

Perspectives on Prevention and Behavioral Health across the Life Cycle

Challenges and Opportunities

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Robert J. Ursano MD

Professor of Psychiatry and Neuroscience

Director Center for the Study of Traumatic Stress

Uniformed Services University School of Medicine

Bethesda, MD USA

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Disclaimer Statement

The opinions and assertions expressed herein are those of the author(s) and do not necessarily reflect the official policy or position of the Uniformed Services University or the Department of Defense.

A Nation's Security

- Military Power
- Economic Power
- Information Systems
- Health

Health

Is a part of the USA National Security Plan

And

A part of Security and Continuity or organizations
including the military and civilian communities

“Without health there is no happiness”

(Thomas Jefferson)

Without happiness there is no hope...

Without hope there cannot be a nation or an organization

Target

Who is at risk? (At risk of what?)

When are they at risk?..life course, occupation,
time of year....

Where are they – location?

Core System Interventions

Food/Nutrition

Education

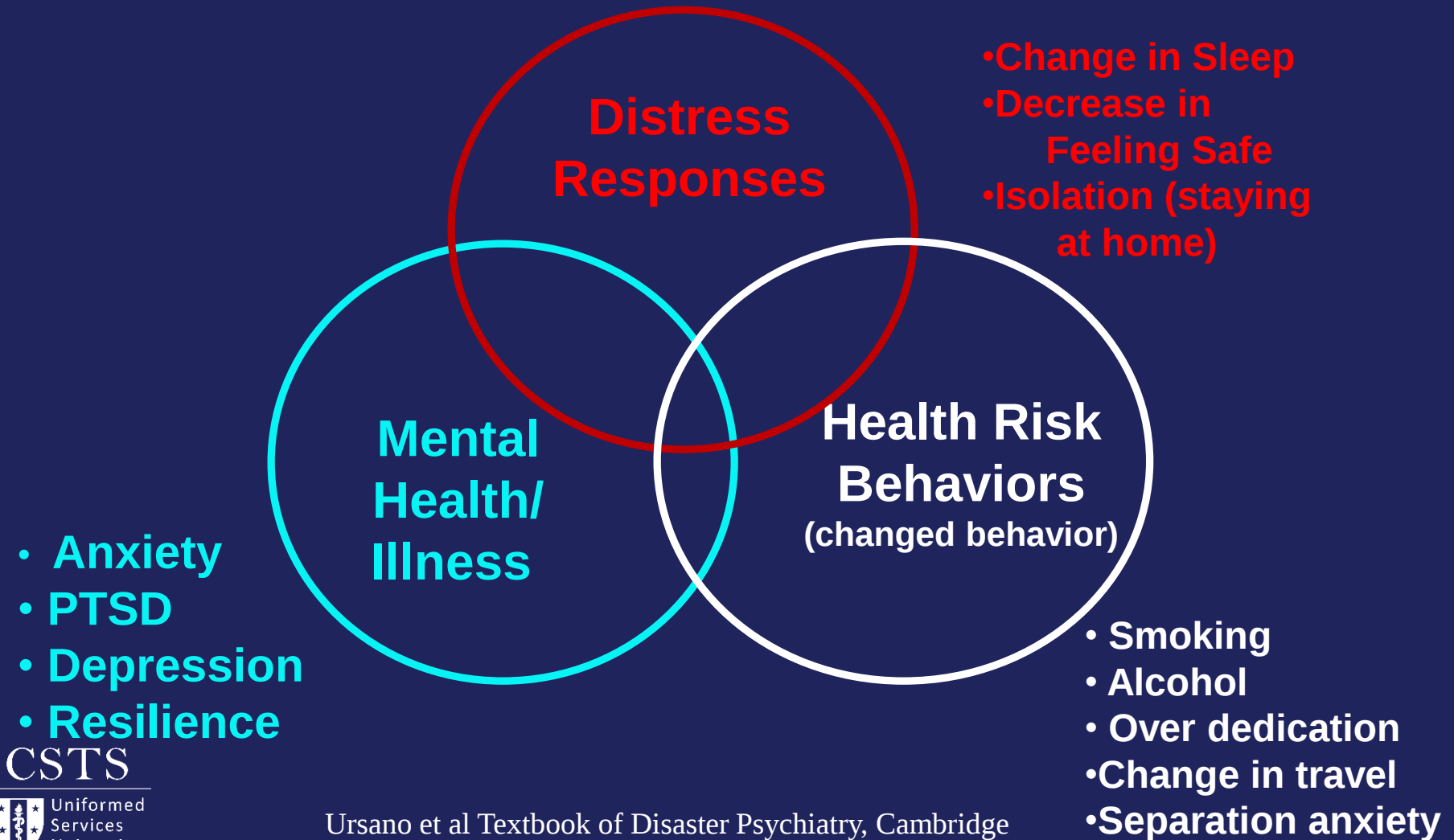
Access to health Care

Safety

.....Sesame Street/Mr Rodgers...

Mental Health Responses:

Event Related Responses from trauma to Disasters



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A Wicked Problem

In 1973, design theorists Horst Rittel and Melvin Webber introduced the term "wicked problem" in order to draw attention to the complexities and challenges of addressing planning and social policy problems. Unlike the "tame" problems of mathematics and chess, the wicked problems of planning lack clarity in both their aims and solutions. In addition to these challenges of articulation and internal logic, they are subject to real-world constraints that prevent multiple and risk-free attempts at solving.

As described by Rittel and Webber,

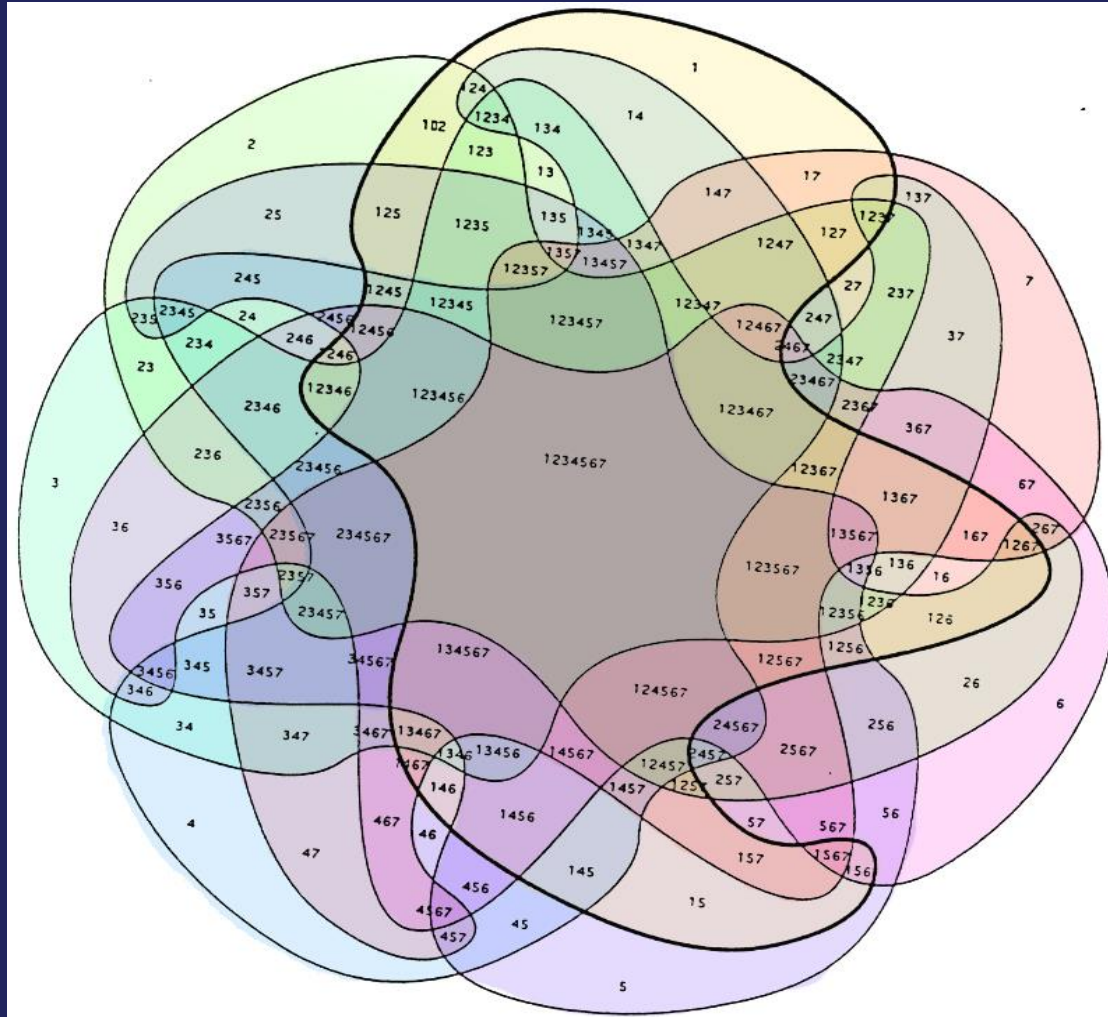
Wicked problems have 10 important characteristics:

- 1) They do not have a definitive formulation.
- 2) They do not have a "stopping rule." In other words, these problems lack an inherent logic that signals when they are solved.
- 3) Their solutions are not true or false, only good or bad.
- 4) There is no way to test the solution to a wicked problem.
by those actions."

