50.5	(304)	31.3	0.45	0.37 - 0.55	<0.001
Concussion History	(200)	26.4	(291)	29.9	1.19	0.96 - 1.47	0.103
High Current Stress	(223)	29.4	(152)	15.6	0.45	0.35 - 0.56	<0.001
Low Unit Support	(145)	19.1	(219)	22.5	1.23	0.97 - 1.56	0.084
Low Current Support	(142)	18.7	(172)	17.7	0.93	0.73 - 1.19	0.579
Majority Friends Veterans	(223)	29.4	(209)	21.5	0.66	0.53 - 0.82	<0.001
Current PTSD	(74)	9.8	(58)	6.0	0.59	0.41 - 0.84	0.003
Current Depression	(95)	12.5	(48)	4.9	0.36	0.25 - 0.52	<0.001
Low Home Support	***(26)***	***3.4***	***(431)***	***44.3***	***22.43***	***14.87 - 33.83***	***<0.001***

Table 3. Multivariable Logistic Regression Predicting Current PTSD (N=1730)*

Variables	OR	OR (95% C.I.)	P-value
Multiple Deployments	0.56	034 - 0.93	0.024
History of Deployment Concuss.	3.15	1.96 - 5.08	<0.001
Current Stress Exposures High	3.39	2.11 - 5.44	<0.001
Current Social Support Low	1.16	0.69 - 1.96	0.568
Current Self-Esteem High (Ref)	1.00	-	-
Current Self-Esteem Moderate	2.61	1.33 - 5.15	0.005
Current Self-Esteem Low	16.15	8.58 - 30.39	<0.001
Combat Exposure Low (Ref)	1.00	-	-
Combat Exposure moderate	1.78	0.81 - 3.92	0.150
Combat Exposure High	3.41	1.57 - 7.40	0.002
Currently most Friends Veterans	1.77	1.10 - 2.85	0.019
Low Unit Support during Deploy.	0.82	0.49 - 1.40	0.480
Home Support Low Post Deploy.	***2.49***	***1.33 - 4.66***	***0.004***

*Regression also included, sex, race, marital status, education level, trauma history, Iraq/Afghan Service, Persian Gulf Service, Vietnam Service, and Deployed Guard/Reserve status, none of which were significant in the final model at the p<0.05 level

Table 4. Multivariable Logistic Regression Predicting Current Depression (N=1730)*

Variables	OR	OR (95% C.I.)	P-value
Multiple Deployments	0.80	0.51 - 1.26	0.339
History of Deployment Concussion	2.00	1.29 - 3.10	0.002
Current Stress Exposures High	1.69	1.09 - 2.62	0.019
Current Social Support Low	2.18	1.39 - 3.42	0.001
Current Self-Esteem High (Ref)	1.00	-	-
Current Self-Esteem Moderate	2.64	1.45 - 4.81	0.002
Current Self-Esteem Low	13.98	7.88 - 24.80	<0.001
Combat Exposure Low (Ref)	1.00	-	-
Combat Exposure Moderate	1.83	0.95 - 3.52	0.069
Combat Exposure High	2.91	1.50 - 5.66	0.002
Currently most Friends Veterans	1.47	0.95 - 2.29	0.086
Low Unit Support during Deploy.	0.85	0.52 - 1.39	0.514
Home Support Low Post Deploy.	***1.06***	***0.59 - 1.93***	***0.837***

*Regression also included, sex, race, marital status, education level, trauma history, Iraq/Afghan Service, Persian Gulf Service, Vietnam Service, and Deployed Guard/Reserve status, none of which were significant in the final model at the p<0.05 level.

Findings

- The mean age of veterans was 60 and 95% were male. Altogether, 56% served in Vietnam, 23% Iraq/Afghanistan, 16% Persian Gulf, and 14% served in other conflicts.
- Among veterans, the prevalence of PTSD was 7.6%, depression 8.3%, anxiety disorders 12.4%, alcohol misuse 24%, and suicidality was 12.4%.
- Overall, 26% of veterans were classified as having low homecoming support based on the Deployment Risk & Resilience Inventory, which was more common among Vietnam compared to other veterans (OR = 22.43, p=0.0001).
- In regressions controlling for demographics, combat, deployments, trauma history, service era, and other support, low post-deployment support was associated with PTSD (OR=2.49, p=0.004) and suicidality (2.056, p=0.001), but was negatively associated with alcohol dependence (OR=0.669, p=0.019) and was ***not*** associated with depression (p=0.837).

Conclusion

- Years after deployments, lower homecoming support for services members was associated with PTSD and suicidality, regardless of service era and warzone exposures.
- Our findings suggest that the impact of low community support on veterans' health status may be long-term. Further research is advised.

Limitations

- Veterans identified in a regional healthcare system
- Survey response rate was ~60%
- Institutionalized/impaired veterans not assessed
- Survey based on self-reported symptoms/utilization
- Medical records were not complete on all veterans
- Study sample was 96% white race
- Study sample was 95% male sex

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Grapheme-color Synesthesia is Associated with PTSD: A Confirmation of Previous Findings and Research Implications

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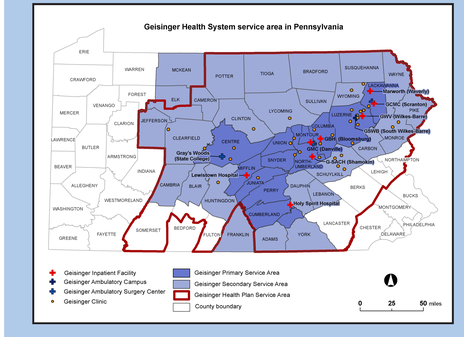
Background

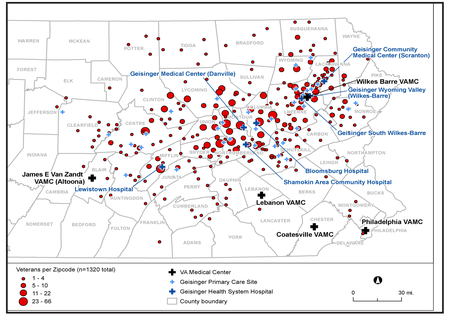
- Our primary objective was to assess the prevalence of mental health disorders and treatment seeking among deployed US military veterans seen in non-VA facilities.
- Our secondary objective was to assess risk and protective factors for the onset of post-deployment mental disorders, including post-traumatic stress (PTSD).
- Our previous research found an association between grapheme-color synesthesia and PTSD among veterans; we sought confirmation of these findings.

Methods

- We surveyed 1,730 veterans who were patients in the largest hospital system in Central & Northeastern PA and collected their electronic health data to assess their post-deployment health.
- The study included patients identified as veterans from several cohorts, including Vietnam, Persian Gulf, Iraq/ Afghan, and Global War on Terrorism veterans.
- *Our hypothesis was that veterans with grapheme-color synesthesia would have higher rates of posttraumatic stress disorders post deployment.*



Veterans Surveyed & VA Facilities in Geisinger's Service



Main Study Assessments

- Combat exposure & trauma history
- Medical & mental health services use
- Psychotropic medication use
- Alcohol use/abuse
- Opioid use/abuse
- Post-traumatic stress disorder (PTSD)
- Major depression
- Generalized anxiety
- Suicide history
- Traumatic brain injury (TBI)

Grapheme-color Synesthesia

PTSD is associated with altered neuro-psychological functioning, possibly including visual and cognitive processing. **Grapheme-color synesthesia is phenomenon in which a particular letter or number elicits a concurrent image or perception of a color.** Since our earlier study was the first to report an association between PTSD and synesthesia,[1] our current objective was to confirm this association using a new cohort.

[1]Hoffman SN, Zhang X, Erlich PM, Boscarino JA. Grapheme-color synesthesia and PTSD: Preliminary results from the Veterans Health Study. Psychosomatic Medicine 2012;74 (9): 912-915.

Table 1. Synesthesia Status by Select Study Variables*

Study Variables	(N)	% Total	Synesthesia % No	Synesthesia % Yes	p-Value	OR
Age: 18-64	(751)	43.7	95.9	4.1	0.915	0.974
Male Sex	(1645)	95.1	96.1	3.9	0.080	0.451
White Race	(1655)	95.7	95.9	4.1	0.963	1.028
Married	(1340)	77.5	96.3	3.7	0.094	0.635
College Graduate	(429)	24.8	97.7	2.3	0.024	0.485
Iraq/Afghanistan Veteran	(396)	22.9	96.5	3.5	0.509	0.821
Vietnam Veteran	(972)	56.2	95.5	4.5	0.313	1.284
Officer Rank	(168)	9.7	99.4	0.6	0.016	0.128
BSI-Anxiety	(213)	12.4	92.0	8.0	0.006	2.334
BSI-Global Severity	(217)	12.7	91.7	8.3	0.002	2.552
Current Depression	(143)	8.3	92.3	7.7	0.041	2.121
PTSD - Past Year	(132)	7.6	88.6	11.4	<0.001	3.530
PTSD – Lifetime	(216)	12.5	90.7	9.3	<0.001	2.927
Fair or Poor Current Health	(633)	36.7	94.6	5.4	0.048	1.622
Stressful Events Past Year	(375)	21.7	93.6	6.4	0.016	1.903
Lifetime Traumatic Events	(357)	20.6	94.1	5.9	0.069	1.654
Pain in Past Month	(578)	33.4	92.9	7.1	<0.001	2.855
Low Self Esteem	(400)	23.1	93.0	7.0	0.002	2.253
Concussion History	(491)	28.4	93.5	6.5	0.002	2.145
Used Sleep Aids Past Year	(415)	24.0	94.5	5.5	0.101	1.549
Psych Services Past Year	(406)	23.5	94.3	5.7	0.080	1.596
Psychotropic Meds Past Yr.	(384)	22.2	94.3	5.7	0.080	1.609
Probable ADHD	(342)	19.8	93.9	6.1	0.044	1.751
Antisocial Disorder	(504)	29.1	94.4	5.6	0.058	1.618
Marijuana Use	(659)	38.1	96.5	3.5	0.308	0.771

*Synesthesia Prevalence = 4.1% (95% CI = 3.3 - 5.1)

Table 2. Correlation Matrix of Synesthesia Symptoms, PTSD & Potential Risk Factors

	Synesthesia	PTSD	ADHD	Conscientious	Stable	Openness	Anxiety
Synesthesia	1.0000						
PTSD Symp.	0.1818 0.<0001	1.0000					
ADHD Symp.	0.0941 0.0001	0.4633 0.<0001	1.0000				
Conscientious	-0.0921 0.0001	-0.2417 0.<0001	-0.2455 0.<0001	1.0000			
Stableness	-0.0947 0.0001	-0.5295 0.<0001	-0.3357 0.<0001	0.3100 0.<0001	1.0000		
Openness	-0.0871 0.0003	-0.1502 0.<0001	-0.1548 0.<0001	0.1732 0.<0001	0.2412 0.<0001	1.0000	
Anxiety Symp	0.0110 0.6484	0.1413 0.0000	0.0892 0.0002	-0.0339 0.1582	-0.1049 0.0000	-0.0801 0.0009	1.0000

Table3. Ordinal Multivariate Regression: Low to High Synesthesia Symptom Score (0-4)*

Ordered logistic regression — Number of obs = 1720; LR chi2(8) = 81.35; Prob > chi2 = 0.0000; Log likelihood = -1156.9371; Pseudo R2 = 0.0340

Synesthesia	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
age	1.00342	.0049482	0.69	0.489	.9937683	1.013165
female	1.866339	.4938625	2.36	0.018	1.11109	3.134958
college grad	.6734364	.0979877	-2.72	0.007	.5063412	.8956738
BSI-18 symp hi	1.637462	.2517161	3.21	0.001	1.211495	2.213201
stable emotions hi	.6409322	.1046262	-2.73	0.006	.4654375	.8825977
openness hi	.712501	.0990872	-2.44	0.015	.5425119	.935754
concussion	1.362595	.1769291	2.38	0.017	1.05643	1.75749
current DSM-5 PTSD	2.236329	.5222387	3.45	0.001	1.415008	3.534375
/cut1	1.442282	.3155074			.8238988	2.060665
/cut2	3.315894	.332324			2.664551	3.967238
/cut3	3.611043	.3384567			2.94768	4.274406
/cut4	4.68013	.3813123			3.932772	5.427489

*Mean synesthesia score = 0.32 (95% CI = 0.28 - 0.35) on a scale coded 0-4.

Table 4. Multivariate Logistic Regression: Binary Scale Results*

Logistic regression — Number of obs = 1720; LR chi2(8) = 35.84; Prob > chi2 = 0.0000; Log likelihood = -239.03674; Pseudo R2 = 0.0697

synesthesia	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
age	.9985688	.0111372	-0.13	0.898	.9769772	1.020638
female	2.002947	1.07191	1.30	0.194	.7016733	5.717468
college grad	.4554327	.1795269	-2.00	0.046	.2103242	.9861865
BSI-18 symp.	1.898845	.6107254	1.99	0.046	1.010922	3.566658
stable emotions hi	.9049474	.3472458	-0.26	0.795	.4265804	1.919755
openness hi	.7757128	.2558423	-0.77	0.441	.4064071	1.48061
concuss_hx	1.717463	.4991857	1.86	0.063	.97159	3.035929
current DSM-5 PTSD	2.892125	1.15271	2.66	0.008	1.324205	6.316538
_cons	.0286251	.0203312	-5.00	0.000	.007115	.1151644

*Prevalence of Synesthesia = 4.1 (95% CI = 3.3 - 5.1)

Study Findings

- Population: 95% male, 96% Caucasian, 56% Vietnam veterans, mean age 59 years old.
- Prevalence of current PTSD = 7.6% (95% C.I. = 6.5-9.0, n = 132).
- Prevalence of grapheme-color synesthesia = 4.1% (95% CI = 3.3 - 5.1)
- Bivariate analyses suggested that synesthesia was associated with current PTSD (OR = 4.1, p<0.001).
- Multivariable regression, adjusting for age, sex, BSI symptoms, personality traits, concussion history, etc., confirmed this association (OR=2.89, p=0.008).
- Positive personality traits (openness, stableness) were associated with lower synesthesia symptom scores.

Study Limitations

- Veterans identified in a regional healthcare system.
- Survey response rate was 55%.
- Institutionalized/impaired veterans not surveyed.
- Survey based on self-reported symptoms.
- Medical records not complete for all veterans.
- Study sample 96% white race.
- Study sample 95% male sex.

Presented at: 2018 Annual Meeting of the Health Care Services Research Network, Minneapolis, MN, April 11-13, 2018

Conclusion

- Synesthesia is associated with PTSD among a second, independent sample of deployed US veterans.
- Further research is recommended to determine if synesthesia could be a risk indicator for PTSD among non-veterans.
- The fact that positive personality traits (e.g., openness, stableness) were associated with lower synesthesia symptoms deserves further research.

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Mental Health Impact of Homecoming Experience Among 1730 Formerly Deployed Veterans From the Vietnam War to Current Conflicts: Results From the Veterans' Health Study

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Abstract: We examined the effects of homecoming support on current mental health among 1730 deployed veterans from Vietnam, Iraq/Afghanistan, Persian Gulf, and other conflicts. The prevalence of current posttraumatic stress disorder (PTSD) was 5.4%, current depression was 8.3%, and 5.4% had suicidal thoughts in the past month. Overall, 26% of veterans had low homecoming support, which was more prevalent among Vietnam veterans (44.3%, $p < 0.001$). In multivariable logistic regressions, controlling for demographics, combat exposure, number of deployments, trauma history, and operational theater, low postdeployment support was associated with PTSD (odds ratio, 2.13; $p = 0.032$) and suicidality (odds ratio, 1.91; $p < 0.030$), but not depression. For suicidality, an interaction was detected for homecoming by theater status, whereby Iraq/Afghanistan veterans with lower homecoming support had a higher probability of suicidal thoughts ($p = 0.002$). Thus, years after deployment, lower homecoming support was associated with current PTSD and suicidality, regardless of theater and warzone exposures. For suicidality, lower support had a greater impact on Iraq/Afghanistan veterans.

Key Words: Veterans, health status, psychosocial factors, PTSD, suicidality

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"How was your homecoming experience?" is a common question asked by mental health practitioners caring for military veterans. In the current study, we examined the impact of homecoming support on mental health outcomes among community-based veterans, including Vietnam, Iraq/Afghanistan, Persian Gulf, and other recent veterans. Consistent with previous research (Adams et al., 2017; Boscarino et al. 2015), the objective of this study is to assess the impact of predeployment and postdeployment psychosocial factors on the mental health status of US veterans. Research related to service in Iraq and Afghanistan suggested that significant numbers of these service members developed mental health disorders after their deployments (Booth-Kewley et al., 2010; Hoge et al., 2004; Jacobson et al., 2008; Kok et al., 2012; Polusny et al., 2017). Earlier studies suggested significant rates of posttraumatic stress disorder (PTSD) and other health problems among former service members after the Vietnam War (Boscarino, 2006, 2007; Kulka et al., 1990b). In addition, a recent follow-up study among these veterans suggested that negative homecoming experiences predicted warzone-related PTSD symptoms up to 40 years postdeployment (Steenkamp et al., 2017).

Given previous research (Boscarino, 1995), our hypothesis was that the prevalence of mental disorders among veterans would be higher among those who experienced negative homecoming experiences, independent of warzone theater, and other variables, such as combat exposure and demographic factors. In the past, knowledge of the mental health impact of the homecoming experience on veterans' mental health had been limited (Frey-Wouters and Laufer, 1986; Lifton, 1973; Polner, 1971). However, more recent studies have confirmed that the homecoming experiences of Vietnam (Fontana and Rosenheck, 1994; Johnson et al., 1997; Koenen et al., 2003; Steenkamp et al., 2017; Schnurr et al., 2004), Croatian (Vuksic-Mihaljevic et al., 2000), and Israeli veterans (Neria et al., 1998), as well as the homecoming experiences of peace-keepers (Bolton et al., 2002), has had an impact on the mental health of veterans. A limitation of past research has been that these studies have primarily assessed the support of family and friends, which may be confounded. In addition, past studies typically assessed a single generation of veterans exposed to the same conflict. As discussed later, our assessment was primarily focused on postdeployment community support, which has been a significant issue among Vietnam veterans since the 1960s (Bowden, 2017). Furthermore, we assessed this homecoming impact among several generations of veterans from different conflicts, which to our knowledge, has not been previously investigated in the same study. As noted later, analysis of different cohorts of veterans has challenges, because these groups have unique differences but also overlap because some veterans have served in multiple conflicts. Nevertheless, understanding of deployment-related risk factors among former service members is important for prevention and treatment of mental health disorders among returning veterans (Adler and Castro, 2013).

METHODS

Sample

The population for the current study included a sample of community-based US military veterans recruited for a study of the health effects of military service (Adams et al., 2017; Boscarino et al., 2015; Lent et al., 2017). All veterans in the study were outpatients in the Geisinger Clinic, the largest multihospital system located in central and northeastern Pennsylvania (Boscarino et al., 2016). In 2007, Geisinger initiated a veterans' registry for patients receiving outpatient care and adult patients since then have been asked to complete a military history questionnaire. To date, over 30,000 patients have provided this information, and this database was used to select a random sample of veterans for the current study. Geisinger is an integrated health services organization with an advanced electronic health record system

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(www.geisinger.org). This system serves more than 3 million residents throughout 45 counties in central, south-central, and northeast Pennsylvania and encompasses a 25,000 square mile service area. The Geisinger system includes 30,000 employees, 1600 employed physicians, 9 hospital campuses, and a 551,000-member health plan (Boscarino et al., 2016).

With patient consent, trained and supervised interviewers administered structured health interviews by telephone from February 2016 through February 2017. All veterans recruited had one or more warzone deployment. Veteran status and deployment history were confirmed based on military records provided by the veteran. Among the ~10,000 veterans initially selected for the surveys, all were younger than 76 years and served in Vietnam or in another post-Vietnam conflict (*i.e.*, Iraq/Afghanistan, Global War on Terrorism [GWOT], Persian Gulf, or other recent conflict). After 10 telephone calls, we were able to complete 1730 interviews, for an estimated survey cooperation rate of 55% among those eligible for the survey (American Association for Public Opinion Research, 2008; Groves et al., 2009). Deceased patients, nursing home patients, institutionalized patients, those who did not serve in Vietnam, Iraq, Afghanistan, GWOT, Persian Gulf, or other recent post-Vietnam conflict were excluded from this study, as were those who were cognitively impaired, and those unavailable during the survey period.