A Wicked Problem (cont)

- 5) They cannot be studied through trial and error. Their solutions are irreversible so, as Rittel and Webber put it, “every trial counts.”
- 6) There is no end to the number of solutions or approaches to a wicked problem.
- 7) All wicked problems are essentially unique.
- 8) Wicked problems can always be described as the symptom of other problems.
- 9) The way a wicked problem is described determines its possible solutions.
- 10) Planners, that is those who present solutions to these problems, have no right to be wrong. Unlike mathematicians, “planners are liable for the consequences of the solutions they generate; the effects can matter a great deal to the people who are touched

Prevention ...A Wicked Problem



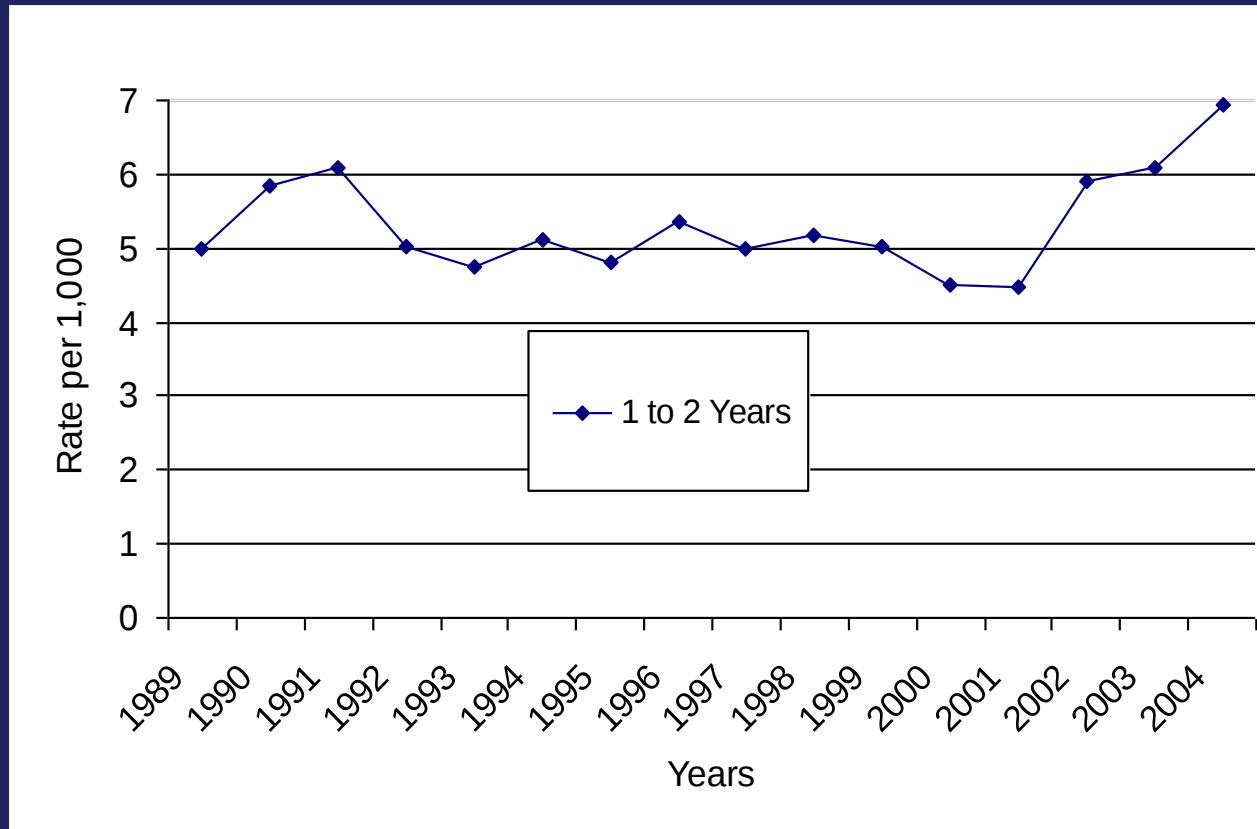
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Taylor, D The Battle of Data Science, <http://www.prooffreader.com/2016/09/battle-of-data-science-venn-diagrams.html> <http://www.kdnuggets.com/2016/10/battle-data-science-venn-diagrams.html/2> 7 sets

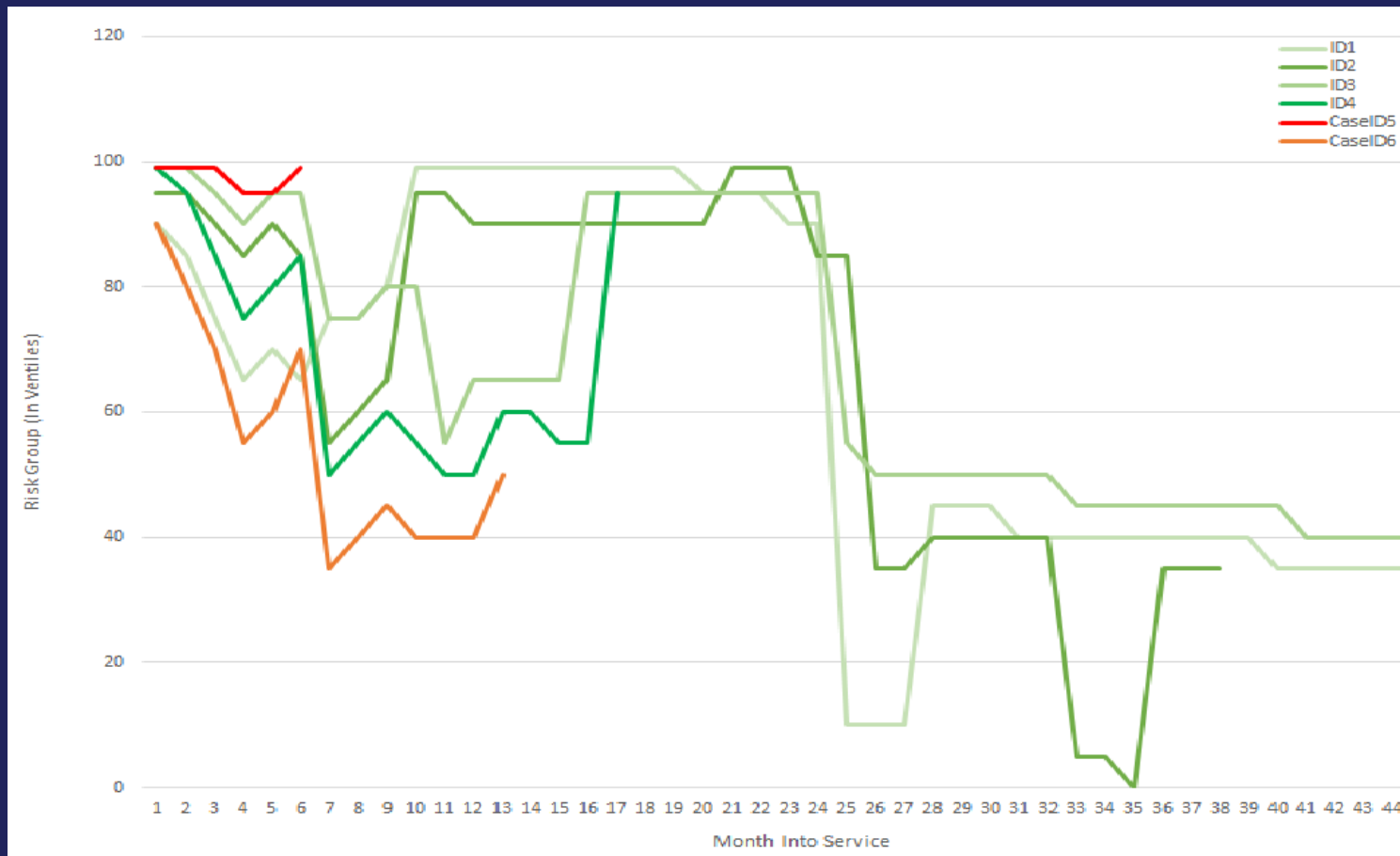
Child Neglect and War

Age 1-2 year olds



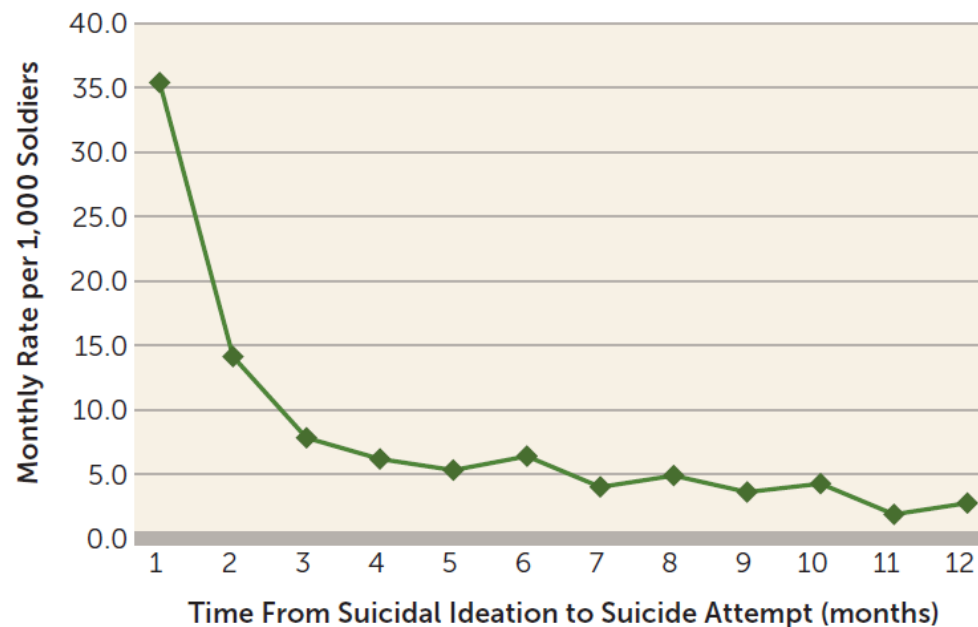
Case Examples: Suicide Risk Over Time

Ventile/highest risk 100 vs months



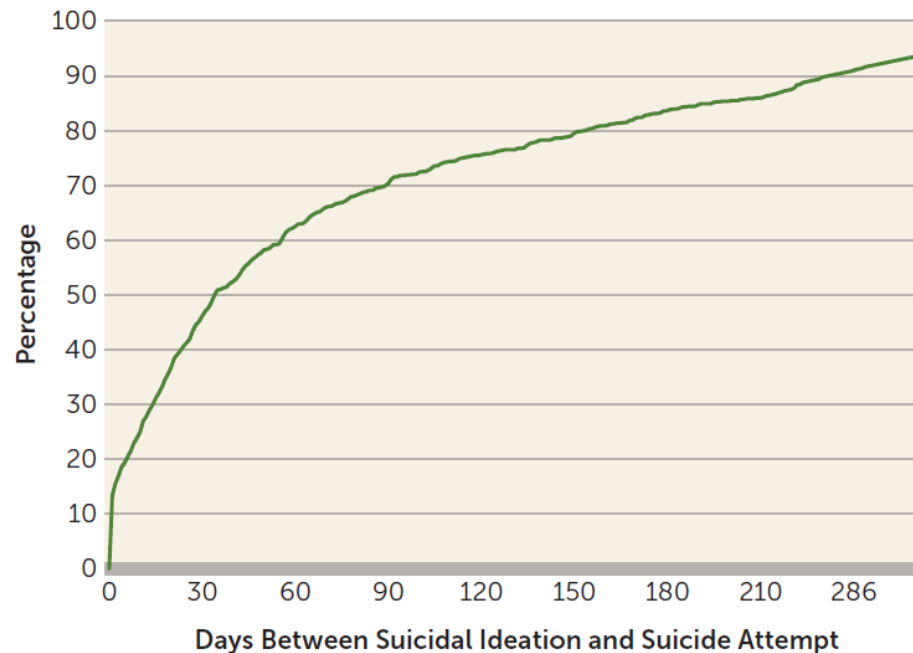
SA among first SI

FIGURE 2. Risk of suicide attempt among 11,178 active-duty U.S. Army soldiers following first documented suicidal ideation, 2006–2009



SA among first SI Dx

FIGURE 1. Cumulative percent of suicide attempts across days since first documented suicidal ideation among 11,178 active-duty U.S. Army soldiers, 2006–2009



the Army (64.1%) (Table 1). Approximately half of the soldiers (52.7%) were in their first 2 years of service, 57.7% had never deployed, and 27.3% were assigned to combat arms. The five

Variation over time

- Attachment style and risk of SA

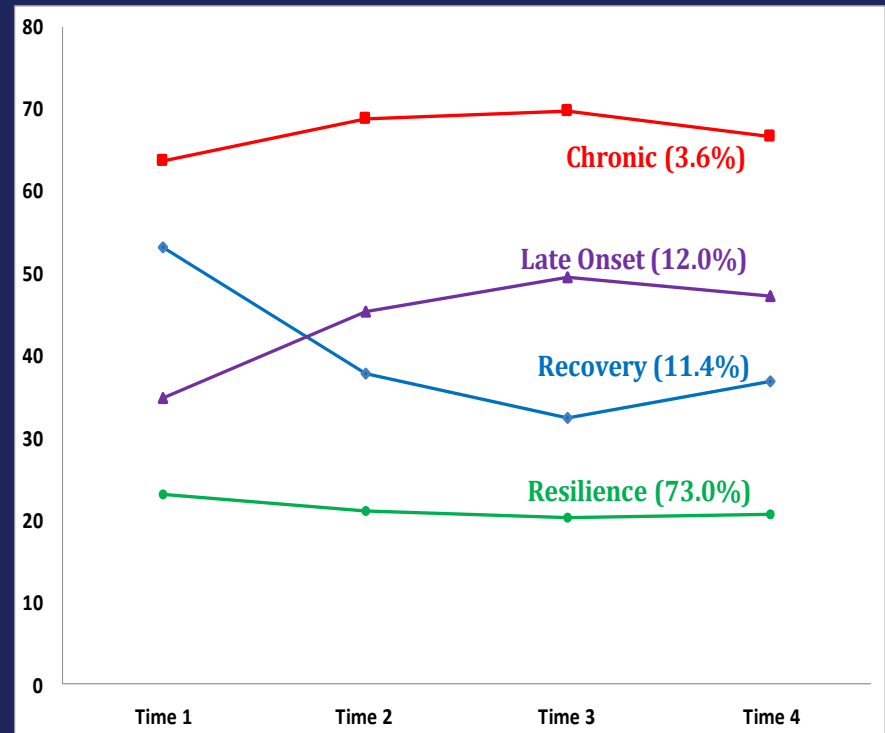
	Preservice/Adol	In service/young adulthood
• ATT 1	yes	no
• ATT 2	yes	yes
• ATT 3	no	yes
• Secure	lower	lower

Precision Medicine (continued)

Precision medicine:

- Who is at risk
- When is the risk
- What are risk-to-disease transition mechanisms
- What are disease sustaining/recovery mechanisms
- Develop models to optimize matching the right person to the best treatment

EXAMPLE:
Trajectory of Deployment-Related PTSD



CSTS Guard and Reserve Study 2018

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Wang J Ursano RJ et al Psychiatry 2018

What to Prevent: Comorbidity among Army Soldiers STARRS: PPDS: TBI

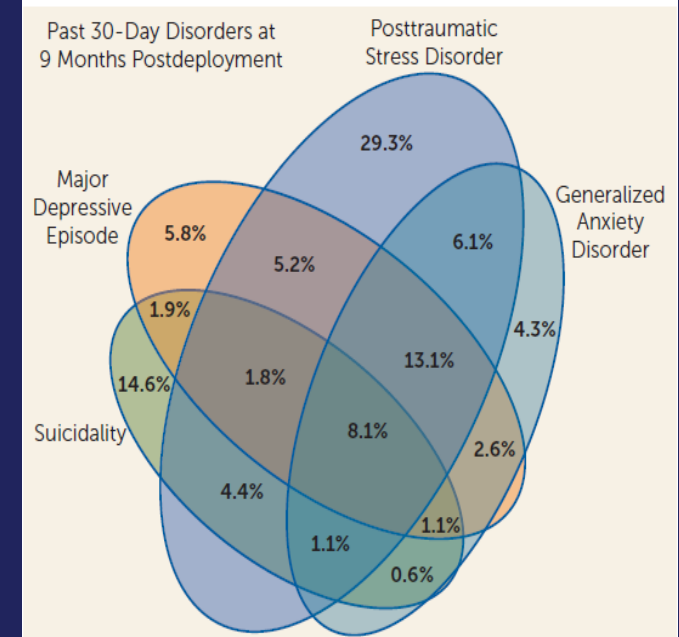
At 3 months post-deployment:

- **Deployment-acquired TBI was strongly associated with increased odds of past-30-day PTSD (AOR= 1.81)**
- **Deployment-acquired TBI was associated with risk of past-30-day major depressive episode (AOR=1.45) and generalized anxiety disorder (AOR=1.81)**
- The association between deployment-acquired TBI and past-30-day suicidality did not reach the threshold for statistical significance (AOR=1.39)

At 9 months post-deployment:

- **Deployment-acquired TBI was strongly associated with increased odds of past-30-day PTSD (AOR=1.48)**
- **Deployment-acquired TBI was associated with risk of past-30-day generalized anxiety disorder (AOR=1.81)**

FIGURE 2. Comorbidity of Disorders Among Soldiers Classified at T3 (9 Months Postdeployment) as Experiencing Major Depressive Episode, Posttraumatic Stress Disorder, Generalized Anxiety Disorder, or Suicidality in the Past 30 Days^a