Measures

To assess PTSD in our study, we used a questionnaire based on the *Diagnostic and Statistical Manual of Mental Disorder, Fifth Edition* (*DSM-5*), the PTSD Checklist (Blevins et al., 2015; Bovin et al., 2016). To receive a diagnosis of PTSD, veterans had to meet the *DSM-5* diagnostic criteria A through G within the past 12 months (American Psychiatric Association, 2013). This PTSD scale has been used in several recent studies (Cox et al., 2014; Hoge et al., 2014, Wortmann et al., 2016), although there has been debate related to the changes in *DSM-5* (Hoge et al., 2016). Nearly 80% of the veterans in the current study reported that the most significant lifetime stressor they experienced was warzone exposure. In addition to PTSD, the survey collected data related to the veteran's military history, concussion exposure, combat exposure, and demographic background. Concussion history was assessed based on reported concussions experienced during military service (*e.g.*, ever dazed, confused, saw stars, or knocked out), a concussion scale that has been widely used and validated in previous research (Boscarino et al., 2015; Schwab et al., 2006).

Depression was assessed using a major depressive disorder scale based on the *DSM-4* diagnostic criteria (First and Tasman, 2004; First et al., 1997; Spitzer et al., 1992), which has been used extensively in previous trauma studies (Acierno et al., 2000; Boscarino et al., 2004a, 2014, 2015; Kilpatrick et al., 2003). This measure has been used in telephone-based surveys of World Trade Center Disaster survivors (Boscarino et al., 2006; Galea et al., 2002). Data related to the validity of this depression scale were previously reported and suggest that this scale can be used to diagnose depression in population studies (Boscarino et al., 2004b; Kilpatrick et al., 2003). To meet criteria in the study, subjects had to meet the full *DSM-4* criteria for major depression within the past 12 months.

Other postdeployment health outcomes assessed included a measure of suicidality from the Brief Symptom Inventory-18 (BSI-18) scale (Derogatis, 2001). This symptom was assessed for the past 30 days ("please tell me how much thoughts of ending your life distressed or bothered you in the past 30 days"), which was consistent with the current PTSD and depression timeframes used (*i.e.*, past 12 months). The BSI-18 scale is a widely used psychological symptom scale, originally developed from the Hopkins Symptom Inventory, which has a long history in psychiatric research (Adams et al., 2006a; Derogatis and Cleary, 1977; Derogatis et al., 1973, 1976; Franke et al., 2011; Prinz et al., 2013).

Potential mental health risk and protective factors also assessed in the study included demographic factors (*e.g.*, age, sex, race, marital status, and education), multiple warzone deployments, and combat exposure, which were all derived from the survey instruments and used in previous research (Adams et al., 2017; Boscarino et al., 2015). Warzone exposures included the Vietnam War, Persian Gulf War, Afghanistan/Iraq War, and "other" recent warzone deployments, as currently defined by the VA, which encompasses four veteran cohorts of interest: Vietnam, Persian Gulf, Iraq/Afghanistan, and other post-Vietnam deployed veterans. Global War on Terrorism (GWOT) veterans ($n = 70$) were combined with Iraq/Afghanistan veterans, because these deployments were during the same timeframe and were in supporting theaters of operations. Combat exposure was based on the Combat Experience Scale, which is a widely used measure of combat exposure first used in the Vietnam Legacy Study (Frey-Wouters and Laufer, 1986; Laufer et al., 1984). Versions of this scale have been used in key studies since the Vietnam War, including the Vietnam Experience Study, the National Vietnam Veterans Readjustment Study, the Vietnam Twin Registry, among others (Centers for Disease Control, 1988; Boscarino, 1996; Boscarino et al., 2010; Kulka et al., 1990a; McLeod et al., 2001). The Combat Experience Scale used in the current study was updated for recent conflicts (Adams et al., 2017; Boscarino et al., 2015; Lent et al., 2017). Based on previous research, scale measures for combat exposure were divided into cut-points described elsewhere (Adams et al., 2017; Boscarino et al., 2015).

Our study also assessed the occurrence of 12 lifetime traumatic events (*e.g.*, forced sexual contact, domestic abuse, a serious accident, served in a warzone, experienced a major disaster) (Freedy et al., 1993). As we had no a priori method to judge the severity of these events, based on previous research, we collapsed these exposures into three categories: less than three traumatic events, three to five events, and six or more events. A total of 21% of respondents experienced six or more lifetime traumatic events in the current study. This traumatic event scale was developed from other trauma studies, was used in previous research, and had good reported reliability and validity (Adams and Boscarino, 2006; Boscarino et al., 2004a, 2012, 2013, 2014, 2015; Galea et al., 2002; Freedy et al., 1993; Resnick et al., 1993).

Homecoming support was assessed by four Likert survey items (rated "strongly agree" to "strongly disagree") from the postdeployment section of the Deployment Risk & Resilience Inventory (DRRI), which asked veterans to report their homecoming experiences (*e.g.*, "when I retuned, people made me feel proud to have served," "the reception I received when I returned from deployment made me feel appreciated," "the American people made me feel at home," etc.) (Vogt et al., 2008). The Cronbach's alpha for this DRRI subscale in the current study was 0.86. Those scoring in the lowest quartile were classified as having low homecoming support. Total scores on this scale ranged from 0 to 16 (mean, 9.36; SD, 5.20).

Our study also included measures of current life stressors, current social support, deployment unit support, and VA service use, all of which were based on survey questions (Adams et al., 2017; Boscarino et al., 2015). Current life stressors included a count of eight experiences that could have happened to the respondent in the past 12 months (*e.g.*, death of spouse or close family member, being injured, problems at work, getting married, having financial problems, etc.). Experiencing two or more of these events in the past 12 months (~22% of the survey sample) was classified as high exposure to stressful life events. As with the traumatic event scale, this life stress scale was developed from other trauma studies, used in previous research, and had good reported reliability and validity (Adams and Boscarino, 2006; Boscarino et al., 2004a, 2012, 2013, 2014, 2015; Galea et al., 2002; Freedy et al., 1993; Resnick et al., 1993). Unit support was based on survey items from the DRRI, which asked the veterans to report on their unit experiences during deployment (*e.g.*, "felt a sense of camaraderie between myself and others in my unit") (Vogt et al., 2008).

Cronbach's alpha for this scale in the current study was 0.78. Those scoring in the lowest quartile were classified as having low unit support during deployment. The social support scale used was a version included in the Medical Outcomes Study (Sherbourne and Stewart, 1991) that was used in past trauma research (Boscarino et al., 2004a, 2014; Galea et al., 2002; Freedy et al., 1993). Items for this scale were based on a 4-point Likert scale rated "none of the time" to "all the time" (*e.g.*, someone available to help you if you were confined to bed?) (Boscarino et al., 2014). This scale has been used in previous trauma studies and is considered a reliable and valid measure of current social support (Boscarino et al., 2004b; Galea et al., 2002). This scale was used as a categorical measure in the current study, with low social support defined as the lowest quintile (Boscarino et al., 2014). Cronbach's alpha for this scale in the current study was 0.84. Finally, for descriptive purposes we included several questions related to VA service use and VA disability status used in previous research (Boscarino et al., 2015).

It is noted that our study was guided, in part, by a psychosocial stress model, which is focused on the availability of psychosocial resources and the impact of environmental factors in the onset and course of mental disorders (Adams and Boscarino, 2011; Adams et al., 2006a, 2006b; Rosen et al., 2012; Yamashita, 2012). This model guided our instrument selection and data analyses (Adams et al., 2017).

Data Analyses

Statistical analyses included descriptive statistics depicting the study population and testing the association between mental health status and the postdeployment homecoming experience. For descriptive purposes, we present the characteristics of the study population and show these results in Tables 1 and 2. Because there were differences expected between the Vietnam and post-Vietnam cohorts, we present these results in Table 3 and discuss these differences. To minimize bias, we also describe these results using pairwise comparisons of column proportions, with a Bonferroni correction for multiple comparisons (Statistical Package for the Social Sciences, 2012; Dawson and Trapp, 2004). For multivariate analyses, we used logistic regression, whereby key risk/protective factors (*e.g.*, combat exposure, cohort status, lifetime trauma exposure, number of deployments, other mental disorders, etc.) were used to estimate the likelihoods (*i.e.*, odds ratios) for PTSD, depression, and suicidality, respectively, controlling for age, sex, marital status, level of education, and other factors that might affect these associations by including these variables in the regression analyses (Table 4).

All the variables shown in the final multivariate models are included in the analyses presented, otherwise footnoted in Table 4. Because previous reports suggest that the postdeployment homecoming experiences might vary by theater status (Bowden, 2017; Frey-Wouters and Laufer, 1986; Polner, 1971), in our final analyses, we assess interaction effects for homecoming by warzone theater as a final analysis step. We did this by using cross-product terms (*i.e.*, theater × homecoming score) entered in the final regression step that also included the main effects (Harrell, 2001; Hosmer and Lemeshow, 2000). For this interaction assessment, homecoming used as a continuous scale (range, 0–16). Finally, in the discussion section of the article, we discuss study results as they relate to similar studies. Analyses were conducted using Stata, version 13.1 software (Stata Corporation, 2013).

Review Board Approval

This study was approved by the Institutional Review Boards of the Geisinger Clinic and the Department of Defense. All patients provided their informed consent to participate in the study and were offered small monetary incentives for participation.

RESULTS

Using the medical and demographic data included in the patient's electronic medical records, we examined the differences between survey respondents and nonrespondents in terms of sex, race, age, marital status, having a primary care physician, employment status, smoking status, and the prevalence of major health conditions (Boscarino et al., 2015). The only significant differences found were that survey respondents tended to be younger and married ($p < 0.05$).

Most veterans studied were older than 65 years (56.6%), male (95.1%), white (95.7%), and were currently married (77.5%). In addition, 23.6% were deployed guard/reserve service members, 56.2% were Vietnam veterans, and 49.8% were US Army veterans (Table 1). Furthermore, 28.4% reported experiencing a concussion during deployment,

TABLE 1. Demographic Profile of Veterans in Veterans' Health Study ($N = 1730$)

Variables	(*n*) %	(95% CI)
Age, yrs		
18–39	(177) 10.2	8.9–11.8
40–64	(574) 33.2	31.0–35.4
65 or older	(979) 56.6	54.2–58.9
Sex		
Female	(85) 4.9	4.0–6.0
Male	(1645) 95.1	94.0–96.0
Race		
Nonwhite	(75) 4.3	3.5–5.4
White	(1655) 95.7	94.6–96.5
Married		
No	(390) 22.5	20.6–24.6
Yes	(1340) 77.5	75.4–79.4
College grad or higher		
No	(1301) 75.2	73.1–77.2
Yes	(429) 24.8	22.8–26.9
Deployed as guard/reserve		
No	(1322) 76.4	74.4–78.4
Yes	(408) 23.6	21.6–25.6
Multiple warzone tours		
No	(1041) 60.3	58.0–62.6
Yes	(686) 39.7	37.4–42.1
Warzone*		
Vietnam	(972) 56.2	53.8–58.5
Persian Gulf	(275) 15.9	14.3–17.7
Iraq/Afghanistan/GWOT	(396) 22.9	21.0–24.9
Other post-Vietnam conflict	(245) 14.2	12.6–15.9
Combat exposure		
Low	(535) 30.9	28.8–33.2
Moderate	(633) 36.6	34.4–38.9
High	(562) 32.5	30.3–34.7
Service branch*		
Air force	(288) 16.7	15.0–18.5
Army	(861) 49.8	47.4–52.1
Navy	(374) 21.6	19.7–23.6
Marines	(194) 11.2	9.8–12.8
Services used*		
Ever used VA	(1073) 62.0	59.7–64.3
Currently use VA	(864) 49.9	47.6–52.3
Ever applied for VA disability	(812) 46.9	44.6–49.3
Currently have VA disability	(629) 36.4	34.1–38.7

*Multiple responses allowed.
CI, confidence interval.

5.4% met the criteria for current PTSD, 8.3% met criteria for current major depression, and 5.4% had suicidal thoughts in the past 30 days (Table 2). Examination of veteran cohort status by deployment history, risk/protective factors, and deployment outcomes suggests that, compared with other veterans, Vietnam veterans appeared to be older, more often male, more often white, more often married, and less often served on multiple deployments (Table 3). Conversely, Vietnam veterans appeared less likely to have high current stress, current PTSD, and current depression. However, Vietnam veterans were more likely to report low homecoming support postdeployment, compared with other veterans (44.3%, $p < 0.001$) (Table 3). Using pairwise comparisons of column proportions for these different veteran cohorts, with a Bonferroni correction for multiple comparisons, generally confirmed these associations with two noteworthy exceptions. Gulf War veterans had significantly lower combat exposure and significantly lower rates of concussion.

In multivariable analyses, significant predictors of current PTSD were high lifetime trauma exposure ($p < 0.001$), high combat exposure ($p < 0.01$), current depression ($p < 0.001$), current suicidality ($p < 0.05$), and low homecoming support ($p < 0.05$) (Table 4). The significant predictors of current depression included moderate ($p < 0.01$) and high ($p < 0.01$) lifetime trauma exposure, high combat exposure ($p < 0.001$), current PTSD ($p < 0.001$), and recent suicidality ($p < 0.001$). However, low homecoming support was not significant for this outcome. In addition, for veterans, significant predictors of recent suicidality were current PTSD ($p < 0.01$), current depression ($p < 0.001$), and low homecoming support ($p < 0.05$) (Table 4). Of note, guard/reserve status, serving on multiple tours, and theater status were not associated with any of these three study outcomes, nor were the demographic factors we assessed. Because there was a significant difference found for current stressful life events between the veteran groups assessed (Table 3), we added this measure to the regression models for PTSD and suicidality, but this did not change these results. We also assessed interactions effects for theater status by homecoming support score and these were nonsignificant, except for current suicidality among the Iraq/Afghanistan veterans. In this case, a significant interaction was detected, whereby Iraq/Afghanistan veterans with low homecoming support scores were more likely to experience suicidality than other the veterans ($p < 0.002$), as shown in the effects plot presented in Figure 1.

TABLE 2. Psychosocial Profile of Veterans in Veterans' Health Study ($N = 1730$)

Variables	(*N*) %	(95% CI)
Lifetime trauma exposure		
Low	(608) 35.2	33.0–37.5
Moderate	(765) 44.3	41.9–46.6
High	(356) 20.6	18.8–22.6
Current social support		
High	(1416) 81.9	80.0–83.6
Low/moderate	(314) 18.1	16.4–20.0
Current stress exposures		
Low/moderate	(1355) 78.3	76.3–80.2
High	(375) 21.7	19.8–23.7
History of deployment concussion		
No	(1239) 71.6	69.4–73.7
Yes	(491) 28.4	26.3–30.6
Low unit support during deployment		
No	(1366) 79.0	77.0–80.8
Yes	(364) 21.0	19.2–23.0
Low home support after deployment		
No	(1273) 73.6	71.5–75.6
Yes	(457) 26.4	24.4–28.6
Current PTSD (past year)		
No	(1637) 94.6	93.5–95.6
Yes	(93) 5.4	4.4–6.5
Current depression (past year)		
No	(1587) 91.7	90.3–92.4
Yes	(143) 8.3	7.1–9.7
Current suicidality (past month)		
No	(1636) 94.6	93.4–95.5
Yes	(94) 5.4	4.5–6.6

CI, confidence interval.

TABLE 3. Veteran Cohort Status by Postdeployment Risk Factors and Health Outcomes ($N = 1722$)*

	Veteran Cohort Status				
	Vietnam	Gulf	Iraq/Afghan	Other	
Variables	%	%	%	%	*p*
Male sex	99.8	89.7	87.9	91.1	<0.001
Age 45+ yrs	100.0	90.8	40.4	76.2	<0.001
White race	97.4	91.3	93.5	96.4	<0.001
Married	80.2	74.6	72.5	76.8	0.017
Multiple deployments	30.9	49.6	50.3	53.9	<0.001
High combat exposure	26.7	14.3	25.4	16.1	<0.001
Concussion history	29.9	19.0	30.2	30.4	0.005
High current stress	15.5	30.2	27.8	30.4	<0.001
Low unit support	22.5	15.5	19.8	23.8	0.071
Low current support	17.7	19.4	18.0	19.6	0.888
Low home support	44.3	2.0	2.1	9.5	<0.001
Current PTSD	5.9	7.5	12.1	8.9	0.003
Current depression	4.8	11.9	13.0	13.7	<0.001
Current suicidality	4.8	6.3	6.2	6.5	0.567
n	(964)	(252)	(338)	(168)	—

*Veteran status based on first deployment mentioned, because veterans may have had multiple deployments.

DISCUSSION

Given previous research (Boscarino, 1995, 2007; Steenkamp et al., 2017), our premise was that the prevalence of mental disorders among veterans would be higher among those who experienced negative homecoming experiences, regardless of the theater of deployment. Until recently, the impact of the homecoming experience on veterans' mental health status has been mostly anecdotal (Polner, 1971; Frey-Wouters and Laufer, 1986). However, investigators for the National Vietnam Veterans Longitudinal Study (NVVLS) reported that postdeployment risk factors, including the homecoming experience, predicted warzone-related PTSD up to 40 years postdeployment (Steenkamp et al., 2017). There have been previous studies that have examined the impact of homecoming on mental health outcomes among veterans (Fontana and Rosenheck, 1994; Johnson et al., 1997; Koenen et al., 2003; Neria et al., 1998; Vuksic-Mihaljevic et al., 2000), but these mostly assessed the support of family and friends, which may be confounded.

As shown, low postdeployment community homecoming support was associated with PTSD and suicidality, but not depression. Thus, our PTSD finding is consistent with the NVVLS findings (Steenkamp et al., 2017). Recently, there has been an increased focus on psychosocial factors occurring in the predeployment, deployment, and postdeployment periods for service members to minimize the adverse impact of warfighting among veterans (Adler and Castro, 2013; Vogt et al., 2013). We note that

TABLE 4. Multivariable Logistic Regressions Predicting Current PTSD, Depression, and Suicidality Among Veterans (N = 1730)[a]

	PTSD		Major Depression		Suicidality[b]	
Variables	**OR**	**(95% CI)**	**OR**	**(95% CI)**	**OR**	**(95% CI)**
Life time trauma low (ref)	1.00	—	1.00	—	1.00	—
Life time trauma moderate	1.72	(0.80–3.71)	2.39**	(1.35–4.24)	1.47	(0.82–2.63)
Life time trauma high	4.40***	(2.04–9.50)	2.42**	(1.30–4.53)	1.50	(0.77–2.92)
National guard/reserve	1.24	(0.62–2.51)	0.78	(0.45–1.35)	1.31	(0.66–2.57)
Multiple tours	0.95	(0.56–1.60)	0.87	(0.56–1.35)	0.75	(0.46–1.24)
Iraq/Afghan/GWOT deployment	1.01	(0.35–2.90)	1.56	(0.73–3.34)	1.30	(0.50–3.38)
Persian Gulf deployment	0.90	(0.34–2.36)	1.40	(0.69–2.82)	1.74	(0.74–4.09)
Vietnam deployment	0.82	(0.22–3.00)	0.65	(0.25–1.71)	2.76	(0.84–9.07)
Other deployment	0.75	(0.34–1.67)	1.62	(0.90–2.93)	1.98	(0.99–3.97)
Combat low (ref)	1.00	—	1.00	—	1.00	—
Combat moderate	1.66	(0.67–4.12)	1.85	(0.99–3.43)	0.99	(0.54–1.82)
Combat high	4.24**	(1.79–10.01)	3.07***	(1.65–5.69)	0.86	(0.45–1.63)
Current PTSD	—	—	8.35***	(4.97–14.04)	2.43**	(1.27–4.65)
Current depression	8.79***	(5.18–14.90)	—	—	6.36***	(3.67–11.00)
Current suicidality	2.34*	(1.19–4.61)	6.39***	(3.70–11.04)	—	—
Homecoming support low	2.13*	(1.07–4.25)	1.16	(0.65–2.08)	1.91*	(1.06–3.42)

[a]Regressions also included age, sex, race, marital status, education level in the final models, none were statistically significant.

[b]Interaction effect detected for suicidality and Iraq/Afghan/GWOT × homecoming score: OR = 0.81, p = 0.002 (see Figure 1 for interaction results in this model).

*p < 0.05. **p < 0.01. ***p < 0.001.