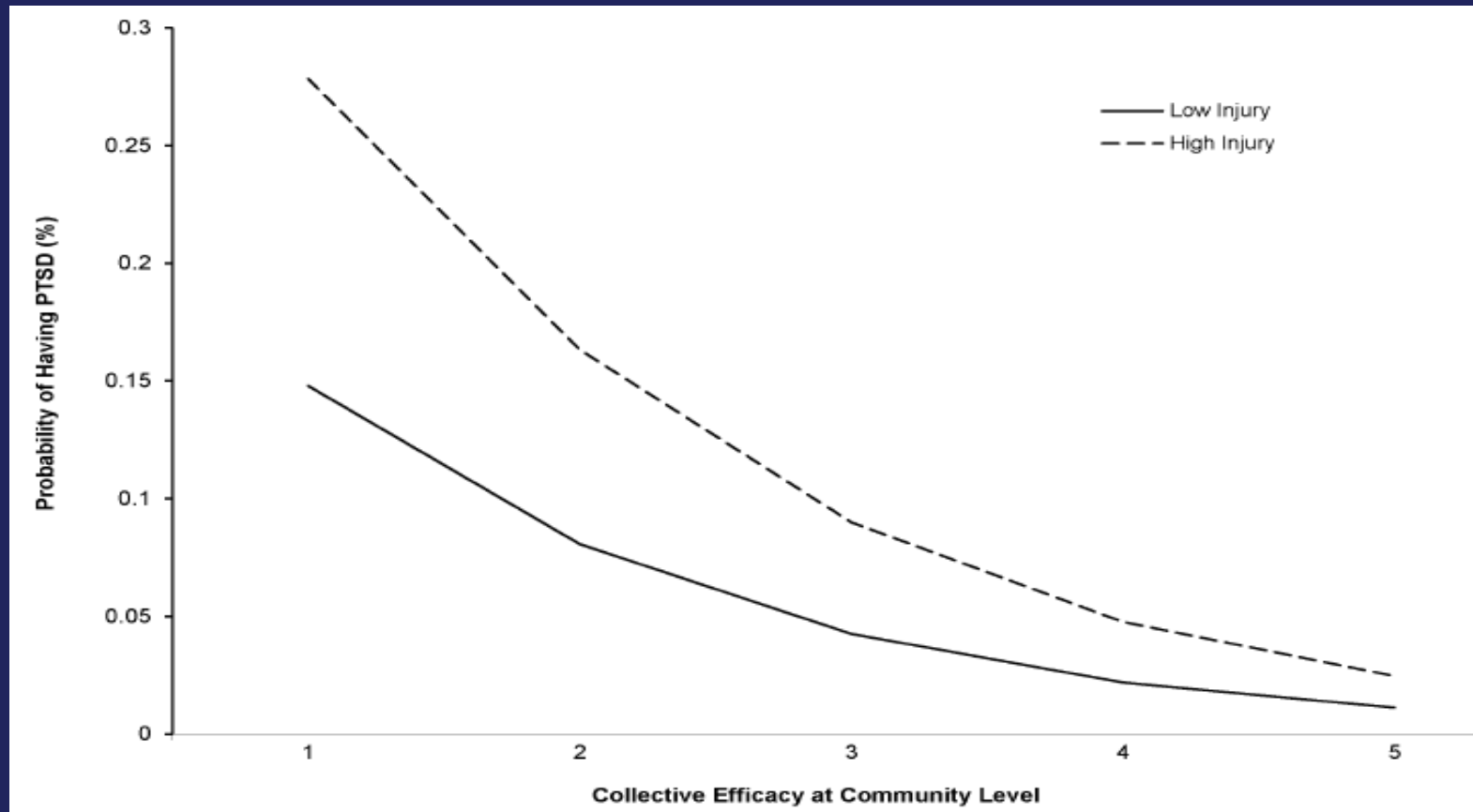


^a Prevalence of any of these four outcomes at T3 was 16.8%.

Treatment : Across The Domains of Illness

	PTSD	MI	Mult.Scler	Back Pain
Disorder	The Glue Self Repair	ICU		
Symptoms	Withdawal Nightmares	Nitroglycerin		
Impairment Of Function	Marital Job	Walker Job Couns.		
Disability	Job “phobic”	Lg Trm Plan and Asst		
Co-Morbid Conditions	Depression Subst Abuse	Hypertension Hyper chol.		
Trajectory- Prev of Relapse/Chro	Acute, Chronic, Delayed Recovering	Life Style Changes (smoking)		

So What else helps? Collective Efficacy & Probability of PTSD



Haddon Matrix

Motor Vehicle Accidents

Not Applicable	Human	Vehicle/ Equipment	Physical Environment	Socioeconomic
Pre-Crash	Poor vision or reaction time, alcohol, speeding, risk taking	Failed brakes, missing lights, lack of warning systems	Narrow shoulders, ill-timed signals	Cultural norms permitting speeding, red light running, DUI
Crash	Failure to use occupant restraints	Malfunctioning safety belts, poorly engineered air bags	Poorly designed guardrails	Lack of vehicle design regulations
Post-Crash	High susceptibility, alcohol	Poorly designed fuel tanks	Poor emergency communication systems	Lack of support for EMS and trauma systems

Haddon Matrix

	Agent: Malaria	Vector: Mosquito	Population: Person
Pre			
During			
Post			

Psychological and Behavioral Intervention Matrix (Bio)

	Agent: Anthrax/Terror	Vector: Terror/Mail	Population: Person
Pre	-Premedication -vaccination -Air detection sys	-Airport Screening	Preparedness Behaviors -Participation in Vaccination -Information/plan.
During	-Specific medication rx -supportive rx -Masks/Cover	-Security -Detectors	Disaster Behaviors: -Quarantine -Evacuation -Grief Leadership
Post	-rehabilitation	-Justice system	Response/Recovery Behaviors -Help seeking -Specific Rx's

Psychological and Behavioral Intervention Matrix (WTC)

	Agent: Blast/Terror	Vector: Terrst /Truck	Population: Person
Pre	-Modify Building design	-Airport Screening	Preparedness Behaviors -Risk Assessment -Information/plan.
During	-Sprinkler system -Firefighter Response	-Harden CP Door -Passenger active coping	Disaster Behaviors: -Escape/Rescue -Evacuation
Post	-Emergency Response System	-Justice system	Response/Recovery Behaviors -Specific Rx's -Screening -Parent-Teacher Ed

Psychological First Aid

Fostering Resilience and recovery

- Safety - be safe, feel safe
- Calming – rest, relax, sleep
- Efficacy – skills and confidence
- Connectedness – social support
emotional and instrumental
- Hope - optimism

Can we predict.....plan for..
model..intervene..prevent,
modify, alter

who, what, when, where

BACK-UP

Time to recover –data: prior to and after disaster work

Table 2. Time to recover: Relationship of demographic characteristics and predisaster factors^a

Risk factors	Univariate		Multivariate ^b	
	OR	CI	OR	CI
Demographics^{c, d}				
Age	1.02	1.00-1.04		
Gender	1.51	.87-2.65		
Race	1.03	.60-1.78		
Marital status	.98	.89-1.08		
Parental status	1.08	.71-1.65		
Work/trauma history				
Years in present job ^e	1.02	.99-1.05		
Prior disaster work ^e	1.57	.94-2.64		
Past trauma history ^d	1.63*	1.07-2.48	1.03	.60-1.77
Social support^d				
Can rely on spouse, friends, family	.68***	.57-.81	.74**	.60-.92
Can rely on supervisor	.90	.77-1.06		
Can rely on coworkers	.83	.67-1.03		
Response to prior hurricanes^f				
Time to recover ^d	5.98***	3.80-9.42	5.22***	3.01-9.08
Lower work productivity ^d	3.03***	1.88-4.89	1.98*	1.08-3.61
Disaster exposure^{e, g}				
Personal injury/damage	2.95***	1.90-4.59	3.08***	1.70-5.58
Neighborhood damage	2.08*	1.17-3.71	1.60	.77-3.36
Initial emotional response ^e	2.27***	1.85-2.78	1.71***	1.34-2.19

significant in any model. The AUC of the final model was 0.84. Using predicted probabilities from this model, the 5% of participants with the highest predicted risk of greater time to recover included 21.5% of participants with longer time to recover (2-3 mo or longer; ie, sensitivity of 21.5%), with a specificity of 98.5% and PPV of 74.1% at that threshold. Among the 10% of partic-

Mash HBH, Fullerton CS, Ursano RJ
Responding to repeated
disasters: time to recovery s.
Disaster Med Public Health
Prep. June 30 2022