OR, odds ratio; GWOT, Global War on Terrorism.

similar research efforts emerged after the terrorist attacks in New York City on September 11, 2001, among trauma-exposed civilian populations (Adams and Boscarino, 2006; Hobfoll et al., 2009; Norris et al., 2009; Pietrzak et al., 2014). The detection of an interaction effect for homecoming support score by Iraq/Afghanistan veteran status is an intriguing finding, given that Vietnam veterans were known to have received lower homecoming support postdeployment, compared with more recent veterans (Bowden, 2017), as was shown in Table 3.

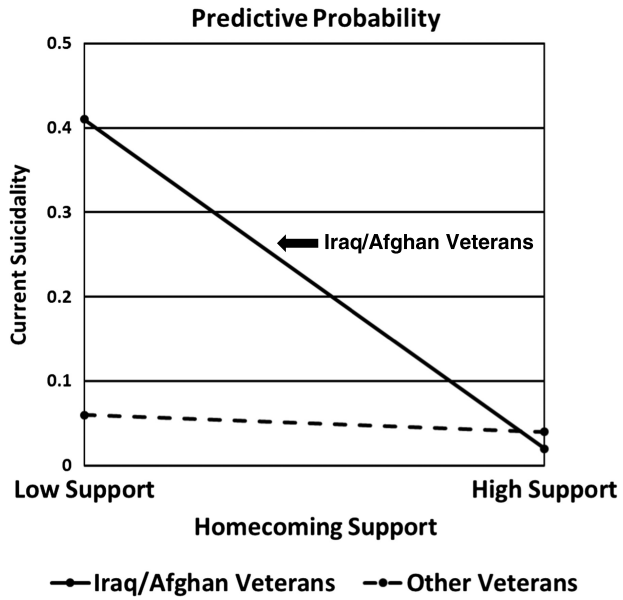

FIGURE 1. Current suicidality by homecoming support score and veteran status (N = 1730).

Nevertheless, Iraq/Afghanistan veterans with lower homecoming support scores were more likely to experience recent suicidal thoughts (Fig. 1).

The current study has several strengths. First, we recruited a large sample of community-based veterans. Second, we used validated scales and measures from previous research (Adams and Boscarino, 2006; Boscarino et al., 2015). Third, we included veterans from Vietnam through to current conflicts in Iraq and Afghanistan, something not typically done in the same study. Fourth, we examined several postdeployment outcomes, including current PTSD, depression, and current suicidality. Fifth, our homecoming measure was focused on community-level support not just family-level support, which may be confounded. Sixth, our multivariable analyses included all the mental health outcomes studied in the final models, considered a conservative approach, because these outcomes tend to be interrelated (Boscarino et al., 2004a). Nevertheless, the results for PTSD and suicidality remained statistically significant (Table 4).

However, our study has several limitations, including that the study was based on a cross-sectional survey. Because of this limitation, it is possible that the associations found in our study could be reversed (Hulley et al., 2013), such that those with postdeployment mental health issues may have a more negative recall of community homecoming support. In addition, although our study was based on a large survey, the study was conducted among mostly white patients in a multihospital system located in central and northeastern Pennsylvania. Furthermore, we found some survey response differences, whereby survey respondents tended to be younger compared with nonrespondents (p < 0.05). Thus, it may not be possible to fully generalize these findings to other geographic areas and study populations. As noted elsewhere, however, there are few stable national samples of veterans available, because this population is dynamic, given different deployments, ongoing conflicts, and the aging of the veteran population (Boscarino, 2007; Hynes et al., 2007; Shen et al., 2003). In addition, most veterans do not use the VA system for health care (Boscarino et al., 2015), which complicates identifying representative samples of veterans for clinical research. Nevertheless, although there were significant differences found between the

veteran cohorts in bivariate analyses (Table 3), there were no differences detected in the final multivariable analyses (Table 4).

CONCLUSIONS

Despite these limitations, our findings are consistent with a recent 40-year follow-up study conducted by NVVLS investigators (Steenkamp et al., 2017). Those researchers reported that the service members' homecoming experiences had an adverse impact on mental health decades after deployment. To our knowledge, this postdeployment risk factor has not been previously studied among a multigenerational sample of community-based veterans. We suggest that services to returning veterans that result in a positive and sustained homecoming experiences are important. Further research is advised to both confirm our findings and improve "welcome home" programs that enhance mental health among retuning veterans and their families. Although our sample is limited, it is interesting that Iraq/Afghanistan veterans with low homecoming support scores were more likely to experience recent suicidality (Fig. 1). This was unexpected and warrants further investigation. Although some have advocated a broad occupational health model for service members (Adler and Castro, 2013), it has been suggested that there are few specific behavioral health models to improve the "homecoming" experience for veterans (Bolton et al., 2002; Boscarino, 2007). Although recent research progress has been made (Steenkamp et al., 2017), the reasons why veterans with low homecoming support are at greater risk for both current PTSD and recent suicidality are unclear. Given ongoing conflicts, better understanding of the "active ingredients" of the homecoming experience need to be further delineated, to prevent the onset of mental illness among the next generation of returning service members.

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DISCLOSURE

The authors declare no conflicts of interests related to this research.

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Mental Health Impact of Homecoming Experience Among 1730 Formerly Deployed Veterans From the Vietnam War to Current Conflicts: Results From the Veterans' Health Study

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Abstract: We examined the effects of homecoming support on current mental health among 1730 deployed veterans from Vietnam, Iraq/Afghanistan, Persian Gulf, and other conflicts. The prevalence of current posttraumatic stress disorder (PTSD) was 5.4%, current depression was 8.3%, and 5.4% had suicidal thoughts in the past month. Overall, 26% of veterans had low homecoming support, which was more prevalent among Vietnam veterans (44.3%, $p < 0.001$). In multivariable logistic regressions, controlling for demographics, combat exposure, number of deployments, trauma history, and operational theater, low postdeployment support was associated with PTSD (odds ratio, 2.13; $p = 0.032$) and suicidality (odds ratio, 1.91; $p < 0.030$), but not depression. For suicidality, an interaction was detected for homecoming by theater status, whereby Iraq/Afghanistan veterans with lower homecoming support had a higher probability of suicidal thoughts ($p = 0.002$). Thus, years after deployment, lower homecoming support was associated with current PTSD and suicidality, regardless of theater and warzone exposures. For suicidality, lower support had a greater impact on Iraq/Afghanistan veterans.

Key Words: Veterans, health status, psychosocial factors, PTSD, suicidality

(*J Nerv Ment Dis* 2018;00: 00–00)

"How was your homecoming experience?" is a common question asked by mental health practitioners caring for military veterans. In the current study, we examined the impact of homecoming support on mental health outcomes among community-based veterans, including Vietnam, Iraq/Afghanistan, Persian Gulf, and other recent veterans. Consistent with previous research (Adams et al., 2017; Boscarino et al. 2015), the objective of this study is to assess the impact of predeployment and postdeployment psychosocial factors on the mental health status of US veterans. Research related to service in Iraq and Afghanistan suggested that significant numbers of these service members developed mental health disorders after their deployments (Booth-Kewley et al., 2010; Hoge et al., 2004; Jacobson et al., 2008; Kok et al., 2012; Polusny et al., 2017). Earlier studies suggested significant rates of posttraumatic stress disorder (PTSD) and other health problems among former service members after the Vietnam War (Boscarino, 2006, 2007; Kulka et al., 1990b). In addition, a recent follow-up study among these veterans suggested that negative homecoming experiences predicted warzone-related PTSD symptoms up to 40 years postdeployment (Steenkamp et al., 2017).

Given previous research (Boscarino, 1995), our hypothesis was that the prevalence of mental disorders among veterans would be higher among those who experienced negative homecoming experiences, independent of warzone theater, and other variables, such as combat exposure and demographic factors. In the past, knowledge of the mental health impact of the homecoming experience on veterans' mental health had been limited (Frey-Wouters and Laufer, 1986; Lifton, 1973; Polner, 1971). However, more recent studies have confirmed that the homecoming experiences of Vietnam (Fontana and Rosenheck, 1994; Johnson et al., 1997; Koenen et al., 2003; Steenkamp et al., 2017; Schnurr et al., 2004), Croatian (Vuksic-Mihaljevic et al., 2000), and Israeli veterans (Neria et al., 1998), as well as the homecoming experiences of peace-keepers (Bolton et al., 2002), has had an impact on the mental health of veterans. A limitation of past research has been that these studies have primarily assessed the support of family and friends, which may be confounded. In addition, past studies typically assessed a single generation of veterans exposed to the same conflict. As discussed later, our assessment was primarily focused on postdeployment community support, which has been a significant issue among Vietnam veterans since the 1960s (Bowden, 2017). Furthermore, we assessed this homecoming impact among several generations of veterans from different conflicts, which to our knowledge, has not been previously investigated in the same study. As noted later, analysis of different cohorts of veterans has challenges, because these groups have unique differences but also overlap because some veterans have served in multiple conflicts. Nevertheless, understanding of deployment-related risk factors among former service members is important for prevention and treatment of mental health disorders among returning veterans (Adler and Castro, 2013).

METHODS

Sample

The population for the current study included a sample of community-based US military veterans recruited for a study of the health effects of military service (Adams et al., 2017; Boscarino et al., 2015; Lent et al., 2017). All veterans in the study were outpatients in the Geisinger Clinic, the largest multihospital system located in central and northeastern Pennsylvania (Boscarino et al., 2016). In 2007, Geisinger initiated a veterans' registry for patients receiving outpatient care and adult patients since then have been asked to complete a military history questionnaire. To date, over 30,000 patients have provided this information, and this database was used to select a random sample of veterans for the current study. Geisinger is an integrated health services organization with an advanced electronic health record system

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(www.geisinger.org). This system serves more than 3 million residents throughout 45 counties in central, south-central, and northeast Pennsylvania and encompasses a 25,000 square mile service area. The Geisinger system includes 30,000 employees, 1600 employed physicians, 9 hospital campuses, and a 551,000-member health plan (Boscarino et al., 2016).

With patient consent, trained and supervised interviewers administered structured health interviews by telephone from February 2016 through February 2017. All veterans recruited had one or more warzone deployment. Veteran status and deployment history were confirmed based on military records provided by the veteran. Among the ~10,000 veterans initially selected for the surveys, all were younger than 76 years and served in Vietnam or in another post-Vietnam conflict (*i.e.*, Iraq/Afghanistan, Global War on Terrorism [GWOT], Persian Gulf, or other recent conflict). After 10 telephone calls, we were able to complete 1730 interviews, for an estimated survey cooperation rate of 55% among those eligible for the survey (American Association for Public Opinion Research, 2008; Groves et al., 2009). Deceased patients, nursing home patients, institutionalized patients, those who did not serve in Vietnam, Iraq, Afghanistan, GWOT, Persian Gulf, or other recent post-Vietnam conflict were excluded from this study, as were those who were cognitively impaired, and those unavailable during the survey period.

Measures

To assess PTSD in our study, we used a questionnaire based on the *Diagnostic and Statistical Manual of Mental Disorder, Fifth Edition* (*DSM-5*), the PTSD Checklist (Blevins et al., 2015; Bovin et al., 2016). To receive a diagnosis of PTSD, veterans had to meet the *DSM-5* diagnostic criteria A through G within the past 12 months (American Psychiatric Association, 2013). This PTSD scale has been used in several recent studies (Cox et al., 2014; Hoge et al., 2014, Wortmann et al., 2016), although there has been debate related to the changes in *DSM-5* (Hoge et al., 2016). Nearly 80% of the veterans in the current study reported that the most significant lifetime stressor they experienced was warzone exposure. In addition to PTSD, the survey collected data related to the veteran's military history, concussion exposure, combat exposure, and demographic background. Concussion history was assessed based on reported concussions experienced during military service (*e.g.*, ever dazed, confused, saw stars, or knocked out), a concussion scale that has been widely used and validated in previous research (Boscarino et al., 2015; Schwab et al., 2006).

Depression was assessed using a major depressive disorder scale based on the *DSM-4* diagnostic criteria (First and Tasman, 2004; First et al., 1997; Spitzer et al., 1992), which has been used extensively in previous trauma studies (Acierno et al., 2000; Boscarino et al., 2004a, 2014, 2015; Kilpatrick et al., 2003). This measure has been used in telephone-based surveys of World Trade Center Disaster survivors (Boscarino et al., 2006; Galea et al., 2002). Data related to the validity of this depression scale were previously reported and suggest that this scale can be used to diagnose depression in population studies (Boscarino et al., 2004b; Kilpatrick et al., 2003). To meet criteria in the study, subjects had to meet the full *DSM-4* criteria for major depression within the past 12 months.

Other postdeployment health outcomes assessed included a measure of suicidality from the Brief Symptom Inventory-18 (BSI-18) scale (Derogatis, 2001). This symptom was assessed for the past 30 days ("please tell me how much thoughts of ending your life distressed or bothered you in the past 30 days"), which was consistent with the current PTSD and depression timeframes used (*i.e.*, past 12 months). The BSI-18 scale is a widely used psychological symptom scale, originally developed from the Hopkins Symptom Inventory, which has a long history in psychiatric research (Adams et al., 2006a; Derogatis and Cleary, 1977; Derogatis et al., 1973, 1976; Franke et al., 2011; Prinz et al., 2013).

Potential mental health risk and protective factors also assessed in the study included demographic factors (*e.g.*, age, sex, race, marital status, and education), multiple warzone deployments, and combat exposure, which were all derived from the survey instruments and used in previous research (Adams et al., 2017; Boscarino et al., 2015). Warzone exposures included the Vietnam War, Persian Gulf War, Afghanistan/Iraq War, and "other" recent warzone deployments, as currently defined by the VA, which encompasses four veteran cohorts of interest: Vietnam, Persian Gulf, Iraq/Afghanistan, and other post-Vietnam deployed veterans. Global War on Terrorism (GWOT) veterans ($n = 70$) were combined with Iraq/Afghanistan veterans, because these deployments were during the same timeframe and were in supporting theaters of operations. Combat exposure was based on the Combat Experience Scale, which is a widely used measure of combat exposure first used in the Vietnam Legacy Study (Frey-Wouters and Laufer, 1986; Laufer et al., 1984). Versions of this scale have been used in key studies since the Vietnam War, including the Vietnam Experience Study, the National Vietnam Veterans Readjustment Study, the Vietnam Twin Registry, among others (Centers for Disease Control, 1988; Boscarino, 1996; Boscarino et al., 2010; Kulka et al., 1990a; McLeod et al., 2001). The Combat Experience Scale used in the current study was updated for recent conflicts (Adams et al., 2017; Boscarino et al., 2015; Lent et al., 2017). Based on previous research, scale measures for combat exposure were divided into cut-points described elsewhere (Adams et al., 2017; Boscarino et al., 2015).

Our study also assessed the occurrence of 12 lifetime traumatic events (*e.g.*, forced sexual contact, domestic abuse, a serious accident, served in a warzone, experienced a major disaster) (Freedy et al., 1993). As we had no a priori method to judge the severity of these events, based on previous research, we collapsed these exposures into three categories: less than three traumatic events, three to five events, and six or more events. A total of 21% of respondents experienced six or more lifetime traumatic events in the current study. This traumatic event scale was developed from other trauma studies, was used in previous research, and had good reported reliability and validity (Adams and Boscarino, 2006; Boscarino et al., 2004a, 2012, 2013, 2014, 2015; Galea et al., 2002; Freedy et al., 1993; Resnick et al., 1993).

Homecoming support was assessed by four Likert survey items (rated "strongly agree" to "strongly disagree") from the postdeployment section of the Deployment Risk & Resilience Inventory (DRRI), which asked veterans to report their homecoming experiences (*e.g.*, "when I retuned, people made me feel proud to have served," "the reception I received when I returned from deployment made me feel appreciated," "the American people made me feel at home," etc.) (Vogt et al., 2008). The Cronbach's alpha for this DRRI subscale in the current study was 0.86. Those scoring in the lowest quartile were classified as having low homecoming support. Total scores on this scale ranged from 0 to 16 (mean, 9.36; SD, 5.20).

Our study also included measures of current life stressors, current social support, deployment unit support, and VA service use, all of which were based on survey questions (Adams et al., 2017; Boscarino et al., 2015). Current life stressors included a count of eight experiences that could have happened to the respondent in the past 12 months (*e.g.*, death of spouse or close family member, being injured, problems at work, getting married, having financial problems, etc.). Experiencing two or more of these events in the past 12 months (~22% of the survey sample) was classified as high exposure to stressful life events. As with the traumatic event scale, this life stress scale was developed from other trauma studies, used in previous research, and had good reported reliability and validity (Adams and Boscarino, 2006; Boscarino et al., 2004a, 2012, 2013, 2014, 2015; Galea et al., 2002; Freedy et al., 1993; Resnick et al., 1993). Unit support was based on survey items from the DRRI, which asked the veterans to report on their unit experiences during deployment (*e.g.*, "felt a sense of camaraderie between myself and others in my unit") (Vogt et al., 2008).

Cronbach's alpha for this scale in the current study was 0.78. Those scoring in the lowest quartile were classified as having low unit support during deployment. The social support scale used was a version included in the Medical Outcomes Study (Sherbourne and Stewart, 1991) that was used in past trauma research (Boscarino et al., 2004a, 2014; Galea et al., 2002; Freedy et al., 1993). Items for this scale were based on a 4-point Likert scale rated "none of the time" to "all the time" (*e.g.*, someone available to help you if you were confined to bed?) (Boscarino et al., 2014). This scale has been used in previous trauma studies and is considered a reliable and valid measure of current social support (Boscarino et al., 2004b; Galea et al., 2002). This scale was used as a categorical measure in the current study, with low social support defined as the lowest quintile (Boscarino et al., 2014). Cronbach's alpha for this scale in the current study was 0.84. Finally, for descriptive purposes we included several questions related to VA service use and VA disability status used in previous research (Boscarino et al., 2015).

It is noted that our study was guided, in part, by a psychosocial stress model, which is focused on the availability of psychosocial resources and the impact of environmental factors in the onset and course of mental disorders (Adams and Boscarino, 2011; Adams et al., 2006a, 2006b; Rosen et al., 2012; Yamashita, 2012). This model guided our instrument selection and data analyses (Adams et al., 2017).

Data Analyses

Statistical analyses included descriptive statistics depicting the study population and testing the association between mental health status and the postdeployment homecoming experience. For descriptive purposes, we present the characteristics of the study population and show these results in Tables 1 and 2. Because there were differences expected between the Vietnam and post-Vietnam cohorts, we present these results in Table 3 and discuss these differences. To minimize bias, we also describe these results using pairwise comparisons of column proportions, with a Bonferroni correction for multiple comparisons (Statistical Package for the Social Sciences, 2012; Dawson and Trapp, 2004). For multivariate analyses, we used logistic regression, whereby key risk/protective factors (*e.g.*, combat exposure, cohort status, lifetime trauma exposure, number of deployments, other mental disorders, etc.) were used to estimate the likelihoods (*i.e.*, odds ratios) for PTSD, depression, and suicidality, respectively, controlling for age, sex, marital status, level of education, and other factors that might affect these associations by including these variables in the regression analyses (Table 4).

All the variables shown in the final multivariate models are included in the analyses presented, otherwise footnoted in Table 4. Because previous reports suggest that the postdeployment homecoming experiences might vary by theater status (Bowden, 2017; Frey-Wouters and Laufer, 1986; Polner, 1971), in our final analyses, we assess interaction effects for homecoming by warzone theater as a final analysis step. We did this by using cross-product terms (*i.e.*, theater × homecoming score) entered in the final regression step that also included the main effects (Harrell, 2001; Hosmer and Lemeshow, 2000). For this interaction assessment, homecoming used as a continuous scale (range, 0–16). Finally, in the discussion section of the article, we discuss study results as they relate to similar studies. Analyses were conducted using Stata, version 13.1 software (Stata Corporation, 2013).

Review Board Approval

This study was approved by the Institutional Review Boards of the Geisinger Clinic and the Department of Defense. All patients provided their informed consent to participate in the study and were offered small monetary incentives for participation.

RESULTS

Using the medical and demographic data included in the patient's electronic medical records, we examined the differences between survey respondents and nonrespondents in terms of sex, race, age, marital status, having a primary care physician, employment status, smoking status, and the prevalence of major health conditions (Boscarino et al., 2015). The only significant differences found were that survey respondents tended to be younger and married ($p < 0.05$).