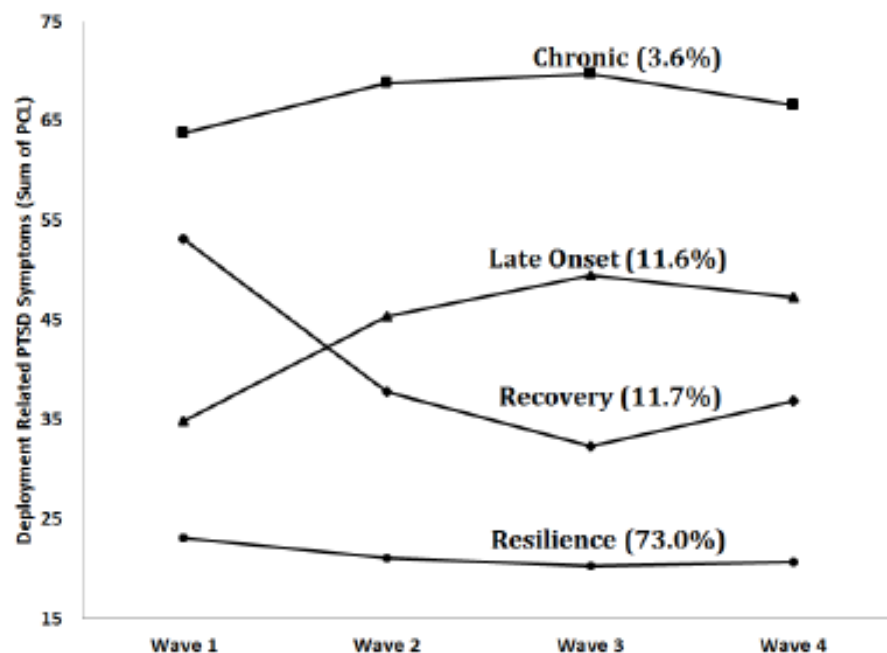
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Trajectory of PTSD & SI-Risk among reserve soldiers

PTSD Trajectories of Deployment
traumatic event exposure

Figure 1. The Four Trajectories of PTSD Symptoms Related to Recent Deployment across Four Annual Waves



Note. PTSD symptoms relating to most recent deployment were assessed in four annual waves beginning with January to July of 2010.

% Suicide ID

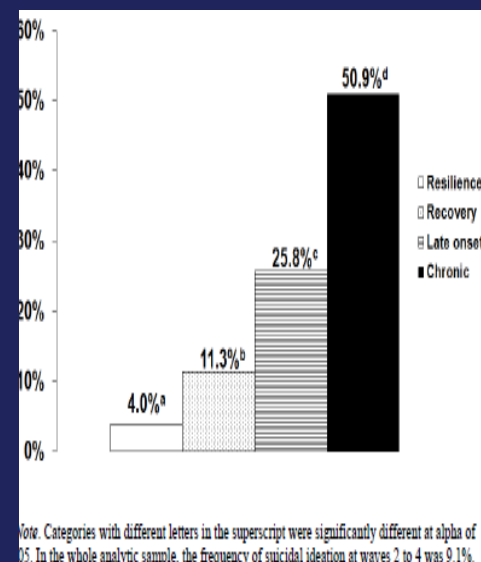


TABLE 3. Multivariate associations of psychiatric diagnosis and health care factors in active-duty U.S. Army soldiers with documented suicide attempt within 30 days after initial suicidal ideation, 2006–2009^a

Characteristic	χ^2	Odds Ratio	95% CI
Sociodemographic characteristics			
Gender	4.64*		
Male		1.0	
Female		1.3*	1.0, 1.8
Current age (years)	2.77		
<21		1.4	0.7, 3.0
21–24		1.4	0.7, 2.7
25–29		1.5	0.8, 2.5
30–34		1.0	
35–39		0.9	0.4, 1.9
≥40		1.2	0.5, 3.3
Race/ethnicity	9.98*		
White		1.0	
Black		0.6*	0.4, 0.9
Hispanic		1.2	0.8, 1.6
Other		0.6	0.4, 1.2
Education	1.64		
Less than high school		1.1	0.9, 1.4
High school		1.0	
Some college		1.3	0.7, 2.6
College or more		1.2	0.5, 2.8
Marital status	3.47		
Never married		1.0	
Currently married		1.2	1.0, 1.6
Previously married		1.3	0.6, 2.7
Service-related characteristics			
Age at Army entry (years)	1.05		
<21		1.2	0.8, 1.6
21–24		1.0	
≥25		1.1	0.7, 1.8
Time in service (years)	0.95		
1–2		1.1	0.6, 2.0
3–4		1.1	0.7, 1.6
5–10		1.0	
>10		0.7	0.3, 1.6
Deployment status	0.22		
Never		1.0	
Currently		0.9	0.6, 1.4
Previously		1.0	0.7, 1.4
Demotion	0.32		
Past year		0.9	0.5, 1.4
Before past year		1.0	0.6, 1.6
Never demoted		1.0	
Delayed promotion	3.18		
On schedule		1.0	
Late: ≤2 months		1.2	0.7, 2.2
Late: >2 months		0.8	0.5, 1.3
Not relevant due to rank ^b		0.7	0.4, 1.2
Military occupational specialty	6.41*		
Combat arms ^c		1.1	0.8, 1.4
Combat medic		1.6*	1.1, 2.2
Other specialty		1.0	
Psychiatric diagnoses			
Anxiety disorder (day of suicidal ideation)	6.67*		
Yes		0.7*	0.5, 0.9
No		1.0	

TABLE 3, continued

Characteristic	χ^2	Odds Ratio	95% CI
Anxiety disorder (prior to suicidal ideation)	5.16*		
Yes		1.3*	1.0, 1.6
No		1.0	
Sleep disorder (day of suicidal ideation)	5.47*		
Yes		2.3*	1.1, 4.6
No		1.0	
Physical health care and injury visits			
Recency of injury visit (outpatient)	6.56		
1 month		1.4*	1.0, 1.9
2 months		0.9	0.6, 1.4
≥3 months		1.2	0.9, 1.6
No injury-related visit		1.0	

^a All variables that were significant in separate multivariate models that adjusted for sociodemographic (gender, current age, race, education, and marital status) and service-related characteristics (age at entry into Army service, time in service, deployment status, delayed promotion, demotion, and military occupation) were examined together in a final multivariate model.

^b Soldiers above the rank of E4 are not promoted on a set schedule.

^c Combat arms includes combat arms and Special Forces soldiers.

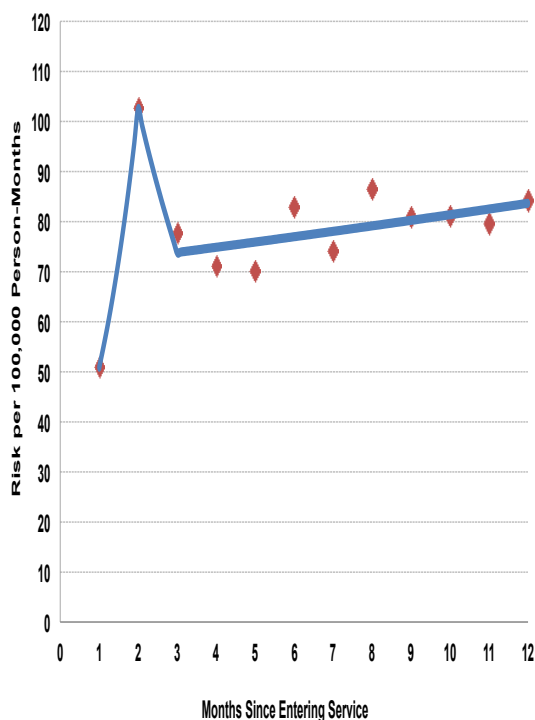
* $p < 0.05$.

SA among first SI

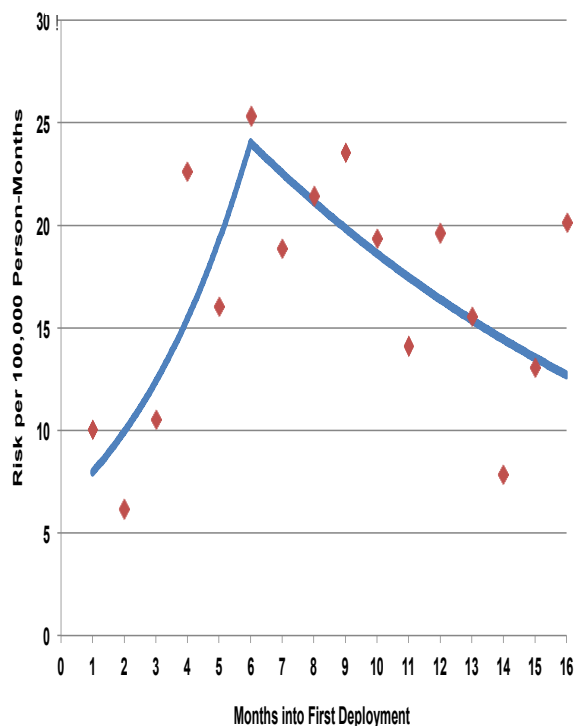
Suicide Attempt Risk among Enlisted Soldiers by Deployment Status (HADS 2004-2009)