Most veterans studied were older than 65 years (56.6%), male (95.1%), white (95.7%), and were currently married (77.5%). In addition, 23.6% were deployed guard/reserve service members, 56.2% were Vietnam veterans, and 49.8% were US Army veterans (Table 1). Furthermore, 28.4% reported experiencing a concussion during deployment,

TABLE 1. Demographic Profile of Veterans in Veterans' Health Study ($N = 1730$)

Variables	(*n*) %	(95% CI)
Age, yrs		
18–39	(177) 10.2	8.9–11.8
40–64	(574) 33.2	31.0–35.4
65 or older	(979) 56.6	54.2–58.9
Sex		
Female	(85) 4.9	4.0–6.0
Male	(1645) 95.1	94.0–96.0
Race		
Nonwhite	(75) 4.3	3.5–5.4
White	(1655) 95.7	94.6–96.5
Married		
No	(390) 22.5	20.6–24.6
Yes	(1340) 77.5	75.4–79.4
College grad or higher		
No	(1301) 75.2	73.1–77.2
Yes	(429) 24.8	22.8–26.9
Deployed as guard/reserve		
No	(1322) 76.4	74.4–78.4
Yes	(408) 23.6	21.6–25.6
Multiple warzone tours		
No	(1041) 60.3	58.0–62.6
Yes	(686) 39.7	37.4–42.1
Warzone*		
Vietnam	(972) 56.2	53.8–58.5
Persian Gulf	(275) 15.9	14.3–17.7
Iraq/Afghanistan/GWOT	(396) 22.9	21.0–24.9
Other post-Vietnam conflict	(245) 14.2	12.6–15.9
Combat exposure		
Low	(535) 30.9	28.8–33.2
Moderate	(633) 36.6	34.4–38.9
High	(562) 32.5	30.3–34.7
Service branch*		
Air force	(288) 16.7	15.0–18.5
Army	(861) 49.8	47.4–52.1
Navy	(374) 21.6	19.7–23.6
Marines	(194) 11.2	9.8–12.8
Services used*		
Ever used VA	(1073) 62.0	59.7–64.3
Currently use VA	(864) 49.9	47.6–52.3
Ever applied for VA disability	(812) 46.9	44.6–49.3
Currently have VA disability	(629) 36.4	34.1–38.7

*Multiple responses allowed.
CI, confidence interval.

5.4% met the criteria for current PTSD, 8.3% met criteria for current major depression, and 5.4% had suicidal thoughts in the past 30 days (Table 2). Examination of veteran cohort status by deployment history, risk/protective factors, and deployment outcomes suggests that, compared with other veterans, Vietnam veterans appeared to be older, more often male, more often white, more often married, and less often served on multiple deployments (Table 3). Conversely, Vietnam veterans appeared less likely to have high current stress, current PTSD, and current depression. However, Vietnam veterans were more likely to report low homecoming support postdeployment, compared with other veterans (44.3%, $p < 0.001$) (Table 3). Using pairwise comparisons of column proportions for these different veteran cohorts, with a Bonferroni correction for multiple comparisons, generally confirmed these associations with two noteworthy exceptions. Gulf War veterans had significantly lower combat exposure and significantly lower rates of concussion.

In multivariable analyses, significant predictors of current PTSD were high lifetime trauma exposure ($p < 0.001$), high combat exposure ($p < 0.01$), current depression ($p < 0.001$), current suicidality ($p < 0.05$), and low homecoming support ($p < 0.05$) (Table 4). The significant predictors of current depression included moderate ($p < 0.01$) and high ($p < 0.01$) lifetime trauma exposure, high combat exposure ($p < 0.001$), current PTSD ($p < 0.001$), and recent suicidality ($p < 0.001$). However, low homecoming support was not significant for this outcome. In addition, for veterans, significant predictors of recent suicidality were current PTSD ($p < 0.01$), current depression ($p < 0.001$), and low homecoming support ($p < 0.05$) (Table 4). Of note, guard/reserve status, serving on multiple tours, and theater status were not associated with any of these three study outcomes, nor were the demographic factors we assessed. Because there was a significant difference found for current stressful life events between the veteran groups assessed (Table 3), we added this measure to the regression models for PTSD and suicidality, but this did not change these results. We also assessed interactions effects for theater status by homecoming support score and these were nonsignificant, except for current suicidality among the Iraq/Afghanistan veterans. In this case, a significant interaction was detected, whereby Iraq/Afghanistan veterans with low homecoming support scores were more likely to experience suicidality than other the veterans ($p < 0.002$), as shown in the effects plot presented in Figure 1.

TABLE 2. Psychosocial Profile of Veterans in Veterans' Health Study ($N = 1730$)

Variables	(*N*) %	(95% CI)
Lifetime trauma exposure		
Low	(608) 35.2	33.0–37.5
Moderate	(765) 44.3	41.9–46.6
High	(356) 20.6	18.8–22.6
Current social support		
High	(1416) 81.9	80.0–83.6
Low/moderate	(314) 18.1	16.4–20.0
Current stress exposures		
Low/moderate	(1355) 78.3	76.3–80.2
High	(375) 21.7	19.8–23.7
History of deployment concussion		
No	(1239) 71.6	69.4–73.7
Yes	(491) 28.4	26.3–30.6
Low unit support during deployment		
No	(1366) 79.0	77.0–80.8
Yes	(364) 21.0	19.2–23.0
Low home support after deployment		
No	(1273) 73.6	71.5–75.6
Yes	(457) 26.4	24.4–28.6
Current PTSD (past year)		
No	(1637) 94.6	93.5–95.6
Yes	(93) 5.4	4.4–6.5
Current depression (past year)		
No	(1587) 91.7	90.3–92.4
Yes	(143) 8.3	7.1–9.7
Current suicidality (past month)		
No	(1636) 94.6	93.4–95.5
Yes	(94) 5.4	4.5–6.6

CI, confidence interval.

TABLE 3. Veteran Cohort Status by Postdeployment Risk Factors and Health Outcomes ($N = 1722$)*

	Veteran Cohort Status				
	Vietnam	Gulf	Iraq/Afghan	Other	
Variables	%	%	%	%	*p*
Male sex	99.8	89.7	87.9	91.1	<0.001
Age 45+ yrs	100.0	90.8	40.4	76.2	<0.001
White race	97.4	91.3	93.5	96.4	<0.001
Married	80.2	74.6	72.5	76.8	0.017
Multiple deployments	30.9	49.6	50.3	53.9	<0.001
High combat exposure	26.7	14.3	25.4	16.1	<0.001
Concussion history	29.9	19.0	30.2	30.4	0.005
High current stress	15.5	30.2	27.8	30.4	<0.001
Low unit support	22.5	15.5	19.8	23.8	0.071
Low current support	17.7	19.4	18.0	19.6	0.888
Low home support	44.3	2.0	2.1	9.5	<0.001
Current PTSD	5.9	7.5	12.1	8.9	0.003
Current depression	4.8	11.9	13.0	13.7	<0.001
Current suicidality	4.8	6.3	6.2	6.5	0.567
n	(964)	(252)	(338)	(168)	—

*Veteran status based on first deployment mentioned, because veterans may have had multiple deployments.

DISCUSSION

Given previous research (Boscarino, 1995, 2007; Steenkamp et al., 2017), our premise was that the prevalence of mental disorders among veterans would be higher among those who experienced negative homecoming experiences, regardless of the theater of deployment. Until recently, the impact of the homecoming experience on veterans' mental health status has been mostly anecdotal (Polner, 1971; Frey-Wouters and Laufer, 1986). However, investigators for the National Vietnam Veterans Longitudinal Study (NVVLS) reported that postdeployment risk factors, including the homecoming experience, predicted warzone-related PTSD up to 40 years postdeployment (Steenkamp et al., 2017). There have been previous studies that have examined the impact of homecoming on mental health outcomes among veterans (Fontana and Rosenheck, 1994; Johnson et al., 1997; Koenen et al., 2003; Neria et al., 1998; Vuksic-Mihaljevic et al., 2000), but these mostly assessed the support of family and friends, which may be confounded.

As shown, low postdeployment community homecoming support was associated with PTSD and suicidality, but not depression. Thus, our PTSD finding is consistent with the NVVLS findings (Steenkamp et al., 2017). Recently, there has been an increased focus on psychosocial factors occurring in the predeployment, deployment, and postdeployment periods for service members to minimize the adverse impact of warfighting among veterans (Adler and Castro, 2013; Vogt et al., 2013). We note that

TABLE 4. Multivariable Logistic Regressions Predicting Current PTSD, Depression, and Suicidality Among Veterans (N = 1730)[a]

	PTSD		Major Depression		Suicidality[b]	
Variables	**OR**	**(95% CI)**	**OR**	**(95% CI)**	**OR**	**(95% CI)**
Life time trauma low (ref)	1.00	—	1.00	—	1.00	—
Life time trauma moderate	1.72	(0.80–3.71)	2.39**	(1.35–4.24)	1.47	(0.82–2.63)
Life time trauma high	4.40***	(2.04–9.50)	2.42**	(1.30–4.53)	1.50	(0.77–2.92)
National guard/reserve	1.24	(0.62–2.51)	0.78	(0.45–1.35)	1.31	(0.66–2.57)
Multiple tours	0.95	(0.56–1.60)	0.87	(0.56–1.35)	0.75	(0.46–1.24)
Iraq/Afghan/GWOT deployment	1.01	(0.35–2.90)	1.56	(0.73–3.34)	1.30	(0.50–3.38)
Persian Gulf deployment	0.90	(0.34–2.36)	1.40	(0.69–2.82)	1.74	(0.74–4.09)
Vietnam deployment	0.82	(0.22–3.00)	0.65	(0.25–1.71)	2.76	(0.84–9.07)
Other deployment	0.75	(0.34–1.67)	1.62	(0.90–2.93)	1.98	(0.99–3.97)
Combat low (ref)	1.00	—	1.00	—	1.00	—
Combat moderate	1.66	(0.67–4.12)	1.85	(0.99–3.43)	0.99	(0.54–1.82)
Combat high	4.24**	(1.79–10.01)	3.07***	(1.65–5.69)	0.86	(0.45–1.63)
Current PTSD	—	—	8.35***	(4.97–14.04)	2.43**	(1.27–4.65)
Current depression	8.79***	(5.18–14.90)	—	—	6.36***	(3.67–11.00)
Current suicidality	2.34*	(1.19–4.61)	6.39***	(3.70–11.04)	—	—
Homecoming support low	2.13*	(1.07–4.25)	1.16	(0.65–2.08)	1.91*	(1.06–3.42)

[a]Regressions also included age, sex, race, marital status, education level in the final models, none were statistically significant.

[b]Interaction effect detected for suicidality and Iraq/Afghan/GWOT × homecoming score: OR = 0.81, p = 0.002 (see Figure 1 for interaction results in this model).

*p < 0.05. **p < 0.01. ***p < 0.001.

OR, odds ratio; GWOT, Global War on Terrorism.

similar research efforts emerged after the terrorist attacks in New York City on September 11, 2001, among trauma-exposed civilian populations (Adams and Boscarino, 2006; Hobfoll et al., 2009; Norris et al., 2009; Pietrzak et al., 2014). The detection of an interaction effect for homecoming support score by Iraq/Afghanistan veteran status is an intriguing finding, given that Vietnam veterans were known to have received lower homecoming support postdeployment, compared with more recent veterans (Bowden, 2017), as was shown in Table 3.

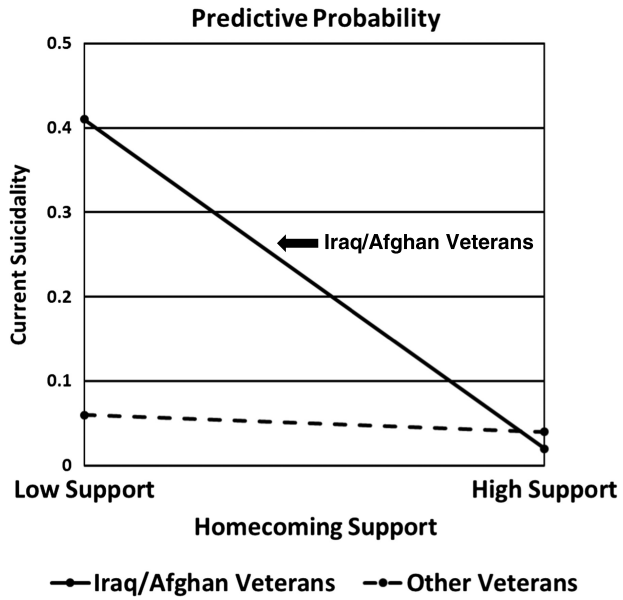

FIGURE 1. Current suicidality by homecoming support score and veteran status (N = 1730).

Nevertheless, Iraq/Afghanistan veterans with lower homecoming support scores were more likely to experience recent suicidal thoughts (Fig. 1).

The current study has several strengths. First, we recruited a large sample of community-based veterans. Second, we used validated scales and measures from previous research (Adams and Boscarino, 2006; Boscarino et al., 2015). Third, we included veterans from Vietnam through to current conflicts in Iraq and Afghanistan, something not typically done in the same study. Fourth, we examined several postdeployment outcomes, including current PTSD, depression, and current suicidality. Fifth, our homecoming measure was focused on community-level support not just family-level support, which may be confounded. Sixth, our multivariable analyses included all the mental health outcomes studied in the final models, considered a conservative approach, because these outcomes tend to be interrelated (Boscarino et al., 2004a). Nevertheless, the results for PTSD and suicidality remained statistically significant (Table 4).

However, our study has several limitations, including that the study was based on a cross-sectional survey. Because of this limitation, it is possible that the associations found in our study could be reversed (Hulley et al., 2013), such that those with postdeployment mental health issues may have a more negative recall of community homecoming support. In addition, although our study was based on a large survey, the study was conducted among mostly white patients in a multihospital system located in central and northeastern Pennsylvania. Furthermore, we found some survey response differences, whereby survey respondents tended to be younger compared with nonrespondents (p < 0.05). Thus, it may not be possible to fully generalize these findings to other geographic areas and study populations. As noted elsewhere, however, there are few stable national samples of veterans available, because this population is dynamic, given different deployments, ongoing conflicts, and the aging of the veteran population (Boscarino, 2007; Hynes et al., 2007; Shen et al., 2003). In addition, most veterans do not use the VA system for health care (Boscarino et al., 2015), which complicates identifying representative samples of veterans for clinical research. Nevertheless, although there were significant differences found between the

veteran cohorts in bivariate analyses (Table 3), there were no differences detected in the final multivariable analyses (Table 4).

CONCLUSIONS

Despite these limitations, our findings are consistent with a recent 40-year follow-up study conducted by NVVLS investigators (Steenkamp et al., 2017). Those researchers reported that the service members' homecoming experiences had an adverse impact on mental health decades after deployment. To our knowledge, this postdeployment risk factor has not been previously studied among a multigenerational sample of community-based veterans. We suggest that services to returning veterans that result in a positive and sustained homecoming experiences are important. Further research is advised to both confirm our findings and improve "welcome home" programs that enhance mental health among retuning veterans and their families. Although our sample is limited, it is interesting that Iraq/Afghanistan veterans with low homecoming support scores were more likely to experience recent suicidality (Fig. 1). This was unexpected and warrants further investigation. Although some have advocated a broad occupational health model for service members (Adler and Castro, 2013), it has been suggested that there are few specific behavioral health models to improve the "homecoming" experience for veterans (Bolton et al., 2002; Boscarino, 2007). Although recent research progress has been made (Steenkamp et al., 2017), the reasons why veterans with low homecoming support are at greater risk for both current PTSD and recent suicidality are unclear. Given ongoing conflicts, better understanding of the "active ingredients" of the homecoming experience need to be further delineated, to prevent the onset of mental illness among the next generation of returning service members.

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DISCLOSURE

The authors declare no conflicts of interests related to this research.

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Mental Health Disorders, Suicide Risk and Treatment seeking among Formerly Deployed National Guard and Reserve Service Member seen in Non-VA Facilities

Log Number: PT140183; Data analyses and study dissemination phase

Award Number: W81XWH-15-1-0506

PI: Joseph A. Boscarino, PhD, MPH **Org:** Geisinger Clinic, Danville, PA **Award Amount: $ 2,261,852**

Study Aims

Aim 1: To estimate the prevalence of and risk factors for mental health disorders, substance use disorders, TBI, and suicide among National Guard and Reserves personnel who have returned from recent combat.

Aim 2: To identify protective factors for the onset and course of posttraumatic stress disorder (PTSD) and related disorders among service members after combat operations.

Aim 3: To assess the outcome of interventions received by National Guard and Reserves members during/after recent combat operations, including brief interventions.

Aim 4: To conduct genetic research related the risks for mental disorders, including the development of a DNA repository and research panel for future studies related to the genetics and consequences of PTSD and related disorders.

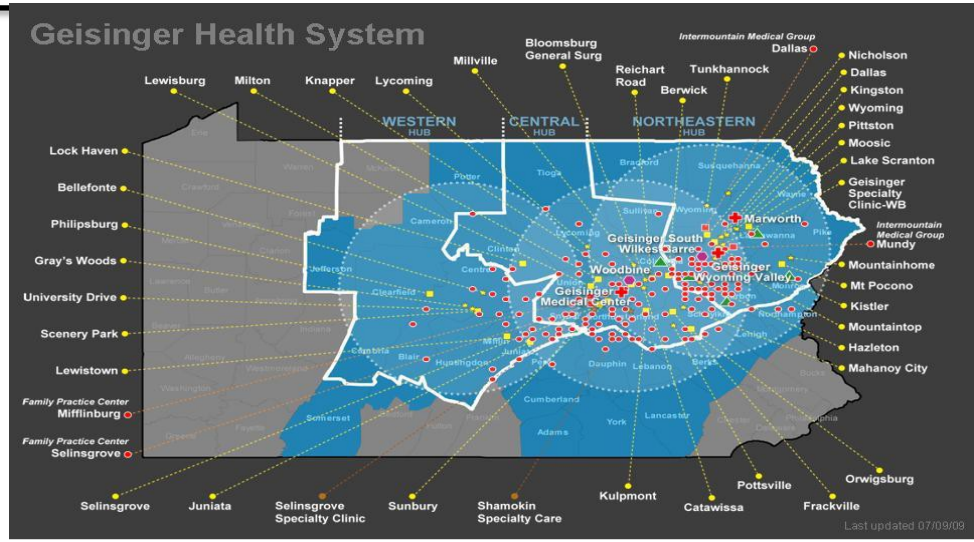
Method

A cohort study that includes multivariable analyses of diagnostic interviews with 900 deployed National Guard/Reverse veterans and 900 deployed veterans from other service eras, plus longitudinal clinical data from electronic health record (EHR) and DNA samples from Geisinger Clinic veterans.

Timeline and Cost

Activities / CY	15	16	17	18
Setup, IRB, recruit, data collection				
Merge survey, EHR data, DNA				
Conduct data analyses				
Complete analyses & disseminate				
Estimated Budget ($K)	**$857K**	**$804K**	**$601K**	

Updated: 10-4-2018 (CAW)



Goals/Milestones

CY15 Goals – Study preparation, and set-up, IRB phase

- ☑ Hired 2 personnel key to study operation
- ☑ Conducted initial meeting, updated veteran registry, and revised phone survey
- ☑ Submitted protocol and supporting documents to Geisinger & DoD IRB and National Institute of Mental Health (NIMH) for Certificate of Confidentiality
- ☑ Received Geisinger/DoD IRB approval & Certificate of Confidentiality from NIMH

CY16 Goals – Recruit study subjects from Geisinger Clinic

- ☑ Using the veterans' registry, conducted data pull for veteran status and demographics
- ☑ Began survey interviewing and collection of DNAs
- ☑ Conducted preliminary data analyses
- ☑ Prepared and submitted abstracts to professional meetings and began writing manuscripts
- ☑ Began genotyping of selected SNPs
- ☑ Presenting findings at regional & national conferences
- ☑ Extracted DNA & genotyped candidate genes for PTSD/addiction disorders, etc.
- ☑ Held local town hall meeting for ~100 veterans who participated in survey
- ✓ Completed extraction of relevant clinical data from EHR
- ✓ Merged & clean final dataset, complete analyses

CY17-CY18 Goals – Complete data analyses & disseminate results

- ☑ Submission of papers for publication to key medical journals

Comments/Challenges/Issues/Concerns

- ✓ Delayed timeline due to ceding IRBs and having a survey time of >60 minutes
- ✓ Had to increase recruitment efforts for National Guard/Reserve cohort to meet study objectives

Budget Expenditure to Date

Projected Expenditure: $ 2,261,852

Actual Expenditure: 1,592,497