◆ Hazard Rates — Spline Model

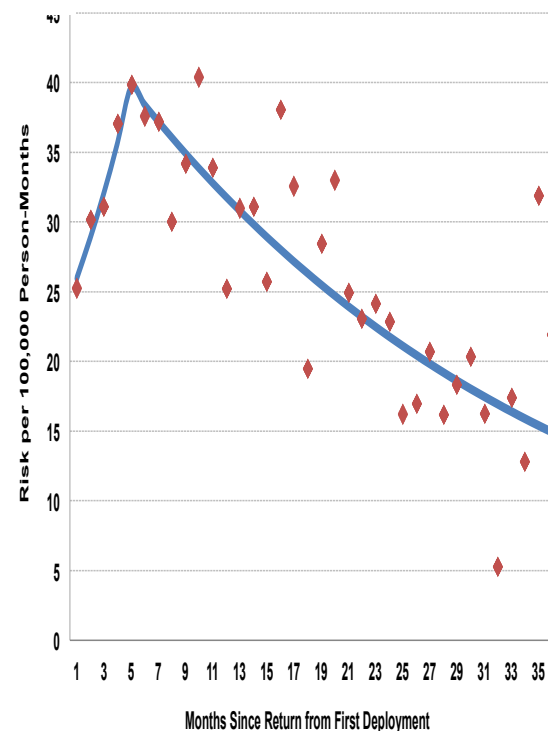
Never Deployed Soldiers in Their First Year of Service



Currently Deployed Soldiers on Their First Deployment



Previously Deployed Soldiers After Their First Deployment



Ursano et al. (2015). *JAMA Psychiatry*



National Institute of Mental Health



UC San Diego
SCHOOL OF MEDICINE



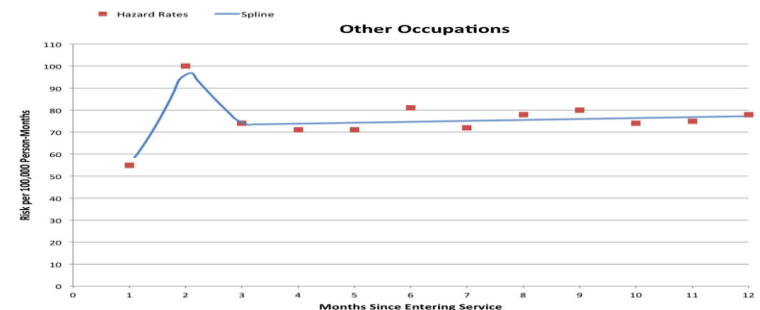
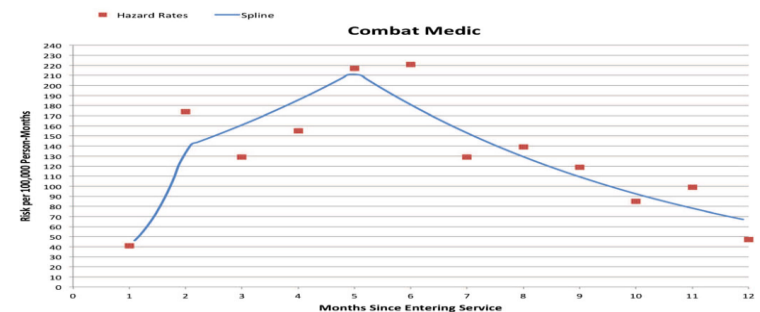
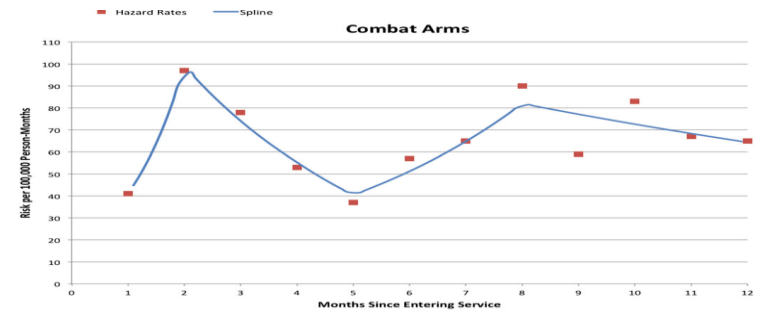
Suicide Attempt (S.A.) Risk: Combat Arms, Special Forces & Combat Medics (HADS 2004-2009)

Overall: Combat Arms & Combat Medics had higher odds of S.A. (1.2, 1.4), & Special Forces had lower odds (0.3), than other MOSs. MOS associated with S.A. in first 10 years of service, but not beyond.

First year of service: Combat Medics had higher odds of S.A. than Combat Arms & other occupations.

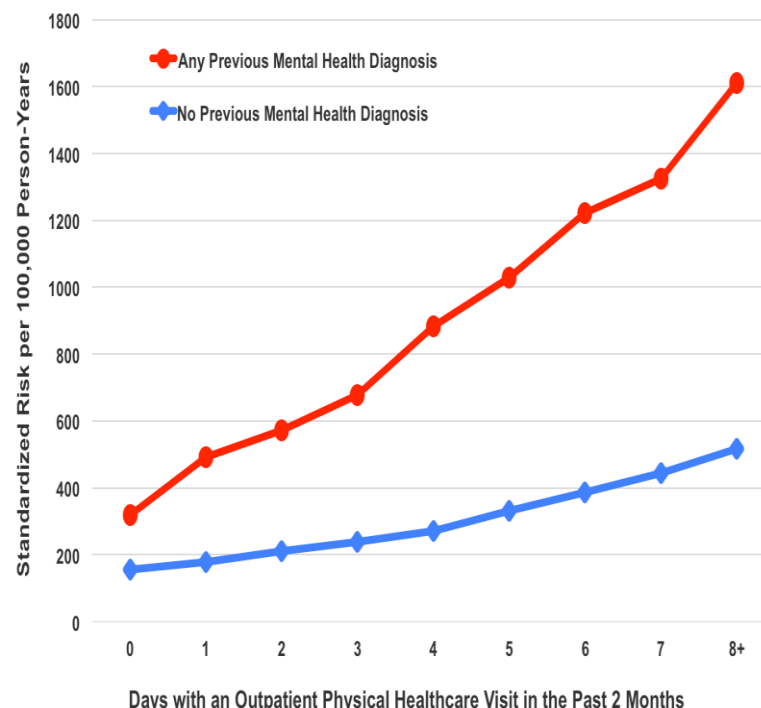
Deployment: Combat Arms & Combat Medics had higher odds of S.A. than other occupations among those never deployed and those previously deployed. Combat Medics also had higher odds of S.A. among deployed.

Military occupation can inform the understanding of S.A. risk.



Ursano, et al. (2017) *BMC Psychiatry*

- Active-duty Regular Army enlisted w/medically documented S.A. (n=9,650) & controls (n=153,528)
- 36.3% (n=3,507) w/S.A. no prior mental health dx
- Those w/out previous dx: highest odds of S.A.= females, < H.S. education, 1st yr service, previously deployed, promotion delayed 2 months or less, past-yr demotion, 8+ outpt physical health care visits last 2 months, past-month injury-related outpt & inpt health care visit, prior combat injury, minor violent crime victimization, major violent crime perpetration, family violence
- Most of these variables also associated with S.A. for those w/prior M.H. dx (strength of associations differed)
- S.A. risk for those w/unrecognized M.H. problems: significant & important challenge
- Administrative records from personnel, medical, legal, and family services systems can assist in identifying those at risk



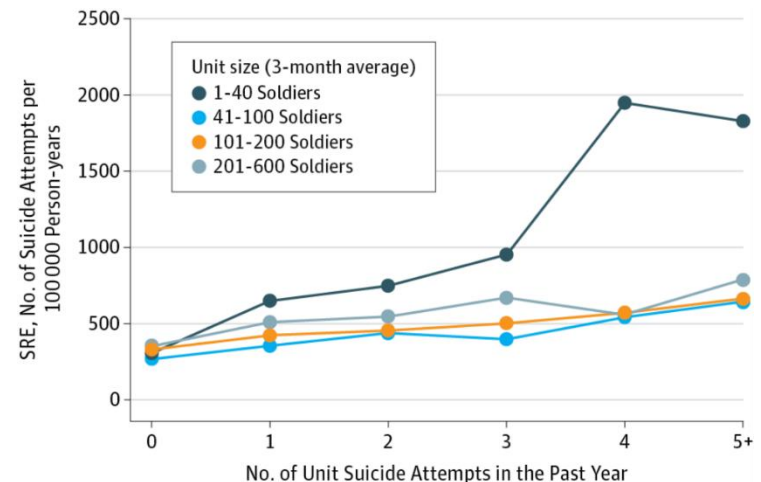
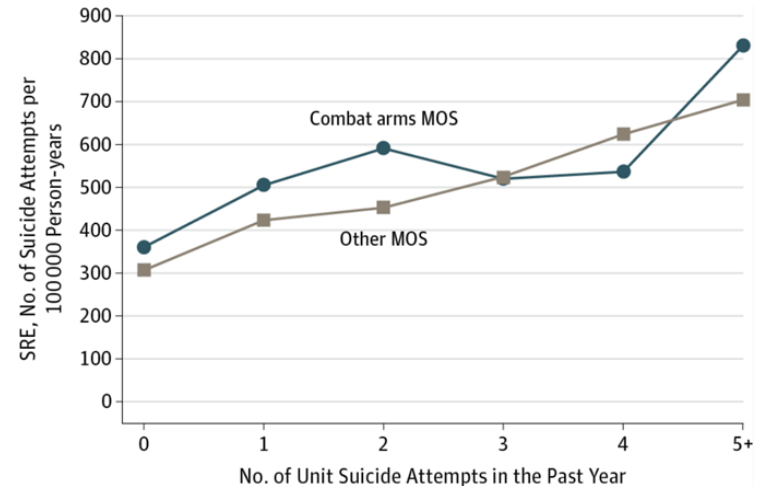
Risk of Suicide Attempt (SA) among Soldiers in Army Units with a History of Suicide Attempts (HADS 2004-2009)

- SA risk increased if 1 S.A. in unit in past yr
- Odds increased with # of SAs in unit (OR=1.4 with 1 SA; OR=2.3 with 5+ SAs)
- Association true in combat arms & other MOS
- Highest risk in small units (1-40 Soldiers)
- If risk reduced to 0 SAs in unit in past yr, number of SAs would decrease 18.2%

Conclusion:

- **Units with a history of SAs are important targets for preventive interventions**

Study included all SAs in enlisted Regular Army Soldiers 2004-2009 (n=9,650) and an equal-probability sample of control person-months (n=153,528)

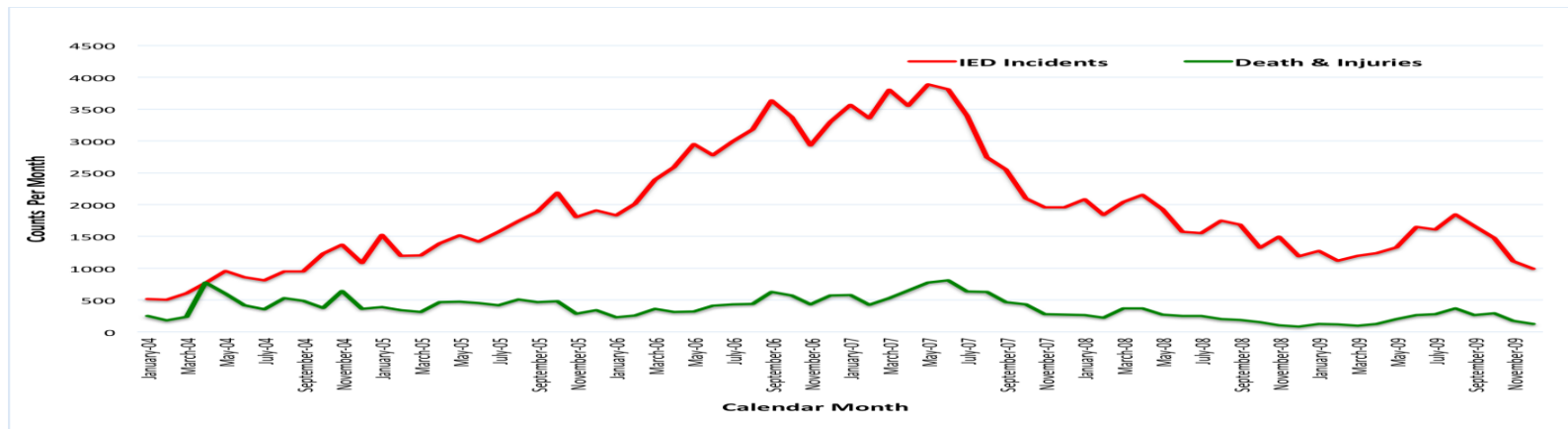


Ursano, et al. (2017) *JAMA Psychiatry*

Frequency of IEDs & Suicide Attempts (HADS 2004-2009)

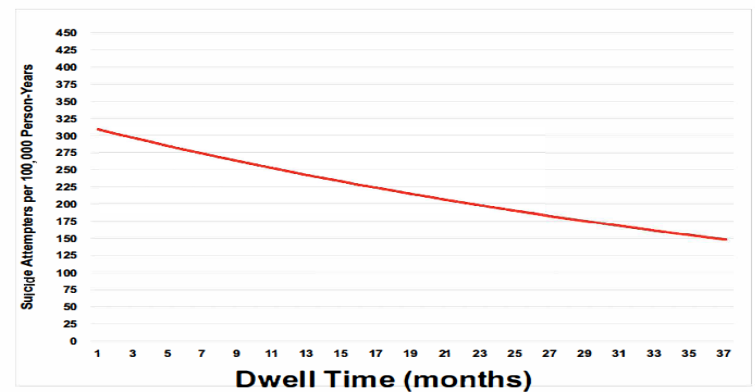
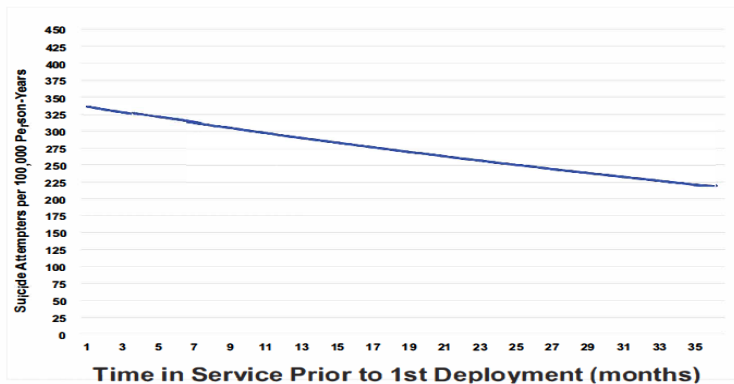
BLUF: Threat of new weapons may increase stress burden as measured by suicide attempt rate among Soldiers. Targeting risk perception & perceived preparedness, particularly early in a Soldier's career, may improve psychological resilience & reduce suicide risk.

- Examined association of monthly IED rates with suicide attempt risk in deployed & non-deployed for all active duty Regular Army suicide attempters (n=9,791) & equal-probability sample of control person-months (n=183,826).
- Soldiers' suicide attempt risk increased with increasing numbers of IEDs.
- **Suicide attempt was 26% more likely for each 1,000 IED increase in monthly frequency.**
- **Association of IED frequency with suicide attempt was greater for Soldiers in first 2 years of service than for those with 3+ years of service.**
- **Among Soldiers in 1st two years of service, association was constant for all 3 deployment statuses.**
- **Among Soldiers with 3+ years of service, association was higher for those never deployed & currently deployed, than for those previously deployed.**



Ursano, et al. (2017) *Military Med*

- N=593 SA cases, N=19,034 controls (HADS)
- **Suicide attempt risk during or after 2nd deployment was higher:**
 - deployed within 1st 12 mos of service (OR=2.0)
 - dwell time of 6 months or less (OR=1.6)
- **Time in service prior to 1st deployment & dwell time are modifiable risk factors for suicide attempt risk among Soldiers**



And remember to get out of the box...

Who will be a terrorist?

Where will refugees go?

Who is at risk of suicide among our drone fliers? Our security analysts

What are the phases of unit cohesion reformation after casualties?

Which SOF soldiers are most resilient?

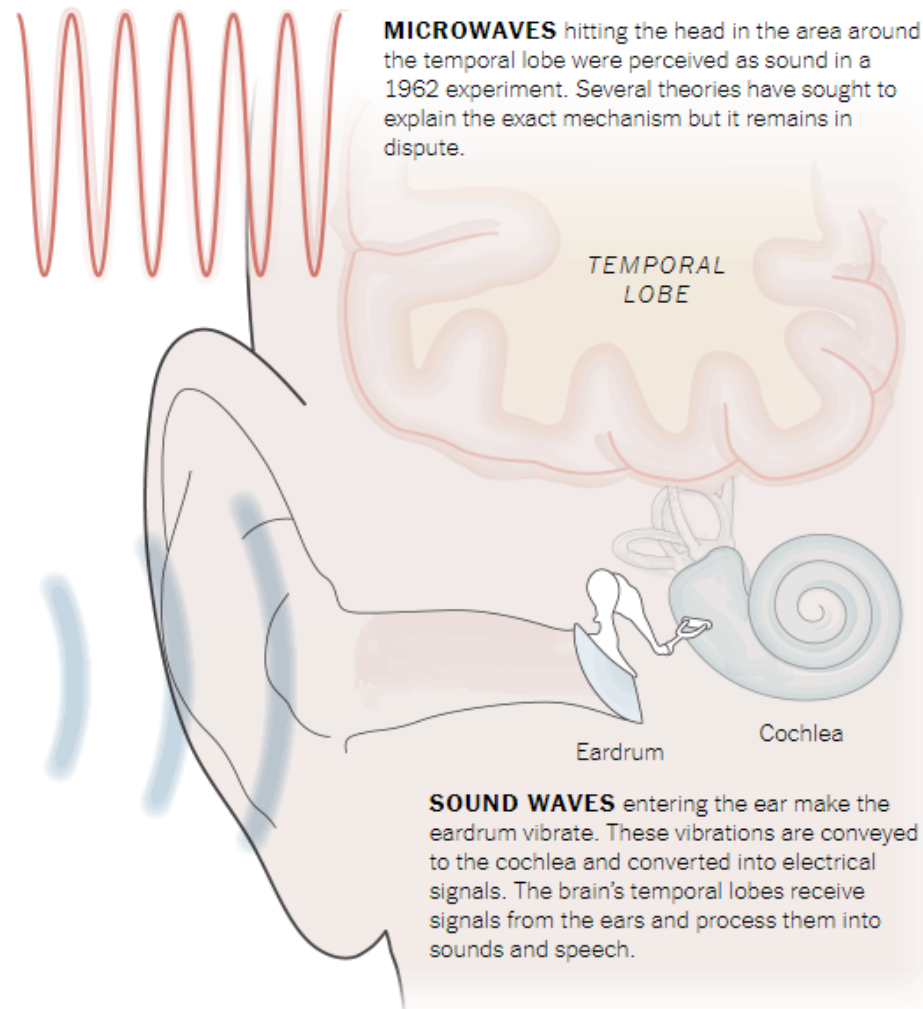
Which soldier families will have child maltreatment after deployment?

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Hearing Microwaves

Scientists have known for decades that the brain can perceive some microwaves as sound.



By The New York Times | Sources: Allan H. Frey; Centers for Disease Control and Prevention

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Services
University

Broad W (2018). Microwave Weapons Are Prime Suspect in Ills of U.S. Embassy Workers. *The New York Times*.

Other Trauma-Related Disorders

- Traumatic grief
- Unexplained somatic symptoms
(MUPS/MIPS)
- Depression
- Sleep disturbances
- Increased use of alcohol and
cigarettes
- Increased family violence and conflict

Estimated Mental Health Needs in NY State after Sept 11

Expos Group (pop)	% PTSD	# Cases	% Seek	# Trt
WTC (162,715)	25%	41,562	50 %	20,615
Manhattan (919,000)	10%	91,900	28 %	20,586
All 5 NYC Bur. (6.92 mil)	5%	346,328	28 %	77,577
Surr. 10 cnties(4.8mil)	1%	48,000	28 %	10,752
TOTAL	4.5 %	527,790	24.5%	129,530

War, Terrorism and Disaster Behaviors

- Preparedness Behaviors (family locator plan, masks)
- Vaccination Behaviors
- Adherence/Compliance
- Evacuation Behaviors
- Health Risk Behaviors (smoking/substance use/trauma expos)
- Health Practices (seat belts, diet, exercise)
- Performance (workplace)
- Economic Behaviors
- Stigmatization/Fear Generalization

Dimensions of illness and distress that alter behavior and create risk behaviors

- Withdrawal/Isolation
- Loneliness/alienation
- Hopelessness
- Helplessness
- Demoralization
- Optimism
- Efficacy
- Cohesion/cared for/matter
- Tipping Points

Resilience Targets

Optimism

“Recovery Skills”

Self regulation of emotions

Attachment/Social Support

Altruism (?)

Active vs passive responses (instrumental)

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STARRS-LS

Study to Assess Risk and Resilience in Servicemembers - Longitudinal Study

Examples of STARRS Genetic Findings

PTSD

(Duncan, et al. 2017. *Molecular Psychiatry*)

- Largest GWAS ever of PTSD (n=20,070).
- Identified molecular genetic index of risk for PTSD.

Alcohol Use: A Risk for Suicide

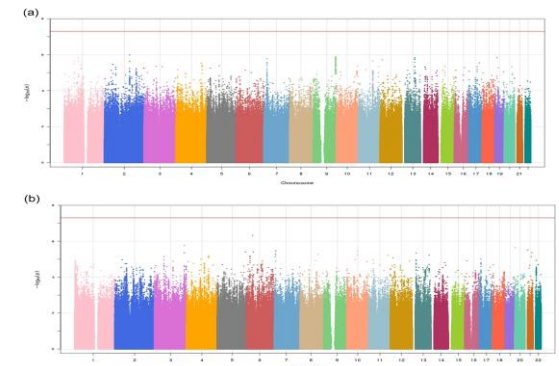
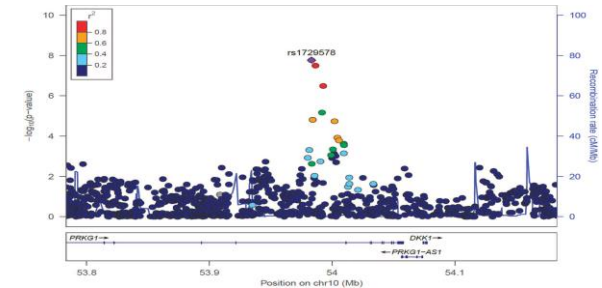
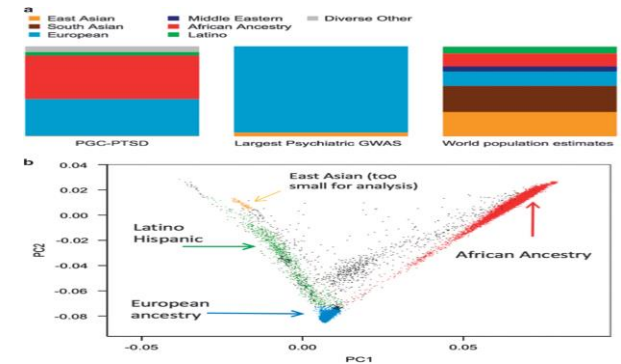
(Polimanti, et al. 2017. *Molecular Psychiatry*)

- Gene-by-environment genome-wide interaction study (GEWIS) of alcohol use problems in two cohorts: Army STARRS (N=16,361) and Yale-Penn (N=8,084).
- 1st GEWIS ever for alcohol misuse risk.
- In African-American subjects: interaction of PRKG1 with trauma exposure in STARRS sample was replicated in Yale-Penn cohort.

Social Anxiety

(Stein, et al. 2017. *American Journal of Medical Genetics*)

- Think thwarted belongingness and burdensomeness: social anxiety?
- 1st GWAS ever of social anxiety to confirm a genetic basis for social anxiety.
- Social anxiety was significantly genetically correlated (negatively) with extraversion but not with neuroticism or anxiety disorder factor score.



8 Army STARRS Studies Completed

1	Historical Admin. Data Study (HADS)	>1.6 million active duty Soldiers from 2004 to 2009 - Integrated >1.1 billion de-identified records (from 38 Army/DoD sources)
2	New Soldier Study (NSS)	55,814 Soldiers participated in survey (at 3 sites) 34,986 Soldiers provided a blood sample
3a	All Army Study (AAS)	32,272 Soldiers participated in survey (at >50 sites CONUS & OCONUS)
3b	AAS In-Theater (in Kuwait)	“Outbound” & “inbound” Soldiers during R&R processing in Kuwait 8,938 Soldiers participated in survey
4	Pre/Post Deployment Study (PPDS)	Longitudinal study with 4 waves of data collection (4 time-points) at 3 sites 1 mo pre-deployment (T0): 9,488 Soldiers participated; 8,090 gave blood 1 mo post-deployment (T1): 10,116 Soldiers participated; 8,822 gave blood 3 mos post-deployment (T2): 9,193 Soldiers participated 9 mos post-deployment (T3): 6,977 Soldiers participated
5	SHOS-A (case-control)	- Interviewed in-patient suicide attempters (cases) at 5 sites & controls 561 Soldiers enrolled (186 cases, 375 controls) & 296 blood samples
6	SHOS-B (case-control)	- Interviewed Army supervisors & next-of-kin of suicide cases & controls 603 interviews completed for 150 cases & 276 controls
7	Criminal Investigation Division Study (CID)	- Systematic review & abstraction of Army death reports from 2005 to 2009 - Reviewed, abstracted, thematically-coded 1,311 CID case files
8	Clinical Reappraisal Study (CRS)	- To calibrate clinical survey measures used in AAS and NSS - Conducted clinical interviews with 460 Soldiers



Study to Assess Risk and Resilience in Servicemembers - Longitudinal Study

Army STARRS Data Collection Summary: Soldiers, Surveys, Biosamples

**For Studies with Data Collection from Soldiers
(HADS, CID, CRS not included)**

Studies		Number of Soldiers Who Participated*	Number of Surveys Collected	Number of Biosamples		
				Soldiers Who Provided Blood	Blood Tubes Collected	Vials in Frozen Storage
Cohort Studies						
NSS (2 survey sessions/Soldier)		55,814	111,628	34,986	34,986	37,477
AAS (including Guard & Reserve)		32,272	32,272	-	-	-
AAS in-theater (Kuwait)		8,938	8,938	-	-	-
PPDS	Pre-deployment Time 0	10,116	9,488	8,090	23,791	53,966
	Post-deployment Time 1		10,116	8,822	17,542	55,136
	Post-deployment Time 2		9,193	-	-	-
	Post-deployment Time 3		6,977	-	-	-
Total Participants in Cohort Studies		107,140				
Case-Control Studies						
SHOS-A		186	756	296	592	873
SHOS-B		150	603	-	-	-
Total for All Studies		107,476	189,971	52,194	76,911	147,452

*Participation is defined as starting a survey. For SHOS-A and SHOS-B, number of participants includes only cases (because controls are already counted in AAS) but number of surveys includes cases and controls. For SHOS-B cases (deceased) and controls (living), surveys were administered to Army supervisors and/or next-of-kin.

NOTE: NSS blood collection started 6 months after data collection began and about 80% of Soldiers who were asked gave blood.

